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Glad Tidings and Grave Warnings: The Role of Advice on Cooperation in Public Goods Dilemmas With Value Uncertainty

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We investigate how third-party advice on the estimated value of a public good acts as a dual-uncertainty reducing mechanism to encourage cooperation in a trust social dilemma. Experiment 1 finds that the valence of an advisor's estimate affects cooperation behavior and that this advice effect is mediated by the level of trust that an individual has in fellow group members. Experiment 2 finds that when estimates about the value of the public good are mixed, trust in experts declines, and trust in other group members also declines. Experiment 3 finds that mixed valence estimates do not affect cooperation behavior when the majority of advisors are in consensus. In merging the social dilemma and advice-giving literatures, we show one way to navigate the dual-uncertainty problem when producing public goods and how independent, third-party advice can influence interpersonal relations among group members. *Organization Management Journal*, 10: 4–21, 2013. doi: 10.1080/15416518.2013.781396

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Many of the benefits we enjoy in organizations and society come in the form of *public goods*: resources that can be enjoyed by anyone, irrespective of who helped in their provision and without diminishing their benefits to others (Olson, 1995). Public goods are provided by individuals cooperating: They contribute private resources, incurring short-term costs to generate collective, long-term benefits (Messick & Brewer, 1983). For instance, the construction of a wind power grid, intended to produce a bounty of green energy for citizens, is made possible through the cooperative efforts of citizens, government agencies, private businesses, not-for-profit entities, and educational institutions.

However, there is often a dearth of cooperation necessary to produce public goods. For example, many green marketing initiatives struggle because of insufficient private resource contributions (Wiser & Pickle, 1997). The social dilemma paradigm maintains that cooperation is challenging when producing public goods because of an inherent tension between satisfying self-interests and collective interests (Dawes, 1980). Public goods provision is a type of *social dilemma* (Messick & Brewer, 1983) or interdependent decision where "individually reasonable behavior leads to a situation in which everyone is worse off than they might have been otherwise" (Kollock, 1998, p. 183). When producing public goods, individuals may be motivated to satisfy their own interests at the expense of the collective's: They defect or do not contribute toward the public good (Zeng & Chen, 2003). Individuals do not contribute either because they go on the offense (i.e., they free ride and attempt to enjoy the benefits of the public good without incurring much [or any] of the cost) or they go on the defense: that is, they anticipate others are untrustworthy and seek to avoid being "suckered" (Schnake, 1991; Yamagishi & Sato, 1986). The consequence of undercontribution, however motivated, is that the collective incurs the ultimate costs: The public good's provision is either slowed or halted.

Two sources of uncertainty encourage undercontribution and are present when providing many real-world public goods. The first source is *social uncertainty* (Sniezek, May, & Sawyer, 1990). This barrier is a function of insufficient information about whether individuals will contribute toward the public good (Messick, Allison, & Samuelson, 1988). For instance, water quality (a public good) suffered in the 1990s in northern Florida primarily from farmers' lack of certainty about one another's willingness to invest in green farming practices (Lubell, 2004).

The second source of uncertainty is *outcome variance*. This is a type of environmental uncertainty—a lack of information

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about the value of the public good prior to contributing (van Dijk, Wilke, Wilke, & Metman, 1999). McCarter and colleagues (2010) found that outcome variance negatively affects contributions to further a collective interest when there is a potential for a loss (i.e., loss prospect) in the value of the public good. Fearing that the value of the public good may not be worth the aggregated contributions of the group, an individual defensively does not contribute. To illustrate, the potential wind power grid in the central United States is anticipated to supply the Midwest and eastern states with abundant green energy. However, it is unclear how much energy (if any) would be available—let alone whether it would be enough to balance the collective costs contributed to construct the grid (Joyce, 2009). Not limited to green energy, other examples of public goods with outcome variance include generic advertising (Miller, 1982) and strategic alliance initiatives (Luo, 2007).

These two uncertainty sources pose a significant problem to organizations because, in addition to their ubiquity when producing real-world public goods, both encourage *independently* an individual's tendency to satisfy his or her self-interests at the expense of the collective's (McCarter et al., 2010). The presence and independence of social uncertainty and outcome variance create a need to explore dual-uncertainty reducing mechanisms. Further, although we know many ways to reduce social uncertainty, the same cannot be said for outcome variance, and this is despite over a decade of admonition (Gärling, Biel, & Gustafsson, 1998). We fill these gaps by drawing from a body of work that has received little attention from social dilemma scholars: the third-party, advice-giving literature (Bonaccio & Dalal, 2006).

Drawing from social psychology and decision-making domains, we submit that the existence of social uncertainty and outcome variance in public goods dilemmas makes individuals susceptible to informational social influence (Deutsch & Gerard, 1955). Advice from third-party experts as informational social influence may affect an individual's perceptions of the value of the public good and willingness to trust others. The number of advisors and the distribution of outcome valence estimates may also play a critical role in affecting contribution behavior. A series of laboratory experiments tests our predictions and simulates the provision of green energy sources to remain grounded in a real-world context. We preface further discussion with a boundary condition. Because defection can still abound even after offensive defection is made impossible (Kollock, 1998; Marinoff, 1999), we follow the burgeoning interest in mitigating defensive defection (McCarter, Mahoney, & Northcraft, 2011; Rockmann & Northcraft, 2008).

THEORETICAL BACKGROUND AND HYPOTHESES

Public Goods Dilemmas, Outcome Variance, and Trust

Ostrom's (2003) behavioral model submits that three structural elements influence cooperation in social dilemmas: the institution (through rules and incentives), cultural norms (at the individual, group, or societal level), and physical characteristics of the shared resource.[1] These structural elements impact the willingness of the decision maker to trust others, and, consequently, affect the likelihood of that individual's cooperation (in our case, contribution toward the public good).

Outcome Variance

Embedding the dual-uncertainty problem of public goods dilemmas into Ostrom's (2003) model, two elements are germane. The first is the physical characteristics of the shared resource. Outcome variance in the value of the public good is a physical characteristic that influences cooperative behavior (Ostrom, 1990). Compared to when the value of the public good is known prior to an individual's contribution, outcome variance in the value of the public good containing only the prospect of a gain should have no effect on the likelihood of cooperation (or contributing to the public good) (van Dijk et al., 1999). However, when outcome variance contains the prospect of a loss—that is, the value of the benefit from the public good may be less than my individual contribution—the likelihood of cooperation declines (McCarter et al., 2010). As discussed by McCarter et al. (2010), loss prospects decrease the likelihood of contributing toward a public good because they decrease an individual's subjective expected net benefit from the public good.

Trust

The second relevant construct from the Ostrom (2003) model is trust. *Trust* is a key motivator for cooperation in public goods dilemmas (De Cremer, 2007; McCarter & Northcraft, 2007). Though many conceptualizations of trust exist (for reviews see Hardin, 2001, 2002; Lewicki, Tomlinson, & Gillespie, 2006), the unidimensional psychological approach views trust as an individual's "expectations, assumptions or beliefs about the likelihood that another's future actions will be beneficial, favorable or at least not detrimental" to them (Robinson, 1996, p. 576) and views trust and distrust at opposite ends of the same spectrum (Jones & George, 1998). Inherent to Robinson's (1996) definition of trust is the necessity of the presence of risk and that the trustor is aware of the risk he or she is taking (Mayer, Davis, & Schoorman, 1995). The unidimensional, psychological approach views trust as having both cognitive (or calculative) and emotional (or value) elements (McAllister, 1995). For an individual to have trust in another person there must be the perception of shared expectations and values (Jones & George, 1998). In relation to social dilemmas, individuals must mutually hold (and believe others hold) an expectation of cooperation (the cognitive side of trust) and goodwill (the emotional side of trust). In such a situation one could cooperate without fear of being "played the sucker" (Schnake, 1991).[2]

Informational Social Influence and Third-Party Advice

Two literatures are germane to this article's focus on third-party advice and their effects on decision making in public

goods dilemmas with environmental uncertainty: informational social influence theory and the judge–advisor system paradigm.

