Motivating the Self-Interested Consumer: Choosing Early Promotes Prosocial Decisions

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The authors used artificial intelligence as part of an integrated development environment when writing the data-analysis scripts.

ABSTRACT

Consumers frequently are asked to decide whether to make a donation at the supermarket checkout, give to a crowdfunding campaign, or make a sustainability commitment—all without observing what others have chosen. Standard economic theory predicts that the order of unobserved decisions should not matter. In five incentivized experiments ($N = 6{,}057$) we reveal a robust positional order effect: consumers who know they are early in a sequence contribute substantially more to a collective good than those who know they are late. This effect is driven exclusively by self-interested consumers; prosocially motivated consumers contribute consistently regardless of position. Prediction data show that consumers treat their own choices as more diagnostic of future others' choices than of past others' choices—a future similarity effect consistent with forward-looking as-if reasoning. Experimentally varying whether future decisions are made by human agents or by a random process confirms that the effect depends on perceived future human agency: the contribution gradient appears only when future decision-makers are human. These findings identify a temporal heuristic that promotes collective action among the consumers least inclined to cooperate, and suggest that framing sequential prosocial decisions to emphasize early position and future human participation can increase contributions.

Keywords: prosocial behavior; sequential decisions; cooperation; self-interest; as-if reasoning; collective action

INTRODUCTION

Consider a consumer who encounters a checkout donation prompt: "Would you like to add $1 to support local food banks? We will match your donation." The shopper knows that hundreds of other customers will face the same prompt today, but cannot see what anyone else has chosen. From a purely self-interested perspective, the dollar is a cost with negligible collective impact—a rational reason to decline. Yet millions of consumers say yes. What drives prosocial behavior when contributions are private, progress is invisible, and the consumer is focused on maximizing personal outcomes?

A large body of consumer research has investigated the psychological drivers of prosocial behavior, including perceived impact (Sharma & Morwitz, 2016), goal proximity (Cryder, Loewenstein, & Seltman, 2013; Koo & Fishbach, 2012), social observability (Kristofferson et al., 2014; Yang & Hsee, 2022), moral identity (Aquino & Reed, 2002), and warm glow (Andreoni, 1995). These accounts share a common feature: they explain why consumers who are already inclined to help end up giving more or less. Far less is known about what drives contributions from consumers who are overtly self-interested—the segment least likely to participate in collective action and, for that reason, the most important to understand.

We identify a new mechanism that promotes prosocial behavior among precisely these self-interested consumers. In sequential prosocial decisions where choices are private and unobserved, the mere knowledge that one is early in the sequence increases contributions among self-interested individuals, while being a late-mover decreases them. We call this the *positional order effect*. The effect is driven by a forward-looking heuristic: self-interested consumers act as if their own choice will be mirrored by those who follow, making early cooperation appear individually worthwhile—saying to themselves, "If I cooperate, others will too and I will reap the benefits of their cooperation." Critically, the effect disappears when future decisions are described as determined by a random process rather than by other people, confirming that perceived future human agency is the active ingredient. In contrast, consumers who are motivated by prosociality contribute consistently regardless of position.

Across five preregistered, incentivized experiments ($N = 6{,}057$), we document the positional order effect and progressively test its mechanism. The first two studies establish the basic effect in sequential social dilemmas with two and three participants. Study 3 shows that the effect is moderated by social value orientation: it is driven entirely by self-interested participants. Study 4 demonstrates that the effect can be induced by simply instructing participants to maximize their personal earnings. Study 5 provides a direct causal test by experimentally varying whether the future portion of the sequence consists of human decision-makers or a random process, showing that the positional order effect depends on anticipated future human agency.

This research makes three contributions. First, we identify a novel psychological mechanism—forward-looking as-if reasoning—that promotes cooperation among the consumers least inclined to cooperate. Second, we complement the goal-gradient literature (Cryder, Loewenstein, & Seltman, 2013; Kuppuswamy & Bayus, 2017) by documenting what happens when progress is invisible and choices are private: in this regime, earlier position is more motivating, not later position. Third, our findings suggest a practical lever for nonprofits, crowdfunding platforms, and policymakers: framing consumers as "among the first to decide" and emphasizing that future human decision-makers will follow may increase contributions from the self-interested consumers who are traditionally hardest to reach.

CONCEPTUAL DEVELOPMENT

Prosocial Consumer Behavior and the Self-Interest Gap

Consumer researchers have made substantial progress in understanding the drivers of prosocial behavior. The SHIFT model (White et al., 2020) organizes this work around five broad categories of influence: social norms, habit formation, individual self-concept, feelings and cognition, and tangibility. Within this landscape, several streams are particularly relevant to the present research.

One influential stream examines *perceived impact and tangibility*: consumers give more when they believe their contribution will make a tangible difference (Cryder, Loewenstein, & Scheines, 2013; Sharma & Morwitz, 2016; Small & Loewenstein, 2003). A related line of work on *goal proximity* shows that contributions increase as a collective goal nears completion—the goal-gradient effect (Cryder, Loewenstein, & Seltman, 2013; Koo & Fishbach, 2012; Kuppuswamy & Bayus, 2017). These findings suggest that later contributions can be especially motivating, because progress is visible and the donor's marginal impact appears larger.

A second stream focuses on *social observability*. Consumers are more prosocial when their choices are visible to others (Yang & Hsee, 2022), and token public acts can sometimes substitute for more meaningful private contributions (Kristofferson et al., 2014). Social information about what others have done—such as large prior donations—also shapes giving (Frey & Meier, 2004; Shang & Croson, 2009). These effects operate through reputation, social norms, or informational signals, all of which require some form of observability.

A third stream traces prosocial behavior to relatively stable individual differences and person-centered motives. Moral identity (Aquino & Reed, 2002; Reed et al., 2007), self-construal (Duclos & Barasch, 2014), and warm-glow motives (Andreoni, 1995) have all been linked to prosocial judgments, preferences, and generosity. Because these factors are relatively stable or person-centered, they help explain persistent cross-individual variation in generosity but are less equipped to explain why the *same* consumer would behave differently depending on an incidental contextual feature like sequential position.

These literatures share a common feature: they explain prosocial behavior among consumers who are already inclined to give, or in contexts where progress, social cues, or goal proximity are available. Far less is known about what happens in the regime where (a) contributions are private, (b) progress is invisible, and (c) the consumer is self-interested. This regime describes many real-world consumer situations. A shopper deciding whether to round up at checkout cannot see others' choices and receives no feedback about collective progress. An early backer on a crowdfunding platform makes a pledge before any momentum is visible. A household deciding whether to adopt a costly sustainable practice does so without knowing how many neighbors will follow. In each case, the consumer faces a sequential prosocial decision under uncertainty—precisely the setting we investigate.

To study this setting with experimental rigor, we use a sequential Public Goods Game (PGG), an incentive-compatible paradigm that captures the core structural features of these consumer situations: participants contribute to a shared pool, contributions are private and unobserved, and total contributions are multiplied and redistributed. We frame the game to participants as a "Community Fund" contribution decision, and the decision closely resembles the structure of checkout donations, crowdfunding, and collective sustainability choices (see web appendix A).

Forward-Looking As-If Reasoning in Sequential Decisions

Standard game theory predicts that the sequence of moves should not matter if choices are unobserved. The foundational assumption, termed "preliminarity" by Von Neumann and Morgenstern (2004), holds that strategy should be guided by available information, not by the mere chronological order of unobserved moves ("anteriority"). Under this view, a consumer moving first should behave identically to one moving last, because neither can observe the other.

However, a broad family of ideas in psychology and behavioral economics suggests that people treat their own choices as informative about uncertain outcomes, even when no causal pathway exists. Quattrone and Tversky (1984) demonstrated that people sometimes act as if their behavior can influence events it cannot causally affect—what they termed "diagnostic" actions. Shafir and Tversky (1992) documented "quasi-magical thinking": people who would cooperate in a Prisoner's Dilemma if they knew their partner had cooperated *and* if they knew their partner had defected nonetheless chose to defect when the partner's choice was unknown, as if their own choice could retroactively affect the outcome. Related theoretical perspectives formalize this intuition, including self-signaling and diagnostic utility (Bodner & Prelec, 2003; Dhar & Wertenbroch, 2012), social projection (Krueger & Clement, 1994; Krueger, 2013; Ross et al., 1977), the notion of "translucent players" who expect their dispositions to correlate with others' (Capraro & Halpern, 2019), and moral universalization—the intuition that one should act as if everyone will act similarly (Levine et al., 2020).

Consumer research has documented analogous noncausal intuitions in marketplace settings. Consumers exhibit contagion beliefs, inferring transfer of properties through mere contact (Argo et al., 2006; Morales & Fitzsimons, 2007). They act on superstitious beliefs they know to be irrational (Hamerman & Johar, 2013; Kramer & Block, 2008; Risen, 2016). And they overestimate the influence of their own mental states on external outcomes (Pronin et al., 2006). These findings suggest that noncausal "as-if" reasoning is a pervasive feature of consumer cognition, not merely a laboratory curiosity.

We propose that this family of reasoning processes, when applied to sequential decisions, generates a specific temporal asymmetry. The critical distinction is between what we call "open fates" and "closed fates" (Morris et al., 1998). A future decision-maker's choice is an open fate: it has not yet been made, and the uncertainty is aleatory. A past decision-maker's choice is a closed fate: it has already been made and is merely unknown, a case of epistemic uncertainty. We propose that consumers' as-if reasoning is directed primarily toward open fates. When consumers act as if their choice will be mirrored by others, they apply this inference selectively to those whose decisions are still undetermined—the people who will move *after* them. For early movers, this effectively turns a costly prosocial contribution into a bet that subsequent decision-makers will match it, making cooperation appear individually worthwhile. For late movers, few open fates remain, and the heuristic provides little reason to contribute.

