

Nudging Organizations: Evidence from three large-scale field experiments

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Nudges and changes to choice architecture can affect individual behaviors. However, there is no evidence that these interventions are equally effective at changing the behaviors of organizations, in which decisions are typically high stakes, repeated, and made by a group. In three field experiments in which the subjects are organizations, we test the efficacy of five nudges and changes in choice architecture that have been shown to affect individual-level decisions in public goods and charitable giving contexts. In comparison to the estimated treatment effects of similar interventions among individuals, our estimated effects are dramatically smaller and of the opposite sign.

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I. Introduction

By incorporating "more realistic" assumptions about how humans behave, behavioral economics aspires to develop better economic theory and better public program design and delivery. This behavioral literature typically focuses on individual decision-making, often in low-stakes laboratory or field experiments and often using decisions that are unfamiliar or infrequently made (e.g., risky lotteries, retirement planning, new products, vaccinations, or charitable giving). Thus whether the behavioral patterns reported in this literature are also exhibited by organizations remains an open question. Organizations, in contrast to the individual economic agents in much of the behavioral science literature, tend to make recurring decisions in high-stake contexts and make these decisions as groups of individuals.

In prior experimental studies, each attribute - i.e., higher stakes, recurring decisions and group decisions - has been reported to drive behavior towards the traditional "rational" model of human behavior. For example, in a review of thirty-one experiments, behavior is closer to the predictions of the rational model when stakes are high (Smith and Walker 1993). The pattern is the same in the Ultimatum Game, where rejection rates approach zero as stakes increase (Andersen et al. 2011). When decisions are repeated in public goods games, contributions decay and become closer to the rational model prediction (Andreoni 1988; R. M. Isaac, McCue, and Plott 1985; M. R. Isaac and Walker 1988; R. M. Isaac, Walker, and Thomas 1984; Kim and Walker 1984). In field experiments, experience with the decision context eliminates anchoring (Alevy, Landry, and List 2015) and the endowment effect (List 2003). With regard to group decision-making, a large body of laboratory evidence reports that individuals and groups make decisions differently (Brown 1986; Forsyth 2014), with groups typically behaving more like rational agents (Charness and Sutter 2012). For example, groups behave more

selfishly (Schoppe and Insko 1992), trust less (Kugler, Kausel, and Kocher 2012), conform more closely or converge more quickly to game-theoretic solutions (Bornstein, Kugler, and Ziegelmeyer 2004; Kocher and Sutter 2005; Maciejovsky et al. 2013), and attenuate the effects of myopic loss aversion (Sutter 2007) and anchoring (Meub and Proeger 2018).

Thus, increasingly popular applications of behavioral science aimed at changing human behaviors may affect organizations differently from what is reported in the literature on individual decision-making. Although there are many studies that examine individual behavior within organizations (see review by Ashraf and Bandiera 2018), we know of no field experimental studies in which the research subjects are the organizations themselves.

To help fill this gap, we run three large-scale field experiments in collaboration with the National Association of Conservation Districts (NACD) in the United States. NACD requests voluntary membership dues from nearly 3,000 nonprofit conservation districts. Between 2015 and 2018, NACD sought to increase total annual member contributions, as well as the percent of districts that gave. To achieve this goal, five well-established behavioral interventions were tested in three randomized controlled trials. The first experiment (2016) tested a combination of three techniques that, individually, have been reported to increase charitable contributions: making “the ask” clear and salient, providing a social comparison, and emphasizing the public benefits from contributions (NACD’s accomplishments that benefit districts). The second experiment (2017) tested another intervention that has been shown in laboratory and field experiments to be consistently successful at inducing larger voluntary contributions to public goods: making district contributions observable to other districts. The third experiment (2018) tested a widespread technique used by charities to encourage contributions: setting a goal for total member contributions at the national level. Quarterly progress towards the goal was visually displayed via an image of a thermometer and

associated text. In the economics and psychology literatures, these interventions have been shown to increase voluntary contributions from individuals (see Table 1; for reviews, see Karlan and List 2007; Shang and Croson 2009; Rand, Yoeli, and Hoffman 2014; Kraft-Todd et al. 2015).

Conservation districts, however, are organizations. Specifically, they are groups of elected individuals (governing boards) with delegated authority from district stakeholders (e.g. farmers, landowners, etc.). For decades, districts have had to decide each year whether and how much to contribute to the national organization, which currently aims to induce each district to contribute \$775 or more per year. In 2015, nearly two-thirds of the districts contributed some amount towards their dues, with some contributing several thousand dollars each year. Given that laboratory evidence suggests that group decision-making, repeated decisions, and high stakes lead to more rational (self-interested) decisions, interventions known to increase individual voluntary contributions may be less effective at increasing contributions from organizations.

Whether the insights from the “behavioral science of philanthropy,” which are based entirely on individual decision-making, apply to organizations is an important empirical question. For example, organizations and institutions often belong to larger professional societies or associations, such as NACD, which are mutually beneficial for all members. However, encouraging member organizations to contribute dues can be challenging, especially for associations that cannot credibly threaten or are reluctant to censure free riders. This dilemma is found in both private and nonprofit sectors. For example, in the natural resource sector and the tourism sector, firms may contribute voluntarily to generic advertising efforts aimed at increasing overall market demand for firms within the industry, or contribute to sectoral-based trade organizations (Krishnamurthy 2001; Depken, Kamerschen, and Snow 2002; Messer, Kaiser, and Poe 2007; Messer, Kaiser, and Schulze 2008; Roma and Perrone 2010). In secular and religious non-profit sectors,

organizations and congregations are expected to contribute to broader umbrella organizations (e.g., Land Trust Alliance). In all of these situations, member organizations face strong incentives to free ride on others' contributions. While public goods games are well-studied in economics and psychology, we know of no study that has focused on whether interventions that have been reported to affect individual behaviors also affect the behaviors of organizations.

In all three field experiments, we observe one consistent result: in comparison to the published estimated effects of these behavioral interventions on individual contributions, our estimated effects on districts' contributions are much smaller. In fact, in contrast to studies of individuals, our point estimates are negative (i.e., contributions decrease) and our confidence intervals are narrowly bracketed around zero (i.e., informative null effects). The estimated effect sizes range from -0.02 SD to -0.01 SD. We cannot reject the null hypotheses of small positive increases, but the confidence intervals exclude treatment effect sizes that are often reported in the literature on individuals in similar contribution settings (see Section 2 for details on this literature and Section 4 for estimated effects in our three experiments and their confidence intervals).

Our results imply that the behavior of organizations may be better described by conventional economic models of rational agents. Whether our findings generalize to other organizations or decision contexts is an important empirical question, and our study opens the door for future research. If organizations and individuals respond differently to behavioral economics-inspired interventions, the implications are important to practitioners and scholars in economics and the behavioral sciences attempting to influence organizations.

TABLE 1—STUDIES OF NUDGES FOR INDIVIDUAL CONTRIBUTIONS TO PUBLIC GOODS

Citation	Treatment	Study Type	Subject Type	Outcome Variable	Sample Size	Effect Size
Andreoni et al. 2017	Saliency of the Ask	Field	Shoppers	Donation amount	17,662	75% increase
Andreoni & Rao 2011	Saliency of the Ask	Lab	Students	Giving in dictator game	238	50% increase
DellaVigna et al. 2012	Saliency of the Ask	Field	Households	Donation amount	7,669	28 - 42% increase
Cryder et al. 2013	Highlight Benefits	Field	Pedestrians	Donation amount	119; 94	80 - 85% increase
Aknin et al. 2013	Highlight Benefits	Lab	Students	Donation amount	181	4.8% increase
Frey & Meier 2004	Social Comparison	Field	Students	% of subjects donating	37,624	2.3 pp increase
Shang et al. 2009	Social Comparison	Field	Radio callers	Donation amount	538	12% increase
Bartke et al. 2017	Social Comparison	Field	Commuters	Ticket donation rate	263	30 pp increase
Ferraro & Price 2013	Social Comparison	Field	Households	Water consumption	106,669	4.8% decrease
Allcott 2011	Social Comparison	Field	Households	Energy consumption	588,446	2% decrease
Ayres et al. 2013	Social Comparison	Field	Households	Energy consumption	17,000	1.2 - 2.1% decrease
Sudarshan 2017	Social Comparison	Field	Indian Households	Energy consumption	484	7% decrease
Samek & Sheremata 2017	Observability of Actions	Framed field	Family members in early childhood study	Donation amount	102	32% increase
Andreoni & Petrie 2004	Observability of Actions	Lab	Students	Donation amount	60	59% increase
Alpizar et al. 2008	Observability of Actions	Field	Tourists	Donation amount	997	25% increase
Yoeli et al. 2013	Observability of Actions	Field	Households	Participation rate	2,413	5.8 pp increase
Bond et al. 2012	Observability of Actions	Field	Facebook users	Voter participation	61 million	2.1 pp increase
Cameron et al. 2013	Observability of Actions	Field	Facebook users	Organ donor registration	All Facebook users	5.8-fold increase
Haley & Fessler 2005	Observability of Actions	Lab	Students	Giving in dictator game	248	55% increase
Kessler 2017	Observability of Actions	Field	Workplaces	Donation amount	278 workplaces (36340 workers)	16% increase

* All donations are in local currency units unless otherwise noted. “pp” = percentage points

II. Background on NACD

NACD is a national non-profit organization that serves roughly 3,000 conservation districts in every state and seven territories of the US. Funded by varying combinations of federal, state and local funds, districts coordinate the actions of millions of private landowners, developers, tenants, and public land managers to implement conservation practices on private and public lands. These practices protect and restore soil productivity, water quality and quantity, air quality, and wildlife habitat, and are often implemented in the context of voluntary, natural resource conservation incentive programs funded by public and private actors. Districts were established in the 1930s under state government laws, but operate independently under a locally-elected, managing board of citizens (called directors or supervisors). Districts act as delegated committees, made up of elected, individuals acting as a group on behalf of their constituents in the local districts.

