STRATEGIC SIMILARITY AND EMERGENT CONVENTIONS:
EVIDENCE FROM SIMILAR STAG HUNT GAMES†

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Running Head: Emergent Conventions.

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Abstract: This paper reports evidence on the origin of convention in laboratory cohorts confronting similar but not identical strategic situations repeatedly. The experiment preserves the action space of the game, while randomly perturbing the payoffs and scrambling the action labels in an effort to blunt the salience of retrospective selection principles. Hence, the similarity between stage games is reduced to certain strategic details, like efficiency, security, and risk dominance. Nevertheless, we do observe conventions emerging in half of the laboratory cohorts. When a convention emerges subjects's behavior conforms to the selection principles of efficiency rather than security or risk dominance.

Key words: evolutionary games, coordination, similarity, convention, payoff dominance, risk dominance, learning, human behavior.

JEL classification: c72, c78, c92, d83.

List of Symbols:

α - alpha

β - beta

ε - epsilon

c - italic c

g - italic g

i - italic i

t - italic t

w - italic w

x - italic x

y - italic y

A - italic A

B - italic B

C - italic C

G - italic G

T - italic T

X - italic X

I. Introduction

There is now a lot of evidence against the claim that people use efficiency to solve strategy coordination problems. For example, in a series of papers on two player stag hunt games investigators find that the observed emergent mutually consistent behavior need not be efficient.[1] Battalio *et al.* (1997) review the evidence and conclude that while risk dominance is not used by a majority of the subjects initially it accurately predicts the emergent convention when the earnings difference between the two strategies is sufficiently large.

This evidence is from experiments using evolutionary matching protocols. In an *evolutionary* game, a stage game is played repeatedly by random subsets of the community, usually referred to as cohorts or populations in the experimental literature. A behavioral regularity in a recurrent situation amongst community members is a *convention* if it is customary, expected, and mutually consistent, see Lewis (1969).

In both the theoretical and experimental literature, subjects confront the same stage game repeatedly, either with the same opponent or with opponents drawn from a well defined community. These sequences of stage games have an extraordinary degree of similarity not observed in most field situations. Kreps' (1990) argues that, "If we rely solely on the story of directly relevant experience to justify attention to Nash equilibria, and if by directly relevant experience we mean only experience with precisely the same game in precisely the same situation, then this story will take us very little distance outside the laboratory."[2]

The inefficient behavior reported in the literature may reflect subjects learning to use a deductive selection principle, like risk-dominance or security. Alternatively, the behavior may reflect the coincidence of situation specific adaptive behavior converging to a mutually consistent outcome. In strategically similar, but contextually different situations, conventions based on non-strategic details, like action labels, player labels, or population membership, may be difficult or impossible to establish.[3] In such environments, mutually consistent behavior, if it is to emerge at all, must be based on the strategic selection principles emphasized in a general theory of games.

This paper reports evidence on the origin of convention in laboratory cohorts confronting similar but not identical strategic situations repeatedly, all of which are two player stag hunts. The experiment preserves the action space of the game, while randomly perturbing the payoffs and scrambling the action labels in an effort to blunt the salience of retrospective selection principles.[4] Hence, the similarity between stage games is reduced to certain strategic details, like efficiency, security, and risk dominance. Conventions based on strategic details require members of a community to focus on the same deductive concept derived from shared past instances of similar games and, further, to use that concept to solve the strategy coordination problem in the present game.

We do observe conventions emerging in laboratory cohorts playing a 75 period sequence of scrambled payoff perturbed 2×2 stag hunt game forms using an evolutionary matching protocol. The observed conventions require cohort members to recognize strategic similarities between stage games. When a convention emerges subjects' behavior is consistent with efficiency rather than security or risk dominance.

II. Analytical Framework

In order to focus the analysis, consider the following two player stag hunt game, denoted $g(x)$, in figure 1. For $0 < x < 1$, the game $g(x)$ has three Nash equilibria, two strict equilibria, $A = (\alpha,\alpha)$ and $B = (\beta,\beta)$ and the mixed-strategy equilibrium, $\{(1\text{-}x, x),(1\text{-}x, x)\}$. When equilibrium analysis results in multiple equilibria it fails to prescribe rational behavior in the game or predict which, if any, equilibrium will be selected.

<insert figure 1 about here.>

However, players may use deductive principles to identify a specific equilibrium point in situations involving multiple equilibria. Deductive selection principles select equilibrium points based on thinking about the description of the game. If deductive selection principles such as security, efficiency, and risk dominance are to provide an accurate theory of observable games they must formalize characteristics that are commonly known to be psychologically salient. Further, in games where more than one selection principle can be applied, decision makers must focus on the same principle. A salient and convincing selection principle would allow players to implement a specific equilibrium point based on its conspicuous uniqueness. The salience and persuasiveness of an equilibrium selection principle is essentially an empirical question, see Schelling (1960).

A. Efficiency, Security, and Risk Dominance

The equilibria of the game *g(x)* can be Pareto ranked. Harsanyi and Selten (1988;p.81) call an equilibrium *payoff dominant* if it is not strictly Pareto dominated by any other equilibrium point. The payoff dominant equilibrium of the game *g(x)* is *B*. The concept of payoff dominance selects a unique equilibrium in stag hunt games.

In many strategic situations payoff dominance may not be salient and convincing because it disregards out-of-equilibrium payoffs that may influence the actions of players. A *secure* action in a game is an action in which the smallest payoff is at least as large as the smallest payoff of any other feasible action. The secure action in game *g(x)* is α, which guarantees a payoff of x. Since the secure action is mutually consistent, the concept of security also selects a unique equilibrium, which is always the inefficient equilibrium *A*.

In game *g(x)* both security and efficiency select a unique equilibrium point, and both are potentially salient and convincing selection principles. It is this conflict between efficiency and security that has made stag hunt games the canonical example of the equilibrium selection problem. An interesting conjecture is that the salience of security and efficiency may depend on the magnitude of x. Intuitively, as $x \to 0$ one expects play to conform to the payoff dominant equilibrium, *B*, and as $x \to 1$, one expects play to conform to the secure equilibrium, *A*. The selection principle of *risk dominance* captures this intuition by selecting *B* for $x < 0.5$, the mixed equilibrium for $x = 0.5$, and *A* for $x > 0.5$, see Harsanyi and Selten (1988).

