

# WHO MAKES A GOOD LEADER? COOPERATIVENESS, OPTIMISM, AND LEADING-BY-EXAMPLE

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*We examine the characteristics of effective leaders in a simple leader-follower voluntary contributions game. We focus on two factors: the individual's cooperativeness and the individual's beliefs about the cooperativeness of others. We find that groups perform best when led by those who are cooperatively inclined. Partly, this reflects a false consensus effect: cooperative leaders are more optimistic than noncooperators about the cooperativeness of followers. However, cooperative leaders contribute more than noncooperative leaders even after controlling for optimism. We conclude that differing leader contributions by differing types of leader in large part reflects social motivations. (JEL A13, C92, D03)*

*"Then I would look for integrity. A leader sets an example, especially a strong leader. He or she is someone on whom people ... in the organization model themselves." Peter Drucker on Picking a Leader, excerpted from "The Daily Drucker" (Drucker [2004], p. 5)*

## I. INTRODUCTION

One of the challenges facing leaders is how to get followers to do something they otherwise

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would not do. In settings where followers are tempted to free-ride on the contributions of others, the challenge is for leaders to somehow induce followers to eschew their narrowly defined personal interests to promote the wider interests of the group. Such settings are commonplace in the workplace, and also in political and military organizations. One mechanism by which a leader may influence her followers is through leading-by-example. Recent experimental research has shown that followers respond strongly to the example set by a leader (Arbak and Villeval 2007; Gächter and Renner 2003, 2007; Güth et al. 2007; Kumru and Vesterlund forthcoming; Levati, Sutter, and Van Der Heijden 2007; Moxnes and Van Der Heijden 2003; Pogrebna et al. 2009; Potters, Sefton, and Vesterlund 2007; Rivas and Sutter 2008).

In this paper, we report an experiment on a simple leader-follower game in which efficiency and self-interested behavior are in conflict. More specifically, we study a sequential voluntary contributions game where each player has an endowment and can choose how much of this to contribute to a project. Joint earnings are

## ABBREVIATIONS

LRM: Linear Regression Model  
NC: Non-Cooperator  
OLS: Ordinary Least Square  
ORM: Ordered Regression Model  
SC: Strong Cooperator  
WC: Weak Cooperator

maximized when each player contributes their full endowment, but if subjects maximize own-earnings they will contribute nothing. We focus on the question of who makes the best leader, in terms of promoting efficient outcomes. We focus on two factors: the individual's cooperativeness, as measured by her willingness to contribute to the project when others do so, and the individual's beliefs about the cooperativeness of others.<sup>1</sup>

Previous experiments with this type of game show that subjects do make positive contributions, but, at the same time, contributions fall short of efficient levels. Moreover, there is substantial heterogeneity in decisions across subjects in both roles. Among followers, some maximize own-earnings but others contribute substantial amounts. Moreover, follower contributions are heavily influenced by leader contributions. In experiments with sequential prisoner's dilemmas second-movers often cooperate if the first-mover cooperates, but hardly ever if the first-mover defects (Clark and Sefton 2001), and in experiments with sequential contributions to a public good followers' contributions tend to increase with leader contributions (Gächter and Renner 2003, 2007). Thus, cooperative behavior by followers is often described as evidence of reciprocation or conditional cooperation (Croson 2007; Fischbacher, Gächter, and Fehr 2001; Frey and Meier 2004; Glöckner et al. forthcoming; Keser and Van Winden 2000).

The experiments also reveal variability in leader decisions. Some leaders contribute nothing, almost certainly leading the group toward the lowest possible joint earnings. Other leaders contribute large amounts. If matched with a conditional cooperator this leads to high joint earnings, but there is also the possibility of being suckered when matched with a self-interested player. Compared with follower decisions, it is more difficult to interpret leader decisions. If a person contributes a lot in the role of leader is it because they are somehow cooperatively

inclined, or simply because they are self-interested but optimistic about the prospects of meeting a cooperator? If a person contributes nothing is it because they are selfish, or are they cooperators who are pessimistic about the prospects of meeting another cooperator? And, what type of player is likely to set a better example as a leader?

To answer these questions, we present a new experiment based on a leader-follower game in which contribution decisions were elicited using the strategy method and subjects played in both roles. Using decisions in the role of follower we are able to classify players according to their degree of conditional cooperativeness. Correlating these measures with their own decisions in the role of leader allows a within-subject cross-tabulation of leader contribution against follower type. Thus, we are able to answer whether cooperators make better or worse leaders. To answer whether differences between leader decisions reflect differing underlying social motivations or differing expectations about the follower, we also have subjects predict what their opponent will do in the role of a follower. These predictions are used to gauge how optimistic subjects are about the chances of meeting a cooperator, and we then ask whether leadership decisions vary across follower types controlling for this degree of optimism. That is, we ask whether optimistic cooperators or optimistic self-interested noncooperators make better leaders.

From their follower decisions we classify about half of our subjects as noncooperative and about half as cooperative to some degree. In the role as leader we find that cooperators contribute substantially more than noncooperators. Although several variables help predict leader decisions—for example, economists contribute less than noneconomists—the most useful variable for explaining leader contributions is their degree of (conditional) cooperativeness. We find that part (roughly, a quarter) of the difference between the leader contributions of “Non-Cooperators (NCs)” and “Strong Cooperators (SCs)” can be attributed to their differing beliefs. These differences in beliefs are consistent with a *false consensus effect* (Ross, Greene, and House 1977). NCs tend to expect they will be paired with another NC and thus contribute little, whereas SCs are more optimistic about the prospect of being paired with another SC and so contribute more. Even so, after controlling for optimistic beliefs SC leaders still contribute

1. Of course, there are many other aspects of leadership that we do not address in this paper. See Yukl (1989) for a comprehensive treatment. In natural settings, the role of a leader may encompass a broad range of activities—coordinating and organizing efficient allocation of individual tasks, mediating conflicts, designing incentive schemes, disciplining deviators, maintaining group relations, and so on—and these activities may require different (psychological) qualities. See Van Vugt and De Cremer (2002) for a social psychological perspective on aspects of leadership in social dilemma situations.

substantially more than NC leaders. Thus, we conclude that differing leader contributions by differing types of leader must in large part reflect social motivations. Groups perform best when led by those who are cooperatively inclined.

