Highlights

Give Effort or Give Money: A Public Goods Experiment[⋆]

Li-Hsin Lin

- Research highlight 1: Effort-giving increases participants' initial contribution levels. On the other hand, Money-giving slows down the decline of participants' contributions over rounds.
- Research highlight 2: There are heterogeneous preferences for contribution channels. Providing both effort-giving and money-giving enables participants to contribute through their preferred channel, encouraging cooperation.
- Research highlight 3: People think in proportions rather than in absolute amounts when contributing to public goods, implying that perceptions of "fairness" in contributions are fundamentally proportional.

Give Effort or Give Money: A Public Goods Experiment

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Abstract

Despite the prevalence of volunteering one's effort in every society, public goods experiments have focused almost exclusively on voluntary monetary contributions. A small number of studies have examined the differences between contributions of time and money, but none have investigated effort-giving within the context of an effort-based voluntary contribution mechanism. In this paper, I design an effort-giving public goods experiment in which participants can freely alternate between working to keep their earnings and working to contribute publicly. I find that initial contributions are higher in treatments that incorporate effort-giving; however, monetary contributions demonstrate greater sustainability over repeated rounds. Notably, contributions are highest when both money- and effort-giving options are available, with 30% of participants contributing their entire earnings in the final round. These findings suggest that the optimal policy approach may be to allow contributions in both forms — money and effort. If only one contribution channel is feasible, effort-based contributions may be more effective for one-time provisions, whereas monetary contributions are better suited for long-term sustainability.

Keywords: experimental economics, public goods game, volunteering, warm glow, conditional cooperation

JEL: C90, D91, H41

1. Introduction

Many critical societal challenges — such as pandemics, climate change, and natural disasters — require collective efforts and resources. An extensive literature emphasizes the potential for

⋆I would like to thank the McMaster University Department of Economics for their invaluable feedback and support. I also thank the McMaster Decision Science Laboratory (McDSL) for financial support. Special thanks to Bradley Ruffle, Katherine Cuff, Jonathan Zhang, and Robert McKercher for their insights and discussions. Any errors remain my own. The experiments were pre-registered.

financing public goods or services through voluntary contributions (Buckley and Croson [3]; Grant and Langpap [10]; Gächter et al. [11]; Hudik and Chovanculiak [14]; Shang and Croson [20]; Smith et al. [21]; Sugden [22];Van Dijk and Van Winden [23]). To better understand human cooperative behavior, experimentalists commonly use Public Goods Games or voluntary contribution mechanisms as research tools. Typically, four participants form a group, receive or earn laboratory money, and subsequently decide how much money to allocate to a public good and to keep privately.

However, this standard experimental design fails to capture certain features of cooperative behavior observed in real-world settings, particularly contributions involving effort rather than money. Effort-based contributions arguably represent the earliest form of human cooperation, predating monetary exchanges. Foragers, as documented by Hawkes et al. [13] and Mayor [16], consistently share food within their communities. Unlike traditional public goods experiments, where participants allocate financial endowments, foragers allocate their effort between searching for personal sustenance and engaging in collective activities, such as group hunting — activities that inherently possess public-good characteristics. Thus, current experimental designs might inadvertently underestimate true cooperative behavior through neglecting one of the forms it often takes.

To address this gap, I propose modified real-effort public goods experiments to investigate the effects of "effort-giving". Four participants form a group and play a public goods game together over ten rounds. Inspired by Brown et al. [2], participants in my experiment engage in a real-effort task and can freely choose between exerting effort to benefit the public good and to keep for themselves the returns to their effort. The experiment consists of three treatments differing by how contributions to the public good are made: *Give-Money*, where participants allocate their earned money between contributing to the public good and keeping it; *Give-Effort*, where participants decide how much to work for the public good and for their personal gain. And *Give Money-Effort*, where participants choose between both money- and effort-giving contributions. Results indicate higher initial contributions in treatments involving effort-giving, though monetary contributions demonstrate greater sustainability across repeated rounds. Notably, when both money- and effort-giving contributions are feasible, overall contributions are highest, averaging 50.8% compared to 27.2% in *Give-Money* and 24.0% in *Give-Effort*. Remarkably, two out of ten groups in *Give Money-Effort* achieved full cooperation by the ninth and tenth rounds.

This paper contributes to existing literature in several ways. First, my results suggest a context-

based model for contributions in public goods game experiments. Although many studies investigate prosocial behavior under different contexts (Davis et al. [6]; Jouxtel [15]; Noussair and Stoop [17]; Wu [24]), this study is the first to examine prosocial behavior specifically within an effort-based context in a repeated public goods game. The experimental tasks differ solely in their contribution formats, preserving identical incentives and removing potential confounding factors. Leveraging the extensive literature on public goods game experiments, my design can be broadly applied to revisit various findings in the field. It suggests that our understanding of human cooperative behavior in these experiments may be shaped by context.

