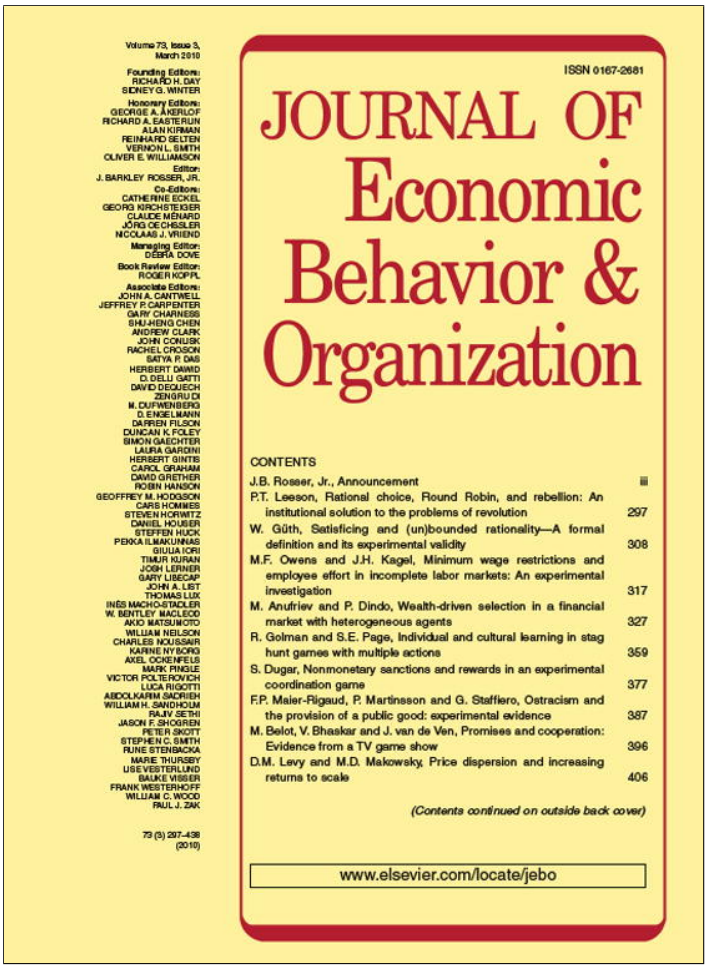

Volume 73, Issue 3,
March 2010

73 (3) 297–438
(2010)

ISSN 0167-2681

JOURNAL OF Economic Behavior & Organization

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(Contents continued on outside back cover)

www.elsevier.com/locate/jebo

Journal of Economic Behavior & Organization 73 (2010) 396–405

Contents lists available at ScienceDirect

Journal of Economic Behavior & Organization

journal homepage: www.elsevier.com/locate/jebo

Promises and cooperation: Evidence from a TV game show☆

Michèle Belot[a], V. Bhaskar[b], Jeroen van de Ven[c,*]

[a] Nuffield College, Oxford University, New Road OX1 1NF, Oxford, United Kingdom
[b] Department of Economics, University College London, Gower St., London WC1E 6BT, United Kingdom
[c] Department of Economics and Amsterdam Centre for Law and Economics (ACLE), University of Amsterdam, The Netherlands

ARTICLE INFO

Article history:
Received 28 May 2009
Received in revised form 6 January 2010
Accepted 14 January 2010
Available online 22 January 2010

JEL classification:
C72
C93

Keywords:
Cheap talk
Communication
Promises
Cooperation

ABSTRACT

We study the role of communication in a high stakes prisoner's dilemma, using data from a television game show. 40 Percent of the players voluntarily promise to cooperate, and these players are 50 percentage points more likely to cooperate than players who do not volunteer a promise. However, promises that arise in response to an explicit question by the presenter of the show are uninformative about behavior. These results augment and qualify recent experimental findings on communication—people do not want to volunteer lies but may have no compunction in lying if they feel compelled to do so.

1. Introduction

It has now been has established that individuals do not like to lie, and in consequence, communication can be useful in engendering trust or promoting cooperation. In a meta-study surveying experimental research on the prisoner's dilemma, Sally (1995) finds that communication is very effective in fostering cooperation.[1] The reluctance to lie has subtle determinants, as Gneezy (2005) shows. He finds that experimental subjects are especially reluctant to lie if this brings small benefits to themselves or if lying is particularly harmful for their opponent.

