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How Effective Is Advice From Interested Parties? An Experimental Test Using a Pure Coordination Game

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ABSTRACT: This study experimentally investigates whether and how the effect of non-binding advice in coordination is influenced by knowledge of the adviser's motive. We use pure coordination games in which a non-playing adviser makes a recommendation of which strategy to play. The advisor either does or does not have a stake in the final payoff of the game.

We find that if the advice appears to be "self-interested" (i.e., the adviser has a monetary stake in the advice being followed), it is less effective than if the same advice is given by a neutral independent party with no economic interest in the game. That is, the effectiveness of advice appears to be affected by knowledge of the adviser's motive. We discuss the significance of our results for the effectiveness of advice in real-world economic and organizational situations.

JEL Classification: C72; C92; D21; D70

Key Words: Coordination games; advice; equilibrium selection

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1. INTRODUCTION

Coordination is important in much economic activity. Coordination games, therefore, are a very useful tool for modeling and studying economic and organizational phenomena. In such games, coordination can be difficult due to multiple equilibria and strategic uncertainty – players find it difficult to anticipate which equilibrium others will attempt to implement (Schelling 1960; Van Huyck et al. 1990; Ochs 1995).

One way to solve coordination problems might be to give common-knowledge advice to players regarding what action to take (Brandts & MacLeod 1995). However, standard economic theory predicts that such “cheap talk” advice will be effective only if it is consistent with players’ self-interest (Harsanyi & Selten 1988). Hence, the effectiveness of non-binding advice in coordinating behavior – particularly when it conflicts with other equilibrium selection criteria such as payoff-dominance and risk-dominance – is an empirical issue.

Aside from its interest for game theorists, the effectiveness of non-binding advice is also important for understanding the role and influence of leadership in real firms. A key role of organizational leaders is frequently argued to be to ensure coordination among employees (Milgrom & Roberts 1992; Foss 2001). Thus, the effectiveness of leadership is largely dependent on the extent to which the leader’s guidance actually impacts which equilibrium arises within an organization.

Previous studies find that non-binding advice has considerable influence on behavior in coordination games. Specifically, when advice leads away from a payoff-dominant

equilibrium, and there are no other conflicting selection criteria, a significant proportion of players (up to half) follow it (Van Huyck et al. 1992). In this prior research, the advice is usually provided either as a message from the experimenter or as communication between players. This, however, only imperfectly captures the context in which such advice is usually given outside the laboratory. This previous research does not explore the impact of advice in situations where a non-participating adviser's wealth is influenced by the combined actions of the players receiving the advice and, in particular, where the adviser's interest is inconsistent with players' interests.

Such instances are common in real organizations. For example, a coordination problem may arise within a division of a firm when employees have to choose among technologies possessing network externalities (e.g., operating systems, communication technologies). Suppose a manager can recommend which technology employees should adopt. How effective will such a recommendation be, particularly when it is counter to what employees generally perceive as being the best choice?

While previous research has explored the effect of such recommendations when employees are *unaware* of the reasons behind recommendations, we argue that in real organizations the reasons are usually known and salient (or at least employees believe they know the reasons). For instance, the manager may obtain a kickback from one alternative's manufacturer or may have a preference for a different kind of technology than the employees (e.g., one that allows easier monitoring of communication). If the preferences of the person giving the advice influence its effectiveness as a coordinating device, then ignoring the role of such preferences makes it difficult to generalize existing experimental results to situations outside the laboratory.

We investigate the influence on behavior of a recommendation to play a payoff-dominated equilibrium in a pure coordination game. We first replicate previous results (e.g., Van Huyck et al. 1992; Brandts & MacLeod 1995) with a treatment in which the advice comes from the experimenter (with no mention of motivation for why the recommendation is made). We then focus on whether the influence of advice is affected by the adviser's motivation. To do so, we explore how the effectiveness of advice differs between a treatment in which "interested" advice comes from an adviser with an explicit stake in the final outcome of the game and a treatment in which "uninterested" advice comes from a third party with no stake in the game. Our experimental results show that players' perceptions of the adviser's motive significantly influence the effectiveness of advice. If the advice appears to be motivated by self-interest, it is less effective than if the same advice is given by a neutral party who has no economic interest in the game.

The remainder of this paper is organized as follows: Section 2 reviews related literature and sets forth our hypotheses; Section 3 presents the design of our experiments; Section 4 discusses the main experimental results using only first-round choices; Section 5 reports dynamic results; and Section 6 summarizes and concludes.

2. BACKGROUND AND HYPOTHESES

A number of experimental studies examined the effect of non-binding messages and advice on players' behavior in coordination games. Most of these studies used games in which payoff-dominance and risk-dominance select different equilibria (as in the "stag hunt" or "weak link" games) and the advice was usually to implement the payoff-dominant, risk-dominated, equilibrium. Therefore, a player's willingness to follow the advice reflects her

belief in the effectiveness of the advice in distinguishing between these two selection principles. For example, Charness (2000) and Weber et al. (2001) found that non-binding messages to play the payoff-dominant equilibrium significantly increased the frequency with which players selected the corresponding strategy. Offerman et al. (2001) found that when players were given advice to choose a cooperative but risky strategy in an overlapping-generations coordination game, about 30 to 46 percent of the players followed the advice. Similarly, in Chaudhuri et al.'s (2001) multi-generational minimum-effort coordination game, in which a predecessor gives advice to a successor, the advice to choose the option corresponding to the Pareto-optimal equilibrium was followed by approximately 43 percent of the players. To summarize, these studies show that if payoff-dominance conflicts with risk-dominance, advice pointing to an equilibrium selected by the former principle will be followed by a significant proportion of players, but not by all of them (and will not ensure coordination on the efficient equilibrium).¹