Second, the results highlight how different contribution formats influence cooperative behavior dynamics across repeated interactions. Fischbacher et al. [9] demonstrate that most participants in public goods experiments exhibit conditional cooperation: they adjust their contributions according to their beliefs about group members' average contributions. Consequently, studies often find that free-riding and less than 1:1 conditional cooperation lead to declining contributions over repeated rounds (Fischbacher and Gächter [8]). Yet this pattern contrasts with many real-world settings where voluntary contributions remain stable. In the *Give-Money* treatment, I observed no decline in contributions over repeated rounds, aligning with previous research that providing feedback on group members' contributions mitigates this decline (Fiala and Suetens [7]; Hartig et al. [12]; Sell and Wilson [19]). Moreover, my results clarify that this feedback-driven stabilization is specific to money-giving contexts. In effort-giving scenarios, participants tend to make higher initial contributions but then exhibit a decline across rounds.

Third, my design endogenizes participants' income-generating ability, in contrast to much of the public goods literature, which often constrains potential earnings through artificial caps in the case of choosing the contribution level from a range (e.g., 0 to 10 tokens) or uses overly simple tasks that yield minimal income variation (Carbone and Gazzale [4]; Schütze and Wichardt [18]). By intentionally preserving this variation, I aim to evaluate the treatment effect in a context that more closely reflects real-world heterogeneity in ability. The findings indicate that the treatments influence contributions proportionally rather than in absolute terms. This result provides further evidence for the conditional cooperation literature, suggesting that when ability is not experimentally induced, the operative form of conditioning concerns the contribution proportion rather than its absolute level. Participants appear to interpret fairness as requiring equal proportional

contributions of effort or income, rather than equal absolute amounts.

Finally, my results imply that the voluntary provision of public goods can be significantly enhanced by diversifying available contribution forms. Contributions are notably higher in *Give Money-Effort*, suggesting that participants contribute more when allowed their preferred contribution formats. Expanding contribution formats could therefore encourage broader participation and maximize resources, ultimately improving social welfare.

The rest of the paper proceeds as follows. Section 2 reviews relevant literature exploring contextual effects in prosocial experiments. Section 3 details the tasks, experimental design, pre-registered hypotheses, and summary statistics. Section 4 presents hypothesis testing results, develops regression models based on findings, and discusses suggestive evidence for potential mechanisms. Section 5 concludes.

2. Literature Review

A seminal paper by Andreoni [1], which introduced the impure altruism theory, suggests that people's satisfaction from giving may derive not solely from the recipient's equivalent monetary gain, but from the intrinsic "warm glow" of the act itself. If this warm glow varies across different contexts of contributing to public goods, then we should observe variations in contribution levels across different contribution formats in public goods experiments.

The idea of employing various mediums in social preference experiments to explore whether time equates to money has been examined through dictator games, ultimatum games, trust games (Davis et al. [6]; Noussair and Stoop [17]; Wu [24]), and public goods games (Jouxtel [15]). In their time-based treatments, participants play prosocial games in a laboratory setting. They receive a fixed monetary payment and must wait for a specified period after the experiment. Their payoffs determine how much of that waiting time can be reduced. These studies primarily investigate if changing the payoff medium — time instead of money — alters prosocial behavior. My study extends this research by incorporating real-effort tasks, explicitly highlighting effort-giving and underscoring the concept of "working for others."

Regarding voluntary effort contributions, Brown et al. [2] examined a volunteer work scenario compared to donation. Treatments allowed participants either to donate their earned income at the end of effort tasks, switch to a donation mode during the tasks (allocating earnings directly to

a chosen charity, thereby simulating volunteering), or do both. Their results indicate a stronger warm glow effect when participants contributed through volunteer work than through equivalent monetary donations. This effect remained robust even when the piece rate in the donation mode was lower, with the option to donate earned income at the session's end.

Similarly, Carbone and Gazzale [4] structured five rounds of real-effort tasks into environmental and earning rounds. In environmental rounds, participants worked to offset real-world carbon emissions; in earning rounds, they worked for personal financial gain. Participants had the option to "buy out" environmental rounds at a fixed price, converting them to earning rounds. Around two-thirds of participants rejected the buyout, even when financially advantageous, indicating a preference for contributing effort over monetary contributions.

Both studies suggest that contributing to public goods through effort is preferred over monetary contributions by certain individuals. Schütze and Wichardt [18] compare a one-shot, effort-giving public goods game with the standard one-shot version, in which participants contribute part of their endowment to a public pool. They find that participants contribute significantly less in the effort-giving scenario. However, individual preferences and contribution dynamics over repeated rounds, particularly in the context of comparing effort-giving and money-giving, remain unexplored within an effort-based voluntary contribution mechanism. In my design, participants directly benefit from the public good and observe each other's contributions through repeated interactions within fixed groups.

In summary, this study aims to examine the impact of "effort-giving" within public goods scenarios. Diverging from many social preference experiments focused on payoff medium differences, my research draws inspiration from findings regarding volunteering. I propose an innovative, effort-based contribution design within the public goods game framework.