Districts have a national voice via NACD. It connects districts across the US, organizes annual national meetings, provides agricultural education outreach, and directs conservation policy at the federal level (including petitioning Congress to approve funding for key conservation provisions), among other services. NACD provides its services free to all districts, thus providing a pure public good for local districts. NACD asks districts to voluntarily pay annual dues of at least \$775/year. Contributions larger than \$775 are categorized by giving levels (Gold \$775-\$1,775, Diamond \$1776-\$3,000, and Platinum \$3,001+), but a list of contributors and their levels has historically not been made public. Intra-year variation in dues payments is large: about one-third of districts pay nothing, about one-third pays exactly \$775, about one-third pays less than \$775, and a few (~3%) pay more than \$775. Although the number of contributing districts has remained roughly constant at about 65%

over the last ten years, the average contribution has been declining: in 2015, it was about \$375, which is 20% less than the average contribution in 2008.

NACD sought ways to reverse this trend. At the beginning of each quarter, NACD sends districts a mailing, with first quarter mailings going out around 1 October. These mailings update districts on national events and encourage districts to pay their dues (see example of the status quo mailing in Appendix A). To test the impact of changes to this quarterly outreach effort, we collaborated with NACD in three field experiments.

III. Experimental Design and Treatment Effect Estimator

The first field experiment took place in fiscal year 2015-16 (FY16), the second in fiscal year 2016-17 (FY17), and the third in fiscal year 2017-2018 (FY18). In the three experiments, districts were randomly assigned to one of two groups, a control (status quo) group or a treatment group. To the best of our knowledge, there are no studies on how organizations respond to behavioral interventions aimed at increasing contributions to a public good. Thus we developed the treatments based on evidence from studies of individual decision-making.

In FY16, districts who had not yet paid their dues by the end of the second quarter were treated in the third and fourth quarters. In FY17 and FY18, districts who had not yet paid by the end of the first quarter were treated in the second, third and fourth quarters. Treatment assignment was later in FY16 because we started collaborating with NACD in March 2016. The FY17 and FY18 experiments did not start in the first quarter because: (1) NACD and the authors agreed to analyze the previous year's results before initiating another experiment (complete data were not available until after the first quarter began); and (2) the districts that contribute in the first quarter tend to contribute every year at or above the \$775 level, and thus

were not part of the population that NACD targeted for increased contributions. See Appendix B for more details on sample selection and randomization. All code and data for the randomization and estimation are available at <https://osf.io/9dqgx/> (districts and states are identified with random numbers) and the experiment was registered on the AEA RCT Registry at <https://www.socialscienceregistry.org/trials/4238>.

We seek to estimate the ATE on the monetary value of a district's annual contribution. To increase the precision of our estimates, we use an Ordinary Least Squares (OLS) regression estimator that includes the treatment variable and historical contributions for each district dating back to FY08. Randomization was done within each state, and thus state dummy variables are also added to the regression specification. We present ex ante power analysis simulations for each experiment in next three subsections (details in Appendix F). As a robustness check, we also present estimates from a zero-inflated Poisson regression, as well as power analyses using this estimator (see Appendices E and F). As a secondary outcome measure, we also present an estimate of the treatment effect on the likelihood of contributing (Appendix E). The estimates from these regressions lead to the same conclusions.

A. Design: Fiscal Year 2015-2016 (FY16) Experiment

To modify the quarterly mailing, we made three changes that are hypothesized to operate through the bounded rationality and pro-social (or pro-conformist) preferences of decision-makers: 1) we made the “ask” clearer and more salient, 2) we highlighted the accomplishments of NACD, and 3) we provided social information via a social (peer) comparison. We tested the combined effect of these treatments, which are described in more detail below. The treatment mailing is in Appendix C.

Experimental studies have reported that making the request for contributions - the “ask” - more salient can increase contributions by 28% - 75% (Table 1). The “Power of the Ask” is so well known that the Science of Philanthropy Initiative lists it as one of their key pieces of practical advice (<http://spihub.org/importance-of-the-ask>). In NACD status quo mailing, the ask is buried in a densely worded cover letter and is missing from the contribution form, which sits behind the cover letter (see Appendix A). In the treatment mailing, we make the ask clearer and more salient by placing the contribution form on top and adding an explicit ask in large font at the top: “We hope that your district will consider renewing your membership in NACD, helping us to provide national leadership and a unified voice for natural resource conservation.” That text is followed by a personalized ask that names the district. We also place another ask on the second page of the quarterly letter in a call-out box that states, “Support NACD! We are now in the third quarter of our fiscal year. Please remember your district’s financial support in the months ahead is critical to NACD’s ongoing efforts.”

Prior studies have also found that charitable giving and prosocial expenditures increase when the impact (benefits) of the contributions are made more salient (Table 1). Building on this literature, we modify the status quo mailing to more clearly highlight the actions and accomplishments of NACD, and how it effectively uses member contributions to provide benefits to all districts in the US. NACD typically describes these actions, accomplishments and benefits in a dense, one-page cover letter. By reformatting them into a newsletter, we sought to make them more salient and clearly differentiated from the ask.

Social (peer) comparisons combine the injunctive norm embodied in the ask (i.e., contributing is a good thing) with a descriptive norm that emphasizes that the target behaviors are common among members of a relevant peer group. In economic, psychology, and management studies, such comparisons have been reported to increase contributions to charities and other public goods (Table 1; see also review

in Kraft-Todd et al. 2015). Like the Power of the Ask, the impact of social information is also highlighted by the Science of Philanthropy Initiative (<http://spihub.org/social-information>).

Based on this empirical evidence, we added a social comparison that reports a historical rate of paying annual dues and, among those giving, what proportion contribute \$775 or higher. Prior research has argued that descriptive norms can backfire if they highlight that few peer group members engage in the target activity (Cialdini et al. 2006) – thereby inadvertently establishing a social norm to free ride. For NACD, the national contribution rate was 66% of districts, and just over half of contributing districts gave \$775 or more. For districts that were in states for which the rates were higher, the state rates were used and the peer group comprised districts in the state. For districts in states for which the rates were lower than the national rates, the national rates were used and the peer group comprised all districts in the country (see Appendix C).

The target population in FY16 comprised 1,231 districts and state associations¹ that had not yet paid any membership dues by end of the second quarter (31 March). The new modified mailing was sent to a randomly selected treatment group of 617 districts. NACD's status quo letter was sent to a control group of 614 districts. This sample comprises about 40% of the total population of conservation districts. We conducted power analysis simulations, using historical data, to explore minimum detectable treatment effects in our design under a range of assumptions (see Figures F1-F2, Appendix F). With a Type 1 error rate of 5% and power of 80%, we can detect an effect of 0.10 standard deviation (SD) or larger in our design.

¹ See Appendix B for details on state conservation associations, and how they differ from districts.

B. Design: Fiscal Year 2016-2017 (FY17) Experiment

In FY17, NACD opted to continue using their status quo approach, but agreed to test a new modification that is widely hypothesized to operate through the emotions or pro-social (or pro-conformist) preferences of decision-makers: making contributors observable to other districts. Historically, only the national office knew which districts paid their dues and how much they paid. There was no public recognition of contributors or their contribution levels. The absence of public recognition was a deliberate decision. NACD believed that publicly recognizing contributors could stigmatize, or even indirectly ostracize, the non-contributors.

Making contributors and their contributions observable, however, has been reported in experimental studies of individual decision makers to substantially increase contributions (Table 1). Observability was also found to be an important moderator in a field experiment testing the effect of incentives on blood donations (N=2,009): incentives in the form of prizes reduced the elapsed time between consecutive donations by almost one-third, but only if the prizes were publicly announced in the local newspaper and awarded in a public ceremony (Lacetera and Macis 2010). The sole exception is a laboratory study on voluntary contributions (Noussair and Tucker 2007), which reported that although publicizing the contribution of each subject increased giving by 26% in a one-shot public goods game (N=40), it decreased average contributions by 52% in a repeated game (N=32). The authors posit this result was driven by negative reinforcement and negative reciprocation. Nevertheless, a recent review paper on social cooperation reported that, in contrast to interventions based on material incentives, “interventions based on observability ... are consistently highly effective” (Kraft-Todd et al. 2015).

