How large looms the ghost of the past? State-dependence vs. heterogeneity in the stag hunt

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Discussion Paper

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How large looms the ghost of the past? State-dependence vs. heterogeneity in the stag hunt[1]

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Abstract

In games with multiple, Pareto-rankable equilibria and repeated play, does a history of playing an inefficient equilibrium make it harder for the players to reach the efficient equilibrium? In other words, can people 'get stuck' in bad equilibria? Using variants of the stag hunt, previous studies have found support for this, but they have relied on naturally occurring variation in precedent. I implement randomized control to establish that precedent effects are important, but that natural occurring variation exaggerates the importance of precedent. I present evidence that some of the endogeneity of naturally occurring precedents is due to variation in risk-attitudes.

Understanding the causal effect of precedent is important since many development problems, such as institutional change and technological advancement, are viewed as coordination games with Pareto-rankable equilibria. Moreover an appreciation of how potential heterogeneity may interact with the policy is essential when trying to lift groups out of bad precedents.

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1. Introduction

In games with multiple, Pareto-rankable equilibria and repeated play, does a history of playing an inefficient equilibrium make it harder for the players to reach the efficient equilibrium? Can people ‘get stuck’ in bad equilibria?

		Median of choices	
		1	*0*
Your choice	*1*	5	1
	0	3	3

Figure 1: The *N*-player Stag hunt

The number in each cell is your payoff. Payoffs are symmetric.

Variations of the stag hunt have been used to study this question. Figure 1 is the *N*-player stag hunt (also referred to as the average opinion game). Its key features are that there are two Pareto-rankable pure strategy Nash equilibria $\big((1,1),(0,0)\big)$, and that the choice corresponding to the inefficient equilibrium is the safest (it has the highest guaranteed payoff).[3] The stag hunt has been used as a metaphor for a wide variety of social interactions, such as the establishment of a new institution, the implementation of a new technology that has network externalities, or even the overthrow of a dictatorial regime.[4]

Suppose that this game is repeated and players are informed about the median at the end of every period. Let $\bar{X}_t$ denote the median in period t. A precedent effect occurs when a median of x in period $t-1$ causally increases the likelihood of that same median occurring in period t:

$$\Pr(\bar{X}_t = x|\bar{X}_{t-1} = x) > \Pr(\bar{X}_t = x|\bar{X}_{t-1} \neq x)$$

As part of their pioneering work on coordination games, van Huyck et al. (1991) used a version of the *N*-player stag hunt with more strategies (see figure A1 in the appendix).[5] *Every* time the game was played, they found that the median in the first period was perpetuated for the remaining periods. Similar results were reported by Cachon and Camerer (1996) and Blume and Ortmann (2007). Statistically seemingly the most acute possible precedent effect: $\Pr(\bar{X}_t = x|\bar{X}_{t-1} = x) = 1$ and $\Pr(\bar{X}_t = x|\bar{X}_{t-1} \neq x) = 0$. Van Huyck et al. (1991) concluded that “subjects select an equilibrium that is determined by the historical accident of the initial median,” (p898).

Precedent effects are a plausible explanation for the perpetuation of inefficient equilibria. Schelling’s (1960) focal point theory, and its formalization by Bacharach and Bernasconi (1997), argue that in multiple equilibrium games, players search for salient equilibria (focal points). In repeated play, the preceding median can be quite salient, especially when it is one of the few pieces of information delivered to players after each round.

[3] Harsanyi and Selten (1988) describe it as risk-dominant.

[4] Tullock (1974), Chong (1993), Hardin (1995), Lichbach (1995), Moore (1995), Weingast (1997), Ginkel and Smith (1999) and Goldstone (2001), Weber (2005) and Acemoglu and Robinson (2006).

[5] For the weakest link game, a different class or coordination game, see van Huyck et al. (1990).

Understanding the precedent effect is critical to policies that try to lift groups out of inefficient equilibria. The persistence of poor institutions has been blamed for the inferior economic performance of many countries and the often complementary difficulty in transiting to democracy (Acemoglu and Robinson (2001), North (2005), North, Wallis and Weingast (2009)).

