The Janus Face of Cooperation - An Intra- and Cross-Cultural Review

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Abstract

This paper introduces a two-sided methodological framework for studies on cooperation based on a new game design. Presented games are continuous prisoner's dilemma games with positive and negative presentations of an identically structured decision problem. Decision makers can choose an individual level of cooperation from a given range of possible actions. Within a cross-cultural experimental study involving Palestinian and Israeli subjects we test for a strategic presentation bias applying our framework. Palestinians show a substantially higher cooperation level in the positive externality treatment. In Israel no presentation effect is observed. Critically discussing our findings, we argue that cross-cultural comparison leads to only partially meaningful and opposed results if only one treatment condition is evaluated. We therefore suggest a complementary application and consideration of different presentations of identical decision problems within cross-cultural research.

Keywords: Cooperation, presentation of decision problems, framing, methodology, cross-cultural research

JEL Classification: A13, C72, C91, F51, Z13

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"It would be corruption to take if one could choose between 'to take' and 'not to take'. It would not be a favor to give if one could choose between 'to give' and 'not to give'. [...]"

Mencius

1 Introduction

Economic literature on experimental economics has delivered an overwhelming evidence for a substantial gap between theoretical predictions deducted from standard game theory and actual behavior of subjects manifested in laboratory experiments around the world (e.g. Güth et al., 1982; Güth and Tietz, 1990; Fehr et al., 1993; Berg et al., 1995; Güth, 1995; Ledyard, 1995; Dufwenberg and Gneezy, 2000; Fahr and Irlenbusch, 2000; Janssen and Ahn, 2003).

Several frameworks try to explain the remarkable influences on subjects' behavior guiding choices away from predicted standard equilibria. These concepts either challenge the concept of expected utility maximization (c.f. Kahneman and Tversky, 1979; 1992), question the homo economicus supposition by assuming heterogeneous and boundedly rational actors with limited cognitive abilities (Gigerenzer and Selten, 2001; Kahneman, 2003), or imbed social preferences of individuals evoking equitable outcomes (Rabin, 1991; Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). Further studies describe the influence of population-specific determinants like social norms, values and attitudes which depend on the cultural background of decision makers (Roth et al., 1991; Hofstede, 2001; Inglehart et al., 2001; Henrich et al., 2001; Cardenas and Carpenter, 2004).

The detection of human values, social preferences, and mechanisms and their impact on human decisions and behavior creates one of the most popular research fields in recent experimental economics work. A growing body of theoretical and experimental research on nationwide or cross-cultural similarities and differences emphasizes the importance of research accompanying globalization. Analyzing national data and conducting empirical studies in different countries Gambetta (1988), Putnam (1993), and Fukuyama (1995, 2001) have investigated the link between economic performance of institutions and nations and the inherent social capital, including the ability to cooperate and to trust, of involved populations. They conclude that social capital strongly affects the efficiency of organizations and an economy's economic success. Furthermore, Knack and Kefer (1997),

La Porta et al. (1997), and Fukuyama (1995, 2001) have documented that social and civic norms of cooperation have a significant impact on institutions and aggregate economic activity.

Key attribute of so far conducted cross-cultural experimental studies (e.g. Anderson et al., 2000; Henrich, 2000; Henrich et al., 2001; Buchan et al., 2004a,b) is the sequential application of an identical experimental setup within selected areas while controlling for stakes, language, experimenter effects and demographic background variables (Roth et al., 1991, Camerer and Kagel, 1995; Walkowitz et al., 2004; Dakkak et al., 2006).

Extracted data are to be analyzed and compared to identify and evaluate matching or divergent preferences and behavior. However, present approaches usually exclusively apply uni-dimensional and positively presented designs provoking positive (e.g. cooperative, trusting, fair) actions which might induce unilateral choices in the given context. The outcome of these uni-directional presentations of strategic interaction problems are commonly used to derive more general conclusions about the distribution of specific behavioral attitudes within certain societies and their potential impact on economic variables.

In a *positive* presentation of an experimental design the first player i (e.g. first mover, sender, divider) can usually contribute, send, or transfer a certain amount a_i of a given initial endowment X_i to a matched second player j (e.g. second mover, responder, receiver), chosen from a given interval $[0, X_i]$. By choosing a_i player i temporarily *increases* player j's (intermediate) payoff π_j. In a second stage player j can either accept or reject player i's offer (e.g. ultimatum game), transfer a certain amount back to player i (e.g. investment game), determine an effort (e.g. gift exchange game), or do nothing (e.g. dictator game). In the literature player i's choice a_i is typically interpreted as player i's cooperation, trust, or fairness attitude toward player j.

Theoretically, for most standard experimental designs containing a pattern as described above - forming the foundation of experimental economics' research - a complementarily structured decision framework can be derived containing identical types and number of players, institutions and payoff-space but differing in eligible strategies. In this paper we will show that it is essential to evaluate results taken from several experimental studies, including a complementarity of game-designs - particularly in cross-cultural research. Taking multidimensional findings into account might not only enrich standard socio-economic theory but also refine our experimental methodology.

Closely related to the complementary application of games is the field of framing and

presentation in games. Several experimental studies have shown that differently framed descriptions of decision tasks can lead to different behavior (e.g. Kahneman and Tversky, 1979; Abbink and Hennig-Schmidt, 2006; Dufwenberg et al., 2006). In the broad field of framing[1], studies dealing with problems creating either positive externalities (public good) or negative externalities (public bad) are well established (e.g. Andreoni, 1995; Sonnemans et al., 1998; Willinger and Ziegelmeyer, 1999; Cookson, 2000; Park, 2000). Results from these publications suggest that experimental designs enabling positive externalities are aligned with significantly higher cooperation levels compared to setups allowing for negative externalities.