Given the ample experimental evidence about the potential effects of publicly acknowledging NACD contributors and their contributions, and the failure to detect

a treatment effect in the FY16 experiment (see next section), NACD agreed to experimentally test public recognition of contributors in FY17. To operationalize the recognition, the treatment mailing added another sheet of paper in which the names of last year's contributing districts in the region were listed, along with the category of giving (Gold, Platinum, Diamond, Other). See Appendix D for an example of the additional treatment sheet.

The target population comprised 1,732 districts and state associations that had not yet paid their dues by end of the first quarter. The new modified mailing was sent to 862 districts, the treatment group, which was created by a block-randomized design that ensured a nearly equal number of districts from each state would be in the treatment and control group. NACD's status quo letter was sent to a control group of 870 districts. This sample represents almost 60% of the population of conservation districts. We conducted power analysis simulations, using historical data, to explore minimum detectable treatment effects in our design under a range of assumptions (see Figures F3-F4 in Appendix F). With a Type 1 error rate of 5% and power of 80%, we can detect an effect of 0.06 standard deviation (SD) or larger.

C. Design: Fiscal Year 2017-2018 (FY18) Experiment

In FY18, NACD opted to continue using their status quo approach, but tested a new modification that is hypothesized to operate through the bounded rationality and pro-social (or pro-conformist) preferences of decision-makers: announcing a national goal for total contributions. Each quarter, progress towards the goal was displayed as a percentage, visualized as a thermometer (see Appendix D). Setting a goal is a widely used technique, often by non-profit organizations such as the United Way and the Red Cross. Experimental evidence in psychology, economics, and management science have repeatedly demonstrated the efficacy of setting a goal for individuals and groups (see Locke and Latham 2002 for review). Research

in these fields have primarily focused on increasing productivity, decreasing costs, saving time, and other metrics of worker performance. The FY18 treatment mailing used the otherwise blank side of the invoice to display progress towards the national goal as a percentage, updated with each mailing. NACD did not wish to display actual dollar amounts on the thermometer.

The target population comprised 1,447 districts and state associations that had not yet paid their dues by end of the first quarter. The new modified mailing was sent to a randomly selected treatment group of 746. NACD's status quo letter was sent to a control group of 701 districts. We conducted power analysis simulations, using historical data, to explore minimum detectable treatment effects in our design under a range of assumptions (see Figures F5 and F6 in Appendix F). With a Type 1 error rate of 5% and power of 80%, we can detect an effect of 0.075 standard deviation (SD) or larger.

IV. Results

A. Results: Fiscal Year 2015-2016 (FY16) Experiment

In Table 2, we report descriptive statistics and the estimated treatment effect. In both the control and treatment groups, 15% of districts contributed. In both groups, the average contribution is just below \$70, and the average contribution for districts that choose to give is about \$450. The covariate-adjusted estimate of the ATE is the estimated average change in contribution, in dollars, from the treatment. The estimated ATE is small and negative at \$1.34; i.e., a 2% decrease in contributions, or -0.01 SD. The confidence interval excludes positive effects larger than \$16; in other words, a 24% or higher increase in the average contribution. In Appendix E, we present alternative specifications (including without any covariates), as well as the alternative zero-inflated Poisson model specifications. Like the estimate in

Table 2, the estimated treatment effects are small and statistically indistinguishable from zero, with narrow confidence intervals.

TABLE 2—DESCRIPTIVE STATISTICS AND ESTIMATED TREATMENT EFFECT (FY16 EXPERIMENT)

	<i>Control Group</i>	<i>Treatment Group</i>
Sample Size	614	617
Average Previous Contribution FY08-FY15	\$181.02	\$173.70
Number of Districts that Contributed (Percent of Districts that Contributed)	95 (15%)	91 (15%)
Average Contribution (Standard Deviation)	\$69.79 (210.38)	\$66.28 (207.72)
Average Contribution Conditional on Contributing (Standard Deviation)	\$451.04 (338.88)	\$449.41 (348.20)
Estimated Treatment Effect	-\$1.34	
OLS Regression Estimator*	95% CI [-18.67, 15.99]	
	p = 0.88	

* For full output from the OLS regression, see Table E1, Appendix E.

B. Results: Fiscal Year 2016-2017 (FY17) Experiment

In Table 3, we report descriptive statistics and the estimated treatment effect. In both the control and treatment groups, the percentage of contributing districts is similar, as are the average contributions. The covariate-adjusted estimate of the ATE is small and negative at \$2.00; i.e., a 1% decrease in contributions, or -0.01 SD. The confidence interval excludes positive effects on the average contribution larger than \$14.55; in other words, larger than a 7% increase. In other words, as in the FY16 experiment, the confidence interval excludes the typical effect sizes reported in the behavioral literature. In Appendix E, we present alternative specifications (including without any covariates), as well as the alternative zero-inflated Poisson model specifications. Like the estimate in Table 3, the estimated

treatment effects are small and statistically indistinguishable from zero, with narrow confidence intervals.

TABLE 3—DESCRIPTIVE STATISTICS AND ESTIMATED TREATMENT EFFECT (FY17 EXPERIMENT)

	<i>Control Group</i>	<i>Treatment Group</i>
Sample Size	870	862
Average Previous Contribution FY08-FY16	\$289.61	\$293.17
Number of Districts that Contributed (Percent of Districts that Contributed)	358 (41%)	384 (45%)
Average Contribution (Standard Deviation)	\$212.64 (360.46)	\$215.11 (362.00)
Average Contribution Conditional on Contributing (Standard Deviation)	\$516.75 (398.36)	\$482.87 (406.15)
Estimated Treatment Effect	-\$2.00	
OLS Regression Estimator*	95% CI [-18.56, 14.55]	
	p = 0.81	

* For full output from the OLS regression, see Table E2, Appendix E.

C. Results: Fiscal Year 2017-2018 (FY18) Experiment

In Table 4, we report descriptive statistics and the estimated treatment effect. In both the control and treatment groups, the percentage of contributing districts is similar, as are the average contributions. The covariate-adjusted estimate of the ATE is small and negative at \$5.25; i.e., a 4% decrease in contributions, or -0.02 SD. The confidence interval excludes positive effects on the average contribution larger than \$10.06; in other words, larger than a 7% increase. In Appendix E, we present alternative specifications (including without any covariates), as well as the alternative zero-inflated Poisson model specifications. Like the estimate in Table 4, the estimated treatment effects are small and statistically indistinguishable from zero, with narrow confidence intervals.

TABLE 4—DESCRIPTIVE STATISTICS AND ESTIMATED TREATMENT EFFECT (FY18 EXPERIMENT)

	<i>Control Group</i>	<i>Treatment Group</i>
Sample Size	701	746
Average Previous Contribution FY08-FY16	\$223.02	\$232.42
Number of Districts that Contributed (Percent of Districts that Contributed)	256 (37%)	260 (35%)
Average Contribution (Standard Deviation)	\$145.70 (273.39)	\$142.43 (262.91)
Average Contribution Conditional on Contributing (Standard Deviation)	\$398.96 (322.09)	\$408.67 (299.32)
Estimated Treatment Effect	-\$5.25	
OLS Regression Estimator*	95% CI [-20.57, 10.06]	
	p = 0.52	

* For full output from the OLS regression, see Table E3, Appendix E.

V. Discussion

Understanding how organizations respond to behavioral interventions is of interest to both practitioners and scholars. To test the effects of nudges and changes in choice architecture aimed at influencing organizations, we collaborated with a national association that serves about 3,000 local organizations and requests annual voluntary contributions from these organizations. In three randomized field experiments, we tested the impact of common behavioral interventions aimed at increasing voluntary contributions to a public good. Our experiments use designs with high statistical power and strong internal validity, and take place in a naturally-occurring organizational setting with national coverage. Treatment assignment was embedded in the umbrella organization's operations and the local organizations were unaware of the randomized design. To our knowledge, our experiment is the first field experiment to target organizations in a public goods context.

We detect no positive effect on contributions from any of the interventions, despite sufficient statistical power to detect the effect sizes typically reported in the behavioral science literature. The mechanisms through which the tested interventions were hypothesized to operate - namely forms of bounded rationality, such as inattention, and pro-social preferences (broadly construed to include conformity) - do not appear to be operative in our context. While this result may be specific to our context, without more field experiments targeting organizations in a public good setting, external validity is difficult to assess.

Nevertheless, the lack of a positive behavioral response to the interventions is consistent with results from prior studies that report high stakes, repeated decisions, and groups of decision makers lead to more rational and less cooperative decisions, which would lead one to expect that organizations would be less responsive to popular behavioral economics-inspired interventions. In naturally-occurring decision contexts like ours, one cannot experimentally manipulate the stakes, district experience, or whether a governing board makes the decision or a single individual. To make progress on understanding how organizations respond to interventions derived from behavioral economic theories, we therefore need wider use of well-powered field experiments in various contexts. This research agenda should extend to other popular behavioral economics-inspired interventions, such as changes to framing and defaults, as well as to for-profit settings, where profit motives and competitive pressures might be expected to further differentiate individual and organizational responses. We believe such extensions will offer promising avenues of research for economics, psychology, and behavioral science, as well as policy and business practice.

