The Role of Responsibility in Strategic Risk-Taking

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Abstract: We explore play between groups where one member of each 2-person group dictates the play of that group and is therefore responsible for the payoff of the other group member. We compare this to play when the game is the same, but each person is playing only for herself. Consistent with the principle of responsibility-alleviation described in Charness (2000), we find that a sense of responsibility for the welfare of others has an effect. While the issue of responsibility does not appear to influence the decisions of 2/3 of the population, almost 90 percent of the remaining 1/3 of the population plays a less risky strategy when choosing for a group than when playing only for herself.

Keywords: Equilibrium Selection, Responsibility, Risk-taking

JEL Classification Numbers: A13, B49, C91

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1. Introduction

How does having the responsibility for someone else's welfare, as well as one's own, affect choice behavior? If people care about the payoffs of others, there may well be differences according to whether someone is an individual acting alone or is instead a representative who makes binding decisions for a group.

There is a body of research coming from both social psychology and economics which sheds some light on this question. For instance, Kerr and MacCoun (1985) provide evidence that people will consciously let others free ride on their efforts if they feel that their social role prescribes it. And Charness (2000) suggests that an agent who bears the responsibility for an outcome will behave in a more 'pro-social' manner.[1]

While there is some research on responsibility, there is nothing in the models of social preferences that provides predictions regarding the willingness of a decision maker to take on risk when the welfare of others rests on his or her shoulders. Yet, we suspect that risk-taking behavior will be affected by a feeling of responsibility. To make things concrete, it is easiest to discuss the issue directly in terms of the game that we use in the experimental part of our study. Consider the following variation on Rousseau's classic Stag Hunt game.

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[1] The flip side of this is that perceiving that one has diminished responsibility gives license to more competitive or selfish urges, as it is someone else's responsibility to make a final determination. Such behavior can be seen in compliance with honor codes (the absence of a proctor is found to decrease cheating in Campbell, 1935), and compliance with dispute-resolution outcomes (McEwen and Maiman, 1984 find that *ex post* compliance rates are twice as high with mediation as with arbitration), as well as to sporting activities. (The original insight came from playing in two different softball leagues, one in which there were umpires and one in which the player makes the call herself. For example, an outfielder who has trapped a fly ball is more likely to be honest when she has to make the call then when there is an umpire, in which case there is the inevitable posturing of the ball being in one's glove and therefore being a catch.) There is only a modest degree of experimental support for this idea. In a gift-exchange experiment, Charness (2000) finds that 'workers' are more generous when 'wages' have been chosen by a random mechanism (a draw from a bingo cage) or assigned without explanation by the experimentalist. Morgenstern (2004) also finds evidence of responsibility alleviation in a gift-exchange environment, where 'workers' are more generous when the production technology is randomly determined.

		Player 2	
		Stag	Hare
Player 1	Stag	9, 9	1, 8
	Hare	8, 1	8, 8

In this game, there are two Nash equilibria in pure strategies: one where both players play Stag, and another where both players play Hare.[2]

Now let us consider a simple variation of the game. Instead of just two players, consider a situation where each 'player' is actually a 'pair'. That is, there are four players in total, two who play the game and then two others who do not directly participate but are paired with the players in the game, so that one of them earns whatever player 1's payoff is and the other earns whatever player 2's payoff is. In terms of Rousseau's setting, player 1 makes a decision to play either hunt "Stag" or "Hare", but also realizes that when he or she comes home, that there is a second person who will either eat a stag (payoff 9), a hare (payoff 8), or go hungry (payoff 1) depending on the outcome of the game. So, each of the two players who take actions in the game has a player who earns their same payoff but does not take any action in the game or communicate in any way with the players who take the actions the game. Thus, each player is not only playing for him or herself, but also another person who just sits aside.