One goal of our work is to merge the cross-cultural experimental approach with methods from framing and presentation literature. To the best of our knowledge up to now no study exists that deals with the influence of different presentation forms of similar games on cross-populational or cross-cultural comparison. With this procedure we want to demonstrate the following: First, results obtained from the application of one-sided designs can lead to only partly valid results and conclusions about population-specific behavior. This holds especially true if results are compared across cultural borders. Second, results from two-sided designs (c.f. public good and public bad settings) can not be generalized across different cultures.

To prove presentation-dependent cooperation behavior we will introduce a multidimensional methodological framework consisting of two game designs. Both games - named the 'First Kiss Game' and the 'War of the Roses Game' - are positive and negative presentations of a strategically and formally identical decision problem. The terms 'positive' and 'negative' strategic presentation are chosen with respect to a positive or negative externality caused by one player's actions and not with respect to different value- or norm-oriented presentations. Both designs represent continuous prisoner's dilemma and public good games in which subjects can choose an individual level of cooperation from a given range of possible actions. Thus, the question whether to cooperate or to defect is not a binary choice. Both conditions allow total free-riding to both players. On the other hand, there exists a combination of strategies that generates a maximal mutual benefit for both players.

We will test for a strategic presentation bias under two different conditions in an one-

[1]For an elaborate review of the framing literature in general and the influence of loaded instructions refer to Abbink and Hennig-Schmidt (2006).

shot experimental setting run with Palestinian and Israeli subjects. Our Palestinian data show that the presentation of the dilemma significantly influences decision makers' choices. In the positive situation substantially more cooperation is manifested. Moreover, in both games subjects do deviate remarkably from Nash and Pareto solutions. The experiment conducted in Israel yielded to different results. There, on an aggregate level, no significant presentation effect can be detected. Nevertheless, aggregated data show that neither the Nash equilibrium nor the Pareto optimal strategy is played.

Comparing the level of cooperation under each condition across the two populations leads to opposite conclusions on relative country-specific cooperation behavior. In contrast to this a *total* evaluation of *all* data gathered from each of the two populations shows no significant difference in the cooperation behavior. Our results underline the need for a more context-specific evaluation of experimental data in cross-cultural investigations and sheds new light on the impact of presentation conditioned on values, preferences and social norms within cultural habitats. Therefore, we will argue that for deriving a conclusion about a population's cooperative behavior, especially within a cross-national context, different presentations of logically identical experimental setups must be considered and evaluated adequately.

The remainder of this paper is organized as follows: In the next part we will introduce our multidimensional framework by illustrating the design of two games named 'First Kiss game' (FK) and 'War of the Roses game' (WR). We will show formally an internal analogy - both designs are theoretically identical - and external analogy to the standard prisoner's dilemma game and the public good game. In the third section, we describe the method and procedure we applied conducting the experimental study in the Westbank and Jerusalem. In part four, we present population-specific results. We compare data within and across populations. The final section discusses our findings and their impact on cross-national research, concludes and gives advices for future research.

2 Experimental Framework

In this section we will introduce the two games and discuss their features. Our experimental framework is based on the classical prisoner's dilemma game (PD). The PD sets up a social dilemma for two players in which one strategy leads to the global optimum while the dominant strategy, or best response function, leads to an inefficient outcome. The game

is typically conducted as a symmetric two-person game with two strategies: 'cooperate' (C) and 'defect' (D), where 'defect' strictly dominates 'cooperate'. Formally, the classical PD can be described as a 2×2 game, satisfying the PD-condition: $T > R > P > S$. T represents the *temptation*, R is the *reward*, P stands for the *punishment* and S embodies the *sucker's payoff* (see table 1). The level of the conflict of interest among the two players is determined by the degree of dichotomy of payoffs. The higher the potential of conflict, the more likely both parties will behave competitively - guided by a payoff-maximizing self-interest, or by fear (Schopler et al., 2001; Wildschut et al., 2003).

π_1, π_2	$\mathbf{C_2}$	$\mathbf{D_2}$
$\mathbf{C_1}$	R, R	S, T
$\mathbf{D_1}$	T, S	P, P

Table 1: 2×2-matrix representing the classical prisoner's dilemma game for two players 1 and 2.

In literature almost exclusively binary choice settings of prisoner's dilemma games are applied to analyze cooperative behavior (c.f. Axelrod, 1984). Instead of using a binary choice structure we apply two continuous games. In these games players can decide on a certain degree of cooperation. Our design allows subjects to choose from a range of disposable strategies. Moreover, both games are equivalent in logical and strategical terms. They only differ in their strategic presentation to the decision makers.

The scope of literature dealing with continuous prisoner's dilemma games is still relatively small. Most contributions are delivered from the field of theoretical biology. In this area results from simulations over several time periods enlighten questions on evolutionary strategies as well as general aspects like interspecific mutualism (Doebli and Knowlton, 1998), the evolvement of cooperative behavior from an initially selfish state (Killingback et al., 1999), and the robustness of such cooperation (Roberts and Sherratt, 1998; Wahl and Nowak, 1999). Furthermore, Smale (1980) analyses fix points in repeated prisoner's dilemma games with continuous choices and bounded memory and rationality. Verhoeff (1999) introduces the *Trader's Dilemma* and theoretically analyzes the structure of this game. In the majority of these studies the cost of cooperation is understood as an investment into a partnership.

2.1 The First Kiss Game

We start with the First Kiss game. At the beginning of the game, two matched players i and j obtain an initial endowment $X = X_i = X_j$. Each player then has the opportunity to transfer an integer part a of X, nothing, or the entire amount X *to* the opposite player. Both players choose $a \in [0, 1, ..., X-1, X]$ simultaneously. Each amount a, which is transferred to the paired player, will be multiplied by factor k yielding to an efficiency gain by transferring a positive amount a. Players' payoffs consist of the initial endowment X minus the transferred amount a plus the obtained and multiplied amount $k \cdot a$ transferred by the opposite player. Formally, player i's payoff function is given by:

$$\pi_i^{FK} = X_i - a_i^{FK} + k \cdot a_j^{FK}, \text{ with } X_i = X, a_i^{FK} \wedge a_j^{FK} \in [0, X], \text{ and } k > 1 \qquad (1)$$

The payoff of the opposite player j is calculated analogously. The only Nash equilibrium is $a_i^* = a_j^* = 0$. Player i anticipates player j's choice $a_j^{FK} = 0$ and will therefore also choose $a_i^{FK} = 0$. The collective optimal choice is $\hat{a}_i = \hat{a}_j = X$ since it maximizes the joint payoff $\Pi^{FK} = \pi_i + \pi_j$.

