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Leadership Styles and Free-Riding: An Experimental Investigation

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Abstract We investigate the effect of leadership styles on free-riding. Leadership styles are implemented by asking the leader to choose a message from a set of messages that correspond to specific styles. The leader sends these messages to the participants at the beginning of each round of a voluntary contribution experiment. There are two treatments per style: in one, the message is public; in the other, the public message is supplemented by vertical chat between the leader and targeted participants. When there is no chat, we find that the collegial leadership style leads to less free-riding than the top-down leadership style. In contrast, when there is vertical chat in addition to the public message, the top-down leadership style reduces free-riding more than the collegial leadership style and overall contributions are larger. Private communication enables top-down leaders to be more successful at improving coordination between the participants and in motivating them than collegial leaders. The results suggest that the organizational costs associated with leading a team with a collegial leadership style may have been under-estimated in the vast literature that promotes this style.

Key words leadership style, voluntary contribution mechanism experiments, coordination, free-riding, communication.

Research question This paper investigates the effects of leadership styles on free-riding and cooperation decisions.

Motivation Leadership is usually understood as the process of social influence in which one person enlists support of others in the accomplishment of a common task. Leaders lead people and have followers and managers manage tasks and have subordinates. Since the mid-twentieth century psychologists, led by Kurt Lewin, set out to identify different styles of leadership. While further research has identified more specific types of leadership, this early study was very influential and established three major leadership styles: the authoritarian leadership style, the democratic leadership style or laissez-faire leadership style. This work and the work of others motivated much work in management and psychology. To the best of our knowledge, this paper is the first one to study leadership styles on cooperation in an economics experiment and in a setting that replicates incentives as they are set in organizations.

Related experimental literature on leadership The main channel to study leadership using voluntary contributions experiments has relied on having the leader being the first mover in the game. Sutter, Levati and van der Heijden (2007) examine leadership in a sequential public goods game with heterogeneous endowments. The leader is the first player to contribute and the endowments of two “rich” and two “poor”

members are common knowledge. The main result is that the presence of a leader increases average contribution levels but less so than in case of homogeneous endowments. Guth, Werner et al (2007) examine the effects of leading by example in voluntary contribution experiments and find that leading by example results in a marginally significant increase in contributions, compared to a situation without leadership. Rivas and Sutter (2011) examine the effects of a voluntary leadership not restricted to one specific group member through comparing contributions in a public goods game with voluntary leadership to contributions when (a) the same sequence of leadership is enforced exogenously, and (b) there is no leadership at all. They find that voluntary leadership when each group member can take the lead yields clearly higher contributions than when leadership is enforced exogenously, or when there is no leader at all.

Communication has also been used another experimental procedure to study leadership. Using coordination games, Brandts and Cooper (2007) study the effect of messages in context in which leaders can implement bonuses to participants.

Kochera, Pogrebnad and Sutter (2013) examine whether and to what extent do other-regarding preferences of team managers influence their management style in choice under risk. In the experiment, teams of three receive a sequence of risky lottery pairs. All team members vote for their preferred lottery, but the team manager makes final decision (autocratic (contradicts) vs. democratic (confirms)). After comparing the decisions of elected leaders with the decisions of heterogeneously assigned leaders, Engelmann and Strobel (2004) identify that one of the questions that has to be addressed in economics is whether management style's influence on employees' performance.

The game theoretical setup The game theoretical setup is a repeated linear voluntary contribution mechanism (hereafter, VCM). Players are either assigned to a participant role or to a leader role. Let i with $i = \{1, \dots, 4\}$ denote the four individuals that compose a group $G = \{1, \dots, 4\}$ who interact for $t = \{1, \dots, T\}$ periods with $T = 16$. Each player i receives an endowment $e_{i,t}$ that is fixed and that can be either privately consumed or contributed to the group account c_j . The internal and external return α_j to contributing to the group account is equal to 0.4 of the value of the token contributed with $0 < \alpha_j < 1 < 4 \cdot 0.4$. The payoff of a player i in period t is defined by: $\pi_{i,t} = e_{i,t} - c_{i,t} + 0.4 \sum_{j=1}^4 c_{j,t}$. Given $0 < \alpha_j < 1$, the dominant strategy for a selfish, payoff-maximizing player is to contribute nothing and given $\alpha_j < 1 < 4 \cdot 0.4$, the socially efficient outcome is to contribute everything. Each group i is matched with a leader k . Leaders receive no endowment and their payoff in period t is defined by: $\pi_{k,t} = 0.5 \sum_{j=1}^4 c_{j,t}$. The external return to contributions to the group account α_k is greater for k players, which replicates the fact that leaders are, in reality, more likely to be in a managerial position in which they receive higher private benefits from their group's productive output.

