Why Can't We Be Friends? Entitlements and the Costs of Conflict *

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Abstract

We design an experiment to explore the impact of earned entitlements on the frequency and intensity of conflicts in a two-stage conflict game with side-payments. In this game, residents (Proposers) make side-payment offers and contestants (Responders) decide whether to accept the offers and whether to engage in a conflict. When subjects earn their roles, conflicts are 44% more likely to be avoided than when roles are assigned randomly. Earned rights impact behavior in three important ways: (1) residents who have earned their position persistently offer larger side-payments; (2) larger offers lead to a lower probability of conflict, but (3) residents whose offers do not lead to conflict resolution respond spitefully and exhibit greater conflict expenditure. Hence, with earned rights, the positive welfare effects of reduced conflict frequency are offset by higher conflict intensity.

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1. Introduction

> When you reap the harvest of your land, do not reap to the very edges of your field or gather the gleanings of your harvest. Do not go over your vineyard a second time or pick up the grapes that have fallen. Leave them for the poor and the alien. (Leviticus 19:9-10)

The God of the Old Testament instructed his followers to leave some of the fruits of their harvest in their fields, un-harvested. An economist might assume merely that God understood the Law of Diminishing Returns and taught his followers accordingly. But to ignore the exhortation to leave something behind for the poor and alien is to miss a potentially rich historical and economic point. Why, beyond the diminishing returns to labor, might one want to leave unpicked fruit on a vine?

The property rights to the goods are clearly delineated in this story. No indication is given that the people for whom the gleanings are to be left have any claim to the harvest through the application of their labor or capital to the production process. Furthermore, that one indirect object of the exhortation is "the alien" (that is, foreigners and persons unknown) rules out the folk theorem and the shadow of the future as explanations. One way to reconcile these issues, then, is to postulate altruistic intentions or social preferences. However, this explanation ignores a few historical facts which, taken together, suggest an altogether different interpretation.

During the historical era in which this text was written, the world of the Jewish people was in upheaval. Ravaged by war, famine, and forced migrations in the previous century, the people had begun to resettle, but for each family that settled a piece of land, there was another traveling in search of a place of its own.[1] The poor wanderer who hungrily stumbled upon a thriving farm would have been tempted to steal from the farm for sustenance. Violence to one's property likely would have been met with violence, and costly conflict ensued. In this context, the idea of leaving unpicked fruit for "the poor and alien" begins to look more strategic and less altruistic. The leftover goods take on the characteristics of a side-payment, offered by the farmer to ward off predation.[2]

In societies without strong institutional structures, the prospect of resource conflict is similarly ubiquitous. To reduce the risk of conflict, groups often uphold informal norms of

[1] Whether one accepts the timeline laid out in the text of the Old Testament itself (Genesis 12:4-9, 26:12-22; Exodus 14:5-9; Joshua 13:1-32) or one follows the standard view of Biblical historians who argue that Leviticus was first put to paper in the wake of the Babylonian Captivity c. 500 BCE (Warington 1873, Harris 1985), this narrative can be demonstrated to reflect the experience of the Jewish people.

[2] Jones (1994) offers a similar argument for the emergence of human food sharing in general.

reciprocal gift-giving, tolerated theft, and sharing (see e.g., Gurven 2004; Henrich et al. 2005; Schechter 2007). However, any (implicit or explicit) promises to avoid conflict made in the context of an informal norm are unenforceable. Thus, when one party offers resources to another in order to deter predation, there is always the risk that the payment is accepted and then conflict occurs anyway.

For this reason, most models of conflict resolution rely on the ability of parties to commit to a plan of action. For example, if contracts are enforceable, then binding, strategy-contingent transfer payments are sufficient to obviate costly conflicts in both theory and practice (Anbarci et al. 2002; Muthoo 2004; Garfinkel and Skaperdas 2007; Esteban and Sakovics 2008; Kimbrough and Sheremeta 2012).[3] Nevertheless, in many conflicts, parties often incur large costs despite the possibility of Pareto improving resolutions. Experimental evidence suggests that individuals are prone to reject Pareto-improving settlements when the proposed outcome is perceived as unfavorable (or unfair)[4] and some individuals may simply enjoy fighting (or winning).[5] On the other hand, there is some evidence that even in the absence of enforceable contracts, individuals can achieve Pareto improvements by employing conventions,[6] reputation-based mechanisms, and reciprocity, particularly in the context of the informal norms mentioned above.[7] However, it is unclear under what circumstances non-binding mechanisms can be employed to avert conflict.

In a recent study, Kimbrough and Sheremeta (2012) report a two-player game of conflict resolution via side-payments in which the Proposer may offer a transfer payment to the Responder in order to prevent the pair from entering into a lottery contest in which they expend costly effort in order to claim a valuable resource. However, when accepting the side-payment does not bind the Responder's actions (i.e., there are no enforceable contracts), the Proposer should never offer a side-payment because a rational Responder will always accept the transfer and then choose to enter the contest anyway. In experimental tests of this model, subjects'

[3] For a comprehensive review of the theoretical literature see Garfinkel and Skaperdas (2012) and for the experimental literature see Dechenaux et al. (2012).
[4] See Hoffman and Spitzer (1985), Guth and Tietz (1990) and Henrich et al. (2001) for experimental evidence.
[5] Sheremeta (2010a, 2010b) find that subjects expend resources seeking a prize worth nothing.
[6] Maynard Smith and Parker (1976) and Maynard Smith (1982) first demonstrated that employing such conventions is an evolutionarily stable strategy in Hawk-Dove games. Similar conventions can emerge to solve numerous other coordination problems (Young 1993; Sugden 2005). However, Grafen (1987) shows that when the chosen convention is persistently disadvantageous to one agent, "desperado" behavior may be optimal.
[7] Hafer (2006) shows that in a repeated conflict over a resource with incomplete information, possession is a signal of success in previous conflicts and can establish expectations among potential contestants that support equilibria in which no conflict occurs. Muthoo (2004) shows how transfers can reduce conflict in repeated games of production and appropriation.

behavior deviates substantially from the theoretical predictions in that: (1) Proposers make offers significantly larger than predicted, and (2) some Responders choose not to enter the conflict, despite the strong incentive to accept the side-payment and still enter the conflict. Noting the affinity of their design to the Ultimatum Game, the authors hypothesize that the observed facts may be explained by the perceived presence or absence of initial entitlements, which can impact subjects' willingness to bargain.

