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Social capital and equilibrium selection in stag hunt games

Steven J Bosworth
University of Pittsburgh

Abstract

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Social Capital and Equilibrium Selection in Stag Hunt Games

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UNIVERSITY OF PITTSBURGH

Abstract

Surveys of trusting attitudes are frequently tied to development outcomes but are found by laboratory experiments to have poor instrumentality for trusting behavior in social dilemmas like the Berg et al. trust game. I propose that such surveys remain valid if they capture facets of trust not operative in the Berg et al. game. Trust is also an important feature of coordination games in a way that is distinct from its role in social dilemmas. Hence a complete evaluation of trust surveys must encompass their predictive power in a coordination setting. This study investigates whether affirmative responses to surveys of trust attitudes correlate with and predict trusting behavior in a Stag Hunt game.

1 Introduction

Learned, instilled or innate trust attitudes constitute a part of what social scientists call 'social capital': norms that enable people to participate in mutually beneficial economic activities. Social capital or trust more generally is important because it is proposed as a key "glue" that holds economies together. It is commonly assessed using various survey instruments and combined with field data such as Putnam (1993)'s examination of local government outcomes in Italy. It is important however to identify these phenomena in the lab. Field data may be contaminated by reverse causation: societies with histories of good economic outcomes will instill more trust in their citizens. The development literature motivates experimentalists to slice through this endogeneity. Experiments to date cast doubt on whether social capital instruments predict trusting behavior. This literature suggests that commonly used survey instruments fail to measure social capital. Social capital is not merely a question of finding Pareto-superior deviations from equilibrium play, however. Rather a society with substantial social capital may be successful in coordinating on Pareto-preferred equilibria. That is, in the sender-receiver game, we conceptualize trust as leading to a specific out-of-equilibrium behavior. Even if we were to ascribe the motivation to send money in say, a trust game solely to a belief that the receiver will return a share of the earnings, it is completely different to believe that another will commit to an action that is part of an equilibrium. This paper investigates the hypothesis that social capital surveys measure this other facet of social capital and predict trusting behavior in a *coordination* setting. Showing that survey questions on trust correlate with efficient solutions in at least *some* controlled (albeit very stylized) setting would point to how trust impacts broader developmental concerns such as willingness to invest in a project of uncertain outcome.

2 Social Capital

The ability to exploit Pareto-improving opportunities in the face of uncertainty has profound relevance to economic development and entrepreneurship. Trust as an enabler, connector and coordinator of economic activity is grouped under the sociological concept of social capital. Dasgupta (2008) collects competing and overlapping definitions:

> 'features of social organization, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions' *Putnam, Leonardi and Nanetti, 1993, p. 167*;

> 'social capital refers to connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them.' *Putnam (2000, p. 19)*;

and

> 'Social capital generally refers to trust, concern for one's associates, a willingness to live by the norms of one's community and to punish those who do not' *Bowles and Gintis, 2002, p. F419.*

Social capital is an oft-used regressor in development and growth studies. A seminal example is Putnam (1993), who contrasts local government effectiveness among the regions of Italy following power devolution in the 1970s. Putnam correlates several measures of perceived government effectiveness; most importantly citizen powerlessness, corruption, respect for the law and public safety; with measures of civic engagement; including referendum turnout, newspaper readership, number of sports and cultural associations, the ability of political machines to enforce "preference voting", and perceived trust in others. Higher levels of civic engagement are associated with more effective governance. Putnam himself argues against a causal interpretation of his data, emphasizing "path-dependent social equilibria" and saying that "*Norms and networks of civic engagement contribute to economic prosperity and in turn are reinforced by that prosperity*." Knack and Keefer (1997) document a correlation between trust and productivity, growth, confidence in government, bureaucratic efficiency, and rule of law in a panel of countries. Adler and Kwon (2002) summarizes the literature on the importance of social capital to firms. Social capital strengthens networks that create initial matches, fosters continued success (promotion, reduced turnover), supports research and development and generally encourages positive spillovers.

