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Is it even worth it? The effect of loss prospects in the outcome distribution of a public goods dilemma

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ABSTRACT

Contributions to public goods are premised on the expectation that the collective will realize benefit in excess of the value of required contributions. However, past research has focused on public goods of fixed and known value, for which the added value of the produced public good is obvious. Research has largely ignored public goods whose eventual value is uncertain at the time contribution decisions are made. Two studies explored the effects of outcome variance on individuals' contributions to a public good and their reasons for contributing. Contributions were negatively affected by loss prospects in the distribution of possible outcomes. Further, loss prospects directly discouraged contributions because of loss aversion, and indirectly discouraged contributions by fueling fears that others would not contribute. The negative effects of loss prospects were stronger when social uncertainty was low. Implications for social dilemma research and the effective management of collective action are discussed.

Introduction

Many acts of collective action involve the production of public goods – resources that, once produced, can be enjoyed by any member of the collective both without restraint and without diminishing another member's enjoyment of the benefits. Examples of public goods include community- and nation-wide vaccination initiatives to alleviate communicable diseases (Smith, Woodward, Acharya, Beaglehole, & Drager, 2004), public sporting events such as the Olympics (Hoffmann, Ging, & Ramasamy, 2002), and (in the private sector) generic advertising such as the "Beef – It's what's for dinner!" and "Got Milk?" campaigns (Krishnamurthy, Bottom, & Rao, 2003). The success of these collective actions is based in part on member contributions. If enough members contribute, the campaign, initiative, or event is launched; if members do not sufficiently contribute, the campaign, initiative, or event is underfunded and fails (Messick & Brewer, 1983).

Kollock (1998) notes that a primary characteristic of public goods dilemmas is the amount of benefit provided in relation to the amount of contributions required for its production; contributions to produce public goods are premised on the expectation that the collective will realize benefit in excess of the value of the required contributions. Past experimental research has focused on public goods of fixed and known value, for which the benefit in excess of the required contributions is obvious. However, many real-world public goods do not resemble the public goods traditionally studied in experimental settings, in which the value of the public good is fixed and known with certainty at the time contribution decisions must be made. For example, no one can know with certainty the amount of revenue a generic advertising campaign will generate for an industry prior to collective investment (Miller, 1982); the benefits of vaccine initiatives often are not known with certainty until after community- or nation-wide inoculation (Picard, 2005); and no one can know how successful public sporting events will be for a nation's or city's commerce until after the event is under way or even complete (Horner, 1997). These examples suggest that there are two different aspects of success in producing a public good: success of the collective in cooperating to produce the public good and success of the public good in living up to its anticipated benefit. Research has largely ignored public goods whose eventual benefit is uncertain at the time contribution decisions must be made.

Uncertainty about the realized value of the public good (henceforth termed *outcome variance*) could lead members of the collective to fear the possibility of a loss even if the public good is produced. This fear might lead individuals to not contribute to the public good, *even if the expected value of contributions is positive*. Further, individuals may expect other members of the collective to not contribute for fear of realizing a loss, thus further discouraging an individual's own willingness to contribute.

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The current paper details two studies – each using a different public goods dilemma – that explore the effects of outcome variance on both individuals' contributions to a public good and their reasons for contributing. Prior to these two studies, we review research pertinent to our primary hypothesis about when outcome variance will (and will not) influence contribution behavior. We conclude by discussing these two studies' implications for research in the social dilemma paradigm and managing collective action.

Step-level public goods dilemmas and the role of outcome variance

Since the influential work of Samuelson (1954) and Olson (1965), many researchers have studied contribution behavior in public goods dilemmas (see Ledyard, 1995, for a review). In this paper we focus on public goods dilemmas where the provision of the public good is a step-level function of the amount of resources individuals contribute (Rapoport & Eshed-Levy, 1989; Suleiman & Rapoport, 1992). In such "lumpy" public goods dilemmas, the public good is produced only after a predetermined critical mass (*provision threshold*) of aggregate contributions is reached by the collective (Taylor & Ward, 1982). An example of a step-level public good is the generic advertising campaign launched by the American steel industry, in which participation from 75% of industry members was required before the campaign could be launched (Krishnamurthy, 2001). In this example, if the 75% participation threshold is not reached, the public good — the generic advertizing campaign — is not produced.

