TRUST, COMMUNICATION AND EQULIBRIUM BEHAVIOUR IN PUBLIC GOODS GAME: A CROSS-COUNTRY EXPERIMENTAL STUDY

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ABSTRACT. This paper reports a novel cross-cultural public goods game experiment played in real time through Internet. Web-based software was used to compare the contributions to public good of different groups of participants: mixed, consisting of both Italians (students in law and economics) and Russians (students in economics), as well as all-Italian and all-Russian groups. This setup allows for testing for a number of effects, including participants' awareness of the group composition in terms of nationality and gender of group members; possibility of coordination of one's strategy during a cheap talk session organized before some of the games was used as an additional control. Our results show that the degree of cooperation is rather high, but does not vary significantly with nationalities of the group members, while communication tends to enhance contributions to public goods. A notable difference between the subjects representing the two nations is an overly strong and increasing cooperativeness of the Russian female participants in contrast to that of the Russian men, as well as the Italians.

1. INTRODUCTION

Experimental data convincingly show that individual behaviour frequently departs from the benchmark model of a selfish economic man. Yet the exact boundaries of selfishness, as well as the institutional or cultural determinants of selfish vs. cooperative behaviour remain at large unexplored - as John Ledyard concisely put it, "the debate has been long-standing with much heat and little light" (Ledyard, 1995, p.121). This paper contributes to that research using new technology of cross-cultural experimentation in the framework of the public goods game.

Cultural anthropologists and psychologists have a long tradition of such experiments, dating back to early XXth century. Economists began a systematic exploration of country effects only in the last couple of decades. Perhaps the first and most important lesson of these experiments was that people's behaviour tends to be fundamentally uniform across countries, nations and continents. In other words, the fundamental principles of rationality for the Americans are the same as for the Chinese Kahelmeier and Shehata (1992), Slovenians, Israeli, or Japanese (Roth e.a., 1991), Indonesians (Cameron, 1999) or Russians (Belianin, 1998). Nevertheless there exist symptomatic differences among people with different socio-cultural background, e.g. different attitudes towards risk, reciprocity or confidence

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(Camerer, 1995). The most ambitious of these works (Henrich e.a., 2001) consists of 15 field studies of several games, such as ultimatum or public goods provision, played mostly in remote areas with illiterate subjects.

This last example is rather specific; most of modern experiments are played in computer classes. At the same time, cross-country coordination remains 'remote' in the sense that comparability is ensured by the uniformity of experimental technique and design alone, which still leave some room for procedural diversity beyond experimenter's control. Modern technologies, first of all the Internet, provide experimentalists with new experimental methods and tools. An experimental software developed at one of our universities, (International College of Economics and Finance (ICEF) of Higher School of Economics) allows for not just cross-country comparison, but helps us to bring together people from different countries in a single 'virtual' experimental laboratory. The present paper reports the first results of such an experiment - the public goods game, played by the students from Italy (Università del Piemonte Orientale (University of Eastern Piedmont) in Alessandria), and Russia (ICEF, Higher School of Economics, Moscow).

The paper is organized as follows. Section 2 describes the public goods game and summarizes recent results obtained by numerous researchers in this area. Section 3 presents our experimental design, and the next section 4 summarized its results. The final section summarizes our findings.

2. The public goods game: experimental evidence

The public goods (PG) game has been introduced in modern experimental economics by Marvell and Ames (1979), Isaac e.a. (1984), Kim and Walker (1984) and others. The simplest, linear PG voluntary contributions game is conducted in groups of $n \geq 2$ players endowed with w experimental currency units (points) each. The game consists of a number of periods, in which every player i independently of the others bid any integer amount $c_i, 0 \geq c_i \geq w$ she wishes to the public account, and retains the rest $(w - c_i)$. Each retained point contributes one to the final utility of that *individual*, while each unit deposited on public account is an increasing linear function of the number of points deposited by the *entire group*, $k \cdot \sum_i c_i = \alpha \bar{c}$, where $\bar{c} = \frac{\sum_i c_i}{n}$ is average contribution of the group and $\alpha = kn, k < 1 < kn$. Possible revenues from the public account are collected in a special table showing the worth of public good for any amount of points contributed by group; this table is made available to the individuals. Given the contributions vector $\mathbf{c}$, total utility of every individual is

$$(1) \qquad\qquad v_i(\mathbf{c}) = w - c_i + \alpha \bar{c}$$

Since $1 < kn$, the efficient outcome is to contribute everything to public account. However, $k < 1$ implies that the game has a prisoner dilemma structure, and any individual is better-off depositing nothing on that account in a single-period version of this game. This result extends to any finitely repeated game, where backward induction stipulates non-cooperative behaviour at every stage game, which is the only subgame-perfect solution[1].

This prediction of the standard theory, however, is not supported by the empirical evidence. A typical pattern from the very first experimental observations is

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[1]Infinitely repeated version of the game admits other solutions via the Folk theorem.

the that the average initial bid is about 50%, but gradually decreases with replications. Further robust effects include increase of contribution with higher return from public good and communication between subjects, and decrease of contributions with repetitions within the same group, experience in different groups and training in economics (Ledyard, 1995). Similar trends were observed in other versions of this game, such as the threshold condition, where the (discrete) public good is not created unless the sum of contributions $\sum_i c_i$ reaches a predetermined threshold $\hat{c}$; or common pool resource (Henrich e.a., 2001): instead of contributing to public good, each of n individuals can independently withdraw up to V/n from the common pool of resources worth V points. Among less common examples, it is worth citing a challenging experiment by Keser (2000): her experiment consisted of three computer simulations of a PG game using strategies solicited from established academics all over the world. 'Human' subjects had a chance to revise their strategies after each simulation. Despite the game structure implied nonzero equilibrium contributions, the initial contributions were again above equilibrium, with uniform decrease to the equilibrium level at the end.