Our study is related to a number of experimental papers that explore how social preferences affect play in social dilemmas by examining the correlations between decisions in the role of first-mover, decisions in the role of second-mover, and beliefs about opponents, in games where subjects play both roles (Altmann, Dohmen, and Wibral 2008; Blanco, Engelmann, and Normann 2008; Blanco et al. 2009; Bruttel and Eisenkopf 2009; Chaudhuri and Gangadharan 2007; Fischbacher, Gächter, and Fehr 2001; Vyrastekova and Garikipati 2005). We discuss this related literature in the conclusions.

The remainder of the paper is organized as follows. In the next section, we describe our experimental design and procedures. Section III presents our results. We offer concluding comments in Section IV.

## II. DESIGN AND PROCEDURES

### A. The Experimental Game

Our experiment is based on a simple two-player Leader-Follower game. Each player is endowed with five tokens, and must decide how many to contribute to a joint project. Leaders move first and their contribution decision is revealed to the Follower before the Follower chooses her own contribution. After the Follower's choice, the game ends and players' earnings are determined. For each token contributed to the project both players receive £1, and for each token not contributed to the project that player receives £1.50. Thus, player  $i$ 's earnings are given by

$$(1) \quad \pi_i = 1.5 \times (5 - c_i) + c_i + c_j$$

where  $c_i, c_j \in \{0, 1, 2, 3, 4, 5\}$  represent the contribution decisions of player  $i$  and  $j$ , for  $i, j \in \{\text{Leader}, \text{Follower}\}$  and  $i \neq j$ .

In our experiment, we implemented a one-shot version of this game and had subjects make decisions both in the role of Leader and Follower. Follower's decisions were elicited using the strategy method (Selten 1967), that is they had to specify complete strategies in the game-theoretic sense. Thus, participants in our experiments were asked to make in total seven contribution decisions: one contribution

decision in the role of Leader and six contribution decisions in the role of Follower, one for each possible contribution by the Leader. Only after all decisions had been made were subjects assigned a role in the experiment and paid according to the decisions they made in that role: with probability one half they were assigned the role of Leader and with probability one half the role of Follower. Hence, all seven contribution decisions were elicited using monetary incentives.

Subjects also had to complete a "Prediction Task." In this task, subjects were asked to predict the contribution decisions that the other person in their group had made in the role of Follower. Thus, subjects made 6-point predictions, one for each contribution decision their opponent made in the role of Follower. Subjects earned £0.50 for each correct prediction.

Immediately after having submitted their decisions, subjects were asked to complete a short post-experimental questionnaire asking for basic demographic and attitudinal information. This included a self-assessment of subjects' risk attitudes, which were elicited using the question suggested by Dohmen et al. (forthcoming). The question reads: "Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?" and subjects answered on a scale from 1 (unwilling to take risks) to 10 (fully prepared to take risk).<sup>2</sup> To measure and control for inherent predisposition to self-interested behavior we also used the "Machiavellian instrument" (Christie and Geis 1970), a psychometric test consisting of 20 statements—such as "anyone who completely trusts anyone else is asking for trouble" or "it is hard to get ahead without cutting corners here and there"—to which subjects were asked to agree or disagree using a 7-level Likert scale. Those who tend to agree with the statements score higher on the Machiavellian instrument, signaling a combination of selfishness, cynicism about human nature, and manipulativeness.<sup>3</sup>

2. The average response was 6.05 (*SD* 2.10).

3. Higher Machiavellian scores are generally associated with less generous offers in dictator games, but not in ultimatum games (see, e.g., Carpenter, Burks, and Verhoogen 2005; Carpenter, Verhoogen, and Burks 2005; Spitzer et al. 2007). Meyer (1992) shows that subjects scoring high on the Machiavellian instrument are less likely to reject unfair offers in a one-shot ultimatum game with hypothetical payoffs. Burks, Carpenter, and Verhoogen (2003) find that subjects with higher Machiavellian scores send less in trust games, while Gunnthorsdottir, McCabe, and Smith (2002) find that subjects with higher Machiavellian scores are less likely to reciprocate trust.

### B. Discussion of the Design

Our main interest lies in exploring the relation between subjects' Leader contributions, their own cooperation preferences, and their expectations about others' cooperation preferences. We measure subjects' cooperation preferences by the extent to which they are conditionally cooperative in their Follower contribution response to the Leader's contribution decisions. Note that the Follower's decision directly determines the distribution of earnings and thus provides a cleaner measure of cooperation preferences than the Leader's decision. It is possible that a Leader may contribute not because they are inherently cooperative, but rather because they expect a cooperative response that makes contributing pay. To measure a Follower's degree of conditional cooperation, we need to observe a follower response to different possible leader contribution decisions.<sup>4</sup> The use of the strategy method allows us to observe subjects' follower contribution responses conditional on *each* possible Leader contribution decision without either resorting to repeated play (which might induce strategic confounds) or using deception. Thus, from each subject we elicit in an incentive compatible way a complete vector of conditional contribution decisions that we then use to classify subjects into "cooperation types" according to their revealed (conditional) cooperativeness.

Letting subjects play in both roles of the game allows us to correlate subjects' cooperativeness (measured, as explained, by their conditional contribution decisions) with their (unconditional) contribution decision in the role of Leader. Thus, we can observe a within-subject cross-tabulation of Leader contribution against Follower cooperation types that allows us to explore whether more cooperative types make better or worse Leaders.

Because we are also interested in how subjects' beliefs about others' cooperation preferences relate to their leader contributions and their cooperation types, we also have subjects predict what their opponent will do in the role of Follower. That is, from each subject we elicit a vector of *predicted* conditional contribution

decisions. This allows us to measure how optimistic subjects are about the cooperativeness of the players they are matched with. Subjects were given monetary incentives for correctly predicting others' contributions and could earn up to £3 from the prediction task. Note that this gives subjects an incentive to predict the most likely response to each possible leader contribution, rather than report their subjective probability distributions over possible responses. To elicit subjective probability distributions over possible responses in an incentive compatible manner subjects would have had to complete a  $6 \times 6$  matrix, and we would have had to use a different scoring rule. This of course would only be incentive-compatible to the extent that subjects understand the mechanism. Our simpler Prediction Task has the advantage that it yields an operational measure of optimism while keeping the task manageable for subjects.