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APPENDIX

A1. Status Quo 3rd Quarter Mailing, 1st Sheet Front (FY16 Experiment)

A2. Status Quo 3rd Quarter Mailing, 1st Sheet Back (FY16 Experiment)

A3. Status Quo 3rd Quarter Mailing, 2nd Sheet (FY16 Experiment)

B. Sampling and Block Randomization

C1. Treatment 3rd Quarter Mailing, 1st Sheet (FY16 Experiment)

C2. Treatment 3rd Quarter Mailing, 2nd Sheet (FY16 Experiment)

D1. Treatment 3rd Quarter Mailing, 2nd Sheet (FY17 Experiment)

D2. Treatment 3rd Quarter Mailing, 2nd Sheet (FY18 Experiment)

E. Regression Estimators

F. Power Analyses

A1. Status Quo 3rd Quarter Mailing, 1st Sheet Front (FY16 Experiment)

The arrows and associated text were not in the original mailing, but added here to highlight problems with the status quo letter to both practitioners and scholars.



National Association of Conservation Districts

April 1, 2016

Milwaukee County Land Conservation Department

NACD kicked off our second quarter with a successful 70th Annual Meeting in Reno, Nevada. The meeting focused on the theme "Historic Legacy Guiding a Brighter Future" and brought together conservation leaders from across the country for education sessions, workshops, and networking. In just a few short months, we'll head to Bloomington, Minnesota for the NACD Summer Board Meeting and Conservation Tour. Planning is well under way and we hope that you will be able to join us.

We are now in the third quarter of our fiscal year. Please remember your financial support in the months ahead is critical to NACD's ongoing efforts.

Here are just a few highlights of our work.

- During the Annual Meeting NACD signed a Memorandum of Understanding with National Agriculture in the Classroom to promote education and outreach projects and Conservation Districts and agriculture in the classroom programs.
- Our Spring Fly-In was a great success that brought more than 120 leaders from districts across the country to meet face-to-face with their members of Congress and share their insight on the importance of voluntary, locally-led conservation. During the Fly-In NACD held briefings on soil health and wildfire issues for Congressional staff and concluded the event with a reception on Capitol Hill where Representative Cynthia Lummis from Wyoming addressed attendees.
- NACD recently conducted three forest health and wildfire listening sessions in the West, which served as forums for conservation districts to share lessons learned and partnering ideas.
- In collaboration with the National Horse and Burro Rangeland Management Coalition, NACD launched an informational and educational ad campaign on the problem of wild horse overpopulation in the West.
- NACD transitioned its stewardship and education materials to a purely electronic format so that all this year's "We All Need Trees" materials can be downloaded and printed locally. This format is FREE for all districts and state associations.
- NACD submitted letters to House and Senate Agriculture Appropriations Committees calling on Congress to:
 - Approve the funding levels outlined in the President's fiscal year 2017 budget proposal for USDA-NRCS's Conservation Operations Account;
 - Fund the Watershed Rehabilitation Program at \$100 million and Watershed Operation account at \$400 million;

Letter starts with information about recent annual meeting

"The Ask"

Accomplishments presented in list format with active verbs buried in text

National Headquarters
509 Capitol Court, NE, Washington, DC 20002
Phone: (202) 547-6223 Fax: (202) 547-6450
www.nacdnet.org

A2. Status Quo 3rd Quarter Mailing, 1st Sheet Back (FY16 Experiment)



National Association of Conservation Districts

- Approve the \$164.9 million funding level for the Environmental Protection Agency's (EPA) 319 Nonpoint Source Grants;
- Authorize adequate funding for the US Forest Service and the Department of Interior to conduct effective prescribed fires, pre-suppression activity, and silvicultural treatments without having to halt these essential programs in order to transfer funds, or "fire borrow," for emerge fire suppression; and
- Re-approve the fiscal year 2016 funding level of \$237 million, for the US Forest Service's State and Private Forestry programs for the FY17 Interior Appropriation bill.
- President-elect Brent Van Dyke and CEO Jeremy Peters attended the Commodity Classic in New Orleans, Louisiana where they provided information to growers on conservation districts, the conservation delivery system and NACD's efforts to raise awareness on soil health.

Thank you for getting conservation on the ground! We are proud of you and proud to be your national voice for conservation. We appreciate your continued support.

We encourage you to contact your NACD Board Member, an Officer, an Executive Board Member, your Region Chair, or staff to discuss **what NACD does for you** and what **you want NACD to do for you**.

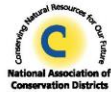
Thank you,

John A. McDonald
NACD Secretary/Treasurer

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www.nacdnet.org

A3. Status Quo 3rd Quarter Mailing, 2nd Sheet (FY16 Experiment)

The status quo contribution form has no clear ask, and lists contribution options below the desired amount, \$775.



National Association of Conservation Districts

CONSERVATION INVESTMENT

Customer #: 37803

Investment Date: April 1, 2016

Plaquemines SWCD
499 Herbert Boulevard
Belle Chasse, LA 70037-3018

2016 Membership Level	Quantity	Price	Amount
☐ Platinum (\$3,001 +)	_____	\$ _____	\$ _____
☐ Diamond (\$1,776 - \$3,000)	_____	\$ _____	\$ _____
☐ Gold (\$775 - \$1,775)	_____	\$ _____	\$ _____
☐ Silver (\$501 - \$774)	_____	\$ _____	\$ _____
☐ Bronze (\$101 - \$500)	_____	\$ _____	\$ _____
☐ Contributor (\$1 - \$100)	_____	\$ _____	\$ _____

PLEASE RENEW YOUR MEMBERSHIP NOW!

Please continue to support your National Association by making your membership payment. Complete the application form and send with payment to NACD headquarters.

John McDonald
John McDonald
NACD Secretary/Treasurer

Investment Total	\$ _____
Taxes	\$ 0.00
Amount Paid	\$ _____
Please Pay	\$ _____

PLEASE DETACH AND REMIT WITH YOUR PAYMENT

Conservation Investment FY16 (check one)					
☐ Platinum (\$3,001 +)	☐ Diamond (\$1,776 - \$3,000)	☐ Gold (\$775 - \$1,775)	☐ Silver (\$501 - \$774)	☐ Bronze (\$101 - \$500)	☐ Contributor (\$1 - \$100)
Payment					
☐ Final Payment ☐ Installment _____ of _____		☐ Check # _____			
Amount Paid: _____		☐ Visa ☐ MasterCard ☐ Discover			
Card No. _____ Exp. Date _____		Name on Card _____ Signature _____			
Customer #: 37803 Plaquemines SWCD 499 Herbert Boulevard Belle Chasse, LA 70037-3018 ☐ check here for change of address (see back for details)			Mail check and form to: National Association of Conservation Districts 509 Capitol Court NE Washington, DC 20002 Fax credit cards and form to: 202-547-6450		

B. Sampling and Block Randomization

Like conservation districts, state conservation associations are asked to pay NACD membership dues. In most states, the state association operates independently from the (county-level) districts and thus, in these states, we treat state associations as independent subjects in our experiment. In Alabama, Arkansas, Delaware, Hawaii, and West Virginia, the state association pays the membership dues for both itself and all the districts (most of the districts for AR). NACD desired that these states be excluded from the experiment. In the FY17, Arkansas, Delaware, Hawaii, and West Virginia were mistakenly included in the randomization. Districts from these states are not excluded from the main analysis (Table 3). As a robustness check, we exclude them, re-estimate the treatment effect, and find little change in the estimated treatment effect (Table E2 in Appendix E). The estimated effect in Table 3 is \$2.00, whereas the revised estimated effect is -\$2.64, 95% CI[-\$19.67, \$14.38]. In FY18, NACD originally wanted to set state-specific fundraising goals and wanted to exclude 17 districts that are from US territories. When NACD decided instead to set a national-level fundraising goal, the 17 districts were not put back in the sample and thus were excluded from that year's experiment.

In all years, treatment was blocked randomized at the state level. In FY18, blocking was also done on whether the district had contributed any dues in FY17. However, the randomization code created for this experiment by one of the authors had a flaw in it, which led to 6.5% more districts being randomized to the treatment rather than control condition. In the block randomization, strata with odd numbers of districts had one additional district assigned to treatment, a problem that was not caught due to a short turnaround time between NACD providing the status quo mailing and the mail out date. Nevertheless, there are no statistically significant

differences between the treatment and control group in terms of historical contribution and state: a regression of treatment in FY18 on dummy variables for contributing in FY17, state, and the interaction term yields no statistically significant coefficients and a tiny F-statistic of 0.08 for the joint test that all coefficients in the regression are jointly equal to zero. Moreover, the imbalance between the number of units in treatment and control conditions has little effect on statistical power.