Recent experimental work examines in more detail why communication is not just cheap talk. In particular, *promises* are informative about intended behavior (Ellingsen and Johannesson, 2004; Charness and Dufwenberg, 2007). Given this, and given that receivers understand the sender's reluctance to lie, communication can foster cooperation and increase efficiency. For example, in a trust game, where the second mover has the option of sending a costless message to the first mover (the one who must choose whether or not to trust), most second movers state that they will repay the trust, and first movers often believe this statement.

☆ Thanks to Rob Alessie, Robin Cubitt, Simon Gächter, Sanjeev Goyal, Steffen Huck, Steve Machin, Imran Rasul, the editor (J. Oechssler), two anonymous referees, and seminar audiences at the Edinburgh, ESEM/EEA (Vienna), ESSET (Gerzensee), Essex, Rotterdam, the Institute of Economic Analysis (Barcelona), Nottingham and IAREP-SABE (Paris) for comments and suggestions on an earlier version of this paper. Jeroen van de Ven gratefully acknowledges support from the Netherlands Organisation for Scientific Research (NWO), grant Veni 451-05-005.

* Corresponding author. Tel.: +31 020 5255435; fax: +31 020 5255318.
E-mail addresses: Michele.Belot@nuffield.ox.ac.uk (M. Belot), v.bhaskar@ucl.ac.uk (V. Bhaskar), j.vandeven@uva.nl (J. van de Ven).

[1] Early studies of the effectiveness of communication include Loomis (1959); Radlow and Weidner (1966); Dawes et al. (1977); Cooper et al. (1989, 1992); Orbell et al. (1990); Ledyard (1995); Bohnet and Frey (1999) and Crawford (1998).

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doi:10.1016/j.jebo.2010.01.001

	S	G
S	$\frac{E}{2}, \frac{E}{2}$	$0, E$
G	$E, 0$	$0, 0$

Fig. 1. Monetary payoffs.

This paper contributes to the existing literature, and extends it in two ways. First, we provide data on the informativeness of communication in a field setting, using data from a game show. This setting differs from most laboratory experiments since the choices of players are not anonymous and the stakes are very high. Secondly, we show that people are especially reluctant to volunteer a lie. We distinguish between two types of promises: *voluntary* promises that are volunteered by the players, and *elicited* promises that arise in response to an explicit question by the presenter. Our key finding is that a player who makes a voluntary promise is very likely to honour it, while a player who makes a promise in response to an explicit question appears to have no compunction in lying. Our findings therefore provide new insights on the constraints imposed by communication and promises upon actual behavior.

Our analysis of the TV show focuses on its last stage, where a sum of money is at stake, and two players must simultaneously decide whether to share or grab this stake. Monetary payoffs in this game have the structure of a generalized prisoner's dilemma, where grab is a weakly dominant strategy. Before they make these choices, each player has the opportunity to make a short speech to the other. We have coded these speeches, focusing on whether a player makes a voluntary promise to share or not. After this free format communication, a player is sometimes asked about his or her intentions by the presenter of the show, and almost invariably, a player replies that he/she will share. We dub such a response an elicited promise. Voluntary and elicited promises have very different implications for behavior. A voluntary promise is a very strong predictor of sharing behavior—40 percent of players make a voluntary promise and a player who makes such a promise to share is *50 percentage points more likely to share* than a player who makes no promise. The magnitude of this effect is large and is in line with existing studies on the role of promises. On the other hand, an elicited promise is uninformative.

The remainder of the paper is organized as follows. In the next section, we describe the setup of the game show. Section 3 sets out the relevant theoretical frameworks, while Section 4 presents the empirical analysis. We discuss the related literature in Section 5 and conclude in Section 6.

2. Description of the game show

The data come from the Dutch television game show "*Will (s)he share or not?*"[2] The game starts with five players and has two important stages. In the first stage, players answer quiz questions. Their score is determined by how much money they invest. For each correct answer, their score increases by their investments, while for each incorrect answer, their score decreases by that amount. Every question is answered by the player who presses the buzzer first. At the end of every quiz round, the player with the highest score (the *lead player*) decides which of the other players is eliminated from the show. At the end of the third (and last) round, the lead player of that round chooses one of the other two remaining players, and they play the final stage, where the prize money they play for (E) is determined by adding the scores of the two finalists. The two finalists have to decide simultaneously to share the money (play S) or to grab the money (play G). The monetary payoffs from the decisions are as in Fig. 1. That is, if both players share, they each get $(1/2)E$; if only one player shares, his opponent gets the entire amount; and if both players choose to grab, they both go home empty handed. Monetary payoffs have the structure of a generalized prisoner's dilemma, where G is weakly dominant.