Decisions in the role of Leader and Follower and beliefs were elicited using a single computer screen so that subjects could make and revise their choices in any order they liked.<sup>5</sup> This design choice was motivated by a desire to avoid potential ordering effects which could have arisen had we prompted subjects to complete the three experimental tasks in a predetermined order.

### C. Experimental Procedures

The experiment was conducted at the University of Nottingham in Autumn 2008 using subjects recruited from a university-wide pool of students who had previously indicated their willingness to be paid volunteers in decision-making experiments.<sup>6</sup> Six sessions were conducted, four with 18 participants, one with 16 participants, and one with 14 participants: Thus, 102 subjects participated in total. The average age was 19.7 yrs and 55% were male. No subject took part in more than one session.

All sessions used an identical protocol. Upon arrival, subjects were welcomed and randomly seated at visually separated computer terminals. Subjects were then given a written set of instructions that the experimenter read aloud.

5. A screenshot of the computer screen used to elicit subjects' decisions and beliefs was included in the instructions that were given to subjects, which are reproduced in the online supplementary materials.

6. Subjects were recruited through the online recruitment system ORSEE (Greiner 2004). The experiment was programmed and conducted with the software z-Tree (Fischbacher 2007).

4. For example, observing a Follower that contributes zero tokens in response to a leader contribution of zero tokens does not reveal whether the subject is a conditional cooperator (and hence responds with low contributions to low leader contributions) or whether he or she is motivated by own-profit maximization. What we need to observe is the Follower's contributions in different subgames.



The instructions included a set of control questions about how choices translated into earnings. Subjects had to answer all the questions correctly before the experiment could continue. The instructions also included a screenshot of the screen on which subjects entered their decisions. The instructions did not use the labels “Leader” and “Follower,” but rather referred to “First Movers” and “Second Movers.”

The decision-making phase of the session consisted of three tasks: two decision tasks and the prediction task. In the two decision tasks, subjects were asked to make contribution decisions both in the role of Leader and Follower. Subjects were informed at the beginning of the experiment that they would have had to make contribution decisions in both roles and that only after all decisions had been made would they have been informed of their actual role. All decisions were made anonymously, and neither during nor after the experiment were subjects informed about the identity of the other person in their group. Once everyone in the room had completed the three tasks subjects were informed of their role. Decisions and predictions were then implemented and subjects paid accordingly.

With our design players’ earnings can range from a maximum of £15.50 (£12.50 if a player contributes zero tokens to the joint project while her opponent contributes five tokens, plus £3 if she reports six correct predictions) to a minimum of £5. In the experiment, subjects’ earnings ranged from £6.00 to £15.00, averaging £9.39 (at the time of the experiment £1  $\approx$  \$1.50). On average, the experimental sessions lasted about 50 min, including the completion of a post-experimental questionnaire and the payments.

### III. DATA ANALYSIS

The following analysis of data is structured around our main research questions: What type of player makes the best Leader? And, do different Leader contributions reflect differing underlying social motivations, or differing expectations about the Follower? To explore these questions:

1. We first classify subjects’ cooperativeness according to the degree of conditional cooperativeness exhibited by their contribution responses in the role of Follower.

2. We then explore the relation between subjects’ cooperativeness and their (unconditional)

contribution decisions in the role of Leader. Thus, we will be able to answer whether more cooperative types make better or worse Leaders.

3. In a third step, we ask whether cooperativeness is systematically related to beliefs about the cooperativeness of others and whether differences in beliefs are related to differences in Leaders’ unconditional contribution decisions.

#### *A. Expressed Cooperation Preferences and Cooperation Types*

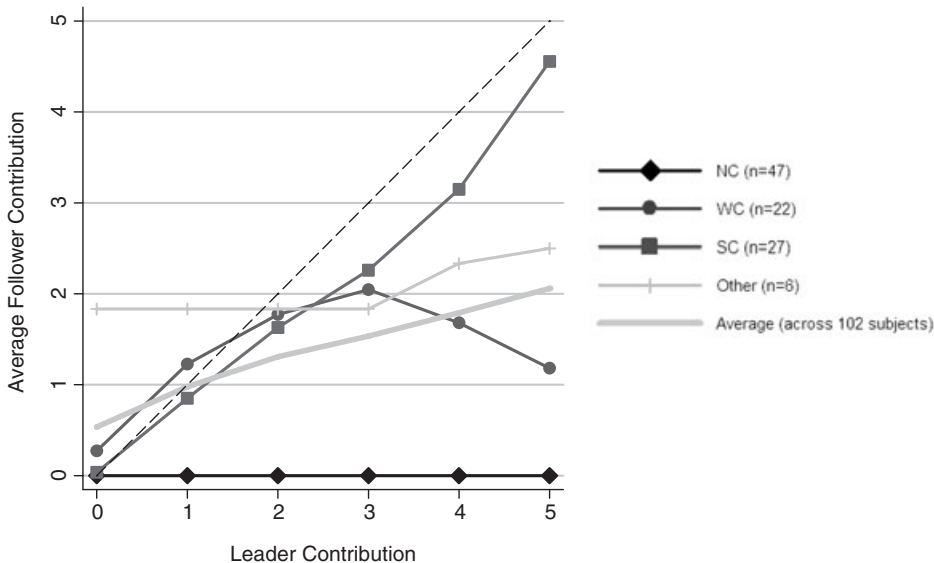
We measure subjects’ cooperativeness using their conditional contribution decisions in the role of Follower. Subjects are classified as NCs if they contribute nothing in the role of Follower irrespective of the Leader’s contribution. Forty-six percent of our 102 subjects fall into the NC category. The remaining subjects are classified into three different cooperation types according to the following criterion. For each subject, we computed how a (hypothetical) self-interested Leader would best-respond to the vector of conditional contribution decisions submitted by this subject.<sup>7</sup> If even a self-interested Leader would contribute her entire endowment as a best-response to the subject’s vector of conditional contributions, we conclude that the subject must exhibit a strong degree of conditional cooperativeness. We classify such a subject as an SC. Twenty-six percent of our subjects fall into this category. A subject is classified as a Weak Cooperator (WC) if, when matched with her, a self-interested Leader would find it optimal to contribute some, but not all, of her tokens. Twenty-two percent of the subjects can be classified as WC. Finally, if a subject submitted a vector of contributions that contains positive contributions in response to some of the Leader’s contributions, but does not give an incentive to a self-interested Leader to contribute any token to the project, we classify the subject in the category Other. Only 6% of subjects fall into this category.<sup>8</sup>

Figure 1 depicts—both separately for each preference type and aggregated across types—the average contribution decisions subjects made

7. Should the Leader be indifferent between two or more contribution decisions, the largest contribution is used for computing the Leader’s best-response.