Informational Social Influence

Theories of informational social influence maintain that individuals seek and use information provided through their social environment as cues regarding what to think about and how to behave in an uncertain situation. *Informational social influence* occurs when people "accept information obtained from another as *evidence* about reality" (Deutsch & Gerard, 1955, p. 629). Individuals are particularly susceptible to informational influence when there is environmental uncertainty coupled with the fear of incurring negative consequences for taking an incorrect course of action (Festinger, 1954; King, 1975). In such situations, information provided by others focuses an individual's attention to specific, important aspects of the situation and as a consequence influences perceptions of the situation and the observer's subsequent behavior (Salancik & Pfeffer, 1978).

Research directly examining the effects of social influence on cooperation behavior in public goods dilemmas is sparse. Wit and Wilke (1998) draw from normative, social influence theory to explain people's cooperation behavior in public goods dilemmas. The work most closely related to the current research is from experimental economics. Chaudhuri and colleagues (2006) examined how advice from progenitors of a public goods dilemma with respect to the amount to contribute influenced contribution levels in individuals presently playing a public goods dilemma with certain value. The Chaudhuri et al. (2006) paper found that intergenerational advice, when made common knowledge by being read out loud, increased the level of contribution compared to either when no advice was given, when advice was given in private, or when advice was shared by everyone presently playing but not read out loud. Similar to the Wit and Wilke (1998) paper, Chaudhuri and colleagues' (2006) work focuses on how norms (concerning the appropriate contribution level) emerge through advice giving. The current research relaxes the assumption that the public good's value is known prior to contributing and, consequently, examines what effect advice about the value of the public good has on cooperation rates.

Judge–Advisor Systems

The judge–advisor system (JAS) paradigm is based on the observation that the opinions of others can influence heavily the formation of our perceptions, attitudes, and choices (Ajzen & Fishbein, 1980).[3] Third-party advisors are often used by policymakers and managers to assist individuals in making more effective decisions because it is assumed that these advisors possess information that others (namely, those making the managerial decision) lack (Harvey, Harriea, & Fischer, 2000). When advice is provided by a third party, the receiver of that advice is the final "judge" or decision maker. The information from the third-party advisor is considered by the judge to make a more accurate assessment of the "correct" state of the world (Yaniv, 2004). Advice provided by these third parties constitutes a form of informational social influence (Messick & Ohme, 1988) since the receiver believes that the advisor has a more complete picture of the situation and that using the advice will aid in making the "right" decision (Insko, Sedlack, & Lipsitz, 1982).

There are innumerable situations in which individual decision makers (judges) receive guidance from external experts (advisors). These situations typically fall into one of three broad categories: dependent, independent, and cued (Sniezek & Buckley, 1995). Dependent judges have no basis for generating choices without the input of advisors and are forced to rely on their advisors heavily. Independent judges have informational resources of their own and form a tentative judgment before hearing what the experts have to say. Cued judges differ from independent judges in that they are exposed to the advice of experts before generating their own judgments (Ronis & Yeats, 1987). Cued judges are, perhaps, the most common naturally occurring of the three and represent situations where decision makers have not already come to a firm judgment before being exposed to the advice of others. For example, if legislators considering green energy initiatives were at least somewhat well informed on the issue but solicited the expert input of, say, an energy committee prior to coming to any conclusions of their own, then this would be considered a cued judge–advisor relationship.

Hypotheses

In public goods dilemmas, third-party advice about the value of the public good can serve two purposes. The first purpose is that third-party advice can reduce uncertainty about the value of the public good. Returning to our earlier wind power example, policymakers are uncertain as to the benefits of such an initiative and, to reduce that uncertainty, turn to third-party advisors such as the Intergovernmental Panel on Climate Change for estimates about the possible value of this public good (Blackwell, 2010). The possibility that a new wind power grid could produce little or no energy leaves potential contributors open to informational social influence from third-party advisors.

Second, reinforcement-affect theory suggests that the level of trust one individual has in his or her group members may be a function of the information valence received from the third-party advisor (Byrne, 1971). Individuals who experience independently a positive external stimulus (positive information about the value of the public good) are more likely to view associated others (even complete strangers) more positively and as more trustworthy (Byrne & Clore, 1970; Veitch & Griffitt, 1976). When the advice from a third-party expert is favorable (i.e., the value of the public good will be worth more than the combined contributions of the group) and is common knowledge among decision makers, an individual's fear of incurring a loss is reduced and the individual's trust in others is increased. As a consequence, we predict that individuals

receiving favorable third-party advice will be more likely to contribute toward a public good than will those not receiving such advice. However, when the situation is reversed and the advice from the third-party expert is unfavorable (i.e., the value of the public good will be worth less than the combined contributions of the group), individuals' fear of incurring a loss increases. Therefore, such individuals will be more likely to conclude that their fellow group members are also fearful of incurring a loss, and, as a consequence, will be less trusting that their group members will contribute toward the public good. Because of this decrease in trust, these individuals will be less likely to contribute toward a public good compared to when no advice is provided. This theorizing leads to the following hypotheses.

Hypothesis 1a: An individual will be more likely to cooperate (i.e., contribute toward the public good) when the advice from the expert is favorable, compared to when no advice is given.

Hypothesis 1b: An individual will be less likely to cooperate (i.e., contribute toward the public good) when the advice from the expert is unfavorable, compared to when no advice is given.

Hypothesis 2a: An individual's trust that his or her group members will cooperate will increase when the advice from the expert is favorable, compared to when no advice is given.

Hypothesis 2b: An individual's trust that his or her group members will cooperate will decrease when the advice from the expert is unfavorable, compared to when no advice is given.

Hypothesis 3: Trust will mediate the relationship between favorable advice from a third-party expert and an individual's likelihood of cooperating.

OVERVIEW OF EXPERIMENTS

To test and extend the preceding hypotheses, we use a series of laboratory experiments. Laboratory experiments provide high *internal validity* and *psychological realism* whereby we can isolate the relationship between perceptions (i.e., trust) and actual behavior (e.g., cooperation) (Colquitt, 2008; Creswell, 2003). The paradigm the current experiments utilize is an assurance dilemma paradigm (Sen, 1985)—also called a trust social dilemma or stag-hunt game (Liebrand, 1983; Skyrms, 2004).[4] The assurance dilemma models public goods problems yet differs from the often utilized prisoners' dilemma in that offensive non-prosocial behavior (i.e., free riding) is impossible, leaving defensive, non-prosocial behavior as the only means of hindering public good provision (Kollock, 1998). There are several benefits from using the assurance social dilemma. First, as observed by Kollock (1998) and Skyrms (2004), the structure of the assurance public goods dilemma isolates trust as the psychological explanatory variable for a group's deviation from cooperation. Even through incentives are aligned in the assurance public goods dilemma to encourage mutual cooperation, each individual must trust that other parties share his or her expectations and values. An individual must expect the others to cooperate and not want to incur "pleasure from being nasty" by defecting (Abbink & Sadrieh, 2009, p. 306). Further, assurance public goods are common in organizational life. Strategic supply chains that reduce their supply base (making each partner indispensable) and the assembly of land parcels to enhance societal welfare with the creation of renewable energy grids are but two examples of assurance public goods dilemmas where the value of cooperation is uncertain and the providers often turn to outside advice for counsel (Joyce, 2009; McCarter & Northcraft, 2007).

Experiment 1 tests the hypotheses already presented. To enhance external validity (Rosenthal, 1990), the subsequent experiments replicate one another and extend the core model. Experiment 2 replicates and extends Experiment 1 by also examining how mixed estimates (i.e., receiving favorable and unfavorable estimates from two independent advisors) influence cooperation. Experiment 3 replicates and builds on Experiment 2 by increasing the number of independent advisors to four and investigates how different distributions of advice valence (e.g., one favorable estimate with three unfavorable estimates) affect cooperation behavior. In this way, external validity is increased through "generalization" with different populations and "exact replication" across experiments (Tsang & Kwan, 1999).