Before the candidates make their final decision in the last round, they get the opportunity to make a brief speech. The chosen player speaks first, and the lead player speaks after this. This speech is "cheap talk" in the sense that any promises made are not binding and do not affect monetary payoffs. Players may say anything they please. The players take their sharing decision right after the speech. The decisions are then revealed to the players and the public. The presenter ends the show usually by asking a brief reaction from the players. In the majority of the episodes, the presenter adds some neutral remarks. On a few occasions, the presenter commented on the players' decisions. These comments are very brief, and do not systematically condemn or praise any behavior.

3. Theoretical frameworks

3.1. Social preferences

To organize our discussion, consider a general model of social preferences as set out in Fig. 2, where the parameters $\alpha_i(E)$, $\lambda_i(E)$, $\gamma_i(E)$ and $\delta_i(E)$ are subtracted from the monetary payoffs of the player. We do not consider communication at this point. These four preference parameters are sufficient to encompass different standard models in the literature of this

[2] The title in Dutch is *Deelt ie 't of deelt ie of deelt ie' t niet?*

	Share (S)	Grab (G)
Share (S)	$\frac{E}{2} - \delta_i(E)$	$-\alpha_i(E)$
Grab (G)	$E - \lambda_i(E)$	$-\gamma_i(E)$

Fig. 2. Payoffs with social preferences.

specific game. We emphasize that these payoffs are private information to player i —being social preferences, it is unlikely that the other player (j) knows exactly what these are.

1. *Inequity aversion*: if $\alpha_i(E) > \lambda_i(E) > 0$ and $\gamma_i(E) = \delta_i(E) = 0$, we have the Fehr and Schmidt (1999) model of inequity aversion (see also Bolton and Ockenfels, 2000). Additionally, if $\lambda_i(E) > E/2$, the player is sufficiently superiority averse that he prefers to share if his opponent also shares.
2. *Altruism or social-welfare preferences*: if $\delta_i(E) = -\alpha_i E/2$, $\lambda_i(E) = \gamma_i(E) = 0$, and $\alpha_i(E) = -\alpha_i E$, $\alpha_i < 1$, the player maximizes a weighted sum of his own and his opponent's monetary payoff, with weights 1 and α_i, respectively. Interestingly, an imperfect altruist may prefer to grab if he expects his opponent to play share; however, he prefers to share if he expects his opponent to grab. If his opponent grabs, grabbing himself leads to Pareto-damaging behavior, which an altruist likes to prevent. Charness and Rabin (2002) also consider a more complex variant, where a player's weight to the other person's payoff depends on whether the other person is ahead or behind in payoff terms. This payoff structure is partly motivated by considerations of reciprocity, and gives similar predictions.
3. *Reputation*: $\lambda_i(E) = \gamma_i(E) > 0$, $\delta_i(E) = \alpha_i(E) = 0$. The player suffers a reputation cost from playing G, equal to $\lambda_i(E)$. If this cost is greater than $E/2$, the player always plays S; however, for moderate reputation costs, the conclusions are similar to the impure altruism case, i.e. the player prefers to play an action different from his opponent. Intuitively, if the opponent is likely to grab, then one might as well get a reputation for being nice by sharing, but if he shares, then the increase in monetary payoff from grabbing outweighs the reputational cost.

To summarize, social preference models give rise to ambiguous conclusions in our prisoner's dilemma game—player i is more likely to share if he believes that his opponent will share if he is sufficiently inequity averse, but this conclusion is overturned in other models, such as altruism or a concern for reputation. We refer the interested reader to a previous version of this paper (Belot et al., 2008) for more precise theoretical derivations from Bayesian equilibrium behavior in social preference models.

3.2. Communication

We now turn to the role of communication. In our game, we may assume that a player always prefers the allocation $(E, 0)$ to $(0, 0)$, which is true if $E - \lambda_i(E) > -\gamma_i(E)$ and $E/2 - \delta_i(X) > -\alpha_i(E)$. This implies that he prefers that his opponent plays S, irrespective of what he himself intends to play. The structure of the game is therefore similar to that to Aumann (1990) stag hunt game, where a player strictly prefers that his opponent hunts the stag, irrespective of the action that he intends to take. Aumann's point is that if talk is completely cheap – so that a player's messages have no direct payoff consequences for him – then one should expect communication to be completely ineffective in such games. A player will send whatever message induces his opponent to play S. Recognizing this, his opponent is unlikely to attach any credence to the message, or any promise made.[3]

The experimental literature suggests however, that subjects do not like to lie, and suffer disutility from doing so. Ellingsen and Johannesson (2004) formally model this in the context of an investment game, where they assume that a player suffers a cost from lying.[4] Suppose that a player suffers a cost if he makes a promise to share that he does not honour, and suppose that this cost is private information. In this case, we have a signalling game, and a promise by i will increase the probability that j assigns to i sharing. j's response will depend upon his social preference type—he is more likely to share if he is inequity averse, but less likely to share if he is altruistic or concerned with reputation. This in turn implies that i would like to make a promise only if he believes that j is inequity averse, since otherwise a promise is ineffective.