It is well documented in experimental literature that property rights (entitlements) significantly affect behavior in ultimatum, dictator, and team production bargaining games (Hoffman et al. 1994, 1998; Cherry et al. 2002; Oxoby and Spraggon 2008; Gachter and Riedl 2005), and there is also anthropological evidence that people treat windfall gains differently than hard-earned gains; see e.g., Henrich et al (2005) and associated commentary. In general, inducing a property right leads to more self-regarding behavior on the behalf of the right-holder and more acceptance of such behavior by others without rights. To see how a perceived property right could impact bargaining in a two-stage conflict game, suppose that a contested resource is first discovered by one individual, call him the resident (i.e., the Proposer), and only later contested by another, the contestant (i.e., the Responder). If the contestant believes that the resident has a property right to the resource, then she may be more likely to accept a contractual resolution, and knowing this, the resident may be more willing to offer a side-payment.[8] This is the effect that has been observed in previous work on entitlements in bargaining games, but our design introduces a second dimension on which property rights may have an impact. Specifically, previous experiments have employed *exogenous* disagreement payoffs, but in the conflict game, rent dissipation in conflict is *endogenous*, and thus the impact of earned entitlements may also be observed in conflict expenditures. For example, if first possession creates an endowment effect in the resident, say, by reference to some social convention (finders keepers), then all else equal, the resident may be willing to fight harder than the contestant for the resource.[9]

[8] Empirical studies of animal territoriality frequently identify a 'residency effect'; that is, first possessors disproportionately win resource contests (Haley 1994; Alcock and Bailey 1997; Kemp and Wiklund 2004), and a recent experiment by DeScioli and Wilson (2011) documents the residency effect in human subjects.

[9] Gintis (2007) exploits the logic of Parker's (1974) "fighting assessment" to show how such a tendency could describe the origin of property rights in wars of attrition: if the contestant knows that the resident will be willing to expend more effort on defense than she will on offense, then she should respond by choosing not to fight.

We design an experiment to explore the impact of earned entitlements on the frequency and intensity of conflicts. In one treatment, we model a situation in which one party has come to possess a valuable resource by chance, and in our other treatment, we model a situation closer to that described in the biblical passage above in which one party has *earned* the resource. In both cases another party can attempt to take the resource, but the parties have the opportunity to bargain beforehand. Specifically, the experiment consists of two stages. In the bargaining stage, the Proposer offers a side-payment to the Responder in an attempt to keep the resource and to avoid participation in a lottery contest in the conflict stage. After receiving the offer from the Proposer, the Responder decides whether to accept the side-payment and *also* whether to enter the conflict. Hence, the Responder may accept a side-payment and nevertheless enter the conflict. If the Responder accepts the offer, the Responder's payoff increases by the amount of the side-payment offer and the Proposer's payoff decreases by the same amount. However, if the Responder rejects the offer (or accepts the offer and still enters the conflict), both players advance to the conflict stage, in which, according to our instructions, the Responder "may attempt to take" the resource from the Proposer in a lottery contest. Since the side-payment contract is not enforceable, the subgame perfect Nash equilibrium is for the Proposer to make a zero side-payment offer and for the Responder to accept any offer and enter the conflict anyway.

We examine two treatments. In the *Random* treatment, the computer randomly assigns the role of Proposer to each subject. In the *Earned* treatment, the role of Proposer is assigned to subjects who better performed on a ten-question, general knowledge quiz (that is, subjects are ranked according to how many questions they answer correctly, with ties broken by how quickly they completed the quiz). We find that with random allocation of roles (Proposer and Responder), conflicts are avoided 16% of the time, and when subjects earn their roles, conflicts are avoided 23% of the time (a 44% increase relative to the no-entitlement baseline). This effect is driven by the fact that *Earned* Proposers persistently make higher offers than Proposers in the *Random* treatment. However, earned rights have no beneficial impact on average surplus; higher levels of conflict intensity offset the positive welfare effects of reduced conflict frequency.

2. Experimental Environment, Design, Predictions and Procedures

2.1. Experimental Environment and Model Predictions

Our experiment examines a two-player conflict game in which both players expend resources competing for a resource that each value at v = 60. The game is divided into two sequential stages: the bargaining stage and the conflict stage. In the bargaining stage, the *Proposer* offers a side-payment s between 0 and 60 to the *Responder* in an attempt to avoid participation in a rent-seeking lottery contest in the conflict stage. After receiving the side-payment offer s from the Proposer, the Responder decides whether to accept the offer and also whether to enter the conflict. Hence, the Responder may accept a side-payment s and nevertheless enter the conflict. If the Responder accepts the offer and decides not to enter the conflict, the game ends with the Responder receiving a payoff of $v - s$ and the Proposer receiving a payoff of s, and neither player enter the conflict stage. In such a case, the surplus split between the two players is $\Pi = v - s + s = v = 60$. However, if the Responder rejects the offer (or accepts the offer and still enters the conflict), both players advance to the conflict stage, in which, according to our instructions, the Responder "may attempt to take" the prize from the Proposer.

In the conflict stage, the Proposer and the Responder partake in the rent-seeking lottery contest due to Tullock (1980) between two symmetric players (i.e., player 1 and player 2). Both players expend costly resources e_1 and e_2 to increase their probabilities of winning the prize. A player i's probability of winning is defined by a lottery contest success function, i.e., $p_i(e_1, e_2) = e_i/(e_1 + e_2)$. The expected payoff for a risk-neutral player i is $E(\pi_i) = p_i(e_1, e_2)v - e_i$. By differentiating $E(\pi_i)$ with respect to e_i and solving the best response functions simultaneously, we obtain unique Nash equilibrium expenditure levels $e_1^* = e_2^* = v/4 = 15$. Given the equilibrium expenditures, the expected payoffs of both players are $E(\pi_1^*) = E(\pi_2^*) = v/4 = 15$. Hence, the equilibrium prediction for the Tullock contest, independent of the bargaining stage, is that both players will expend 15 and each will receive on average a payoff of 15. Given that the game proceeds to the conflict stage, the equilibrium surplus split between the two players is $\Pi^* = E(\pi_1^*) + E(\pi_2^*) = v/2 = 30$.

Going back to the bargaining stage, since the side-payment is non-binding, the Responder has a dominant strategy to always accept the side-payment s and to enter the conflict stage, where she earns an additional expected payoff of 15. Thus, knowing that the Responder cannot be dissuaded from conflict in the bargaining stage, the Proposer should never offer a side-

payment, i.e., $s^* = 0$, and the game should always reach the conflict stage. Hence, the subgame perfect Nash equilibrium is for the Proposer to offer a side-payment of zero and for the Responder to accept all the offers and always enter the conflict.

2.2. Experimental Design

Building on this environment, we employ a between-subjects experimental design to explore the impact of earned rights on the frequency and intensity of conflict. Our treatments vary whether a subject's assignment to the role of Proposer is *Earned* or *Random*. In the *Earned* treatment, after reading the instructions, all subjects took a ten-question, general knowledge quiz. Subjects were ranked by the number of questions they answered correctly and ties were broken by how quickly the answers were submitted. The subjects knew that they would be assigned their roles on the basis of their performance on the quiz. They were also told that the top performers on the quiz had "earned the right to be Proposers" and that the bottom half were assigned to be Responders. While the instructions in all treatments indicated that Proposers had prior claims to the resource – recall the statement that Responders "may attempt to take" the resource from Proposers – in the *Earned* treatment we allocate these prior claims by relative performance on the quiz rather than randomly, as in the other treatments. The outline of the experimental design and theoretical predictions are shown in Table 1.

2.3. The Hypothesized Effects of Earned Rights

Note that the *Earned* treatment changes neither the structure of the game nor the expected payoffs relative to the *Random* treatment. However, it has been well documented in experimental literature that when subjects earn their roles, their behavior changes (Hoffman et al. 1994, 1998; Cherry et al. 2002; Oxoby and Spraggon 2008; Gachter and Riedl 2005). Based on previous findings, we suggest several hypotheses as to the impact of earned rights on the frequency and intensity of conflicts.