B. *Cutpoint Strategies and the Origin of Conventions*

In the absence of a universally salient and convincing deductive selection principle, repeated interaction with similar but not identical strategic situations amongst members of a community may allow them to learn to focus on the same deductive concept and establish a convention that solves the coordination problem. Consider a finitely repeated sequence of stag hunt games $G(X,T)$, which involves n players randomly matched to play $g(x)$ for T periods, where each period x_t is the realization of a random variable X, which is distributed uniformly on (0,1). Having t periods of experience in $G(X, T)$ provides players with observed facts that can be used to reason about the equilibrium selection problem in the continuation game $G(X, T\text{-}t)$. This experience with the stage game may influence the outcome in the continuation game $G(X, T\text{-}t)$ by coordinating beliefs on the same deductive selection principle.

The concept of a *cutpoint strategy* will be used to analyze the data, see Palfrey and Rosenthal(1988) and Palfrey and Prisbrey (1990). For a sequence of payoff perturbed stag hunt games, a cutpoint strategy is a rule expressed as a "cutpoint" C_i, such that player i will play β, the action associated with the payoff dominant equilibrium, if $x_t \leq C_i$, and α, the secure action, if $x_t > C_i$. When all players use the same cutpoint, C^*, a Nash equilibrium results. There exist a continuum of such Nash equilibria indexed by cutpoint C^* in [0,1].

When we analyze the data it will not be possible to estimate C^* precisely and we will focus on the cutpoints that map back into a general theory of games. Most of the analysis will be conducted at the individual subject level. The security hypothesis is that a player is using a cutpoint of 0.0. The risk dominance hypothesis is that a player is using a cutpoint of 0.5. The payoff dominance hypothesis is that a player is using a cutpoint of 1.0. The rule-of-thumb we adopt is to call an observable regularity in the behavior of cohort members a convention if all of the players's estimated cutpoints are within 0.1 of the same cutpoint value. Conventions based on security, payoff dominance, and risk dominance correspond to cutpoint values of 0.0, 0.5, and 1.0 respectively.

III. EXPERIMENTAL DESIGN

Human subjects played a sequence of payoff perturbed 2×2 stag hunt games for seventy-five periods with a one population matching protocol. The population size was eight and subjects were randomly pairwise matched each period. Many sequences of seventy-five matrices were generated by computer using the following algorithm: one of the two matrices from figure 2 was randomly selected each period with equal probability. The cells were populated with randomly drawn values for y and ε from the following intervals with uniform probability : $y \in [1,2,...,369]$ and $\varepsilon \in [0,1,...50]$. The constant w always equaled 370. One sequence was chosen and used for all cohorts in the experiment.[5] Matrix entries denote tenths of a cent.

<insert figure 2 about here.>

Scrambling the action labels changes the location of the payoff dominant equilibrium and the secure equilibrium in order to differentiate between selection principles based on action labels and selection principles based on a deductive concept. In other words, a convention emerging based on payoff dominance, security, or risk dominance requires subjects to switch action choices in response to the value of y and the location of payoffs in the matrix. Adding ε to all payoffs prevents subjects from focusing on the payoff dominant equilibrium due to it always being the same number.

The money payoffs used in the experiment can be normalized to the unit interval. Under the own money motivated abstraction assumption, these normalized money payoffs correspond to x_t in figure 1. Figure 3 graphs the values of x_t used for all cohorts in the experiment.

<insert figure 3 about here>

The subjects made choices using a computer assisted graphical user interface available in the TAMU economics laboratory. The payoff matrix for each period was displayed on a monitor at the front of the room to ensure that the game form was common information. No preplay communication was allowed. After each repetition of the period game, subjects' earnings were calculated for that period. Subjects only observed the outcome of their own pairing. To further limit the usefulness of retrospective selection principles, there was no computer assisted record keeping of experienced payoff matrices or action combinations. Subjects did have access to pencil and paper and could have kept what ever records they felt would be useful. Almost all chose not to keep any records whatsoever.

Subjects always made choices as a row player with the rows labeled “your choice”. The other participant's choice was displayed as a column with the columns labeled “other participant's choice.” They were only informed that they would be playing a computer generated sequence of 75 matrix games. They had no information about the parameters involved and the example in the instructions was not a stag hunt game.

The subjects were undergraduate students at Texas A&M University in the 1994 summer semester. A total of 48 subjects participated in the six cohorts reported below. After the instructions, but before the experiment began, the subjects filled out a questionnaire to ensure that it was common information that everyone understood how to compute payoffs for themselves and their opponents. If any subject made a mistake on the questionnaire, the relevant part of the instructions were read again. In the seventy-five period sessions, which take about two hours to conduct, a subject could earn as much as $29.50.

IV. EXPERIMENTAL RESULTS

Table I reports the percentage of efficient play in the first ten periods and the last ten periods by cohort. The data is sorted by risk dominance. Recall that when $x_t > 0.5$ risk dominance selects the secure action, and when $x_t < 0.5$ risk dominance selects the efficient action. If subjects had coordinated on risk dominance or security, the values in the columns for $x_t > 0.5$ would have been 0.

<insert table I about here>

Pooling over cohorts and the first ten periods, 65 percent of the choices correspond to the efficient action when risk dominance selects the secure action, while 85 percent of the choices correspond to the efficient action when risk dominance selects the efficient action. A Fisher’s exact test rejects the hypothesis that these sample frequencies drawn from the same population at essentially the 0.00 level of statistical significance.

There exists a statistically significant difference in the frequency of the efficient action in the first ten periods when actions are sorted by risk dominance.[6]

For the four cohorts that lasted 75 periods and when $x_t > 0.5$, 63 percent of the choices in the first ten periods correspond to the payoff dominant action, β, and 37 percent correspond to the risk dominant or secure action, α.[7] In the last ten periods, 91 percent correspond to the payoff dominant action and only 9 percent correspond to the risk dominant and secure action. When $x_t < 0.5$, risk dominance reinforces payoff dominance. For the four cohorts that lasted 75 periods, 84 percent of the choices in the first ten periods correspond to the payoff dominant and risk dominant action, β, and 16 percent correspond to the secure action, α. In the last ten periods, 100 percent correspond to the payoff dominant and risk dominant action, β, and no one chose the secure action, α. A mutually consistent way to play does emerge and it is based on payoff dominance rather than security or risk dominance.