Many researchers have investigated the effects of experimental environment and design in the PG game. Croson and Marx (2001) observed significant effect of the recommended amount to contribute on actual contribution, which implies that these can be affected by exogenous non-obligatory signals. Further evidence confirming that publicly observed information can affect bidding behaviour was obtained by Moxnes and van der Heijden (2000) who played a public bad game with a publicly known leader. Van Dijk e.a. (1996) observe higher social ties as a result of successful cooperation. Earlier, Isaac e.a. (1988) found significant increase of contribution as a function of nonbinding communications (cheap-talks); symptomatically enough, communication seems to enhance cooperation with repetitions, unlike the benchmark case.

Andeoni (1988), Palfrey and Prisbrey (1996) and Keser and van Winden (2000) showed that a similar effect can result simply from group member familiarity. Their studies compare the standard PG design (e.g. five groups of four subjects in each, or *partners*, played 25 rounds of the game) with the one where the same 20 individuals were re-matched in five groups of equal size in each of the 25 rounds, so that the opponents were (*strangers*). Evidence here is nonconclusive: Andreoni and Palfrey and Prisbrey discover that partners contribute less than strangers, while Keser and van Winden's findings were the opposite, supporting the cooperation hypothesis even without the opportunity of communication. Coricellia e.a. (2003) observed yet higher cooperation when individuals are allowed to participate in partners' preselection. Fehr and Gächter (2000) showed that contribution increases substantially in both partner and stranger conditions provided the subjects *ex ante* know they can penalize non-contributors at a private cost. Finally, Rege and Telle (2003) observe systematic increase in contribution in an experiment in Norway when, unlike the standard setup, each person's contribution is revealed to all participants.

Several explanations to high cooperation have been proposed in the literature. One of these attributes this phenomenon to *mistakes* made by limitedly rational individuals whose behaviour will tend to the Nash equilibria as they become more experienced (Anderson e.a., 1998). Another explanation is based on reputation building in the spirit of the 'gang of four' (Kreps e.a., 1982): people who know they play with each other in the same group (as partners) try to build a *reputation* of

being cooperative. Yet another hypothesis is that individuals do care of the others, i.e. reveal pure *altruism* (individual utility increases in well-being of the others), or *warm-glow* (individual utility increases in own contribution, regardless of the utility of the others, which also depends on others' contributions - see Palfrey and Prisbrey, 1997). Goeree e.a. (1999) and Carter e.a. (1992) separate the motive of altruism (care of the others, or *external* motive) from that of increasing return to oneself because of larger income from public account (the *internal* motive) by varying the returns from public account accrued to the contributor and to the other members of the group. Their conclusion was that the actual contribution is well-explained by a mixture of external and internal motives. Ma e.a. (2002) split participants into three groups formed on the ground of their degree of altruism measured by a preliminary psychological test, but found no expected variance in contributions. Finally, Goeree e.a. (1999), Anderson e.a. (1998) and Palfrey and Prisbrey (1997) estimated the probability of contribution as a function of payoffs under various utility specification (linear or Cobb-Douglass) of own and others' earnings, and random mistakes whose probabilities are inversely related to the individual cost of that decision.

Yet another argument is that of *conditional contribution* theory (Levati, 2002), which says that individual contributions tend to the average contribution of the group. This later can be inferred from the payoff table at reasonable effort, which offers a natural benchmark for anyone whose behaviour is not entirely selfish, but guided by the attitude of others. Intuitively, one would feel it 'uneasy' and even 'ashamed' of behaving in a way that goes at odd with what the others do. An interesting demonstration of mutual dependence of contribution decision is obtained by Levati and Neugebauer (2001) who used ascending clock (English auction) mechanism to indicate the amount the subjects want to contribute. Cooperation tends to be more uniform in case of observable contributions, which fact itself may not depend on the clock. Housera and Kurzban (2003) and Potters e.a. (2003) used sequential contributions by forcing the players to make their decisions upon observing moves of the others, and by making the true value of the public good known only to some subjects who may revise their choices. In both cases contributions raised in comparison to the benchmark case.

In recent years, several explanations to high cooperation in PG game were proposed from *evolutionary* perspective. Carpenter (2002) describes actual behaviour through conformity with that of the group as captured by the familiar replicator dynamics of evolutionary game theory; see Clemens and Reichmann (2001) for another application of the same tools. Montoro-Pons and Garcia-Sobrecases (2000) derive the evolution of cooperation from the relative success of the existing strategies and imitation of others' behaviour which evolve according to a variant of fictitious play dynamics. Levati (2002), building on the approach of Güth and Yaari (1992), justifies cooperation as an evolutionary stable strategy in conditional cooperation framework, so that the individual payoff is

$$(2) \qquad\qquad u_i(\mathbf{c}) = v_i(\mathbf{c}) - r_i \max(0, \bar{c} - c_i)$$

Unlike (1), this function also depends on a parameter $r_i \geq 0$ is the regret parameter reflecting psychological pain for contributing less than the average. An important drawback of (2) is that it is never optimal to contribute less than the average, and may be suboptimal to contribute more. In parallel, further and growing body

of explanations derive high cooperation from reciprocity, or fairness considerations (Rabin, 1993), or from inequality aversion (Fehr and Schmidt, 1999).

Despite this abundance of experimental evidence and explanations, cross-country studies of the PG game have so far not been quite abundant, with a notable exception of Henrich e.a. 2001. Our work contributes to that kind of research, which we find worthwhile for at least two reasons. First, the stylized facts obtained in some countries may not hold across different cultures. For instance, Cason e.a. (2003) conducted an ingenious two-stage common pool experiment (inspired by Sajio and Jamato, 1999) in which Japanese subjects at first decided whether they will contribute or not, then learn each others' decisions, and only then decide upon the size of their personal contributions. The authors found the level of cooperation to be rather low and decreasing with time, which fact they attribute to people's *spitefulness* (disappointment of non-cooperativeness of the opponents), and call for "rethinking our fundamental assumptions of human nature" (Cason e.a., 2003, p.18). Before reaching this conclusion, however, it will be interesting to know whether this result might be due to the fact that it has been conducted in Japan - a country of rather idiosyncratic cultural traditions and values[2].