In general, we argue that when subjects earn their roles and the initial allocation of resources clearly assigns first-mover rights to one individual, cooperation will be easier because subjects' expectations will be aligned. Specifically, we expect that earned rights will decrease conflict entry by Responders because Responders will respect the rights of Proposers who make positive offers (Gachter and Riedl 2005).

Hypothesis 1: Earned rights decrease the rate of conflict entry by Responders.

The first hypothesis suggests that earned rights should decrease the frequency of conflicts and increase the probability of conflict resolution. At the same time, earned rights may also lead to heavier fighting by Proposers because rebuffed attempts at cooperation can lead to retaliation. This can also be interpreted as earned rights producing an endowment effect (Gintis 2007).

Hypothesis 2: Conditional on conflict, earned rights increase conflict expenditures by Proposers.

Thus, we hypothesize that earned rights will decrease the frequency of conflicts and increase the probability of conflict resolution (Hypothesis 1). However, if and when conflict ensues, we expect Proposers to react spitefully because they will believe that their property right is being disrespected (Hypothesis 2).

Finally, the expected effect of earned rights on offers is indeterminate because there are two potential effects. First, those subjects who would already seek to cooperate by making positive offers when rights are randomly assigned may decrease their offers if they believe they have earned the right to a larger share of the surplus (Hoffman et al., 1994). On the other hand, some Proposers who would not make positive offers if rights were randomly assigned may now choose to offer positive amounts because they have expectations that a sufficient offer will induce non-entry.

2.4. Procedures

To test these hypotheses we ran three experimental sessions of each treatment with 12 subjects per session. Each session consisted of 30 periods of a single treatment in which subjects were randomly and anonymously re-matched in each period. Subjects were assigned the role of either Proposer or Responder (randomly in the *Random* treatment and earned through quiz competition in the *Earned* treatment), and they persisted in that role throughout. At the end of each experimental session, subjects completed a brief demographic survey. To reinforce the one-shot incentives of the game, subjects knew beforehand that we would select five of the 30 periods for payment using a bingo cage; subjects' earnings from these five periods were added to

or subtracted from a participation fee of $20. We converted endowments and earnings to USD at a rate of 30 = $1 and subjects were paid privately in cash at the end of the experiment. Sessions lasted one hour each.

Subjects were recruited at random from the undergraduate student body of Chapman University. Subjects sat at, and interacted via, visually isolated computer terminals, and instructions were read aloud by the experimenter as subjects followed along on paper. Subjects received a participation fee of $20 for arriving to the session on time and which was increased or decreased according to their performance in the session. Subjects received their earnings in cash privately at the end of each session. The average experimental earnings, including the $20 participation fee, were $22.6, ranging from a low of $16.0 to a high of $28.3. No subject participated more than once, and no subject had prior experience with a similar experimental environment. Instructions for the *Earned* treatment are included in the Appendix. Instructions for the other treatments and the quiz are available from the authors upon request.

3. Results

3.1. Comparisons to the Theory

Table 2 displays summary statistics for our treatments. Theory predicts a total surplus of 30 in both the *Random* and *Earned* treatments (see Table 1). However, the data from the experiment indicate that in the *Random* and *Earned* treatments, the average surpluses of 20.3 and 18.4 are significantly lower than the theoretical prediction of 30.

Finding 1: Surplus in both treatments is smaller than predicted.

To support these conclusions we estimated simple panel regressions separately for each treatment, where the dependent variable is the surplus (payoff) and the independent variables are a constant and a period trend. The models included a random effects error structure, with the individual subject as the random effect, to account for the multiple decisions made by individual subjects. The standard errors were clustered at the session level, to control for the fact that multiple subjects repeatedly interacted with each other in a given session. Based on Wald tests conducted on estimates of each model, we found that surplus in all treatments is significantly lower than predicted (p-values < 0.01).

Furthermore, much of the predicted surplus is lost due to substantial overinvestment in conflict relative to the predictions (see Figures 1a and 1b). Additional panel regressions for each treatment where conflict expenditure is the dependent variable and the independent variables are a constant, a dummy variable indicating whether the subject was a Responder, and a period trend indicate that these differences are statistically significant. As before, we include a random effects error structure by subject to account for multiple observations, and we cluster standard errors by session. Wald tests confirm that expenditures are greater than the predicted value of 15 (p-values < 0.01), and the coefficient on the Responder dummy is positive but insignificant for all treatments.

However, the welfare losses due to over-dissipation are actually understated by the fact that some pairs in both the *Random* and *Earned* treatments are able to use side-payments to avoid conflict – with probabilities 0.16 and 0.23, respectively. Figures 2a and 2b display histograms of side-payment offers for each treatment, and we confirm that offers are also significant larger than predicted by the theory with additional random-effects panel regressions for each treatment where the Proposer's stage 1 offer is the dependent variable and the independent variables are a constant and a period trend. We cluster standard errors by session, and Wald tests confirm that offers are greater than the predicted amount of 0 in both the *Random* and *Earned* treatments (p-values < 0.01).

Overall, these results are consistent with the findings of other studies on contests and conflict resolution (for a review see Dechenaux et al. 2012). Specifically, the findings that subjects sometimes use non-binding side-payments to successfully resolve conflicts (16% in *Random* and 23% in *Earned*), replicate the findings of Kimbrough and Sheremeta (2012), who report a conflict resolution rate of 14%. The finding that subjects overinvest in conflict (modeled as a lottery contest) replicates the findings of a large experimental literature on rent-seeking (Davis and Reilly 1998; Potters et al. 1998; Anderson and Stafford 2003; Sheremeta 2010a, 2010b, 2011; Sheremeta and Zhang 2010; Mago et al. 2011, 2012; Chowdhury et al. 2012).

These facts taken together indicate that our data replicate the patterns of deviation from the theory observed in other studies, so now we turn our focus to the hypothesized effects of earned rights.

3.2. Earned Rights

First we examine whether the *Earned* treatment yields a significant increase in the probability of avoiding conflict. Recall, Hypothesis 1 states that earned rights should decrease entry by Responders and increase the probability of conflict resolution. Table 2 provides support for Hypothesis 1, indicating that conflict in the *Earned* treatment is resolved with significantly higher probability than in the *Random* treatment (probability of 0.23 versus 0.16), leading to 44% increase in the conflict resolution rate in the *Earned* case.

Finding 2: Earned rights increase the probability of conflict resolution because Proposers make persistent and significantly larger offers in the *Earned* treatment.

Table 3 displays the probability of conflict resolution by treatment, conditional on the size of the side-payment offer. For offers in the intervals [0, 15], (15, 30], and (30, 60], the probability of avoiding conflict is increasing for both treatments, but the probability is consistently higher for the *Earned* treatment. This finding and a significant and negative effect of offer size on conflict probability are supported by regression analysis.