2.2 The War of the Roses Game

The design of this second game is equivalent to the first game, but instead of choosing an amount a which is transferred *to* the opposite player, decision makers must choose an integer which is transferred *from* the other player. Again two players i and j simultaneously interact. Initially, both receive an endowment $X = X_i = X_j$. Each player then has the opportunity to transfer a part a, nothing, or the entire amount X *from* the matched player. Thus, again, both players simultaneously choose $a \in [0, 1, ..., X-1, X]$. The difference $X - a$, which is mutually left, will be multiplied with k. Thus, by transferring low amounts or nothing efficiency increases. In contrast to the FK-game, the amount a, which is transferred is not multiplied. Players' payoffs are determined by the multiplied difference of their initial endowments X and the amount a taken by the opposite player and the amount a which players take away from the counterpart. Formally, player $i's$ payoff function is given by:

$$\pi_i^{WR} = (X_i - a_j^{WR}) \cdot k + a_i^{WR}, \text{ with } X_i = X, a_i^{WR} \wedge a_j^{WR} \in [0, X], \text{ and } k > 1 \qquad (2)$$

Player j's payoff is calculated analogously. The only Nash equilibrium is $a_i^* = X_j$ and $a_j^* = X_i$. Player i anticipates player j's choice $a_j^{WR} = X_i$ and will therefore also choose

$a_i^{WR} = X_j$. The optimal collective choice is $\hat{a}_i = \hat{a}_j = 0$ since it maximizes the joint payoff $\Pi^{WR} = \pi_i + \pi_j$.

2.3 Internal Equivalence and External Analogy

We will now take a closer look at the formal structure of the two games. It is to be shown that both games are from a rational perspective identical, yielding to internal equivalence. Internal equivalence enables a control for a presentation bias applying both treatments. Furthermore, either case represents a special case of the PD and the standard public good game (PG), resulting in external analogy. External analogy allows an effective application of our methodological framework for research focused on cooperation.

As a starting point, both games have an identical incentive structure, given equal initial endowments. It holds that $X = X_i = X_j$ and $X = X^{\mathrm{FK}} = X^{\mathrm{WR}}$ which is a crucial precondition for our framework. Partial cooperation of player i under the first condition is manifested by $a_i^{FK} > 0$, full cooperation by $a_i^{FK} = X_i$. Under the second condition, player i cooperates partially by choosing $a_i^{WR} < X_j$, and fully by choosing $a_i^{WR} = 0$.
Consequently, in our games cooperation can be understood as *transferring* something *to* (or taking it away from oneself), as well as *not transferring* everything away *from* (or leaving it to) the counterpart.
Formally, this yields the following equation:

$$a_i^{FK} \equiv X_j - a_i^{WR} \tag{3}$$

Correspondingly, we can say that *not transferring* an amount (or leaving it *to* oneself) in the first condition is the same as *transferring* the same amount (or taking it away) *from* the opposite player in the second condition:

$$X_i - a_i^{FK} \equiv a_i^{WR} \tag{4}$$

It is obvious that in both games the attributed ownership of X does not necessarily correspond with the individual power of control on X. Under both conditions, player i decides on the transfer amount a_i, either as a positive or a negative transfer to the opposite player. Similarly, player i depends on player j's decisions on the same decision task. Thus, player i's payoff π_i consists of two parts - a self-determined component π_{iA} and a part π_{iB} resulting from player j's actions, yielding $\pi_i = \pi_{iA} + \pi_{iB}$. Player i's self-determined payoff

fraction in the FK-game can be stated as:

$$\pi_{iA} = X_i - a_i^{FK} \tag{5}$$

Player i's foreign determined payoff fraction in the FK-game can be stated as:

$$\pi_{iB} = k \cdot a_j^{FK} \tag{6}$$

Thus, player i's total payoff in the FK-game is given by:

$$\pi_i = \pi_{iA} + \pi_{iB} = X_i - a_i^{FK} + k \cdot a_j^{FK} \tag{7}$$

Given equation (1/7) we can substitute the equivalents (3) and (4) in equations (5) and (6). This yields to equation (8), which is equal to equation (2):

$$\pi_i = \pi_{iB} + \pi_{iA} = (X_i - a_j^{WR}) \cdot k + a_i^{WR} \tag{8}$$

The same analogy holds for player j's payoff-functions.