Two studies explored the effectiveness of advice in a context similar to ours.² Van Huyck et al. (1992) used a pure coordination game in which concerns about risk do not have any offsetting (and therefore confounding) effect to that of payoff-dominance. Specifically, they used a game similar to the one in Table 1. This game has three Nash equilibria (along

¹ Relatedly, Brandts and MacLeod (1995) show that recommendations from the experimenter to play imperfect Nash equilibria are not followed, and subjects instead play strategies consistent with perfection.

² Schotter and Sopher (2003a, 2003b, 2004) and Celen et al. (2004) investigated the effect of advice on the formation of social conventions in a variety of intergenerational games. They found that previous players' advice significantly impacts subsequent players' behavior, and that such advice can facilitate coordination in games such as the battle-of-sexes game. In this work, the adviser has an interest, much as in our experiments. However, this work differs from ours in two important ways. First, in the work by Schotter and Sopher and Celen et al. the adviser, prior to giving advice, plays the game in the same role as the advisee, while in our experiment the adviser and advisee are in totally different roles (and the adviser does not make any strategic choice in the game). This distinction is important since our work focuses on the effectiveness of "outside" advice, while their work mainly focuses on the effectiveness of "peer" or "parent" advice. Second, in most of their experiments the adviser shares common interest with the advisee, because the adviser's payoff is positively related to the advisee's payoff. In our study, the adviser either has no interest in the game or has conflicting interest with the advisee.

the diagonal), one of which, (a, a) , is payoff-dominant. Van Huyck et al. found that when the experimenter recommended that players play strategy b , which corresponds to a payoff-dominated equilibrium, 48 percent of the players followed the advice. Using a different game, Brandts & MacLeod (1995) obtained a similar result (31 percent of subjects followed a recommendation to play a payoff-dominated equilibrium). Taken together, the results of prior research indicate that when non-binding advice conflicts with payoff-dominance – and there are no other selection principles involved – it is followed by a significant proportion of players (up to one half).

Table 1: Game One

		<i>Player Y's Choice</i>		
		a	b	c
<i>Player X's Choice</i>	a	6, 6	0, 0	0, 0
	b	0, 0	5, 5	0, 0
	c	0, 0	0, 0	4, 4

In our study, we first replicate the above previous results. We use Game 1, in which the three strategy combinations (a, a) , (b, b) , and (c, c) are all Nash equilibria, but (a, a) is payoff-dominant. We compare a treatment without advice (1NA) with one in which there is advice to play b from the experimenter (1A).

The equilibrium refinement of payoff dominance suggests that in Game 1 without advice players will choose a (Farrell 1988; Harsanyi & Selten 1988). This leads to our first hypothesis:

H1: In Game 1 without advice (treatment 1NA), subjects will choose strategy a .

If players receive advice from the experimenter to play strategy b , standard equilibrium refinements predict that players will realize that this advice is collectively

irrational since it results in an inferior payoff ((b, b) is a payoff-dominated equilibrium) and will then deem this advice strategically irrelevant, ignore it, and coordinate on the payoff-dominant equilibrium (Harsanyi & Selten 1988; Sugden 1995). However, in light of previous results showing the partial effectiveness of such a recommendation (e.g., Van Huyck et al. 1992; Brandts & MacLeod 1995), we hypothesize that:

H2: In Game 1 with advice to play b from the experimenter (treatment 1A), a significant proportion of subjects will choose strategy b .

While previous research demonstrates that non-binding advice can influence behavior in a coordination game, our focus is on exploring the effectiveness of such advice while varying the perceived motivation for the advice. To explore this issue, we conducted experiments using Game 2 (shown in Table 2), a modified version of Game 1. In Game 2, there is a third player (Player Z) who does not make any choice, but instead receives a payoff determined by the choices of Players X and Y (Player Z's payoff is the third number in each cell). The only outcome in which Player Z receives a positive payoff is (b, b) , which is a payoff-dominated Nash equilibrium for Players X and Y. Thus, if it is common knowledge that Players X and Y do not care at all about Player Z, their behavior will be uninfluenced by the fact that there is a third, strategically-irrelevant, player, and should be identical to that in Game 1.

The main focus of our study is on how advice from an interested party (Player Z) differs in effectiveness from advice from an uninterested party. Therefore, we vary the source of a recommendation to Players X and Y to play b in Game 2. We wish to explore how a recommendation to play strategy b affects the propensity of Players X and Y to do so, and how the source of the recommendation influences its effectiveness. We conduct three

treatments: one without advice (2NA), one with advice from the “interested” party (2AI), and one with advice from an “uninterested” party (2AU).