Specifically, we estimate a linear probability model where the dependent variable is one or zero indicating whether the Responder chose to enter the conflict stage. Restricting attention to non-zero offers, we estimate the impact of earned rights on the probability of entry, controlling for a period trend, the amount of the proposer's offer, and whether the offer was accepted. We include random effects to account for multiple observations on each subject, and we cluster standard errors by session. The effect of earned rights on the probability of conflict is negative and weakly significant (p-value = 0.09), and the effect of offer size is significant and negative (p-value < 0.01).

However, this regression underestimates the treatment effect because offers are persistently higher in the *Earned* treatment. The mean offer in the *Earned* treatment is 15.8 while it is only 12.3 in the *Random* treatment (Table 2). Figures 2a and 2b, displaying histograms of bargaining stage offers in the *Random* and *Earned* treatments, indicate the increase in the observed frequency of offers around 30 in the *Earned* treatment.

The effect of earned rights on offers is even more pronounced when we look at the change in the distribution of offers over time. Figure 3 displays time series of the mean offer in

the *Earned* and *Random* treatments. In the first 10 periods, the mean offer of 18.7 in the *Random* treatment is marginally higher than the mean offer of 17.5 in the *Earned* treatment. However, by the final 10 periods, the mean offer in the *Random* treatment has fallen by 63% to 7.0, while the mean offer in the *Earned* treatment has fallen only by 9% to 16.0.

Regression analysis indicates a significant relative decline in offers in the *Random* treatment. We estimate a panel regression with a random effects error structure to account for multiple observations on each subject, and we cluster standard errors at the session level. The dependent variable is the amount of the offer, and the independent variables are a constant, a period trend, an *Earned* treatment dummy variable, and a term capturing the interaction of the period trend and the *Earned* rights dummy. The coefficient on the interaction term is positive and significant (p-value < 0.01) and the coefficient on period alone is negative and significant (p-value < 0.01). A Wald test cannot reject the linear hypothesis that the period trend and the period×treatment interaction term sum to zero, which indicates that offers decline over time only in the *Random* treatment (p-value = 0.13).

To understand the source of the treatment effect on offers, Figure 4 displays time series of offers for each Proposer. In both the *Random* and *Earned* treatments, many subjects make substantial offers in early periods, but in the *Earned* treatment, far fewer of those subjects eventually reduce their offers to 0. The bold outlined panels in Figure 4 show subjects who made cooperative offers in early periods and later reduced their offers. Eleven subjects in the *Random* treatment offered less than 5 (on average) over the final 10 periods, while only five subjects do the same in the *Earned* treatment. Hence, earned rights induce persistent *attempts* at cooperation, which translate into a 44% increase in the probability of conflict resolution.

Despite the surplus gains from attempted cooperation and the resulting increase in the probability of avoiding conflicts, our data indicate that earned rights had no significant effect on total welfare[10], in particular due to a reduction in Proposer payoffs (see Table 2).[11] What explains these apparently contradictory tendencies? Table 4 displays statistics on offers, rejections, and

[10] We estimate simple panel regressions, with subject-specific random effects and standard errors clustered by session where the dependent variable is surplus and the independent variables are a constant, a period trend, and an *Earned* treatment dummy. We cannot reject the null hypothesis that the *Earned* treatment has no effect (p-value > 0.7).

[11] We estimate additional random-effects panel regressions, with standard errors clustered by session, separately for Proposers and Responders. The dependent variable is individual payoff and the independent variables are a constant, a period trend, and an *Earned* treatment dummy. The effect of earned rights is negative and (weakly) significant only for proposers in the *Earned* treatment (p-value = 0.06).

conflicts in each treatment. To understand the source of the decrease in Proposers' payoffs, notice first that Proposers in the *Earned* treatment make non-zero offers 75% of the time versus only 70% in the *Random* treatment. Furthermore, Responders reject a slightly larger percentage of non-zero offers in the *Random* treatment, which allows Responders to retain more of the surplus. This partly explains the decrease in Proposers payoffs, but both effects are welfare neutral, given that side-payments merely transfer resources to the Responder. To understand why the *Earned* treatment does not generate an increase in total surplus, we analyze the conflict expenditures of each type in both treatments.

Finding 3: There is no significant effect of earned rights on total surplus because the increase in the rate of conflict resolution is offset by higher conflict expenditures by those Proposers who find themselves in a conflict after their offer is accepted.

According to Hypothesis 2, when conflict ensues, earned rights should increase contest expenditures by Proposers, thereby reducing surplus. Table 5 displays average conflict expenditure by treatment and subject type, depending on whether a positive offer was accepted or rejected. In the *Random* treatment, non-zero accepted offers lead Proposers to reduce their expenditures (either because the positive offer signals cooperative intentions or because they are cutting their losses), but in the *Earned* treatment, when Responders accept positive offers and still choose to enter the conflict, Proposers react spitefully, fighting just as hard as when their offers are rejected.

These results receive statistical support in additional random-effects panel regressions, estimated separately for Proposers and Responders and restricted to observations in which Proposers made non-zero offers. The dependent variable is conflict expenditure and the independent variables are a constant, a period trend, the stage 1 offer, an *Earned* treatment dummy, a binary variable indicating whether the offer was accepted, and an interaction term of the treatment dummy and whether the offer was accepted. We cluster standard errors by session. For Proposers, the coefficient on "accept" is significant and negative (p-value < 0.02), which indicates that Proposers in the *Random* treatment invest less when their offers are accepted. On the other hand, the coefficient on the interaction term is significant and positive (p-value < 0.02), and a Wald test cannot reject the hypothesis that the two coefficients sum to zero (p-value =

0.77). This indicates that *Earned* treatment proposers fight just as hard when their offer is accepted as when it is rejected, thus accounting for the diminished surplus. All other coefficients except the constant are insignificant (p-values > 0.5).[12] In the estimated equation for Responders, all coefficients are insignificant (p-values > 0.15).

Finding 4: Controlling for offer size, Proposers in the *Earned* treatment expend more resources in conflict when their offers are accepted than Proposers in the *Random* treatment.

Taken together, this evidence explains why earned rights do not change the aggregate surplus, despite decreasing the probability of conflict. According to these findings, earned rights impact behavior in three important ways: (1) Proposers who have earned their position persistently offer larger side-payments; (2) larger offers lead to a lower probability of conflict; but (3) *Earned* Proposers whose offers do not lead to conflict resolution respond spitefully and spend just as much in conflict as when offers are rejected (Finding 3). Hence, with earned rights, the positive welfare effects of reduced conflict *frequency* are offset by greater conflict *intensity*, resulting in unchanged surplus.

4. Discussion

In many contexts, individuals and groups attempt to employ non-binding mechanisms to resolve costly conflicts. As our biblical example suggests, the threat of resource conflict has motivated attempts to implement such mechanisms, despite issues of enforceability, far into recorded history, and recent research suggests that similar mechanisms are at work in many small-scale societies even today (e.g., Gurven 2004; Schechter 2007). Here, we design an experiment to explore how the effectiveness of non-binding conflict resolution mechanisms depends on how the objects of conflict were allocated in the first place. In particular, we examine how earned rights to a valuable resource impact the following variables: (1) the willingness to offer payments intended to obviate resource conflict, (2) the willingness to accept such payments and voluntarily forgo conflict, and (3) the costs of conflicts that result from failed attempts at cooperation.