8. Half of these subjects are “unconditional cooperators” who contribute the same (nonzero) amount irrespective of the Leader’s contribution. The other half contributes one or two tokens only if the Leader contributes four or five tokens.

**FIGURE 1**  
Average Follower Contribution



in the role of Follower as a function of the contribution level by the Leader.<sup>9</sup>

#### B. Which Cooperation Type Makes a Better Leader?

We next move to the analysis of the relation between subjects' cooperativeness and their contribution decisions as Leaders. Figure 2 plots the average Leader contribution decisions separately for the three major preference types.<sup>10</sup> SC Leaders are those who contribute most to the public good (about 2.8 tokens on average), whereas NC Leaders contribute on average

least (slightly more than 0.5 tokens on average). WC Leaders' contribution decisions fall midway between the contributions of NC and SC Leaders.

We can strongly reject the hypothesis that types contribute similar amounts (Kruskal–Wallis test:  $\chi^2(2df) = 38.65$ ,  $p < 0.001$ ). Pairwise two-sided Mann–Whitney– $U$  tests reveal that NC Leader contributions differ significantly from WC Leader contributions ( $z = 4.575$ ,  $p < 0.001$ ), which in turn differ significantly from SC Leader contributions ( $z = 2.065$ ,  $p = 0.039$ ).

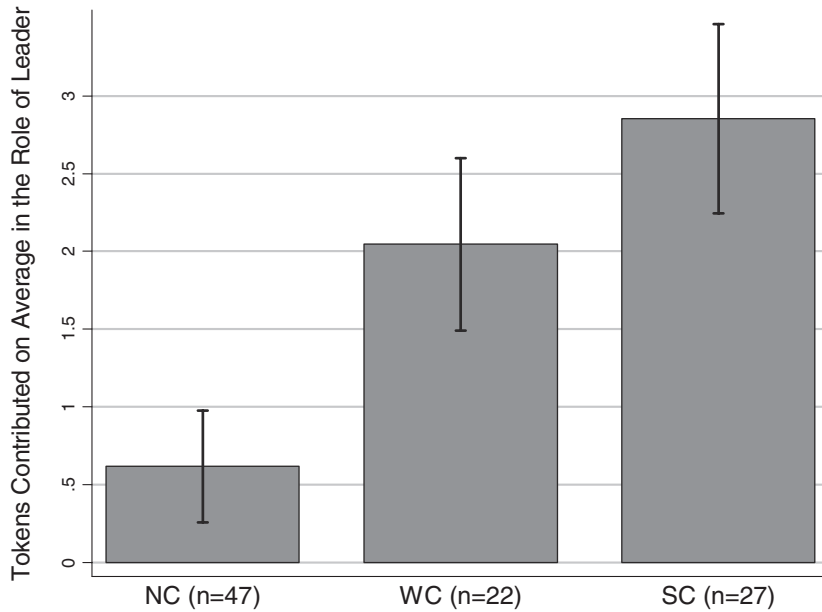
Regression analysis of Leaders' contributions on a set of dummy variables identifying the three Leader types shows that the results are substantially robust to a set of controls for individual and session effects (Table 1).<sup>11</sup> Models I–III build incrementally including

9. Note that the patterns of contribution decisions of NC, SC, WC, and Other closely resemble the average contribution patterns typically found in linear public goods games for "Free Rider," "Conditional Cooperator," "Hump-shaped," and "Other" according to the classification system introduced by Fischbacher, Gächter, and Fehr (2001). In fact, the two classification systems are highly consistent with one another: All NC and Other would be classified as Free Riders and Other, respectively, 85% of SC subjects as Conditional Cooperators, and 64% of WC subjects as Hump-shaped Contributors.

10. In the remainder of the paper, we will focus our analysis on the three major groups and ignore the subjects we classified as Other. With only six subjects in the Other category, we would not be able to draw any valid inference from their behavior and their inclusion in the analysis would only unnecessarily complicate the exposition of our results. All our findings are robust to whether we include or exclude these six subjects.

11. Long (1997) (pp. 115–119) discusses the costs and benefits of using a linear regression model (LRM) instead of ordered regression models (ORMs) when using ordinal dependent variables and concludes that in general "... the results of the LRM only correspond to those of the ORM if [the cut-points of an ORM] are all about the same distance apart" (p. 119), that is, if the intervals between adjacent categories of the dependent variable are equal, which is in fact the case for the variable "Leader's contribution." Given their simpler interpretation, OLS estimates are reported hereafter. Any inference based on such estimates can be also derived using ORM estimation.

**FIGURE 2**  
Average Contribution in the Role of Leader\*



\* Lines represent 95% confidence intervals.

**TABLE 1**  
Determinants of Leader Contributions

	I	II	III
1 if SC	2.235*** (0.345)	2.078*** (0.364)	1.928*** (0.384)
1 if WC	1.428*** (0.320)	1.400*** (0.286)	1.187*** (0.324)
1 if male		0.287 (0.284)	0.401 (0.301)
1 if area of study is economics		-0.841*** (0.263)	-0.876*** (0.287)
Willingness to take risks		-0.010 (0.077)	0.001 (0.081)
Machiavellian score		-0.021** (0.010)	-0.021* (0.010)
Number of known others in session			-0.507** (0.237)
Constant	0.617*** (0.180)	2.867*** (1.323)	2.882** (1.386)
Session dummies	No	No	Yes
N	96	96	96
F-statistic	$F(2,93) = 24.55$	$F(6,89) = 16.16$	$F(12,83) = 10.60$
Prob > F	0.000	0.000	0.000
R <sup>2</sup>	0.360	0.447	0.489

Ordinary least squares (OLS) regressions. Dependent variable is Leader's contribution. Robust standard errors are in parentheses.