It is important to emphasize that we use "as-if" language descriptively. We do not claim that consumers consciously believe they can cause others to cooperate, nor that they can articulate this reasoning. The heuristic may operate through any of several cognitive channels—diagnostic inference, social projection, false consensus, or intuitive moral universalization. What these channels share is a forward-looking structure: the consumer's own choice becomes informative about the uncertain future, not about the already-settled past.

This account differs from existing explanations of sequential prosocial behavior in two important ways. First, it differs from informational cascade models (Banerjee, 1992; Bikhchandani et al., 1992) and leading-by-example theories (Eichenseer, 2023; Hermalin, 1998; Vesterlund, 2003), which require that later movers can *observe* earlier movers' choices. In our setting, choices are completely private. Second, it differs from goal-gradient accounts (Cryder, Loewenstein, & Seltman, 2013; Kuppuswamy & Bayus, 2017), which require *visible progress* toward a collective goal. In our setting, no progress information is available. We therefore predict that the positional order effect operates in precisely the regime where these other mechanisms are silent.

H1: In sequential prosocial decisions without observation, contributions decline with position in the sequence (the positional order effect).

If this behavioral pattern reflects forward-looking as-if reasoning, it should also be visible in consumers' beliefs. Specifically, consumers should treat their own choices as more diagnostic of the choices of future decision-makers (whose fates are still open) than of past decision-makers (whose fates are closed). We call this the *future similarity effect*.

H2: Consumers treat their own choices as more diagnostic of future others' choices than of past others' choices (the future similarity effect).

The Role of Self-Interest and Future Human Agency

Not all consumers should exhibit the positional order effect. For prosocially motivated consumers, the decision to contribute stems from an intrinsic preference for generosity—often understood as a "warm glow" derived from the act of giving itself (Andreoni, 1995). Because this motivation does not depend on what others will do, prosocial consumers' contributions should be relatively insensitive to sequential position. They give because giving is inherently valued, regardless of whether they move first or last.

Self-interested consumers face a fundamentally different decision. For them, contributing to a collective good is a certain personal cost weighed against an uncertain collective benefit. The forward-looking as-if heuristic provides a resolution to this tradeoff: if early movers can reason as if their contribution will be matched by those who follow, then the expected return from contributing rises with the number of future human decision-makers. A formal model in appendix generates this prediction quantitatively: the minimum "as-if influence" parameter needed to justify contribution increases with position in the sequence, and this increase is steeper for more self-interested individuals. In other words, the positional order effect should be strongest among those most focused on maximizing their own direct payoffs.

This prediction connects to consumer research on self-diagnosticity. Touré-Tillery and Fishbach (2012) show that the position of an action within a sequence affects its perceived diagnosticity for self-concept: actions at the beginning and end of a sequence feel especially self-revealing. Touré-Tillery and Fishbach (2015) further demonstrate that consumers exercise more restraint when choices appear self-diagnostic. In our setting, early choices in a sequence may feel especially diagnostic not only of who the consumer is, but of what future others will do. For self-interested consumers, this diagnostic weight creates a reason to cooperate that does not exist for late movers.

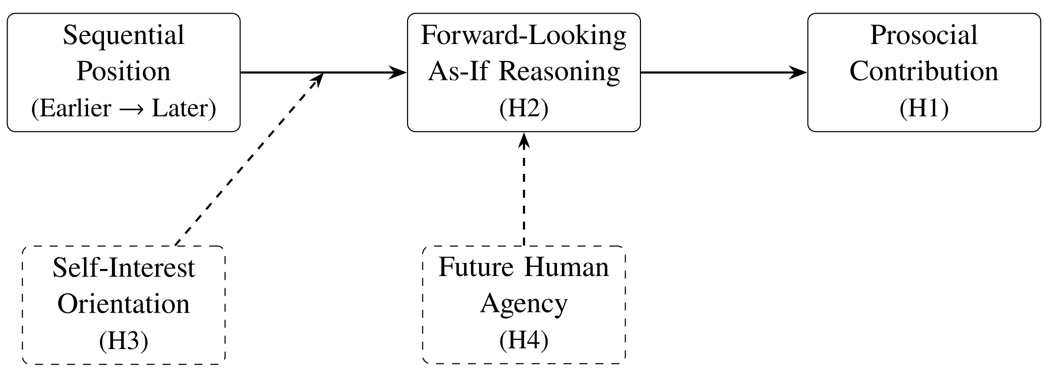
H3: The positional order effect is driven by self-interested consumers; prosocially motivated consumers contribute consistently regardless of position.

Finally, the as-if heuristic should depend on a critical structural feature of the decision environment: the presence of future *human* decision-makers. The logic of forward-looking as-if reasoning requires agents whose choices might plausibly mirror one's own. A random process—such as a computerized draw—cannot mirror a consumer's choice. If the future segment of the sequence is determined by a random process rather than by other people, there is no basis for treating one's own contribution as informative about what will follow, and the positional order effect should disappear. Conversely, if the *past* segment is described as random but the *future* segment consists of human decision-makers, the effect should persist, because the relevant open fates remain human. This asymmetric prediction provides a direct causal test of the proposed mechanism: it is not sequential position per se that drives cooperation, but sequential position *relative to future human agents*.

H4: The positional order effect depends on the presence of future human decision-makers and disappears when future outcomes are determined by a non-agentic process.

FIGURE 1

Conceptual model. Sequential position influences prosocial contribution through forward-looking as-if reasoning: consumers in earlier positions reason as if their choices will be mirrored by future decision-makers, increasing willingness to contribute. This mechanism is moderated by self-interest orientation (the effect emerges among self-interested consumers; H3) and by the presence of future human agency (the effect requires that future positions are occupied by human decision-makers, not random processes; H4). Hypotheses are indicated in parentheses.



OVERVIEW OF STUDIES

We tested these predictions across five incentivized experiments ($N = 6{,}057$) using sequential social dilemmas—controlled paradigms that capture the core structure of many consumer situations where individual contributions are pooled for collective benefit. Table 1 summarizes the design and purpose of each study.

The empirical package proceeds as follows: Study 1 documents the initial, serendipitous observation of the positional order effect in a two-player sequential Prisoner's Dilemma, where first-movers cooperated at significantly higher rates than second-movers even though neither could observe the other's choice. Study 2 replicates this effect in a three-person public goods game with a longer sequence and a simultaneous-move control condition, and provides the first evidence for the future similarity effect (H2). Study 3 tests whether the effect is driven by self-interest (H3) by measuring Social Value Orientation: the contribution decline with position appeared only among individualistic participants, while prosocial participants contributed consistently regardless of position. Study 4 demonstrates that instructing participants to maximize their personal earnings is sufficient to induce the effect, confirming the role of self-interested motivation and setting up the mechanism test. Study 5 provides the critical causal test (H4): by experimentally replacing future human decision-makers with a random process, the positional order effect disappears entirely, establishing that forward-looking as-if reasoning requires perceived future human agency.

All participants were recruited from U.S.-based online panels. Studies 1–3 used Amazon Mechanical Turk (AMT); Studies 4–5 used CloudResearch's filtered AMT panel. All studies except Study 4 were preregistered. All decisions were incentivized.

Common Design Elements

All studies were real-time, one-shot linear PGGs with a multiplier of two (or a structurally equivalent two-person Prisoner's Dilemma in the case of Study 1). PGG tasks were framed to participants as decisions about whether to contribute to a "Community Fund". Participants contribute three main inputs: comprehension checks, game playing decisions, and predictions of the responses of other players. Apart from a base payment and proceeds from the game, correct

Table 1: Overview of Studies

Study	Task	*N* (recruited / analyzed)	Pre-reg?	Purpose	Key manipulation
1	2-player sequential PD	2,371 / 1,075	Yes[a]	Initial observation of positional order effect (H1)	Order (P1 vs. P2)
2	3-player SPGG	1,444 / 1,002	Yes	Replicate order effect; test future similarity (H1, H2)	Order (P1–P3)
3	5-player SPGG	1,298 / 484[b]	Yes	Test moderation by self-interest (H3)	Order × SVO
4	5-player SPGG	197 / 183	No	Induce effect via self-interest instruction (H3)	Order × Instruction
5	5-player SPGG	747 / 617	Yes	Causal test: future human agency required (H4)	Order × Agent type

[a]The order effect was a post-hoc finding; the preregistration covered other aspects of the design.
[b]P1 data excluded due to technical error (see Study 3 Method).

answers to comprehension checks are directly incentivized and accurate predictions of others' moves are incentivized based on the mean squared error between the actual and predicted value. In all studies, players participated in a brief text chat with their groupmates *before* learning the task they will complete to increase engagement and confirm to them that they were interacting with real people in real time. The text chat was prior to learning the game they would play, and prior to being assigned to conditions. There is no interaction once the initial text chat is finished, so effects of the group chat on gameplay are necessarily random in the manipulated variables (see web appendix C for robustness checks against group-level dependencies). All experiments except Study 1 included simultaneous-move control conditions; in Studies 4 and 5 these included simultaneous conditions with delays matched to late-mover waiting times, to control for wait time effects. Across all simultaneous-move controls, there is no evidence that longer waits reduce contributions, ruling out wait time as an explanation for the positional order effect (see web appendix E for details).