Second, the PG game is a stylized, yet very instructive method to see the extent and possibly also motives for people's cooperation, both within and across countries. The need to study that kind of phenomena became especially apparent with the emergence and expansion of the European Union: how successful will be the cooperation of people representing different nationalities within this new entity? And, within the context of a public goods game, could the subjects grown in a modern market economy find a common ground with the subjects from a transition economy struggling with a long systemic crisis? These questions can be usefully addressed within the frame of our experiment in real time.

3. Experimental design and methods

The experiment consisted of three sessions classical PG voluntary contribution games with $w = 10$ and $k = 1/3$. Two of these were played by the Russians only and the Italians only; these were used as controls for the main cross-cultural session played by mixed Russian-Italian group which convene at the same (real) time in Moscow and Alessandria. Altogether there were 24 participants from both Russian and Italian side. Russian subjects were second- and third-year students of ICEF who specialize in Economics; they played in ICEF computer class. Italians were university students in Law attending different years of the their academic career and just occasional training in economics at an introductory level; they played at the Centro Alex of the Università del Piemonte Orientale. All sessions were conducted using an experimental software developed at ICEF (Moscow) and stored at ICEF local web-server, but available through Internet at a password-protected site (http://mief.hse.ru). The entire experiment was conducted in English, which language was commonly familiar to all subjects.

At the beginning of each session the experimenters on both sides collected the subjects' consent forms and distributed logins and passwords for the participants who used them to log on to the game. The experimenters introduced the participants to the game environment, read aloud the instructions (available in the Appendix), and answered the questions.

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[2]Not to speak of *very* specific institutions of their experimental design!

Table 1. Summary of experimental design

Italian-Russian session (gender identities unknown)

Groups\Treatment	Game 1 (no cheap-talk)	Game 2 (preceded by cheap-talk)
A	Mix males	Italian
B	Mix females	Russian
C	Italian	Mix 1
D	Russian	Mix 2

Single-country sessions (gender identities known)

Game 1	Game 2	Game 3
2 Male-female groups, no cheap talk	2 Male-female groups, preceded by cheap talk	All-male and all-female group, no cheap talk (but 2-games experience)

Each of the three sessions consisted of two or three replicas of the same PG game of 12 rounds in the groups of 6 players according to the rules specified below. For the cross-country experiment we have chosen a block design with several treatment dimensions (see Table 1). The first treatment was country: the subjects in the groups represented either the same country (referred as to Italian or Russian groups) or a mixture of subjects from two countries (referred as to Mix). Subjects were told the nationality of the other players in their group, but not the proportion of Italians or Russians in the Mix group (in reality, the composition was always 50-50). The second treatment was the opportunity of 'cheap talk', which gave the subjects a chance to share their views of the game, and try to coordinate their future actions. This treatment was implemented as follows. The first game in each of the three sessions precluded any form of communication or cheap-talk: subjects were strictly prohibited to reveal their identities or negotiate their strategies, although they might record their choices and scores. After the first game of 12 rounds was over, the subjects were invited to the second game of the same length, but before the game started, they were given a chance to exchange their views in a specially electronic forum integrated into the experimental system. This discussion lasted for 20 minutes, during which the participants were identified by their logins, and explicitly prohibited to reveal their real identities, including nationality. Logs of this cheap-talk session constitutes additional information which sheds some light into how did the players make their decisions.

Finally, we were interested in gender effect, both within and across countries. We expected this effect to be significant regardless of subjects' knowledge of the gender identities of their partners: Holt and Laury (1997, p.213) report that women participants are more often less cooperative than male participants; evidence collected by one of us (Belianin, 1998) suggests that Russian females are systematically more cooperative than Russian males[3]. To test for this effect, we played one more game in both control (Russian only and Italian only) sessions. Both control groups were balanced in terms of gender, consisting of 6 male and 6 female participants each. Accordingly, following the cheap talk game, the whole procedure was was repeated once again again in two groups, one of which consisted of all males, another - of all females; this time without any cheap talk, but with known gender identities. This design is summarized in the bottom part of Table 1. Given that the PG games are shown to be nonsensitive to monetary rewards, we used a nonpecuniar but easily