3. Experiment

3.1. Participants

Participants were recruited from the existing McMaster Decision Science Laboratory (McDSL) participant pool using the SONA management system. All tasks were programmed using oTree (Chen et al. [5]). The experiment consisted of three treatments: *Give-Money*, *Give-Effort*, and

Give Money-Effort. The total sample size was 124 participants, with 40 assigned to each of the *Give-Money* and *Give Money-Effort* treatments, and 44 participants assigned to the *Give-Effort* treatment. On average, participants received approximately $24 CAD for roughly 50 minutes of participation, including a $5 CAD show-up fee.

3.2. Public Goods Experiment

In each round, participants within groups of four were given one minute (60 seconds) to solve as many addition problems involving four single-digit numbers as possible. Each correct solution earned participants $0.10 (MPCR = 0.5). In *Give-Money*, participants solved as many problems as possible within each round and subsequently decided how much of their earned money to allocate to the public good. In *Give-Effort*, participants chose for each problem whether to work for their own benefit or for the public good. In *Give Money-Effort*, participants had the flexibility to contribute to the public good through both methods. For each $0.10 contributed to the public good, all group members received $0.05. At the end of each round, group members received feedback on the number of correctly solved problems, each group member's contribution to the public good, and earnings. To illustrate, suppose participant i solved x_i questions and contributed s_i questions in a given round ($0 \leq s_i \leq x_i$); their payoff would then be calculated accordingly.

$$\pi_i(x_i, s_i) = 0.10(x_i - s_i + 0.5 \sum_{j=1}^{4} s_j) \tag{1}$$

3.3. Design

The experiment employed a between-subjects design with two factors: Money-giving, allowing participants to contribute money at the end of each task round, and Effort-giving, allowing participants to contribute by working directly for their group during the task. A 2 x 2 factorial design results from the presence or absence of these two contribution options, creating four potential conditions. The condition where no contribution option was available served as the practice round before each treatment, as it lacked the public goods component. That is, participants simply performed the real-effort task for themselves. They each had 60 seconds to solve as many addition problems as possible, where each correctly solved problem earned them $0.10. No contribution decision is made.

3.4. Treatments

Three between-subjects treatments were conducted: *Give-Money*, *Give-Effort*, and *Give Money-Effort*. In *Give-Money*, all money earned from the real-effort task initially goes to the "Individual Project" (IP). Participants see one button labeled "Show Question" above the addition questions (Appendix, Figure 5.1), along with a counter showing how many questions have been correctly solved for the IP. After 60 seconds, participants choose how much money they earned they wish to reallocate to the "Group Project" (GP) in increments of ten cents (Figure 1.2). Participants then see their results for each round.

In *Give-Effort*, participants see two buttons labeled "Individual Project" and "Group Project," each accompanied by a separate counter displaying correctly solved questions for each project during the round. Before solving each question, participants choose to allocate their effort either to the GP or to their IP by selecting the corresponding button.

In *Give Money-Effort*, both contribution methods are available. That is, participants can either allocate their effort directly to the GP during the task or allocate money to the GP after the task.

The 60-second timer counts down only when participants click "Show Question," "Individual Project," or "Group Project" buttons, and pauses when clicking "Next Question." The timer restarts only after participants again select one of these three buttons. This approach ensures actual problem-solving time is exactly 60 seconds per round in all treatments. It also allows participants adequate time to decide whether to solve each question for themselves or the group without a time penalty compared to *Give-Money*, where the allocation decision is made only at the end of the round. Figures 1 and 2 below provide screenshots of the real-effort task for *Give-Money* and *Give-Effort* treatments, respectively. Additional screenshots are available in Figures 6 to 8 of the Appendix.