To ensure that participants fully understood the incentive structure we employed comprehension checks. All experiments except Study 1 (which used similar comprehension questions; see Study 1 Method below) share the following three up-front comprehension and attention check questions (randomized in order):

1. *Do any of the other players* ***know how much YOU decide to contribute?***
2. *Jack and Jill are playing this game together. Jack decided to* ***TRANSFER*** *and Jill decided to* ***KEEP****. Who will make more money, Jack or Jill?*
3. *What year is it?*

Participants are given one chance to get each of these questions right, and a single wrong answer results in their data being excluded from analyses. Responses to the comprehension questions are only relevant to data analysis, however: players continue on whether or not they have answered correctly because it is necessary that they move in order for everyone else to finish the game. They have no contact with, and so no effect on, others' choices. Participant compensation included a base payment, earnings from the game, and incentivized bonuses for correct comprehension answers and accurate predictions of others' moves. All experiment software was written in the open-source oTree framework (Chen et al., 2016).

Statistical Approach

Primary statistical inference for all linear models relies on a non-parametric bootstrap procedure at the participant level to account for the non-normal distribution of the contribution data (which is heaped at 0, 50, and 100), and potential heteroskedasticity. Though predictions were directional, we report two-tailed tests with $\alpha = .05$ alongside 95% confidence intervals. The primary dependent variable, *contribution*, is treated as a continuous outcome in percentage points on the interval $[0, 100]$. We report 95% confidence intervals and two-tailed p-values derived from 10,000 bootstrap replicates. Figures display point estimates with 95% confidence intervals. We include the results of several robustness tests in web appendix C. These include standard errors clustered at the group level, to account for any group-level dependence, and corrections to Study

3's preregistered partial correlations analysis (reported in the main text for all studies) to account for multiple measurements per person.

Coding. *Order* is an integer representing a player's position in the sequence. *SVO* is either a categorical factor (Individualistic vs. Prosocial) or a continuous *SVO angle*. In Study 4, *instruct_or_no* is a binary indicator for the instruction to maximize payoffs. In Study 5, *random_before* is a binary indicator for the "Random Before" condition.

Diagnostic predictions analysis. To assess whether players treat their own choice as diagnostic of others' choices, we computed partial correlations between a player's own contribution a_i and their prediction of another player's contribution $\hat{a}_k$, controlling for their prediction of the population average $\bar{a}_{\text{pop}}$. The partial correlation isolates the relationship between own choice and predictions about specific group members, above and beyond general optimism or pessimism about the population:

$$r_{a_i,\hat{a}_k\cdot\bar{a}_{\text{pop}}} = \frac{r_{a_i,\hat{a}_k} - r_{a_i,\bar{a}_{\text{pop}}} \cdot r_{\hat{a}_k,\bar{a}_{\text{pop}}}}{\sqrt{1 - r^2_{a_i,\bar{a}_{\text{pop}}}} \cdot \sqrt{1 - r^2_{\hat{a}_k,\bar{a}_{\text{pop}}}}} \tag{1}$$

We computed these partial correlations separately for predictions about participants who had yet to move ("forward" direction) and participants who had already moved ("backward" direction), and compared them using Fisher's z-transformation.

Software and reproducibility. All analyses were implemented in python using statsmodels for estimation and custom resampling code for bootstraps. Analysis scripts and preregistrations are available at the OSF links provided in each study's Method section.

STUDY 1: INITIAL OBSERVATION IN A SEQUENTIAL PRISONER'S DILEMMA

We first observed the positional order effect serendipitously in a two-player sequential game. This surprising finding motivated the subsequent, preregistered studies.

Method

Participants. A total of 2,371 U.S.-based participants were recruited from Amazon Mechanical Turk (AMT) to complete the study. Of these, 1,075 (45%) passed all comprehension checks and were included in the final analysis.

Procedure and Design. This study employed a two-person Sequential Prisoner's Dilemma (PD), which is structurally equivalent to a two-person Public Goods Game. The study was preregistered at osf.io.

Upon arrival, participants provided informed consent. Participants were then placed into a real-time chat room for 30 seconds to exchange messages, confirming that their partner was a real person. Following this, they received instructions for the game.

The game was framed as an allocation task. Each player was endowed with a sum of money and chose either to "keep" it or "transfer" it to the other player. If transferred, the amount was doubled before reaching the partner. Player 1 moved first, followed by Player 2. Crucially, Player 2 did not observe Player 1's move before making their own decision. The payoff matrix is provided in web appendix B.

Before playing, participants completed five comprehension questions testing their understanding of the incentive structure and the sequential (but unobserved) nature of the game (see web appendix for full question text). Failure to answer any question correctly resulted in exclusion from the analysis. After making their decision, participants predicted the likelihood that their partner had transferred (0–100%) and the likelihood that an average player would transfer.

Treatments. Participants were randomized into one of several conditions. These included the standard sequential PD described above, as well as exploratory conditions involving manipulations of social information and mentalizing. As these exploratory manipulations are not central to the positional order effect reported here, we collapse across conditions for the primary analysis.

Analytic Strategy. We employed a logistic regression to analyze the binary decision to transfer (cooperate) or keep (defect) as a function of the player's order in the sequence (Player 1 vs. Player 2):

$$\text{logit } \Pr(\text{coop\_recode}_i = 1) = \alpha + \beta\, \text{C(order)}_i + \varepsilon_i. \tag{2}$$

Additionally, we analyzed the relationship between a player's own move and their prediction of their partner's move.

Results and Discussion

Consistent with H1, first-movers were significantly more likely to cooperate (i.e., contribute their full endowment) than second-movers (57.2% vs. 50.1%, a 12% decrease; logistic odds ratio = 0.75, 95% CI = [0.59, 0.96], $p = 0.020$).

A conceptually parallel exploratory analysis of prediction data shows the same future similarity effect—partial correlations between one's own choice and predictions about the partner's move were larger for forward predictions ($r = 0.31$) than for backward predictions ($r = 0.27$), though the difference between directions does not reach significance. Decisions in Study 1 were binary (cooperate vs. defect), so there was substantially less variability in responses which reduces statistical power to detect differences.

This initial observation motivated a direct test with a longer sequence. The positional order effect was preregistered for all subsequent studies.

STUDY 2: REPLICATION IN A THREE-PERSON PUBLIC GOODS GAME

Having observed the positional order effect in a two-player game, we next tested whether it would replicate in a three-person SPGG with a longer sequence, additional measures, and a simultaneous-move control condition.

Method

Participants. A total of 1,444 U.S.-based participants were recruited from Amazon Mechanical Turk. Of these, 1,002 (69%) passed all comprehension checks and were included in the final analysis. Among these 1,002 participants, 782 were randomized to the sequential condition and 220 to the simultaneous condition.

Procedure and Design. This study employed a three-person Sequential Public Goods Game (SPGG). The study was preregistered at osf.io.

The game was a one-shot linear PGG with a multiplier of two. Each player was endowed with $1 and decided how much to contribute to a "Community Fund." The total amount contributed was doubled and distributed evenly among all three players, regardless of their individual contributions.

The experimental flow proceeded as follows. First, participants transcribed nonsense sentences to filter out bots. Next, they were placed into groups of three and entered a 30-second real-time chat room to establish that they were interacting with real people. The game rules were then explained, emphasizing that choices would be made sequentially but without observing prior moves. Participants subsequently answered the three comprehension questions shared with Studies 2–5; incorrect answers resulted in exclusion from analysis. Players then made their contribution decisions. In the sequential condition, the decision screen highlighted the player's position (e.g., "You are Player 1 of 3"). Finally, participants completed incentivized predictions of others' contributions, a Social Value Orientation (SVO) slider task (Murphy et al., 2011), and demographic questions.

Treatments. Groups were randomly assigned to one of two conditions. In the sequential condition, participants moved one after another (Positions 1, 2, or 3). Crucially, participants knew their position but could not see the contributions of those who moved before them. In the simultaneous condition, all three participants made their decisions at the same time, serving as a control condition where temporal order was removed.

Analytic Strategy. We analyzed contributions using OLS linear regressions. The primary predictor was the player's order in the sequence. The preregistration for Study 2 specified backwards-difference coding, enforcing a monotonic decline in contribution with order and a test for each difference.

$$\text{contribution}_{ig} = \alpha + \beta_1 \,\text{order}_{ig} + \varepsilon_{ig}. \tag{3}$$

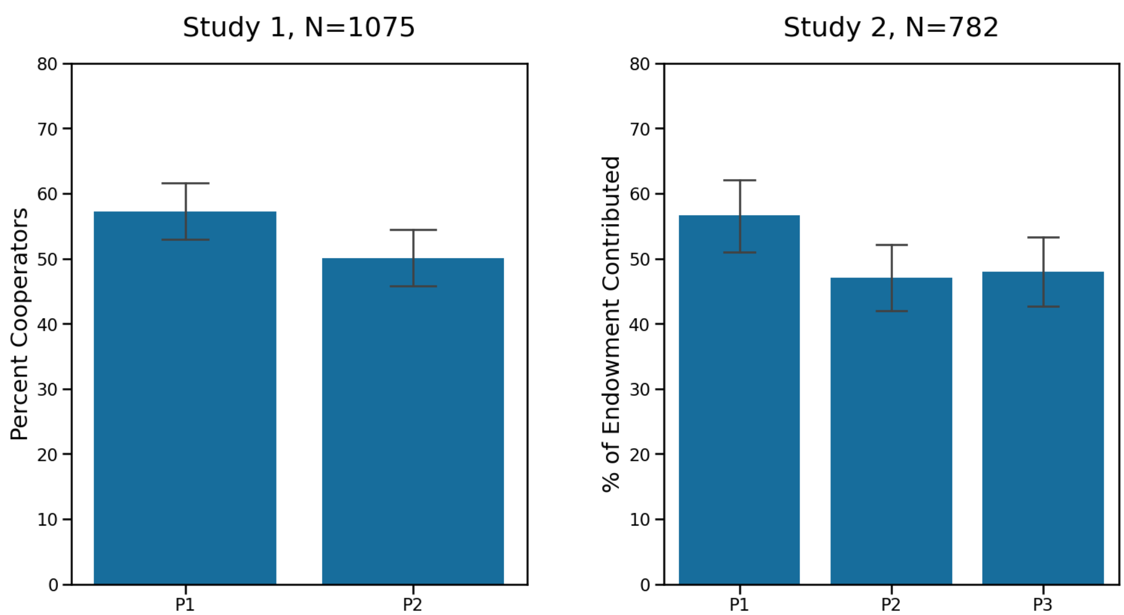
We also analyzed the relationship between a player's own contribution and their predictions of others' contributions as in Study 1.