Detractors abound to the concept of social capital however. Critiques range from the vagueness of its definition to its lack of 'microfoundations' to its poor instrumentality for actual trusting or trust-worthy behavior. Prominently, Durlauf (1999) has criticized social capital for being ill-defined, being broad enough to encompass 'bad' social cohesion like segregation; he wants more theoretical underpinnings and more empirical work on how social capital correlates with behavior. Current methods of measuring social capital are many and varied, but most entail questionnaires that tease out indicators or specific outcomes of social capital. A good example of standardized social capital measurement is undertaken by the World Bank in Grootaert, Narayan, Jones and Woolcock (2003). This survey asks about the respondents' membership in civil society organizations and general attitudes towards cooperation. While this approach is cheaper than running experiments in a lab setting, it is unclear what is revealed in the responses to such questionnaires. A seminal paper in this literature is Glaeser, Laibson, Scheinkman and Soutter (2000), which combines a demographic and trust survey with 'trust game' experiments comprising a modified 'sender-receiver' game a la Berg, Dickhaut and McCabe (1995), and an 'envelope drop'. In the Berg et al. trust game, a 'sender' makes a choice on how much money to send to a 'receiver'. Money sent is multiplied; hence social surplus is maximized by sending the entirety of one's endowment. The receiver has the ability, but no obligation, to return some of the resulting surplus to the sender. The latter activity elicits subjects' valuations for an envelope to be anonymously left in Harvard Square but addressed to them. Thus, the more trusting a subject is, the more they should be willing to pay for the envelope. The authors find some support that survey questions correlate with returns in the Berg et al. game, which indicates trust*worthy* behavior. However, they find no correlation between trust*ing* behavior (amount sent in the Berg et al. game, willingness to pay for the envelope) and survey questions about trusting attitudes. This study casts serious doubt on surveys' ability to measure social capital and instead suggests that the behavioral responses examined are the sole valid metrics of social capital.

Subsequent studies have further explored Glaeser et al.'s technique of combining social capital surveys with trust experiments. Ortmann, Fitzgerald and Boeing (2000) find that outcomes in the Berg et al. trust game are robust with respect to presenting the payoff table in terms of percentages, and prompts to think about the game more strategically. Fehr, Fischbacher, von Rosenbladt, Schupp and Wagner (2003) conduct the Berg et al. game via postal mail with a representative sample of Germans and find that contrary to Glaeser et al., a version of the GSS question used by the latter paper is found correlate with amount sent, but oddly not the amount returned. Another refute to Glaeser et al. is Anderson, Mellor and Milyo (2004), which finds that the GSS trust question administered in a post-hoc survey does indeed predict amount invested in the public account of a VCM game. This is intriguing, but the authors make no attempt to explain why they, but not Glaeser et al. find support for the GSS trust question. Naef and Schupp (2009) develop an alternative to the standard GSS trust questions used in Glaeser et al. which they claim is more indicative of trust in strangers. Their instrument *is* correlated with trusting behavior in the Berg et al. trust game (Spearman coefficient .23), but is not correlated with trust in institutions or known others. The standard GSS trust questions are found to capture trust more broadly (strangers, institutions and known others), but are *not* correlated with trusting behavior in the trust game (per Glaeser et al.). Ben-Ner and Halldorsson (2010) has subjects engage in a standard trust game and dictator game but attempts to measure a wider range of personal attitudes, including risk attitudes. Sending in the trust game is significantly explained by altruistic feelings the sender has towards the receiver. The authors also find that the standard GSS trust question does better in the context of predicting receiver expectations in a dictator game. Risk attitudes are not found to correlate with survey-based trust measures. A working paper by Thöni, Tyran and Wengström (2010) picks up where Anderson et al. left off. They find that affirmative answers to the trust question predict being a conditional contributor in a VCM game à la Fischbacher, Gächter and Fehr (2001). Trust is not robustly related to *beliefs* in the Thöni et al. experiment, but it seems to boost contributions at all levels of belief about other contributions.

The critique this literature provides is powerful; but I will argue that such a conclusion may be premature. Specifically, Glaeser et al.'s study examines only outcomes in social dilemmas. However, social capital is also a question of coordination games, where trust and rationality are not in strict conflict. Indeed all attempts to correlate the notion of trust with economic outcomes to date share a common feature; acting on trust is never part of a Nash equilibrium. A sender in the classic trust game must believe that her partner will send money back. Since keeping all money is a dominant strategy for the receiver, a belief by the sender that money will be sent back is necessarily an assumption of other-regarding preferences. When people say that they have trust in others, more is being expressed than simply a belief in others' altruism. For example, a business that decides to open in a promising but risky locale needs other businesses to make similar investments in the area to attract a critical mass of customer traffic. For an entrepreneur to deem the risky investment worthwhile, she most likely senses positive entrepreneurial attitude in her community, not others' altruistic feelings towards her. Situations of strategic coordination are an excellent place to examine how trust may operate independent of altruistic concerns. Coordination may be just as important to the success of economic development as is cooperation. Rodrik (2007) presents a development model where coordination impedes formation of new and potentially profitable enterprise.