To summarize, lying costs have the following implications:

1. A promise by player i will increase the probability that this player shares.
2. A promise by i may or may not increase the probability that his opponent shares, even if his opponent appreciates point 1 above, that a promise increases the player's sharing probability.[5]
3. A player who intends to share may still fail to make a promise, since he may believe that this needs not to increase his opponent's sharing probability.[6]

[3] Farrell and Rabin (1996) present an alternative point of view, arguing that cheap talk may allow players to coordinate on efficient equilibria, even in the context of a stag hunt type game.

[4] Miettinen (2006) extends the analysis to general normal form games, and characterizes equilibrium outcomes with lying costs.

[5] This implies that expectations are not fully rational—i believes that a promise increases j's sharing, although this is not so.

[6] It is also possible that some players do not appreciate that a promise is informative.

Table 1
Individual characteristics of players.

	Lead player	Chosen player
N obs.	69	69
Mean age	33.9	32.1
Share women	22 percent	52 percent

Table 2
Distribution of outcomes and stakes.

Outcome	Frequency	Median stake (€)
S,*S*	19 percent	3090
G,*S*	48 percent	1533
G,*G*	33 percent	1850

Note also that the experiment by Gneezy (2005) suggests that the lying cost also depends upon the monetary cost imposed upon the opponent. In our context, if a player intends to choose to grab, then his opponent's monetary payoff does not vary with the opponent's action, and thus lying imposes no monetary cost upon the opponent. Since the purpose of lying is presumably to increase the probability that the opponent shares, one would expect lies to increase with the size of the stake.

4. Empirical analysis

4.1. Data and descriptive statistics

We use data from 69 episodes of the show,[7] which were aired in the spring of 2002.[8] The total prize at stake, *E*, varies between €380 and €26,600, with a median value of €1683. These are considerable sums given that the median monthly disposable income of a full-time employed person in the Netherlands was roughly €1200 for the year 2000 (CBS, 2006).

Table 1 summarizes basic descriptive characteristics of the players reaching the last selection stage.[9] The average player is 34 years old, with no significant difference between ages according to player rank. Women constitute about one-half of the chosen players, but only 22 percent of the first-ranked players.[10] In the final stage of the game, 43 percent of the players choose to share.

Table 2 shows the distribution of joint decisions and median stakes. 19 Percent of the episodes end with a joint outcome "$S-S$", one-third with "$G-G$" and 48 percent with "$S-G$". Since 0.19 is almost exactly equal to 0.43^2(=0.185), we cannot reject that the decisions of the players are independent of each other, a surprising finding given that the game is non-anonymous and involves pre-play communication. We will come back to this point later.

Let us now turn to the communication stage. As we mentioned earlier, communication occurs sequentially. The chosen player speaks first, and the lead player speaks after this. Players may say anything they please, and there is a diversity of ways in which players use this opportunity. Some players make a promise to share, while others do not—they sometimes talk about what they intend to do with the money; try to convince the other player to share, or say in general terms that "sharing is good". We coded the communication into a dummy variable which equals 1 if the player makes an explicit promise to share.[11] In some episodes a player does not volunteer a promise, but is induced to make a promise because the presenter asks explicitly, at the end of their speech, if he/she intends to share. Out of 20 such instances, only one player did not explicitly answer "yes", and we label these yes responses as "elicited promises".[12]

Table 3 presents summary statistics regarding the communication stage. We find that lead and chosen players are roughly equally likely to make a voluntary promise, an elicited promise or no promise at all.

[7] 78 episodes were recorded, but 9 episodes were not archived by the broadcasting company.

[8] A similar game has been produced in the UK and in Australia, but we were unable to obtain videotapes of these for analysis. The US game show, *Friend or Foe*, has an identical final stage, but the overall extensive form is quite different. Several papers(List, 2004, 2006; Kalist, 2004; Oberholzer-Gee et al., 2009) analyze the US game show, but they focus on the demographic determinants of cooperation, and do not analyze the role of communication.