EXPERIMENT 1

Method

Sample and Design

One hundred and twenty-seven students enrolled in business courses at a university in the western United States participated in this experiment for course credit. Experiment 1 investigates the influence of advice (and its valence) on contribution behavior. To this end, this experiment used an unbalanced within-subjects design in which the first factor involved three outcome variance conditions (no outcome variance, outcome variance with only gain prospects, and outcome variance with gain and loss prospects) and the second factor involved two advice conditions (i.e., positive advice, negative advice). The second factor was crossed with the last condition of the outcome variance factor because we are primarily interested in defensive non-prosocial behavior when facing uncertainty with loss prospects. All advice, when provided, occurred when the value of the public good was uncertain and contained a gain and loss prospect.

Task and Procedure

Participants completed this experiment via computer. This allowed all decisions to be made anonymously and privately. Upon registering for the experiment, participants were directed to instructions for a series of five independent resource allocation decisions. These resource allocation decisions were presented in a preselected random order. Each decision in this experiment involved a public goods assurance dilemma with

three players. In each resource allocation decision, participants were asked to imagine themselves in the role of a property owner who, with two other individuals, had to decide whether to transfer his or her property rights to a firm for the development of a green energy power plant or retain them for private development. The firm and power plant were respectively paired in each resource allocation decision. If not, then whoever retained their property rights for private development would receive 200 game dollars and whoever gave their property rights to the firm received nothing.

Participants were informed that at the end of the experiment each of their choices would be randomly combined with the choices of two other participants for each resource allocation decision, and that each participant would be combined with the same group only once. Neither communication nor contact among the participants was permitted, and additional information about the behavior of other participants or their demographics was not provided. After reading the instructions, the participants completed a quiz to assess their understanding of the nature of the resource allocations decisions being made. Once they completed the quiz, participants made the five resource allocations at their own pace, and answered several questions about the game after each resource allocation decision.

Manipulations

Consistent with previous research, outcome variance was manipulated by placing a uniform distribution around the value of the public good. Following McCarter and colleagues (2010), the expected value of the public good *remained constant* in each outcome variance condition, while the upper and lower bounds of the distribution varied to create either a gain-only prospect or a gains-and-loss prospect. The three outcome variance conditions, given three-person groups, were as follows.

- *No variance condition:* The value of the public good, if provided, would be \$1350 (\$450 per property owner).
- *Uncertain, gains-only prospect condition:* The value of the public good, if provided, would be any value between \$900 and \$1800 (between \$300 and \$600 per property owner).
- *Uncertain, gains-and-loss prospect condition:* The value of the public good, if provided, would be any value between \$0 and \$2700 (between \$0 and \$900 per property owner).

Thus, based on these three conditions, any time the value of the public good, once produced, falls below \$200 for an individual property owner (or below \$600 in total value in a three-person group), individuals contributing their property rights would incur a loss. The individual incurs a loss because the value of the public good is less compared to if that individual had kept his or her property rights and the sure amount of \$200.

Our third-party advice manipulation had three conditions. In the control condition, no advice was provided, leaving the participants to face a generic three-player public goods assurance dilemma. In the advice conditions, participants were informed that an individual in a previous session with a PhD and expertise in statistics and estimation methods was provided with additional information about the potential value of the public good and made a prediction based on this information (i.e., the advice offered to the participant). In the favorable condition, the expert believed that the value of the public good would be a total of \$1800 (\$600 per property owner). In the unfavorable condition, the expert believed that the value of the public good would be a total of \$21 (\$7 per property owner).

In each circumstance when advice was provided, participants were informed that the expert was not the same person who provided (or would provide) the estimate about the value of the public good. Having independence among advisors within and across the conditions accomplishes two things. First, independence among advisors prevents participants from experiencing impression effects from repeated interaction with the advisor (Yaniv & Kleinberger, 2000). Second, previous research has found that, controlling for the number of opinions, similar opinions from perceived independent individuals are given more credibility (and as a consequence provide stronger social influences) compared to similar opinions from a group of interdependent individuals (Wilder, 1977). Therefore, this approach facilitates the effective manipulation of informational social influence.

Behavioral and Survey Measures

The behavioral variable of interest in this study was whether an individual behaved prosocially (and contributed their property rights) or non-prosocially (and kept their property rights for private development). This variable is a binary decision: 1 = behave prosocially and 0 = behave non-prosocially.

Trust in whether an individual's fellow group members would contribute their property rights was measured using a 4-item scale adapted from Robinson (1996). These items were "I fully trust both of the other landowners in my group to allocate their property rights to [the respective firm]," "I believe both of the other players in my group have high integrity," "I believe both of the other landowners in my group have good motives and intentions," and "I think both of the other landowners in my group will treat me fairly by allocating their property rights to [the respective firm]" (1 = *strongly disagree*, 6 = *strongly agree*). The trust scale demonstrated high internal consistency: $\alpha = .84$. To assess an individual's fear of incurring a loss even if the public good was provided, we adapted a single item question from McCarter et al. (2010) and asked, "If you and other landowners in your group allocated your property rights to [the respective firm] how concerned would you be about incurring a loss?" (1 = *not at all concerned*, 6 = *very concerned*). Because personal interest or liking toward a "green" cause may influence an individual's willingness to contribute resources toward it, a single-item question asking, "In general, how important do you believe is the development of [the respective green-energy

source]?" (1 = *not at all*, 6 = *very much*) was used as a control variable.

Results

The control variable measuring the perceived importance of the development of a respective green energy source did not significantly affect any of the primary results in the current experiment and was excluded from further consideration. The within-subjects design and dichotomous nature of the main dependent variable (i.e., contribution toward the public good) required that we utilize a Generalized Estimating Equations (GEE) approach. This statistical technique provides output similar to logistic regression and a Wald χ^2 test statistic (Ballinger, 2004). Prior to testing our hypotheses, the proportion of cooperators and fear of incurring a loss in each outcome variance condition in which no advice was provided was compared to assure successful replication of previous findings. Panel A in Table 1 provides the means and standard deviations of these conditions. As shown in the table, comparing the combined proportions of the two gains-only prospect conditions to the loss-and-gain prospect condition, the proportion of contributors toward the public good only significantly differed between the losses-and-gains prospect condition compared to the two gains-only prospect conditions ($M = 78\%$, $SD = 0.42$); ${\chi^2}_1 = 11.47$, $p < .001$. Using a repeated-measures analysis of variance (ANOVA), a Helmert test found that an individual's fear of incurring a loss was significantly greater in the gain-and-loss prospect condition ($M = 4.02$, $SD = 1.31$) compared to the combined means of the uncertain, gains-only and certain prospects conditions ($M = 3.73$, $SD = 1.45$); $F_{1, 126} = 6.49$, $p = .012$. There was no significant difference in fear of occurring a loss when comparing the uncertain, gains-only prospects condition to the certain prospects condition; $F_{1, 126} < 0.30$, *n.s*. These findings are consistent with past research (McCarter et al., 2010).

Panel B in Table 1 displays the mean cooperation rates and trust levels across conditions. Hypothesis 1a predicts that individuals will be more likely to cooperate and contribute toward the public good when the advice from the expert is favorable, compared to when no advice is given. Consistent with this prediction, individuals were more likely to contribute toward the public good when positive advice was provided compared to when no advice was provided; ${\chi^2}_1 = 20.42$, $p < .001$. Hypothesis 1b predicts that individuals are less likely to contribute toward the public good when the advice from the expert is unfavorable, compared to when no advice is given. As posited, individuals were less likely to contribute toward the public good when negative advice was provided compared to when no advice was provided; ${\chi^2}_1 = 5.09$, $p = .024$.