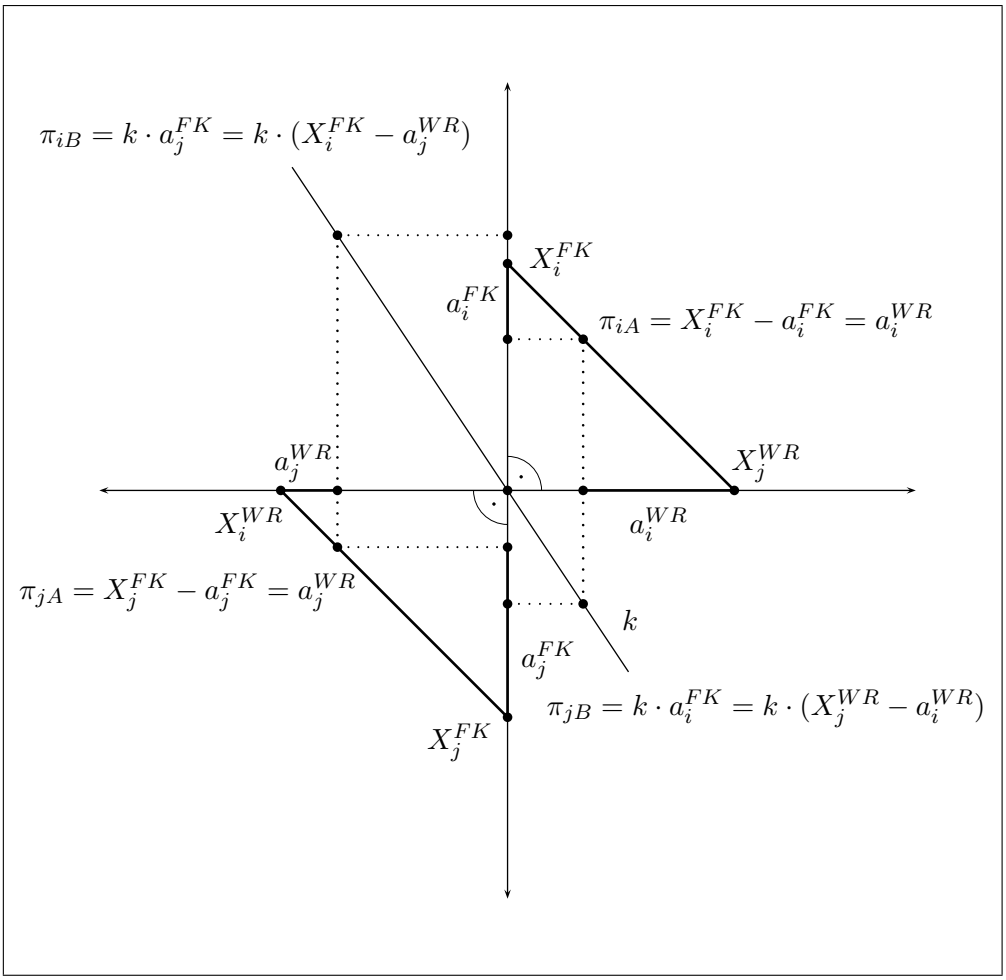

Figure 1: Graphical illustration for the equivalence of the two games.

Figure 1 displays a graphical illustration of this equivalence. The initial endowment X for both players is the same in both games. Thus, X_i^{FK} and X_j^{WR} form an isosceles triangle as shown in the upper right section of the figure. Player i chooses in the FK-game his self-determined payoff $X_i^{FK} - a_i^{FK}$ (thin line). In the WR-treatment player i can chose a_i^{WR} (thick line), which ensures him the same self-determined payoff. If player i does so, the left over $X_j^{WR} - a_i^{WR}$ equals the amount a_i^{FK} transferred in the FK-treatment. These amounts are part of player j's foreign-determined payoff function and are multiplied with k which is shown in the lower right section. The multiplier k is described as a straight line. The lower left section of the graphic illustrates analogously the self-determined payoff of player j and the upper left section the foreign-determined payoff of player i. This illustrates, that in each strategy space of the two games there exists a strategy a_i or a strategy-combination $(a_i; a_j)$ that also exists in the corresponding game in terms of cooperation, individual and collective payoff.

To show external analogy of our continuous games with a classical binary-choice PD we write down the 2×2-payoff matrix form of both designs including only the extreme points of total (e.g. $a_i^{FK} = 10; a_i^{WR} = 0$) and no cooperation (e.g. $a_i^{FK} = 0; a_i^{WR} = 10$):

π_1, π_2	$\mathbf{C_2}$	$\mathbf{D_2}$
$\mathbf{C_1}$	$k \cdot X, k \cdot X$	$0, X + k \cdot X$
$\mathbf{D_1}$	$X + k \cdot X, 0$	X, X

Table 2: 2×2-matrix, representing the prisoner's dilemma game.

The PD condition $(1 + k) \cdot X > k \cdot X > X > 0$ is satisfied for all $k > 1$ for both games. In our experiment this condition is fulfilled, with $k = 2$. Given these parameters, by linear interpolation payoffs from the discrete payoff matrix can be obtained[2]. Having a freely pre-determined range of possible actions a allows to obtain a non-binary measure of cooperation.

In the last part of this section, we show external analogy of both games to a typical PG-design. The payoff function of a common 2-person PG is given by:

$$\pi_i^{PG} = X_i - a_i + k \cdot \frac{a_i + a_j}{2}, \text{ with } i \neq j, \text{ and } k > 1$$

[2]See also Verhoeff (1998).

X_i represents player i's initial endowment. The parameter a_i is the investment into the public good. Accordingly, $X_i - a_i$ represents the investment into the private good. All investments made to the public good are multiplied by the factor k. The fraction of one half of the increased public pie is returned to both players i and j by the addition to their investments into the private good. For $k < 1$ it is rational for both players to invest nothing into the public good since the public pie shrinks. In the case of $k > 1$ both players can increase their personal income by investing into the public good. However, in this case each player has a strong incentive to free-ride hoping to reach even higher returns caused by a positive investment of the second player. From the initial PG-equation we get:

$$\pi_i = X_i - (1 - \frac{k}{2}) \cdot a_i + k \cdot \frac{a_j}{2}$$

$$\iff \pi_i = X_i - \theta \cdot a_i + k^* \cdot \theta \cdot a_j, \text{ with } \theta = 1 - \frac{k}{2} \text{ , and } k^* = \frac{k}{1 - \frac{k}{2}}$$

The payoff-function of the FK-game was given in equation (1) by:

$$\pi_i^{FK} = X_i - a_i^{FK} + k \cdot a_j^{FK}$$

It is evident that both games are of the same type: A PG with parameter k^* is formally similar to the FK-game with parameter k. Because of internal equivalence among FK and WR it is obvious that the WR-game is a PG too. Contrary to the PG, in FK and WR there is no back flow of own investments. Thus, each $a_i > 0$ is transferred directly to the opposite player thereby providing a lower individual incentive to cooperate.