Returning to van Huyck et al.'s (1991) data, was the initial median actually a historical accident? Perhaps not. Serial correlation can be explained by state-dependence, such as the precedent effect, but it can also be the result of heterogeneity in unobservable explanatory variables that persists over time (Heckman (1991)). Whatever generated the first round median of 0 may also directly increase the likelihood of a subsequent median being 0. In the case of the stag hunt, heterogenous risk attitudes could be an example of persistent unobserved heterogeneity: risk-averse groups of players generate a median of 0 *every* round. Rather than being 'stuck' in the inefficient equilibrium due to historical forces, they are continually drawn to it for ex ante reasons.

In response to potential variation in unobserved explanatory variables, I build upon van Huyck et al. (1991) by randomizing the precedent. I do this by running a variant of the *N*-player stag hunt that uses computer players as confederates. To act as a natural variation benchmark, I also run a version with only human players.

I find that there is a precedent effect, but that it is substantially overestimated by relying on natural variation. By collecting data on risk preferences, I present evidence that naturally occurring variation in risk preferences can partially explain the endogeneity of naturally-occurring precedents.

An important step towards dissecting the precedent effect is being able to estimate it accurately. More generally, it is important that policymakers be aware of the possibility of an interaction effect between whatever got a group into a bad equilibrium in the first place and the outcome of an intervention.

The remainder of this paper is organized as follows. Section 2 is the experimental design. Section 3 is the empirical results. Section 4 is the discussion.

2. Experimental design

A. Procedure

I use the stage game in figure 1 with a 1-point-to-$1 exchange rate. All features of the game, including those about to be described, are common knowledge.

There are 7 players and 3 periods. After each period, players see what the median was in that period. After the second period, the 7 players are randomly divided into two sub-groups of 3 players with 1 player eliminated. The remaining 6 players then proceed to play the last period in their sub-group. There is no communication during the session.[6]

In the human treatment, all 7 players are humans. Consequently, the precedent taken into periods 2 and 3 is naturally generated.

In the computer treatment, 4 of the starting 7 players are computers and the remaining 3 are human. Computers play according to the following rules (recall that these are common knowledge):

1. Within each period, all the computers choose the same action: they behave as a bloc.
2. The computers choose the same action in all periods: they repeat their first period choice.
3. The computers' common first period choice is determined by chance.

Actually the computers are equally likely to choose each action in the first period but subjects are not given any information about the probabilities. After the second period, the 4 computer players are eliminated and the 3 human players play the third period together in a sub-group of size 3.

In each of the first two periods of the computer treatment, the common computer choice determines the median. Consequently, the precedent taken into periods 2 and 3 is exogenous.

Human sessions have 14 human subjects and computer sessions have 12 or 15 human subjects. All matching is anonymous and payments are private.

After playing the stag hunt, subjects participates in a Hey-Orme risk preferences test (Hey and Orme (1994)).[7] This is an individually completed task. Each period, the subject is faced with a choice between two lotteries, each over the same four outcomes ($0, $10, $20, $30). The subject chooses which they prefer (or expresses indifference). The subject does this for 20 pairs.[8] To generate incentives for truthful revelation, subjects are informed that one of the pairs will be selected at random at the end and each subject will play out the lottery for which she declared a preference.[9]

Using maximum likelihood estimation (see Harrison and Rutstrom (2008), Andersen et al. (2009)), one can use the choice data to estimate the parameter K in the constant relative risk aversion (CRRA) von Neumann-Morgenstern utility function $u(m) = m^K$, where m denotes $ wealth. K is a measure of risk-lovingness.

[6] The experiment was computer based. It was programmed using z-Tree, software created by Urs Fischbacher.
[7] The instructions (see the appendix) are adapted from a set provided by Glenn Harrison.
[8] Subjects do not know how many pairs they will have to ponder.
[9] This procedure determines the earnings for the risk preferences task. Subjects are only paid for one out of the stag hunt and the risk preferences task, as determined by the outcome of a coin flip.