[9] We have analyzed all the selection stages; however, since these are less critical we do not report these findings in order to economize on space.

[10] The reason why fewer women reach the final round in a position of leader is explained by the fact that they answer fewer questions than men and invest less aggressively. Men answer on average 2.1 questions per series of 10 questions, while women answer 1.7. The frequency of correct answers is roughly the same across gender (78 percent for men against 75 percent for women).

[11] Typical promises take the form: "I will share", "I promise to share" or "I will not let you down". The key criteria we use is that the statement includes the word "I", and a clear statement of the intention to share.

[12] In an interview, we asked the compere the reasons for asking this explicit question. He responded that this was dictated mainly by a consideration of how much time was left for the program. We find no correlation between the compere's question and the observable characteristics of players in the sample of players who do not make a voluntary promise.

Table 3
Distribution of messages (percent).

	Lead player	Chosen player
No promise	56	51
Voluntary promise	32	33
Elicited promise	12	16
	100	100

Table 4
Determinants of probability of sharing.

Player	(1) Lead		(2) Chosen		(3) Lead		(4) Chosen	
Bivariate probit estimates—marginal effects								
Voluntary promise	.29	(.13) **	.62	(.09) ***	.29	(.14) **	.60	(.10) ***
Elicited promise					.05	(.21)	−.20	(.10)
Age	−.01	(.01)	.01	(.01)	−.01	(.01)	.01	(.19)
Female	.24	(.17)	.24	(.16)	.24	(.17)	.23	(.16)
Contribution (percent)	−.41	(.46)	−.86	(.57)	−.42	(.46)	−.81	(.57)
Prize (x €1000)	.03	(.01) **	.01	(.03)	.03	(.01) **	.01	(.03)
Rho			.09 (.26)				.14 (.26)	
N observations (pairs)			69				69	

** Significant at 5 percent level.
*** Significant at 1 percent level.

4.2. Promises and cooperative behavior

We now turn to the relationship between promises and behavior. Players who do volunteer a promise are substantially more likely to share: 73 percent of them do hold their promise. In contrast, only 28 percent of those who make no promise share, and there are almost no differences between players who make no promise or an elicited promise: 26 percent of those who make an elicited promise choose to share.

We estimate a bivariate probit model, where the dependent variables are the decisions of pairs of players in the final round (lead and chosen players). Denote by y the decision to share ($y = 1$) or not ($y = 0$) and z the corresponding latent variable such that:

$$\begin{aligned} y_{lead} &= 1 \quad \text{if } z_{lead} = X'_{lead}\beta + \varepsilon_{lead} > 0 \\ &= 0 \quad \text{otherwise,} \\ y_{chosen} &= 1 \quad \text{if } z_{chosen} = X'_{chosen}\beta + \varepsilon_{chosen} > 0 \\ &= 0 \quad \text{otherwise,} \\ &[\varepsilon_{lead}, \varepsilon_{chosen}] \sim \text{bivariate normal}[0, 0, 1, 1, \rho] \end{aligned}$$

where X is a vector of player characteristics and ρ is the correlation coefficient between the disturbances ε_{lead} and ε_{chosen}.

We can control for a number of important characteristics of players: age and gender; their relative contribution to the final stake and their total stakes. Next to that, we control for the contents of the speeches of the players: voluntary promise, elicited promise, and no promise.

Table 4 presents the results, separately for lead and chosen players. We find that age does not have any significant effect, but we find a substantial gender effect.[13] A robust finding is that women are roughly 20 percentage points more likely to share. We also find that players are more likely to share when the stakes are high—an increase of €1000 in the stakes raises the probability of sharing by 3 percentage points. The total stake is determined by the sum of the scores of the finalists ($E = E_1 + E_2$), and the relative contribution to the total stake (E_i/E) may therefore differ between the finalists. We would expect that a player who contributes more to the pot is less likely to share, since she may feel entitled to a larger share of the pie. This is confirmed—an increase of the relative contribution by 10 percentage points reduces the probability of sharing by 4 percentage points for leaders to 8 percentage points for chosen players, evaluated at the mean. This is consistent with the findings of Cherry et al. (2002) in the context of a dictator game—a dictator who has contributed more to the pot is significantly less likely to allocate substantial amounts to the recipient. Interestingly, we find that this extends to a strategic setting of a simultaneous move game, where things might have been expected to be less clear cut.[14] The estimated correlation between decisions, $\hat{\rho}$, is small (0.14 when controlling for promises) and not significantly different from 0. Hence, we find no evidence of a correlation in the unobservables determining the decisions to share or grab. Oberholzer-Gee et al. (forthcoming) also find this for the first season of the game show *Friend or Foe*. They find that subjects learn over time, and in the second season decisions become related to opponents' observable characteristics.