Table II reports Fisher's exact tests for risk dominant behavior by individual subjects in the last 25 periods. We reject risk dominant play at the five percent level of statistical significance for all but two subjects in cohort three, two subjects in cohort five, and two subjects in cohort six.

<insert table II about here>

Table III reports Fisher's exact tests for payoff dominant behavior by individual subjects in the last 25 periods. At the five percent level of statistical significance we can reject payoff dominant play for only one subject in cohort one, two, four, five, and six, and two subjects in cohort three. Most subjects learned to use efficiency to solve their strategy coordination problem. 23 of 48 subjects choose the payoff dominant action in every one of the last 25 periods.

<insert table III about here>

We estimate cutpoints for each subject by minimizing the classification errors associated with all possible cutpoints. Each of the realizations of the random variable X are considered and a classification error occurs if $x_t < C_i$ and the secure action is chosen or if $x_t > C_i$ and the payoff dominant action is chosen. We will call a value of *C* with the minimum number of classification errors a subject's estimated cutpoint. These were calculated using fifteen period moving intervals. Usually there exists an interval of possible cutpoints that minimizes a subject's classification errors. Table IV reports the estimated cutpoint intervals by subject for cohorts that ran for 75 periods.

<insert table IV about here>

For the first fifteen periods, 8 of 32 subjects have an estimated cutpoint interval that includes payoff dominance, $C^* = 1.00$. So, 25 percent of the subjects may have brought payoff dominance into the laboratory. Similarly, 2 of 32 subjects have an estimated cutpoint interval that includes risk dominance, $C^* = 0.50$. So, 6 percent of the subjects may have brought risk dominance into the laboratory. No subject has a cutpoint interval that includes security, $C^* = 0.00$. Most of the subjects begin with a cutpoint interval between risk dominance and payoff dominance.

For the last fifteen periods, 17 of 32 subjects have an estimated cutpoint interval that includes payoff dominance. So, 53 percent of the subjects end up using payoff dominance. One subject had an estimated cutpoint interval that includes risk dominance: subject 7 of cohort three. Note this is not a subject who began with risk dominance, but rather one who adopts it only later in the session. Subject 8 of cohort one and subject 1 of cohort two both abandon risk dominance by the end of the session. All of the subjects in cohorts one, two, and four have a maximum cutpoint greater than 0.90. A convention of using payoff dominance emerged in these three cohorts.

Figures 4 to 9 graph by cohort the emergence of payoff dominance using moving fifteen period intervals for each of the eight subjects. The reported figures graph the minimum classification error cutpoint under the maintained hypothesis of payoff dominance, that is, in cases of non-unique cutpoint estimates we selected the maximum valued minimum error cutpoint. Only cohort four conforms to a convention initially. A convention emerges in two of the remaining five cohorts. We do observe conventions emerging and when a convention emerged it corresponded to the deductive principle of payoff dominance.

<insert figures 4 to 9 about here>

V. SUMMARY AND CONCLUSION

Three of the four cohorts that ran a full 75 periods coordinate on a convention of selecting the payoff dominant equilibrium. The other 75 period cohort and the two 56 period cohorts appear to be converging towards the same convention. In short, the observed emergent conventions were always based on payoff dominance rather than risk dominance or security.

Our results provide evidence on the ability of subjects to achieve mutually consistent outcomes in recurring strategic situations that are similar but not identical. Studying behavior in this framework is important since many recurring strategic situations in the field are not identical.[8] Our results provide evidence that human subjects do recognize strategic principles when confronted with a sequence of similar but not identical strategic situations and, moreover, some cohorts are able to use these strategic similarities to solve their coordination problem.

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Appendix A

Instruction Text File for Graphical User Interface

INSTRUCTIONS

This is an experiment in the economics of strategic decision making. Various agencies have provided funds for this research. If you follow the instructions and make appropriate decisions, you can earn an appreciable amount of money. At the end of today's session, you will be paid in private and in cash.

It is important that you remain silent and do not look at other people's work. 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.

You will be making choices on a Logitech mouse, which is located on the mouse pad in the middle of your table. You may move the pad to the right or left if this would be more comfortable. Hold the mouse in a relaxed manner with your thumb and little finger on either side of the mouse. Rest your wrist naturally on the table surface. When you move the mouse, let your hand pivot from the wrist. Use a light touch. Your cursor (a white arrow on your screen) should move when you slide the mouse on the mouse pad. If it does not, raise your hand.

To participate, you must be able to move the cursor onto an object and click any one of the mouse buttons. We will call pointing at an object and then clicking your mouse "clicking on" an object displayed on the screen. Click on the page down icon located below to display the next page.

The experiment consists of seventy-five separate decision making periods. In this experiment you will participate in a group of eight people. At the beginning of period one, each of the participants in this room will be randomly assigned to a group of size eight and will remain in the same group for the entire seventy-five decision making periods of the experiment. Hence, you will remain grouped with the same seven other participants for the next seventy-five periods.

At the beginning of each decision making period you will be randomly re-paired with another participant in your group. Hence, at the beginning of each decision making period, you will have a one in seven chance of being matched with any one of the other seven participants from your group. Click on the page down icon located below to display the next page.

At the beginning of each period, you and all other participants will choose an action. An earnings table is provided which tells you the earnings you receive given the action you and your currently paired participant chose. The actions you may choose are row 1 or row 2. During a period everyone will have the same earnings table which will be displayed on the monitor in the front of the room. However, the earnings table will differ from period to period during the experiment. Seventy-five earnings tables, one for each of the seventy-five periods, have been generated by a computer. Many sequences of seventy-five earnings tables were generated. One of these sequences will be used in today's session. However, in each period, all participants in the experiment will have the same earnings table which will be displayed on the monitor in the front of the room. Click on the page down icon located below to display the next page.

The outcome each period will be found in the cell determined by your action and the action of the participant from your group that you are paired with for the current decision making period. Your action determines the row and the other participant's action determines the column of the earnings table. The values in the cell determined by the intersection of the row and column chosen is the outcome for the current period. The first (lower left) value in each earnings cell, displayed in green, is the amount of money, in tenths of cents, that you earn and the second (upper right) value in each earnings cell, displayed in gray, is the amount of money in tenths of cents that the other participant earns. Therefore, the amount that you earn in cents is the number in the earnings table multiplied 1/10. For example, if the outcome is 642, your earnings will be 64.2 cents or 0.642 dollars for that period. Click on the page down icon now to view the earnings table while I describe how the earnings for each decision making period are calculated. You can review this page at any time during the experiment by returning to the instructions.