B. Hypotheses to be tested

Let X_{it} be the choice of player i in period t and let $\bar{X}_t$ be the median of X_{it} in period t. The causal effect of interest is the effect of an exogenously 'good' vs. 'bad' precedent on the probability of a good median:

$$\Pr(\bar{X}_t = 1|\bar{X}_{t-1} = 1) - \Pr(\bar{X}_t = 1|\bar{X}_{t-1} = 0)$$

Prediction 1: Using exogenous variation in precedent ($\bar{X}_{t-1}$), there is a positive causal effect of precedent.

Playing $X_{it} = 1$ carries some risk whereas $X_{it} = 0$ is riskless. If risk-averse players are more likely to generate a precedent $\bar{X}_{t-1} = 0$, then they are also more likely to generate a median of 0 in subsequent rounds independently of any precedent effect. This means that natural variation in the precedent $\bar{X}_{t-1}$ is positively correlated with an unobservable variable (risk-lovingness; K_i) that is also positively correlated with $\bar{X}_t$. This is classic endogeneity.

Prediction 2: Estimating the causal effect using natural variation in precedent leads to higher estimated causal effect than using exogenous variation in precedent.

Prediction 3: The probability that player i chooses $X_{it} = 1$ is increasing in her risk-lovingness (K_i).

3. Empirical results

All sessions were conducted at Interdisciplinary Center for Economic Sciences at George Mason University in spring of 2009. Subjects were recruited from a database of students who had declared an interest in participating in experiments. Sessions lasted 30 minutes and average earnings per subject were $20. There were seven sessions (99 subjects) total. Unless otherwise stated, all statistical tests that follow are Mann-Whitney tests.

Result 1: Using exogenous variation in precedent, there is a positive causal effect of precedent.

There were 19 groups in the computer treatment (3 human + 4 computer players). Of the 9 where I induced a good precedent, *all* 9 sustained the good equilibrium in the third period. Of the 10 where I induced a bad precedent, only 3 sustained the bad equilibrium in the third period.[10] The point estimate of the causal effect of precedent is therefore 30%. This difference is statistically significant (p-value = 8%).

One can also test this using the 57 individual choice observations. Subjects in the good precedent are 19% more likely to play $X_{i3} = 1$ than subjects in the bad precedent (p-value = 8%).

[10] Due to the simplicity of the data, tables of summary statistics do not add to the presentation of the results and I therefore relegate them to the appendix.

Result 2: Estimating the causal effect using natural variation in precedent leads to higher estimated causal effect than using exogenous variation in precedent.

There were 6 groups of 7 humans which divided into 12 groups of 3 humans (recall that 1 subject in each 7 is excluded from the third period). Of the 6 subgroups that naturally generated a good precedent, *all* 6 sustained the good equilibrium in the third period. Of the 6 subgroups that naturally generated a bad precedent, *all* 6 sustained the bad equilibrium in the third equilibrium. The point estimate of the causal effect of precedent is therefore 100% (p-value = <1%), replicating what van Huyck et al. (1991) and subsequent studies find in the K-strategy version of the stag hunt.

	Model 1	**Model 2**	**Model 3**
Estimation method	Regression	Regression	Probit
Dependent variable	Median in period 3	Choice in period 3	Choice in period 3
Constant	0.00	0.17*	-
Standard error	(0.11)	(0.09)	-
Computer session	0.70***	0.53***	0.50***
Standard error	(0.14)	(0.11)	(0.14)
Median from last period	1.00***	0.78***	0.70***
Standard error	(0.16)	(0.12)	(0.11)
Computer session x Median from last period	-0.70***	-0.59***	-0.63***
Standard error	(0.21)	(0.16)	(0.20)
R^2 / Pseudo-R^2	0.67	0.37	0.30
Observations	31	93	93

Table 1: Regression and probit results

'Computer session' is a dummy variable that takes the value 1 for computer sessions. In the probit (model 3), the reported figure is the estimated marginal effect. Asterices denote statistical significance (* = 10%, ** = 5%, *** = 1%).