To evaluate the role of existing surveys in measuring social capital, I propose an experimental test of the following hypothesis:

Hypothesis 1 *Trusting attitudes, as revealed through GSS-style questions, represent optimistic beliefs about partner behavior in coordination games. Individuals who score highly on GSS trusting are more likely to behave in a manner consistent with optimistic beliefs.*

3 The Stag Hunt

In investigating coordination settings, I opt to focus on the Stag Hunt game. Its namesake motivating example originates in a passage of Rousseau. In the canonical story a hunting party must cooperate to hunt stag, the attractive yet elusive prize, or individuals may seek a self-reliant consolation prize, the hare. The structure of the game is as follows: each agent chooses between a '$Stag$' option and a '$Hare$' option. If both players choose the '$Stag$' option then both will receive high rewards. If a player chooses the '$Hare$' option, she is given a low reward regardless of the action of her partner. Players who choose the '$Stag$' option but whose partners choose the '$Hare$' option will receive no reward.The generalization of this situation to a strategic form game captures the essence of many social coordination problems:

	$Stag$	$Hare$
$Stag$	H, H	$0, M$
$Hare$	$M, 0$	L, L

Figure 1: A Stag Hunt game where $H > M > L > 0$

There are two pure-strategy Nash equilibria, one of which Pareto dominates the other. At first glance the situation looks rather sanguine; a happy Pareto optimal outcome is supported as a Nash equilibrium in pure strategies. However it is clear that for an individual to play $Stag$ she needs to trust that her partner plays $Stag$ as well. Applying Harsanyi and Selten (1988)'s risk dominance method of equilibrium selection selects the low-payoff equilibrium. Suppose that you believe your partner will play $Stag$ with probability p and $Hare$ with probability $1 - p$. Your payoffs from playing $Stag$ and $Hare$, respectively, are given $pH + (1 - p) \times 0$ and $pM + (1 - p)L$. Thus a risk-neutral player is willing to play $Stag$ only when the probability her partner plays $Stag$ exceeds $\frac{L}{H+L-M}$. Even mildly risky parametrizations of the game, such as $H = 7$, $M = 5$, $L = 5$ demonstrates that a significantly optimistic belief $p = \frac{5}{7}$ is required for an individual to play $Stag$.

Behavioral investigations of coordination games reveal that the Pareto-ranked outcome is not always selected. A seminal paper by Cooper, DeJong, Forsythe and Ross (1990) demonstrates convergence to pure-strategy Nash equilibria. Neither the risk-dominant nor payoff-dominant equilibrium arises with predominant frequency. The several treatments in Cooper et al. vary in their payoff matrices and the Pareto-ranked equilibrium was more prevalent in some treatments than others. In a series of papers spanning the 1990s, Van Huyck and Battalio investigate the motivations that players use to select equilibria in coordination games. Van Huyck, Battalio and Beil (1990) conducts a series of minimum games and finds that subjects use strategies that are good responses to stated beliefs about others' strategies and find these beliefs to vary considerably in early rounds but converge to the least efficient equilibrium as players gain experience. Van Huyck, Cook and Battalio (1997) investigates median games and finds that convergence to equilibria is determined by early medians. They find that fictitious play does a good job of explaining their data, but also find support for players immediately moving to the median they observe the previous round. Rankin, Van Huyck and Battalio (2000) has subjects play a series of randomly generated Stag Hunt games and finds that subjects respond to the "riskiness" of the efficient action (captured by the mixtures associated with a game's mixed-strategy equilibrium), but that they play $Stag$ far more than is expected assuming risk dominance with uniform priors. Battalio, Samuelson and Van Huyck (2001) extends the previous paper with three between-subject treatments. All treatments have a mixed-strategy equilibrium attaching probability .8 to $Stag$ and the same payoff level to the efficient equilibrium, but differ in the payoff to the risk-dominant equilibrium. The authors find that the probability of coordination on the efficient equilibrium increases in the difference between payoffs of the two pure-strategy equilibria. They interpret this finding by saying that players use the opportunity cost of mis-coordination as a selection principle. Devetag and Ortmann (2007) surveys the literature on subsequent laboratory coordination experiments. They find that coordination is aided by higher expected payoffs from the risky action, low deviation costs, more repetitions, fewer players per game, less randomness in matching, adding players to groups known to have coordinated before, expensive talk, cheap talk, richer communication, and loss-avoidance.