While it is not completely obvious in our game what 'pro-social' behavior would be, we might nevertheless expect players to choose a safer strategy when someone else's welfare depends on their decision. On the one hand, the "risky-shift" literature in social psychology (beginning with Stoner, 1961) hypothesizes that deliberation leads groups to make riskier

[2] The selection between these equilibria (and those in related coordination games) has been the subject of much study. See for instance, Harsanyi and Selten (1988), Kandori, Mailath and Rob (2003), Young (1993), and the literature that followed.

decisions than the average of its individual members; which would give the opposite prediction.[3] On the other hand, there is also the opposite effect of a "cautious shift," where deliberation takes a more cautious position. These are both examples of "group polarization" (a term due to Moscovici and Zavalloni, 1969), where the tendency of the average opinion becomes more extreme in the process of discussion. Empirically, Viscusi, Magar, and Huber (1987) find that managers wish to avoid decisions leading to even a small increase in the probability of a disaster.[4] In addition, Reynolds, Joseph, and Sherwood (2007) find that people are less risk averse in making decisions for themselves than when making decisions that affect others. We outline some possible explanations for this result (and, as we shall see, our own) in Section 2.

We design an experiment where, in one case, an individual decides Stag or Hare for only his or her own payoff. In the other case, the decider has a silent and anonymous partner who receives the same outcome as the decider. Naturally, this means that their outcome preferences are totally aligned, although of course individuals could differ with respect to risk preferences.

Our findings are that, in the aggregate, players are 18 percentage points more likely to choose Stag, the risky play, when choosing solely for one's own payoff as opposed to having another silent player earn the same payoff. The differences in behavior break down unevenly across the population. The behavior of about one-third of the population is substantially sensitive to the issue of being responsible for another person's welfare; but in almost 90% of these cases, the decider takes on less risk when he or she is the agent for another party than when

[3] Note that this study (and others involving "group polarization") involve discussion between or among the group members; without such group discussion, this effect doesn't appear to be present.

[4] An example of the cautious shift can be taken from the cleanup of the plutonium processing facility at Rocky Flats, Colorado. Public pressure caused political leaders to pursue a cleanup strategy that was largely focused on appeasing public opinion. The option that was taken ended up costing between $2 and $3 *billion* per expected life saved on the chance that the radiation might cause cancer (Schultz 2004).

acting only for him or herself. This lessened risk does come at a social cost, however, as average payoffs are reduced substantially when the deciding player also represents another party.

2. Experimental Design and Hypotheses

In order to see how feelings of responsibility influence decisions to take on risk in a strategic environment, we ran two treatments. One was a control treatment in which there were just two players, one in each role. These games with individual players served as a benchmark. We also ran a variation, where we introduced pairs into the player roles, but only one individual in the pair made the decision: he or she was a dictator for the pair and there was no communication within (or across) pairs.

We conducted a series of experiments in six separate sessions at the University of California at Santa Barbara. There were 16 participants in each session, with average earnings of about $15 (including a $5 show-up payment) for a one-hour session. Our experiment was programmed using the z-Tree software (Fischbacher 1999). As our design was partly motivated by considerations of network formation, we framed our game in terms of a decision whether to add a link to an existing network. We also ran additional treatments beyond those reported here, where pairs voted on which strategy to play. The full results of those treatments are reported in Charness and Jackson (2007), and a complete description of all of the experimental treatments and instructions are in Appendices A and B.[5]

Participants played each treatment for a 15-period segment with the same set of players. They were re-matched between treatments, and half of the subjects had the 'play-for-self' treatment first, while the other half had the 'play-for-pair' treatment first. Participants always

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[5] As can be seen from these appendices, these games were run in conjunction with two other games in a session, so we kept the same structure of link addition in a game throughout.

knew which case applied before making any decision, (and half of the people in the play-for-pair case had no decision to make). Once the decisions for the period were reached, each person learned his or her payoff, and the decision of the other individual or pair. Participants also knew that they would learn this information before making subsequent choices.

If being responsible for another player's payoff has no effect on how individuals act, then choices in the play-for-self treatment and play-for-pair treatments should be the same. If there is a significant difference, then it means that being completely responsible for another individual's payoff influences the way in which an individual plays a game. Indeed, as we shall see, this does influence play. This result could have ramifications for the decisions made in a society, as these decisions may be a function of how people participate in the process.

We work with the following hypotheses.

Null Hypothesis: (No Responsibility Effect) *Play will not differ across the play-for-self and play-for-pair treatments.*

In terms of an alternative hypothesis to the view that responsibility will not affect play, our view is that while the decider is attracted to maximizing the expected earnings for the group, there is also a strong inclination to avoid a bad outcome. We do not assert that there is a 'safety-first' lexicographic preference, but rather presume that the decider would put some weight on both factors and that the weight on safety is higher when an individual is deciding for the group, in line with the cautious shift.