Hypotheses 2a and 2b maintained that the valence of the advisor's estimate would affect the level of trust perceived by group members: A positive outcome estimate would increase trust (H2a) and a negative outcome estimate would decrease trust (H2b) as compared to there being no advice provided. As predicted, an analysis utilizing a repeated-measures ANOVA found trust to be significantly higher when advice was favorable compared to when no advice was provided; $F_{1, 126} = 23.32$, $p < .001$, and trust was lower when advice was unfavorable compared to when no advice was provided; $F_{1, 126} = 8.32$, $p = .004$. Hypotheses 2a and 2b were supported.

Hypothesis 3 posits that an individual's trust in his or her group members would mediate the relationship between an expert's advice valence and that individuals' willingness to allocate his or her property rights toward a green initiative.

TABLE 1
Mean cooperation rates by condition in Experiment 1

Panel A: Mean cooperation rates and fear of incurring a loss in Experiment 1 (replication of McCarter et al., 2010)

	Outcome prospects		
Variable	No variance	Gains-only	Losses-and-gains
Cooperation rates	0.80 (0.40)	0.75 (0.44)	0.61 (0.49)
Fear of incurring a loss	3.76 (1.46)	3.70 (1.43)	4.02 (1.31)

Panel B: Mean cooperation rates and trust by advice-giving treatment

	Advice valence		
Variable	No advice	Favorable advice	Unfavorable advice
Cooperation rates	0.61 (0.49)	0.87 (0.34)	0.46 (0.50)
Trust (in group members)	3.57 (0.99)	3.96 (1.01)	3.32 (1.06)

Note. Standard errors in parentheses. For Panel B, all conditions involve outcome variance with losses-and-gains prospects.

To test this hypothesis, the necessary procedures for testing mediation outlined by Kenny, Kashy, and Bolger (1998) were employed. In step 1 the effects of the valence of an advisor's outcome estimate were examined related to the level of trust (Hypothesis 2a and 2b satisfy this step). In step 2 a GEE found a significant, positive relationship between trust and the likelihood of cooperation; $\chi^2_1 = 51.77$, $p < .001$. Lastly, a Sobel test found complete mediation by trust between the valence of the advice and the likelihood of cooperation: advice with positive outcome valence, $z = 2.54$, $p = .007$, and advice with negative outcome valence, $z = -2.17$, $p = .015$, supporting our prediction.

Discussion

We found support for all of the current experiment's hypotheses. An individual's likelihood of contributing toward a public good with outcome variance was affected by the advice provided to him or her by a third-party advisor. Trust in whether other group members would contribute toward the public good was found to mediate the relationship between third-party advice and contribution behavior. It was also found that fear of incurring a loss decreased when advice from the third-party expert was favorable.

Experiment 2 examines how cooperation behavior may change when two advisors provide either unanimous or conflicting estimates about the value of the public good. This is an important extension for several reasons. First, in the theoretical sense, understanding how conflicting information from third-party advisors in a small-group situation like ours pushes our understanding about the boundaries of informational social influence affects on intergroup relations. Second, in the managerial sense, advice is often acquired from multiple sources of information and these sources of information may contradict.

EXPERIMENT 2

It is often the case that decisions are made based on advice from multiple advisors (Yaniv & Milyavsky, 2007), and such advisors may have different preferences about a course of action. For decades, the divergence of expert advice has been found in a variety of organizational contexts such as medical diagnoses (Einhorn, 1974), auditing financial reports (Kida, 1980), and, more recently, green energy initiatives (Mieszkowski, 2006). Given the ubiquitous nature of conflicting input, we argue that understanding the effects of multiple advisors is important to advancing our understanding of how judges make decisions in public good dilemmas.

Trusting an advisor's estimate is a critical determinant for whether an individual uses the advice (Sniezek & Van Swol, 2001). Receivers of mixed information often discount the information altogether and do not trust the sources of the information. This discounting may be a defensive strategy because the nonexpert cannot evaluate the relative merits of the different sources of advice (Shanteau, 2001). Thus, we predict that receiving mixed estimates from two advisors about the potential value of a public good will have a negative effect on the likelihood of an individual cooperating as compared to when two advisors both give favorable estimates. Receiving mixed estimates, an individual is likely to have low trust in both experts' estimates and discount both estimates. Having low trust in the estimates, an individual remains uncertain about the value of the public good.

When experiencing this uncertainty about the value of the public good, individuals may also experience low trust in their group members. Research on uncertainty and emotions suggests that when individuals face uncertainty about the benefits they will receive from participating in a given situation, they experience negative emotions about, and distrust in, those involved in the situation (Kiefer, 2005). This finding is complimentary to reinforcement-affect theory (e.g., Byrne & Clore, 1970): Feeling negative emotions about a situation leads individuals to perceive those associated with the situation (e.g., their group members and the experts giving the information) negatively (e.g., not to trust them). Experiencing low trust and fearing a potential loss, the individual will be more likely not to contribute toward the public good.

Hypothesis 4: Individuals who receive mixed valence estimates from third-party experts will be less likely to contribute toward the public good compared to when both third-party estimates are favorable.

Hypothesis 5: An individual's trust in the experts' advice will be low when the valence estimates from third-party experts are mixed compared to when both third-party estimates are favorable.

Hypothesis 6: An individual's trust that his or her group members will cooperate will mediate the relationship between the distribution of valence estimates and the likelihood of contributing toward the public good.

Hypothesis 7: An individual's trust in the experts' advice will mediate the relationship between the distributions of valence estimates and trust that his or her group members will cooperate.

Method

Sample

Ninety-four students at a university (different from the one in Experiment 1) in the western United States participated in this experiment for payment. Demographic information about the sample was gathered and showed that 48% of the sample was male, the average age was 20 years, and the average work experience was 2.6 years.

Task and Procedure

The procedures for this experiment were identical to those in Experiment 1, with the addition of three advisor conditions. To avoid the potential issue of mixed-gender effects in

groups, all sessions involved individuals of the same gender. Also, the different resource allocation decisions were blocked by advice condition (i.e., no advice provided, one advisor, and two advisors) and within these blocks the treatments were ordered using a Latin square design, allowing us to control for order effects. Participants received a US$7 show-up fee and were informed that at the end of the session one game would be selected and played for real money at the conversion rate of 2¢ = 1 game dollar earned. The participants did not know which resource allocation decision was selected until the end of the session. Upon the participants completing their decisions, a game was selected from the session, a value randomly chosen, and the subjects were paid accordingly and dismissed.

Additional Treatments

Three additional advice treatments were presented in this experiment. Each treatment involved two advisors providing estimates about the value of the public good, and these three treatments varied as to whether the valence of the advisors' estimates agreed or disagreed.

- *Two favorable estimates:* Two advisors provided favorable estimates about the value of the public good; that is, Expert 1 estimated the value of the public good would be $1575 ($525 per property owner) and Expert 2's estimate was $1890 ($630 per property owner).
- *Two unfavorable estimates:* Two advisors provided unfavorable estimates about the value of the public good; that is, Expert 1 estimated the value of the public good would be $90 ($30 per property owner) and Expert 2's estimate was $15 ($5 per property owner).
- *Mixed estimates:* The two advisors provided valence conflicting estimates about the value of the public good; that is, Expert 1 estimated the value of the public good would be $66 ($22 per property owner—an unfavorable estimate) and Expert 2's estimate was $1875 ($625 per property owner—a favorable estimate).

The two unfavorable estimates condition was necessary to assure that trust in the advisor's estimates was only a function of mixed advice and not the valence of the advice.

Measures

Because some participants received mixed advice from advisors, we asked several questions to assess how different distributions of advice valence affected participants' perceptions of the advisors. To assess how much an individual trusted an expert's estimation, a one-item measure asked, "How much did you trust your Expert's estimation?" (1 = *not at all*, 7 = *very much*). All remaining measures were identical to those used in the previous experiment. Questions about trust in advice and consideration of advice were asked separately for each advisor when two advisors were present. The trust scale (in fellow group members) showed high internal consistency: $\alpha = .80$. In addition to an individual's perceived importance of supporting green initiatives, we used gender as a control variable.