Results and Discussion

Replicating the positional order effect (H1), Player 1 contributed on average 56.6% of the endowment, while Player 3 contributed 48.0%, a 15% decrease overall or 7.5% per position on average. Contributions declined from first to second position, though the difference between positions 2 and 3 was not significant. Importantly, this decline is not explained by mere time in the experiment: in simultaneous-move control conditions, there is no evidence that longer delays matched to late-mover waiting times reduce contributions (web appendix E). See figure 2.

FIGURE 2

Contributions to the public good decline with sequential position. Average contribution (as a percentage of initial endowment) is plotted against a player's position in a sequence. Data are from a two-player Prisoner's Dilemma (Study 1) and a three-player Public Goods Game (Study 2), demonstrating a negative trend where earlier movers tend to contribute more. Error bars represent 95% CIs.



Analysis of participants' predictions about others' contributions provided evidence for the future similarity effect (H2): participants' own contributions were much more strongly associated with their predictions about later movers than about earlier movers. For forward-looking predictions (toward open fates), we observed a partial correlation of $r = 0.40$, whereas for backward-looking predictions (toward closed fates), the partial correlation was $r = 0.18$. The difference between these correlations was significant ($N = 1198$ predictions, $\Delta r = 0.22$, $z = 4.08$, $p < 0.001$).

The unexplained lack of difference between positions 2 and 3 led us to design an experiment with a longer sequence and other improvements, adding SVO measurement to test whether the effect is moderated by self-interest.

STUDY 3: MODERATION BY SOCIAL VALUE ORIENTATION

Having established the presence of the positional order effect, we next investigated its psychological origins. We used the Social Value Orientation (SVO) scale to distinguish between "prosocial" participants (who value joint outcomes) and "individualistic" participants (who prioritize their own payoffs).

Method

Participants. A total of 1,298 U.S.-based participants were recruited from Amazon Mechanical Turk (MTurk). Due to a technical error in the experimental software that caused the decision timer for the first-moving player (P1) to expire prematurely, all P1 data and data from groups affected by the cascading timing issue were excluded, leaving 783 unaffected participants (Positions 2–5) who had the full, allotted decision time. Of these, 484 (62%) passed all comprehension checks and were included in the analysis, including 373 randomized to the sequential condition and 111 to the simultaneous condition.

Procedure and Design. This study extended the design to a five-person Sequential Public Goods Game. The study was preregistered at osf.io.

Several design refinements were introduced to improve the participant experience and experimental control compared to Study 2. The pre-game chat was extended to 60 seconds to allow for more meaningful interaction. Instead of a chat box while waiting for groups to form, participants played a simple game to maintain engagement. A player's position in the sequence was made explicitly salient on the wait screen, with a diagram of position and the phrase, "You are player [X] out of 5 players to go." Finally, contribution decisions were made using sliders with dynamic anchors displaying the exact consequences for the self and the fund (e.g., "KEEP FOR SELF: $0.43 ↔ CONTRIBUTE TO FUND: $0.57"), rather than text boxes.

The game structure remained a linear PGG with a multiplier of two and the flow follows Study 2. Participants subsequently answered the three comprehension questions shared with Studies 2–5; incorrect answers resulted in exclusion from analysis. After the game, participants completed the SVO slider measure (Murphy et al., 2011), which assesses willingness to trade off personal gains for others' benefit through a series of incentivized allocation decisions. The measure yields a continuous "angle" score (higher values indicate greater prosociality) and a categorical classification (Individualistic vs. Prosocial). Participants also completed demographic questions.

Treatments. Participants were randomized to either a Sequential condition (Positions 1–5) or a Simultaneous condition.

Analytic Strategy. We analyzed contributions from participants in positions 2–5 using linear regressions. To test the hypothesis that the positional order effect is driven by self-interest, we interacted position order with SVO angle (a continuous measure of prosociality):

$$\text{contribution}_{ig} = \alpha + \beta_1\, \text{order}_{ig} + \beta_2\, \text{SVO\_angle}_i + \beta_3\, (\text{order}_{ig} \times \text{SVO\_angle}_i) + \varepsilon_{ig}. \tag{4}$$

We also analyzed the partial correlations between a player's own contribution and their predictions of others' moves, controlling for population-level predictions, as in Studies 1 and 2.

Results and Discussion

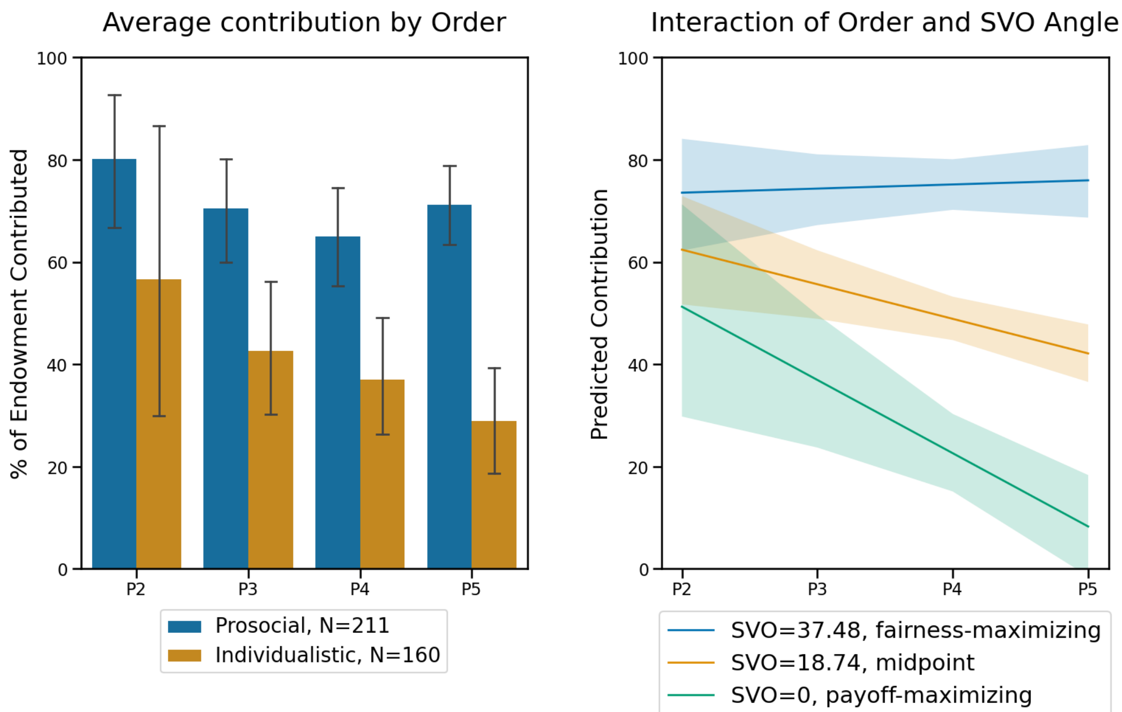
Consistent with H3, the positional order effect was driven almost exclusively by individualistic participants—those trying to maximize their own direct payoffs.

Prosocial participants contributed generously and at a consistent level regardless of their position. A linear model predicting contribution with order among prosocial participants only shows no effect. In contrast, individualistic participants showed a marked decline in contributions with increasing order, exhibiting a strong positional order effect. Player 2 contributed on average 56.7% of the endowment, while Player 5 contributed only 29.0%, a 49% decrease overall or 16% per position ($N = 160$ Individualistic, $\beta = -7.886$, 95% CI = [-15.106, -0.366], $p = 0.042$). This moderation is most apparent when using the continuous SVO angle measure (the SVO battery yields a continuous "angle" score; we focus on SVO angle because it preserves information relative to coarsening and using categories) instead of categorical Individualistic / Prosocial, where a stronger orientation toward self-interest (a smaller angle) is strongly associated with a steeper decline in contributions with order (figure 3; Order × SVO-angle interaction: $N = 373$, $\beta = 0.402$, 95% CI = [0.107, 0.683], $p = 0.008$.

This study also replicated the future similarity effect (H2). Predictions about participants who had yet to move were more tightly coupled to one's own contribution ($r = 0.41$) than predictions about participants who had already moved ($r = 0.25$; $N = 1492$ predictions, $\Delta r = 0.16$, $z = 3.11$,

FIGURE 3

The positional order effect is driven by self-interested players. (**A**) In a five-player game (Study 3) from which P1 data was excluded due to technical fault, contributions decline with order only for individualistic participants, not for prosocial participants. Participant types were determined by Social Value Orientation (SVO), a measure of preference for own versus joint outcomes. (**B**) The moderating effect is continuous. A smaller SVO angle (indicating greater self-interest) is associated with a steeper negative slope of contribution on order. Shaded areas represent 95% CIs.



p = 0.002 for the difference). See figure 4.