We suggest three possible forces that would affect behavior in this direction. First, the individual may wish to avoid blame.[6] In other words, there is a concern over how the other group member might react (even if it is not possible to directly communicate with the decider).

[6] In a sense, this is related to the notion of guilt aversion described in Charness and Dufwenberg (2006).

Second, the individual genuinely cares about the other group member, but believes that he or she likes risk more than the average person. Third, the individual has been 'socialized' to believe that he or she should be more cautious when in a position of responsibility; this could even be instinctual, as in a parental environment. If some combination of these forces applies and we expect people to be more concerned with safety when they are responsible for a partner's payoff, then we have:

Alternative Hypothesis: *There will be more risky (Stag) play in the play-for-self treatment than in the play-for-pair treatment.*

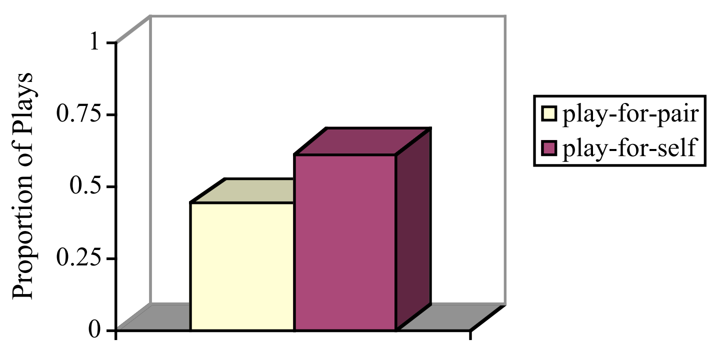
3. Analysis of the Experimental Results

Table 1 and the corresponding Figure 1 give us an initial look at the data:

Table 1 - Votes by Game

Game	Stag	Hare
Play-for-self	882 (61.2%)	558 (38.8%)
Play-for-pair	316 (43.9%)	404 (56.1%)

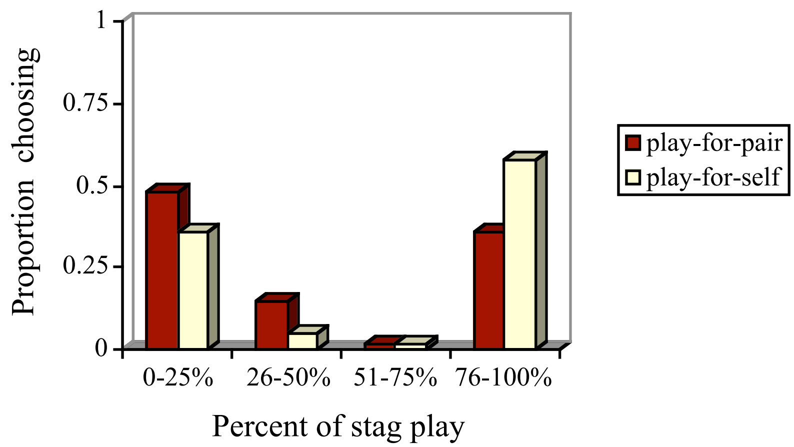
Figure 1 - Stag Play, by Type of Game



A chi-square test, with the numbers in Table 1 divided by 15 (as each decider makes 15 choices in the game), gives $\chi_1^2 = 3.85$, $p = 0.050$, in what is essentially a two-tailed test.[7] Thus, this simple test indicates a significant difference across treatments for Table 1 and Figure 1.

We also consider the choice tendencies of each individual in Table 2:

Figure 2 - Rate of Stag play, by individual



Again, we use the chi-square test to check for differences across treatments. Since there are few observations (rendering this test less valid; see Siegel and Castellan 1988) in the 26-50% and 51-75% ranges, we combine the 0-25% and 26-50% ranges into a 0-50% range, and combine the 51-75% and 76-100% ranges into a 51-100% range. This yields $\chi_1^2 = 6.13$, $p = 0.013$.[8]

Another approach is to consider the overall behavior of each individual in each segment; each person's overall choices in the games played are shown in Appendix C. We see substantially more risky play in the play-for-self games, with 57.5 percent of individuals playing Stag more than three-quarters of the time when on their own, compared to 35.5 percent when

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[7] If we do not divide the numbers in Table 1 by 15, we have $\chi_1^2 = 58.61$, $p = 0.000$.