To formally compare the precedent effect across the data types, I run a regression with the pooled data (model 1 in table 1). The dependent variable is the median in period 3. The model contains a dummy for computer sessions, a dummy for the median from period 2 and a variable interacting these dummies. The interaction term confirms that the precedent effect is 70% higher in the human sessions (where the precedent is based on natural variation) and that this figure is statistically significant.[11]

[11] A probit is not possible because of the perfect correlation in the human treatment.

Using individual data generates analogous results. Subjects in the good precedent are 78% more likely to select $X_{i3} = 1$ than subjects in the bad precedent (p-value < 1%). Models 2 (regression) and 3 (probit) in table 1 use an interaction term to compare the precedent effect in the computer sessions to that in the human sessions. In both models, the precedent effect is about 60% higher in human sessions, and this figure is statistically significant.

Result 3: The probability that player i chooses $X_{i1} = 1$ is increasing in her risk-lovingness (K_i).

Recall that I use the Hey-Orme test to estimate i's parameter K_i in the CRRA utility function $u(m) = m^{K_i}$, where m denotes $ wealth. $K_i = 1$ implies risk-neutrality, while higher (lower) values denote risk-lovingness (risk-aversion). Figure 2 is a histogram of the recovered estimates of the risk-lovingness parameter.[12] The sample mean of K_i is 0.62 and the sample standard deviation is 0.23.

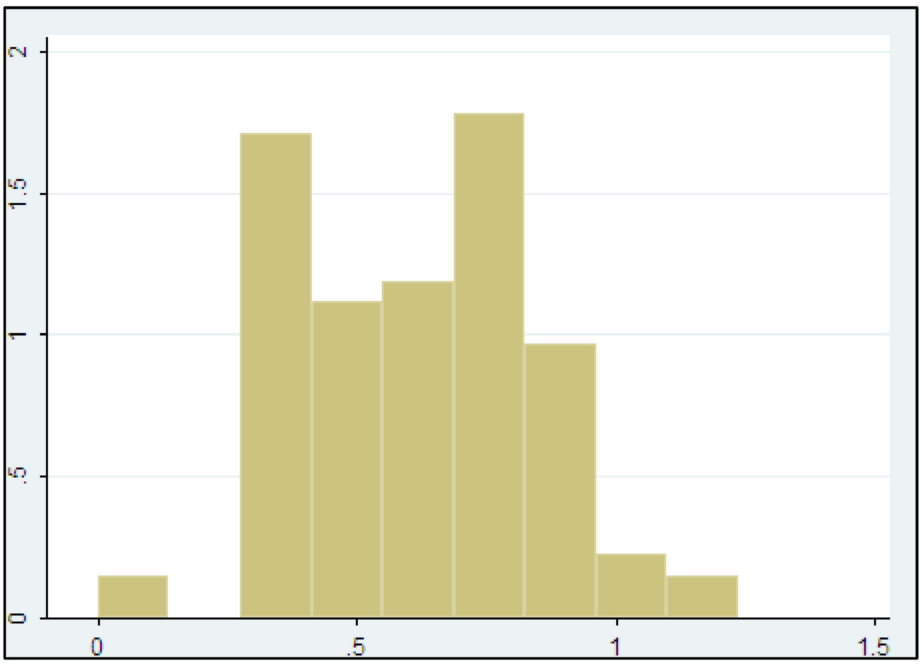

Figure 2: Histogram of estimated risk-lovingness

Estimated risk-lovingness comes from fitting data from a Hey-Orme test to the CRRA utility function $u(m) = m^K$, where m denotes $ wealth and K is the risk-preferences parameter.