[12] An alternative specification excluding the interaction term shows no effect of accepting the offer and instead gives a positive and weakly significant coefficient on the *Earned* treatment dummy (p-value = 0.09), which imperfectly captures the same effect.

In previous literature, earned entitlements frequently increase the extent to which behavior approximates Nash play in bargaining games. When subjects observe that a decision maker has earned the right to an assigned role (e.g., the Proposer), the decision maker often behaves more selfishly and others are more likely to accept decisions that favor the right-holder (e.g., by accepting lower offers in ultimatum games, see Hoffman et al. 1994). However, in these papers, the disagreement payoff is *exogenous* and subjects whose offers are rejected have no opportunity to impact the payoffs of their counterpart after bargaining. Here we *endogenize* the disagreement payoff in the conflict stage, which allows us to identify both the gains from bargained conflict resolution and the costs of conflict escalation after bargaining fails.

In the Nash equilibrium of our two-stage conflict game with non-binding side-payment contracts for conflict resolution, Proposers offer nothing to Responders since they know that Responders will accept their offer, take the transfer payment, and then choose to enter the conflict anyway. However, when Proposers earn the right to make side-payment offers, it creates a sense of entitlement to a share of the prize. Proposers respond by offering more and persisting in making high offers over time. These offers increase the rate of conflict resolution, but this does not improve welfare. When Proposers who earned their role observe their counterparts accepting transfer payments and nevertheless choosing to enter the conflict, they increase the intensity of conflict, offsetting the gains from higher conflict avoidance.

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Tables

Table 1: Experimental Design and Theoretical Predictions

	Player	Treatment *Random*	Treatment *Earned*
Side-payment, s^*	Proposer	0	0
Probability of Conflict Resolution	Responder	0.00	0.00
Equilibrium Expenditure, e^*	Proposer	15	15
	Responder	15	15
Expected Payoff, $E(\pi^*)$	Proposer	15	15
	Responder	15	15
Available Surplus, v		60	60
Equilibrium Surplus, Π^*		30	30

Table 2: Average Individual Per Period Surplus and Expenditure by Treatment

	Player	Treatment *Random*	Treatment *Earned*
Side-payment, s	Proposer	12.3 (13.2)	15.8 (14.1)
Probability of Conflict Resolution	Responder	0.16	0.22
Average Expenditure, e	Proposer	23.3 (12.7)	26.9 (10.9)
	Responder	23.9 (12.8)	27.3 (12.3)
Average Payoff, π	Proposer	5.1 (33.1)	1.9 (34.1)
	Responder	15.2 (30.1)	16.5 (29.2)
Total Surplus, Π		20.3	18.4

Standard deviations in parentheses.

Table 3: Probability of Conflict Resolution Conditional on the Side-Payment Offer

Side-Payment	Treatment *Random*	Treatment *Earned*
$0 \leq s \leq 15$	0.07	0.09
$15 < s \leq 30$	0.24	0.36
$30 < s \leq 60$	0.48	0.64

Table 4: Number of Offers, Rejections and Conflicts

	Treatment	
	Random	*Earned*
# of Offers	540	540
# of Non-Zero Offers	377	404
	(0.70)	(0.75)
# of Rejections	199	169
	(0.37)	(0.31)
# of Non-Zero Rejections	70	70
	(0.19)	(0.17)
# of Conflicts Avoided	89	125
	(0.16)	(0.23)

Probabilities in parentheses.

Table 5: Mean Non-Zero Offers and Expenditures by Treatment

		Treatment			
		Random		*Earned*	
Decision	Player	Offer > 0	Expenditure	Offer > 0	Expenditure
Accept	Proposer	16.9 (12)	20.9 (12.4)	20.4 (11.4)	28.2 (11.6)
	Responder	16.9 (12)	22.7 (12.7)	20.4 (11.4)	27.4 (13.3)
Reject	Proposer	9.6 (9.7)	26.8 (11.4)	8.9 (8.5)	27.8 (9.9)
	Responder	9.6 (9.7)	26.8 (12.1)	8.9 (8.5)	28.6 (9.8)

Standard deviation in parentheses.