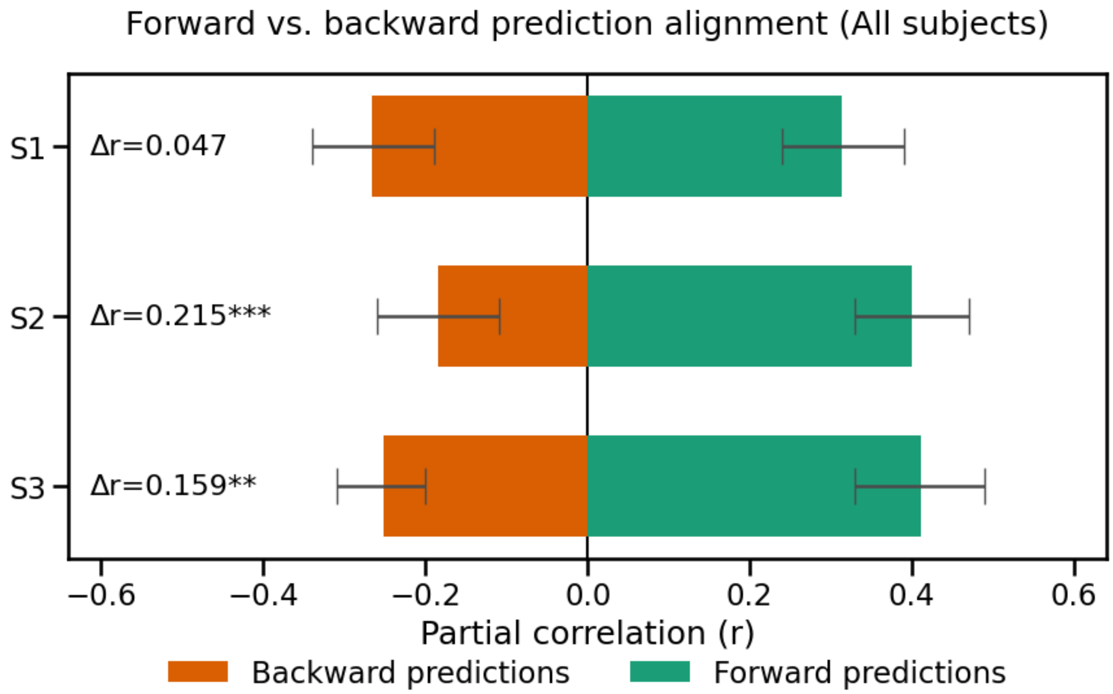
The moderation by SVO angle demonstrates that the positional order effect is a strategic heuristic employed by self-interested participants, not a universal tendency. This finding motivated a test of whether the effect could be experimentally induced through instructions.

STUDY 4: INDUCING THE POSITIONAL ORDER EFFECT

Tests of the underlying mechanism we planned for Study 5 make use of a sample that is composed entirely of self-interested participants. Because assembling such a sample by filtering the

FIGURE 4

Players will bet their decisions are more diagnostic of others' future decisions relative to past decisions. Partial correlations between a player's own contribution and their prediction of another player's contribution, controlling for predictions of the population average. Participants' own choices were more strongly correlated with their predictions about participants who had yet to move (forwards, towards open fates) than about participants who had already moved (backwards, towards closed fates). Error bars represent 95% CIs. Asterisks on Δr indicate forward–backward differences (Fisher's z test): $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.



available study populations proved unworkable for a five-person real-time game, we decided to perform a low-cost test whether the mere *instruction* to act selfishly would produce the positional order effect.

Method

Participants. A total of 197 U.S.-based participants were recruited from CloudResearch's filtered Amazon Mechanical Turk panel. Of these, 183 (93%) passed all comprehension checks and were included in the analysis. Among these 183 participants, 130 were randomized to the sequential condition and 53 to the simultaneous condition.

Procedure and Design. This study utilized a five-person Sequential Public Goods Game similar to Study 3, but introduced an experimental manipulation of self-interest instructions instead of measuring SVO. This study was not preregistered because it was intended as a quick test of the instruction; the next study, Study 5, is preregistered and depends upon the manipulation working.

Several design enhancements were implemented to improve data quality and experimental control. An initial screening involved completing English idioms to ensure high-quality, fluent participants. Participants also completed an incentivized interactive practice round where they calculated payoffs for hypothetical scenarios to ensure understanding of the game mechanics. Participants also experienced additional instruction screens, which reiterated key points. To prevent information leakage through response times (e.g., a late player inferring an early player's hesitation), the experiment advanced in lock-step. Each stage lasted a fixed duration regardless of how quickly a participant made their decision. Participants answered the three comprehension questions shared with Studies 2–5; incorrect answers resulted in exclusion from analysis.

In the "Instruction" condition, participants received the following prompt designed to induce self-interested behavior:

> Please try to play this game however you think will make you the most money. We understand that sometimes you want to help other people, but for the purposes of this experiment we want you to try to make as much money as possible.

Participants in the control condition did not receive this prompt.

Treatments. Participants were randomized into instruction versus no-instruction versions of a five-position sequential game and two simultaneous-move control conditions. In the sequential game, participants were assigned to one of five positions. To explicitly control for the effect of waiting time on contributions, the simultaneous controls included a no-delay condition corresponding to the timing of a first-mover and an 80-second delay condition corresponding to the waiting time experienced by a fifth-mover in the sequential game.

Analytic Strategy. We analyzed contributions using a linear regression to test if the instruction to maximize payoffs induced a positional order effect among sequential-condition subjects. The model included an interaction term between order and the binary instruction variable:

$$\text{contribution}_{ig} = \alpha + \beta_1\,\text{order}_{ig} + \beta_2\,\text{instruct\_or\_no}_i + \beta_3\,(\text{order}_{ig} \times \text{instruct\_or\_no}_i) + \varepsilon_{ig}. \quad (5)$$

Results and Discussion

Providing further support for H3, instructing participants to maximize their personal payoffs successfully induced the positional order effect. We observe a decrease from 70% contribution in Player 1 to 27% in Player 5 among players instructed to maximize earnings, a 61% decline overall or 15% per position. In particular, we still observe very high cooperation rates among first-movers despite the instruction. Among players not instructed to maximize earnings, Player 1 contributes 48% on average compared to Player 5's 77%. There is substantial noise in these estimates given the small sample, but we observe a strong interaction between order and the instruction to maximize own direct earnings, $N = 130$, $\beta = -15.671$, 95% CI = [-26.052, -4.668], $p = 0.006$; there is a strong order effect in the "instruct" condition, and none at all in the "no instruction" condition.

The presence of a positional order effect moderated by SVO angle in Study 3, combined with the ability to induce the effect with the instruction to maximize their own direct earnings shown in Study 4, suggests that the entire phenomenon—both the action and the belief that supports it—

is a strategic heuristic used by those focused on maximizing their personal outcomes. This result made us confident that deploying the mere instruction to maximize would result in the positional order effect in a larger study designed to test the mechanism directly.

STUDY 5: THE ROLE OF FUTURE HUMAN AGENCY

In Study 5, we tested whether the positional order effect depends on participants facing *future human decision-makers*, as opposed to future outcomes described as non-agentic and fixed by a random process.

Method

Participants. A total of 747 U.S.-based participants were recruited from CloudResearch's panel. Of these, 617 (83%) passed all comprehension checks and were included in the analysis. Among these 617 participants, 487 were randomized to the sequential condition and 130 to the simultaneous condition.

Procedure and Design. This study employed a five-person Sequential Public Goods Game to test the causal mechanism of the positional order effect. The study was preregistered at osf.io.

The flow of this study follows that of Study 4. Participants subsequently answered the three comprehension questions shared with Studies 2–5; incorrect answers resulted in exclusion from analysis.

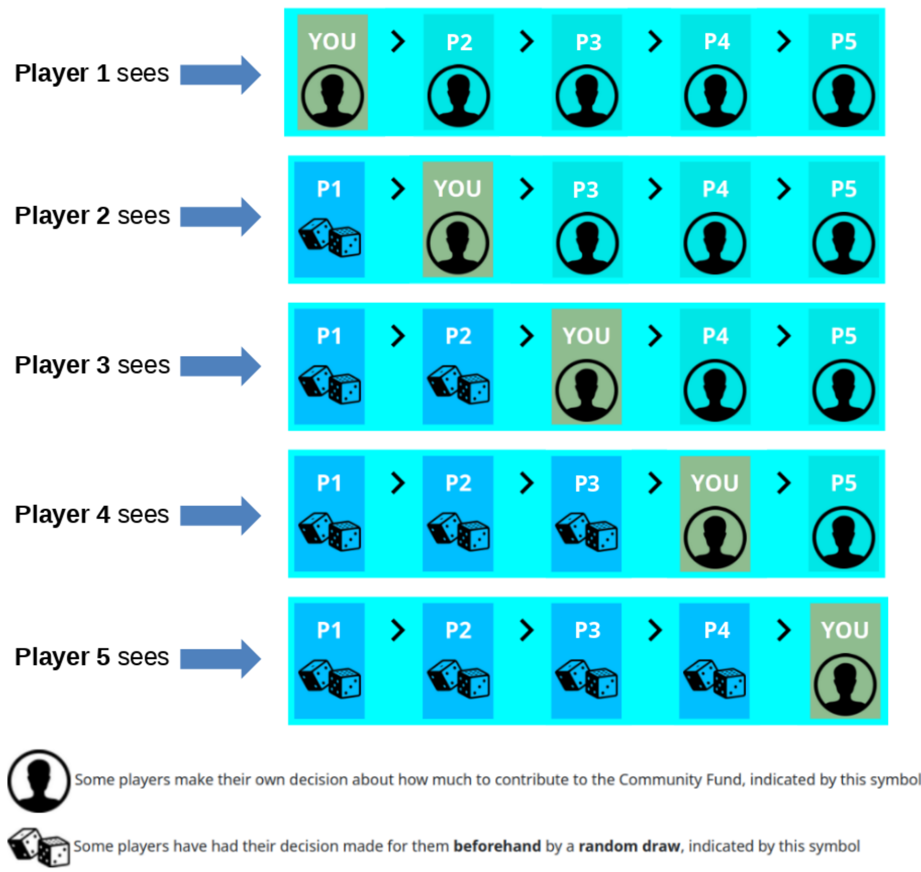
All participants received the instruction to maximize their personal earnings (identical to the "Instruction" condition in Study 4). The key manipulation involved the nature of the other agents in the sequence. To test whether the effect depends on the presence of future decision-makers, we introduced conditions where some players' moves were described as being determined by a random process (a computerized random draw, depicted with dice icons) rather than by a human agent. Visual aids (see figure 5) reinforced this distinction throughout the game.