For the 21 subjects who played 0 in the first round of the human sessions ($X_{i1} = 0$), the mean risk-lovingness was 0.52 while for the 20 who played 1, the mean was 0.67.[13] The difference is statistically significant (p-value = 4%). In the computer sessions, the mean risk-lovingness for the 37 who played $X_{i1} = 0$ was 0.59 and for the 20 who played $X_{i1} = 1$ it was 0.71. The difference is also statistically

[12] The Hey-Orme test was done after the coordination game. Kolmogorov-Smirnov (p-value = 19%) and MW (p-value = 21%) tests on the recovered risk-lovingness parameters confirm that session type (human vs. computer) did not affect behavior in the Hey-Orme test.

[13] The total observations sums to less than a multiple of 7 because I lost the risk-lovingness data for one of the subjects.

significant (p-value = 4%).[14] An ancillary result is that of the 30 subjects in the computer treatment who are induced into the bad precedent, the 21 who play $X_{i3} = 1$ have a risk-lovingness parameter that is 0.14 higher than the 9 who played $X_{i3} = 0$ (p-value = 10%).

4. Discussion

In line van Huyck el al. (1991) and the remainder of the literature, I have demonstrated a precedent effect.[15] As mentioned in the introduction Schelling's (1960) focal point theory offers a compelling explanation. At the end of each round, the median choice is reported to all subjects and this is common knowledge, therefore it is particularly salient.

Bacharach and Bernasconi's (1997) formalization can further flesh out the mechanism. In their theory, players look at the strategies and they generate frames for describing them, e.g., 'even numbered strategies', or 'strategies that correspond to my favorite number'. These frames differ in their likelihood of being generated, known as their availability. They also differ in the extent to which they narrow down the strategy space, known as their rareness. For example if two strangers are trying to coordinate on a European country in the absence of communication, then the frame 'countries with English as the first language' is very rare since only the UK and Ireland satisfy it. It is probably highly available, especially if it is common knowledge that the players are from the UK. In contrast, if the players are well-traveled, then 'countries that player 1 has been to' is neither rare nor available. Bacharach and Bernasconi (1997) argue that frames that are highly available and rare are the best targets for coordination.

In the stag hunt, the preceding median is highly available. It is also perfectly rare. In a stage game with only two strategies, rareness is essentially a non-issue. However in the K-strategy version considered by van Huyck et al. (1991), a group focused on trying to climb out of the worst equilibrium might not know whether to play the next best equilibrium or to just jump to the best equilibrium in one go. In the face of such uncertainty, the preceding median likely becomes even more operationally focal.

I have also demonstrated the possibility of overestimating the precedent effect if identification is based on natural variation in the precedent. Risk attitudes clearly affect choices in the stag hunt. People do not purely randomly find themselves in the bad precedent – they often end up there because their group

[14] Similar results are obtained using regressions and probits where X_{i1} is the dependent variable and K_i is the explanatory variable.

[15] In addition to the studies mentioned in the introduction, there are several other studies of precedent. Meyer et al. (1992) and Schotter and Sopher (2003) study games with multiple equilibria, but all are efficient and so precedent is not as damaging as it can be in games with Pareto-rankable equilibria. In some of the other experiments reported in van Huyck et al. (1991), in addition to Knez and Camerer (1994), Devetag (2005) and in some sense, Weber (2005), a weaker form of precedent is studied. A game where it is 'easy' to coordinate is followed by a game where it is more difficult to coordinate. The strategies are labeled in a way that continuing the choices of the first game in the second game yields the efficient outcome. These studies report mixed results on the strength of weak precedent.

members are risk averse. The same distaste for risk will push them towards the inefficient equilibrium in subsequent rounds independently of any precedent effect.

The payoff structure of the stag hunt means that risk attitudes are an important determinant of choices, and in turn they could be a source of endogeneity. However if one modifies the payoffs, heterogeneity in social preferences, intelligence, or in many other dimensions can generate endogeneity.[16] One should note that my design permits only suggestive evidence about risk preferences as a source of endogeneity. This is because I rely on natural rather than induced variation in risk attitudes.