Table 2: Game Two

		<i>Player Y's Choice</i>		
		<i>a</i>	<i>b</i>	<i>c</i>
<i>Player X's Choice</i>	<i>a</i>	6, 6, 0	0, 0, 0	0, 0, 0
	<i>b</i>	0, 0, 0	5, 5, 5	0, 0, 0
	<i>c</i>	0, 0, 0	0, 0, 0	4, 4, 0

To create a base rate for behavior without any recommendation, we conduct a treatment using Game 2 with no advice. Traditional game theory assumes that the presence of Player Z should be irrelevant (payoff dominance should still select (a, a)). On the other hand, a large amount of experimental research reveals that subjects are often influenced by concerns for equity or fairness (see Camerer 2003). Therefore, we anticipate that fairness concerns will influence behavior in Game 2. Specifically, we expect subjects to treat fairness (which selects the (b, b) equilibrium) as a potential coordinating device.

H3: In Game 2 without advice (treatment 2NA), a significant proportion of Players X and Y will choose b .

When there is a recommendation to choose b , we predict that its effectiveness will be “motivation dependent.” That is, whether the advice is followed will be affected by what players know about the adviser’s motive for making the recommendation. More precisely, we believe that the strength of the recommendation will be undermined when the recommendation is explicitly consistent with the adviser’s known self-interest.³

³ This is somewhat related to research on “reactive devaluation” in social psychology, which shows that outcomes are made less attractive by having another party (in a bargaining situation) indicate the outcome is favorable (see Ross 1995).

We conducted two different treatments with advice using Game 2. In one treatment (2AI), Player Z gives advice to Players X and Y to play b .⁴ We anticipate that such advice from an “interested” party will have a negligible incremental coordinating effect (above the frequency of b choices in the absence of any advice). Thus, our next hypothesis:

H4: In Game 2 with advice from Player Z (treatment 2AI), Player Z’s advice to play b will produce no change in Players X’s and Y’s behavior relative to the benchmark case in which Game 2 is played with no advice (treatment 2NA).

We also compare behavior in treatment 2AI to that in treatment 2AU, in which the advice to play b comes from a neutral independent party with no interest in the game (a subject in a previous experiment). When advice is given by someone who has no stake in the advice being followed, we anticipate that it will be more effective than when it comes from an interested party. That is, advice from “uninterested” parties will have a stronger influence on behavior. This allows a test of our main research question:⁵

H5: In Game 2, the advice to play b will be more effective if it is given by a neutral independent party (treatment 2AU) than if it is given by Player Z (treatment 2AI).

3. EXPERIMENTAL DESIGN

In our experiment, pairs of subjects played either Game 1 or Game 2 twice. There were five conditions:

- 1) In treatment 1NA, two subjects played Game 1 with no recommendation.
- 2) In treatment 1A, two subjects played Game 1, but received a recommendation (from the experimenter) to play strategy b .

⁴ We allowed Player Z to freely choose any advice to give (a , b , or c), but expected that a large majority would recommend b .

⁵ In a sense, H4 is “stronger” than H5 in that H4 posits that there will be no change in behavior from 2NA to 2AI, while H5 simply posits that the change from 2NA to 2AI will be smaller than the change from 2NA to 2AU.

- 3) In treatment 2NA, two subjects played Game 2, producing a payoff for a passive third subject, with no recommendation.
- 4) In treatment 2AI, two subjects played Game 2, producing a payoff for a passive third subject, with a recommendation of what strategy to play from the third subject.
- 5) In treatment 2AU, two subjects played Game 2, producing a payoff for a passive third subject, with a recommendation of what strategy to play from a neutral independent party outside the experiment.

The recommendation for treatment 2AU was collected in the following manner: a few days before running the 2AU sessions, we asked six people who showed up for a cancelled experiment to give advice to players in an experiment that we would run in the future.⁶ They received a fixed amount (\$6, which included a \$5 show-up fee) for making this recommendation. In their instructions (included in the appendix), we explained to them the structure and rules of Game 2 and gave them a short quiz to ensure that they fully understood the game. We then told them that we would like to ask a neutral independent party to give advice to future participants in the role of Players X and Y. They then each indicated their choice of advice (a , b , or c) by circling it at the bottom of the instruction sheet. Among the six subjects, four recommended choosing b , and two recommended choosing a . To maintain comparability with treatment 2AI (in which every Player Z recommended b), we only used the sheets of the four recommenders who suggested b .

We ran the experiments in five 2-round sequences: 1NA-1A, 1A-1NA, 2NA-2AI, 2AI-2NA, and 2AU-2NA, in which subjects played two games with randomly drawn opponents each time (subjects could not be matched with the same person twice). To limit

⁶ These people were told they would be eliminated from the list of potential participants for this experiment.

potential learning effects, we did not give subjects any feedback about the first round's result before they played the second round.

Our subjects were undergraduate students in various fields at the University of Pittsburgh and Carnegie Mellon University. Table 3 presents the combinations of conditions by sequence and population.⁷ Experimental instructions and procedures were constant across conditions, except for the necessary variations in the specific treatments.

Table 3: Experimental Sessions

Sequence of conditions	University of Pittsburgh		Carnegie Mellon University	
	Date	# of subjects (# Player X or Y)	Date	# of subjects (# Player X or Y)
1NA-1A	11-20-02	10 (10)	3-12-03	10 (10)
1A-1NA	9-25-02	10 (10)	3-7-03	8 (8)
2NA-2AI	2-14-03	12 (8)	3-18-03	15 (10)
2AI-2NA	10-15-02	18 (12)	3-4-03 & 6-12-03	30 (20)
2AU-2NA	4-22-03	18 (12)	4-25-03 & 6-11-03	30 (20)

In every session, the experimental instructions consisted of two parts. The first part consisted of general instructions, which explained how to interpret generic payoff tables (for either 2 or 3 players, depending on the condition for that session). Subjects were told that each point in the payoff table corresponded to \$0.50. These general instructions were distributed and read aloud to all subjects. Subjects' questions were answered and a short

⁷ Subjects' affiliations produced no significant difference in results, so we pool data from the two populations.

quiz was given to ensure that they understood how to read and interpret payoff tables of the form presented in Tables 1 and 2 (but with generic payoffs).