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[3]Originally we have envisaged a completely randomized block design, however, the last treatment was not completed because of a recruitment problem.
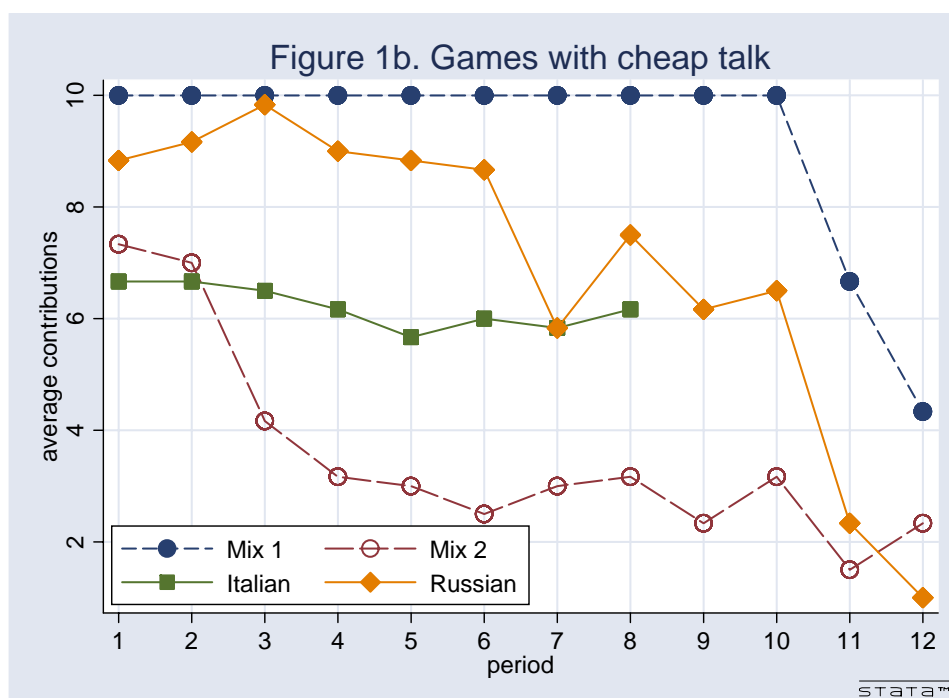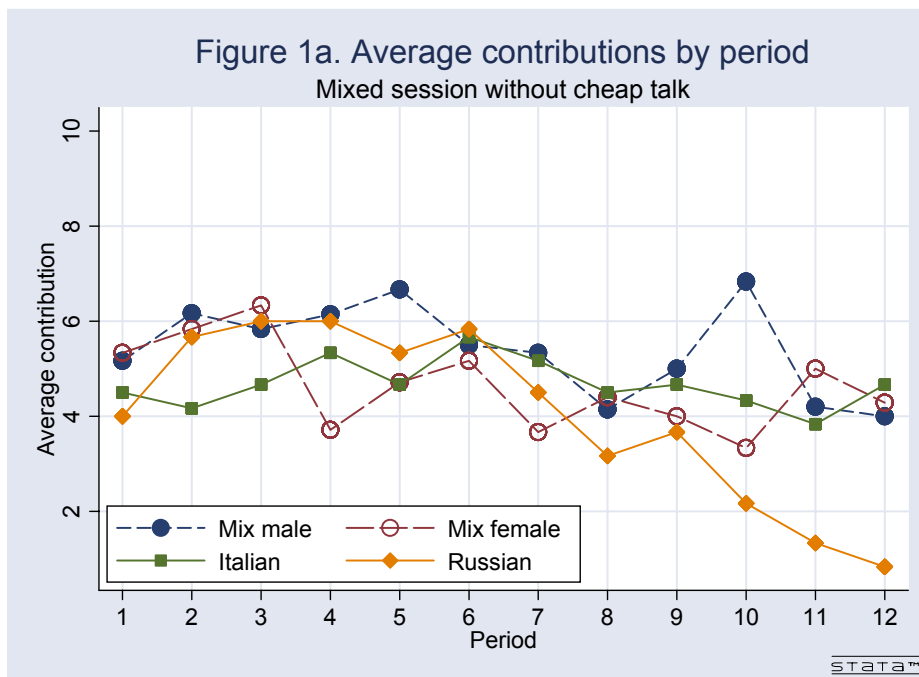
understandable incentive: percentage points to the total mark for the courses taken by the participants. Italian participants were granted additional credits necessary for their academic career on the ground of the score obtained. Russian participants were told that the player who will earn the most in both groups will be entitled for 10% of the total coursemark; the other participants will receive the number of percentage points proportional to their earnings during the experiment.
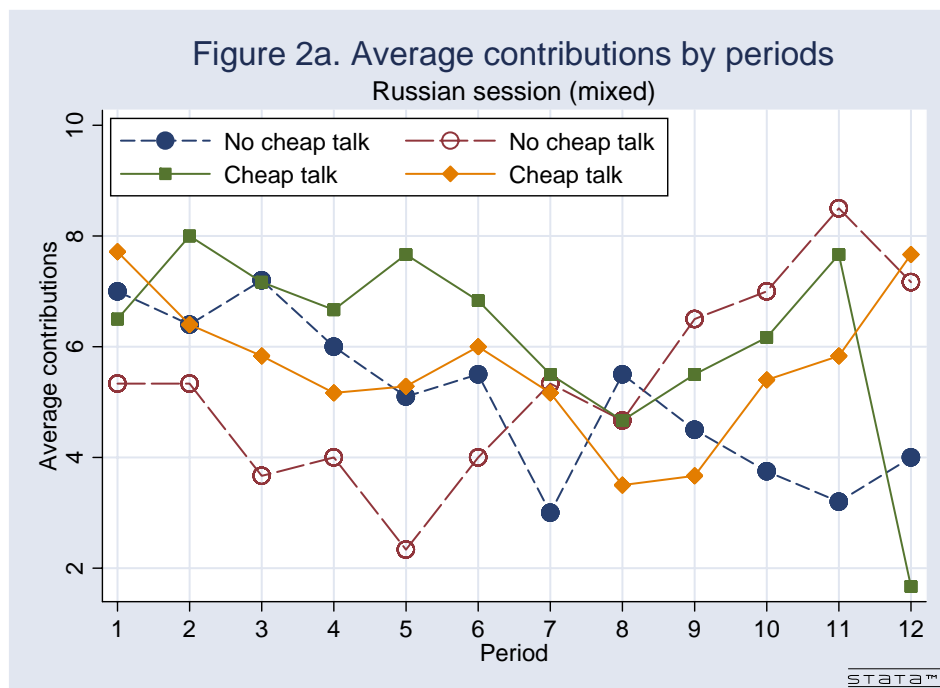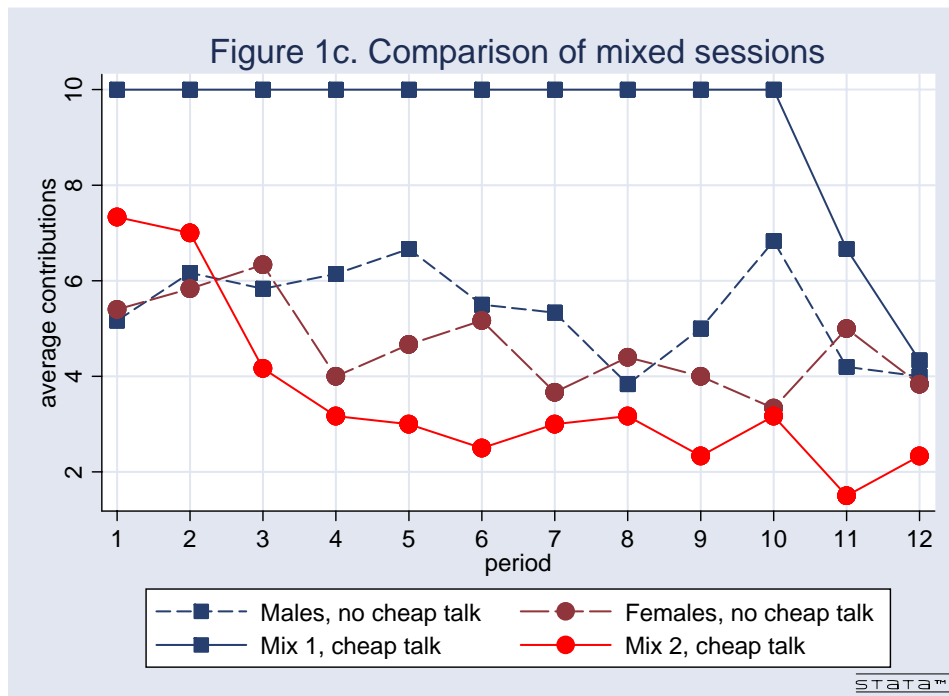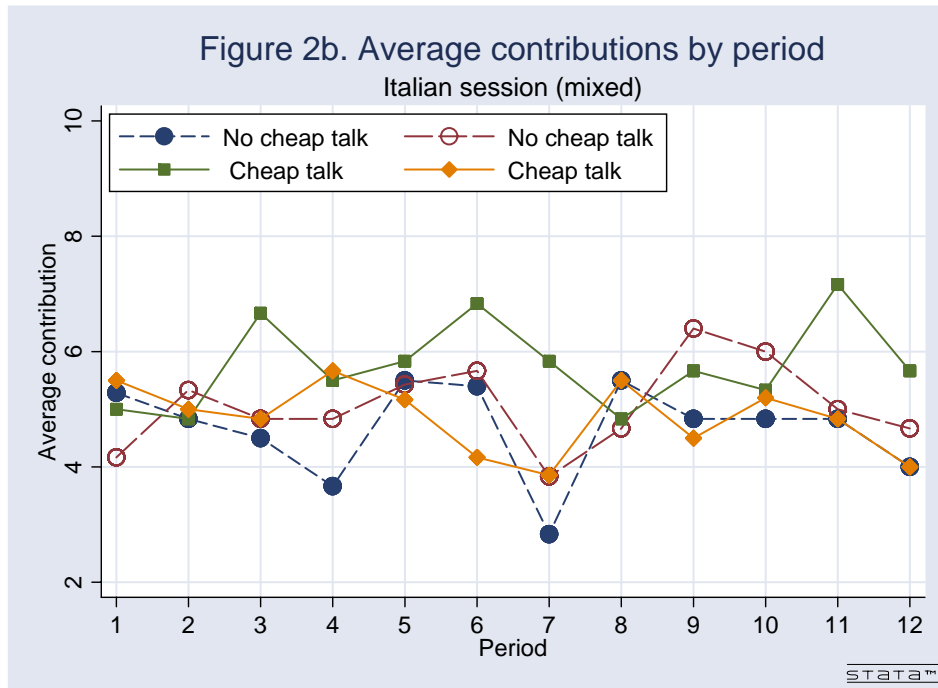
4. RESULTS