[8] If we do not combine any categories, we have $\chi_3^2 = 7.41$, $p = 0.060$. If we instead combine only the two middle categories, we have $\chi_2^2 = 7.03$, $p = 0.030$.

responsible for another person's payoff. Comparing each person's behavior in the two games, 20 people made more Stag choices in the play-for-self game than in the play-for-pair game, while this was reversed for seven people. A binomial test gives $Z = 2.50$, $p = 0.006$, one-tailed test.[9]

However, some of these differences in individual Stag rates are very small. Table 2 considers more substantial differences in Stag rates for each individual; the first letter in the column heading refers to play in the play-for-self game, while the second letter refers to play in the play-for-pair game.

Table 2 – Individual Profiles

	SS	SM	SH	MS	MM	MH	HS	HM	HH
number of subjects	17	3	11	0	0	0	1	1	15

"S" (Stag) or "H" (Hare) means the subject made this choice at least 10 times (out of 15). "M" (Mix) means that a subject chose each action at least six times (out of 15). The first entry is play in the play-for-self treatment and the second entry is in the play-for-pair treatment.

We see that play was essentially the same across treatments for 2/3 of the population. However, among the 1/3 of the population sensitive to the issue of responsibility, 14 people made the risky play (Stag) more frequently when on their own than when responsible for a silent partner's payoff, while only two people did so less frequently when on their own.[10] A binomial test on the segment of the population sensitive to the responsibility issue strongly rejects this as representing random behavior ($Z = 3.00$, $p = 0.001$, one-tailed test).[11]

[9] If we distribute the ties equally for the other 21 people who had the same Stag rates in both games, the binomial test gives $Z = 1.88$, $p = 0.030$, one-tailed test.

[10] In regressions examining whether the sensitivity to the game for these individuals can be explained by demographic variables, we find no effects at all for gender, age, or whether one receives financial aid, is a member of a club or team, or likes to gamble. The fact that an attraction to gambling does not have any explanatory value makes it less likely that the belief that one is less risk averse than others drives the sensitivity. Nevertheless, we do not measure such beliefs, so it is possible that such beliefs by a segment of the population could explain why only a fraction of the participants is sensitive to the issue of responsibility.

[11] We can also perform a binomial test on the entire population, distributing the 32 ties equally. In this case, $Z = 1.73$, $p = 0.042$, one-tailed test.

Another, perhaps more conservative, test involves only the choices in the last period of the 15-period segments; these data might also be seen as reflecting more 'settled' behavior.

Table 3 – Stag vote totals for groups in last period of segment

	Number of groups with:		
	0 Stag votes	1 Stag vote	2 Stag votes
play-for-self	20	1	27
play-for-pair	15	0	9

The hypothesis that there is no difference across treatments does not look to be supported by our data. If we consider individual voting in the last period, there are 18 of 48 people (37.5 percent) voting for Stag in the play-for-pair case and 55 of 96 people (57.3 percent) voting for Stag in the play-for-self case. The test of proportions gives $Z = 2.24$, significant at $p = 0.013$ on a one-tailed test.

Overall, given all of the test results we have derived above, we reject the null hypothesis of no effect in favor of the alternative hypothesis of safer play in the play-for-pair game.[12]

From the standpoint of social-welfare analysis, it is also relevant to consider outcomes in addition to individual voting behavior. Table 4 shows these outcomes:

[12] One potential concern is that perhaps behavior is distorted due to the fact that participants also played other games in the same session (this experiment was originally intended as one project), so that the order of presentation might be relevant. In addition, perhaps the order in which people played the play-for-self and play-for-pair games could affect the choices made. While the order is balanced over the participants in each session, so that any such effects might be expected to wash out, it is nevertheless worth considering this issue. We find only slight effects. The difference in Stag rates according to whether the play-for-self game was played immediately after a game requiring only one of two votes for the group to play Stag (see Appendix A) or immediately after a game requiring both votes for the group to play Stag was 8.6 percentage points; for the play-for-pair game, the corresponding difference was 4.5 percentage points. When the play-for-pair game was played at any point after the play-for-self game, the Stag rate was 1.3 percentage points higher than when this order was reversed. None of these differences approaches statistical significance.

