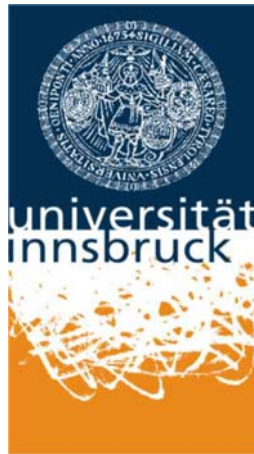


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# Conditional cooperation on three continents<sup>#</sup>

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**Abstract:** We show in a public goods experiment on three continents that conditional cooperation is a universal behavioral regularity. Yet, the number of conditional cooperators and the extent of conditional cooperation are much higher in the U.S.A. than anywhere else.

**JEL classification:** C72, C91, H41

**Keywords:** conditional cooperation, public goods, experiment

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# 1 Introduction

Even when it is not in their monetary interest, many subjects contribute voluntarily to the provision of public goods. Conditional cooperation has been invoked as one important explanation of these voluntary contributions (see, e.g., Keser and van Winden, 2000; Brandts and Schram, 2001; Fischbacher et al., 2001; Croson, 2002; Fischbacher and Gächter, 2006). The widespread behavioral regularity of conditional cooperation is defined in these studies as a subject's willingness to contribute to a public good when others also contribute or are expected to do so.

The existence and the extent of conditional cooperation are well documented in the economics literature on public good provision. All studies conclude that about half of the population in experiments exhibits conditional cooperation preferences, and a large majority of these preferences show a self-serving bias, such that subjects increase their contributions with the others' contributions, but fall short of matching them. Yet, the existing experimental evidence is confined to the Western world, predominantly to Europe, without any cross-country comparisons.

In this paper we investigate whether the existence and extent of conditional cooperation are similar across three countries on three different continents. By running identical public goods experiments in North Carolina (U.S.A.), Tyrol (Austria), and Tokyo (Japan), we can test for the ubiquity of conditional cooperation and possible cultural differences. To the best of our knowledge, such a study has not been conducted before.<sup>1</sup>

Our results indicate that conditional cooperation is prevalent on all three continents. The distribution of player types such as conditional cooperators and free riders as well as the extent of conditional cooperation, however, differ across countries. There are more

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<sup>1</sup> Henrich et al. (2005) analyze cross-cultural differences in cooperation within small-scale societies but they do not focus on conditional cooperation.

conditional cooperators and less free riders among subjects in the U.S.A. than in Austria and in Japan. Also, the extent of conditional cooperation is stronger, on average, in the U.S.A. than in the two other countries, even though unconditional contributions to a public good do not differ across continents (as, for instance, already established by Brandts et al., 2004).

## 2 Experimental design and procedure

Our experimental design builds upon the standard voluntary contribution mechanism with the following linear payoff function:

$$p_i = 20 - g_i + 0.6 \sum_{j=1}^3 g_j, \quad (1)$$

where  $g_i$  denotes the contribution of subject  $i$  to the public good. Each group consists of  $n = 3$  randomly assigned subjects, and each subject receives an endowment of 20 tokens. The marginal per capita return (MPCR) from investing in the public good is 0.6.

Assuming that participants are rational and selfish payoff maximizers, it is obvious that any  $\text{MPCR} < 1$  yields a dominant strategy for every group member to free ride, i.e., to contribute nothing to the public good. From a social or efficiency perspective, it is, of course, optimal to contribute the whole endowment because  $\text{MPCR} \cdot n > 1$ .

The details of the preference elicitation and the incentive mechanism in our experiment follow Fischbacher et al. (2001). Subjects are asked to make two types of decisions: an *unconditional contribution* to the public good, and a *conditional contribution*.

The unconditional contribution is a single integer number that satisfies  $g_i \leq 20$ . For the conditional contributions, subjects have to indicate how much they would contribute to the public good for any possible average contribution of the two other players within their group (rounded to integers). For each of the 21 possible averages from 0 to 20, subjects

must decide on a contribution between and including 0 and 20. In the experimental instructions it is stressed that subjects are completely free in choosing their contribution levels and contributions do not need to vary for different averages.<sup>2</sup>

In order to ensure incentive compatibility, both the unconditional as well as the conditional contribution are potentially payoff relevant. For one randomly selected group member the conditional contribution is relevant, whereas the unconditional contributions are relevant for the other two group members. More specifically, the two unconditional contributions within a group and the corresponding conditional contribution (for the specific average of the two unconditional contributions) determine the sum of money contributed to the public good. Individual earnings can then be calculated according to equation (1).