MAIN SCREEN

We will now view the main screen. You will use the main screen to make your choices each period. While you view the main screen I will read the description of the screens contained in the next two pages. You can review the text that I am reading at any time during the experiment by returning to the instructions. Click on the word "MAIN" located on the second line down from the top of the screen now. (The second line is the light blue line on your screen).

The top line of the main screen displays the title of the screen, the current period number and your current balance. The second line has word "PROCEED" and the abbreviation "INSTR". During the session you will be able to return to these instructions by clicking on "INSTR." The remainder of the screen is devoted to the earnings table.

Please look at the monitor at the front of the room while I demonstrate how you make and enter a choice. Do not use your main screen until you are instructed to do so.

Making a choice consists of clicking any mouse button while the cursor is in the row of your choice. When you have clicked on the earnings table, your cursor is replaced by a green highlight around the row that contained the cursor when you clicked the mouse. You can change the highlighted row by sliding your mouse up or down. Click the mouse a second time and your cursor returns, but a row remains highlighted. To enter your choice for the current period you need to confirm your choice. You confirm your choice by first clicking on the word "PROCEED" and then clicking on "YES" to confirm and enter your choice for the current period. This confirmation step lets you catch any mistakes you make.

Please make a choice now, click on proceed and then click on "NO". Notice that the row is no longer highlighted and you may now make a different choice.

Before making another choice click on "PROCEED" without making a choice and notice that you receive the following message:

YOU MUST MAKE A CHOICE BEFORE PROCEEDING

At the time this message is present, a red box is also pulsing around the outside of your earnings table.

Please make a choice now, click on "PROCEED" and then confirm your choice by clicking on "YES".

WAITING SCREEN

During a session a waiting screen will appear after you have made a choice. While you are waiting, you can view the instructions clicking on "INSTR". When all participants have made a choice for the current period you will be automatically switched to the outcome screen. The choice displayed is the choice that you made during the demonstration of the main screen. You will automatically return to the instructions. Click on "WAITING" now.

OUTCOME SCREEN

During a session, after everyone has made their choices, the outcome screen will appear. The outcome screen summarizes what happened each period for fifteen seconds. Your choice will be highlighted in green. The column determined by the other participant's choice will be highlighted in red. The screen is not active.
The choice displayed for your choice reflects the choice you made during the demonstration of the main screen. The outcome screen also contains your balance from the previous period labelled "Old Balance", your earnings, converted to dollars from the last period labelled "Earnings", and your current balance labelled "New Balance", which is the sum of your previous balance and your earnings from the last period. During the instructions there are no values next to these headings since at this time you do not have a balance and you are not paired with another participant. During the experiment these values will equal your actual balance and earnings. You will automatically return to the instructions. At the end of seventy-five periods a summary of all period earnings will be displayed. Click on "OUTCOME" now.

QUESTIONNAIRE

We will now pass out a questionnaire to make sure that all participants understand how to read the earnings table and calculate their earnings. Please fill it out now. Raise your hand when you are finished and we will collect it. If there are any mistakes on any questionnaire, I will go over the relevant part of the instructions again. Do not put your name on the questionnaire.

Click on the page down icon located below to display the next page.

SUMMARY

*** The experiment consists of seventy-five separate decision making periods.

*** At the beginning of period one, each of the participants in this room will be randomly assigned to a group of size eight and will remain in the same group for the entire seventy-five decision making periods of the experiment.

*** Each period you will be randomly re-paired with one of the seven other participants in your group. Hence, at the beginning of each decision making period, you will have a one in seven chance of being matched with any one of the seven other participants your group. The earnings table will differ from period to period. However, in each period, all participants in the experiment will have the same earnings table which will be displayed on the monitor in the front of the room

*** You make a choice by clicking on a row, which highlights the row in green; clicking the mouse a second time, which restores your cursor, and then clicking on proceed and yes to confirm your choice of the highlighted row.

*** Remember that you can view the instructions by clicking on the appropriate word on the light blue bar.

*** Your balance at the end of the session will be paid to you in private and in cash.

Click on the page down icon located below to display the next page.

We have completed the instructions. Again, it is important that you remain silent and do not look at other people's work.

If you have a question, please raise your hand, and an experimenter will come to assist you. If there are no questions, period one of the experiment will begin.

	α	β
α	x, x	x, 0
β	0, x	1,1

Figure 1: Stag Hunt Games ($0 < x < 1$)

	1	2
1	$y+\varepsilon$, $y+\varepsilon$	$y+\varepsilon$, ε
2	ε, $y+\varepsilon$	$w+\varepsilon$, $w+\varepsilon$

	1	2
1	$w+\varepsilon$, $w+\varepsilon$	ε, $y+\varepsilon$
2	$y+\varepsilon$, ε	$y+\varepsilon$, $y+\varepsilon$

Figure 2: Isomorphic Stag Hunt Games.