3 Experimental Method and Procedure

The experiments were conducted in May 2006. The Palestinian[3] sessions were run at the AlQuds University located in the Westbank, close to the city of Jerusalem. Israeli observations were gained at the RatioLab of the Hebrew University in Jerusalem. In both universities students from different departments participated. Showing up for the experiment each student received a fixed payment of 25 NIS.

Two sessions with 20 subjects[4] were conducted in each university applying pen and

[3] At the moment, a Palestinian state does not exist. Most of our subjects are formally citizens of the states of Israel and Jordan. Nevertheless, we will refer to them as Palestinians to ease the notation.

[4] In Israel only subjects with limited experimental experience (excluding previous collaborations in trust game, prisoner's dilemma, gift exchange, or public good game experiments) were allowed to take part in the experiments. Palestinian subjects had no experimental experience.

paper method. In the first session subjects decided first under the FK-condition and then under the WR-treatment. Consequently, the second session consisted of the run of the WR-condition first and the FK-treatment second. In both sessions subjects were not informed about the subsequent second decision task. All experimental stages were run as one-shot setups. The experimental design ensured that the first stage of the experiment delivered one independent observation for each participant. In this paper we will concentrate on the primarily played games, since we want to focus on the analysis of the unbiased presentation effect.

At the beginning of the experiment subjects were immediately separated into cabins to avoid any communication among them. Instructions were given to the students before the particular game was played. For both games instructions were absolutely identical except the technical presentation of the design of the two games to strictly avoid a framing bias due to any instruction difference[5]. Translations from German into Arabic and Hebrew were made under the supervision of the authors by native Arabic and Hebrew speakers living in Germany. Final versions were back-translated into German language according to back-translation method (Brislin, 1970). This method guarantees mutual consistency of instructions and ensures that no translation errors regarding the task and the cadence occurred. Moreover, we controlled for neutral language to avoid further framing effects, such as labeling effects (Ross and Ward, 1996; Liberman et al., 2004) and other context framings (Abbink and Hennig-Schmidt, 2006)[6]. Furthermore, we did not explicitly state, that subjects generate positive or negative externalities for the paired player by realizing a transfer. These, and terms like 'give' and 'take' were strictly avoided. In the verbal specification of the experimental procedure *only the direction* of the conducted transfer differed - transfers were to be realized *to* player j or *from* player j. After having finished the lecture of the instructions students were asked to fill in a short test questionnaire to check their comprehension of the game structure.

Subjects were initially endowed with $X = 10$ Talers in the opening of every game[7]. The

[5] See Appendix for instructions.

[6] See also: Cooper et al. (1999) for loaded instructions issues, Burnham et al. (2000) for the influence of wording on social aspects, and Baldry (1986) and Alm et al. (1992) for the influence of ethical aspects on taxation.

[7] Taler=Experimental Currency. During the experiment all transfers were made in Taler. The exchange rate from Taler to NIS is 1 Taler = 2.5 NIS. We adjusted expected hourly payoffs to the average hourly wage of a local student helper.

multiplier k was fixed with $k = 2$. The individual payoff in the Nash equilibrium was 10 Talers, for each player. The Pareto optimum outcome generated 20 Talers, respectively. In the run of the experiment participants received no feedback on matched player's decisions.

After running the experiment two questionnaires were passed out. In the first questionnaire we asked participants for their first-order beliefs on the behavior of the matched player[8]. The second questionnaire covered socio-demographic questions. At the end of the session the outcome for each participant was calculated, converted into NIS, and paid out.

Both experiments were run by local helpers unknown to the participants comprehensively instructed and supported by the authors, who stayed in the background. We are aware that this might result in an experimenter effect. We decided to choose this procedure to avoid self-presentation and face-saving effects (Bond and Hwang, 1986) of unexperienced subjects resulting from the presence of people from foreign countries. Since we are interested in the pure presentation effect this procedure seems to be justified.

4 Results

In this section we present the results of our study. First, we start with our findings in the Palestinian population. In the second subsection we will present the Israeli data. Finally, we will cross and compare results from both societies. For our analysis, it is necessary to transform WR-amounts (WR) into FK-values (WR') as described in the theoretical section to enable a comparison of results from both treatments with one common measure for cooperation[9].

[8] We are aware of the fact that stated beliefs can be biased by prior decisions already undertaken. However, since actual unbiased decisions are more valuable for our analysis we agreed upon this procedure.

[9] Recall that $a_i^{FK} \equiv X_j - a_i^{WR}$. Transformed WR-transfers are denoted as WR'.

4.1 Palestinian Choices

In the following, table 4 gives an overview on Palestinians' aggregated actions and beliefs in both treatments:

	Actions		Beliefs	
	FK	WR'	FK	WR'
Mean:	7.10	2.65	6.05	2.75
Median:	7	2	5	2
Mode:	5/10	2	5	0
SD:	2.36	2.08	2.89	2.34

Table 4: Descriptive statistics for Palestinian choices.

Result 1: *The formal presentation of the game influences Palestinian subjects' actions substantially. Cooperation is higher under the FK-condition than in the WR-treatment.*

SUPPORT: On average, under the FK-condition 7.10 Talers are transferred to the opposite player, contrary to the WR-treatment where 2.65 Talers are left. The observed treatment effect is highly significant ($p < 0.0001$, Mann-Whitney test, two-sided). Moreover, in the FK-treatment the quadratic distance to the Pareto optimum ($\Delta^2 = 0.137$) solution is significantly smaller than to the Nash equilibrium ($\Delta^2 = 0.557$, $p = 0.0019$, Wilcoxon signed rank test, two-sided)[10]. In the WR-treatment the opposite holds. Here, the quadratic distance to the Pareto optimum ($\Delta^2 = 0.582$) is significantly bigger than to the Nash equilibrium ($\Delta^2 = 0.112$, $p = 0.0007$, Wilcoxon signed rank test, two-sided). Our findings get additional support evaluating median (7 vs. 2) and mode (5/10 vs. 2) values from both treatments. A distribution of transfer-amounts is shown in figure 2.