Figures

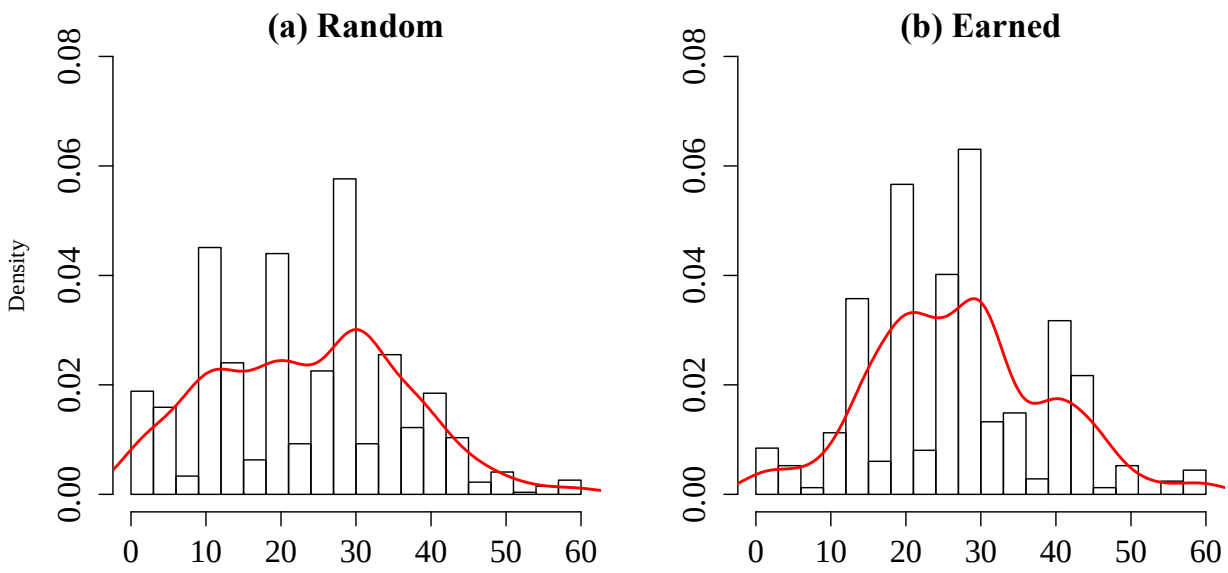


Figure 1: Histograms of Conflict Expenditures by Treatment

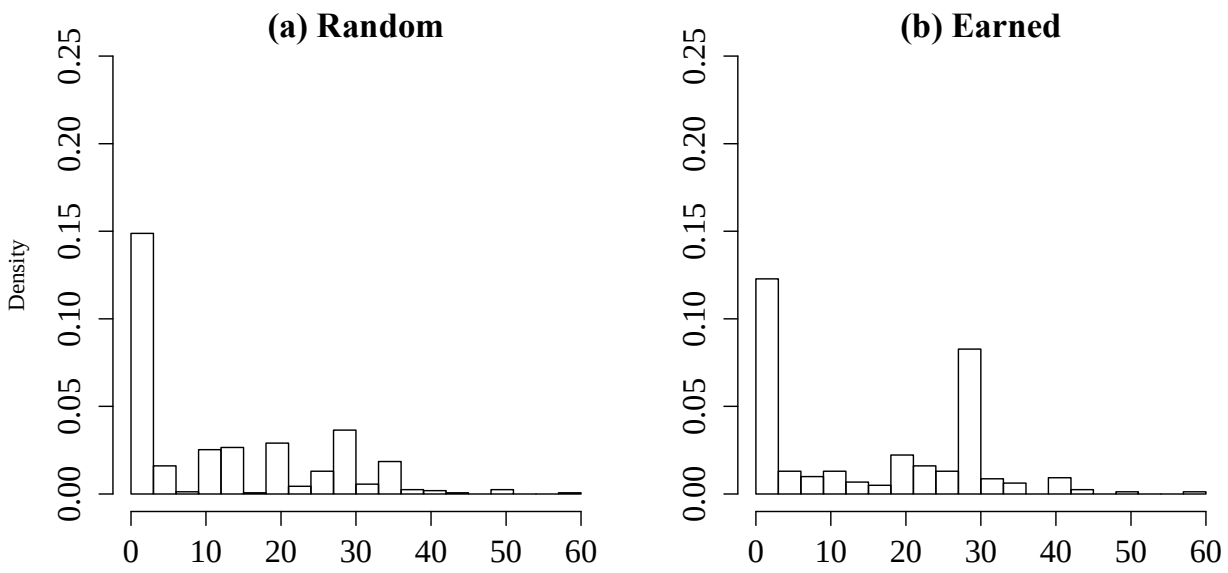


Figure 2: Histograms of Bargaining Stage Offers by Treatment

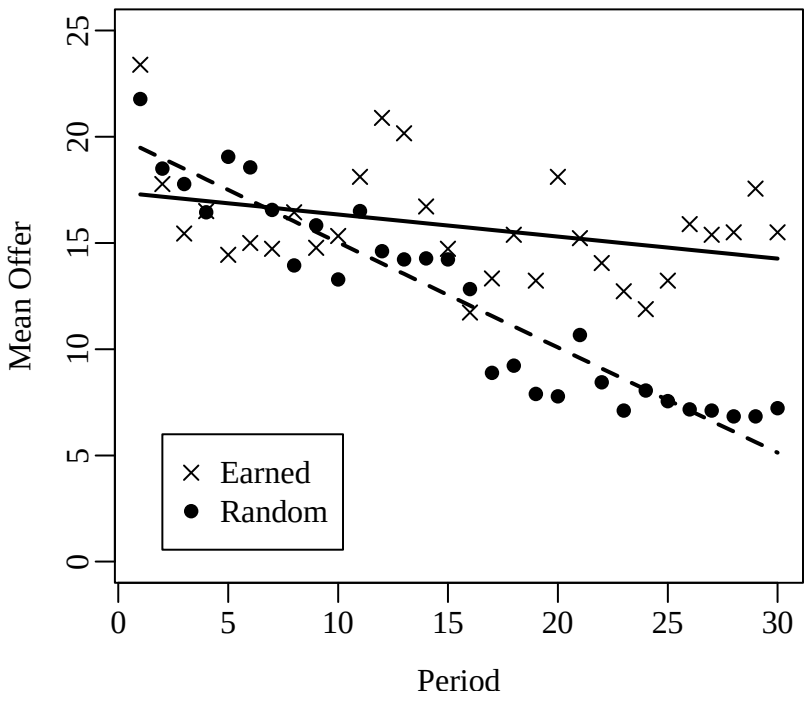
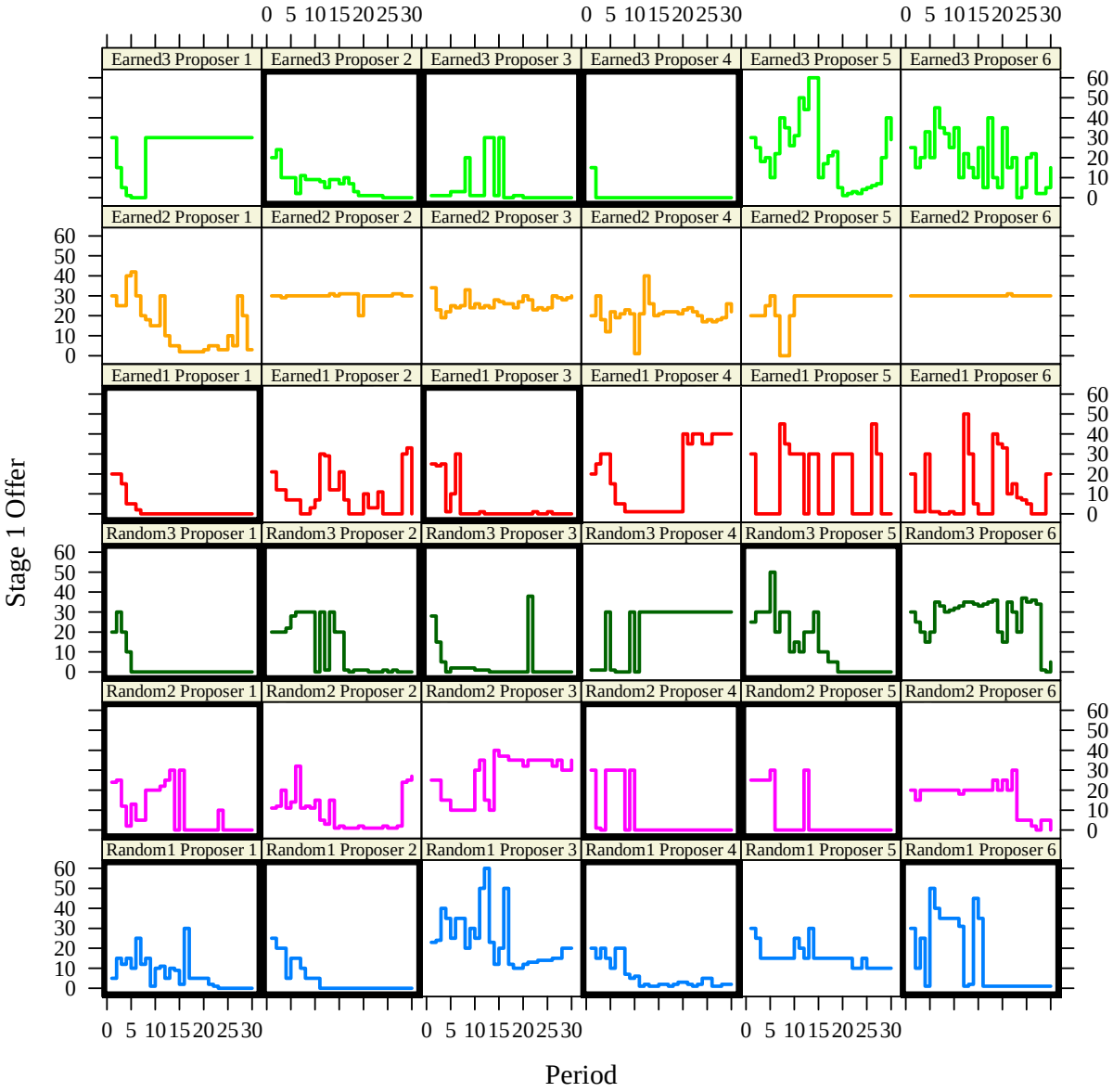


Figure 3: Time Series of Mean Offers By Treatment with OLS Fit



Note: Each Row Represents Proposers in 1 Session (Rows 1-3 *Earned* and Rows 4-6 *Random*). Panels outlined in **bold** indicate subjects who offered less than 5 on average from period 21-30.