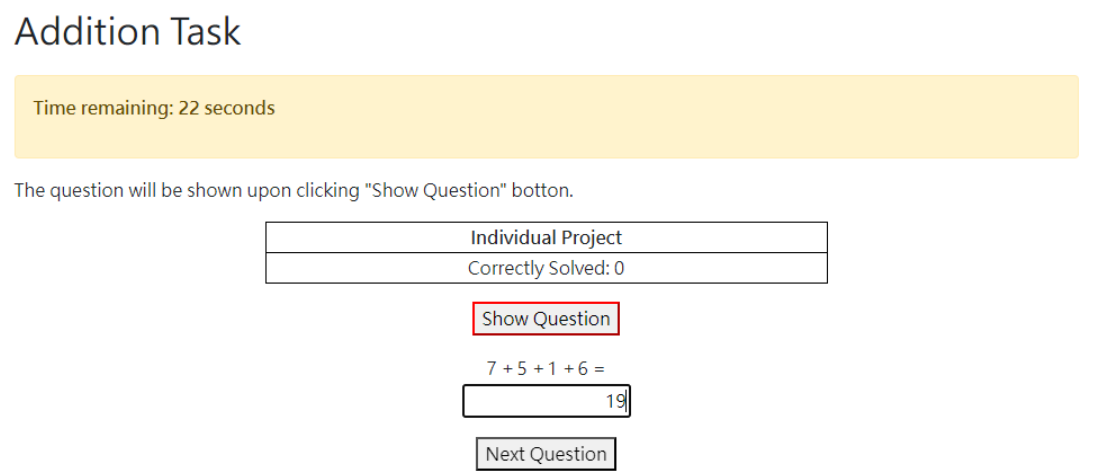

Figure 1: Screenshots from *Give-Money*

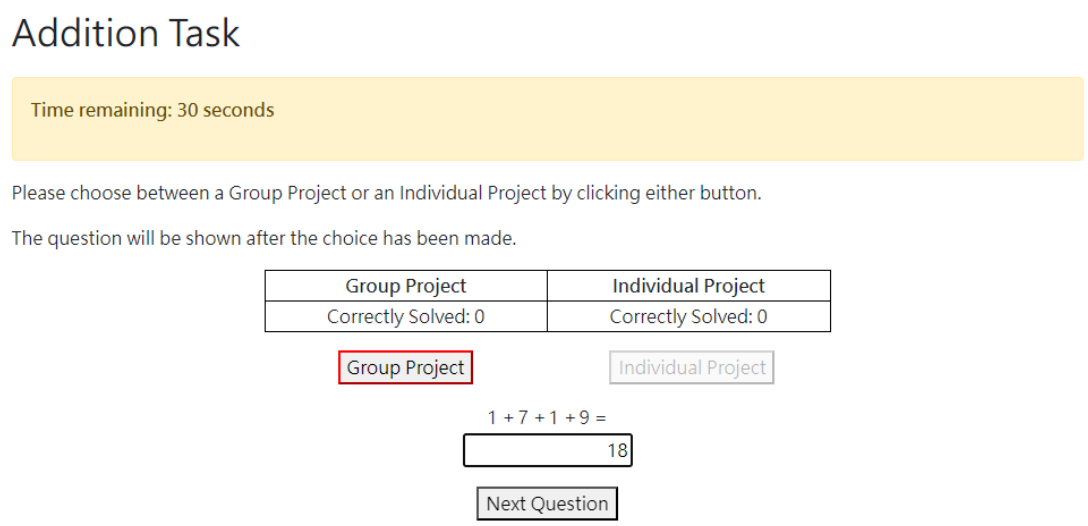

Figure 2: Screenshots from *Give-Effort* - In the *Give Money-Effort* treatment, participants completed the addition task in the same manner as shown in Figure 2. After 60 seconds, they were prompted again to decide how much of the money kept in the "Individual Project" (IP) they wished to reallocate to the "Group Project" (GP), as illustrated in Figure 1.2.

3.5. Pre-registered Hypothese

The pre-registered hypotheses were formulated based on the assumption that effort-giving fosters cooperation and increases overall group contributions. Contribution rate is defined as the proportion of total correctly solved questions contributed to the group project by a participant in a given round.

H1: The contribution rates (average of all rounds) will follow:

Give Money-Effort $\geq$ ***Give-Effort*** $>$ ***Give-Money.***

I divide this hypothesis into three sub-hypotheses and discuss each one in turn.

H1a: ***Give Money-Effort*** $\geq$ ***Give-Effort.***

Despite *Give Money-Effort* offering two contribution channels, substitution and crowding-out effects suggest total contributions in this treatment may be only weakly greater than those in *Give-Effort*.

H1b: ***Give-Effort*** $>$ ***Give-Money.***

The warm-glow effect is expected to be stronger in *Give-Effort*, leading to higher total contributions compared to *Give-Money*.

H1c: ***Give Money-Effort*** $>$ ***Give-Money.***

Similar rationale as above.

H2: The difference in contribution rates (H1) is explained by the initial contribution level.

H3: The difference in contribution rates (H1) is explained by the rate of decline.

In repeated public goods experiments, group contributions depend on the initial contribution (intercept) and variations over repeated rounds (slope).

H4: Participants' contribution rates respond to group members' contributions.

This reflects conditional cooperation, where participants adjust contributions based on their group's average contribution from the previous round.

3.6. Demographic Summary Statistics

A brief questionnaire was administered at the end of the experiment to verify that the random assignment to treatment achieved a balance across treatments. Differences in demographic variables across treatments were tested (Table 1). The Kruskal-Wallis (K-W) test indicates that most demographic variables, including sex, age, faculty, risk preferences, and political views, are not

significantly different across treatments. However, significant differences were identified in terms of economic views and the average number of questions participants solved within 60 seconds in the practice round (ability). Participants in *Give Money-Effort* exhibited higher task ability. Regarding economic views, the survey question asked: "In terms of your economic views, are you more...?" Response options ranged from Very Liberal to Very Conservative, including Moderate, No Opinion, and Other. Participants in *Give-Effort* and *Give Money-Effort* treatments reported more conservative economic views. To account for these differences, demographic variables will be included as controls in the regression analysis to ensure the robustness of the results.