[10]The average quadratic distance is defined as $\Delta^2 = \frac{1}{n}\sum_{i=1}^{n}(r_i - t)^2$, with n being the number of participants, $r_i \in (0, 1)$ being the transfer rate of player i, and $t \in (0, 1)$ the predicted transfer rate. To apply the quadratic distance concept we calculated relative transfers.

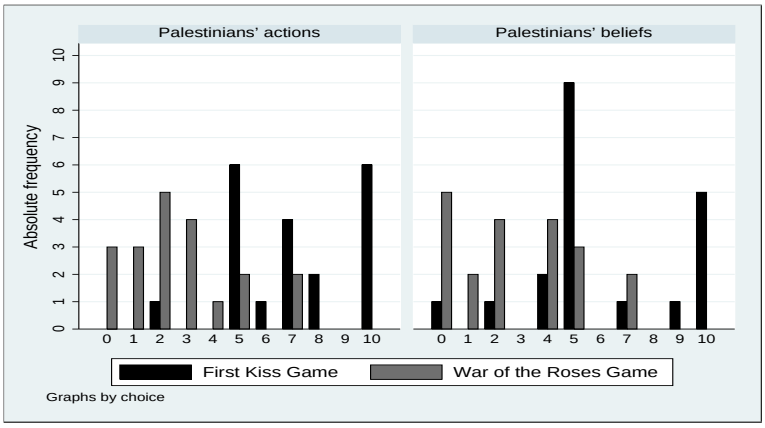

Figure 2: Distribution of Palestinians' actions and beliefs.

Result 2: *The formal presentation of the game influences Palestinian subjects' beliefs substantially. Stated beliefs on cooperative behavior are higher under the FK-condition than in the WR-treatment.*

SUPPORT: On average, under the FK-condition 6.05 Talers are expected to be transferred from the opposite player, contrary to a remaining share of 2.75 Talers in the WR-treatment. The observed treatment effect is highly significant ($p = 0.0008$, Mann-Whitney-test, two-sided). This finding gets further support considering median (5 vs. 2) and mode (5 vs. 0) values from both treatments.

Comparing actions and beliefs we find no statistically significant difference. This holds for both treatments.

4.2 Israeli Choices

Israeli aggregated actions and beliefs are presented in the following table 5:

	Actions		Beliefs	
	FK	WR'	FK	WR'
Mean:	4.40	4.55	3.40	3.40
Median:	4	5	4	4
Mode:	2	5	4/5	0
SD:	2.95	3.38	2.50	3.14

Table 5: Descriptive statistics for Israeli choices.

Result 3: *No evidence is found that the formal presentation of the game influences Israeli subjects' actions in a significant way. Both conditions imply a similar level of cooperation.*

SUPPORT: On average, under the FK-condition 4.40 Talers are transferred to the opposite player. Similarly, in the WR-treatment 4.55 Talers are chosen not to be taken by the participants. There is no statistical significant difference in behavior across the two treatments ($p = 0.9455$, Mann-Whitney-test, two-sided). Furthermore, we observe a general tendency to play according to the Nash equilibrium - the quadratic distance to the Nash equilibrium is smaller in both treatments than the distance to the Pareto optimum. However, in the FK-treatment the quadratic distance to the Nash equilibrium ($\Delta^2 = 0.276$) is not significantly different from the quadratic distance to the Pareto optimum solution ($\Delta^2 = 0.396$, $p = 0.4039$, Wilcoxon signed rank test, two-sided). The same holds for the data from the WR-treatment. Here, the quadratic distance to the Nash equilibrium ($\Delta^2 = 0.316$) is not significantly different from the quadratic distance to the Pareto optimum ($\Delta^2 = 0.406$, $p = 0.5295$, Wilcoxon signed rank test, two-sided) either. Our findings are supported by considering median (4 vs. 5) values from both treatments. The distribution of transfer amounts is shown in figure 3.

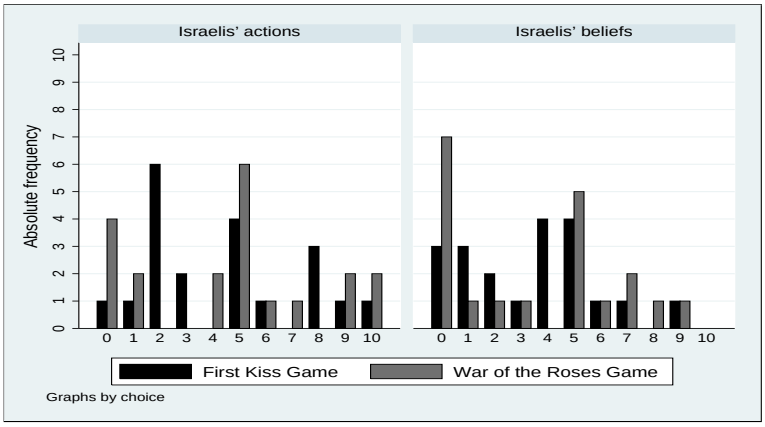

Figure 3: Distribution of Israelis' actions and beliefs.

Result 4: *No evidence is found that the formal presentation of the game influences Israeli subjects' beliefs significantly. Stated beliefs on cooperative behavior under the FK-condition are not substantially different from those in the WR-treatment.*

SUPPORT: On average, under both conditions 3.40 Talers were expected to be contributed from the opposite player. No statistical evidence for difference can be found ($p = 0.9671$,

Mann-Whitney-test, two-sided). This finding gets further support considering median (4 vs. 4) values from both treatments.

Contrasting actions and beliefs we find slightly higher amounts in actions compared to stated beliefs (4.40 Talers vs. 3.40 Talers) for the FK-treatment ($p = 0.0467$, Wilcoxon signed rank test, two-sided). No statistically significant difference is detected under the WR-condition.

4.3 Crossing and merging the data

In the following we want to compare results from both populations and assess cross-cultural validity. Our experimental design allows to test for consistency of presentation effects, their direction and strength. First, we evaluate population-specific results from the FK-treatment.