Figures 1, 2 and 3 plot the average bids for all three sessions. As can be seen from the figures, these were significantly different from zero, rejecting the hypothesis of equilibrium behaviour, although the extent of this deviation varied significantly from session to session. Figure 1a shows average bids from the mixed session before cheap talk for the various treatments; figure 1b shows the behaviour of the same groups of people after cheap talk. The graphs reveal systematic upward deviations from the cheap talk session in comparison to no-cheap talk session, as summarized in figure 1c for the mixed sessions, implying that cheap talk enhances cooperation. The difference between both the first-period contributions (interpreted as the single-shot, or initial contribution) and the average contributions over all twelve periods were significant in means and medians. Further, the distributions of initial bids and overall bids were again significantly different according to Kolmogorov-Smirnov test at any reasonable degree of confidence. Hypotheses that these observations were drawn from the same population were confidently rejected too by the Mann-Whitney test for the initial bids ($z = -4.16$) and all bids ($z = -7.23$). This difference might of course be partly attributable to learning effect rather than to that of communication. However, we do not think this explanation is quite compelling because all groups have undergone the same treatment in the first part.

These conclusions do not hold for the other two sessions - all-Russian and all-Italian, whose average bids are plotted on Figures 2a and 2b respectively (median trends are quite similar, and thus are omitted). The only case where the difference was marginally significant was overall bidding pattern of the all-Russian session (Student t-test for the equality of means returns $t = -2.38, p < 0.017$; Mann-Whitney $z = -2.32, p < 0.02$), suggesting there was no significant effect of cheap-talk. This result might appear rather unusual: textbook wisdom of social psychologists tells us that people are more fair and altruistic when dealing with persons belonging to the same group, which would have suggested the opposite conclusion. A possible interpretation of our observations is that cross-cultural character in fact enhances cooperativeness, as the desire to "be nice" is larger for someone whom you do not know and who belongs to a different culture.