Experimental design Our experiment was designed to create test the effect of leadership styles on cooperation and free-riding decisions. Subjects were randomly assigned to either the role of a leader or a participant based on their time of login in the interface. The first subjects to login were leaders and the other subjects were assigned to the role of participants. In the interface, group members were named "participants" and leaders were named "leaders". Participants played 16 rounds of a linear public good game in fixed groups of five subjects composed of one leader and four participants. The last round was announced the specifications of the game that are explained in Table 1 were known to all participants, with the exception of the initial cash endowment which differed between the leader and participant roles.

This difference was introduced in order to guarantee minimal earnings to the leaders in case contribution decisions of the participants were very low. The initial endowment of the participants was non zero so that the instructions could be read out loud. The amount of the initial endowment was not disclosed but its existence was.

Table 1: Features of the experiment

Treatment name	Collegial no chat	Top down no chat	Collegial vertical chat	Top down vertical chat
Leadership style	Collegial	Top Down	Collegial	Top Down
Communication	No chat		Vertical chat	
Show-up reward			\$6	
Undisclosed leader initial cash endowment			\$6	
Undisclosed participant initial cash endowment			\$2	
Leader endowment per round			0	
Participant endowment per round			10	
Value of a token			\$0.10	
MPCR participants			0.4	
MPCR leader			0.5	
N	Ten groups of five subjects per treatment, composed of one leader and four participants			
Number of rounds announced			16	

The sequence of decision and information disclosed was similar across all rounds. First, the leader was shown a description of his role as a leader and s/he was given the list of messages that s/he can send to participants. For concision, we do not report the list of messages here. The list can be provided upon request. Leaders in the Collegial treatments received the messages correspond to the collegial leadership style and leaders in the Top down treatments received the messages that correspond to the top down leadership style. The interface provides leaders with nine pre-registered messages that correspond to nine states. These states include, for example, “an initial message to set the tone and expectations”, a message “after contributions are decreased”, a messages “after contributions are increased”, etc. The interface instructed: “You begin the round by sending a message to all participants in your group”. The leader would select a message and submit it to the participants. Participants received the message and they had to acknowledge that they have read it. In the Vertical Chat treatment, participants were given a two minute-period to send messages to the leader. Communication between participants was not permitted. During that period, leaders were able to send messages to targeted participants. In the No Chat treatments, leaders and participants would be given a one minute-period to record their thoughts about their strategy and the decisions of others or their decisions, the decision of others and the leader, respectively. This feature of the interface added time between each round in the experiment, which reduced the difference between both treatments on that dimension and promoted introspection. The real difference between the two treatments is the difference in ability to communicate and not the time allocated to each decision. A one-minute introspection mode was chosen over a two-minute one in order to avoid loss in attention to

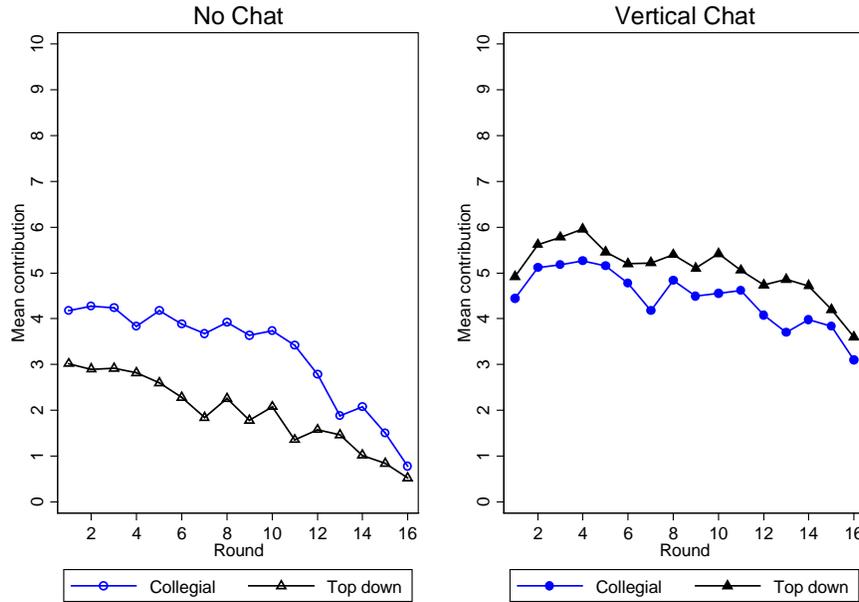
the game, which would have been more likely to happen with a two minute period. Experiments were conducted in the Veconlab at the University of Virginia and using the Management/Leadership Experiment of the Veconlab software (<http://veconlab.econ.virginia.edu/>). Treatments were assigned randomly to subjects; we also randomized treatments over morning and afternoon time slots and over days of the week.