Treatment	**Giving-Money**		**Giving-Effort**		**Money-Effort**		**K-W test**	
Variables	Mean	(SD)	Mean	(SD)	Mean	(SD)	$\chi^2(2)$	(p-value)
Male	0.375	(0.490)	0.477	(0.505)	0.425	(0.501)	0.890	(0.641)
Age	23.23	(5.940)	24.73	(7.410)	24.63	(4.070)	5.614	(0.060*)
Student	0.914	(0.284)	0.864	(0.347)	0.925	(0.267)	0.611	(0.736)
Engineering	0.500	(0.506)	0.545	(0.504)	0.475	(0.506)	0.428	(0.807)
Science	0.225	(0.423)	0.114	(0.321)	0.175	(0.385)	1.846	(0.397)
Other Faculty	0.275	(0.452)	0.341	(0.479)	0.350	(0.483)	0.530	(0.767)
Risk	4.615	(1.444)	4.750	(1.449)	4.925	(1.248)	0.802	(0.670)
Economic View	2.655	(0.974)	3.241	(0.872)	3.281	(0.813)	7.717	(0.021**)
Political View	2.423	(0.902)	2.862	(0.953)	2.963	(0.980)	4.087	(0.130)
Ability	10.23	(3.919)	11.34	(4.226)	13.38	(5.197)	7.012	(0.030**)
Accuracy	0.913	(0.101)	0.931	(0.081)	0.930	(0.080)	5.737	(0.057*)

Table 1: Summary Statistics by Treatment Group - Accuracy is defined as the proportion of questions correctly solved by a participant relative to the total number of questions attempted in each round. Risk Willingness was assessed through a survey question asking participants: "How willing are you to take risks, in general?" Responses were recorded on a seven-point Likert scale, ranging from "unwilling" to "very willing." * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4. Results

4.1. Contribution each round by treatment

Figure 3 below displays the average contribution rate (i.e., the number of contributed questions divided by the total number of questions solved per participant) for each treatment, broken down by round. There are three main observations from the graph: 1. The contribution rate in *Give Money-Effort* is significantly and consistently higher than in the other two treatments. 2. Contributions are significantly higher in round one when effort-giving is feasible. 3. Contribution rates decline more slowly across rounds when money-giving is feasible.