The experiment was conducted with identical procedures at Appalachian State University (U.S.A.), the University of Innsbruck (Austria) and the Todai University of Tokyo (Japan). At each location the experiment was run with paper and pen, subjects were seated far away from each other to guarantee privacy and group composition was not revealed to the subjects. Subjects received written instructions that were read aloud by the instructor. In order to ensure that all participants understood the task completely, participants were given 10 control questions. After completion of the questionnaire, the questions were publicly solved. Any remaining questions were answered in private. The public goods game was only played once.<sup>3</sup>

To ensure comparability of the data, we implemented several safeguards. For example, we strictly followed a single fixed and written protocol that precisely dictated

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<sup>2</sup> The instructions can be found on the following website: [will be made available upon publication].

<sup>3</sup> The existing literature shows that one-shot and repeated games provide very similar results, i.e., conditional cooperation preferences are pretty robust with respect to design features such as the number of repetitions (compare Fischbacher et al., 2001, and Fischbacher and Gächter, 2006).

each step of the sessions. To ensure equivalence of instructions and to avoid unwanted language effects, instructions were first written in English, then translated into German and Japanese, and then translated back into English by another person and checked for possible disparities.

The sessions involved 36 participants at each location and lasted about 70 minutes. We had participants from various fields of study, and their socio-economic characteristics were similar across countries. Subjects were informed that their decisions and their final payment would remain confidential. The average earnings of 14.6 euro were paid in cash immediately after the experiment.

### **3 Experimental results**

The unconditional contributions are, on average, 8.11 tokens in the U.S.A, 7.53 tokens in Austria, and 7.22 tokens in Japan. They are not significantly different across the three countries, neither when using a Kruskal Wallis test ( $p > 0.6$ ), nor in any pairwise comparison (two-sided Mann-Whitney-U-tests;  $p > 0.1$  in each case). This null-result confirms prior findings on the robustness of the voluntary contribution mechanism with regard to differences in cultural and social variables (see Zelmer, 2003; Brandts et al., 2004).

We follow convention by defining four general types of players: *Conditional cooperators* submit a contribution schedule that is monotonically increasing with the average contribution of the other group members.<sup>4</sup> *Hump-shape contributors* (also called *triangle contributors*) submit a monotonically increasing contribution schedule up to an

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<sup>4</sup> Fischbacher et al. (2001) and Fischbacher and Gächter (2006) also count subjects without a monotonically increasing schedule as conditional cooperators in case they have a highly significant (at the 1%-level) and positive Spearman rank correlation coefficient between own and others' contributions.

average contribution of others of  $x < 20$ . Above  $x$  conditional contributions are monotonically decreasing. *Free riders* contribute nothing for any average group contribution. The type *Others* refers to the remaining subjects. Table 1 reports the distribution of players.

Table 1: Distribution of player types

	<b>U.S.A.</b>		<b>Austria</b>		<b>Japan</b>	
	<i>Distri- bution</i>	<i>Av. uncond. contrib.</i>	<i>Distri- bution</i>	<i>Av. uncond. contrib.</i>	<i>Distri- bution</i>	<i>Av. uncond. contrib.</i>
<i>Conditional cooperators</i>	80.6%	9.0 (5.6)	44.4%	8.9 (7.6)	41.7%	9.2 (7.7)
<i>Free riders</i>	8.3%	0.0 (0.0)	22.2%	2.9 (7.0)	36.1%	3.5 (6.3)
<i>Hump-shape contributors</i>	0.0%	-	11.1%	7.0 (7.7)	11.1%	11.0 (4.7)
<i>Others</i>	11.1%	7.8 (8.4)	22.2%	8.4 (7.6)	11.1%	10.8 (8.3)

Note: Av. uncond contrib. = average unconditional contributions; standard deviations in parentheses.

The distribution of types is not significantly different ( $p > 0.5$ ; Chi<sup>2</sup>-test) between Austria and Japan. Especially the relative frequency of conditional cooperators is almost identical (and closely matches previous numbers in Fischbacher, 2001, and other studies). The only noteworthy difference is the slightly higher number of free riders in Japan than in Austria<sup>5</sup>.

Results for the U.S.A. are, however, strikingly different. We observe a much higher number of conditional cooperators and fewer free riders there. The difference between U.S. subjects and participants from the other two countries is highly significant ( $p < 0.01$  for each comparison; chi<sup>2</sup>-tests). Note that the number of hump-shape contributors and the number of other types are even smaller in the U.S. Thus if one wants to take them as an

<sup>5</sup> Roth et al. (1991) also report for an ultimatum game that behavior in Japan is, on average, closer to the standard game theoretic predictions than in Europe.



indirect indicator for possible confusion, we can confidently conclude that confusion is very likely not the driving force of our results.