Results For concision, only the main results are presented here. The results are summarized in Table 2 and Figure 1. Contributions are the highest in the top down vertical chat treatment, so when assertive leaders can both send formatted messages to the participants and send private messages to targeted participants. The lowest level of contribution is achieved when leaders who are assigned to the top down message interface do not have the ability to chat with targeted participants. In the case in which no communication is possible between the leaders and the participants, then the collegial messages lead to higher contributions than the top down messages. In the no chat treatments, contributions start at 40% of the endowment or below and end at 10% of the endowment. In the vertical chat treatment, contributions start between 40% and 50% of the endowment and they stay above 30% of the endowment, which shows that there is no sharp decline in the contribution patterns in the presence of vertical chat.

Table 2: Descriptive statistics per round and per treatment

Treatment name	Statistic	Obs	Mean	Std. Dev.	Min	Max
	Participant					
Collegial no chat	contribution	640	4.06	3.50	0	10
	Participant earnings	640	1.24	0.28	0.52	2.16
	Leader earnings	160	0.81	0.52	0	1.95
Top down no chat	Participant					
	contribution	640	2.44	2.98	0	10
	Participant earnings	640	1.15	0.26	0.4	2.04
	Leader earnings	160	0.49	0.38	0	1.3
Collegial vertical chat	Participant					
	contribution	640	5.57	4.23	0	10
	Participant earnings	640	1.33	0.33	0.4	2.2
	Leader earnings	160	1.11	0.67	0	2
Top down vertical chat	Participant					
	contribution	640	6.35	3.95	0	10
	Participant earnings	640	1.38	0.32	0.4	2.2
	Leader earnings	160	1.27	0.57	0	2

Figure 1: Mean contribution per round and per treatment



The effect of message types on contribution is investigated using a linear regression with group random effect on mean group contribution per round as opposed to mean individual group contribution in order to avoid accounting for the noise that would be generated by mean individual contributions. The results without group random effect provide much stronger coefficients and the signs do not change. Table 4 shows that positive messages do not have a systematic effect on mean group contribution per round in the no chat treatment

Table 4: Effect of message types on mean group contribution per round with group random effect

Variables	No chat		Vertical chat	
	Collegial	Top down	Collegial	Top down
Positive messages	0.571 (0.615)	-0.645 (0.472)	1.034** (0.425)	0.998* (0.510)
Negative messages	-0.726 (0.618)	-1.101** (0.479)	-0.178 (0.438)	-0.215 (0.533)
Constant (neutral messages)	4.078*** (0.610)	3.220*** (0.592)	5.051*** (0.616)	5.840*** (0.789)
Observations	160	160	160	160
Number of groups	10	10	10	10

Standard errors in parentheses

*** p<0.01, ** p<0.05, *

p<0.1

Analysis in progress Current analysis of the chat and of the contribution patterns show that leadership styles have strong effects on leaders' ability to motivate and synchronize the contributions of the participants. Most of our effort will be focused on documenting and on explaining the results, using the data from chat and the responses to the post-experiment questionnaires.

References

Brandts and Cooper (2007) "It's What You Say, Not What You Pay: An Experimental Study of Manager-Employee Relationships in Overcoming Coordination Failure," *Journal of the European Economic Association*, 5(6): 1223-1268.

Guth, Levati, Vittoria, Sutter and van der Heijden (2007) 'Leading by example with and without exclusion power in voluntary contribution experiments,' *Journal of Public Economics*, 91(5-6): 1023-1042.

Kochera, Pogrebnad and Sutter (2013) 'Other-regarding preferences and Management Styles,' *Journal of Economic Behavior & Organization*, 88: 109-132.

Rivas and Sutter (2011) 'The benefits of voluntary leadership in experimental public goods games', *Economics Letters*, 112: 176-178.

Sutter, Levati and van der Heijden (2007) 'Leading by example in a public goods experiment with heterogeneity and incomplete information' *Journal of Conflict Resolution*, 5: 793-818.