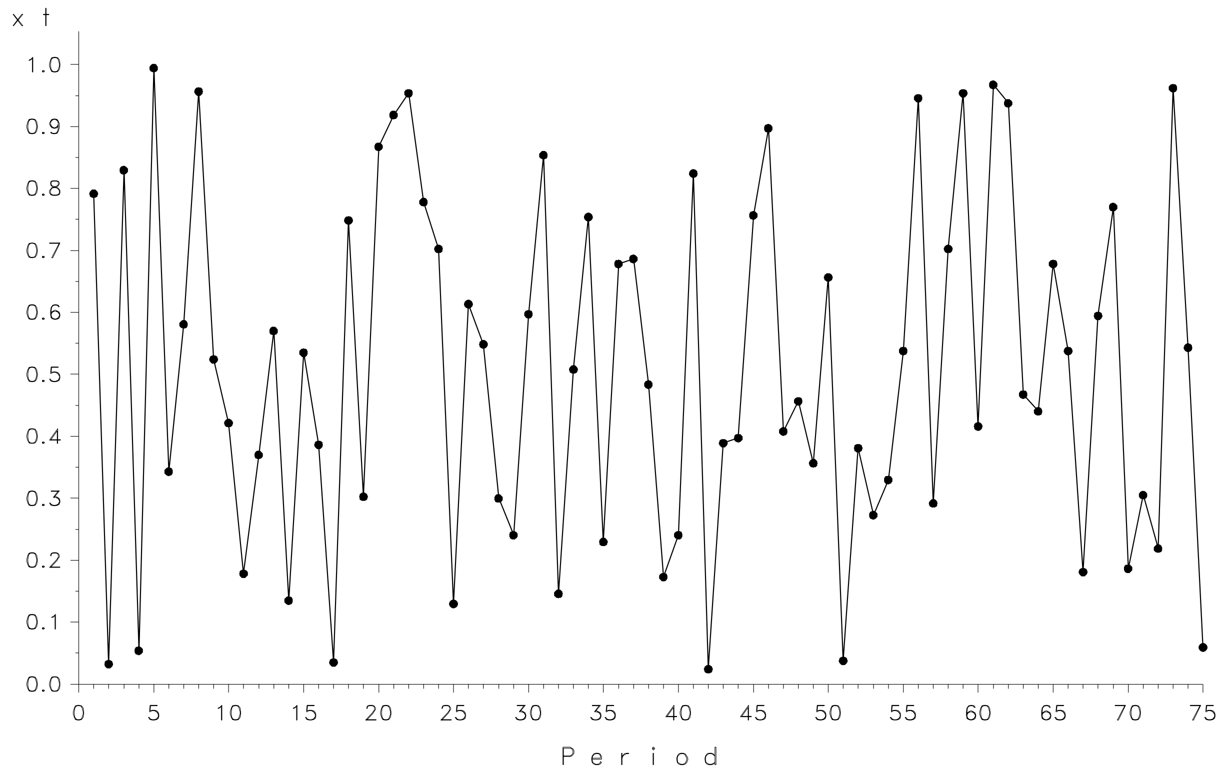

Figure 3: Sequence of *x* used by all cohorts.

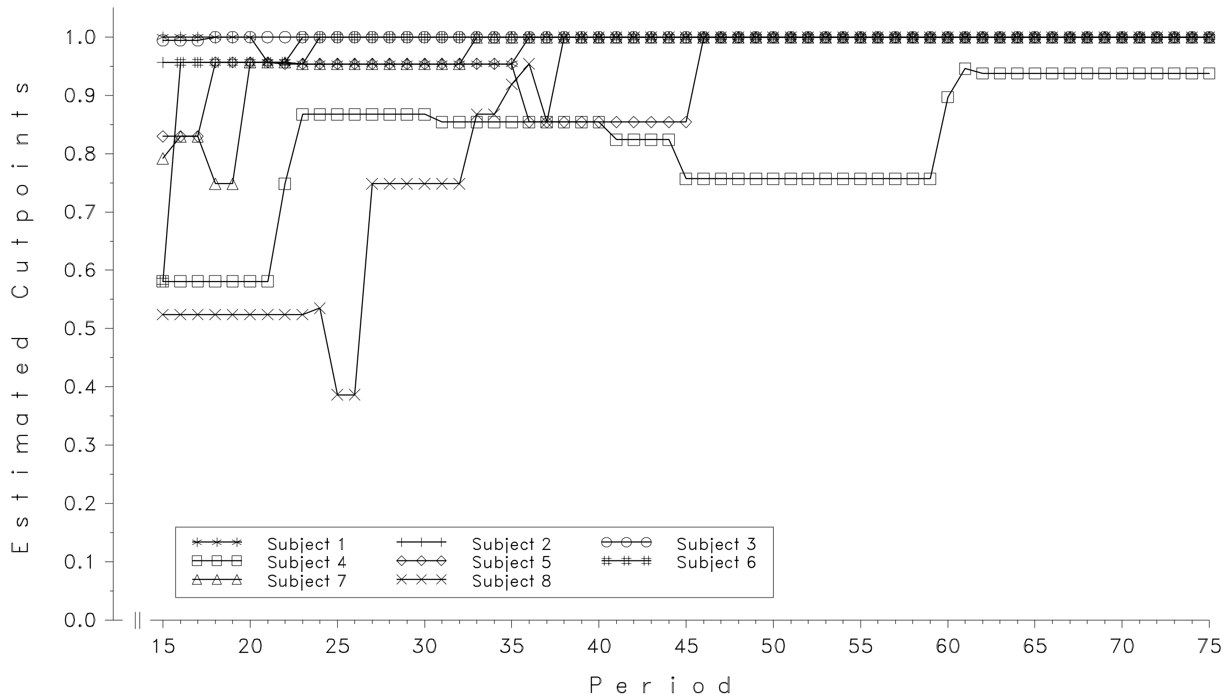

Figure 4: Payoff dominance hypothesis: cohort one.