C1. Treatment 3rd Quarter Mailing, 1st Sheet (FY16 Experiment)

The arrows and associated text were not in the treatment mailing, but added here to highlight changes from the status quo letter. The bold text in letter are original.



National Association of Conservation Districts

Spring is a time of renewal and new beginnings. **We hope that your district will consider renewing your membership in NACD**, helping us to provide national leadership and a unified voice for natural resource conservation.

Plaquemines SWCD
499 Hebert Boulevard
Belle Chasse, LA 70037-3018

Plaquemines SWCD, are you with us? We are YOUR voice!

Any amount you can contribute helps NACD continue to be your voice for conservation at the national level and to facilitate collaboration and communication across districts.

You might be interested to know that over the last eight years 81% of districts in Louisiana paid their annual dues. In fact, last year, the majority of member districts across the country contributed \$775 or more!

PLEASE DETACH AND REMIT WITH YOUR FY16 MEMBERSHIP DUES

☐ **Yes!** To help NACD represent Plaquemines SWCD, I am enclosing dues in the amount of:

☐ Gold \$775-\$1775 ☐ Diamond \$1776-\$2999 ☐ Platinum \$3,000+

☐ Other (Contributor, Bronze, Silver levels) \$ _____

Member # 37803	
☐ Final Payment	☐ Check # _____
☐ Installment _____ of _____	☐ Visa ☐ MasterCard ☐ Discover
Amount Paid: _____	Card No. _____ Exp. Date _____
Name on Card _____ Signature _____	
For check or credit card, mail payment and form to: National Association of Conservation Districts 509 Capitol Court NE Washington, DC 20002 For credit card, you can also fax form to: 202-547-6450 ☐ Check here for change of address (see back for details)	

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“The Ask” is clearer and more salient – first thing you see

A social comparison establishes a norm to give

The desired level is the lowest listed level. The categories below \$775 are grouped and made less salient than in status quo form

C2. Treatment 3rd Quarter Mailing, 2nd Sheet (FY16 Experiment)

The arrows and associated text were not in the treatment mailing, but added here to highlight changes from the status quo letter.



National Association of Conservation Districts

NACD Newsletter (3rd Quarter 2016)

What has NACD been up to these past few months? Here are just a few recent highlights from our busy year.

- **MOU with National Agriculture in the Classroom:** During the Annual Meeting, NACD signed a Memorandum of Understanding with National Agriculture in the Classroom to promote education and outreach projects and opportunities of mutual interest and foster collaborative relationships between Conservation Districts and agriculture in the classroom programs.
- **Spring Fly-In:** Our Spring Fly-In was a great success that brought more than 120 leaders from districts across the country to meet fact-to-face with their members of Congress and share their insight on the importance of voluntary, locally-led conservation. During the Fly-In, NACD held briefings on soil health and wildfire issues for Congressional staff and concluded the event with a reception on Capitol Hill where Representative Cynthia Lummis from Wyoming addressed attendees.
- **Forest Health and Wildfire Listening Sessions:** NACD conducted three forest health and wildfire listening sessions in the West, which served as forums for conservation districts to share lessons learned and partnering ideas.

Second Quarter Highlight
NACD kicked off our second quarter with a successful 70th Annual Meeting in Reno, Nevada. The meeting focused on the theme "Historic Legacy Guiding a Brighter Future" and brought together conservation leaders from across the country for education sessions, workshops and networking.

Lead with actions

Ask again



National Association of Conservation Districts

Support NACD!

We are now in the third quarter of our fiscal year. Please remember your district's financial support in the months ahead is critical to NACD's ongoing efforts.

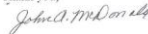
- **Wild Horse Management:** In collaboration with the National Horse and Burro Rangeland Management Coalition, NACD launched an informational and educational ad campaign on the problem of wild horse overpopulation in the West.
- **We All Need Trees is Online:** NACD transitioned its stewardship and education materials to a purely electronic format. All this year's "We All Need Trees" materials can be downloaded and printed locally! This format is FREE for all districts and state associations.

- **Letters to Congress:** NACD submitted letters to House and Senate Agriculture Appropriations Committees calling on Congress to:
 - Approve the funding levels outlined in the President's fiscal year 2017 budget proposal for USDA-NRCS's Conservation Operations Account;
 - Fund the Watershed Rehabilitation Program at \$100 million and Watershed Operation account at \$400 million;
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- **NACD Represents at the Commodity Classic:** President-elect Brent Van Dyke and CEO Jeremy Peters attended the Commodity Classic in New Orleans, Louisiana where they provided information to growers on conservation districts, the conservation delivery system and NACD's efforts to raise awareness on soil health.

Looking Ahead
In just a few short months, we'll head to Bloomington, Minnesota for the NACD Summer Board Meeting and Conservation Tour. Planning is well under way and we hope that you will be able to join us.

Thank you for getting conservation on the ground! We are proud of you and proud to be your national voice for conservation. We appreciate your continued support.

We encourage you to contact your NACD Board Member, an Officer, an Executive Board Member, your Region Chair, or staff to discuss *what NACD does for you* and *what you want NACD to do for you*.

Thank you,

John A. McDonald
NACD Secretary/Treasurer

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D1. Treatment 3rd Quarter Mailing, 2nd Sheet (FY17 Experiment)

A Big Thank You to Districts that Paid their Membership Dues Last Year!

Louisiana & Texas

Conserving Natural Resources for Our Future!

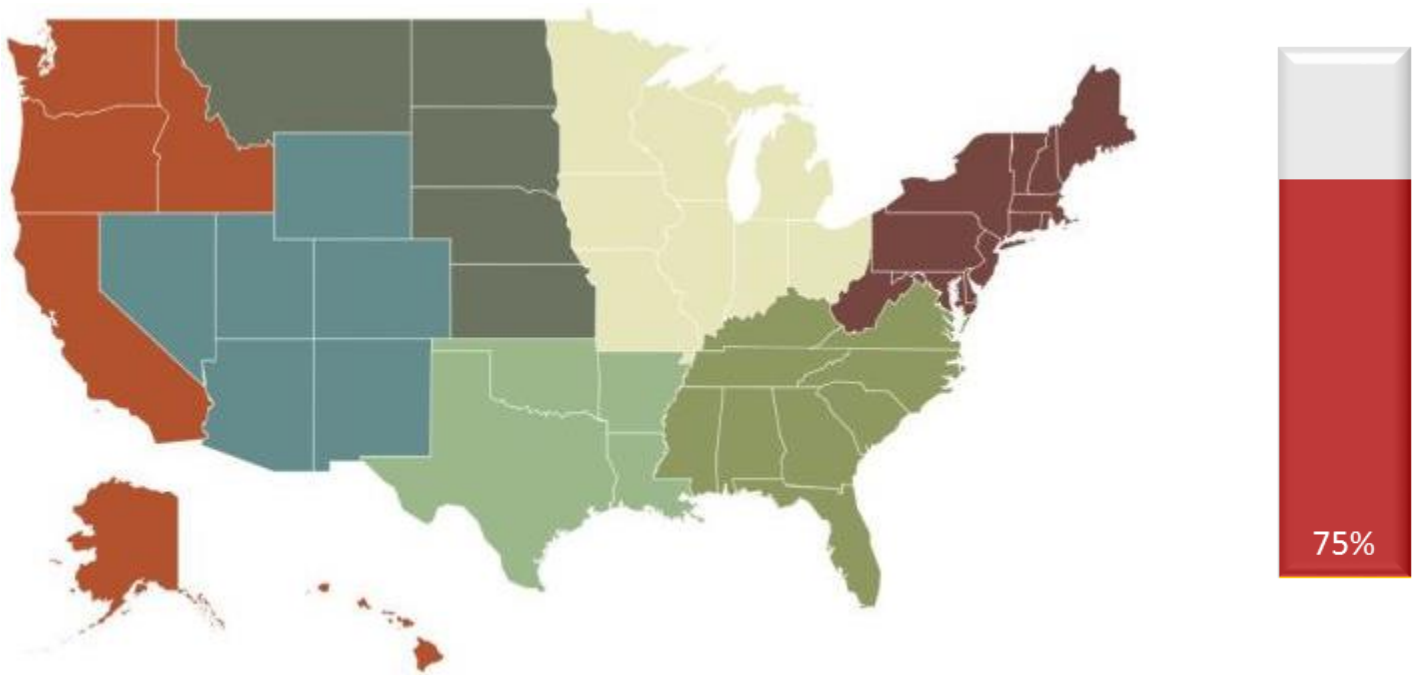
Gold Level Members (\$775-\$1775)