Coordination games have been used to study a wide variety of decisions where we observe naturally occurring data that is consistent with a strong effect of precedent. As mentioned in the introduction, these include legal and political systems. My goal was *not* to generate an externally generalizable estimate of the endogeneity bias. Rather I wanted to demonstrate that the bias can be large: in this study, naturally occurring variation in precedent leads to an overestimation of the precedent effect by a factor of over three.

In the case of policies designed to lift a group out of a bad equilibrium, the importance of this finding is two-fold. First, if the intervention attempts to diminish the precedent effect, then predictions about its productivity may be biased. Second, and more importantly, policymakers need to consider the possibility of an interaction between the intervention and whatever got the group into the bad equilibrium in the first place.

As an example, consider a community trying to manage a common property resource, a problem that has stag hunt coordination aspects (Ostrom (1990)). Reaching and maintaining the good equilibrium is easier for groups whose members have social preferences, since playing 1 in the stag hunt has a positive externality. Therefore to some extent, communities that are more successful at coordinating may be communities with above average social preferences. Consequently, transplanting good coordination to the communities that demonstrate poor coordinators may prove fruitless. This would be even more likely if the stag hunt took the weakest-link form (figure 3; van Huyck et al. (1990)) which is an even riskier version.

		Smallest choice	
		1	*0*
Your choice	*1*	5	1
	0	3	3

Figure 3: The *N*-player weakest link game

The number in each cell is your payoff. Payoffs are symmetric.

All it takes is *one* player choosing 0 for all the players choosing 1 to earn $1 (in the average-opinion version, a majority is required). In K-strategy versions, choices quickly unravel towards inefficient equilibria even when high minima are achieved in early periods (van Huyck et al. (1990)).

[16] See Jones (2008) for how intelligence affects decision-making in the related issue of cooperation.

In conclusion, state-dependence is a plausible explanation of the serial correlation observed in coordination games, but just like in labor market settings, an investigation of heterogeneity is critical when considering policy interventions.

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Appendix

A. Average opinion game in van Huyck et al. (1991)

This game can also be described as the K strategy version of the stag hunt.

		Median choice						
		7	*6*	*5*	*4*	*3*	*2*	*1*
Your choice	*7*	1.30	1.15	0.90	0.55	0.10	-0.45	-1.10
	6	1.25	1.20	1.05	0.80	0.45	0.00	-0.55
	5	1.10	1.15	1.10	0.95	0.70	0.35	-0.10
	4	0.85	1.00	1.05	1.00	0.85	0.60	0.25
	3	0.50	0.75	0.90	0.95	0.90	0.75	0.50
	2	0.05	0.40	0.65	0.80	0.85	0.80	0.65
	1	-0.50	-0.05	0.30	0.55	0.70	0.75	0.75

Figure A1: The average opinion game in van Huyck et al. (1991)

The number in each cell is your payoff. Payoffs are symmetric.

Playing 3 yields the highest guaranteed payoff (0.50), though it constitutes an inefficient equilibrium.

B. Data tables

In every session, the median in period 2 was equal to the median in period 1 ($\bar{X}_1 = \bar{X}_2$).

		Median in period 3	
		0	1
Median in period 2	0	3	7
	1	0	9

		Choice in period 3	
		0	1
Median in period 2	0	9	21
	1	3	24

Table A1: Group and individual choice data from computer sessions

		Mode in period 3	
		0	1
Median in period 2	0	6	0
	1	0	6

		Choice in period 3	
		0	1
Median in period 2	0	15	3
	1	1	17

Table A2: Group and individual choice data from human sessions

C. Experimental instructions

Welcome to our study in decision-making. If you pay attention and make good decisions, you may earn a considerable amount of money. At the end of the experiment, you will be paid your earnings privately and in cash.

Just for showing up, you have earned $7. Today you will do 2 tasks. In each task, the choices that you make will determine your earnings. However you will only be paid the earnings that correspond to one of the 2 tasks. After you have completed the tasks, I will flip a coin to determine which of the 2 tasks will be used to determine your earnings. Whatever you earn from the task will be in addition to the $7 that you got for showing up.