Results

The control variables gender and perceived importance of green initiatives had no significant effect on the primary results of this experiment. We also successfully replicated all findings in Experiment 1.[5]

Hypothesis Testing

Table 2 provides the mean cooperation rates and trust levels for group members and advisors for Experiment 2. Hypothesis 4 posits that when the estimate of the outcome is mixed, individuals would be less likely to contribute than when both advisors gave favorable estimates. GEE revealed that contribution rates were significantly less when advisors provided mixed outcome valence estimates compared to when both estimates were favorable; $\chi^2_1 = 31.76$, $p < .001$, supporting Hypothesis 4.

Hypothesis 5 predicts that an individual's trust in the experts' advice will be low when the valence estimates from experts are mixed compared to when both third-party estimates are favorable. Because our item measuring trust in Expert 1's estimate significantly correlated with trust in Expert 2's estimate ($r = 0.74$, $p < .001$), both items were averaged to produce one score of trust in the paired experts' estimates. In support of Hypothesis 5, a repeated-measures ANOVA found that trust in both experts' estimates was significantly lower when advisors provided mixed outcome valence estimates compared to when both estimates were favorable; $F_{1, 93} = 84.47$, $p < .001$.

Hypothesis 6 posits that an individual's trust in their group members' willingness to cooperate mediates the relationship between the distribution of valence estimates and the likelihood of contributing toward the public good. Following the method of Kenny and colleagues (1998), trust in fellow group members was found to significantly mediate the relationship between the distribution of valence estimates and the likelihood of contributing toward the public good; $z = –3.77$, $p = .001$. This finding supports Hypothesis 6.

Hypothesis 7 stated that an individual's trust in the experts' advice mediates the relationship between the distribution of valence estimates and trust that their group members. A mediation analysis found support for Hypothesis 7: An individual's trust in the experts' advice mediated the relationship between the distribution of valence estimates and trust that their group members would cooperate; $z = 5.58$, $p < .001$ (Kenny et al., 1998).

Post Hoc Analysis

Supplemental analysis involved probing the possibility of different reasons for defection in the conditions with two advisors and examining differences in cooperation rates as a function of advice distribution. Using a Bonferroni adjusted $\alpha =$

TABLE 2
Mean cooperation rates and trust in Experiment 2

	Advice valence and distribution			
Variable	No advice	Uniform favorable advice	Uniform unfavorable advice	Mixed advice
Cooperation rates	0.67 (0.47)	0.95 (0.23)	0.13 (0.34)	0.51 (0.50)
Trust (in group members)	3.98 (1.00)	4.51 (1.01)	3.40 (1.13)	3.77 (1.02)
Trust (in experts)	—	4.55 (1.13)	4.13 (1.52)	3.48 (1.11)

Note. All conditions involve outcome variance with losses-and-gains prospects. Standard errors in parentheses.

.006, a repeated-measures ANOVA indicated that trust in fellow group members was lessened when both experts provided unfavorable advice ($M = 3.40$, $SD = 1.13$) compared to when no advice was provided ($M = 3.98$, $SD = 1.00$); $F_{1,93} = 32.16$, $p < .006$, and that trust in fellow group members increased when both experts provide favorable advice ($M = 4.51$, $SD = 1.01$) compared to when no advice was provided ($M = 3.98$); $F_{1,93} = 35.24$, $p < .006$. Also there was significantly less trust in group members when both experts gave unfavorable estimates compared to when the estimates were both favorable; $F_{1,93} = 104.34$, $p < .006$. Trust in fellow group members was critical of whether individuals decided to cooperate in the various two-advisor conditions. However, this was not the case for an individual's trust in the advisors' estimates. Trust in the advisors' estimates did not significantly change when comparing dual unfavorable advice ($M = 4.13$, $SD = 1.52$) and dual favorable advice conditions ($M = 4.54$, $SD = 1.13$); $F_{1,93} = 6.30$, *n.s.*, but did significantly change in the mixed-estimate advisor condition ($M = 3.48$, $SD = 1.10$); $F_{1,93} = 58.86$, $p < .006$ (Helmert test). These analyses of the changes in trust in advisors' estimates and in fellow group members suggest that trust in group members influenced cooperation behavior in all dual-advisor conditions, but trust in the advisors' estimates also influenced cooperation behavior in the mixed estimate advisor condition.

Our finding that mixed advice decreased participants' trust in the advisors (and group members) led us to speculate that mixed advice would further lead to decreased cooperation compared to our control condition where no advice was given. As shown in Table 2, individuals were more likely to contribute toward the public good when no advice was provided compared to when mixed advice was provided; $\chi^2{}_1 = 4.90$, $p = .027$.

Discussion

This experiment found support for the posited hypotheses. Receiving mixed estimates about the value of the public good from two advisors can impede the public good's provision. However, supplemental analysis suggests that there are different psychological mechanisms that influence cooperation when advisor estimates are unanimous compared to when they are mixed. When estimates about the value of the public good are unanimous (i.e., both favorable or both unfavorable), trust in fellow group members drives cooperation decisions whereas trust in the expert's estimates does not change. One explanation is that when advice is consistent, participants trust the advisors' estimates, whether those estimates are favorable or unfavorable. However, although group-member trust is also important when advice is mixed, trust in the advisors' estimates also plays a significant role. Mixed estimates lead an individual to trust neither advisor's estimate, and this decline in advisor trust decreases trust that fellow group members will contribute toward the public good. Further, these perceptions mirror contribution behavior: Participants receiving mixed advice were less likely to contribute to the public good compared to when no advice was given.

In the current experiment, the mixed condition had a disagreement rate of 50%: One advisor provided a favorable estimate and the other gave an unfavorable estimate. From this, we cannot speak to situations involving more advisors such that a majority could give estimates of one valence (e.g., favorable) whereas a minority provides an estimate of the opposite valence (e.g., unfavorable). We address this question in the third experiment of the current research, drawing from the advice-taking literature on outlying opinions. Also, our post hoc finding that mixed advice created less cooperation compared to there being no advice was unanticipated.

EXPERIMENT 3

In this third experiment, we explore the mixed-estimate finding of Experiment 2 further by examining mixed-estimates coming from a group of four advisors. The presence of four advisors provides the opportunity to examine a wider distribution of advice valence such as a 25% unfavorable/75% favorable split, as well as unanimous estimate valence (100% unfavorable), as well as estimates balanced in valence (50% favorable vs. 50% unfavorable). Although previous work on advice taking suggests that receiving mixed estimates may result in a loss of trust in the advisors (Shanteau, 2001), recent research also finds that individuals discount an advisor's estimate when the advisor is in the minority. Specifically, Harries

and colleagues (2004) investigated the case in which four advisor estimates about a particular question were obtained (e.g., In what year was [a particular city] founded?) such that three advisors were very close to each other in terms of their estimates and the remaining advisor was an outlier. They found that individuals discounted outliers and, because of simplicity of the strategy, made their estimates by taking the median of the three remaining decisions. In short, it may be that it is not the presence of disagreement in estimate valence that decreases cooperation via losing trust in the advisors, but rather it may be necessary for there to be a significant portion of disagreement before trust in the advisors declines. Extending Harries and colleagues' previous findings, we make the following predictions.

Hypothesis 8a: An individual will be more likely to cooperate when the individual receives at least 75% favorable estimates from advisors compared to when the individual does not.

Hypothesis 8b: An individual will be more likely to defect when the individual receives at least 75% unfavorable estimates from advisors compared to when the individual does not.

Experiment 2 found that individuals facing balanced advisors—that is, one advisor is predicting the value of the public good to be positive and the other is predicting it to be negative—are less likely to contribute toward the public good than if no advice had been given. As suggested by Brown and colleagues' (1988) research on information signaling in markets, evenly split advice from advisors creates additional uncertainty that is added to the existing uncertainty experienced by the individual debating whether to contribute to public good with a loss prospect. Adding additional layers of uncertainty has been found to decrease cooperation in social dilemmas—such as contributing toward public goods (Beil & Gärling, 1995). This increase of uncertainty may increase an individual's tendency not to contribute toward the public good.