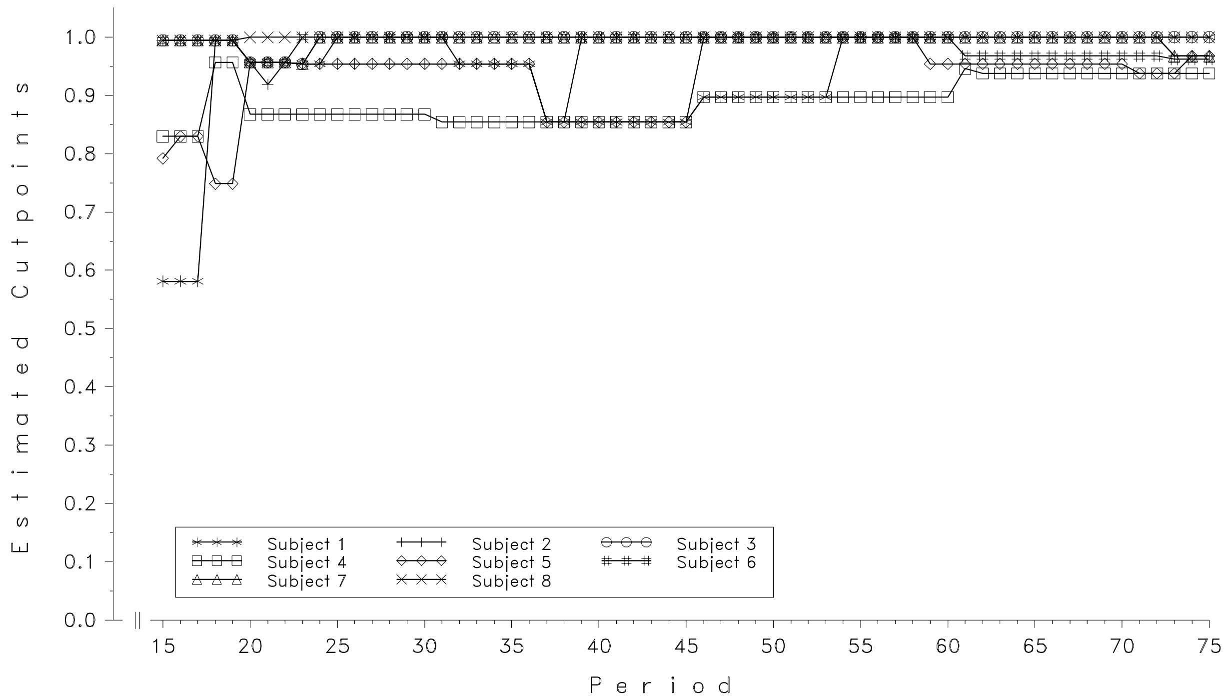

Figure 5: Payoff dominance hypothesis: cohort two.

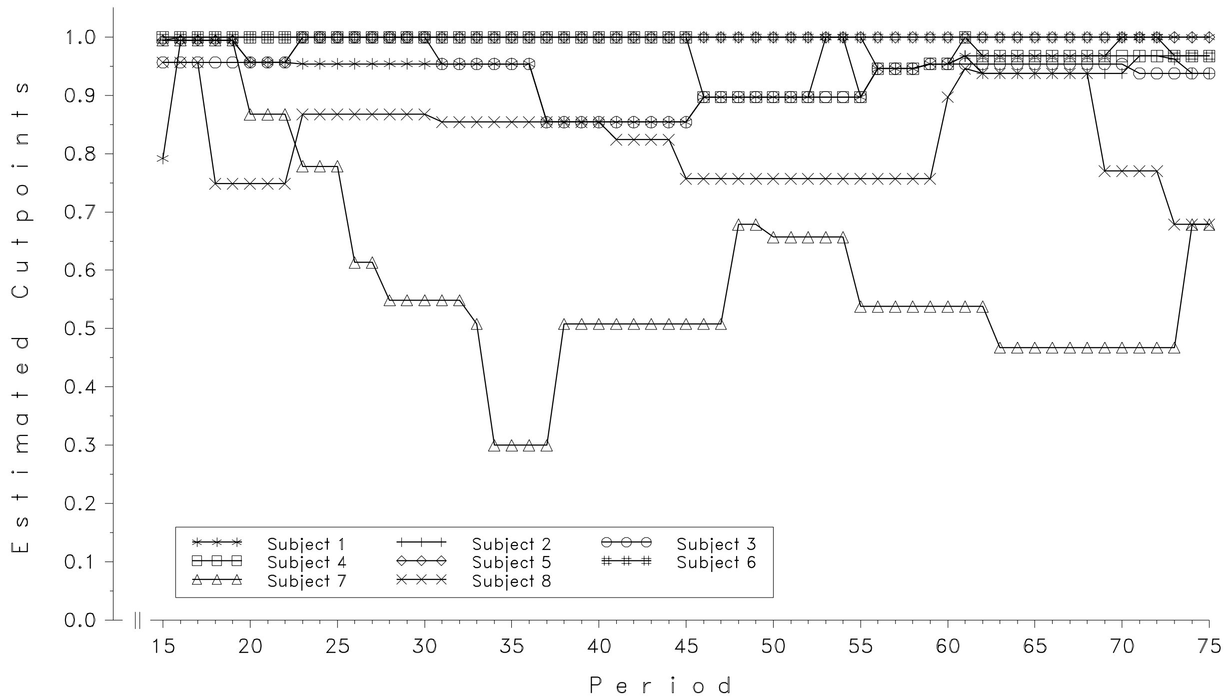

Figure 6: Payoff dominance hypothesis: cohort three.

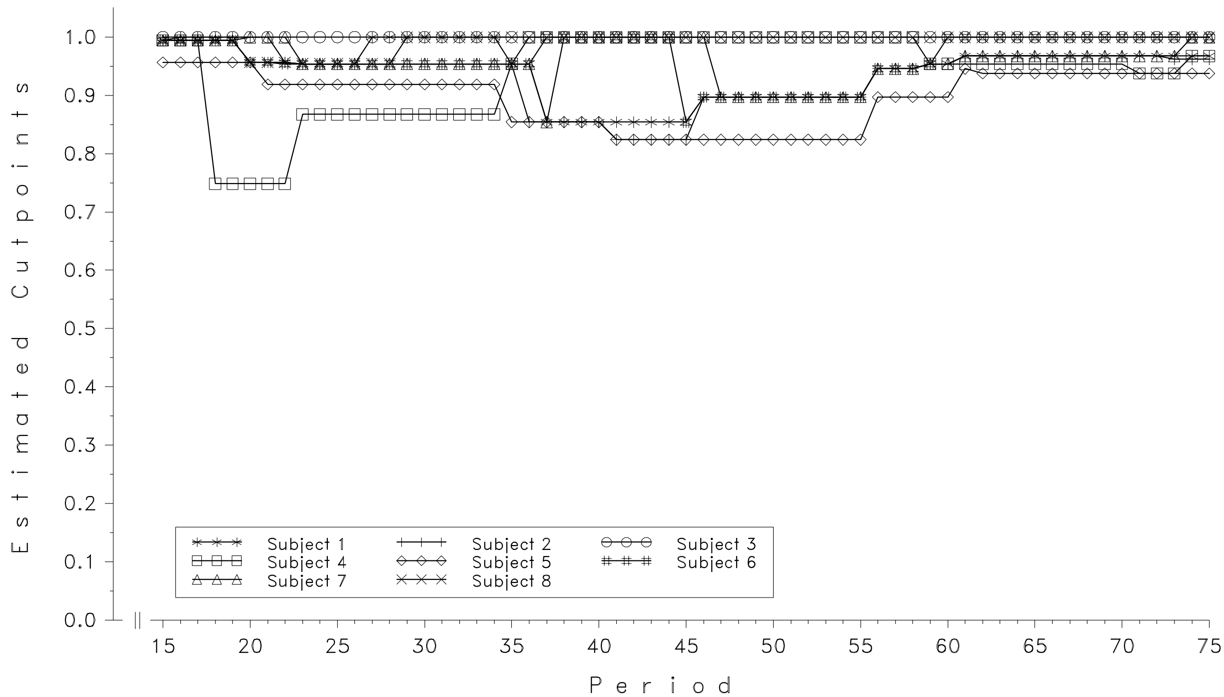

Figure 7: Payoff dominance hypothesis: cohort four.