Figure 1: Average conditional contributions

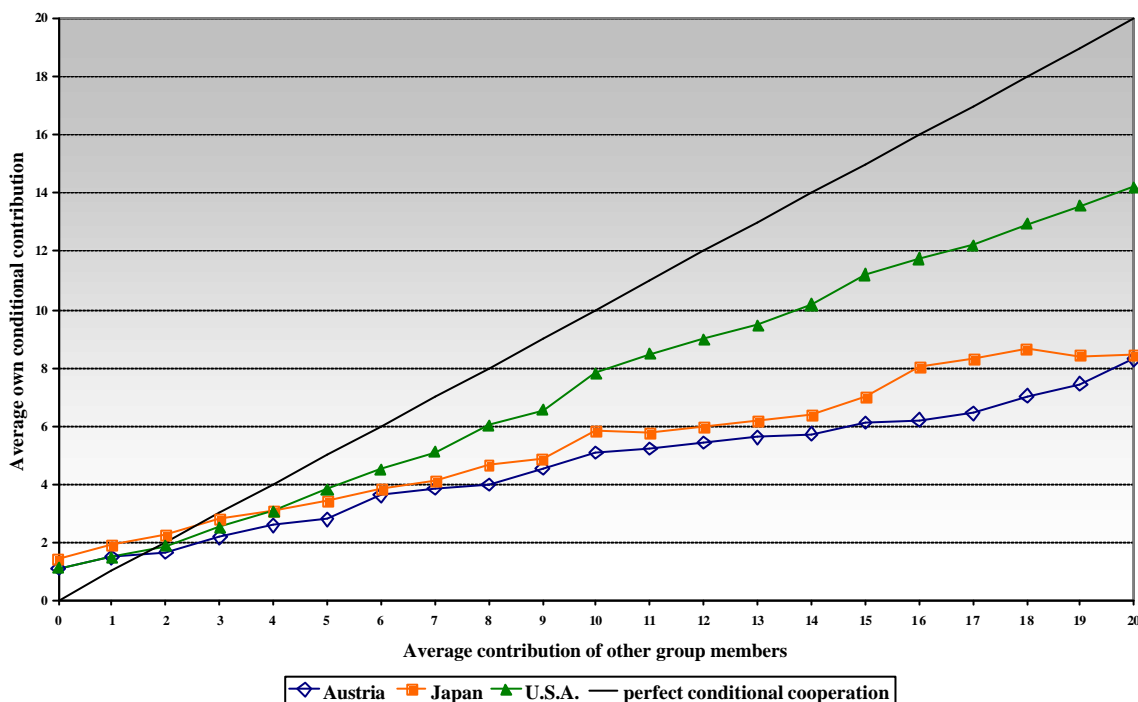


Figure 1 shows the relation between one's own conditional contribution (on the vertical axis) and the other members' average contribution (on the horizontal axis). Note that subjects in the U.S.A. are closest to the 45-degree line – which indicates perfect conditional cooperation – for all average contributions of the other group members above 4 tokens. In fact, the gap is widening between Austria and Japan on the one side and the U.S.A. on the other side the further right we move in Figure 1. A regression analysis confirms that the slope of the conditional-cooperation line is significantly higher for the

U.S.A. than for Austria and Japan, meaning that subjects in the U.S.A. have a smaller self-serving bias in conditional cooperation.<sup>6</sup>

Finally, notice the average unconditional contributions of the different types of players provided in Table 1. The fact that they are very close to each other is another indication that the behavior of subjects on the different continents is very consistent. The noteworthy difference, though, is that the number of conditional cooperators is significantly higher and the extent of conditional cooperation is stronger in the U.S.A. than in Austria and Japan.

## 4 Conclusion

The considerable difference in the nature of cooperative behavior between Austria and Japan, on the one side, and the U.S., on the other side, is staggering. The number of conditional cooperators is much higher among U.S. participants in our experimental study than elsewhere. The same holds true for the extent of conditional cooperation, i.e., the slope of the relation between others' contributions and own conditional contributions. Since there is *no* difference in *unconditional* contributions (confirming previous results), it is not surprising that the difference in *conditional* contributions has been missed so far, despite its significance and its potential implications. A stronger degree of conditional cooperation – as has been observed for the U.S. here – might contribute to explain, for instance, the comparatively huge amounts of charitable fund-raising in the U.S. (List and Lucking-Reiley, 2002).

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<sup>6</sup> We ran both an OLS regression that takes the clustering of the data into account and a Tobit regression that corrects for the censoring of the dependent variable. Both regressions strongly confirm our conclusion. Results are available upon request.

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