Acadia SWCD	Jackson SWCD	Pecan Bayou SWCD
Assoc. of Texas SWCD	Johnson County SWCD	Rapides SWCD
Avoyelles SWCD	Lamb County SWCD	Salt Fork SWCD
Boeuf River SWCD	Little River-San Gabriel	San Patricio SCD
Calcasieu SWCD	SWCD	Sandhills SWCD
Capital SWCD	Louisiana Assoc. of CDs	St. Martin SWCD
Catahoula Parish SWCD	Lower Delta SWCD	Tom Green SWCD
Coastal Plains SWCD	Madison SWCD	Upper Leon SWCD
Crescent SWCD	Montgomery County	Webb SWCD
East Carroll SWCD	SWCD	West Carroll SWCD
Evangeline SWCD	Natchitoches SWCD	Zapata SWCD
Hall-Childress SWCD	Nolan County SWCD	
Hays County SWCD	Parker County SWCD	

Other Contributors

Agua Poquita SWCD	Canadian River SWCD	Dugdemonia SWCD
Alamo SWCD	Central Texas SWCD	Edwards Plateau SWCD
Anderson-Houston SWCD	Cherokee County SCD	El Paso-Hudspeth SWCD
Andrew Kent SWCD	Coastal SCD	Eldorado Divide SWCD
Atascosa County SWCD	Cochran County SWCD	Ellis Prairie SWCD
Austin County SWCD	Comal-Guadalupe SWCD	Fannin SWCD
Bandera SWCD	Concho SWCD	Fayette SWCD
Bastrop County SCD	Copano Bay SCD	Floyd County SWCD
Bedias Creek SWCD	Cottle County SWCD	Foard County SWCD
Big Bend SWCD	Crockett SWCD	Freestone County SWCD
Blackwater Valley SCD	Dallam SWCD	Frio SWCD
Bodcau SWCD	Dalworth SWCD	Gaines County SWCD
Bowie County SCD	D'Arbonne SWCD	Gillespie County SWCD
Caddo SWCD	Davy Crockett-Trinity SWCD	Glasscock County SWCD
Caldwell-Travis SWCD	Dawson County SWCD	Goliad County SWCD
Calhoun SWCD	De Soto SWCD	Gonzales County SWCD
Callahan-Divide SWCD	Devil's River SWCD	Grant SWCD
	Dewitt County SWCD	Gulf Coast SWCD

**After the second quarter of NACD's
2018 fiscal year, we have already
reached 75% of our national goal!**



Please contribute today!
Together, we will reach our FY18 goal.

* Text formatting altered from the original to conform to manuscript formatting style.

E. Regression Estimators

TABLE E1—OLS REGRESSION ESTIMATES FOR FY16 EXPERIMENT

	(1) FY16 Contribution	(2) FY16 Contribution	(3) FY16 Contribution
Treated FY16	-3.50 [-26.88,19.88]	0.86 [-16.72,18.44]	-1.34 [-18.67,15.99]
Constant	69.79*** [53.13,86.44]	-0.03 [-13.97,13.91]	64.14 [-5.00,133.27]
Past Contributions	No	Yes	Yes
State Dummies	No	No	Yes
Observations	1231	1231	1231
R ²	0.00	0.45	0.49

Treatment effect estimates are in USD\$. 95% confidence intervals in brackets. Past Contributions are the amounts contributed by the district in each year from FY08 to FY15 (i.e., eight variables).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE E2—OLS REGRESSION ESTIMATES FOR FY17 EXPERIMENT

	(1) FY17 Contribution	(2) FY17 Contribution	(3) FY17 Contribution	(4) FY17 Contribution	(5) FY17 Contribution
Treated FY17	2.47 [-31.58,36.51]	-3.16 [-20.00,13.68]	-2.20 [-18.82,14.43]	-2.00 [-18.56,14.55]	-2.64 [-19.67,14.38]
Constant	212.64*** [188.67,236.61]	3.38 [-7.82,14.59]	-37.73 [-93.97,18.51]	-35.26 [-93.76,23.24]	-26.73 [-84.24,30.79]
Past Contributions	No	Yes	Yes	Yes	Yes
State Dummies	No	No	Yes	Yes	Yes
Past Treatments	No	No	No	Yes	Yes
Excludes Group Contributors	No	No	No	No	Yes
Observations	1732	1732	1732	1732	1623
R ²	0.00	0.76	0.77	0.77	0.75

Treatment effect estimates are in USD\$. 95% confidence intervals in brackets. Past Contributions are the amounts contributed by the district in each year from FY08 to FY16 (i.e., nine variables). Past Treatments are indicator variables (dummies) for whether, in FY16, the district was assigned to the treatment group, assigned to the control group, or not assigned to either (paid dues in first quarter). Group Contributors are districts that may have contributed as a statewide group.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE E3—OLS REGRESSION ESTIMATES FOR FY18 EXPERIMENT

	(1) FY18 Contribution	(2) FY18 Contribution	(3) FY18 Contribution	(4) FY18 Contribution
Treated FY18	-3.26 [-30.96,24.43]	-7.70 [-23.34,7.94]	-6.43 [-21.74,8.89]	-5.25 [-20.57,10.06]
Constant	145.70*** [125.44,165.95]	20.33*** [8.27,32.39]	43.53* [0.70,86.37]	39.65 [-3.30,82.59]
Past Contributions	No	Yes	Yes	Yes
State Dummies	No	No	Yes	Yes
Past Treatments	No	No	No	Yes
Observations	1447	1447	1447	1447
R ²	0.00	0.69	0.71	0.71

Treatment effect estimates are in USD\$. 95% confidence intervals in brackets. Past Contributions are the amounts contributed by the district in each year from FY08 to FY17 (i.e., ten variables) as well as an indicator of contributing a positive amount in FY17, which was used as a blocking variable for randomization. Past Treatments are indicator variables (dummies) for whether, in FY16 or FY17, the district was assigned to the treatment group, assigned to the control group, or not assigned to either (paid dues in first quarter).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE E4—LOGISTIC REGRESSION ESTIMATES FOR FY16, FY17 AND FY18 EXPERIMENTS

	(1) Contribute FY16	(2) Contribute FY17	(3) Contribute FY18
Treated FY16	0.82 [0.56,1.21]		
Treated FY17		1.15 [0.84,1.57]	
Treated FY18			0.74 [0.53,1.03]
Past Contribution Dummies	Yes	Yes	Yes
Past Treatments	No	Yes	Yes
Observations	1231	1732	1447
Pseudo R ²	0.31	0.53	0.47

Exponentiated coefficients. 95% confidence intervals in brackets. Past Treatments are indicator variables (dummies) for whether, in prior treatment years, the district was assigned to the treatment group, assigned to the control group, or not assigned to either (paid dues in first quarter).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE E5—ZERO-INFLATED POISSON REGRESSION ESTIMATES FOR FY16, FY17, AND FY18 EXPERIMENTS

	(1) FY16 Contribution	(2) FY17 Contribution	(3) FY18 Contribution
Treated FY16	0.26 [-8.77,9.28]		
Treated FY17		-8.92 [-23.51,5.68]	
Treated FY18			5.65 [-7.51,18.80]
Past Contributions Amount	Yes	Yes	Yes
Past Contributions Dummies	Yes	Yes	Yes
Past Treatments	No	Yes	Yes
Observations	1231	1732	1447

Treatment effect estimates are in USD\$. 95% confidence intervals in brackets. Past Contributions Amount are the amounts contributed by the district in each year from FY08 to the year prior to treatment assignment. Past Contributions Dummies are indicators for a positive contribution in each year from FY08 to the year prior to treatment assignment. Past Treatments are indicator variables (dummies) for whether, in prior treatment years, the district was assigned to the treatment group, assigned to the control group, or not assigned to either (paid dues in first quarter).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE E6—ZERO-INFLATED NEGATIVE BINOMIAL REGRESSION ESTIMATES FOR FY16, FY17, AND FY18 EXPERIMENTS

	(1) FY16 Contribution	(2) FY17 Contribution	(3) FY18 Contribution
Treated FY16	-1.79 [-20.49,16.90]		
Treated FY17		3.56 [-20.21,27.33]	
Treated FY18			-9.98 [-28.34,8.38]
Past Contributions Amount	Yes	Yes	Yes
Past Contributions Dummies	Yes	Yes	Yes
Past Treatments	No	Yes	Yes
Observations	1231	1732	1447

Treatment effect estimates are in USD\$. 95% confidence intervals in brackets. Past Contributions Amount are the amounts contributed by the district in each year from FY08 to the year prior to treatment assignment. Past Contributions Dummies are an indicator for a positive contribution in each year from FY08 to the year prior to treatment assignment. Past Treatments are indicator variables (dummies) for whether, in prior treatment years, the district was assigned to the treatment group, assigned to the control group, or not assigned to either (paid dues in first quarter).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

F. Power Analyses

Model Selection.— Given the historical number of zero contributors and the bunching at recommended contribution amounts, the contribution data violate assumptions of standard models. Thus to conduct power analyses, we use simulations and explore a variety of model specifications, including Ordinary Least Squares (OLS), negative binomial, zero-inflated negative binomial (ZINB), Poisson, and zero-inflated Poisson (ZIP). The details of these simulations, including the data generating processes, are described in the next section.