This conclusion would be yet more interesting when contrasted with the participants' own reaction on each other bids as revealed during the email interviews which have been arranged after the sessions. Within the frame of our experiment this has been done by means of a separate questionnaire sent out to all participants which revealed their attitudes towards the game, satisfaction with its results and perception of the PG environment in cross-country perspective. Based in these interviews, the following conclusions can be made. First, almost all participants have appreciated the cheap-talk session, and unanimously argued that it helped them to coordinate their activities. People also often refer to the cheap-talk discussion as

Figure 1a. Average contributions by period
Mixed session without cheap talk

Figure 1b. Games with cheap talk

Figure 1c. Comparison of mixed sessions

Figure 2a. Average contributions by periods
Russian session (mixed)

Figure 2b. Average contributions by period

to the benchmark bid to which they felt motivated to adhere. Thus, conforming the finding of Isaac e.a. (1988) and others, even nonbinding communication can indeed contribute to higher social coordination if only all parties see *some* benefit of it. Second, cross-country differences do not appear to be significant: both Italian and Russian participants said they did not notice any difference between the play of different nationalities. This observation probably suggests that, while the fact of interaction with the strangers might create extra incentives for higher cooperation, it need not cause any perceptive problem - in other words, individuals in cross-country context may be exceedingly well-disposed towards each other, even without noticing it themselves.

The Mann-Whitney test may be somewhat misleading because it assumes that observations came from independent samples, whereas in fact they came from the same. A more appropriate method in this context would be to apply Wilcoxon matched pairs test for the same individual before communication and after communication. This test convincingly shows that the above conjecture of significant difference is valid for a mixed group ($z = -7.43$ for the first and -3.55 for the overall contributions, significant at a 1% level), whereas none of the null hypotheses can be rejected in both all-Russian and all-Italian sessions.

We have also evaluated the regularities in people's behavior across sessions. As can be seen from the figures, Russians' average bids are typically somewhat more volatile than that of the Italians - but how robust is this finding on individual basis? We have estimated the volatility of bids by computing, for each person, the variance among all offers in the same session. These results are summarized in table 2, which shows the mean values of such variances. Significant differences imply that Russians indeed exhibit more variability, which may be attributable to

Table 2. Mean volatility of bids across sessions

Session\Treatment	Game 1 (no cheap-talk)	Game 2 (preceded by cheap-talk)
Italian	2.8 (n=6)	1.8 (n=6)
mixed	4.4 (n=12)	6.7 (n=12)
Russian	6.4 (n=6)	11.0 (n=6)
F test (anova): F=2.87, p value 0.079		F test (anova): F=5.60, p value 0.011
K-W: chi-squared 5.9, p value: 0.053		K-W: chi-squared 7.4, p value: 0.024

Figure 3. Average contributions by period
Males vs. Females groups (by countries)
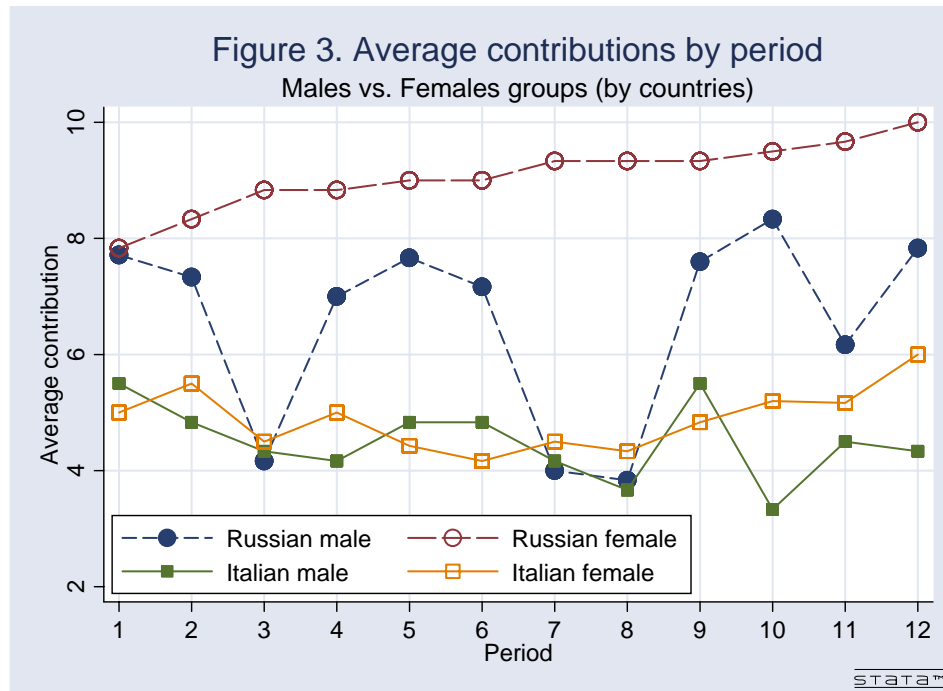
lower stability of economic environment in the country. The problem is that the observation within each group may be dependent (i.e. as you change continuously your decision, I do the same) and therefore this test may be misleading - an issue which is worth theoretical exploration. The last figure 3 shows another contrast which is fairly interesting: the gender difference in contributions for the Russian and Italian sessions. Italian male and female groups demonstrate a pretty close pattern with no significant differences. This is not the case of the all-Russian group: here females are constantly and *increasingly* cooperative, whereas males' cooperation demonstrates rather irregular waves. This difference is significant at any reasonable degree of confidence (Student t-statistic = 4.65; the other tests reveal significant differences too). This observation may of course be due to sampling error; nevertheless previous results obtained by one of the author (Belianin, 1998) reveal the same tendency of amazingly high degree of cooperation among Russian women. The present experiment shows that this result does not extend to other populations and samples, which suggests that this observation might constitute a peculiarity of the Russian subjects.

5. CONCLUSION

The experimental evidence presented above allows us to make three sorts of conclusions. First, cross-country experimentation in real time is an interesting mechanism compatible to the single-country experiments. Second, in our case we found that cheap-talk enhances cooperation when the groups are formed out of members of different nations, rather than by a single-country nationals, which seem to contradict the conventional wisdom. Third, gender effects seem to be present, especially in Russian context. Further exploration of these phenomena can result in new insights light into the character and nature of human behavior in different cultures and in theoretically unambiguous circumstances.

REFERENCES

[1] Anderson, Simon P., Jacob K. Goeree, and Charles A. Holt (1998). A Theoretical Analysis of Altruism and Decision Error in Public Goods Games. Journal of Public Economics, 70(2), 297-323.