Hypothesis 9: An individual will be less likely to cooperate when the individual receives perfectly mixed estimates from advisors compared to when the individual receives no advice.

Method

Sample

Eighty-nine students at a university (same as the one in Experiment 2) in the western United States participated in this experiment for payment. The average age was 20 years, 51% were male, and the average work experience was 3.2 years.

Task and Procedures

The task and procedures (i.e., payment method and session procedures) for the current experiment were identical to those in Experiment 2 of the current research with the exception of our use of four-person advisory conditions with five treatments (described in the next subsection). As with Experiment 2, the different resource allocation decisions were blocked by advice condition (i.e., no advice provided, one advisor, two advisors, and—in the case of the current experiment—four advisors) and the treatments within these blocks were ordered in a Latin square design.

Additional Treatments

The additional condition involved providing participants with four estimates about the value of the public good, each coming from an independent advisor. The five treatments within the new condition varied as to whether the valence of the advisors' estimates agreed or disagreed. Specifically:

- *Four favorable estimates:* The four advisors all provided favorable estimates about the value of the public good; that is, Expert 1 estimated the value of the public good would be $1200 ($400 per property owner), Expert 2's estimate was $1449 revenue dollars ($483 per property owner), Expert 3's estimate was $1236 revenue dollars ($412 per property owner), and Expert 4's estimate was $1527 revenue dollars ($509 per property owner).
- *Four unfavorable estimates:* All four advisors provided unfavorable estimates about the value of the public good; that is, Expert 1 estimated the value of the public good would be $21 ($7 per property owner), Expert 2's estimate was $30 revenue dollars ($10 per property owner), Expert 3's estimate was $18 revenue dollars ($6 per property owner), and Expert 4's estimate was $27 revenue dollars ($9 per property owner).
- *One favorable and three unfavorable:* One advisor provided a favorable estimate and the remaining advisors gave unfavorable estimates about the value of the public good; that is, Expert 1 estimated the value of the public good would be $1824 ($608 per property owner), Expert 2's estimate was $72 revenue dollars ($24 per property owner), Expert 3's estimate was $99 revenue dollars ($33 per property owner), and Expert 4's estimate was $66 revenue dollars ($22 per property owner).
- *One unfavorable and three favorable:* One advisor provided an unfavorable estimate and the remaining advisors gave favorable estimates about the value of the public good; that is, Expert 1 estimated the value of the public good would be $33 ($11 per property owner), Expert 2's estimate was $1800 revenue dollars ($600 per property owner), Expert 3's estimate was $1500 revenue dollars ($500 per property owner), and Expert 4's estimate was $1740 revenue dollars ($580 per property owner).
- *Two unfavorable and two favorable:* Two advisors provided an unfavorable estimate and the other two advisors gave favorable estimates about the value of the public good; that is, Expert 1 estimated the value of the public good would be $1650 ($550 per property owner), Expert 2's estimate was $48 revenue dollars ($16 per property owner), Expert 3's

estimate was \$54 revenue dollars (\$18 per property owner), and Expert 4's estimate was \$1749 revenue dollars (\$583 per property owner).

In the outlier conditions, we followed Harries and colleagues (2004, p. 338) by preparing the materials such that the outlier estimate had a z-score greater than 2.0 and all other estimates have z-scores less than 2.0.

Measures

All measures were identical to the previous experiment with two exceptions. Questions about trust in advice were asked four times in conditions with four advisors. The Cronbach's alpha for the trust (in fellow group members) scale was $\alpha = .79$.

Results

The control variables gender and perceived importance of green initiatives had no significant effect on the primary results of the current experiment. We successfully replicated all findings from Experiment 2.[6]

Hypothesis Testing

Table 3 provides the mean cooperation rates and trust levels across conditions. Hypothesis 8a predicted that an individual would be more likely to cooperate when the individual receives 75% or more favorable estimates from advisors compared to when the individual does not, and Hypothesis 8b maintained that an individual would be more likely to defect when the individual receives 75% or more unfavorable estimates from advisors compared to when the individual does not. Using the unanimous favorable condition as the reference category, a GEE found that cooperation did not significantly change when three advisors gave favorable estimates: ${\chi^2}_1 = 0.01$, *n.s.*, but did significantly decrease when only two advisors' estimates were favorable: ${\chi^2}_1 = 28.99$, $p < .001$; when only one advisor's estimate was favorable: ${\chi^2}_1 = 60.83$, $p < .001$; and when no advisors' estimates were favorable; ${\chi^2}_1 = 54.22$, $p < .001$. Lastly, there was no significant difference in cooperation rates when comparing three unfavorable advisors to four unfavorable advisors conditions; ${\chi^2}_1 = 0.15$, *n.s.* These findings support Hypotheses 8a and 8b.

Hypothesis 9 maintained that individuals would be less likely to cooperate when receiving perfectly mixed advice (50% favorable vs. 50 unfavorable) compared to when they received no advice about the value of the public good. Merging the two perfectly split conditions, GEE found that balanced mixed advice significantly decreased cooperation; ${\chi^2}_1 = 4.78$, $p = .029$. Comparing each perfectly split condition independently to the control condition yielded results consistent with this omnibus finding; two-advisor condition (${\chi^2}_1 = 4.08$, $p = .043$) and four-advisor condition (${\chi^2}_1 = 3.74$, $p = .053$).

Post Hoc Analyses

To examine further why individuals cooperated, we analyzed the participants' trust in their individual advisors and fellow group members. The descriptive statistics for these trust measures are provided in Table 4, and the following supplemental analysis used a Bonferroni adjusted $\alpha = .004$. From Panel A, it can be seen that trust in an individual advisor's estimate depends on how their estimate compares to the other advisors' estimates. Specifically, individuals trust an outlying advisor significantly less than those whose estimates are in consensus. Also, it may be observed that the mean level of trust in agreeing advisors is significantly less when those advisors are balanced (i.e., 50% favorable vs. 50% unfavorable) compared to when there is an outlying estimate. When comparing agreeing advisors in the two-unfavorable-versus-two-favorable condition to the respective three-(un)favorable-versus-one-favorable (unfavorable) condition, a repeated-measures ANOVA found a significant difference in trust in advisor estimates: Participants trusted the agreeing advisors with favorable estimates less in the two-unfavorable-versus-two-favorable condition compared to the agreeing advisors in the three-favorable-versus-one-unfavorable condition; $F_{1, 88} = 50.14$, $p < .004$; and participants trusted the agreeing advisors with unfavorable estimates less in the two-unfavorable-versus-two-favorable condition compared to the agreeing advisors in the three-unfavorable-versus-one-favorable condition; $F_{1, 88} = 25.30$, $p < .004$.

We examined next how trust in fellow group members changed as a function of the distribution of estimation valence. From Panel B, we see that trust in fellow group members does not change when comparing advisory groups with complete consensus for either 100% unfavorable or 100% favorable estimates as compared to when there is an outlier present (i.e., when either 75% unfavorable or 75% favorable; both F's$_{1, 88} < 2.12$, both p's n.s.). However, trust in group members was significantly different in the balanced advice condition compared to the complete consensus and outlier conditions of either valence; both F's$_{1, 88} > 14.90$, both p's $< .004$ (both Helmert tests).

Discussion

This experiment investigated how different distributions of estimation valence affected cooperation in public goods dilemmas. We found that trust in the advisors' estimates changed as a function of how many advisors within a group agreed concerning whether the public good's value would be favorable or unfavorable. Lastly, regardless of the number of advisors, when the advisors were balanced about the valence of the public good, individuals were less likely to cooperate compared to when no advice was provided.