I view the Stag Hunt as a compelling test of whether trust questions can predict Pareto-enhancing behavior. This game, as a virtue of supporting the efficient outcome as a Nash equilibrium, removes the confounds and drawbacks of both the Berg et al. trust game and VCM laboratory social capital literature. The Berg et al. game requires a sender believe the *receiver* has some form of social preferences, while the VCM public goods game requires a player have particular social preferences herself. The Stag Hunt requires a more pure and basic level of trust; you will play $Stag$ if you trust your partner to play $Stag$ and $Hare$ if you do not. Furthermore, I have argued that this facet of trust is important in its own right. Lastly, the Stag Hunt's simplicity permits a natural modeling of player beliefs and actions that will be seen in the results section.

4 Experimental design

My objective is to replicate the framework of Glaeser et al. as closely as possible, but, with the Stag Hunt as the game of interest. This study tests the hypothesis that indicators of social capital correlate with the frequency of individual $Stag$ play in the Stag Hunt game.

Four sessions were conducted in the Pittsburgh Experimental Economics Laboratory at the University of Pittsburgh. 20 undergraduate subjects per session were recruited to participate. All subjects were recruited from undergraduate economics classrooms at the University of Pittsburgh main campus. We gave a quick presentation in each classroom detailing what economics experiments generally entail, and asked interested students to fill out a piece of paper with their name and email address. Those who indicated interest were then sent information regarding when and where they could participate (the PEEL lab) should they desire to do so. Recruitment materials are included in the appendix.

Each session lasted approximately 30 minutes. The 20 participants in each session were seated and asked to complete an anonymous survey of demographic information and personal attitudes. The questions asked are a subset of those used in Glaeser et al. and are included in the appendix. Subjects were told that they would participate in a decision-making exercise following the survey, but were not given any specific information on the structure of the game before all had completed the survey. The survey questions were designed to elicit opinions on a variety of topics; care was taken not to prime subjects to think about trust issues nor have their responses to the trust questions be particularly salient in their memories. All participants earned $3.00 for completing the survey on top of their $5.00 show-up fee.

The survey questions of primary interest are the following from the National Opinion Research Center's General Social Survey. These questions are specifically designed to gauge trust*ing* attitudes.

> Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?
>
> Most people can be trusted := 1; Can't be too careful := 0

and the modifications:

> Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair?
>
> Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves?

I also measure trustworthiness per Glaeser et al. on a 6-point scale and attitudinal risk preferences using a subset of the questions developed by Weber, Blais and Betz (2002). These are discussed in section 5.2.

Following the survey, the Stag Hunt game was described to participants. Figure 2 shows the payoffs used. The full set instructions are included in the appendix. Ten rounds of the

	$Stag$	$Hare$
$Stag$	$7,7$	$0,5$
$Hare$	$5,0$	$5,5$

Figure 2: The game played by lab participants

same Stag Hunt game are played with absolute-stranger rematching each round. Subjects were also instructed that following the first round, but before learning of its outcome, they would be asked to guess how many of the other people in the room had played Stag. Correct guesses were incentivized by awarding $3.00 to anyone who guessed the exact number correctly and $1.50 to anyone who guessed within one person. This was done to measure naïve beliefs as accurately as possible, since my hypothesis assumes that trust operates through these naïve beliefs. All responses were entered anonymously via Fischbacher (2007)'s z-Tree software on the lab's computer terminals.

Two of the ten rounds were selected at random with uniform probability for payment. Median earnings in both sessions were $18.00. The minimum possible earnings for completing the experiment are $8.00 ($5 show-up fee, $3 survey completion fee and $0 in both selected Stag Hunt rounds) while maximum earnings are $25.00 ($8 + $3 guess reward + 2 × $7 in both selected rounds).

5 Results

First-round play of $Stag$ was never more than 50% in any of the sessions, and all sessions eventually converge to $Hare$. This is as expected, since the payoffs used require a belief that one's partner plays $Stag$ with probability greater than $\frac{5}{7}$ for a risk-neutral subject to play $Stag$. Figure 3 shows how mean $Stag$ play for each session, and all sessions averaged, evolve across the 10 rounds. Figure 4 shows the average incidence of $Stag$ play by round broken down by affirmative answers to gss_trust, gss_fair, gss_help, and self-reported trustworthiness respectively. The naked eye suggests that participants with affirmative answers