[13] We experimented with the age variable in different ways to test whether the effect was non-linear but could not find any supporting evidence.
[14] We find no evidence that inequality of contributions per se affects the probability of sharing.

Table 5
Determinants of probability of sharing.

Player	(1) Lead		(2) Chosen		(3) Lead		(4) Chosen	
Bivariate probit estimates—marginal effects								
Voluntary promise	.30	(.13) **	.62	(.10) ***	.29	(.13) **	.62	(.09) ***
Voluntary promise opponent	−.09	(.13)	.27	(.15) *				
Elicited promise opponent					.20	(.18)	.08	(.27)
Age	−.01	(.01)	.01	(.01)	−.01	(.01)	.01	(.01)
Female	.25	(.18)	.27	(.16) *	.24	(.17)	.24	(.16)
Contribution (percent)	−.34	(.49)	−.76	(.57)	−.29	(.48)	−.82	(.59)
Prize (x €1000)	.03	(.01) **	.01	(.03)	.03	(.01) **	.01	(.03)
Rho	.05	(.27)						
N observations (pairs)	69				69			

Standard errors clustered by episode.
* Significant at 10 percent level.
** Significant at 5 percent level.
*** Significant at 1 percent level.

We now turn to our main variable of interest, promises. Those who voluntarily make a promise to share are 30 (lead) and 60 (chosen) percentage points more likely to indeed do so. Thus voluntary promises are the best predictor of cooperative behavior. Those who grab seem on the other hand reluctant to lie. This is in line with previous experimental evidence that we have discussed, and suggests that making a promise is not cheap talk, since a lie may be psychologically costly for a player.

However, we do not find any significant effect of elicited promises on behavior and we can reject the hypothesis that the coefficients for elicited and voluntary promises are equal. Thus, only promises that are volunteered appear to be correlated with cooperative behavior.

Why is there such a discrepancy between different types of promises? The most plausible explanation is that the costs of lying are lower when promises are elicited, possibly because players feel that they have no choice when asked an explicit question. We should note that the voluntary promise effect is likely to partly be a selection effect. Since the presenter only elicits a promise from those who do not volunteer one, one should expect the selection effect to give rise to a difference between voluntary and elicited promises. However, this does not explain why elicited promises have no effect, since if there was a cost associated with lying, those forced to make an elicited promise would be more likely to share than those who made neither a voluntary nor an elicited promise. Interestingly, Charness and Dufwenberg (2006) also find that the format of communication matters. In one treatment, communication was free format and found to engender promises and foster cooperation. In another treatment, communication was not free format—subjects could only choose between two options: sending no message, or sending a message with a pre-written promise. Faced with only two options, subjects may feel some pressure to make a promise, and indeed 85 percent of the subjects do so, compared to 57 percent when communication was free format.[15] Furthermore, promises in this treatment do not enhance cooperative behavior.

We now investigate whether promises are correlated with the behavior of the opponent. As we discussed earlier, if promises are a credible signal of cooperative behavior – as it seems to be the case when they are volunteered – players who are conditional cooperators should be more likely to cooperate when their opponent makes a promise. To test this hypothesis, we include the opponent's promise as an additional regressor to test this hypothesis. Table 5 reports the results of the probit estimates. The effect of the *opponent's voluntary promise* is not significant in the case of the lead player and positive in the case of the chosen player (but the estimate is quite imprecise). The effect of elicited promises is positive but never significant. Thus, we find some evidence, although not very strong, that players respond somewhat to the promises made by the opponent. As we have discussed in the theory section, the effect of promises upon the opponent's behavior depends not only on their perception but on the precise form of social preferences, with only inequity aversion giving rise to a strong positive effect.

Finally, we examine whether there are any trends in cooperative behavior over time, since the players in later episodes may have seen earlier ones. Fig. 3 shows the proportions of players sharing and making a voluntary promise according to the sequence of shows. We see no specific pattern at all. Promises and behavior do not appear to have changed in any specific way over time.

4.3. Truthful and false promises

Although a large fraction of players hold their promise, we also have some liars—indeed, 41 percent of the people who make a promise to share do not abide by it. Lying is worthwhile if it convinces the opponent to share, i.e., if the opponent

[15] See also Ben-Ner et al. (2007) and Andreoni (2005) for evidence that the form of communication matters.