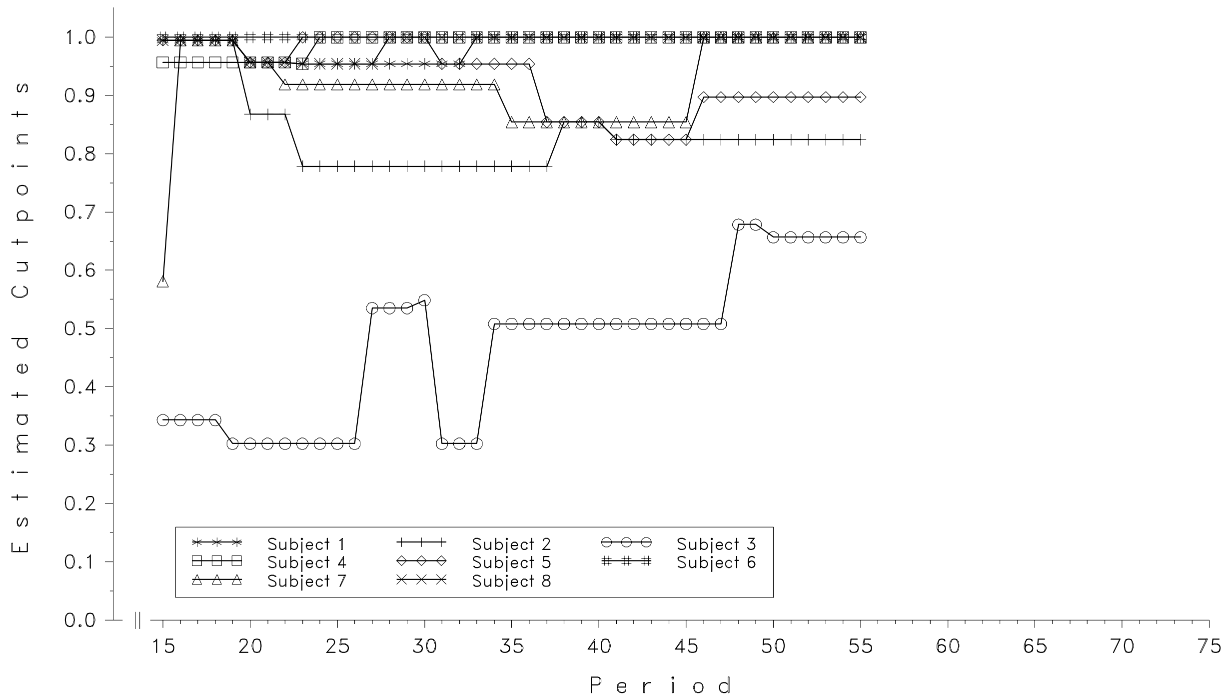

Figure 8: Payoff dominance hypothesis: cohort five.

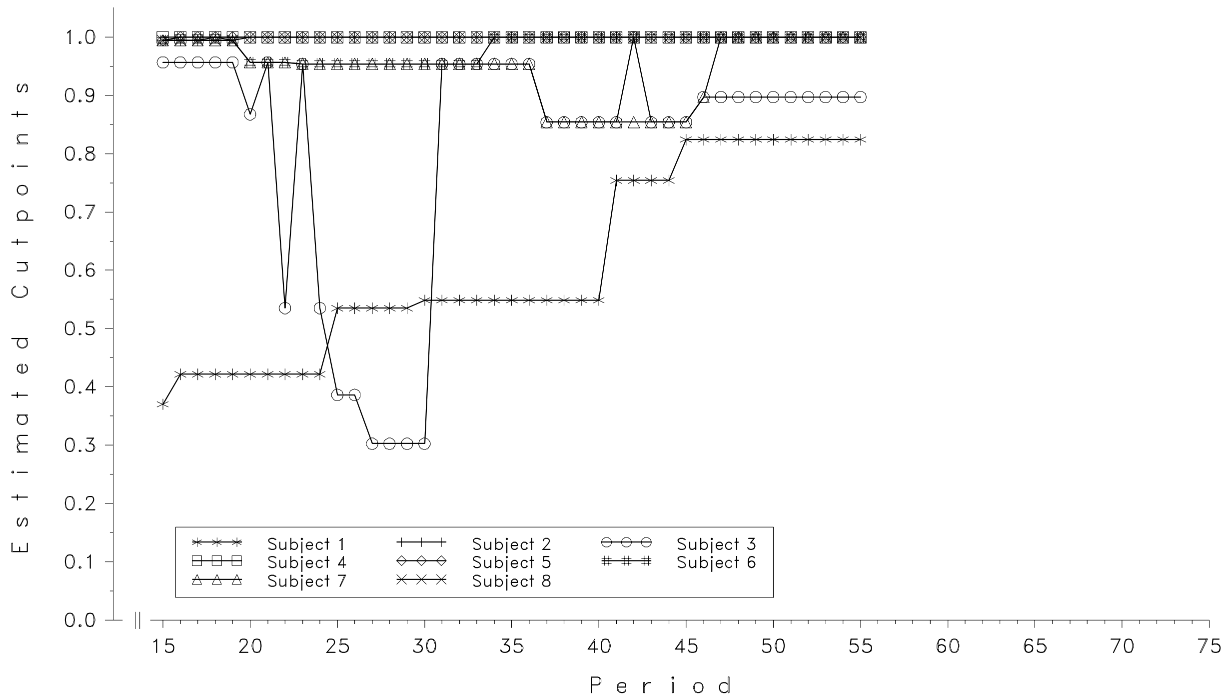

Figure 9: Payoff dominance hypothesis: cohort six.

Table I: Percent of efficient play when $x_t > 0.5$ and $x_t < 0.5$.