\*.05  $\leq p \leq .10$ ; \*\*.01  $\leq p < .05$ ; \*\*\*  $p < .01$ .

personal characteristics (Models II and III) and controls for session effects (Model III). SC Leaders' contributions exceed NC Leaders' contributions by about two tokens in all regression models and the difference is always significant

at the 1% level. WC Leaders also contribute about one token more than NC Leaders and the difference is highly significant in all models. Differences between the contributions of WC and SC Leaders are significant either at the 5%

or 10% level depending on the regression model specification.<sup>12</sup>

Among the variables controlling for individual characteristics, the dummy identifying subjects studying Economics is highly significant in both the regression models where it is included: Leaders who study Economics appear to contribute significantly less than others. This result is consistent with findings from other laboratory experiments (e.g., Frank, Gilovich, and Regan 1993; Marwell and Ames 1981), although there is an ongoing debate about the reasons for these differences in other-regarding behavior (see, e.g., Frey and Meier 2003).

Also important is the "Machiavellianism" of the subject. The coefficient of the Machiavellian score (Christie and Geis 1970)—a psychometric test where higher scores signal a combination of selfishness and opportunism—is negative and statistically significant in both models: Leaders with high Machiavellian scores tend to contribute less than those who score low in Machiavellianism. This result is consistent with Burks, Carpenter, and Verhoogen (2003), who also find that first-movers with a high Machiavellian score send less in a trust game where subjects played both roles.<sup>13</sup>

We do not observe a clear gender effect. The regressions show that, after controlling for cooperativeness, males contribute more than females, although the difference is insignificant. Arbak and Villeval (2007) report a similar finding. This result compares also with findings on first-mover's behavior in trust games where men are sometimes found to send larger amounts than women (e.g., Buchan, Croson, and Solnick 2008), but the effect is often not significant (e.g., Croson and Buchan 1999).<sup>14</sup>

As commitment to a leadership contribution is a risky decision we may expect that Leaders who are more willing to take risks contribute more than those who are less prepared to make risky decisions. Our measurement of subjects' willingness to take risks is instead negatively

correlated with leader contributions in Model II, whereas it enters with a positive coefficient in Model III. In both cases, the effect is not statistically significant ( $p = .896$  in Model II;  $p = .992$  in Model III), suggesting that risk considerations are unimportant for leader decisions in our experiment.

Model III includes session dummies (which are jointly insignificant) and the variable "Number of Known Others in Session" measuring the number of other participants in the session known to the subject. Although the overwhelming majority of participants were strangers to one another (on average a participant only knew 0.12 other participants), knowing other participants in the session reduces the amount a Leader is willing to contribute.

To get a sense of the importance of assigning given cooperation types to the role of Leader, we conducted a simple accounting exercise. For every possible pairing of subjects, we calculated total contributions for both possible role assignments. We present the average of these by cooperation type combination in Table 2. For example, on average an SC Leader and NC Follower make a total contribution of 2.85 tokens. For a given Follower type, contributions increase with the cooperativeness of the Leader, and for a given Leader type contributions increase with the cooperativeness of the Follower (with one exception: when an NC Leader is paired with a WC Follower contributions are higher than when paired with an SC Follower). Note also that when types differ, contributions are always higher when the more cooperative type occupies the role of Leader. Using the observed distribution of cooperation types we also compute the expected total contribution for each Leader cooperation type. SC Leaders generate more

**TABLE 2**  
Total Contributions by Cooperation Types

Type of Leader	Type of Follower			Expected*
	NC ( <i>n</i> = 47)	WC ( <i>n</i> = 22)	SC ( <i>n</i> = 27)	
NC	0.63	1.24	1.17	0.92
WC	2.05	3.66	3.70	2.87
SC	2.85	4.40	5.32	3.89

\*The expected total contribution takes into account that a subject cannot be matched with oneself. For instance, for an NC Leader the expected total contribution is calculated as  $(0.63 \times 46/95) + (1.24 \times 22/95) + (1.17 \times 27/95)$ .

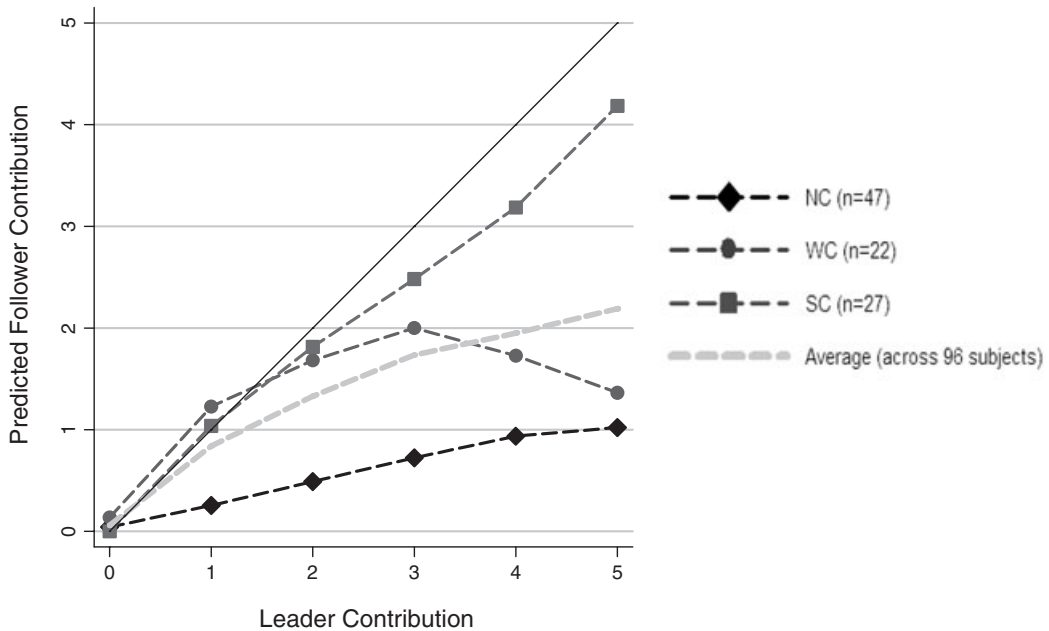
12. The  $p$ -values from the  $F$ -test for equality of coefficients on SC and WC are 0.045 (Model I), 0.069 (Model II), and 0.051 (Model III).