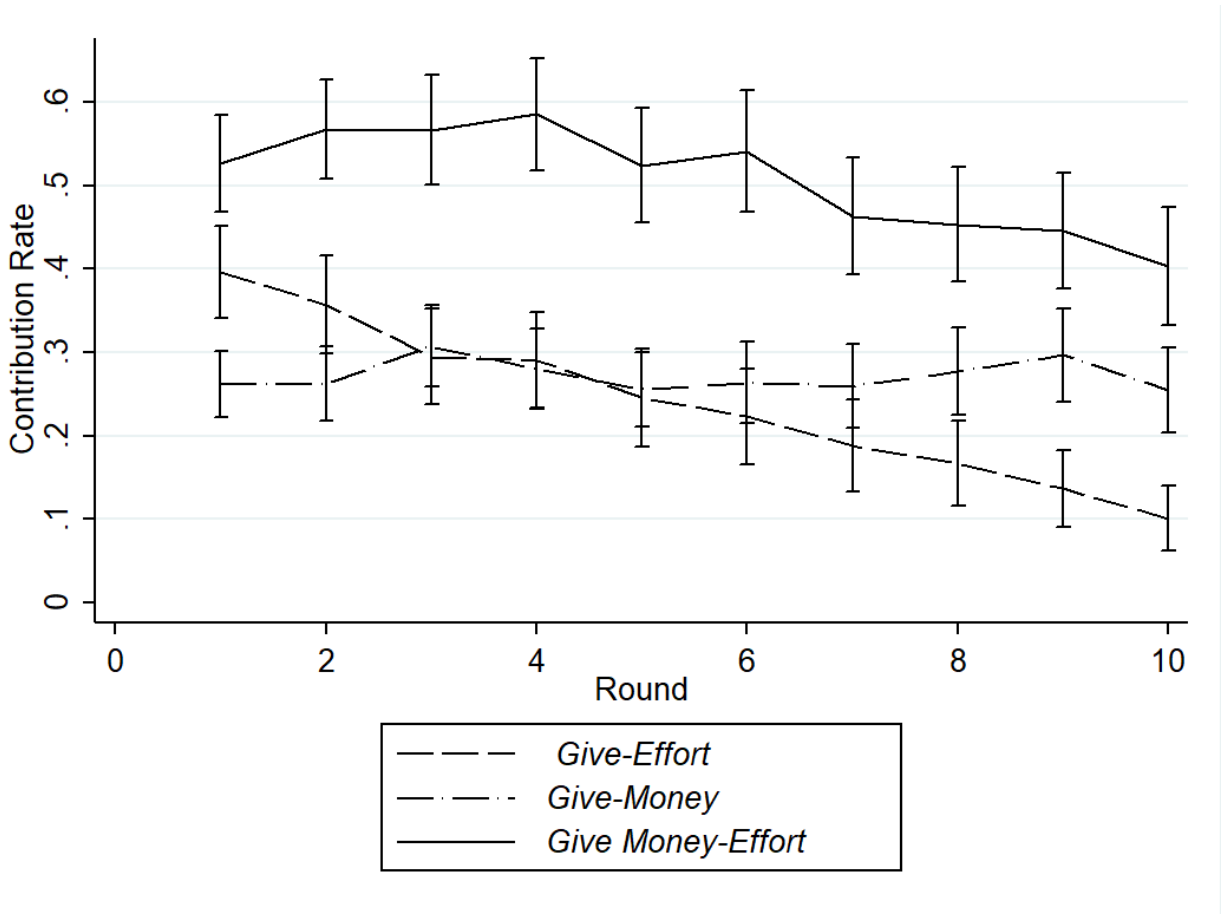

Figure 3: Contribution each round by treatments - The error bars represent the standard errors of the contribution rates in each round for each treatment. These visualizations do not directly indicate statistical significance. The p-values reported in the main text are based on pooled standard errors across groups.

4.2. Pre-registered Hypotheses

H1: The contribution levels (average of all rounds) will obey:

Give Money-Effort $\geq$ ***Give-Effort*** $>$ ***Give-Money.***

H1a: ***Give Money-Effort*** $\geq$ ***Give-Effort.***

H1b: ***Give-Effort*** $>$ ***Give-Money.***

H1c: ***Give Money-Effort*** $>$ ***Give-Money.***

Mostly verified, including H1a, H1c, but not H1b.

As shown in Figure 3, the average contribution rate across all rounds are significantly higher in the *Give Money-Effort* compared to either *Give-Money* or *Give-Effort* ($p < .001$ for both). These findings support H1a and H1c. Nonetheless, I do not observe a significant difference, in terms of

the average contribution level across all rounds, between *Give-Effort* and *Give-Money* in contrast to H1b.

H2: The difference in contribution levels (H1) is explained by the initial contribution level.

Verified.

In line with H1, *Give Money-Effort* demonstrates a higher contribution rate. This difference is evident from round one, where the initial contribution level is higher in *Give Money-Effort* compared to both *Give-Effort* (marginally significant) ($p = .054$) and *Give-Money* ($p < .001$). Notably, the initial contribution level is also significantly higher in *Give-Effort* compared to *Give-Money* ($p < .03$). This leads to my first result which is consistent with the findings from Brown et al. [2]:

Result 1: Effort-giving increases participants' initial contribution levels.

H3: The difference in contribution levels (H1) is explained by the rate of decline.

The opposite is true.

Despite the lower initial contribution rate in *Give-Money*, the contribution level remains stable in many groups. Specifically, 50% of groups ended with higher contributions compared to the first round. These groups show evidence of learning to cooperate more effectively. An additional 20% of groups ended with similar contribution rates. This leads to my second result:

Result 2: Money-giving slows down the decline of participants' contributions over rounds.

This finding aligns with literature suggesting that when feedback focuses on the contributions made by each group member rather than their payoffs, contribution levels tend to stabilize (Fiala and Suetens [7]; Hartig et al. [12]; Sell and Wilson [19]). Admittedly, this outcome was not anticipated during the study design.

H4: Participants' contribution levels are responsive to other players' contributions in their group.

Verified.

46% (R^2) of the variation in the contribution rate can be explained by the previous round's average contribution rate of other players in the group. The correlation between the previous round's average contribution rate of other players in the group and the current self-contribution rate is high but varies across treatments: 41% in *Give Money-Effort*, 49% in *Give-Effort*, and 31% in *Give-Money*. The order of correlations aligns with the rate at which the contribution rate declines over repeated rounds, suggesting that Result 2 — money-giving slows down the decline of participants' contributions over rounds — may be driven by participants in *Give-Money* being less responsive to their group members' contributions, resulting in a slower rate of decline in contribution behavior. The order remains robust to an alternative measure.[1] This leads to my third result:

Result 3: Effort-giving increases participants' overall contribution levels, mediated by the initial contribution.

4.3. Proposed Model

The tests of the pre-registered hypotheses indicate that distinct contribution channels influence contribution dynamics through two primary mechanisms: initial contributions and repeated interaction effects. Specifically, in the *Give-Effort* condition, initial contributions are markedly higher. However, contributions decline across rounds. Conversely, contributions in the *Give-Money* condition exhibit greater sustainability across repeated rounds. Notably, in the *Give Money-Effort* treatment, there appears to be an additive rather than substitutive or crowding-out relationship between contribution channels. This suggests distinct mechanisms underlying each contribution channel. To validate these proposed mechanisms, I adopt analytical frameworks widely recommended in the experimental economics literature to examine both mediation and moderation effects attributable to the experimental treatments. I posit two primary hypotheses: 1. The effort-giving enhances contributions predominantly by raising initial contribution levels, exhibiting a complete mediation through initial contributions without exerting a direct effect on subsequent contributions. 2. The money-giving mitigates the typical decline observed in repeated rounds, thereby moderating

[1] Measured by the number of questions contributed: R^2: 58%; Correlations: 50% in *Give Money-Effort*, 65% in *Give-Effort*, and 44% in *Give-Money*