Cohorts	First Ten Periods		Last Ten Periods	
	$x_t > 0.5$	$x_t < 0.5$	$x_t > 0.5$	$x_t < 0.5$
1	46%	72%	98%	100%
2	54%	81%	90%	100%
3	77%	97%	80%	100%
4	75%	87%	95%	100%
5*	60%	84%	87%	100%
6*	77%	87%	92%	95%

* Cohorts 5 and 6 ran for 55 periods due to a hardware failure in period 56.

Table II: Fisher's Exact (two-tailed) tests for Risk Dominance in the last 25 periods.†

	Probability of Risk Dominance Hypothesis					
	Cohort					
Subject	**1**	**2**	**3**	**4**	**5**	**6**
1	0.00	0.00	0.00	0.00	0.00	0.11
2	0.00	0.00	0.00	0.00	0.11	0.00
3	0.00	0.00	0.00	0.00	1.00	0.36
4	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	1.00	0.00	0.00	0.00
8	0.00	0.00	0.22	0.00	0.00	0.00

† Note that the last 25 periods for cohorts 1 to 4 are periods 51 to 75, while the last 25 periods for cohorts 5 and 6 are periods 31 to 55.

Table III: Fisher's Exact (two-tailed) tests for Payoff Dominance in the last 25 periods.†

	Probability of Payoff Dominance Hypothesis					
	Cohort					
Subject	**1**	**2**	**3**	**4**	**5**	**6**
1	1.00*	1.00*	1.00	1.00	1.00*	0.11
2	1.00*	1.00	0.11	0.23	0.11	1.00*
3	1.00*	1.00*	0.11	1.00*	0.00	0.00
4	0.00	0.00	1.00	0.23	1.00*	1.00*
5	1.00*	0.23	1.00*	0.00	0.49	1.00*
6	1.00*	0.49	1.00	1.00*	1.00*	1.00*
7	1.00*	1.00	0.00	1.00	1.00	1.00
8	1.00*	1.00*	0.00	1.00*	1.00*	1.00*

† Note that the last 25 periods for cohorts 1 to 4 are periods 51 to 75, which the last 25 periods for cohorts 5 and 6 are periods 31 to 55.
* Denotes cases in which subject played the payoff dominant action in all 25 periods.

Table IV: Estimated Cutpoints by Subject for Cohorts lasting 75 periods.

Subject	Periods 1-15 Interval	Periods 61-75 Interval
Cohort One		
1	[0.99, 1.00]	[0.97, 1.00]
2	[0.83, 0.96]	[0.97, 1.00]
3	[0.58, 0.99]	[0.97, 1.00]
4	[0.57, 0.58]	[0.77, 0.94]
5	[0.79, 0.83]	[0.97, 1.00]
6	[0.57, 0.58]	[0.97, 1.00]
7	[0.58, 0.79]	[0.97, 1.00]
8	[0.42, 0.52]	[0.97, 1.00]
Cohort Two		
1	[0.18, 0.58]	[0.97, 1.00]
2	[0.83, 0.99]	[0.94, 0.97]
3	[0.83, 0.99]	[0.97, 1.00]
4	[0.79, 0.83]	[0.77, 0.94]
5	[0.58, 0.79]	[0.77, 0.97]
6	[0.83, 0.99]	[0.94, 0.96]
7	[0.69, 0.99]	[0.94, 0.97]
8	[0.96, 0.99]	[0.97, 1.00]
Cohort Three		
1	[0.58, 0.79]	[0.97, 1.00]
2	[0.99, 1.00]	[0.77, 0.94]
3	[0.83, 0.96]	[0.77, 0.94]
4	[0.99, 1.00]	[0.97, 1.00]
5	[0.83, 0.99]	[0.97, 1.00]
6	[0.99, 1.00]	[0.94, 0.97]
7	[0.83, 0.99]	[0.44, 0.68]
8	[0.58, 0.96]	[0.59, 0.68]
Cohort Four		
1	[0.99, 1.00]	[0.96, 0.97]
2	[0.99, 1.00]	[0.94, 0.96]
3	[0.99, 1.00]	[0.97, 1.00]
4	[0.58, 0.99]	[0.77, 0.97]
5	[0.83, 0.96]	[0.77, 0.94]
6	[0.58, 0.99]	[0.97, 1.00]
7	[0.96, 0.99]	[0.97, 1.00]
8	[0.99, 1.00]	[0.97, 1.00]

Figure 1: Stag Hunt Games ($0 < x < 1$)

Figure 2: Isomorphic Stag Hunt Games.

Figure 3: Sequence of *x* used by all cohorts.

Figure 4: Payoff dominance hypothesis: cohort one.

Figure 5: Payoff dominance hypothesis: cohort two.

Figure 6: Payoff dominance hypothesis: cohort three.

Figure 7: Payoff dominance hypothesis: cohort four.

Figure 8: Payoff dominance hypothesis: cohort five.

Figure 9: Payoff dominance hypothesis: cohort six.

1. See Cooper *et al.* (1992), Straub (1995), Friedman (1996), Clark *et al.* (1996), and Battalio *et al.* (1997). See Ochs (1995) for a general survey.

2. Fudenberg and Kreps (1993), and LiCalzi (1995) consider notions of similarity in game theoretic learning contexts.

3. See Van Huyck, Battalio, and Rankin (1997) for examples of emergent conventions based on non-strategic details of a game.

4. See Rapoport, Guyer, and Gordon (1976) for a discussion of experimental designs using scrambling; Crawford and Haller (1990) and Sugden (1995) for formal theories of scrambling; and Bacharach (1993) for a formal theory of variable frames.

5. A runs tests can not reject the null hypothesis that the chosen y values and ε values are iid uniformly distributed random variables at the 10 percent level of statistical significance. A Kolmogorov test can not reject the null hypothesis that the chosen sequences came from a uniform distribution at a 10 percent level of statistical significance.

6. We thank a referee for suggesting this test and pointing out that their conjecture if correct, as it was, would constitute evidence in favor of some influence from risk dominance type thinking in initial subject behavior.

7. There was a hardware failure in period 56 of the session consisting of cohorts five and six.

8. See Lo, *et al.* (1997) on transfer between field situations and laboratory games. When context is provided, they find some evidence for transfer of the ratchet effect.