We used deception in this study. It was not true that everyone either before or after a given player was making their own decision or having their moves made randomly. Rather, each player in each five-person game made his or her own moves, and was merely told that the others in the game either made their own decisions or had them made randomly. Performing this study without deception would have meant four players who produce no data per five-person game, thus requiring five times as many participants at five times the cost. We determined this was unworkable, and that the risks of using deception were warranted. All participants were fully debriefed regarding the deception upon completion of the study. The use of deception was approved by the authors' institutional review board.

Treatments. Within the sequential condition, participants were randomized to one of two agent type conditions: Random Before or Random After. In the Random Before condition, participants were told that all players moving before them had their contributions determined by a random process, while all players moving after them were human decision-makers. In the Random After condition, participants were told that all players moving before them were human decision-makers, while all players moving after them had their contributions determined by a random process. A separate simultaneous-move control condition (with no sequential ordering) served as a baseline.

As in Study 4, the Simultaneous condition included both "No Delay" and "80-second Delay" variants to control for time spent waiting to move.

FIGURE 5
Study 5 stimuli for the Random Before condition.



NOTE.—Stimuli for the Random Before condition. Players see a graphical representation of their position relative to other players that clearly conveys which players are having their moves made by a random process. The graphics for the Random After condition have the dice and human figures reversed.

Analytic Strategy. We analyzed contributions using a linear regression model that included an interaction between order and the condition (Random Before vs. Random After) among sequential-condition subjects.

$$\text{contribution}_{ig} = \alpha + \beta_1\,\text{order}_{ig} + \beta_2\,\text{random\_before}_i + \beta_3\,(\text{order}_{ig} \times \text{random\_before}_i) + \varepsilon_{ig}. \quad (6)$$

We also analyzed the relationship between a participant's own contribution and their predictions of others' contributions, distinguishing between predictions for human versus randomly determined agents. This was accomplished using the same partial correlations framework used in Studies 1–4. Robustness checks included using a T-test to test for a difference between no-delay and 80-second-delay simultaneous conditions.

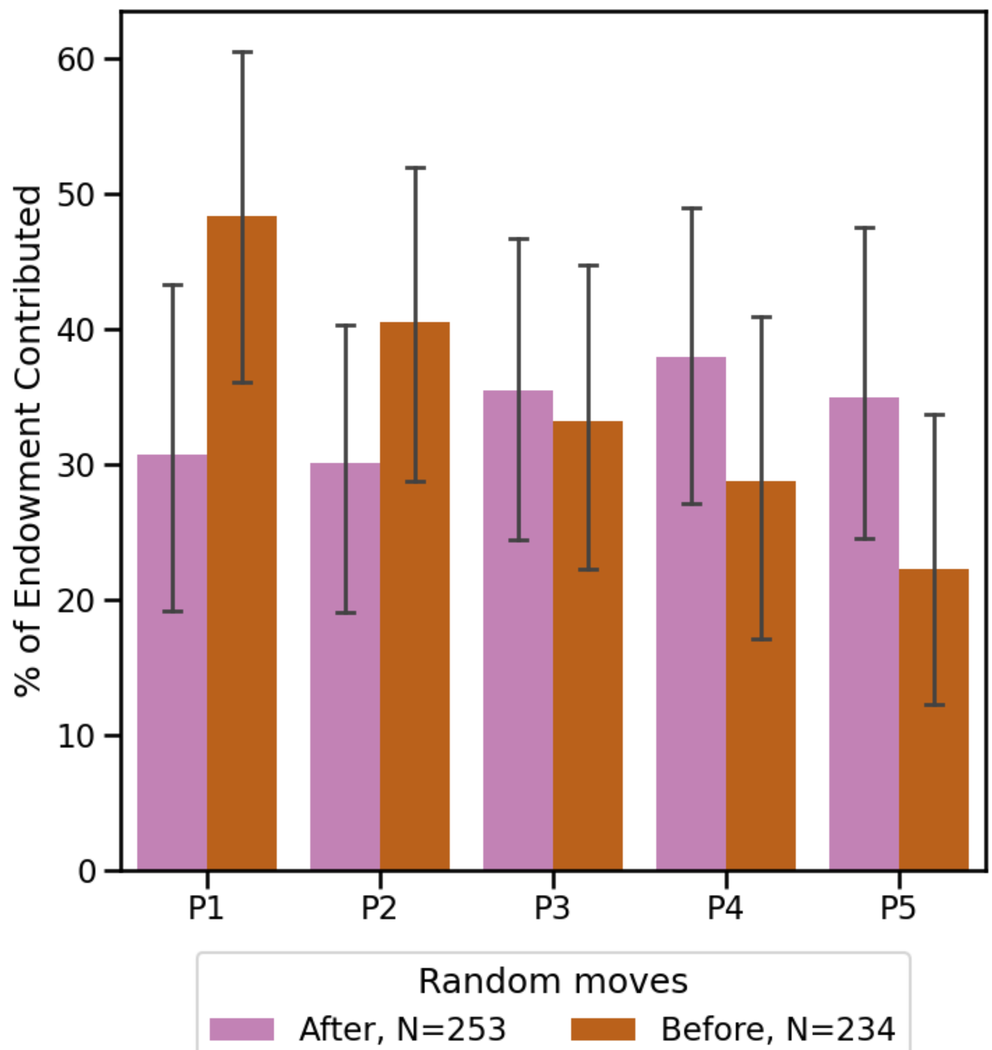
Results and Discussion

The results reveal the boundary condition predicted by H4 (figure 6). A strong positional order effect emerged in the *Random Before* condition, replicating our previous findings: contributions declined by 54%, from P1 (48% of endowment) to P5 (22% of endowment). In contrast, the order effect was eliminated in the *Random After* condition, where contributions were stable (mean 33%) regardless of position (P1: 31%; P5: 35%). The interaction between order and condition was robust ($N = 487$, $\beta = -8.088$, 95% CI = [-12.822, -3.120], $p = 0.001$), indicating that the contribution gradient appears when the *future* segment of the sequence consists of human partners, and disappears when the *future* is described as determined by a random process.

Participants' predictions about others' contributions provide convergent evidence from beliefs that is consistent with this interpretation. In the *Random Before* condition—where future moves were described as being made by human partners—participants' own contributions were strongly aligned with their predictions about future human decision-makers ($r = 0.60$), but only weakly related to predictions about past randomly determined moves ($r = 0.17$), yielding a large difference ($\Delta r = 0.44$, $z = 8.03$, 95% CI = [0.379, 0.577], $p < 0.001$). In the *Random After* condition, this pattern reversed: own contributions were weakly related to predictions about future random moves ($r = 0.05$) but substantially related to predictions about past human players ($r = 0.47$; $\Delta r = -0.42$, $z = -7.23$, 95% CI = [-0.524, -0.322], $p < 0.001$). In other words, participants' forecasts tracked their own choices *selectively for targets described as human agents*, and this selectivity flipped with the direction of agency in the sequence. This pattern is compatible with the idea that the positional order effect is driven less by position in time per se than by position

FIGURE 6

The order effect depends on perceived future human decision-makers. In a five-player game where all participants were instructed to be self-interested (Study 5), the decline in contributions with order appeared only when the players *yet to act* were described as real human decision-makers (*Random Before*). When the players *yet to act* were described as being determined by a random process (*Random After*), contributions no longer declined with position. This experimental dissociation indicates that the positional order effect is selectively engaged by expectations about future human agency. Error bars represent 95% CIs.

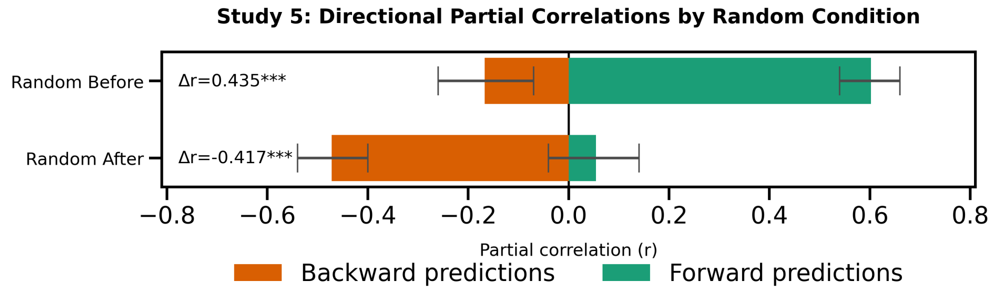


relative to *future human decision-makers* under uncertainty. See figure 7.