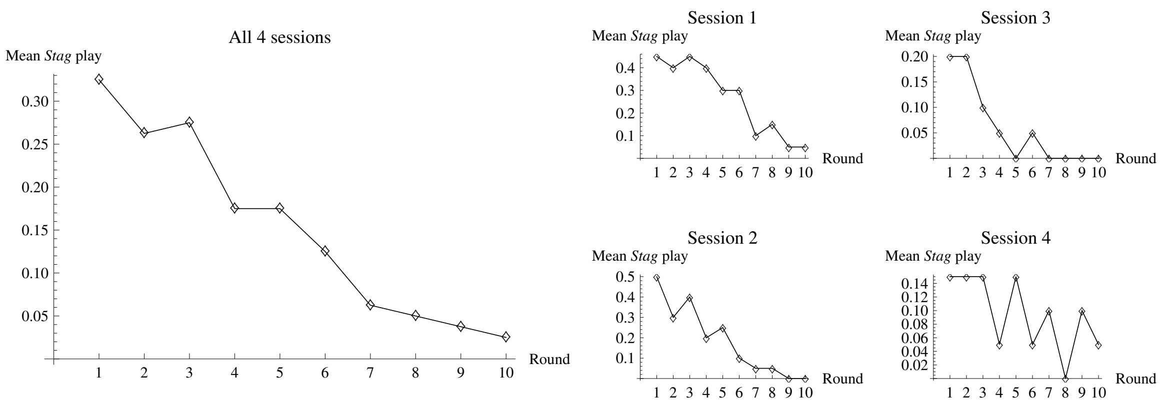

Figure 3: The evolution of mean $Stag$ play across rounds

to the GSS trust questions played $Stag$ more often across the rounds. The stylized fact that the graph of mean $Stag$ play is “higher” for affirmative responders than the comparable graph for negative responders is formalized in the following hypothesis:

$$H_0 : (\overline{Stag}_{Trust} - \overline{Stag}_{NoTrust})_t = 0 \qquad t \in \{1, \ldots, 10\}$$
$$H_a : (\overline{Stag}_{Trust} - \overline{Stag}_{NoTrust})_t \geq 0 \qquad t \in \{1, \ldots, 10\} \, .$$

Nonparametric tests of this hypothesis are obviously not feasible since the observations fail to be independent on two levels. Behavior is related across rounds for a given group of subjects, and those who answer affirmative and negative to a GSS trust question participate in the same session. If we appeal to the central limit theorem, however, $\overline{Stag}_{Trust} - \overline{Stag}_{NoTrust}$ is a multivariate Normal random vector with 10×10 variance-covariance matrix Σ that can be estimated from the data by bootstrapping. For example, if we wanted to test whether the two series of means were simply *different*, we could compute the Wald quadratic form

$$(\overline{Stag}_{Trust} - \overline{Stag}_{NoTrust})' \hat{\Sigma}^{-1} (\overline{Stag}_{Trust} - \overline{Stag}_{NoTrust})$$