Figure 4: Step Plots of Proposer Stage 1 Offers by Period and Treatment

Appendix: Instructions for the Earned Treatment

GENERAL INSTRUCTIONS

This is an experiment in the economics of strategic decision-making. Various research agencies have provided funds for this research. The instructions are simple. If you follow them closely and make appropriate decisions, you and the 11 other participants in this experiment can earn an appreciable amount of money, which will be paid to you in CASH at the end of today's experiment.

The currency used in the experiment is francs. Francs will be converted to U.S. Dollars at a rate of _30_ francs to _1_ dollar. You have already received a $20.00 participation fee (this includes the $7 show up fee). The experiment will consist of 30 periods and at the end of the experiment we will randomly choose 5 of the 30 periods for actual payment using a bingo cage. We will sum your total earnings for these 5 periods and convert them to a U.S. dollar payment.

It is very important that you remain silent and do not look at other people's decisions. If you have any questions, or need assistance of any kind, please raise your hand and an experimenter will come to you. If you talk, laugh, exclaim out loud, etc., you will be asked to leave and you will not be paid. We expect and appreciate your cooperation. The remainder of the instructions will describe the decisions you may face in each period.

INSTRUCTIONS FOR STAGE 1

At the beginning of each period, you will be randomly and anonymously placed into a group of 2 participants. Each randomly chosen pair will consist of one Proposer and one Responder.

The positions of Proposer and Responder will be determined by your scores on a quiz before the first period of the experiment. Each of you will be asked the same set of 10 questions. Your quiz score is the number of questions you answered correctly. Quiz scores will be ranked from highest to lowest and ties are decided by giving a higher ranking to the person who finishes the quiz in the shortest amount of time.

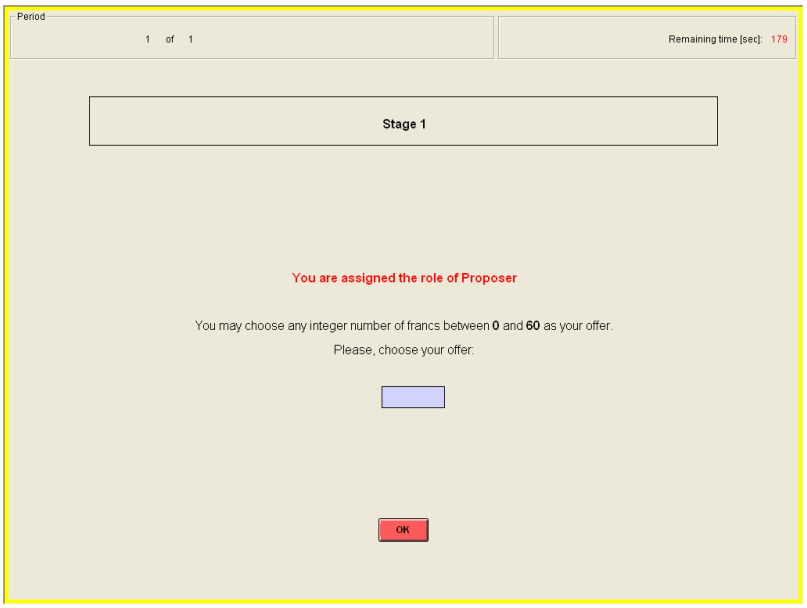
Once the complete rankings of participants are determined, you will enter your name, and the participants will be divided into two groups, the Proposers and the Responders. The lower ranking half will be Responders for all periods of the experiment. The higher-ranking half has earned the right to be Proposers. Your role will determine the decisions that you make.

Once the roles have been assigned, an experimenter will direct you to another computer. The computer will display in the middle of the screen which role you have been assigned.

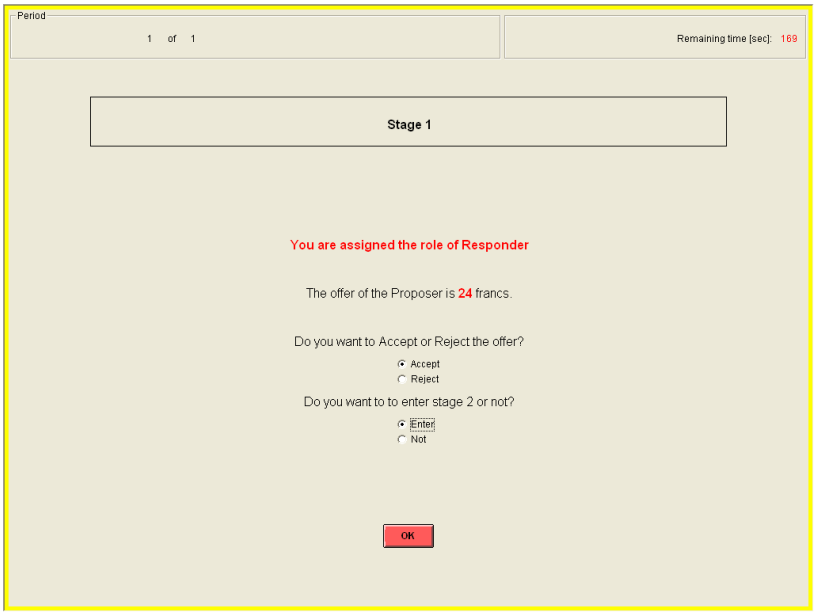
The composition of your pair will be changed randomly every period. Each period will consist of two stages. In Stage 1, you and the other participant in your group will bargain over a reward. The reward is worth 60 francs to you and the other participant in your group.

YOUR DECISION

In each period, the Proposer will be endowed with the 60 franc reward and will have an opportunity to make an Offer to the Responder. The Proposer may offer any integer number of francs between 0 and 60. An example of the Proposer's decision screen is shown below.



Once the Proposer has entered an offer and submitted that offer to the Responder, the Responder will choose either to Accept or Reject the offer and also whether to enter Stage 2 or not. An example of the Responder's decision screen is shown below.