The simulations show the negative binomial is inconsistent, therefore we drop this specification from further consideration. OLS and both zero-inflated models have similar power, achieving 80% power or better with a treatment effect size of 0.10 SD, while the Poisson model shows strictly lower power at comparable effect sizes. Of the three most powerful models, OLS, ZINB, and ZIP, OLS is the only model that does not falsely reject a true null (placebo) at an excessive rate. OLS is also the most robust to variation in the data generating process, described below.

Based on the simulation results, we calculate the power of OLS, Poisson, ZINB, and ZIP models using FY15 data with state and FY08-FY14 contributions as covariates. For the FY17 and FY8 simulations, we also use previous treatment assignment as a covariate because districts not assigned to a treatment in a previous year are more likely to contribute – they were not assigned to a treatment because they had already contributed before that year’s experiment began. OLS, ZINB, and ZIP have similar power. Because of both zero-inflated models’ tendency to excessively reject a true null, we choose OLS as our primary specification. However, using our experimental data, we show that the estimated treatment effects from the three specifications imply the same conclusions (see Appendix E).

Data Generating Process.— To simulate a variety of treatment effect sizes, we use pre-treatment data from FY15 and earlier. A prominent feature of the data is that some districts contribute regularly and some choose not to contribute. In our simulations, districts that do not contribute in FY15 are treated differently from the districts that do choose to contribute in FY15.

Baseline Data.— The outcome variable data for the power simulations are from FY15, the year before treatments began. For each experiment (FY16, FY17, FY18), the sample for randomization comprises the districts that were available for randomization in the relevant year. For example, the power simulations for the FY16 experiment used the FY15 and earlier data from the 1,231 districts that had not paid any membership dues by the end of the second quarter FY16. Likewise, for the FY17 simulations, we use the 1,732 districts that had not paid any membership dues by the end of the first quarter FY17, and 1,447 districts for FY18. The simulations randomly assign half of the districts to the treatment group and add the assumed treatment effect size to the treated group (assumptions are made for both the treatment effect on non-contributors and the effect on positive contributors). Each district is assigned a treatment status exactly once within a simulation; in other words, because our set of assigned districts is fixed, districts are randomly drawn without replacement.

Effect on Contributors.— The treatment effect on contributors is modeled as a percentage increase in the amount contributed in FY15.

Effect on Non-contributors.— The treatment effect on non-contributors is modeled as the probability that a non-contributing district chooses to contribute. In the simulation, we assume that a district that had not contributed in FY15, but which becomes a contributor when treated, contributes \$324. This value is the historical average contribution of districts that had not previously contributed. We vary rate

at which the treatment causes non-contributing districts to become contributors between 0% and 10%. At 0%, any district that did not contribute in FY15 still contributes nothing, even if treated. At 10%, each treated district that contributed nothing in FY15 has a 10% chance of contributing \$324.

In our simulations, we vary the proportion of the treatment effect that comes from the effect of the treatment on non-contributors and on contributors. For a range of values, from 0% effect on non-contributors (i.e., no non-contributors become contributors when treated) to a 10% effect, we find that power in the OLS is relatively insensitive to whether the treatment effect comes from the effect on contributors or non-contributors. Power in the ZINB and ZIP models decline as the proportion of the treatment effect coming from non-contributors increases because the models separately estimate likelihood of contributing and the treatment effect on contributors. Power is also insensitive to the amount contributed by a converted non-contributing district. Power is nearly the same for hypothesized contributions of \$100, \$324, or \$775 for the OLS model.

Power Analysis Results.— Each experiment has its own power analyses, in which only the sample size (N=1231 FY16; N=1,732 FY17; N=1,447 FY18) and included districts differ. The Type 1 error rate is set at 5% and 1,000 repetitions are run for each simulation. We vary the assumed treatment effects on contributions, both the additional amount contributors give and the likelihood of a non-contributor choosing to contribute. For ease of comparing different parameters and comparing the power of our studies to those in the literature, we use the standardized treatment effect: the average effect on contributions in FY15 divided by the standard deviation (SD) of contributions in FY15 under the control condition. Our power analysis shows that our design is reliably able to detect the effect sizes found in laboratory studies, though sufficiently small effects are unlikely to be detected.

The FY16 power analysis shows that OLS, the Zero-Inflated Negative Binomial (ZINB), and the Zero-Inflated Poisson (ZIP) models out-perform the Poisson model in terms of power. Though ZIP appears to have slightly greater power than OLS, the ZIP specification may systematically understate the standard error, resulting in observed excess rejections in the placebo test. We present multiple graphs corresponding to different assumptions about the treatment effect. In Figure F1, we assume the treatment has no effect on a district's likelihood of contributing. In Figure F2, we assume the treatment effect makes 10% of non-contributing districts choose to contribute \$324. In both cases, the OLS specification achieves 80% power for an effect size of 0.10 SD, which corresponds to a 24% increase in average contributions. To the extent that the state in which the district resides affects variation in contribution behaviors, our randomization of the treatment on states (block randomization) will increase the statistical power of our design even further.

The FY17 experiment included more districts, many of which regularly contribute. Figure E3 show the OLS specification reaches 80% power for a treatment effect of 0.06 SD, corresponding to a 9% increase in average contributions. Figure E4 demonstrates that OLS is relatively insensitive to whether the treatment effect comes from the effect on contributors or non-contributors.

The FY18 experiment, Figure F5, shows the OLS specification reaches 80% power for a treatment effect of 0.075 SD, corresponding to a 12% increase in average contributions. Again, Figure F6 shows OLS power is insensitive to whether the treatment effect comes from the effect on contributors or non-contributors.

For treatment effect sizes that are often found in laboratory experiments (0.50 SD or larger), all three experiments achieve nearly 100% power for a variety of assumptions about how the treatment affects behavior.