13. Across the whole sample scores ranged from 67 to 136. The average score was 98.92 with a standard deviation of 14.11, which is similar to that reported in other experimental studies (e.g., Burks, Carpenter, and Verhoogen 2003; Carpenter, Burks, and Verhoogen 2005; Flues and Gächter 2008; Gunnthorsdottir, McCabe, and Smith 2002).

14. See Bohnet (2007) for a discussion of gender effects in trusting behavior. Croson and Gneezy (2009) provide a general review of gender effects in experiments.



**FIGURE 3**  
Average Predicted Follower Contribution



than four times as many contributions as NC Leaders.

### C. Are SCs Better Leaders Because They Are More Optimistic About Followers?

So far we have shown that cooperation preferences, as measured by conditional contribution decisions, strongly correlate with leader contributions: cooperative Leaders contribute significantly more than noncooperative Leaders.

However, the large difference in leader contribution decisions between SC, WC, and NC subjects observed in our experiment may not necessarily be because of differences in the underlying social motivations of these three types. SC, WC, and NC subjects may instead hold different expectations about the Follower's behavior, which may in turn drive their contribution decisions. For example, NC subjects may believe that Followers are more likely to behave as a free-riding "NC type," whereas SC subjects may believe that free-riding behavior is relatively less common and hence may expect a positive return from contributing to the project. Such a systematic bias in beliefs (and, in particular, the tendency to estimate one's own behavior

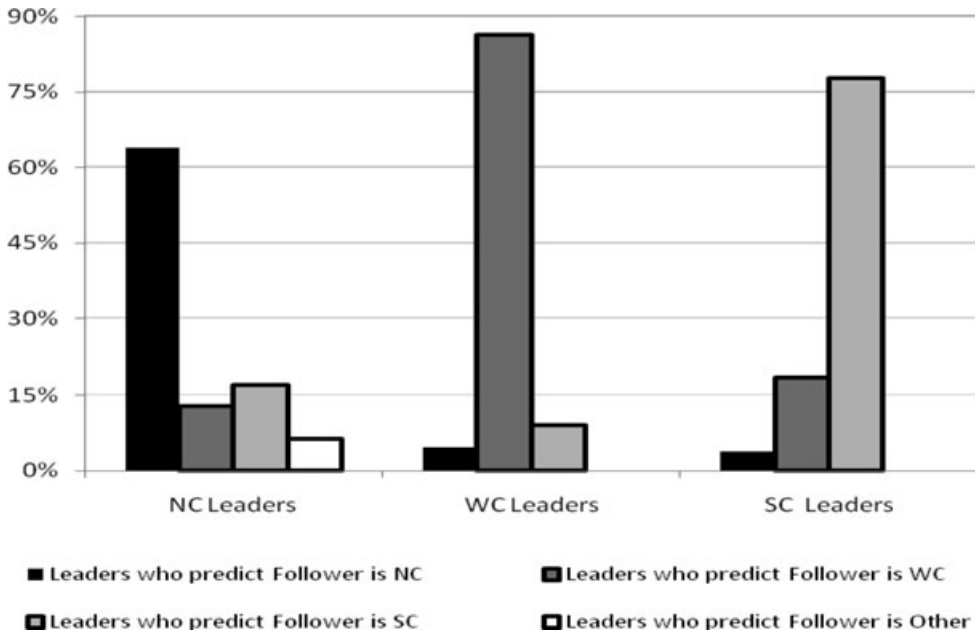
to be more common than it is estimated by those who engage in alternative behaviors) is called the *false consensus effect* (Ross, Greene, and House 1977).<sup>15</sup>

To verify whether a false consensus effect might be driving our results, we start by exploring the relation between subjects' own preferences and their expectations about the cooperation preferences of their opponents, as elicited in the prediction task. As a first step in Figure 3 we draw—both separately for each preference type and aggregated across types—the average conditional contribution decisions that subjects *predicted* the other person in their group would have made in the role of Follower.

The most remarkable feature of Figure 3 is its similarity with Figure 1, where we depicted subjects' average own contribution decisions

15. In the context of cooperation, a seminal paper is Kelley and Stahelski (1970). Recent experimental studies finding evidence of a false consensus effect are Selten and Ockenfels (1998), Charness and Grosskopf (2001), and Van Der Heijden, Nelissen, and Potters (2007). Engelmann and Strobel (2000) and Engelmann and Strobel (2007) discuss whether the consensus effect is "truly" false and show that the bias mitigates with the presentation of representative information (see also Offerman, Sonnemans, and Schram 1996).

**FIGURE 4**  
Proportions of Predicted Follower Type by Each Type of Leader



by cooperation type. SC and WC contribution decisions are almost identical to their beliefs about others' contribution decisions. NC subjects' predictions of others' contribution decisions differ instead from their own contribution decisions, as these subjects seem to believe that others' contributions increase in the Leader's contribution decisions, whereas they always choose to contribute nothing irrespective of the Leader's decision.

Overall, Figure 3 suggests that different cooperation types hold different beliefs about others' cooperation types. To explore this issue further, we use subjects' predictions about their opponent's conditional contributions to classify subjects according to their predicted Follower type. Our classification method parallels the one we used to classify cooperation types. If a subject predicts that the opponent will contribute nothing to the project irrespective of the leader contribution, we classify that subject as having a predicted NC Follower.<sup>16</sup> If

a subject predicts that the Follower will contribute something in response to some Leader contribution, we classify the subject as having a predicted Other, WC, or SC Follower depending on whether a risk-neutral selfish Leader's optimal choice would be to contribute zero, some, or all of her endowment to the project.<sup>17</sup> Figure 4 shows—separately for each preference type—the proportion of Leaders who predict an NC, WC, SC, or Other Follower.

the Follower will contribute zero to insure against the worst possible case. If this were indeed the case, Leaders who contribute more would report more pessimistic beliefs about the Follower's cooperativeness. In fact, Figure 3 suggests the opposite: more cooperative Leaders predict higher contribution by the Follower. More generally, we note that there is very limited evidence of hedging in sequential prisoner's dilemma experiments when first-movers predict second-mover's choices (see, e.g., Blanco et al. 2008).

17. We thought it natural to convert the vector of predictions into a type using the same method as that used to convert the vector of Follower choices into a cooperation type. However, the predicted Follower type labels should be interpreted with caution. The optimal contribution of a risk-neutral selfish Leader depends on the *expected* responses to the six possible leader contributions and, as noted previously, our belief elicitation procedure gives subjects an incentive to reveal the *most likely* response to each leader contribution. Thus, a risk-neutral selfish Leader may not necessarily find it optimal to contribute five tokens against a predicted SC Follower type.