Table 4 - Outcomes: Number of observations (percentages), by category

Game	Both Stag	Mis-coordination.	Both Hare
Play-for-self	407 (56.6%)	68 (9.4%)	245 (34.0%)
Play-for-pair	134 (37.2%)	48 (13.3%)	178 (49.5%)

In this table, we simply count how many times both of the active players both chose Stag, both chose Hare, or one chose Stag and one chose Hare. Since the play-for-self treatment involves two people, while the play-for-pair treatment involves four people (two of whom are silent), there are twice as many observations in the play-for-self treatment.

Here we see that the average payoffs are higher in the play-for-self game, as the average aggregate payoff for the two groups is 15.81 in the play-for-pair game and 16.47 in the play-for-self game. As the range is from 9 (with mis-coordination) to 18 (with both Stag), the relative efficiency in these games is 75.7 percent and 83.0 percent, respectively.

Changes over time and determinants

Does the tendency to play Stag change appreciably over time? If so, can we isolate any determinants of this change? Table 5 shows the average rate of Stag play in the first five periods of the segment, the middle five periods of the segment, and the last five periods of the segment for each of our games. We see a monotonic decrease in risky play over time for both games.

Table 5 – Rates of Stag Play over Time, by Game

	Rate of Stag Play in:		
Game	First five periods	Middle five periods	Last five periods
play-for-self	.6604	.5917	.5855
play-for-pair	.4917	.4209	.4042

We can also examine individual choice tendencies and how common it was for an individual to change his or her strategy over the course of a 15-period segment, and in which direction (from Stag to Hare, or *vice versa*). This is shown in Table 6:

Table 6 – Individual Choice Tendencies, by Game

Game	Stag	Mix	Hare	Stag⇒Hare	Hare⇒Stag
play-for-self	52	1	43	15	4
play-for-pair	18	4	26	12	1

"Stag" or "Hare" means the individual made this choice at least 10 times (out of 15). "Mix" means that an individual chose each action at least six times (out of 15). Switching (rightmost columns) reflects a difference between play in the first and last periods of a segment.

We see that individual behavior mirrors the patterns observed in Tables 2 and 4, and switching behavior (changes from one's choice in the first period of a segment to the last period of a segment) mirrors the pattern seen in Table 5. Overall, people changed their choice in 32 of the 144 possible cases, or 22.2% of the time. We see that 27 of 32 switches go from Stag to Hare; the binomial test rejects the hypothesis that these data reflect random changes ($Z = 3.89$, $p = 0.000$).

Why do people switch their behavior over the course of a segment? One would naturally suspect that this decision is correlated with having previously experienced bad (payoff = 1) outcomes during the segment. In fact, a random-effects probit regression (with the individual as the random effect) strongly confirms this conjecture:

Table 7 – Determinants for Stag Play

Independent variable	Vote for Stag
Play-for-self	1.155*** [0.109]
One bad outcome	-0.210 [0.132]
Two bad outcomes	-1.432*** [0.139]
Three or more bad outcomes	-1.471*** [0.209]
Rho	0.775*** [0.018]
Constant	0.009 [0.113]
# Observations	2160
Log-likelihood	-597.9

Standard errors are in brackets. *** indicates significance at 1%

We see that an individual is significantly more likely to choose Stag in the play-for-self case. Previous bad outcomes do indeed decrease the likelihood of choosing Stag, although the coefficient for a single bad outcome is not significant. However, once the player has experienced at least two bad outcomes, there is a sharp drop in the tendency to choose Stag. Rho (the random-effects term) is highly significant in both regressions, so that individual variation is seen to be an important factor.

4. Conclusion

We have explored behavior in a Stag Hunt where one of the members of the group is a dictator and decides on play unilaterally, and compare this to a game where each person chooses only for herself. We find that the behavior of about one-third of the population is sensitive to the issue of being responsible for another person's welfare. In almost 90% of these cases, the decider takes on less risk when she is the agent for another party than when acting only for herself. However, this lessened risk comes at a social cost, as the average payoffs are slightly reduced when the deciding agent also represents another party.

Thus, we confirm that the responsibility-alleviation effect noted by Charness (2000) extends beyond behavior in gift-exchange games and appears to apply to risky choices as well. Further research should investigate the degree to which this principle generalizes to other environments.