For the remainder of this experiment, please refrain from any communication with other participants.

Task 1 (human treatment)

You will be put into groups randomly. You will never know the identity of the other members of your group. You will only interact with the members of your group. Each group will be comprised of 7 players. Each round, every player makes one decision: they choose between A and B.

The amount you earn for a round depends on your choice.

- If you chose A, then you earn exactly $3 regardless of what other players pick.
- If you chose B, then:
    - If the most popular choice is B, then you earn $5.
    - If the most popular choice is A, then you earn $1.

You will play this game for 3 rounds.

- For the first 2 rounds, you will be in a group of 7.
- After each round, everybody will find out what the most popular choice was in that round.
- In the 3rd round, your group of 7 will be divided randomly into 2 groups of 3 with 1 person left over on their own.
    - The person left on their own will do nothing for the 3rd round. They will receive a fixed payment.
    - The rest of you will play the 3rd round in your groups of 3. Remember that these 3 people were all together in the starting group of 7.

Your total earnings will the sum of your earnings from each round.

Task 1 (computer treatment)

You will be put into groups randomly. You will never know the identity of the other members of your group. You will only interact with the members of your group. Each group will be comprised of 3 human players and 4 computer players. Each round, every player makes one decision: they choose between A and B.

The amount you earn for a round depends on your choice.

- If you chose A, then you earn exactly $3 regardless of what the other players pick.
- If you chose B, then:
    - If the most popular choice is B, then you earn $5.
    - If the most popular choice is A, then you earn $1.

Computer players choose according to the following 3 rules:

1. They all choose the same as each other every round. In other words, they behave as a block.
2. What they pick in the first round is the same is what they pick in all other rounds.
3. Chance determines what they pick in the first round.

Therefore after chance determines the common choice that they all make in the first round, they will all just continue to make that choice in all later rounds. Recall that there is 1 more computer player than human players. This implies 2 things:

- In each round, whatever common choice the computer players make will determine the most popular choice.
- Knowing what the most popular choice in the first round tells you nothing about what the other human players picked in the first round.

You will play this game for 3 rounds.

- For the first 2 rounds, you will be in a group of 3 human players and 4 computer players.
- After each round, everybody will find out what the most popular choice was in that round.
- In the 3rd round, the computer players will be kicked out and you will play the 3rd round with only the human players in your group.

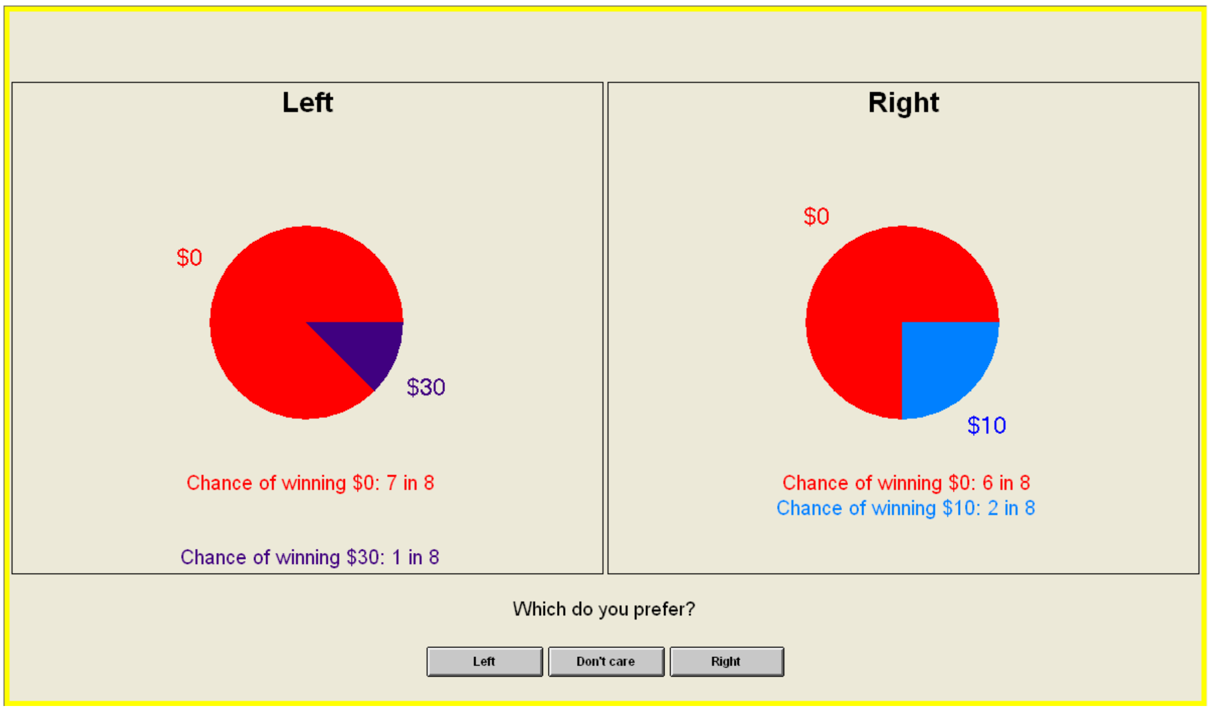
Your total earnings will the sum of your earnings from each round.