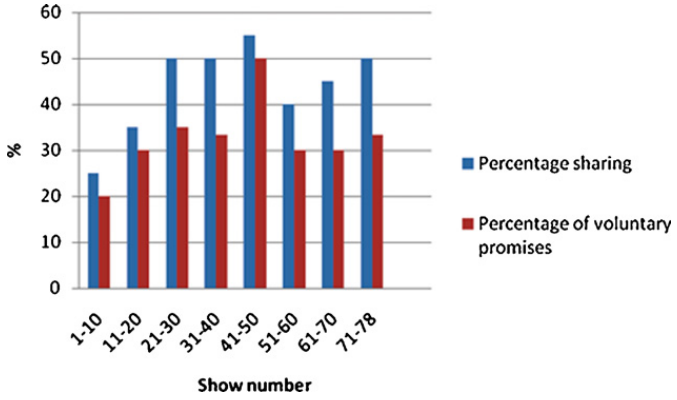

Fig. 3.

Table 6
Cooperation and communication over time.

	(1)	
Probit estimates (marginal effects)		
Age	−.003	(.002)
Female	.022	(.046)
Contribution (percent)	.257	(.091) ***
Prize (x €1000)	.000	(.006)
N obs	138	

*** Significant at 1 percent level.

Table 7
Promises and opponent's promises.

Voluntary promise by chosen player	Voluntary promise by lead player		
	No	Yes	
Distribution of messages of lead player conditional on message of chosen player (percent)			
No	72	28	100
Yes	61	39	100

Pearson $chi^2(1)=0.83$ (p-value: .36).

is a conditional cooperator.[16] Indeed, a player who intends to grab could increase his *own* monetary payoff if the opponent believes the lie and decides to share. The higher the stakes, the higher the monetary payoff from lying. On the other hand, a lie does not directly affect the payoff of the opponent, as we have already discussed.

Table 6 reports probit estimates of the probability of lying (defined as an individual who makes a voluntary promise to share but chooses *G*) as a function of characteristics of the players. We find that the stakes do not directly affect the probability of lying, thus, it does seem that liars do not only care about their own monetary payoff. On the other hand, we find that those who contributed relatively more to the final pot are more likely to break a voluntary promise, perhaps because they feel less guilty about it. The "liars" have no further distinct characteristics—gender or age are not correlated with breaking a voluntary promise.

Since the chosen player always speaks first, we investigate whether the lead player is more likely to volunteer a promise when the chosen player has already done so. Table 7 shows the distribution of messages conditional on the message of the chosen player. It appears that the lead player is more likely to make a voluntary promise if the opponent (who speaks first) has made a voluntary promise. However, this effect is not statistically significant. This is shown in Table 8, where we present estimates from a bivariate probit model, where "voluntary promise" is the dependent variable. Thus, we fail to find evidence that communication enables players to coordinate on cooperation. The only characteristic (marginally) correlated with the decision to make a promise is gender; women are more likely to volunteer a promise.

Our sample is too small to allow us to study well whether the effect of promises on the opponent's behavior depends on whether those promises are truthful or not. That is, if the opponent is able to disentangle truth from lies, his decision whether to share or not will depend on that as well. Nevertheless, we present a simple table which shows some interesting patterns. Table 9 shows the distribution of the sharing decisions conditional on the opponent's speech and on whether promises are truthful or not. We see that if the opponent does not make any promise, the probability of sharing is identical

[16] Our results in the previous section show that promises do not affect the behavior of the opponent, so lying seems totally useless. The fact that players lie suggests that they are unaware of this and believe that they can influence the decision of their opponent.

Table 8
Determinants of probability of voluntary promises.

Player	(1) Lead		(2) Chosen	
Probit estimates—marginal effects				
Voluntary promise opponent	.07	(.13)	n/a	
Age	−.01	(.01)	−.01	(.01)
Female	.28 *	(.16)	.28 *	(.16)
Contribution (percent)	.37	(.44)	.45	(.41)
Prize (x €1000)	.00	(.02)	.00	(.02)
N observations	69		69	

* Significant at 10 percent level.

Table 9
Percentage of players sharing.

Speech of opponent	Decision of opponent	Percentage sharing (percent)
No promise by opponent	Shares	38
	Grabs	38
Voluntary promise by opponent	Shares (truth)	45
	Grabs (lie)	58
Elicited promise by opponent	Shares (truth)	60
	Grabs (lie)	43

whether the opponent shares or not (38 percent). That is, players do not seem able to capture cooperative characteristics of the opponent.