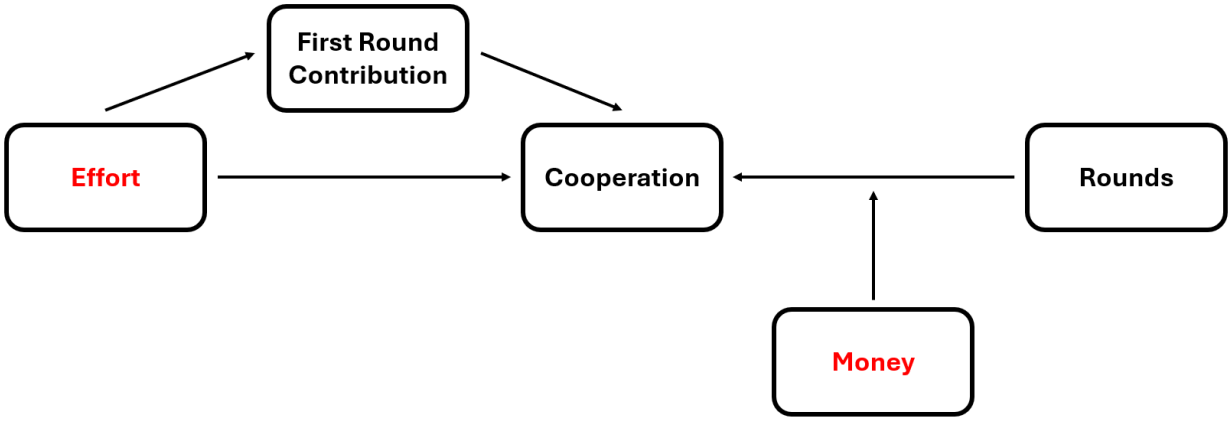

Figure 4: Directed Acyclic Graph

the negative impact of repetition. The proposed complete mediation model can be conceptualized similarly to employing effort-giving as an instrumental variable. Accordingly, I employ mediation analysis techniques to identify both direct and indirect pathways through which effort-giving influences contributions. After demonstrating that the direct effect is negligible, I apply a two-stage least squares (2SLS) estimation to capture the mediated relationship. On the other hand, the moderation effect is examined via an interaction term designed to quantify how money-giving alters the dynamics of contributions across repeated rounds. The Directed Acyclic Graph (DAG) that visually delineates this analytical structure is presented in Figure 4:

4.4. Examination of the Model

The following three regressions test the proposed model:

$$C_{igt} = \phi + \gamma_1 \mathbb{E}_g + \gamma_3 \mathbb{M}_g + \gamma_4 T_t + \gamma_5 (T_t \times \mathbb{M}_g) + \mu_{igt} \tag{2}$$

$$F_{ig} = \eta + \pi_1 \mathbb{E}_g + \nu_{ig} \tag{3}$$

$$C_{igt} = \alpha + \theta_1 \mathbb{E}_g + \theta_2 F_{ig} + \theta_3 \mathbb{M}_g + \theta_4 T_t + \theta_5 (T_t \times \mathbb{M}_g) + \epsilon_{igt} \tag{4}$$

$$C_{igt} = \alpha + \beta_2 \hat{F}_g + \beta_3 \mathbb{M}_g + \beta_4 T_t + \beta_5 (T_t \times \mathbb{M}_g) + \delta \mathbb{X}_i + \epsilon_{igt} \tag{5}$$

Equation (2) represents the naïve or baseline model, assuming that the key factors, $\mathbb{E}_g$ (a binary variable for effort-giving) and $\mathbb{M}_g$ (a binary variable for money-giving), are independent of all other

factors that could potentially influence contribution behavior. The outcome variable, C_{igt}, represents participant i of group g's contribution rate in round t. This model incorporates the main effects of the two contributing factors, along with T_t, representing *rounds*, and tests the interaction effect of rounds and money-giving, $T_t \times \mathbb{M}_g$. Equation (3) tests the impact of effort-giving on the first-round contribution. The dependent variable, F_{ig}, represents the first-round contribution rate. This regression serves as the "first stage" in the two-stage least squares (2SLS) procedure, explicitly examining the effect of effort-giving on initial (first-round) contributions within the mediation framework. Equation (4) illustrates how the experimental treatments — *Give-Money*, *Give-Effort*, and *Give Money-Effort* — impact average contribution rates through two theoretically distinct mechanisms: mediation via initial contributions and moderation via interaction effects with repeated rounds. To address the mediation analysis and the direct effect, equation (4) is explicitly included, but it is crucial to acknowledge endogeneity concerns inherent in this identification approach. Finally, equation (5) represents our preferred specification employing 2SLS, wherein the coefficient of $\hat{\mathbb{F}_g}$ captures the indirect effect of effort-giving on overall contributions. The vector $\mathbb{X}_i$ represents demographic control variables included in the model to test and ensure the robustness of the estimated effects.