[2] Andreoni, James (1988). Why Free Ride? Strategies and Learning in Public Goods Experiments. Journal of Public Economics, 37, 291-304.

[3] Andreoni, James. (1995). Cooperation in Public Goods Experiments: Kindness or Confusion? American Economic Review 85(4), p.891-904.

[4] Belianin, Alexis V. (1998). Risk attitudes and choice under uncertainty: experimental evidence from Russia. EERC working paper, 1998

[5] Camerer, Colin. (1995). Individual Decision Making. In: J.H.Kagel and A.E.Roth (eds.). The handbook of experimental economics. Princeton University Press.

[6] Cameron, Lisa A. (1999). Raising the stakes in the ultimatum game: experimental evidence from Indonesia. Economic Inquiry, v.37, p.47-59.

[7] Carpenter, Jeffrey P. (2002) When in Rome: Conformity and the Provision of Public Goods. Working paper, Middlebury college.

[8] Carter J.R., Drainville B.J., Poulin R.P. (1992). A Test for Rational Altruism in a Public-Goods Experiment. Working paper, College of Holy Cross.

[9] Cason, Timothy N, Tatsuyoshi Saijo, Takehiko Yamato, Konomu Yokotani (2003). Non-Excludable Public Good Experiments. Working paper, Institute of Social and Economic Research, Osaka University.

[10] Clemens, Christiane, and Thomas Riechmann (2001). Dynamic voluntary contributions to public good: learning to be a free-rider. Working paper, Universität Hannover.

[11] Coricellia, Giorgio, Dietmar Fehrb, Gerlinde Fellner (2003). Partner Selection in Public Goods Experiments. Mimeo: CNRS and Max Plank Institute.

[12] Croson, Rachel and Melanie Marks (2001). The Effect of Recommended Contributions in the Voluntary Provision of Public Goods. Economic Inquiry, v.39(2), p.238-49.

[13] van Dijk, Frans, Joep Sonnemans, Frans van Winden (1996). Social Ties in a Public Good Experiment. Working paper, CREED Department of Economics University of Amsterdam.

[14] Fehr, Ernst, and Urs Fischbacher (2003). Third Party Punishment and Social Norms. Discussion paper, University of Zurich.

[15] Fehr, Ernst, and Simon Gächter (2000). Cooperation and Punishment in Public Goods Experiments. American Economic Review, v.90, p.980-994.

[16] Fehr, Ernst, and Klaus M.Schmidt (1999). A Theory of Fairness, Competition, and Cooperation. Quarterly Journal of Economics, v.114, p.817-868.

[17] Goeree, Jacob K., Charles A.Holt, Susan K.Laury (1999). Altruism and Noisy Behavior in One-Shot Public Goods Experiments. Mimeo, Georgia State University.

[18] Güth, Werner, and Menahem Yaari (1992). Explaining Reciprocal Behavior in Simple Strategic Games: An Evolutionary Approach. In: Ulrich Witt, ed., Explaining Process and Change. Approaches to Evolutionary Economics. The University of Michigan Press, Ann Arbor, pp. 23-34.

[19] Henrich J., Boyd R., Bowles S., Camerer C., Fehr E., Gintis H., McElreath R., Alvard M., Barr A., Ensminger J., Hill K., Gil-White F., Gurven M., Marlowe F., Patton J.Q., Smith

N., Tracer D. (2001). Economic Man in Cross-cultural Perspective: Behavioral Experiments in 15 Small-scale Societies. Mimeo, Santa Fe Institute.

[20] Holt, Charles A., and Susan K.Laury (1997). Classroom games: voluntary provision of a public good. Journal of Economic Perspectives, 1997, v.11(4), p.209-215.

[21] Holt, Charles A., and Douglas Davis. (1993). Experimental economics. Princeton University Press.

[22] Housera, Daniel and Robert Kurzban (2003). Conditional cooperation and group dynamics: experimental evidence from a sequential public goods game. Mimeo, Interdisciplinary Center for Economic Science, George Mason University.

[23] Isaac, R.Mark and James Walker (1988). Communication and free-riding: : The voluntary contributions mechanism. Economic Inquiry, v.26, p.585-608.

[24] Isaac, R.Mark, James Walker, S. Thomas (1984). Divergent evidence on free riding: An experimental examination of possible explanations. Public Choice, v.43(1), p.113-149.

[25] Kachelmeier, S.J. and Shehata M. (1992). Examining risk preferences under high monetary incentives: experimental evidence from the People's Republic of China. American Economic Review, v.82, p.1120-1141.

[26] Keser, Claudia (2000). Strategically Planned Behavior in Public Good Experiments. Working paper 2000s-35, CIRANO, University of Montreal.

[27] Keser, Claudia, and Frans van Winden (2000). Conditional cooperation and voluntary contributions to public goods. Scandinavian Journal of Economics, v.102, p.23-29.

[28] Kim, Oliver, and Mark Walker (1984). The free-rider problem: experimental evidence. Public Choice, v.43(1), p.3-24.

[29] Kreps, David, Paul Milgrom, John Roberts, Robert Wilson. (1982), Rational cooperation in the finitely repeated prisoners dilemma, Journal of Economic Theory 27, 245-252.

[30] Ledyard, John O. (1995). Public goods: a survey of experimental research. In: J.H.Kagel and A.E.Roth (eds.). The handbook of experimental economics. Princeton University Press.

[31] Levati, Maria Vittoria (2002). Explaining Private Provision of Public Goods by Conditional Cooperation - An Evolutionary Approach. Mimeo, Max Plank Institute.

[32] Levati, Maria Vittoria, and Tibor Neugebauer (2001). An Application of the English Clock Market Mechanism to Public Goods Games. Mimeo, University of York.

[33] Ma, Leanne, Katerina Sherstyuk, Malcolm Dowling, Oliver Hill. (2002). Altruism and voluntary provision of public goods. Economics Bulletin, Vol. 3, No. 31 pp. 1-8.