Result 5: *Palestinians cooperate significantly more under the FK-condition than Israelis do. Moreover, under this condition Palestinians substantially state higher beliefs on opponent player's cooperation than Israelis do.*

SUPPORT: On average, Palestinians have transferred 7.10 Talers to their counterparts, while Israelis chose 4.40 Talers in this treatment-condition. Similarly, on average Palestinians expect the matched player to transfer 6.05 Talers compared to 3.40 Talers which reflect Israelis' expectations toward their counterparts (see table 4 and 5). Both differences are highly statistically significant ($p < 0.005$ and $p = 0.0058$, Mann-Whitney test, two-sided).

In a next step, we take a closer look at the choices made under the WR-condition.

Result 6: *Israelis cooperate more under the WR-condition than Palestinians do. Furthermore, under this condition the mean belief on cooperation by Israelis is higher than the expectations quoted by Palestinians.*

SUPPORT: On average, in the WR-treatment Israelis have left 4.55 Talers to their counterparts. Palestinians chose to contribute 2.65 Talers on average in this treatment condition. Similarly, on average Israelis expect the matched player not to transfer 3.40 Talers compared to 2.75 Talers which reflect Palestinian expectations toward their counterparts (see table 4 and 5). The difference in actions is significant ($p < 0.076$, Mann-Whitney-test, two-sided). Comparing stated beliefs delivers no significant effect.

Considering our findings from results 1-6 we can derive result 7:

Result 7: *A formal presentation effect is not consistently found across populations. Moreover, the relative level of population-specific contributions depends on the presentation of the decision task.*

SUPPORT: As results 1-6 show, Palestinian choices are sensitive to the formal presentation of the two equivalent game designs whereas Israelis' behavioral consequences - manifested in taking a choice - are not to significantly influenced by the treatment condition. This yields a relatively higher Palestinian cooperation level in the FK-treatment and relatively higher Israeli contributions under the WR-condition. This finding also shows that in both treatments the average Palestinian transfers, or interaction, exceeds the Israeli level, once in a more cooperative and once in a more non-cooperative manner.

Finally, in a last step of our analysis, we investigate all 40 observations (FK- and WR-condition) gathered in the two societies. Table 6 gives an overview on actions and beliefs from both samples.

	Palestinians		Israelis	
	Actions	Beliefs	Actions	Beliefs
Mean:	4.88	4.40	4.48	3.40
Median:	5	5	5	4
Mode:	5	5	5	0
SD:	3.15	3.09	3.13	2.80
Δ^2Nash:	0.334	0.287	0.296	0.192
Δ^2Pareto:	0.359	0.407	0.400	0.512

Table 6: Descriptive statistics and quadratic distances for aggregated data from Palestinians and Israelis.

Result 8: *In the aggregated data from both treatments no significant difference between Palestinian and Israeli level of cooperation is found.*

SUPPORT: On average, Palestinians contribute 4.88 Talers when both treatments are considered. Similarly, Israelis add 4.48 Talers. There is no evidence for a statistical difference among the involved subject-pools ($p = 0.547$, Mann-Whitney-test, two-sided). The same can be stated for merged beliefs. Here, Palestinians on average expect to receive 4.40 Talers, and Israelis expect 3.40 Talers from their counterpart. Again, no statistical difference can be detected across both subject-pools ($p = 0.1938$, Mann-Whitney test,

two-sided). Moreover, we observe no substantial difference among the quadratic distances to the Nash-equilibrium ($\Delta^2 = 0.334$ and $\Delta^2 = 0.296$, $p = 0.5470$, Mann-Whitney-test, two-sided) and to the Pareto optimum ($\Delta^2 = 0.359$ and $\Delta^2 = 0.400$, $p = 0.5470$, Mann-Whitney-test, two-sided) of transfer amounts from both societies. Our results considering actions are supported by evaluating median (5 vs. 5) and mode (5 vs. 5) values from both treatments. Equally, for stated beliefs we find that median (5 vs. 4) values do not substantially differ[11].

5 Summary and Discussion

The aim of this work was to demonstrate that a more complete methodological approach is needed to explore the variety and origins of cooperative behavior specifically measured in a cross-cultural context and to evaluate results adequately.

Merging the experimental application of two logically and strategically identical decision problems with cross-cultural research methods we demonstrated that data obtained from one-sided experimental setups might lead to only partly valid results and conclusions on population-specific behavior. This finding holds especially true if results are compared and evaluated across cultural borders.

Our Palestinian results have shown that the formal presentation of the decision problem can influence subject's choices and beliefs substantially. Cooperation and beliefs on cooperative behavior are significantly higher when subjects can create positive externalities toward each other compared to a situation where externalities are negative. In the positive condition Palestinians are more willing to transfer higher amounts to voluntarily lift the mutual welfare level to a higher stage. Contrary, in the second condition more negative beliefs about the opponent's behavior are formed. In this conflict situation subjects transfer more from the opposite player to ensure a guaranteed minimum payoff. These finding gives support to prior work by Andreoni (1995), Sonnemans et al. (1998), Willinger and Ziegelmeyer (1999), and Park (2000).

One possible explanation for this consistent behavioral pattern might be that, even if

[11] Mode values also support this finding. There, 5 is the amount chosen the *second* highest time by participants. This amount was chosen in 9 from 40 cases, contrary to the actual mode=0 which was chosen 10 times out of 40.

the technical presentation of the implemented game designs was strictly neutral, Palestinian participants perceive situations with potential negative externalities as more competitive than situations with potential positive externalities. Another possible explanation might be, that Palestinians seem to obtain a higher benefit from doing a good rather than from not doing a bad deed. Future studies have to analyze whether Palestinian behavior is similar to Western subjects' behavior as the mentioned public good game results suggest or rooted specifically in Arabian culture. Herrmann et al. (2007) give evidence for the latter conjecture. They have found, that Arabian participants are not - unlike most decision makers from Western populations who cooperate more under a punishment condition - sensitive to the threat and enforcement of punishment in public good game setups.