These belief data reveal two separable components of diagnostic projection. First, there is a *temporal direction* effect: participants project their own choices more strongly toward the future than toward the past, consistent with the open-fates account developed in our Conceptual Devel-

FIGURE 7

Predictions track participants' own choices selectively for human agents. Study 5: correlation between participants' own contributions and their predictions of other players' contributions, separating predictions about *human* decision-makers from predictions about *randomly determined* contributions. In *Random Before*, own contributions are tightly coupled to predictions about future human decision-makers but weakly related to predictions about past random moves; in *Random After*, this pattern reverses. Lines show fitted relationships; shaded areas indicate 95% CIs. Asterisks on Δr indicate forward–backward differences (Fisher's z test): $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.



opment. Second, there is a *human agency* effect: participants project toward human agents more than toward random processes, regardless of temporal direction. In Random After, for instance, participants showed substantial projection toward past human players ($r = 0.47$) even though those fates were already closed. The design of Study 5 crosses these two dimensions, and the behavioral contribution gradient emerges specifically at their intersection—when the future contains human decision-makers. The belief data thus paint a richer picture than the open-fates framing alone would suggest: as-if reasoning is tuned to human agents generally, with an additional forward bias that drives the positional order effect in behavior.

An alternative explanation—that the contribution decline simply reflects fatigue or impatience from waiting longer—is ruled out by the simultaneous-move control conditions, which mimic the timing of first-movers (no delay) and last-movers (80-second delay). Contributions were statistically indistinguishable across these conditions (38.0% vs. 47.2% of endowment, $t(128) = -1.08$, $p = 0.282$), with the trend running in the opposite direction to the positional order effect. The effect is specific to sequential ordering and beliefs about future human decision-makers, not a function of wait time.

Taken together, Study 5 provides causal evidence that the positional order effect depends on the presence of future human agency, ruling out accounts based on temporal position alone.

GENERAL DISCUSSION

Our results reveal a robust forward-looking heuristic that self-interested individuals use in one-shot social dilemmas, causing cooperation to systematically decline with later positions in sequence. This heuristic provides a new explanation for cooperation among the consumer segment who are least inclined to help others. An individual's willingness to contribute is systematically shaped by their position in a sequence, but this sensitivity only emerges when participants are motivated to maximize their own direct payoffs. Across studies, the effect is not explained by new information about others' choices; instead, it appears to reflect a forward-directed shortcut that links one's own decision to expectations about others. In Study 5, experimentally changing whether the *future* portion of the sequence was described as human decision-making versus a random process selectively turned the contribution gradient on or off. Prediction data mirror this boundary condition: participants' forecasts align with their own contributions for targets described as human agents, and this alignment disappears (or reverses) for targets described as random. Together, these findings identify a principled constraint on when the order effect operates—namely, when the future is construed as containing human agency under "open fates" uncertainty.

Theoretical Contributions

This article makes three contributions to consumer psychology and behavioral decision theory. First, we identify a new psychological mechanism—forward-looking as-if reasoning—that promotes prosocial behavior among self-interested consumers. The existing literature on prosocial consumer behavior has focused on drivers such as warm glow (Andreoni, 1995), moral identity (Aquino & Reed, 2002), social norms (White et al., 2020), and perceived impact or tangibility (Sharma & Morwitz, 2016; Small & Loewenstein, 2003). These mechanisms presuppose either intrinsic motivation or visible evidence that one's contribution matters. The positional order effect operates in a regime where neither condition holds: contributions are private, progress is invisible, and the consumers who exhibit the effect are precisely those who prioritize their own payoffs. Forward-looking as-if reasoning thus fills a gap in our understanding of when and why self-interested consumers cooperate in collective action settings.

Second, we contribute to the goal-gradient and perceived-impact literatures by documenting a complementary pattern. The goal-gradient literature shows that visible progress toward a collective goal makes later contributions more motivating (Cryder, Loewenstein, & Seltman, 2013; Kuppuswamy & Bayus, 2017). We document the opposite regime: when progress is invisible and choices are private, *earlier* position is more motivating for self-interested consumers. The two patterns are not contradictory—they operate in different informational environments. Goal-gradient effects require observable momentum; the positional order effect operates exactly where such information is absent, and beliefs about future human agents fill the void.

Third, we introduce a temporal asymmetry to the literature on diagnostic reasoning and decision-making under uncertainty. Prior research on quasi-magical thinking (Shafir & Tversky, 1992), self-signaling (Bodner & Prelec, 2003), and evidential decision theory (Quattrone & Tversky, 1984) did not make the arrow of time an object of study. Our data show that the self–other coupling in beliefs is directed primarily toward the future—the realm of "open fates" that remain mutable (Morris et al., 1998)—though Study 5 reveals that perceived human agency also attracts projection even backward in time. The behavioral contribution gradient, however, emerges specifically when the future contains human decision-makers, suggesting that the conjunction of temporal direction and human agency is what drives the positional order effect. We emphasize that "diagnostic" thinking is best understood here as an *as-if* characterization: consumers act *as if* their choices influence future others' behavior. This framing is descriptive; it does not imply that consumers consciously endorse a belief in causal control. The underlying mechanism could involve diagnostic inference, social projection, false consensus applied selectively to human agents, or intuitive moral universalization. What these channels share is a forward-looking structure that our prediction data confirm: consumers treat their own choices as more informative about the uncertain future than about the already-settled past, and this asymmetry is sharpest when future agents are human.

Implications for Consumer Welfare and Practice

The positional order effect suggests several implications for the design of collective action campaigns, though we note that our evidence comes from controlled experimental paradigms and field validation is needed before drawing strong prescriptive conclusions.

Framing sequential participation. Most collective action campaigns unfold sequentially—donors, backers, and shoppers decide one after another. Our findings suggest that framing the consumer as "among the first" could increase contributions—especially among self-interested consumers who are typically the hardest to reach. In crowdfunding, for example, an early backer may contribute not just to signal support but in part because they reason as if their pledge makes it more likely that subsequent backers will also contribute. This suggests that emphasizing a consumer's early position in a campaign may be a no-cost lever for increasing participation.

Making future human agency salient. The finding that the heuristic requires perceived future human agency suggests that campaigns could make the presence of future decision-makers salient. A message such as "500 more shoppers will face this choice today" may be more effective than "Join 500 others who have already donated," because the former highlights future human agents whose choices remain open, while the latter points to past agents whose fates are closed.

Consumer welfare considerations. The heuristic may lead to outcomes that benefit both the collective and the individual consumer—if future others do indeed contribute, early movers' cooperation is vindicated. However, it may also lead to over-contribution by early movers whose expectations are not matched. Whether the heuristic is welfare-enhancing therefore depends on the structure of the collective action problem and the accuracy of consumers' beliefs about mirroring.

Boundary conditions. It is important to distinguish the regime in which the positional order effect operates from contexts where other mechanisms dominate. Goal-based campaigns with visible progress thermometers, social proof displays showing others' past donations, or observable contributions would engage different psychological processes—and in such settings, later position may become *more* motivating as the goal nears completion (Cryder, Loewenstein, & Seltman, 2013; Kuppuswamy & Bayus, 2017). The positional order effect applies specifically to private, sequential decisions without observation, a regime that describes many real-world consumer situations but not all.

Limitations and Future Research

Several limitations of the present work suggest directions for future research. First, while the "Community Fund" paradigm captures the core structure of many prosocial consumer settings, field experiments with real checkout donations, crowdfunding pledges, or sustainability commitments are needed to assess ecological validity. Second, our samples are U.S.-based online convenience samples with relatively low financial stakes. The majority of such decisions made in the real world may be well-represented by such stakes, but the robustness of the effect across demographics, cultures, and stake levels remains to be established. Third, the "as-if" characterization is intentionally agnostic about the precise cognitive mechanism. Our data do not distinguish between diagnostic reasoning, social projection, moral universalization, or shifts in optimism and pessimism as the underlying process. Future work using think-aloud protocols, process tracing, or formal mediation measures could sharpen this characterization. Finally, our studies use groups of two to five. Real collective action problems—crowdfunding campaigns, sustainability initiatives, public broadcasting pledge drives—can involve hundreds or thousands of participants. Whether the effect is driven by e.g. relative or absolute position within a group is an open question. These represent promising avenues for future research.

Concluding Remarks

Consumers routinely make prosocial decisions—donating at checkout, backing a crowdfunding campaign, choosing a sustainable product—as one of many sequential participants whose choices are private. Using incentivized social dilemmas that capture the core structure of these settings, we show that the mere knowledge of being early in such a sequence makes self-interested consumers more willing to contribute, because they reason as if their choice will be mirrored by those who follow. This forward-looking heuristic offers a new explanation for cooperation among those least inclined to help others, and it identifies the temporal architecture of a choice as a subtle but potentially powerful force in shaping prosocial consumer behavior.

DATA COLLECTION STATEMENT

The first author collected data for all studies under the supervision of the second author at the MIT Sloan School of Management. Study 1 was conducted online with U.S.-based Amazon Mechanical Turk participants from September 29 to October 3, 2019. Study 2 was conducted online with U.S.-based Amazon Mechanical Turk participants from October 28 to November 26, 2019. Study 3 was conducted online with U.S.-based Amazon Mechanical Turk participants from April 7 to May 28, 2021. Study 4 was conducted online with U.S.-based CloudResearch participants from September 21 to 27, 2022. Study 5 was conducted online with U.S.-based CloudResearch participants from November 9, 2022 to March 13, 2023. Both authors jointly analyzed the data. All studies were approved by MIT's Committee on the Use of Humans as Experimental Subjects (COUHES). Data are stored in encrypted local storage at MIT and, in anonymized form, on the Open Science Framework (OSF).