[34] Marwell, Gerald, and Ruth Ames (1979). Experiments on the provision of public goods I: Resources, interest, group size and the free-rider problem. American Journal of Sociology, v.84(6), p.1335-1360.

[35] Montoro-Pons, Juan D., and Francisco Garcia-Sobrecases (2000). Collective action, free-riding and evolution. Mimeo, Universitat de València.

[36] Moxnes, Erling, and Eline van der Heijden (2000). The effect of leadership in a public bad experiment. Mimeo, Tilburg University.

[37] Palfrey, Thomas R. and Jeffrey E. Prisbrey (1996). Altruism, reputation and noise in linear public goods experiments, Journal of Public Economics 61, 409-427.

[38] Palfrey, Thomas R. and Jeffrey E. Prisbrey (1997). Anomalous Behavior in Linear Public Goods Experiments: How Much and Why? American Economic Review, 87, 829-846.

[39] Potters, Jan, Martin Sefton and Lise Vesterlund. After You - Endogenous Sequencing in Voluntary Contribution Games. Mimeo, Tilburg University 2003.

[40] Rabin, Matthew (1993). Incorporating Fairness into Game Theory and Economics. American Economic Review v.83, p.1281-1302.

[41] Rege, Mari, and Kjetil Telle (2003). The Impact of Social Approval and Framing on Cooperation in Public Good Situations. Journal of Public Economics.

[42] Rege, Mari, and Kjetil Telle (2003). Indirect Social Sanctions from Monetarily Unaffected Strangers in a Public Good Game. Discussion Papers No. 359, October 2003 Statistics Norway, Research Department.

[43] Roth, Alvin E., Vesna Prasnikar, Masahiro Okuno-Fujiwara, Shmuel Zamir. (1991). Bargaining and Market Behavior in Jerusalem, Ljubljana, Pittsburgh, and Tokyo: An Experimental Study. American Economic Review, v.81, p.106895.

[44] Saijo, T. and T. Yamato (1999). A Voluntary Participation Game with a Non-Excludable Public Good. J. Econ. Theory 84, 227-242.

EXPERIMENTAL INSTRUCTIONS

Today you are participating in an economic experiment called "Public goods game". The experiment consists of two consecutive sessions or "games" that will be played by the same cohort of participants. At the end of the session you may be approached by an interviewer by email who will ask you several questions about your behaviour during the game. The entire experiment should take approximately two hours. Now your experimenter will ask you to confirm in written your willingness to participate in this experiment by signing the Subject Consent Form. Please read it carefully and if you agree, state your name, date and sign it.

Game 1

For game 1, you will be allocated to one of four groups, labeled A, B, C and D. This allocation will be made by the experimenter who will give you a piece of paper with your login and password for the game. This is your ONLY identifier during game 1. All over the experiment YOU ARE NOT ALLOWED to communicate your true name and surname, or reveal your identity to any other player – either online or in the classroom you are sitting. Please also do not start playing before you will be explicitly authorized by the experimenter.

1. Please go to http://mief.hse.ru in your Internet browser and type your login and password in the two windows provided therein. (For the login, please do not forget to insert space between "player" and your identity, e.g. "A1". Upper- or lowercase letters are immaterial – you may use either).

You will be logged on to the system.

2. Please switch the interface by clicking "English" in the upper right corner of the screen.

3. Go to the bottom of the screen and click on "Public goods game"

4. Choose the game which begins with the same letter as your login. That is, if your login is "player A3", choose " Game A(I)", if your login is "player C2", choose "Game C(I)" etc.).

5. Now the experimenter will read you the instruction for game 1, which is also available on your screen. <u>Please pay special attention to the first sentence of this instruction which tells you who are the other members of your group</u>. YOU ARE NOT TO REVEAL THIS INFORMATION to anyone else – either online or in the classroom you are sitting.

DO YOU HAVE ANY QUESTIONS?

After you have completed this session, please write down the number of points (Total income) you have earned during Game 1, quit the system by clicking "Exit" at the bottom of the left panel on the screen. You will be logged off to the login and password screen.

Game 2

Now we begin game 2, which will be similar to the previous one with a few changes. For this game the experimenter will issue to you a new login and password. This is your ONLY identifier for game 2. All over the experiment YOU ARE NOT ALLOWED to communicate your true name and surname, or reveal your identity to any other player – either online or in the classroom. Please also do not start playing before you will be explicitly authorized by the experimenter.

1. As before, go to http://mief.hse.ru in your Internet browser and type your login and password (For the login, please do not forget to insert space between "player" and your identity, e.g. "A10".) You will be logged on to the system.

2. Switch the interface by clicking "English" in the upper right corner of the screen.

3. Go to the bottom of the screen and click on "Public goods game".

4. Choose the game which begins with the same letter as your login. That is, if your login is "player A8", choose " Game A(II)", if your login is "player C12", choose "Game C(II)" etc.).

5. Now the experimenter will read you the instruction for game 2, which is also available on your screen. <u>Please pay special attention to the first sentence of this instruction which tells you who are the other members of your group</u>. YOU ARE NOT TO REVEAL THIS INFORMATION to anyone else – either online or in the classroom you are sitting.

6. Before this session you will be given a chance to discuss the strategy for this game with other members of your group. Now you may do it using the forum provided (click "Open in a new window" below the word "Forum"). You may share your views, make your suggestions about the strategy for yourself and your groupmates etc. The system will automatically sign your messages by your login name "player A7", "player B10" etc. Remember that YOU ARE NOT ALLOWED TO REVEAL YOUR PERSONALITY to anyone else. To see the last messages in your forum do not forget to refresh the screen by pressing F5. You will be given 25 minutes for this discussion.

DO YOU HAVE ANY QUESTIONS?

After you have completed this session, please write down the number of points (Total income) you have earned during Game 2, and quit the system by clicking "Exit" at the bottom of the left panel on the screen. You will be logged off.