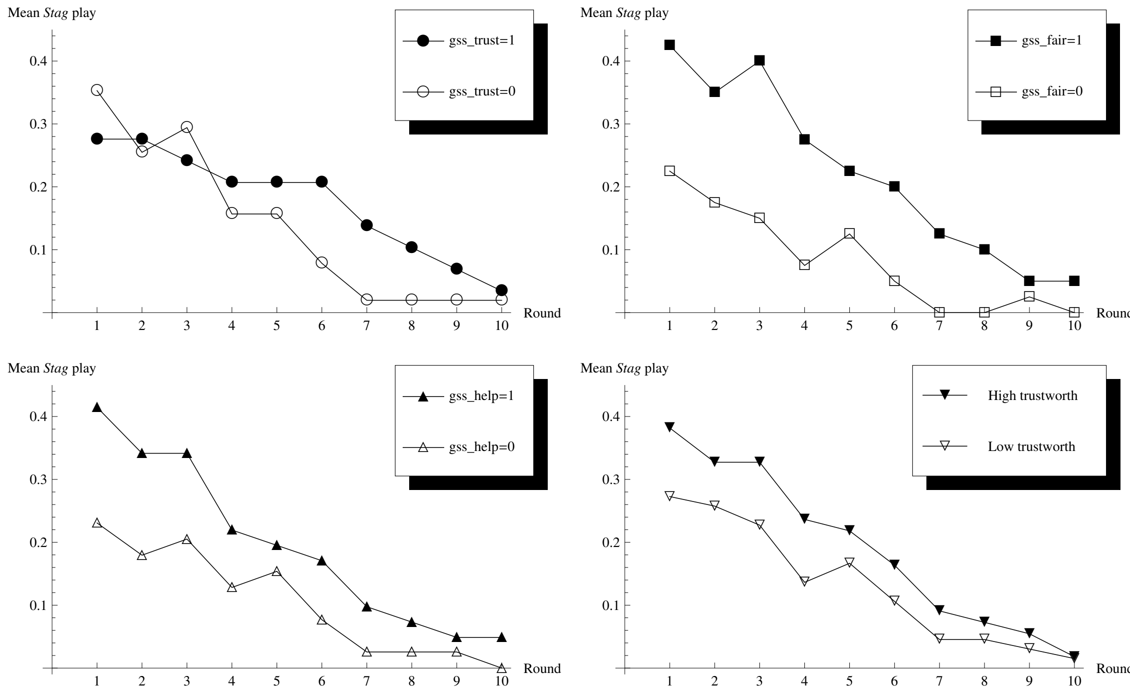

Figure 4: Mean $Stag$ play by trust question responses

which is asymptotically distributed $\chi^2(10)$ under the null. Testing that one series is *greater* than another is slightly more involved. Gouriéroux, Holly and Monfort (1982) develop such a Wald test for hypotheses like mine. Results of these tests are given in Table 1. Subjects who answer in the affirmative to any of gss_trust, gss_fair or gss_help are significantly more likely to play $Stag$ across all 10 rounds, as are subjects who are more self-reportedly trustworthy.

	$\chi^2_{\neq}$	p-value	$\chi^2_{\geqslant}$	p-value
gss_trust	110	.000	107	.000
gss_fair	168	.000	168	.000
gss_help	53	.000	53	.000
trustworth	109	.000	109	.000

Table 1: Wald statistics for the hypotheses $\overline{Stag}_{Trust} \neq \overline{Stag}_{NoTrust}$, $\overline{Stag}_{Trust} \geq \overline{Stag}_{NoTrust}$, etc. Reported p-values are for the relevant asymptotic distribution ($\chi^2(10)$ or a mixture of χ^2 distributions per Gouriéroux et al.)

		guess1
choice1	τ	.665**
	p	.000
gss_trust	τ	-.077
	p	.200
gss_fair	τ	.187**
	p	.018
gss_help	τ	.128*
	p	.091
trustworth	τ	.045
	p	.302

Table 2: Kendall-tau correlations between first-round guesses, first-round choices and GSS trust questions; ** indicates significance at the 5% level, * at the 10% level; p-values are estimated by simulation

5.1 Correlation with beliefs

Reported in Table 2 are the Kendall-tau coefficients and attendant p-values between the series of subject responses to survey measures (gss_help, _fair and _trust), their elicited naïve beliefs (guess1), and actions taken in the first round (choice1). Later rounds are going to be contaminated by one's experience in previous rounds, so the first round is going to most cleanly measure the influence of beliefs on the propensity to play $Stag$. I later utilize a structural model to incorporate observations from later rounds. The results of these simple correlations are as expected. Expectations of the probability that one will encounter $Stag$ are highly and significantly correlated with playing $Stag$ oneself. This suggests that the overriding motive in this game is one of best response to expectations. The two GSS questions that show significant correlation with naïve beliefs are gss_fair and gss_help. The correlation between gss_trust and Guess1 is not significantly different from 0. Since simple correlations are a low-power test of my hypothesis, I proceed to model the evolution of and reaction to beliefs with structural logit estimates in the next subsection.

5.2 The interaction with risk aversion

Since I only measure correlations between attitudes and behavior in the Stag Hunt game, it can be argued that these results merely reflect omitted variables bias due to correlation between trust and another determinant of playing $Stag$. The most obvious such confound is risk aversion, but here I present evidence that this is not a significant confound. On the survey, I include the financial risk-seeking measures from Weber et al. (2002), which they show to correlate with the incentivized risk-aversion procedure of Weber, Shafir and Blais (2004). A composite score of the financial decision-making questions is contrasted with subjects' propensity to play $Stag$, naïe beliefs, and trust measures in Figure 5. The graph shows a rather unintuitive negative relationship between risk attitudes and the probability of playing $Stag$. It is unclear how much credence to place in this result, although it is encouraging that risk attitudes are generally uncorrelated with trust attitudes. To the extent that risk preferences are captured by the index of Weber et al. questions, they appear to not be a confound in this study.

		risk
choice1	τ	-.049
	p	.307
gss_trust	τ	-.054
	p	.303
gss_fair	τ	-.146*
	p	.064
gss_help	τ	.003
	p	.506
trustworth	τ	-.037
	p	.332
guess1	τ	-.082
	p	.178