16. One might worry that subjects may report biased beliefs in the Prediction Task to hedge against risk. For example, a Leader who contributes five tokens will receive a low payoff if the Follower contributes zero. Even if the Leader expects the Follower to reciprocate he may predict

Clearly, subjects' predictions about others' preferences are strongly biased toward their own preference type: More than 60% of NC Leaders predict that they are matched with an NC Follower, more than 80% of WC Leaders predict they are matched with a WC Follower, whereas almost 80% of SC Leaders predict that the person they are matched with is also an SC type. We can strongly reject the hypothesis that the distribution of predicted cooperation types is the same across the three Leader types:  $\chi^2(6df) = 81.11$ ,  $p < 0.001$ . Pair-wise Fisher exact tests performed separately for each preference type are all significant at the 1% level. Thus, subjects' predictions about others' preference types are consistent with a false consensus effect.<sup>18</sup>

Our next step is to explore whether such a false consensus effect is actually driving our results about differences in leader contributions across preference types. It may be that differences in cooperation preferences are not the reason why SC subjects contribute more than NC subjects in the role of leader. Instead, SC subjects may choose to make larger leader contributions than NC subjects because they are more optimistic that Followers will respond with positive contributions. If this is in fact the case, we would then expect that, for a *given* belief about the opponent's type, leader contributions would not be significantly different across Leaders' preference types.

To explore this issue, we augment our regression analysis of Leaders' contributions developed in Models I–III and reported in Table 1 above with the variable "Degree of Optimism." This variable measures the Leader's best-response to his or her own predictions about the opponent's conditional contribution decisions. The higher the Leader's best-response to his or her own beliefs, the more optimistic he or she is about the cooperativeness of their Follower: the most optimistic Leaders are those

whose best-response is to contribute five tokens to the joint project because, as explained above, these Leaders predict that the Follower is a SC. The least optimistic Leaders are those whose best-response is to contribute nothing: These subjects predict that they are matched either with a NC or with a Follower that belongs to the category Other. Leaders whose best-response range from 1 to 4 predict that they are matched with a WC.<sup>19</sup>

The results of the regressions are shown in Table 3.<sup>20</sup> The variable "Degree of Optimism" is significant and positive in all three models: consistent with a belief-based explanation of differing leader contributions across types, Leaders who are more optimistic about the cooperativeness of their Follower make higher contributions. Nevertheless, for a *given* degree of optimism, WC Leaders still contribute about 1 token more than NC Leaders, and SC Leaders contribute about 1-1/2 tokens more than NC Leaders (both coefficients are significantly different from zero at the 1% or 5% level). Hence, Leaders with the same degree of optimism do make different contributions depending on their preference type.

Our controls for individual characteristics and session effects substantially reproduce the same pattern of results observed in the regressions reported in Table 1: Leaders studying Economics contribute significantly less than others, as do Leaders with high Machiavellian scores, as do Leaders who know more other participants in the session. Session dummies, included in Model III, are jointly insignificant, as is the dummy controlling for gender and our measure of subjects' risk attitudes.

Overall, these results show that Leaders' expectations about their opponent's preference type are systematically biased toward their own preference type (i.e., they are influenced by a false consensus effect). However, the large differences in leader contribution decisions between SC, WC, and NC subjects that we observed in our experiment cannot be entirely explained in terms of systematic differences in expectations about others' cooperation preferences, because for a *given* belief about the

18. One may argue that such a strong bias toward the own preference type may be because of the fact that subjects do not report their beliefs truthfully but rather in a way that satisfies the need to see oneself behaving "as others do" and hence behaving appropriately. In fact, one potential explanation for the false consensus effect is based on such a "motivational" mechanism. However, if this is the case, one would also expect the bias to disappear or to be mitigated in the presence of financial incentives and to be stronger for answers to questions about socially desirable/undesirable activities. However, the false consensus effect has also been reproduced in the presence of monetary incentives, as in the present experiment. Moreover, a false consensus effect has been found also in studies employing morally neutral questions (see, e.g., Engelmann and Strobel 2000, 2007).

19. Again, the caveat noted in footnote 17 applies.

20. Because Leaders' type and degree of optimism are correlated it may be difficult to identify the contribution of each factor to leader contributions if there is a co-linearity problem. However, checks for multicollinearity (based on variance inflation factor values) suggest that this is not the case for the Models reported in Table 3.

TABLE 3  
Leader Contribution and Degree of Optimism

	I	II	III
1 if SC	1.712*** (0.497)	1.503*** (0.462)	1.427*** (0.524)
1 if WC	1.228*** (0.344)	1.193*** (0.295)	0.966** (0.375)
Degree of optimism	0.167* (0.097)	0.175** (0.084)	0.159* (0.095)
1 if male		0.265 (0.266)	0.349 (0.280)
1 if area of study is economics		−0.913*** (0.265)	−0.925*** (0.286)
Willingness to take risks		−0.023 (0.078)	−0.011 (0.084)
Machiavellian score		−0.019* (0.010)	−0.019* (0.011)
Number of known others in session			−0.417* (0.224)
Constant	0.414** (0.175)	2.594* (1.345)	2.523* (1.465)
Session dummies	No	No	Yes
N	96	96	96
F-statistic	F(3,92) = 20.16	F(7,88) = 14.30	F(13,82) = 10.54
Prob > F	0.000	0.000	0.000
R <sup>2</sup>	0.390	0.479	0.510

OLS regressions. Dependent variable is Leader’s contribution. Robust standard errors are in parentheses.  
\*.05 ≤ *p* ≤ .10; \*\*.01 ≤ *p* < .05; \*\*\* *p* < .01.

Follower’s cooperativeness, leader contributions are still significantly different across Leaders’ preference types.

IV. DISCUSSION & CONCLUSIONS

We examine how cooperativeness and beliefs about the cooperativeness of others affect leadership contributions in a simple leader-follower game. The game uses the same type of earnings functions used in experiments examining voluntary contributions to a public good. Thus, a Follower’s contribution increases group earnings at the expense of the Follower’s narrow personal interests. Our experiment allows Leaders to attempt to induce such group-oriented behavior through “leading-by-example”: by contributing Leaders might, if the Follower is sufficiently conditionally cooperative, induce the Follower to contribute as well. Our focus is on the extent to which the Leader’s willingness to lead-by-example depends on her own cooperation preferences, her beliefs about the cooperation preferences of her Follower, and other personal characteristics.