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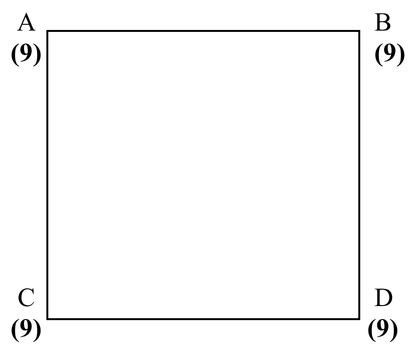
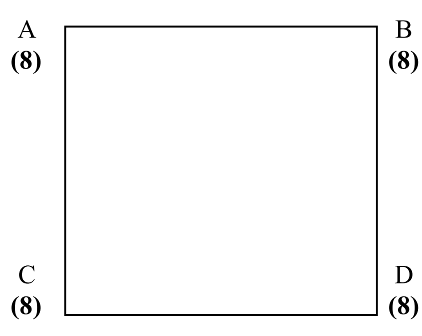
Appendix A - Full Experimental Design

We imposed the initial link structure of a 'square', where each person was linked to two adjacent parties, with no diagonal links. In three of our sessions, this was the initial link structure:



The issue of choice was whether to add a diagonal link, as we described in the previous section. If neither diagonal link was created, each person received nine experimental units. If both diagonal links were created, each person received a payoff of eight. If only one diagonal link was created, the people at the nodes of this link received eight, while the people not connected by a diagonal link received only one.

In the other three sessions, we started with lower default payoffs and also altered the way that payoffs were determined by the links added.



In these sessions, if no diagonal links were added, then each person received a payoff of eight experimental units. If both diagonal links were added, then each person received a payoff of nine. If only one diagonal link was created, the people at the nodes of this link received only one, while the people not connected by a diagonal link received eight. The contrast between the two different starting payoff structures is simply one of framing – do outcomes depend on which payoffs result if no action is taken.

There were 60 periods in a session, comprised of four 15-period segments with different decision rules for whether a diagonal link was created. These segments differed with respect to the decision rules for creating a diagonal link. The people in each group were matched with each other for the 15 periods in a segment; after each segment, participants were randomly re-matched. Each person was involved exactly once in each of these four different cases.

1) **Play-for-pair:** People are in 4-person groups. However, only two of these people will make choices in the game (say players A and C in the above diagrams), and they can unilaterally decide whether or not to add their corresponding links. Each one of these people is paired with a silent partner (say players B and D in the above diagrams) who is inactive in the game but whose payoff depends on the play of the game.
2) **Play-for-self:** People are in 2-person groups. In this case each person controls two vertices that are diagonally opposed to each other (so, one player controls vertices A and D and the other controls B and C). So, one player decides whether one link is added and the other player controls the other link. If a player chooses to add a link, then it is added and he or she receives the payoff that either of his or her vertices would earn.
3) **Mutual consent**: People are in 4-person groups. Consider the two people diagonally across from each other: A link is added if and only if *both of these people* wish to add it.
4) **Unilateral consent**: People are in 4-person groups. Consider the people diagonally across from each other: A link is added if and only if *at least one of these people* wishes to add it.

In Charness and Jackson (2007), we report the results of the 4-voter groups, cases 3) and 4). A quick summary of those experimental results is that the voting rule (unilateral or mutual) is by far the most important factor in determining the outcome. In the current paper, we discuss only cases 1) and 2).

The reason for running variations where the default payoffs differ was to simply check for framing effects. That is, consider two variations: one where the starting payoffs are 8's and another where the starting payoffs are 9's. These two situations are strategically equivalent: they differ only in their framing – there is a risky (Stag) play and a safe (Hare) play from either starting point; the only difference is whether the safe play is to add a link or refrain from adding a link. Yet, it is easy to imagine what where one ends up depends on where one starts. The following table breaks play down by framings.

Table A1 - Individual Votes by Game

Game	Stag	Hare
Play-for-pair (start with 8's)	141 (39.2%)	219 (60.8%)
Play-for-pair (start with 9's)	175 (48.6%)	185 (51.4%)
Overall, Play-for-pair	316 (43.9%)	404 (56.1%)
Play-for-self (start with 8's)	469 (65.1%)	251 (34.9%)
Play-for-self (start with 9's)	413 (57.4%)	307 (42.6%)
Overall, Play-for-self	882 (61.2%)	558 (38.8%)

We first check whether the default payoff from not adding a link leads to different rates of individual Stag choice. In fact, in the play-for-pair treatment, there is a slightly higher tendency to play Stag when this means leaving the link structure as is. On the other hand, in the play-for-self treatment, this tendency is reversed and Stag play is more likely when this means adding a link. The difference for each comparison is about eight or nine percentage points, and since these differences are of roughly equal magnitude, overall there is little difference according to the initial framing of the game.