The first task is finished. We will now do the second task. Recall that you will only receive earnings for one of the two tasks. After you complete the second task, we will flip a coin to determine which.

Task 2

In this task you will make decisions alone and your earnings will not depend upon the decisions of others. You will be given a series of choices between two games of chance. For each pair of games, you should indicate which of the two games you prefer to play. If Task 2 is chosen for your earnings, you will actually get the chance to play one of the games of chance you choose, so you should think carefully about which games of chance you prefer.

Here is a pair of games of chance like the ones you will see on your screen, although the display on your screen will be bigger, easier to read and in color.



The outcome of the games of chance will be determined by a random number between 1 and 8. Each number between (and including) 1 and 8 is equally likely to occur. In fact, you will be able to roll the number yourself using a 8-sided die.

In the above example, the left game pays nothing ($0) if the random number is between 1 and 7, and pays $30 if the random number is 8. Notice that the size of the pie slices shows you the chances of each possible outcome.

In the above example, the game on the right pays nothing ($0) if the random number is between 1 and 6, and pays $10 if the random number is between 7 and 8. As with the game on the left, the pie slices represent the fraction of the possible numbers which yield each payoff.

Each pair of games is on a separate screen on the computer. On each screen, you should indicate which of the games you prefer to play by clicking on one of the three boxes beneath the games. You should click the ‘Left’ box if you prefer the game on the left, the ‘Right’ box if you prefer the game on the right, and the ‘Don’t care’ button if you do not prefer one or the other.

You should approach each pair of games as it is the only pair of games you are considering, because if Task 2 is chosen for your earnings, you are only going to play one of the many games. If you chose ‘Don’t care’ in the games that we play out, we will pick one for you using a coin flip.

If Task 2 is chosen for your earnings, then after you have worked through all of the pairs of games, we will roll a die to determine which pair of games have been chosen to play. If you picked ‘Don’t care’ for that pair, we will flip a coin to decide which one you will play. Then we will let you roll the die to determine the outcome of the game you chose (or that was selected for you based on the coin flip).

For instance, suppose you picked the game on the left in the above example. If your die roll was 6, you would win nothing; if it was 8, you would get $30. If you picked the game on the right and rolled a 6, you would win nothing; if it was 8, you would get $10.

Therefore if Task 2 is selected for your earnings, then your earnings are determined by three things:

1. Which pair of games of chance is chosen at random to be played out.
2. Which game you chose for the pair selected to be played.
3. The outcome of the game when you roll a die.

This is not a test of whether you can pick the best game in each pair, because none of the games are necessarily better than the others. Which games you prefer is a matter of personal taste. The people next to you may have different tastes, so their responses should not matter to you. Please work silently, and make your choices by thinking carefully about each game.