APPENDIX A

THE PUBLIC GOODS GAME

In a standard PGG, n players are each given an endowment e, and are asked to decide what proportion of their endowments to contribute to the public good, from nothing to all of it. A given player's contribution to the public good is represented by a. The total amount from all the players that is contributed to the public good, c, is then multiplied by a multiplier m (which must be less than the number of players), and this amount is distributed evenly among all the players—even those who chose to contribute nothing. An individual player's payoff function in a standard simultaneous-move PGG is as follows:

$$p = \frac{mc}{n} + e(1 - a) \quad (7)$$

Consequently, whenever the multiplier m is less than the number of players n, the group as a whole does better if everyone contributes their entire endowment (cooperates), but each individual player is better off if he or she contributes nothing (defects). Put another way, the total amount of money in the group is maximized if everyone cooperates, but any individual player always makes more by defecting—independent of anyone else's moves. Since other players do not know your move, they cannot change their own moves in reaction to it. If a group plays the game only once, it is impossible to build reputations, enact retribution, or to reward others for their actions.

APPENDIX B

FORMAL MODEL

Here we provide a more precise statement of a model that generates the hypothesized interaction between the positional order effect and prosocial motivation.

Prosocial Preferences

Consider a sequential PGG with n players endowed with 1 payoff unit each, and multiplier m, with $1 < m < n$. Players are indexed by their order of play in the sequence, $i = 1, ..., n$. Let a_i denote the contribution of player i, $0 \leq a_i \leq 1$, and p_i the payoff to player i.

$$p_i = 1 - a_i + \frac{m}{n} \sum_{k=1}^{n} a_k \tag{8}$$

Prosocial preferences are modeled through a prosocial parameter s_i where $s_i = 0$ indicates pure self-interest and $s_i = 1$ pure prosocial motivation. In keeping with the experimental setup, we assume that players do not learn the specific contributions of other players. The utility of player i is therefore a function of the two variables the player does or will know, namely contribution a_i and payoff p_i:

$$u_i\left(a_1, \ldots, a_n\right) = \left(1 - s_i\right) p_i + s_i m a_i \tag{9}$$

where p_i is determined by the game formula, Equation 8. A purely self-interested player ($s_i = 0$) will aim to maximize own payoff, $u_i = p_i$; a purely prosocial player ($s_i = 1$) will aim to maximize the impact of her contribution to the public good, $u_i = ma_i$. The prosocial motive, captured by the second term, thus reflects the impact of own contribution to the public good; other players' contributions enter the utility model only insofar they determine the first, self-interested utility term. In other words, players can: (a) care how their action affects the payoffs of others, (b) care how other players' contribution affect their own payoff, but (c) do not care how other players' actions affect each others' payoffs.

Decision-Dependent Expectations

We assume that players compare expected utilities conditional on contributing ($a_i = 1$) or not contributing ($a_i = 0$), and choose whichever expected utility is higher (we ignore here fractional contributions). The decision criterion is therefore the difference between the two expected utilities:

$$a_i = 1 \Longleftrightarrow \mathbb{E}\left[u_i \mid a_i = 1, s_i\right] > \mathbb{E}\left[u_i \mid a_i = 0, s_i\right] \tag{10}$$

A player knows the value of their prosocial parameter and hence also knows the utility function in Equation 9. If she were just a spectator, not making a decision, her expectation of the contribution of another, randomly selected player would exhibit projection, along the lines of Bayesian updating. The simplest version of such updating is linear, with an intercept b and slope γ:

$$\mathbb{E}\left[a_k \mid s_i\right] = b + \gamma s_i \tag{11}$$

Prosocial players are more optimistic about the overall contribution level, all other things equal. We assume parameters are such that all implied expectations remain in $[0, 1]$.

The critical assumption we now make is that expectations of future players' contributions are additionally influenced by a player's own action, while expectations of prior players' contributions are not influenced. Let $a_{k<i}$ denote the contribution of any player moving before player i, and $a_{k>i}$ the contribution of any player moving after player i. We assume:

$$\begin{aligned} \mathbb{E}\left[a_{k<i} \mid a_i, s_i\right] &= b + \gamma s_i \\ \mathbb{E}\left[a_{k>i} \mid a_i, s_i\right] &= b + \gamma s_i + d\left(a_i - \mathbb{E}\left[a_k \mid s_i\right]\right) \\ &= (1-d)\left(b + \gamma s_i\right) + d a_i \end{aligned}$$

where $\mathbb{E}\left[a_k \mid s_i\right] = b + \gamma s_i$ from Equation 11 is substituted in the final line.

There is no perceived causality with respect to previous players, since expectations are the same irrespective of contribution:

$$\mathbb{E}\left[a_{k<i} \mid 1, s_i\right] - \mathbb{E}\left[a_{k<i} \mid 0, s_i\right] = 0$$

There is perceived causality with respect to future players, proportional to the "as if" influence parameter d, which describes the extent to which the focal player believes other players will mirror his move:

$$\mathbb{E}\left[a_{k>i} \mid 1, s_i\right] - \mathbb{E}\left[a_{k>i} \mid 0, s_i\right] = d$$

The decision criterion in Equation 10 can be expressed as:

$$\begin{aligned}
\mathbb{E}\left[u_i|a_i = 1, s_i\right] - \mathbb{E}\left[u_i|a_i = 0, s_i\right] &= (1 - s_i)\mathbb{E}\left[p_i|a_i = 1, s_i\right] + s_i m - (1 - s_i)\mathbb{E}\left[p_i|a_i = 0, s_i\right] \\
&= (1 - s_i)\left(\mathbb{E}\left[p_i|a_i = 1, s_i\right] - \mathbb{E}\left[p_i|a_i = 0, s_i\right]\right) + s_i m \\
&= (1 - s_i)\left(-1 + \frac{m}{n}\mathbb{E}\left[\sum_{k=1}^{n} a_k|a_i = 1, s_i\right] - \frac{m}{n}\mathbb{E}\left[\sum_{k=1}^{n} a_k|a_i = 0, s_i\right]\right) + s_i m
\end{aligned} \tag{12}$$

where the first line follows from Equation 9 and the third line from substituting Equation 8 into the payoff difference.

Assuming that expectations about contributions of previous players are not affected by own contribution, the difference in expected total contribution resolves as:

$$\begin{aligned}
\mathbb{E}\left[\sum_{k=1}^{n} a_k \mid a_i = 1, s_i\right] - \mathbb{E}\left[\sum_{k=1}^{n} a_k \mid a_i = 0, s_i\right] &= 1 + \mathbb{E}\left[\sum_{k=i+1}^{n} a_k \mid a_i = 1, s_i\right] - \mathbb{E}\left[\sum_{k=i+1}^{n} a_k \mid a_i = 0, s_i\right] \\
&= 1 + d(n - i)
\end{aligned}$$

Substituting into the criterion,

$$\mathbb{E}\left[u_i|a_i = 1, s_i\right] - \mathbb{E}\left[u_i|a_i = 0, s_i\right] = (1 - s_i)\left(-1 + \frac{m}{n}\left(1 + d(n-i)\right)\right) + s_i m$$

For any $s_i \in [0, 1)$ and any player with at least one future mover ($i < n$), the minimum *as if* influence parameter $d^*(i)$ that leads to $a_i = 1$, i.e., full contribution to the public good, is computed as:

$$\begin{aligned}
&\mathbb{E}\left[u_i \mid a_i = 1, s_i\right] - \mathbb{E}\left[u_i \mid a_i = 0, s_i\right] = 0 \\
&\qquad\qquad\qquad \Longleftrightarrow d^*(i) = \frac{(n-m)(1-s_i) - s_i m n}{m(1-s_i)(n-i)} \\
&\qquad\qquad\qquad\qquad\qquad = \frac{1}{n-i}\left(\frac{n-m}{m} - \frac{n s_i}{1-s_i}\right)
\end{aligned} \tag{13}$$

For the last mover ($i = n$), no finite threshold $d^*(n)$ is defined because there are no future players whose actions can be mirrored. When the expression in Equation 13 is nonpositive, contribution is optimal even at $d = 0$, so the operative cutoff is $\max\{0, d^*(i)\}$.

Note that, for $i < n$, $d^*(i)$ is increasing in i and decreasing in s_i. The increase in i is the positional order effect: Players later in the sequence require a higher value of $d^*(i)$ in order to contribute. Assuming that d is an exogenous parameter with some distribution in the participant sample, fewer players will clear the cutoff and contribute if they are later in the sequence. The decrease in s_i indicates that prosocial players require less acting *as if* in order to contribute.

The second implication of the model is that the slope of this function with respect to i (the term in the brackets in 13) is steeper if s_i is smaller, that is, if players are more self-interested. To show this, we differentiate:

$$\frac{dd^*(i)}{di} = \frac{1}{(n-i)^2}\left(\frac{n-m}{m} - \frac{s_i}{(1-s_i)}n\right)$$

which is decreasing in s_i. The threshold is also directly decreasing in prosociality:

$$\frac{\partial d^*(i)}{\partial s_i} = -\frac{n}{(1-s_i)^2(n-i)} < 0$$

This is the hypothesized interaction of order and prosociality. Less prosocial players will exhibit a stronger effect. Conversely, the positional order effect should disappear if s_i is sufficiently high.

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