EARNINGS

If the Responder accepts the offer and decides not to enter stage 2, the Responder receives a payment equal to the offer, and the Proposer receives the 60 franc reward minus the amount of the offer:

Proposer Earnings = 60 – Offer
Responder Earnings = Offer

If the Responder rejects the offer and decides not to enter stage 2, the Responder receives a payment equal to 0, and the Proposer receives the 60 franc reward:

Proposer Earnings = 60
Responder Earnings = 0

If the Responder accepts the offer and decides to enter Stage 2, then the experiment moves to Stage 2 in which the Responder may attempt to take the reward. In that case, the Responder receives a payment equal to the earnings from Stage 2 plus the offer, and the Proposer receives the earnings from Stage 2 minus the offer:

Proposer Earnings = Earnings in Stage 2 – Offer
Responder Earnings = Earnings in Stage 2 + Offer

If the Responder rejects the offer, then the experiment moves to Stage 2 in which the Responder may attempt to take the reward. In that case, both participants will receive their earnings from decisions made in Stage 2:

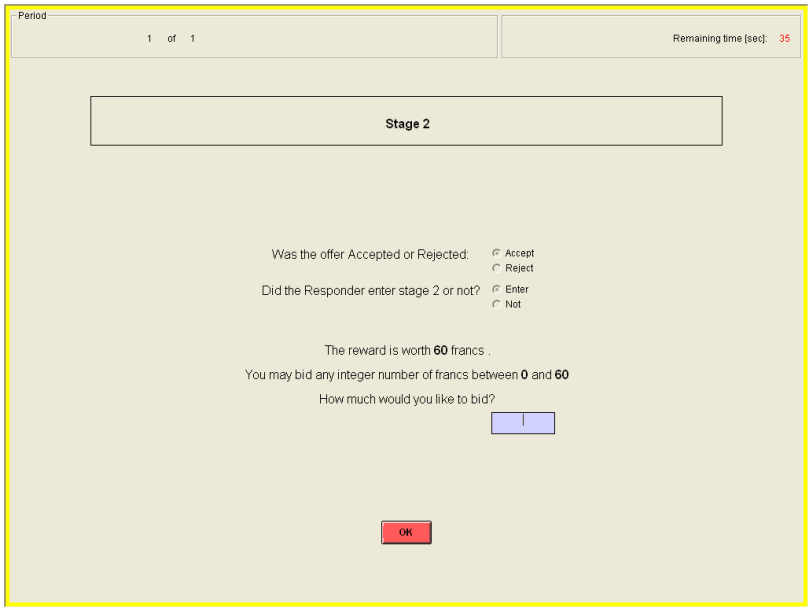
Proposer Earnings = Earnings in Stage 2
Responder Earnings = Earnings in Stage 2

Note, if the Responder decides not to enter stage 2 (disregarding whether he accepts or rejects the offer) then the period ends after stage 1. However, if the Responder decides to enter stage 2 (disregarding whether he accepts or rejects the offer) both participants will enter stage 2.

INSTRUCTIONS FOR STAGE 2

DECISION IN STAGE 2

In Stage 2, the Responder may attempt to take the reward from the Proposer. Each participant may bid for the 60 franc reward. You may bid any integer number of francs between 0 and 60. An example of your decision screen is shown below.



EARNINGS IN STAGE 2

After all participants have made their decisions, your earnings for the period are calculated. Regardless of who receives the reward, all participants will have to pay their bids. Thus, your earnings in stage 2 will be calculated in the following way:

If you receive the reward:
Earnings in Stage 2 = 60 – Your Bid
If you do not receive the reward:
Earnings in Stage 2 = 0 – Your Bid

Remember you have already received a $20.00 participation fee (equivalent to 600 francs). Depending on a period, you may receive either positive or negative earnings. At the end of the experiment we will randomly select 5 out of 30 periods for actual payment. You will sum the total earnings for these 5 periods and convert them to a U.S. dollar payment. If the earnings are negative, we will subtract them from your participation fee. If the earnings are positive, we will add them to your participation fee.

What Does my Bid Mean?

The more you bid, the more likely you are to receive the reward. The more the other participant in your group bids, the less likely you are to receive the reward. Specifically, for each franc you bid you will receive one lottery ticket. At the end of each period the computer draws randomly one ticket among all the tickets purchased by you and the other participant in the group. The owner of the drawn ticket receives the reward worth 60 francs. Thus, your chance of receiving the reward is given by the number of francs you bid divided by the total number of francs you and the other participant in your group bids.

$$\Pr(\text{Winning}) = \frac{\text{Your Bid}}{\text{Your Bid} + \text{Other Participant's Bid}}$$

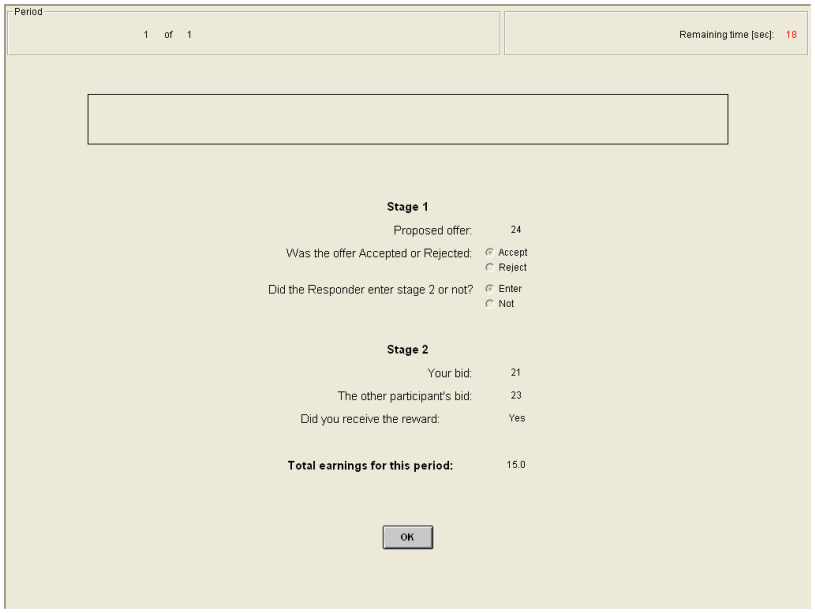
If both participants bid zero, the reward is randomly assigned to one of the two participants in the group.

Example of the Random Draw

This is a hypothetical example used to illustrate how the computer is making a random draw. If participant 1 bids 10 francs and participant 2 bids 20 francs, the computer assigns 10 lottery tickets to participant 1 and 20 lottery tickets to participant 2. Then the computer randomly draws one lottery ticket out of 30 (10 + 20). As you can see, participant 2 has higher chance of receiving the reward: 0.67 = 20/30. Participant 2 has 0.33 = 10/30 chance of receiving the reward.

After all participants make their bids, the computer will make a random draw which will decide who receives the reward. Then the computer will calculate your period earnings based on your bid and whether you received the reward or not.

At the end of each period, the Proposer's offer, whether the offer was accepted, whether the Responder entered Stage 2, your bid, the other participant's, whether you received the reward or not, and the earnings for the period are reported on the outcome screen as shown below. Once the outcome screen is displayed you should record your results for the period on your Personal Record Sheet under the appropriate heading. An example of the outcome screen is shown below.



IMPORTANT NOTES

You will not be told which of the participants in this room are assigned to which group. At the beginning of each period you will be randomly re-grouped with one other participant to form a two-person group. You can never guarantee yourself the reward. However, if you are the Proposer in stage 1, and the Responder decides not to enter stage 2, you will receive the reward. Furthermore, if the experiment proceeds to stage 2 then by increasing your bid in stage 2, you can increase your chance of receiving the reward. In stage 2, regardless of which participant receives the reward, all participants must pay their bids.

Are there any questions?

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