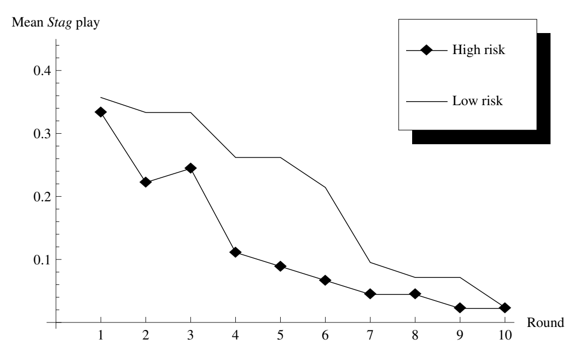

Figure 5: Kendall-tau correlations between risk attitude scores, first-round choices and GSS trust questions; ** indicates significance at the 5% level, * at the 10% level; p-values are estimated by simulation

5.3 Structural model

A way to exploit the power afforded by the repeated setting used in my sessions is to posit a structural model for how agents update and react to beliefs. Battalio et al. (2001) provide just such a model for their Stag Hunt experiment. The probability that any subject attaches to her partner playing $Stag$ in round t is given:

$$q_{it} = \frac{q_{0i}\delta^{t-1} + I_{i1}\delta^{t-2} + \cdots + I_{it-2}\delta + I_{it-1}}{\delta^{t-1} + \delta^{t-2} + \cdots + 1}$$

where the I_{it} represent the actions taken by subject i's previous partners, δ is a discount factor and q_{0i} represents naïve beliefs. A logit model of how the probability of playing $Stag$ reacts to this belief is given:

$$P(Stag)_{it} = \frac{\exp(\alpha + \beta q_{it})}{1 + \exp(\alpha + \beta q_{it})}.$$

The authors' intention is to measure how changing the incentives (payoffs to the risky and safe equilibria) affects the reaction parameter β between sessions. This prompts Battalio et al. to work from the assumption that one set of parameters apply to all subjects in a session. Since I am primarily concerned with individual-level heterogeneity, I estimate different parameters for those with negative and affirmative responses to the trust questions and examine whether those subjects with high trust measures feature greater baseline willingness to play $Stag$ as revealed in their estimate of α.

This estimation strategy assumes that subjects are playing as if they are reacting to their beliefs. The estimates are only meaningful to the extent that this model of subject behavior is well-specified. I secure tight identification by taking directly elicited initial beliefs about how many of the 19 players in the room play $Stag$, normalizing them to the unit interval, and plugging in these values as the q_{0i}. This model was separately estimated for negative and affirmative responses to the GSS trust questions, with random effects on all parameters for each subject. The estimates are given in Table 3.

		α	β	δ
gss_trust	no	-4.73	7.59	.743
		(.102)	(.087)	(.088)
	yes	-3.86	6.31	.720
		(.122)	(.122)	(.131)
gss_fair	no	-5.26	7.38	.764
		(.103)	(.111)	(.103)
	yes	-3.70	6.54	.735
		(.097)	(.110)	(.103)
gss_help	no	-4.52	6.13	.779
		(.106)	(.095)	(.096)
	yes	-4.22	7.74	.744
		(.098)	(.094)	(.104)

Table 3: Structural logit estimates; robust asymptotic standard errors are reported in parentheses.

The results display a robust pattern. Subjects who answer in the affirmative to any of the trust questions have higher $\hat{\alpha}$s, which can be interpreted as having a higher unconditional propensity to play the risky but efficient $Stag$ option. Furthermore, reaction parameter β seems to vary by response to GSS trust question, but in a way that is not clear how to interpret. Since all sessions show declining patterns of $Stag$ play, lower reactivity for gss_trust and gss_fair respondents implies a greater robustness with respect to frustrated coordination attempts. If we take the estimates $\hat{\beta}$ at face value, however, they would also be less likely to match greater $Stag$ play by others with similar behavior. Table 4 reports hypothesis tests on the equivalence of coefficients between each group of negative and affirmative respondents to each question. These generally confirm the observed differences as significant. **The analysis of results from these two sessions provides compelling**

	April		
	t_α	t_β	t_δ
gss_trust	5.49**	-8.56**	-.141
gss_fair	10.9**	-5.36**	-.197
gss_help	2.11*	12.1**	-.248

*significant at 5% **significant at 1%

Table 4: Hypothesis tests; t statistics test equivalence of individual parameters

evidence that the GSS questions measure features of social capital operative in the Stag Hunt game.