Nevertheless, we can test whether either or both individual comparisons yield significant differences. One approach is to consider the number of times that an individual chooses Stag over the entire segment and then perform a Wilcoxon-Mann-Whitney ranksum test (see Siegel and Castellan 1988) across frames, using these individual statistics. Comparing the play-for-pair games, this test finds no significant difference ($Z = 0.72$); similarly, comparing the play-for-self games, there is no significant difference ($Z = 0.79$).

If we count only the last choice made by each individual, 10 of 24 participants chose Stag in the last period in the play-for-pair game when starting with 9's, while 8 of 24 participants chose Stag in the last period in the play-for-pair game when starting with 8's. The test of proportions (see Glasnapp and Poggio 1985) finds no significant difference between these ($Z = 0.60$). In the play-for-self games, 25 of 48 participants chose Stag in the last period when starting with 9's, while 30 of 48 participants chose Stag in the last period in the play-for-pair game when starting with 8's. Again, the test of proportions finds no significant difference between these ($Z = 1.03$).

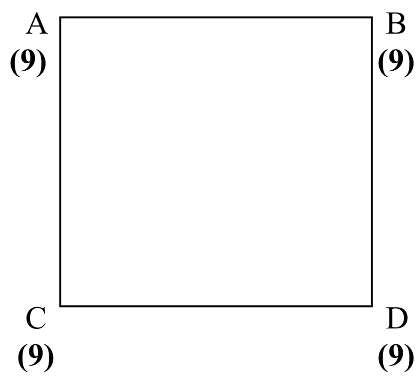
We conclude that there is no significant difference in choices depending on the framing or starting conditions. Thus, in the paper we pool the data from both play-for-pair games and we pool the data from both play-for-self games.

Appendix B - Experimental Instructions (Start at 9's)

Welcome to our experiment. You will receive $5 for showing up, in addition to your earnings from the session.

There will be a total of 60 periods in the session. You will be paired with a group of people (and your position in the group will stay the same) for 15 periods, and then your pairing will change for the next 15 periods, etc.

Payoffs for each person are determined by the links that exist in the *network* below at the end of a period. Your group begins with the following links:



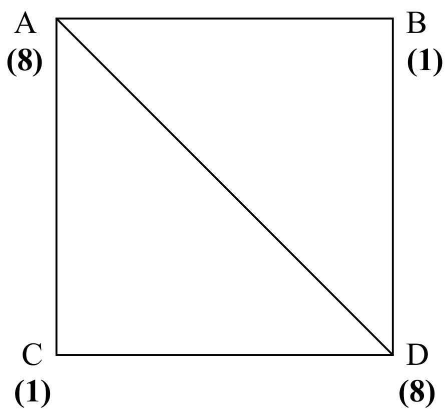
If this network is in place at the end of the period, then each of A, B, C, and D would receive 9 units, as is indicated by the bold number in parentheses below each letter.

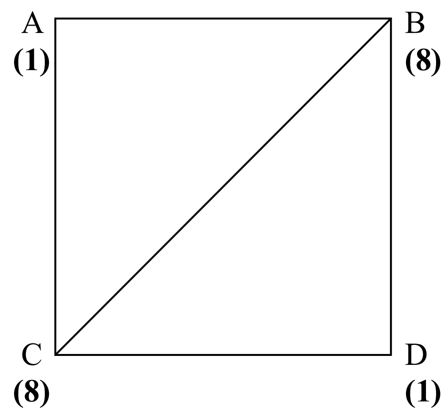
Some or all of the people in the network will simultaneously indicate on their computer their choice concerning whether or not to add a link to the person diagonally opposite. There are 4 different cases, and you will make choices in each case for15 periods during the session:

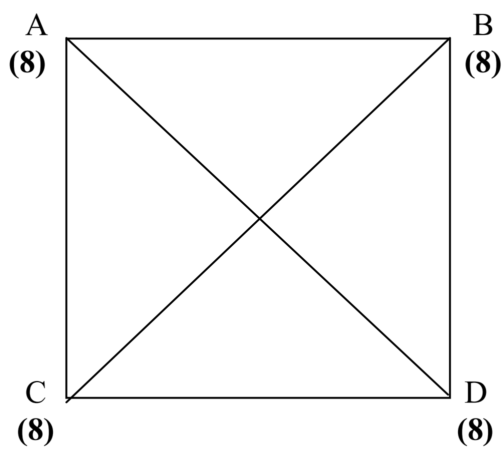
1) People are in 4-person groups. Consider the people diagonally across: A link is added if **at least one of these two people** wishes to add it.
2) People are in 4-person groups. Consider the people diagonally across: A link is added if and only if **both of these two people** wish to add it.
3) People are in 4-person groups; however, only two of these people (not diagonally across from each other) choose whether to add links. Each person's decision is implemented and two silent participants in the group receive payoffs according to these choices.
4) People are in 2-person groups, so that each person controls 2 vertices. If a person chooses to add a link, it is added and he or she receives the payoffs from one vertex.

You will always know which case applies to your decision before you make your decision.

There are four possible networks that could result from the process of adding or not adding links. The first is the network pictured above, where there are no changes. The other three possibilities arise if at least one link is added. These networks, and the corresponding payoffs to the participants are as follows:







The diagrams show that if exactly one diagonal link is included in the final network, the people connected by the link receive 8 units and the people not connected by the diagonal link receive 1 unit.

If both diagonal links are included in the final network, then everyone in the network receives 8 units.

We will randomly choose one period from each of the 15-period blocks for payment, so that only four periods will actually count towards monetary payoffs. These periods will be chosen at the end of the session. We will add up your payoffs from these four periods and convert them to actual dollars at the rate of $0.30 for each unit.

At the end of the experiment, we will pay each participant individually and privately.

We encourage you to ask questions about the instructions by raising your hand.

Thank you again for your participation in our research.

Appendix C

Table C1 – Stag rates, by individual and game

Participant #	Play-for-pair	Play-for-self
1	1.00	1.00
2	-	1.00
3	1.00	1.00
4	-	1.00
5	1.00	1.00
6	0.47	1.00
7	1.00	1.00
8	-	1.00
9	1.00	1.00
10	1.00	1.00
11	-	1.00
12	-	1.00
13	-	0.00
14	-	0.00
15	-	0.00
16	0.33	0.27
17	0.40	1.00
18	-	1.00
19	0.13	1.00
20	-	0.20
21	0.13	1.00
22	0.00	0.00
23	0.00	0.00
24	-	1.00
25	0.27	0.13
26	0.07	0.00
27	-	0.13
28	-	1.00
29	-	0.00
30	-	0.60
31	-	0.73
32	0.13	0.93
33	0.00	0.00
34	-	0.33
35	0.40	0.00
36	-	0.13
37	0.07	0.07
38	0.07	0.07
39	0.40	0.93
40	-	0.00
41	0.33	0.13
42	0.07	0.00
43	-	1.00
44	-	0.27
45	-	0.00
46	-	0.00
47	-	0.00
48	0.00	0.07

49	0.07	0.07
50	-	0.93
51	1.00	1.00
52	-	1.00
53	0.00	0.07
54	0.07	1.00
55	1.00	1.00
56	-	0.07
57	1.00	1.00
58	1.00	1.00
59	-	0.93
60	-	0.13
61	-	0.00
62	-	0.00
63	-	0.00
64	0.00	0.07
65	0.07	1.00
66	-	1.00
67	1.00	1.00
68	-	1.00
69	0.00	1.00
70	0.00	0.87
71	1.00	0.27
72	-	1.00
73	0.67	0.93
74	0.80	0.87
75	-	0.20
76	-	1.00
77	-	1.00
78	-	1.00
79	-	0.00
80	0.00	0.13
81	1.00	1.00
82	-	1.00
83	1.00	1.00
84	-	0.13
85	1.00	1.00
86	0.00	1.00
87	1.00	1.00
88	-	1.00
89	0.00	1.00
90	0.00	1.00
91	-	1.00
92	-	1.00
93	-	0.07
94	-	0.27
95	-	1.00
96	0.13	1.00