Experiments with Israeli subjects yielded different results. There, aggregated subjects' choices and beliefs appear to be unaffected across treatments. No presentation effect can be verified. Israeli seem to show a similar behavioral attitude under both conditions. This fact might be caused by a more systematic way of analyzing the decision problem. In Jewish culture analytical cogitation is rooted in the tradition of the Talmud[12]. It is possible that this tradition has influenced the strategic thinking of Israeli subjects (including secular subjects) in our experiment knowing that they are interacting with countrymen. Further studies should analyze the reason for the similar behavior displayed in both conditions. Do Israelis perceive the two games as presentations of the same decision problem, or do they apply different approaches leading to similar behavioral consequences?

Comparing levels of cooperation under each of the conditions across subject pools might lead to opposite conclusions on society-specific behavioral attitudes. Palestinians display a *relatively* higher cooperation level and more positive beliefs on opponent player's contributions than Israelis when only the positive externalities condition is considered. Contrary, Israelis cooperate *relatively* more and state substantially higher beliefs when only the negative externalities condition is taken into account. However, when all data gathered from each of the two populations are evaluated, we find no evidence that relative cooperation levels and stated beliefs are different. These striking results would not have been detected by the implementation of mere one-sided experimental designs.

Our study sheds new light on the impact of game presentation conditioned on societal habitats. Furthermore, it raises further questions about the effectiveness of presentation

[12] Aumann and Maschler (1982) analyzing the Talmud conclude that the solution regarding the division of a man's estate among his three widows is a game theoretic solution.

conditions on value activation within subjects, their individual motivations and perceptions triggering different cognitive processes leading to divergent behavioral consequences. Finding answers to these issues is essential for the design of international institutions where actors repeatedly interact under a variety of rapidly changing environments. Bargaining and cooperation setups might be perceived differently across different groups of decision makers holding different cultural backgrounds. The culture-sensitive adaptation of constituting conditions is necessary for increasing mutual benefits from cooperation within institutions.

Future experiments in cross-cultural research should focus on repeated interaction of different cooperation schemes to elaborate cultural consequences of the clash of diverging behavioral patterns. Taking findings from two-sided experimental setups into account might not only enrich standard socio-economic theory but also refine our experimental methodology. Therefore, we argue that for the purpose of deriving conclusions about behavioral inclinations of populations, it is advantageous to make use of different presentations of logically identical experimental setups.

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Appendix

Instructions for the experiment

Thank you for taking part in this experiment. Please read these instructions very carefully. It is very important that you do not talk to other participants for the time of the entire experiment. In case you do not understand some parts of the experiment, please read through these instructions again. If you have further questions after this, please give us a sign by raising your hand out of your cubicle. We will then approach you in order to answer your questions personally.

To guarantee you anonymity you will draw a personal code before the experiment starts. Please write this code on top of every sheet you use during this experiment. You will later receive your payment from this experiment by showing your personal code. This method ensures that we are not able to link your answers and decisions to you personally.

During this experiment you can make money. The currency within the experiment is 'Taler'. The exchange rate from Taler to NIS is:

1 Taler = 2.5 NIS

Your personal income from the experiment depends on both **your own** decisions and on the decisions of **other** participants. Your personal income will be paid to you in cash as soon as the experiment is over.

During the course of the experiment, you will interact with a randomly assigned other participants. The assigned participant makes his/her decisions at the same point in time as you do. You will get no information on who this person actually is, neither during the experiment, nor at some point after the experiment. Similarly, the other participant will not be given any information about your identity. You will receive information about the assigned participant's decision after the entire experiment has ended.

After the experiment, please complete a short questionnaire, which we need for the statistical analysis of the experimental data.

Description of the experiment (FK)

In this experiment you are randomly matched with another participant. You act as **Person A**, and the randomly assigned other participant acts as **Person B**. You and Person B must simultaneously make a similarly structured decision.

Person A and Person B first receive an initial endowment of **10 Talers**.

You now have the opportunity to transfer any part of your endowment to Person B. You can only transfer integer amounts - thus, you can only choose amounts $a_A \in$ **[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]**.

The amount you transfer to Person B is **doubled**. That means that Person B receives **twice the amount you have transferred** to him/her.

The randomly assigned participant acting as Person B is given exactly the same alternatives as you have. He/she also has the possibility to transfer any amount to you. The amount Person B transfers to you is also doubled. That means that **you receive twice the amount Person B has transferred** to you.

You will make your decisions **simultaneously**. During the course of the experiment neither person receive any information concerning the decision of the other person.

How the income is calculated

Your personal income can be calculated as follows:

Initial endowment
- amount you choose to transfer to Person B
+ twice the amount b Person B transferred to you
= your personal income

Description of the experiment (WR)

In this experiment you are randomly matched with another participant. You act as **Person A**, and the randomly assigned other participant acts as **Person B**. You and Person B must simultaneously make a similarly structured decision.

Person A and Person B first receive an initial endowment of **10 Talers**.

You now have the opportunity to transfer any part of Person B's endowment to yourself. You can only transfer integer amounts - thus, you can only choose amounts $a_A \in$ **[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]**.

The remaining amount - that is the amount that you do not transfer from Person B's endowment to yourself - is **doubled**. This means that Person B receives **twice the amount that you do not transfer** from him/her.

The randomly assigned participant acting as person B is given exactly the same alternatives as you have. He/she also has the possibility to transfer any amount to himself/herself. The remaining amount that he/she does not transfer from your endowment to himself/herself is **doubled**. This means that you receive **twice the amount that he/she does not transfer** from you.

You will make your decisions **simultaneously**. During the course of the experiment, neither person receives any information concerning the decision of the other person.

How the income is calculated

Your personal income can be calculated as follows:

+ amount you choose to transfer from Person B to yourself
+ twice the amount Person B did not transfer from your endowment to himself/herself
= your personal income