After the general instructions and quiz, each subject randomly drew a participant number, which consisted of a letter (X or Y, as well as Z in the three-player conditions) and a number. The letter gave the role that the subject would play in the game and the number was used for grouping. For example, X3, Y3, and Z3 were in the same group. The process of role assignment and grouping was strictly anonymous, so throughout the experiment a subject did not know whom he or she played with or what role any other subject had.

The second part of the instructions consisted of treatment-specific instructions that were presented to subjects immediately before each of the two rounds. In the specific instructions, subjects were shown the payoff table for the game they would play (Game 1 in 1NA and 1A; Game 2 in 2NA, 2AI, and 2AU). After presenting the game, the instructions included a statement highlighting the strategic aspect of coordination games (“Players X and Y will receive points only if they both make the same choice.”).

Then, in 1A and 2AI, subjects read (and the experimenter read aloud) the following paragraph about advice:

To assist you in figuring out what choice to make, [the experimenter / Player Z] will give both players advice as to which option to choose. Both Player X and Player Y will receive exactly the same advice, so following this advice can be helpful for making the same choice as the other player. The advice is not a requirement. However, since Players X and Y cannot receive any points unless they make the same choice, the advice might help to figure out what choice to make. Note that if you believe the other player in your group will follow the advice, then you will receive points only if you also follow the advice.

In 2AU, subjects read the following statement about the advice:

To assist Players X and Y in figuring out what choice to make, we asked a neutral independent party to give Players X and Y advice as to which option to choose. This neutral independent party understood the game very clearly, and did not know the identities of the players in today’s experiment. This neutral independent party was a student similar to yourselves who was recruited in the same way that you

were. He/she was given a sheet that described the game in detail, and answered questions to make sure he/she understood the game. He/she then gave advice about Players X's and Y's choices.

Both Player X and Player Y will receive exactly the same advice, so following this advice can be helpful for making the same choice as the other player. The advice is not a requirement. However, since Players X and Y cannot receive any points unless they make the same choice, the advice might help to figure out what choice to make. Note that, if you are Player X or Player Y, and if you believe the other player in your group will follow the advice, then you will receive points only if you also follow the advice.

Following the treatment-specific instructions, subjects were asked if they had any questions.

In conditions 1A, 2AI, and 2AU, Players X and Y received advice before playing the game. In condition 1A, players were shown a sheet indicating that they should play action *b*. In condition 2AI, Player Z circled a recommendation on an “Advice Sheet”. The experimenter then collected this sheet and showed it privately to Players X and Y. In condition 2AU, the experimenter privately showed Players X and Y a copy of the exact instruction sheet collected from the recommenders (see appendix). In all three cases, subjects in the role of Players X and Y knew that they were observing the same advice sheet as the other strategic player with whom they were matched.

After completing the instructions (and providing Players X and Y with advice in conditions 1A, 2AI, and 2AU), subjects played the game. When playing the game, subjects in the role of Player X and Y indicated their choices by circling them on a “Record Sheet”.⁸ The experimenter then collected these sheets. Subjects received no feedback about the result of the first round when they entered into the second round.

After the first round (game) was completed, subjects were informed that they would play a second game and received new participant numbers and new condition-specific

⁸ To ensure anonymity, whenever a subset of the participants was making a choice (such as when Players X and Y chose actions in the three-player conditions or when Player Z chose advice in 3A), we also had all other participants make a choice (usually a hypothetical choice) by similarly writing on a piece of paper.

instructions describing the second condition. (As Table 3 indicates, the only thing that varied between the two rounds within a session was the presence or absence of advice, not the game.) The second round then proceeded in the same way as the first.

After conducting both rounds, we matched Players X's and Y's choices for every group, and determined all players' payoffs. The participation fee (\$6) and the money converted from the accumulated points were paid to the subject privately in cash as they exited the experiment.

4. RESULTS

Comparing conditions by position (first or second game) within a session, the results of the three-player conditions exhibit a significant sequencing effect (see Table 4). Hence, our main analysis only uses data from the first round of each sequence, and this essentially makes each condition a one-shot game.⁹ We discuss the second-round data in Section 5.

We first explore behavior in the two-player treatments (1NA & 1A). As Figure 1 indicates, our results closely replicate those of Van Huyck et al. (1992). When there is no advice (1NA), every subject chooses a . However, when advice is given by the experimenter to play b (1A), half of the choices are consistent with this advice. This change is statistically significant (Fisher's Exact, one-tailed, $p < 0.001$).¹⁰ Thus, H1 and H2 are clearly supported, meaning we replicate previous work.

To test H3, which predicts that fairness concerns will influence behavior in Game 2, we compare the frequency of b choices in conditions 1NA and 2NA. The frequencies of b

⁹ Brandts & MacLeod (1995) point out that one-shot design is more suitable for experimental games with recommended play, if the game is not too complicated for subjects to understand.