5.4 Asymmetric belief updating?

My results provide evidence that trust attitudes revealed in the General Social Survey support coordinating on a Pareto-ranked outcome through baseline tendency to play $Stag$ (α), in addition to some support in the nonparametric correlations that they are associated with more optiistic beliefs (q_0). Social psychology provides another plausible channel through which more trusting people may be more likely to play $Stag$. Tazelaar, Van Lange and Ouwerkerk (2004) investigate a voluntary contributions game with "noise": subjects know that their partner's contribution may be randomly reduced. The main focus of Tazelaar et al. is to see whether communication among players reduces the cooperation-impeding effect of noise. The methodology used differs significantly from an experimental economics investigation of their main hypothesis, but they suggest a promising avenue of investigation in the process. Specifically, they note that subjects scoring high on survey trust measures are less adversely affected by noise – that is they are more prone to believe low contributions are in error rather than intended, and thus end up contributing more.

The belief updating model I use in my Stag Hunt game provides an easy way to capture and test the motivations described by Tazelaar et al.. Suppose that instead of incorporating both positive and negative information into their beliefs with equal weight, that negative information ($Hare$) is discounted with additional weight γ. Formally, γ applies only to observations where $I_{it} = 0$:

$$q_{it} = \frac{q_0\delta^{t-1} + \sum_{\tau=1}^{t-1} \delta^{t-1-\tau} I_{i\tau}}{\delta^{t-1} + \sum_{\tau=1}^{t-1} \delta^{t-1-\tau} \left(I_{i\tau} + \gamma(1 - I_{i\tau})\right)}$$

and hence (lower) γ represents one's willingness to additionally discount observations of $Hare$ relative to $Stag$.

Hypothesis 2 *This new treatment will yield lower estimates of γ for subjects who answer in the affirmative to gss_trust than for those who do not.*

Since the behavior I seek to capture is arguably surfacing in the differential estimates $\hat{\beta}$ in Table 3, I restrict β and δ to be the same for affirmative and negative responders and focus on the estimating differences in α and γ. The results of this new model run on my existing data are reported in Figure 5.

The results here prove disappointing. The difference in γ by GSS question response is only significant for one (gss_fair), and not in the hypothesized direction. These results should however carry the caveat that neither of my sessions featured the element of noise, so it is not entirely clear if the parameter γ can truly be interpreted as robustness to noise. γ only represents a relative down-weighting of $Hare$ observations. It appears that subject differences in trust manifest primarily through the main effect α, which remains robustly higher for two of the three questions.

		α	β	δ	γ
gss_trust	no	-5.50	7.87	.790	.6311
		(.075)	(.089)	(.081)	(.092)
	yes	-3.89	6.16	.782	.844
		(.122)	(.119)	(.108)	(.110)
gss_fair	no	-6.67	8.49	829	.448
		(.093)	(.089)	(.080)	(.089)
	yes	-3.59	6.37	.660	1.08
		(.089)	(.110)	(.126)	(.096)
gss_help	no	-4.73	5.99	.752	.680
		(.108)	(.108)	(.092)	(.124)
	yes	-4.86	7.72	.785	.550
		(.085)	(.087)	(.085)	(.094)

Table 5: Structural logit estimates with new parameter γ

6 Discussion

Evidence from the Stag Hunt experiments I conduct provide preliminary evidence that social capital, as measured through trust questions, helps predict coordination on Pareto-dominant equilibria. Hence, surveys on trust measure an important facet of social capital: coordination. It is furthermore clear that players' expectations of what other players will do is a significant predictor of behavior. My experiment affirms the positive value of risk dominance as an equilibrium selection principle. Further exploration of the role that social capital plays in the Stag Hunt game is readily suggested. Another question we can ask is whether trust is more operative in situations where one expects their partners to trust *them*. Pairing those with high trust scores should provide an even greater boost to coordination since prior expectations about partner actions endogenously encompass their expectations about you.

Hypothesis tests

	t_α	t_β	t_δ	t_γ
gss_trust	11.3**	-11.5**	-.062	1.48
gss_fair	24.0**	-15.0**	-1.13	4.83**
gss_help	-.980	12.5**	-.262	-.856

*significant at 5% **significant at 1%

Table 6: Hypothesis tests for the γ-model

The finding that trust attitudes are operative in the Stag Hunt also sheds light on why trust surveys are found to have a relationship to contributions in public goods games (Anderson et al., 2004; Thöni et al., 2010). That result is shown by Thöni et al. to be confined to conditional cooperators, for whom positive contributions entail coordinating with others who give. This leaves open the question of how these two environments (public goods and the Stag Hunt) differ from the classical 'trust game' of Berg et al. (1995), where the relationship between survey and behavioral trust is weak or absent.

Lastly, it should be the goal of this research agenda to take what we know about how social capital operates back into the field. If we can establish both that exogenous increases in trust improve economic outcomes, and that these positive outcomes do indeed feed back into trust, we will be one step closer to explaining elusive cross-country variance in development and human welfare.

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