GENERAL DISCUSSION

In many real-world public good dilemmas, the value of the public good is not known a priori to individuals contributing their resources. When outcome variance in the value of the

TABLE 3
Mean cooperation rates in Experiment 3

	Advice valence and distribution				
Number of advisors	Uniform favorable advice	3 vs. 1 Positive	Mixed advice	3 vs. 1 Negative	Uniform unfavorable advice
2	.96 (.21)	—	.53 (.50)	—	.11 (.50)
4	.93 (.25)	.93 (.25)	.52 (.50)	.19 (.40)	.25 (.43)

Note. All conditions involve outcome variance with losses-and-gains prospects. Standard errors in parentheses. The mean cooperation rate and standard error for the control condition (where no advice was provided) was .67 (.47).

public good contains a loss prospect, individuals are less likely to contribute toward its provision. The presence of both outcome variance and social uncertainty pose a dual-uncertainty problem for organizations attempting to provide public goods through prosocial behavior. We extend previous research by showing how advice from third-party experts can reduce uncertainty about the value of the public good and uncertainty about the future behavior of others involved in the public goods dilemma (Experiment 1). However, although third-party advice can influence cooperative behavior through increasing trust among group members, the uniformity of the valence of advice significantly affects cooperative behavior through trust in the advisory system. This negative effect occurs because individuals lose trust in their fellow group members, and, fearing others think as they do, defect defensively. However, as shown in Experiment 2, the psychological path to cooperation when both advisors are unanimous is different from when they are mixed (with two advisors). When both advisors are unanimous, trust in fellow group members becomes the causal mechanism. Experiment 3 expanded on this, finding that outlying opinions are discounted, resulting in individuals trusting in their group members and cooperating just as much as when the advisors' estimates are unanimous.

Theoretical and Managerial Implications

The current findings push our understanding of public goods dilemmas and advice taking in several ways. First, advice provided by third-party experts represents a dual-uncertainty reducing mechanism. Previous research focuses on how various unilateral and joint interventions influence cooperation through mitigating social uncertainty (Messick & Brewer, 1983), with more than a decade of requests from scholars to find ways to reduce environmental uncertainty (Gärling et al., 1998). The current article investigates at least one way to reduce both sources of uncertainty: advice from third-party experts. Facing environmental uncertainty, individuals are susceptible to social influence, and advice provided by perceived experts can influence an individual's perceptions about others' intentions and the possible value of the public good.

A second insight is in bridging of advice-taking and small-groups literatures. Previous research on advice taking examines how advice is interpreted and used by groups, and these studies focus on how member suggestions are used to collectively make estimates or decide a course of action (Davis, 1973). To extend this work, Bonaccio and Dalal (2006) encouraged applying the advice-taking literature to the small-group research domain. The research reported in the current article applies and empirically explores the psychology behind advice taking, and how advice can influence conflict in small group social dilemmas (Levine & Moreland, 1990). Specifically, third-party advice can influence the interpersonal relations—specifically group-member trust— thereby impacting voluntary cooperation through reducing group conflict.

Our findings also hold implications for managing the provision of public goods. First, consider internal versus external control of public good provision. Collectives often appoint a leader, independent of the group, to help provide the public good (De Cremer, 2007). Although this may appear as a sensible external control mechanism for facilitating public goods provision, the appointment of a leader may raise concern among group members losing control over their ability to choose whether or not to invest, as the leader's decision may conflict with the wishes of the group members. Desiring to preserve their control over their private property (i.e., private resources they can choose contribute toward the public good or withhold), individuals may be reluctant to use a leader (van Dijk, Wilke, & Wit, 2003). In contrast, advice taking from third-party advisors provides groups access to expertise and additional useful information while retaining control over deciding whether or not to attempt collective action.

A second policy implication concerns our robust finding between Experiments 2 and 3: If half of the advisors disagree, then defection is greater than if no advice is provided. This pattern was detected for both two and four advisors scenarios. Although previous research focuses on how trust in an advisor influences the likelihood of following their advice (Sniezek & Van Swol, 2001; Van Swol & Sniezek, 2005), the current article shows at least one practical implication for why having trust in advisors is important: In public goods dilemmas, individuals who receive both glad tidings and grave warnings from

TABLE 4
Mean-level trust in advisor estimates (est.) and group members in Experiment 3

Panel A: Trust in advisors' estimates

	Advisor 1			Advisor 2			Advisor 3			Advisor 4		
Condition	Estimate	Trust in advisor	(*SE*)	Estimate	Trust in advisor	(*SE*)	Estimate	Trust in advisor	(*SE*)	Estimate	Trust in advisor	(*SE*)
4 Unfavorable est. vs. 0 favorable est.	21	4.31	(1.22)	30	4.12	(1.34)	18	4.13	(1.29)	27	4.24	(1.22)
3 Unfavorable est. vs. 1 favorable est.	1824	2.71	(1.41)	72	4.22	(1.12)	99	4.20	(1.07)	66	4.11	(1.10)
2 Unfavorable est. vs. 2 favorable est.	1650	3.66	(1.22)	48	3.57	(1.15)	54	3.60	(1.17)	1749	3.69	(1.22)
1 Unfavorable est. vs. 3 favorable est.	33	2.45	(1.25)	1800	4.39	(1.03)	1500	4.47	(1.04)	1740	4.40	(1.02)
0 Unfavorable est. vs. 4 favorable est.	1200	4.61	(0.97)	1449	4.57	(0.96)	1236	4.54	(0.97)	1527	4.47	(1.00)
2 Unfavorable est. vs. 0 favorable est.	90	4.47	(1.12)	15	4.45	(1.14)	—	—	—	—	—	—
1 Unfavorable est. vs. 1 favorable est.	66	3.37	(1.30)	1875	3.65	(1.39)	—	—	—	—	—	—
0 Unfavorable est. vs. 2 favorable est.	1575	4.66	(1.02)	1890	4.66	(1.02)	—	—	—	—	—	—
No advice (control condition)	—	—	—	—	—	—	—	—	—	—	—	—

(*Continued*)

TABLE 4
(Continued)
Mean-level trust in advisor estimates (est.) and group members in Experiment 3

Panel B: Trust in fellow group members' likelihood of cooperating

Condition	Mean	(*SE*)
4 Unfavorable est. vs. 0 favorable est.	3.44	(0.94)
3 Unfavorable est. vs. 1 favorable est.	3.51	(0.93)
2 Unfavorable est. vs. 2 favorable est.	3.81	(1.02)
1 Unfavorable est. vs. 3 favorable est.	4.41	(0.89)
0 Unfavorable est. vs. 4 favorable est.	4.53	(0.98)
2 Unfavorable est. vs. 0 favorable est.	3.42	(0.96)
1 Unfavorable est. vs. 1 favorable est.	3.82	(0.96)
0 Unfavorable est. vs. 2 favorable est.	4.53	(0.95)
No advice given (control)	3.92	(1.11)

advisors cooperate less than if they receive no advice at all. This may have been found because the outcome variance and social uncertainty when combined with the mixed advisor estimates creates too much uncertainty, resulting in people maintaining the status quo of keeping their property rights (Babbit, 2002).

Limitations, Future Research Directions, and Conclusion

The current article's findings lead to several questions for future research. First consider the trans-paradigmatic question: What are the differences in effects that third-party advice has on cooperation in public good dilemmas compared to common-pool resource dilemmas when the resource is uncertain? This latter social-dilemma scenario is well studied in the current literature (e.g., Gärling et al., 1998; Gustafsson, Biel, & Gärling, 1999; Gustafsson, Eek, & Gärling, 2004; Messick et al., 1988; Rapoport, Budescu, Suleiman, & Weg, 1992; Suleiman, Rapoport, & Budescu, 1996). Similar to the current article's findings, research on common-pool resource dilemmas with uncertain pool size finds that defection (or overharvesting) is greater when the size of the common-pool resource is uncertain compared to certain. This finding is attributed to either motivational biases (i.e., an individual is motivated to believe the resource pool is large because it justifies taking more or the individual "wishfully thinks" the resource is larger because a larger resource is more desirable than a small one [Gustafsson et al., 1999]) or a perceptual bias: Individuals believe that the variance of the resource and the central tendency of the actual size of the resource are correlated (Rapoport et al., 1992). It could be that third-party advice about the size of the commons would reduce wishful thinking and keep individuals from confusing central tendency with variance while having little effect on egoistic motivations.[7] Indeed, individuals often fall victim to *motivated blindness*: They avoid seeing and using information that would not assist in meeting their interests (Gino, Moore, & Bazerman, 2009). Perhaps third-party advice warning that the commons is very limited would fall on deaf ears?