¹⁰ Because the sample sizes in many of our comparisons are relatively small, we employ Overall's Strengthened Fisher's Exact Test (see Rosenthal & Rosnow 1991).

choices for these two conditions are, respectively, 0% and 61%, which are significantly different (Fisher's Exact, one-tailed, $p < 0.001$). Therefore, fairness considerations clearly compete with payoff-dominance and influence Players X's and Y's choices in Game 2.

Table 4: Choices in the two rounds of each sequence

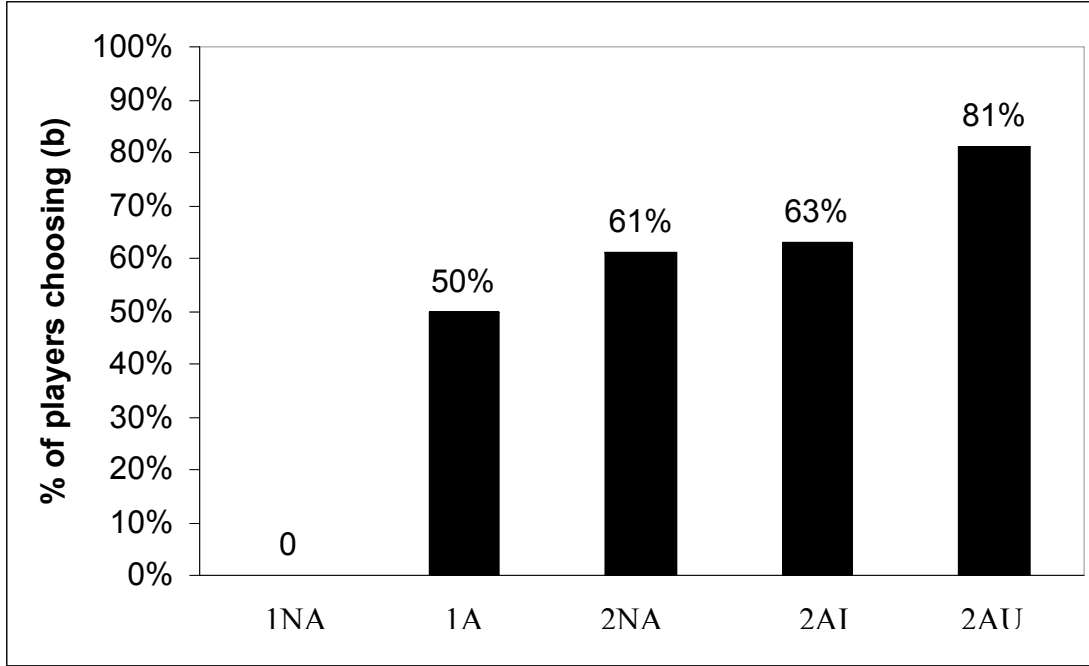
[Entry is the number (percentage) of subjects choosing a , b , or c]

Sequence	1 st Round		2 nd Round	
1NA-1A (n=20)	1NA:	<i>a</i> : 20 (100%)	1A:	<i>a</i> : 8 (40%)
		<i>b</i> : 0 (0%)		<i>b</i> : 12 (60%)
		<i>c</i> : 0 (0%)		<i>c</i> : 0 (0%)
1A-1NA (n=18)	1A:	<i>a</i> : 9 (50%)	1NA:	<i>a</i> : 17 (94%)
		<i>b</i> : 9 (50%)		<i>b</i> : 1 (6%)
		<i>c</i> : 0 (0%)		<i>c</i> : 0 (0%)
2NA-2AI (n=18)	2NA:	<i>a</i> : 7 (39%)	2AI:	<i>a</i> : 3 (17%)
		<i>b</i> : 11 (61%)		<i>b</i> : 15 (83%)
		<i>c</i> : 0 (0%)		<i>c</i> : 0 (0%)
2AI-2NA (n=32)	2AI:	<i>a</i> : 12 (38%)	2NA:	<i>a</i> : 18 (56%)
		<i>b</i> : 20 (63%)		<i>b</i> : 14 (44%)
		<i>c</i> : 0 (0%)		<i>c</i> : 0 (0%)
2AU-2NA (n=32)	2AU:	<i>a</i> : 6 (19%)	2NA:	<i>a</i> : 11 (34%)
		<i>b</i> : 26 (81%)		<i>b</i> : 21 (66%)
		<i>c</i> : 0 (0%)		<i>c</i> : 0 (0%)

We are most interested in the effect of Player Z's advice to play b in Game 2, since this constitutes advice from an "interested" party. (Not surprisingly, every subject in the role of Player Z recommended b .) We saw that advice from the experimenter to play b in Game 1 had a significant effect on behavior (i.e., the frequency of b choices increased from 0% in 1NA to 50% in 1A). H4 predicts that interested advice from Player Z will not have any effect on the behavior of Players X and Y in Game 2. Comparing condition 2NA with 2AI shows that the change in behavior was very small (61% vs. 63%) and not statistically

significant (Fisher’s Exact, one-tailed, $p = 0.45$). Player Z’s recommendation appears to have virtually no impact on behavior in Game 2, providing support for H4.