As in previous experiments, we find that many Followers are conditionally cooperative and are willing to reciprocate the Leader’s contribution. About half of our subjects exhibit a degree of conditional cooperativeness such that it pays for a self-interested Leader to contribute something, and about half of these cooperators are classified as “SCs,” as they are conditionally

cooperative to the extent that a self-interested Leader should contribute her entire endowment. These cooperation preferences are strongly correlated with (unconditional) Leader decisions. For example, SC Leaders contributed around 57% of their endowments, significantly more than NC Leaders who contributed only 12% of their endowments. Part of this effect can be explained by subjects’ personal characteristics. Economists contribute less as Leaders, as do those who are more “Machiavellian.” However, even after controlling for these personal characteristics, SC Leaders contribute 40% more of their endowments than NC Leaders.

Our finding that SCs make higher Leader contributions than NCs is in line with recent studies from trust and sequential social dilemma games where subjects play both roles. For example Altmann, Dohmen, and Wibrál (2008) and Chaudhuri and Gangadharan (2007) both find that trustees who reciprocate more are more trusting in trust games. We see two main differences between trust games and our leader-follower game. First, our focus on leading-by-example has guided our choice of a game where the leader and follower have identical choice sets and earnings functions, and so the leader’s decision can be easily viewed as an “example” to the follower. In the trust game, there is an asymmetry between roles that goes beyond the sequential structuring of choices, and this asymmetry makes it less clear that the trustor can “lead by example.” Second, in our game the follower’s decision affects group earnings, whereas

in a trust game the second-mover's decision is a pure transfer, only affecting the distribution of group earnings.

Altmann, Dohmen, and Wibral (2008) speculate that a false consensus effect, whereby selfish subjects believe others are selfish and reciprocal subjects believe others are reciprocal, could explain why reciprocal trustees trust more in their experiment. The same effect may also explain why SCs make higher Leader contributions in our experiment—they may be more optimistic about the cooperativeness of Followers. Similarly, this could explain the positive correlation between decisions as first-mover and second-mover reported in sequential social dilemma game experiments where subjects play both roles (see, e.g., Blanco et al. 2008; Brutel and Eisenkopf 2009; Fischbacher, Gächter, and Fehr 2001). Differently from these studies, our design allows us to control for differences in beliefs, and we do indeed find a strong correlation between own cooperation preferences and beliefs about the cooperation preferences of others: SCs are more optimistic about the chances of being paired with another SC. However, even after controlling for optimism, SCs contribute about 30% more of their endowment than NC Leaders. Thus, differing degrees of optimism can only explain part of the difference between the Leader contributions of NCs and SCs and most of the difference reflects their differing social motivations.

Our findings are comparable with those reported in a recent experiment by Blanco et al. (2009). Their extensive design uses several treatments to examine the relationship between cooperativeness and beliefs in a sequential prisoner's dilemma game experiment where subjects play both roles. In their Baseline treatment, they do not elicit beliefs about second-movers' cooperativeness, and find, like the studies cited above, that a majority of subjects make the same choice as a first-mover and as a second-mover. The correlation between first- and second-mover decisions persists in a second treatment where, as in our experiment, they elicit subjects' beliefs about second-movers' cooperativeness. They find that beliefs about second movers' cooperativeness are positively related to subjects' own cooperativeness, which is consistent with a consensus effect. In a third treatment, Blanco et al. (2009) provide subjects with feedback about the true distribution of second-movers' cooperativeness before eliciting their first-mover decisions. They find that

the correlation between first-mover and second-mover decisions persists even when accurate feedback about second-movers' cooperativeness is provided, suggesting that a consensus effect can only provide a partial explanation for the positive correlation between first-mover and second-mover decisions observed in their experiments.<sup>21</sup> Our findings are also consistent with those of Vyrastekova and Garikipati (2005): Using a trust game, they correlate trustor decisions with their beliefs about the trustee's decision and with their distributional preferences as measured using the "*Decomposed Game* technique," an instrument developed by sociologists and social psychologists to assess individual value orientations (see, e.g., Liebrand et al. 1986). They find a strong relation between distributional preferences and trustor decisions even after controlling for beliefs. They also find that beliefs are strongly correlated with distributional preferences.

We only address a narrow aspect of leadership: leading-by-example. Nevertheless our results are suggestive that effective leadership will depend on the leader's cooperative preferences and beliefs. To the extent that a large part of the variation in Leader contributions can be explained by cooperation preferences, even after controlling for optimism, this suggests that groups may perform better when led by individuals who are willing to sacrifice personal benefit for the greater good. Furthermore, because beliefs are highly correlated with cooperation preferences, such individuals are more likely to have optimistic views about Followers that will reinforce their propensity to contribute. Although noncooperative Leaders could, in principle, do anything that an optimistic cooperator does, their cooperation preferences and expectations about others may make them less likely to provide effective leadership.

A natural question that follows from our findings and that may be particularly relevant in settings that involve repeated interactions is whether it is more beneficial for the group that the most cooperative individuals set an example by committing to an initial contribution, or whether it can be better to have other, less

21. Note that their subjects are classified as cooperative or not according to whether, as second-mover, they cooperate or defect in response to cooperate. Our second-movers fill in a contribution schedule indicating how many tokens they contribute (up to 5) for each possible contribution decision by the first-mover (again, a number from 0 to 5). We measure a subject's degree of cooperativeness based on the slope of this contribution schedule.



cooperative individuals move first and let SCs observe their contributions and discipline them. Rivas and Sutter (2008) report on an experiment where they let leaders move after other subjects have made a contribution and find that this does not affect cooperation rates in a simple public good setting. However, they do not selectively choose the most cooperative types as leaders in their experiment. Moreover, leaders in their study can only discipline first-movers through their own contribution decisions. An interesting development, which we leave for further investigation, would be to assess how cooperativeness is affected when second-movers are given some form of sanctioning or rewarding power such that they can effectively discipline early contributors' behavior.

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Additional Supporting Information may be found in the online version of this article:

### Appendix S1: Experimental instructions.

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