

## One Bad Apple: Uncertainty and Heterogeneity in Public Good Provision

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Experimental research by psychologists, sociologists and economists has shown that people are not homogenous in their cooperative preferences, but rather an array of social preference types (such as pure altruists and conditional cooperators) exist in addition to the traditional selfish, Nash preferences (see e.g. Fischbacher, Gächter and Fehr, 2001).

Once we recognize that social preference types vary, new factors become important in explaining and predicting behavior in public goods settings: social preference type, group composition, and the information available to group members about the composition. We investigate the impacts of individual social preference type, group composition (of social preference types) and uncertainty (about this group composition) on cooperation. To address these questions, we conduct an incentivized experimental study using a repeated, 3-person, linear voluntary contribution mechanism.

This project is conducted with two waves of experimental sessions. In the first wave, we use a similar methodology to Fischbacher, Gächter, and Fehr (2001) to elicit the strategy profiles of our participants. We then use this information to expressly recruit individuals who are the types of interest into the lab. Since we know an individual's social preference type, we can vary the group composition by constructing laboratory groups that range from all selfish (Nash) to all conditionally cooperative. Half of the groups are aware of the group composition, while the other half are not. This allows us to examine the impacts of preference heterogeneity and uncertainty on cooperation, both as main effects and in interaction with each other.

So, does one "bad apple" spoil the bunch? The results indicate that there are separate effects of group composition and information on the ability of groups to sustain voluntary contribution, but that these effects do not interact. The number of conditional cooperators in a group positively and significantly increases group contribution. While "bad apples" (Nash players) are surely bad, their impact on contributions is gradual rather than all-or-nothing. Selfish players take advantage of others when given the knowledge and opportunity. But as long as they are not in the majority, the impact of the "good apples" far outweighs that of the "bad apples."

We find that information about group composition impacts efficiency, but that information primarily acts through beliefs about others' contributions. Information makes subjects more likely to act on their beliefs, which in turn positively impacts contributions. Additionally, information negatively interacts with the number of conditional players in the group. Given the knowledge and opportunity, participants take advantage of conditional cooperators.

Finally, we did not find the expected result of full contributions in the groups with all conditional cooperators. Instead we find that all participants react more strongly to negative deviations from their beliefs (disappointments) than positive ones (surprises), and thus contributions decline even in all-conditional-cooperative groups.

This research increases our knowledge of the mechanisms that underlie cooperative behavior, advancing our understanding of how agents react to changes in the types of individuals with whom they interact. We believe that the next step is to integrate these behavioral principles into new theoretical models of cooperation, models that recognize the roles that heterogeneity in the social preference domain and beliefs about group composition play in shaping behavior.