Figure 1: First-round b choices by condition



In condition 2AU (uninterested advice), 81% of subjects followed the recommendation to choose b , which is higher than both the 63% who did so in condition 2AI (interested advice) and the 61% who chose b in condition 2NA (no advice). The difference between 2AU and 2NA is statistically significant (Fisher’s Exact, one-tailed, $p = 0.06$), indicating that “uninterested” advice in condition 2AU significantly influenced choices (recall that the difference in between conditions 2NA and 2AI is not significant).

The difference between the proportions of b choices in conditions 2AI and 2AU is also statistically significant (Fisher’s Exact, one-tailed, $p = 0.05$).¹¹ Treatments 2AI and 2AU differ only in the source of the recommendation – whether it comes from an interested

or uninterested adviser. Therefore, the fact that the effect of disinterested advice (2AU) is ten times as big as the effect of interested advice (2AI) provides clear support for H5.¹²

To summarize, we first replicate previous work demonstrating the effect of a recommendation from the experimenter to implement a payoff-dominated equilibrium. Half of our subjects play the advised action even though none play that action in the absence of advice. In a modified game in which a third party earns a positive payoff only if the payoff-dominated equilibrium (b, b) is reached, the advice to play b from the “interested” third party has no effect on behavior. However, when the same advice comes from someone with no monetary interest in the (b, b) equilibrium, significantly more players follow it.

The above results directly address our main research question: the impact of advice is clearly affected by its source and the source’s motivation for making the recommendation. Therefore, in the real world, where the source and motivation for advice frequently vary and the occurrence of “interested” advice is common, the effectiveness of advice is likely to vary across situations. In particular, when advice is perceived to be motivated by self-interest, it is likely to be far less effective than if it is uninterested.

5. SECOND-ROUND DATA

We ran the experiments in 2-round sequences. In each sequence, subjects played two conditions (with vs. without advice) of either Game 1 or Game 2, with a different

¹¹ A logistic regression also reveals that b choices are significantly more likely under the “uninterested” advice than under the “interested” advice ($p = 0.05$, one-tailed).

¹² The percentage of the 3-player groups achieving (b, b) coordination, and the average earnings per subject, are 33% (\$7.06) in 2NA, 31% (\$6.91) in 2AI, and 75% (\$8.13) in 2AU. That is, the uninterested advice also produces the highest efficiency. The difference in the percentage of (b, b) coordination is not statistically significant between 2NA and 2AI ($p = 0.68$, two-tailed), but is significant between 2NA and 2AU ($p = 0.04$, two-tailed), and between 2AI and 2AU ($p = 0.02$, two-tailed). Given the idiosyncrasy of random matching, such comparisons would be more meaningful with a larger sample. However, the fact that we get significant differences in spite of the relatively small samples provides further support for our results.

opponent each time.¹³ However, after running four of our five experimental conditions (i.e., 1NA, 1A, 2NA, and 2AI), we found that, as shown in Table 4, there is a significant sequencing effect for the three-player game (i.e., the results are significantly influenced by whether the game was played first or second).

When 2NA was the first game in a sequence, 61% of subjects chose *b*. However, this percentage dropped to 44% when 2NA was played after 2AI. More surprisingly, when 2AI was played after 2NA, the percentage of *b* choices increased from 63% (when 2AI was played as the first game in the sequence) to 83%. Subjects' behavior appears to be affected by prior experience with a different condition. This is confirmed in Table 5, which reveals a significant condition-round interaction for Game 2.¹⁴

Table 5: Logistic regression testing for sequencing effects for Game 2
Dependent variable: Choice ($a = 0$; $b = 1$)

Variable	Coefficient	Std. Err.	p-value (two-tailed)
Constant	0.452	0.483	0.350
Condition ($2NA = 0$; $2AI = 1$)	0.059	0.606	0.923
Round ($1^{st} \text{ round} = 0$; $2^{nd} \text{ round} = 1$)	-0.703	0.601	0.242
Condition _ Round	1.802	0.946	0.057
N = 100; Pseudo R² = 0.105			

One possible explanation for the above sequencing effect has to do with the fact that in conditions 2NA and 2AI of the three-player game, there are two possible sources of salience for the (*b*, *b*) outcome – fairness and selfish advice – and the order in which these sources are received by players might be important. Psychological research demonstrates that, when individuals are thinking about a problem, once they take a particular perspective

¹³ The purpose of employing this kind of experimental design was to make the most of our subject pool and generate more data points for each experimental treatment. We had hoped that the re-matching between rounds and lack of feedback might eliminate some of the sequencing effects.

at first, this perspective will inhibit future adoption of alternative perspectives (e.g., Hoch 1984). In the 2NA-2AI sequence, fairness concerns are salient in the first round (2NA), and therefore may continue to influence behavior and attenuate the negative effect of the selfish advice in the second round (2AI). As a result, more players chose b in the “second-round” 2AI than in the “first-round” 2AI. Likewise, in the 2AI-2NA sequence, the focal point in the first round (2AI) is the adviser’s selfishness, which might be carried over to the second round (2NA) and impede the effect of fairness preferences. This, however, is only one possible interpretation. Since our primary focus is not on such sequencing effects but rather on the influence of different kinds of recommendations, *ceteris paribus*, we limit our main analysis and conclusions to first-round choices.

6. CONCLUSION

In this paper, we investigate the effectiveness of non-binding advice to play a payoff-dominated strategy in a pure coordination game. We manipulate the explicit motivation of the adviser for making a recommendation, and find that the motivation of the adviser significantly influences the extent to which players follow the recommendation. When advice comes from a party (either the experimenter or another subject) that does not receive a monetary payoff as the result of the advice being followed, it is more likely to be effective than when it comes from someone who receives such a payoff (at a cost to those following the advice).