Uncertainty and public goods dilemmas

Traditionally, public goods dilemma research has examined how contribution behavior is influenced by uncertainty surrounding the collective's ability to produce the public good (see Ledyard, 1995; van Dijk, Wit, Wilke, & Budescu, 2004; Wit, van Dijk, Wilke, & Groenenboom, 2004, for reviews). Uncertainty about whether other individuals will contribute toward the public good is termed *social uncertainty* (e.g., Messick, Allison, & Samuelson, 1988) – also known as strategic risk (e.g., Bottom, 1998; Ledyard, 1995) or relational risk (e.g., Das & Teng, 1996). Experimental research has shown that as social uncertainty increases, so does the temptation to not contribute toward producing the public good (Sabater-Grande & Georgantzis, 2002). Not knowing what others in the collective will do makes contribution to the public good risky since contributors could waste their contributions or could be taken advantage of by non-contributors (Yamagishi & Sato, 1986).

While social uncertainty is critical to understanding contribution behavior in public goods dilemmas, here we seek to extend the public goods dilemma paradigm by considering outcome variance as an additional source of uncertainty for contributors to a public good. Variance in the outcome of the public good, which is outside the collective's control, is a form of environmental uncertainty (van Dijk, Wilke, Wilke, & Metman, 1999) – also known as performance risk (Das & Teng, 1996). Outcome variance in public goods dilemmas raises a new question for individuals in public goods dilemmas: Is the benefit of the public good likely to be worth the cost of producing it?

Ostrom (1990) was one of the first to suggest that outcome variance is an important element influencing contribution behavior. In her work on managing shared resources (e.g., forests, grasslands, fisheries), she noted that, "Uncertainty has many external sources" that can influence "...the market prices of various inputs or final products" (p. 33). Ostrom provides an example in which the shared benefits of additional water resources (e.g., enhanced crop yields and sanitation) cannot be known with certainty until after farmers have contributed their private resources to the construction of dams. Gulati, Khanna, and Nohria (1994) further suggest that even when social dilemmas can be structured so that mutual cooperation always pays more on average than unilateral or joint defection, outcome variance from unanticipated changes in the external environment may affect these payoffs and – as a result – influence the tendency to contribute toward collective action.

Unfortunately, few empirical studies have explicitly addressed the effects of outcome variance in public goods dilemmas. In one of the only studies examining outcome variance effects (van Dijk et al., 1999), participants (in groups of four) were each endowed with 75 points and were told that the provision threshold to produce the public good was 120 points (e.g., 30 points per participant). Participants were then given a choice of keeping their endowment or contributing some of their endowment towards the public good. The two conditions for public good outcome variance were no outcome variance (the value of the public good was fixed and known to be 300 points) and outcome variance (the public good could be any value – all values equally likely – between 190 and 410 points). Outcome variance had little if any effect on contribution behavior. This finding has led some to conclude that uncertainty about the value of the public good has no influence on contribution behavior in public goods dilemmas (Wit et al., 2004).

However, in the outcome variance condition in the van Dijk et al. (1999) study, if the threshold was reached the lowest possible value of the public good (190 points) exceeded the provision threshold (120 points). This meant that a participant's lowest possible portion of the public good (190 points/4 participants = 47.5 points) exceeded the average required individual contribution (120 points/4 participants = 30 points). Thus, if the public good was produced, participants in this study faced only the possibility of a gain and never faced the possibility of a real loss. A psychological approach to decision making under uncertainty (e.g., Kahneman, Slovic, & Tversky, 1982) provides some understanding of how the possibility of a real loss would influence contribution behavior.

Risk aversion and prospect theory

Research on risk preference maintains that an individual's evaluation of an investment changes as a function of the amount of variance in its return (Bell, 1995; Sebora & Cornwall, 1995). All other things equal, individuals are risk averse (Levy, 1992): they prefer certain investments over uncertain investments (Green, 1971). As a consequence of risk aversion, individuals should "prefer lower to higher (outcome) variance" in investments – assuming the expected value remains unchanged (Cheung, 1969, p. 26). With regards to public goods production, this would predict that individuals will contribute less toward producing a public good with outcome variance compared to a public good with a certain, fixed return – assuming the expected return for both was the same. As noted earlier, although outcome variance in the van Dijk et al. (1999) study did not influence contributions to the public good, outcome variance in that study also did not create the prospect of losses if the public good was produced. The difference between outcome distributions that entail only possible gains versus outcome distributions that entail both possible gains and possible losses is significant, as psychological research reminds us that individuals tend to think about gains and losses differently (see Taylor, 1991, for a review).

Prospect theory suggests that gain and loss prospects are created by the comparison of possible benefits realized relative to a reference point (Kahneman & Tversky, 1979), but van Dijk and Wilke (1995, p. 3) have suggested that, "...it is difficult to meaningfully apply prospect theory to social dilemmas..." because it is