When the opponent makes a voluntary promise, we actually see that a lie is more likely to engender cooperation than the truth. The reverse is true for elicited promises. These differences are not significant though, possibly because of the small sample size. Thus, we will interpret these findings as providing suggestive evidence that players may be able to disentangle truth from lies more easily when promises are elicited than when they are volunteered. In a companion paper (Belot et al., 2008), we report results of an experiment where we showed subjects the episodes of the show and asked them to predict the behavior of the contestants in the final stage. We find that experimental subjects are indeed better able to distinguish truth from lies when promises are elicited than when they are volunteered.

Our data also show that not everyone who shares makes a promise. This could arise either because some players do not realize the signalling value of a promise, or because a player does not think that a promise will make his or her opponent more likely to share. As we have discussed in the theory section, if a player believes that his opponent is an altruist or is motivated by reputational concerns, rather than inequity averse, then he will not have an incentive to signal his intention to share.

5. Related literature

Since we have already discussed some of the experimental work on communication, in the introduction and in the theory section, we focus on the work not discussed there. Charness and Dufwenberg (2006) study a trust game where the second mover (i.e. the one who must be trusted) can send a free format message, and find that a promise by the sender reduces the probability that he is opportunistic, and also makes the first mover more likely to trust him. They argue that the reluctance to lie is driven by guilt aversion, and depends on the sender's second order beliefs, on how much he expects the receiver to trust him. Vanberg (2008) questions this conclusion in a related experiment, and argues that rather than being driven by guilt aversion, subjects are averse to lying per se, as suggested by Ellingsen and Johannesson (2004) or Gneezy (2005). Sanchez-Pages and Vorsatz (2007) and Brandts and Charness (2003) find a role for procedural morality: conditional on the payoff distribution, a false promise is punished. Other studies that find an aversion to lying include Ederer and Fehr (2007); Fischbacher and Heusi (2007); Sutter and Strassmair (2008) and Hurkens and Kartik (2009). Finally, Sutter (2009) finds evidence of sophisticated lying: deceiving by telling the truth, anticipating that the truth will not be believed.

While there are several papers that use TV game shows, our paper is most closely related to the paper by List (2006) and Oberholzer-Gee et al. (forthcoming), which analyze a similar prisoner's dilemma game. However, they do not analyze communication. There are other studies which use television game shows in order to study decisions in high-stakes environments. Several studies estimate risk attitudes from game show data for this reason (e.g., Gertner, 1993; Post et al., 2008) and to study discrimination and social learning (see Levitt, 2004; List, 2004, 2006; Kalist, 2004; Oberholzer-Gee et al., forthcoming). A distinguishing feature is that decisions are not anonymous as is the case in many experiments. Decisions are very public, and players interact face to face. This can induce prosocial behavior by players out of a concern for their reputation or preserving a good image. Several studies show that people donate more to charity and/or public goods if their contributions are public (Andreoni and Petrie, 2004), and a recent study by Ariely et al. (2009) finds strong support for the hypothesis that image motivation is an important factor behind behaving prosocially. Relatedly, Charness et al. (2007) find

that, in the presence of an audience with stakes in the outcome of a player's action, subjects coordinate more in the Battle of the Sexes game, and they defect more in the prisoner's dilemma game. Sutter et al. (2009) find that the cooperation rate in a prisoner's dilemma increases when the actions of players can be observed by others (even though the players remain anonymous). Making decisions in public has realism, since decisions are rarely anonymous in real life situation, such as transactions in front of business partners, colleagues or employees.

One potential drawback of game shows is that participants may not be a representative sample of the population. Nevertheless, they do strengthen the external validity of laboratory experiments using students—which are also subject to possible selection issues. Game show participants are a more diverse population, for example in terms of socioeconomic background, thereby possibly enhancing the external validity of laboratory experiments (see Gertner, 1993, and Harrison and List, 2004).[17]

6. Conclusion

We have presented an analysis of the role of communication in a field environment—a television game show, involving high stakes and high publicity. Our study provides new insights on the effect of communication and cooperation, and confirms some of the earlier findings, strengthening their external validity outside of the laboratory. Our key finding is that promises convey information, provided they are made voluntarily. Participants who make a voluntary promise to share are 30–60 percent more likely to share than those who do not. In contrast, we find no correlation between promises that are elicited by the presenter of the show and behavior.

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[17] While we did not systematically classify socioeconomic backgrounds of the players for lack of observations, it is clear from the introductory speeches of the players that they have diverse backgrounds. In terms of employment, they represent all sectors at the two-digit classification level including trade, information technology, education, financial services, health, and unemployed.

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