These results support our prediction that players make causal inferences about the motive that underlies received advice, and use these inferences to determine the validity of

¹⁴ There is no significant sequencing effect for the two-player game.

the advice (for both themselves and the other party). That is, they view advice as less credible or influential when it obviously follows from the adviser's self interest.

There are at least two reasons why our results are important. First, most research studying the effect of non-binding advice in coordination games ignores the possible differential impacts of the source of the message and the (perceived) motivation behind it. That is, players are assumed only to care about the content of a statement and the degree to which it is common knowledge. But as we show, the source, characteristics, and motivation behind a statement (i.e., where it came from and why) are likely to influence the extent to which it is really focal. Thus, our results are important for developing an accurate theory of how non-binding messages and recommendations affect the behavior of players in a game.

Second, in the world outside the laboratory, people rarely receive recommendations that come from an uninvolved party with unknown motivations. Instead, communication to players in a naturally occurring setting usually comes from people with a vested interest in obtaining certain outcomes and avoiding others. In many cases, people making strategic decisions are aware of the motivation behind the recommendation, and when they are not, they likely develop perceived reasons for why it was made. As we demonstrate, such motivations are important in determining what actions people will take.

Applications of our results are ubiquitous in real life. For example, in financial markets, the effectiveness of an analyst's investment recommendation depends on the extent to which investors (playing a form of coordination game) follow that recommendation. Our study suggests that investors' reaction to the analyst's recommendation may be influenced by their perceptions of the analyst's incentive for making that recommendation. This is consistent with the current "credibility crisis" in the financial and accounting professions. In

the wake of recent corporate frauds and scandals, investors' trust in financial advisers and CPAs – and their belief in others' trust in them – has dramatically declined due to the perceived “selfish” motives underlying investment recommendations. Our study provides empirical evidence that one way of restoring investors' faith is to increase the independence of those “advisers” by restricting them from entering into common interest with the company that they evaluate.

Our study also has implications for management literature and practice. In organizational contexts, the leader often needs to give subordinates strategic directions to coordinate their actions. Rather than blindly follow those directions, the subordinates might ask questions like “what's in it for the boss; why did she make that recommendation?” The effectiveness of leadership may be weakened if the leader's directives are perceived to be motivated primarily by personal gain.

As a more general point, we believe it is often very useful to explore issues such as the effect of recommendations on behavior in situations that more closely resemble how they are found in real economic environments. Adding this realism can often help produce results that generalize more easily to situations outside the laboratory, and need not come at too great a cost. In this paper, we recognized that real-world advisers are usually more than passive observers, and we conducted simple experiments in which we “added” this feature to the game.¹⁵ We believe that the addition of such realism where possible (especially when it does not mean the loss of experimental control) should be a goal of experimental research.

¹⁵ In other work (Dana et al. 2004), we recognize that real-world decisions involving altruism and fairness are rarely as simple as most laboratory procedures used to study them (such as the dictator game) and conducted experiments showing how results can change when very minor modifications are made to the laboratory situation (again “expanding” the game to include more realistic features).

REFERENCES

- Brandts, J., and W. B. MacLeod. 1995. Equilibrium selection in experimental games with recommended play. *Games and Economic Behavior* 11: 36-63.
- Camerer, C. F. 2003. *Behavioral Game Theory: Experiments on Strategic Interaction*. Princeton, NJ: Princeton University Press.
- Celen, B., S. Kariv, and A. Schotter. 2004. The advice puzzle: an experimental study of social learning where words speak louder than actions. *Working Paper*. New York University and University of California at Berkeley.
- Charness G. 2000. Self serving cheap talk and credibility: A test of Aumann's conjecture. *Games and Economic Behavior*, 33(2): 177-194.
- Chaudhuri, A., A. Schotter, and B. Sopher. 2001. Talking ourselves to efficiency: coordination in inter-generational minimum games with private, almost common and common knowledge of advice. *Working Paper*. Washington State, New York, and Rutgers Universities.
- Dana, J., R. A. Weber, and J. X. Kuang. 2004. Exploiting moral wriggle room: behavior inconsistent with a preference for fair outcomes. *Working Paper*. Carnegie Mellon University.
- Farrell, J. 1988. Communication, coordination and Nash equilibrium. *Economics Letters* 27: 209-214
- Foss, N. 2001. Leadership, Beliefs and Coordination. *Industrial and Corporate Change* 10: 357-388.
- Harsanyi, J. C., and R. Selten. 1988. *A General Theory of Equilibrium Selection in Games*. Cambridge, MA: The MIT Press.
- Hoch, S. 1984. Availability and interference in predictive judgment. *Journal of Experimental Psychology: Learning, Memory, and Cognition* (October): 649-662
- Milgrom, P., and J. Roberts. 1992. *Economics, Organization, and Management*. Englewood, NJ: Prentice Hall, Inc.
- Ochs, J. 1995. Coordination problems. In *The Handbook of Experimental Economics*, edited by J. Kagel and A. Roth. Princeton, NJ: Princeton University Press
- Offerman, T., J. Potters, and H. A. Verbon. 2001. Cooperation in an overlapping generations experiment. *Games and Economic Behavior* 36: 264-275
- Rosenthal, R., and R. Rosnow. 1991. *Essentials of Behavioral Research: Methods and Data Analysis* (2nd Edition). McGraw-Hill, Inc.