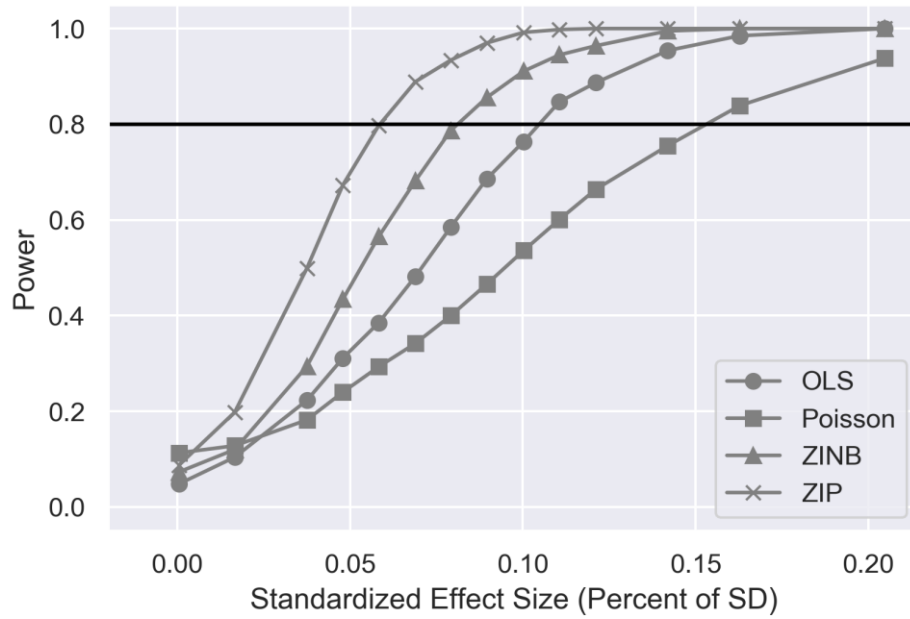


FIGURE F1. FY 16 EXPERIMENT: POWER WHEN THE TREATMENT DOES NOT AFFECT NON-CONTRIBUTORS

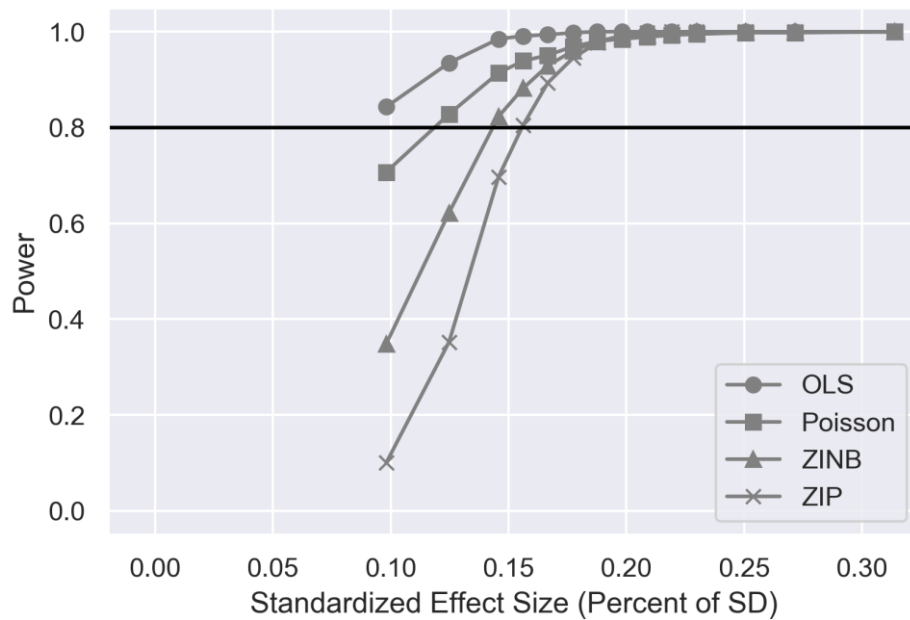


FIGURE F2. FY16 EXPERIMENT: POWER WHEN THE TREATED NON-CONTRIBUTORS CHOOSE TO CONTRIBUTE 10% OF THE TIME

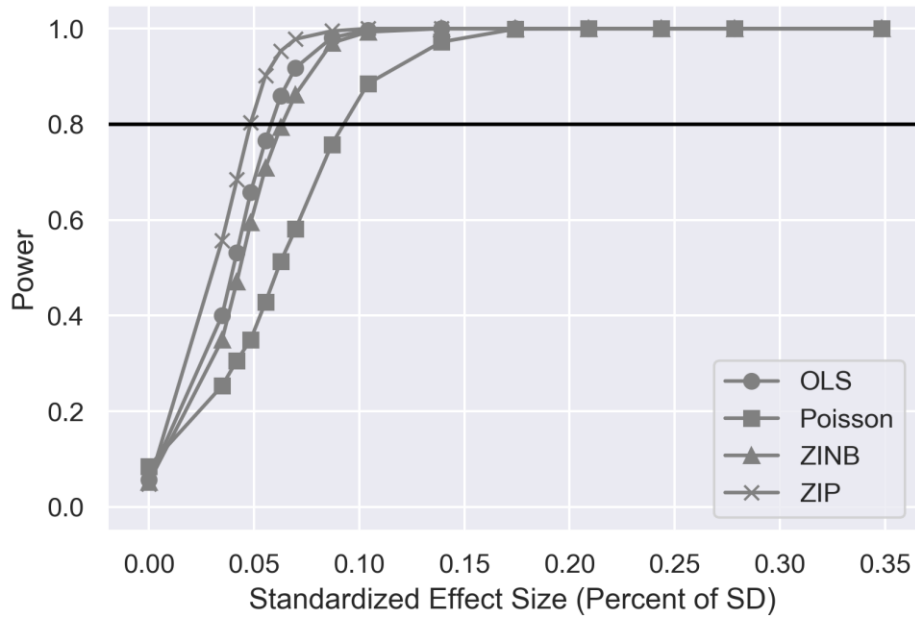


FIGURE F3. FY17 EXPERIMENT: POWER WHEN THE TREATMENT DOES NOT AFFECT NON-CONTRIBUTORS

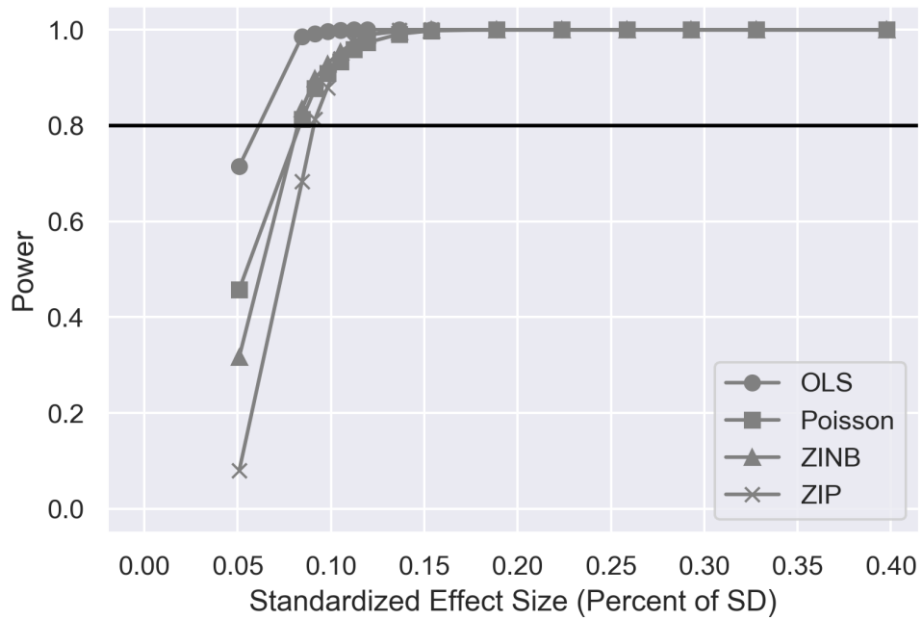


FIGURE F4. FY17 EXPERIMENT: POWER WHEN THE TREATED NON-CONTRIBUTORS CHOOSE TO CONTRIBUTE 10% OF THE TIME

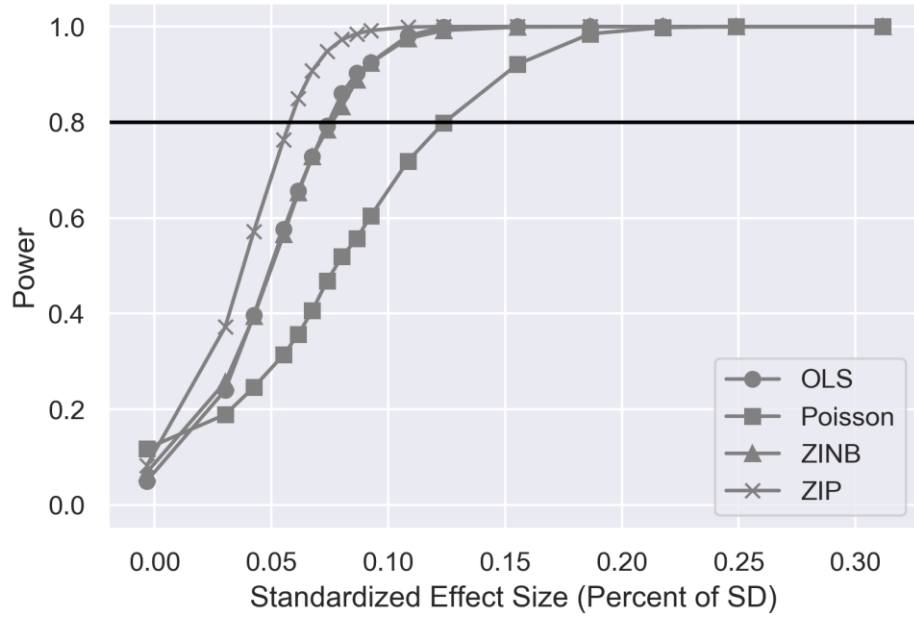


FIGURE F5. FY18 EXPERIMENT: POWER WHEN THE TREATMENT DOES NOT AFFECT NON-CONTRIBUTORS

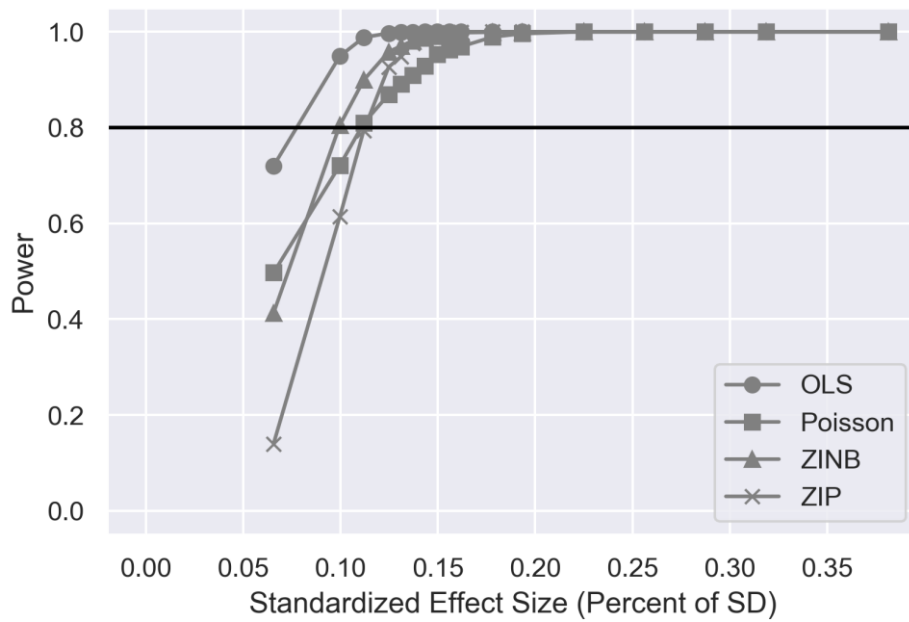


FIGURE F6. FY18 EXPERIMENT: POWER WHEN THE TREATED NON-CONTRIBUTORS CHOOSE TO CONTRIBUTE 10% OF THE TIME