Of course, the motivation to ignore advice is different for contributors compared with takers from a shared resource. Those asked to contribute to shared resource of unknown value are motivated to believe the public good will yield little benefit, thereby justifying undercontribution. Comparatively, those wanting to harvest from a commons are motivated to believe there is plenty and to spare, thereby justifying harvesting more. This distinction may become a source of conflict, considering that many resource management problems—for example, food banks and micro-credit lending—involve parties who give to sustain a shared resource and also parties who take to use the shared resource (Budescu & McCarter, 2012). Future research may benefit from investigating how third-party advice affects social welfare in such (understudied) give-or-take-some dilemmas, where such advice may be not only about what the value of cooperation is but also about who should give and who should take (McCarter, Budescu, & Scheffran, 2011).

A third extension involves the decision maker's trust in advisors. Complementing Sniezek and Van Swol's work on trust between judges and advisors (Sniezek & Van Swol, 2001; Van Swol & Sniezek, 2005), the current article shows how mixed signals from advisors crater judge's trust. However, the current article's single-item measure of advisor trust leaves open the question, "What is it that judges don't trust about mixed-signaling advisors?" Hardin (1993) and Malhotra and Lumineau (2011) remind us that there is a difference between trusting a person's ability and trusting a person's intentions. Future research may benefit in examining whether it be ability or intentions that judges doubt when mixed estimates are advised.

In summary, we investigated how advice from third-party experts, as a form of informational social influence, impacts cooperation in public goods dilemmas where the value of the public good is unknown prior to provision. Although they interpret favorable estimates from third-party experts as glad tidings, individuals view mixed and negative estimates as grave warnings, discouraging cooperation and the provision of the public good by undermining trust.

NOTES

1. Ostrom (2003) also submits reputation as an antecedent to cooperation in social dilemmas. However, reputation is not germane to the current article because reputation in social dilemmas either (a) is equated to an individual's decision history (known to others) in a repeated social dilemma setting or (b) is carried over from one social dilemma context to another. In the current article, the individuals play one-shot social dilemmas where their identities are anonymous and do not receive feedback of their partners' decision. Thus, reputation presently does not apply to the current investigation because there is neither repeated interaction nor opportunity for an individual to know his or her partner's previous behavior.

2. The psychological approach to trust complements other conceptualizations such as the behavioral view of trust in political science and economics. The similarity among these approaches is that trust entails some element of risk and that trustworthiness is a personal characteristic that is developed through reputation (e.g., Mayer et al., 1995; Ostrom, 2003). Further, both perspectives view trust as having the elements of benevolence (e.g., good motives and intentions) and expectations (e.g., Hardin, 2002; Mayer et al., 1995). One way that the psychological approach to trust differs from the behavioral view is in how trust is measured: The latter views trust as a behavioral manifestation, while the former views trust as a psychological state, relying on survey/scale items that are intended to tap into the subfactors (e.g., shared expectations and values) of the trust construct (for a review comparing these approaches to trust see Lewicki et al., 2006).

3. A "prototypical" JAS study involves both the advisor and judge being participants in the experiment: Both advisors and judges may vary in decisions and are often subject to experimental treatment effects (for a review of this paradigm and its variants see Bonaccio & Dahal, 2006). The current article uses a variation of JAS: Only the judges (those receiving advice) are participants in the experiment, and the advisors' estimates (which were calculated previously) are held constant across their respective treatments.

4. The term "trust social dilemma" was pioneered by Liebrand (1983) and is paradigmatically different from other mixed-motive games—such as the trust (or investment) dilemma game (e.g., Berg, Dickhaut, & McCabe, 1995). See Chaudhuri (2009) for discussions about both paradigms.

5. Cooperation did not significantly change between the uncertain gains-only prospect condition ($M = 79\%$, $SD = 0.41$) and the certain condition ($M = 88\%$, $SD = 0.32$); $\chi^2_1 = 2.86$, *n.s.*, but did significantly change between the

loss-and-gain prospects condition ($M = 67\%$, $SD = 0.47$) and the gains-only prospects conditions ($M = 84\%$, $SD = 0.37$); $\chi^2_1 = 14.26$, $p < .01$. In addition, the valence of the advisor's outcome estimate significantly affected cooperation behavior. A positive outcome estimate significantly increased cooperation ($M = 96\%$, $SD = 0.20$) compared to when no advice was provided ($M = 67\%$, $SD = 0.47$): $\chi^2_1 = 23.52$, $p < .01$; and a negative outcome estimate significantly decreased cooperation ($M = 36\%$, $SD = 0.48$) compared to when no advice was given: $\chi^2_1 = 20.66$, $p < .01$. Lastly, a mediation analysis found that trust in fellow group members fully mediated the relationship between estimate valence (from one advisor) and the likelihood of cooperating; favorable estimate, $z = 2.75$, $p < .05$, and unfavorable estimate, $z = -3.96$, $p < .05$. These findings are consistent with the results of Experiment 1 and suggest that the results are not dependent on the particular method we employed.

6. Cooperation rates were significantly less when advisors provided two-advisor, mixed-outcome valence estimates ($M = 53\%$, $SD = 0.50$) compared to when both estimates were favorable ($M = 96\%$, $SD = 0.21$); $\chi^2_1 = 28.57$, $p < .01$. Further, a three-step mediation analysis found that trust in the experts' estimates mediated the relationship between the distribution of valence estimates and trust that their group members will cooperate; $z = 4.40$, $p < .05$ (Kenny et al., 1998). We also replicated several supplemental findings of Experiment 2. We first conducted Pearson correlations of trust in Advisor 1's estimate with Advisor 2's estimate for the three dual-advisor conditions. Although the correlations for dual favorable and dual unfavorable conditions were significant—both r's > 0.80, both p's $< .01$—the correlation for the mixed condition was not; $r = 0.21$, *n.s.* Therefore, we compared trust in the estimates at the individual advisor level (e.g., comparing trust in Advisor 1's estimates across the three dual-advisor conditions). A repeated-measures ANOVA found that trust in Advisor 1's estimate was not significantly different when comparing dual favorable condition ($M = 4.66$, $SD = 1.02$) and dual unfavorable condition ($M = 4.47$, $SD = 1.12$); $F_{1, 88} = 3.05$, *n.s.*, but was significantly different when comparing the mixed condition ($M = 3.73$, $SD = 1.30$) to either the favorable or unfavorable conditions; both F's$_{1, 88} > 26.00$, both p's $< .01$. These effects were also found for trust in Advisor 2's estimates: Trust in Advisor 2's estimate was not significantly different when comparing dual favorable condition (M 4.66, $SD = 1.02$) and dual unfavorable condition ($M = 4.45$, $SD = 1.14$); $F_{1, 88} = 3.61$, *n.s.*, but was significantly different when comparing the mixed condition ($M = 3.73$, $SD = 1.30$) to either the favorable or unfavorable conditions; both F's$_{1, 88} > 25.00$, both p's $< .01$. Trust in fellow group members was lower when both experts provided unfavorable advice ($M = 3.42$, $SD = 0.96$) compared to when no advice was provided ($M = 3.92$, $SD = 1.11$); $F_{1,88} = 22.36$, $p < .01$, and trust in fellow group members was higher when both experts provided favorable advice ($M = 4.52$, $SD = 0.95$) compared to when no advice was provided ($M = 3.98$); $F_{1,88} = 35.45$, $p < .01$. Lastly, there was significantly less trust in group members when both experts gave unfavorable estimates compared to when the estimates were both favorable; $F_{1, 88} = 142.24$, $p < .01$.

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