Ross, L. 1995. Reactive devaluation in negotiation and conflict resolution. In *Barriers to Conflict Resolution*, edited by K. Arrow, R. Mnookin, L. Ross, A. Tversky, and R. Wilson. New York, NY: W. W. Norton & Co.

Schelling, T. 1960. *The Strategy of Conflict*. Oxford University Press

Schotter, A., and B. Sopher. 2003 – (a). Social learning and coordination conventions in intergenerational games: an experimental study. *Journal of Political Economy* 111(3): 498-529

_____. 2003 – (b). Advice and behavior in intergenerational ultimatum games: an experimental approach. *Working Paper*. New York University

_____. 2004. Trust and trustworthiness in intergenerational games: an experimental study of intergenerational advice. *Working Paper*. New York University

Sugden, R. 1995. A theory of focal points. *The Economic Journal* 105: 533-550

Van Huyck, J. B., R. C. Battalio, and R. O. Beil. 1990. Tacit coordination games, strategic uncertainty, and coordination failure. *The American Economic Review* 80(1): 234-248

Van Huyck, J. B., A. B. Gillette, and R. C. Battalio. 1992. Credible assignments in coordination games. *Games and Economic Behavior* 4: 606-626

Weber, R. A., C. F. Camerer, Y. Rottenstreich, and M. Knez. 2001. The illusion of leadership: misattribution of cause in coordination games. *Organization Science* 12 (5): 582-598

APPENDIX : Instructions for recommenders in 2AU

Thank you for your participation. The following activity should take about 5-10 minutes.

In the next couple of weeks, we will invite some students to play a simple game. In the game, they will be randomly divided into groups of three, and each person will be randomly assigned to a role. The role will be Player X, Player Y, or Player Z. Both the grouping and the role assignment will be anonymous, meaning that no one will know which of the other people they are playing with at any time, and no one will know any other person's role at any time.

They will play a game like the one pictured below. In the game, Player X and Player Y will each separately and independently choose one of three options: (a), (b), or (c). Both players will make their choices at the same time without knowing the other's choice. Player Z will NOT make any choice.

All three players will accumulate points based on the combined choices that Player X and Player Y make. The numbers inside each cell of the following table correspond to the points that each player receives for a particular combination of Player X's and Player Y's choices. Player X's points are in the lower left corner of the cell, Player Y's points are in the upper right corner, and Player Z's points are in the lower right corner. At the end of the experiment, the points that each player accumulates will be converted to money at the rate of 50 cents per point.

		<i>Player Y's Choice</i>					
		<i>(a)</i>		<i>(b)</i>		<i>(c)</i>	
<i>Player X's Choice</i>	<i>(a)</i>	Y: 6 X: 6 Z: 0		Y: 0 X: 0 Z: 0		Y: 0 X: 0 Z: 0	
	<i>(b)</i>	Y: 0 X: 0 Z: 0		Y: 5 X: 5 Z: 5		Y: 0 X: 0 Z: 0	
	<i>(c)</i>	Y: 0 X: 0 Z: 0		Y: 0 X: 0 Z: 0		Y: 4 X: 4 Z: 0	

For example, if Player X chooses (b) and Player Y chooses (a), then we should look in the middle left cell for the points that each player receives. Here, Player X receives 0 points, Player Y receives 0 points, and Player Z receives 0 points. To give you another example: If Player X chooses (c) and Player Y chooses (c), then the points that each player receives are in the bottom right cell: Player X receives 4 points, Player Y receives 4 points, and Player Z receives 0 points.

To make sure that you understand the game, please answer the following two questions:

1. If Player X chooses (b) and Player Y chooses (c), then:

Player X receives _____ points; Player Y receives _____ points; Player Z receives _____ points.

2. If Player X chooses (b) and Player Y chooses (b), then:

Player X receives _____ points; Player Y receives _____ points; Player Z receives _____ points.

Are there any questions about the game before we proceed?

Note that in this game Players X and Y will receive points only if they both make the same choice. Since Players X and Y will make their choices at the same time without knowing the other's choice, they will need to choose based on what they believe the other player will choose. The points that Player Z can receive will depend on the combined choices that Players X and Y make.

To assist Players X and Y in figuring out what choice to make, we would like a neutral independent party to give them advice as to which option to choose. You will provide the advice in this experiment. Therefore, your role will be to provide advice to both Player X and Player Y on what choice to make when playing the game. Both Player X and Player Y will receive exactly the same advice when they play the game in the experiment in the next few weeks (they will receive a copy of this exact sheet). Following this advice can be helpful for making the same choice as the other player. The advice is not a requirement. However, since Players X and Y cannot receive any points unless they make the same choice, the advice might help them to figure out what choice to make. Note that, for Players X and Y, if one player believes the other player in his/her group will follow the advice, then he/she will receive points only if he/she also follows the advice.

When we conduct the experiment in the future, the experimenter will show the advice to Players X and Y. After that, Players X and Y will have a moment to think about their choice, and then will make a choice of (a), (b), or (c).

You will be the neutral independent party who gives advice to Players X and Y. Your advice is:

**Players X and Y should both choose
(Please circle one)**

a

b

c