Table 2 presents the regression results. Model (1) examines the effects of my two main factors (effort and money), repeated rounds, and their interaction. On average, compared to participants in *Give-Money*, effort-giving (i.e., in *Give-Effort* and *Give Money-Effort*) increases the contribution rate (contribution to the public pool divided by total earnings) by 23.6 percentage points. Over repeated rounds, participants on average decrease their contribution rate by 3.1 percentage points per round, which sums to a 27.9 percentage-point decrease across 10 rounds. However, when money-giving is feasible (i.e., in *Give-Money* and *Give Money-Effort*), the interaction effect largely offsets the round effect, on average increasing contributions by 2.3 percentage points per round.

Model (2) focuses on the effect of effort-giving on the first-round contribution. The constant of 0.262 reveals a first-round contribution rate of 26.2% when only money contributions are feasible. When effort-giving is feasible, the first-round contribution increases by 19.7 percentage points.

Model (3) examines both the direct and indirect effects of effort-giving on overall contributions. When effort-giving and first-round contributions are considered simultaneously, the direct effect of

effort-giving becomes statistically insignificant ($p = .429$). This result indicates that effort-giving influences overall contributions exclusively through its effect on initial contributions.

Model (4) provides the results from the two-stage least squares (2SLS) estimation, employing a weighted matrix clustered at the group level. Given that effort-giving increases first-round contributions by 19.7 percentage points and the estimated coefficient for first-round contributions is 0.892, the indirect effect of effort-giving translates into a total increase of 17.6 percentage points in overall contributions. Model (5) incorporates demographic control variables to correct for imbalances across treatments, serving as a robustness check for previous findings. Due to missing responses in demographic questions, the sample size is reduced from 1,240 to 900 observations. Importantly, the effects of effort-giving, repeated rounds, and their interaction remain significant and consistent across all model specifications, exhibiting nearly identical coefficient estimates.

Variables	(1) Contribution	(2) Contribution (First-Round)	(3) Contribution	(4) Contribution	(5) Contribution
Contribution (First-Round)			0.661*** (0.076)	0.892*** (0.240)	0.890*** (0.245)
Effort (Channel)	0.236** (0.114)	0.197*** (0.064)	0.061 (0.076)		
Money (Channel)	0.144 (0.115)		0.058 (0.070)	0.028 (0.043)	0.021 (0.061)
Round (T)	-0.031*** (0.008)		-0.031*** (0.008)	-0.031*** (0.008)	-0.032*** (0.012)
Money × Round (M × T)	0.023** (0.010)		0.023** (0.010)	0.023** (0.010)	0.027** (0.013)
Controls					YES
Constant	0.177 (0.144)	0.262*** (0.044)	0.090 (0.088)	0.059 (0.102)	0.076 (0.134)
Observations R-squared	1,240 0.117	124 0.071	1,240 0.434	1,240 0.395	900 0.416

Table 2: Regression Results on Contribution - The dependent variable is the contribution rate, defined as the number of questions contributed divided by the total number of questions solved by a participant in each round, with values ranging from 0 to 1. All models use this variable except Model (2), which includes only first-round contributions. The binary variable *Effort* indicates the feasibility of contributing through the effort-giving channel, while *Money* denotes the feasibility of contributing through the money-giving channel. Thus, participants in the *Give Money-Effort* treatment are coded as 1 for both *Effort* and *Money*. Standard errors, reported in parentheses, are clustered at the group level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.5. Suggestive Evidence for Contribution Mechanism

My main results suggest that most participants may prefer contributing effort rather than money to the public goods pool. For all non-zero round contributions, Figure 5 decomposes the contributions in the *Give Money-Effort* treatment into those made entirely through effort, those made entirely through money and those that are a combination thereof. Among these non-zero contributions (n=280, out of 400 total participant-rounds), a large proportion (45.7%) were made exclusively through effort-giving, with an exceptionally high average contribution rate of 88.6%. Mixed contributions, involving both effort and money channels, accounted for 38.6% of observations, while only 15.7% were made through money-giving alone. Notably, among contributions where 50% or more came from effort-giving (i.e., less than 50% came from money-giving), the mean contribution rate was 80.9%. This is substantially higher than the mean contribution rate of 48.0% observed among those who contributed more than 50% through money-giving (n=209; n=71; $p < .001$). Nonetheless, the mean contribution rate for the money-giving subgroup remains higher than the highest average first-round contribution rates observed in both the *Give-Effort* (40%) and *Give-Money* (31%) treatments. These diverse contribution patterns and the consistently elevated contribution levels in the *Give Money-Effort* treatment lead to the following results:

Result 4: When effort- and money-giving channels are available, most participants prefer effort-giving over money-giving, and participants who prefer effort-giving contribute the most.

Result 5: There are heterogeneous preferences for contribution channels. Providing both effort-giving and money-giving enables participants to contribute through their preferred channel, encouraging cooperation.

In summary, individuals have distinct preferences between effort-giving and money-giving, with the majority preferring effort-giving, and these participants contribute more. By incorporating both money-giving and effort-giving, *Give Money-Effort* achieves the highest potential contribution levels, enabling participants to express their highest cooperative spirit and thereby fostering greater

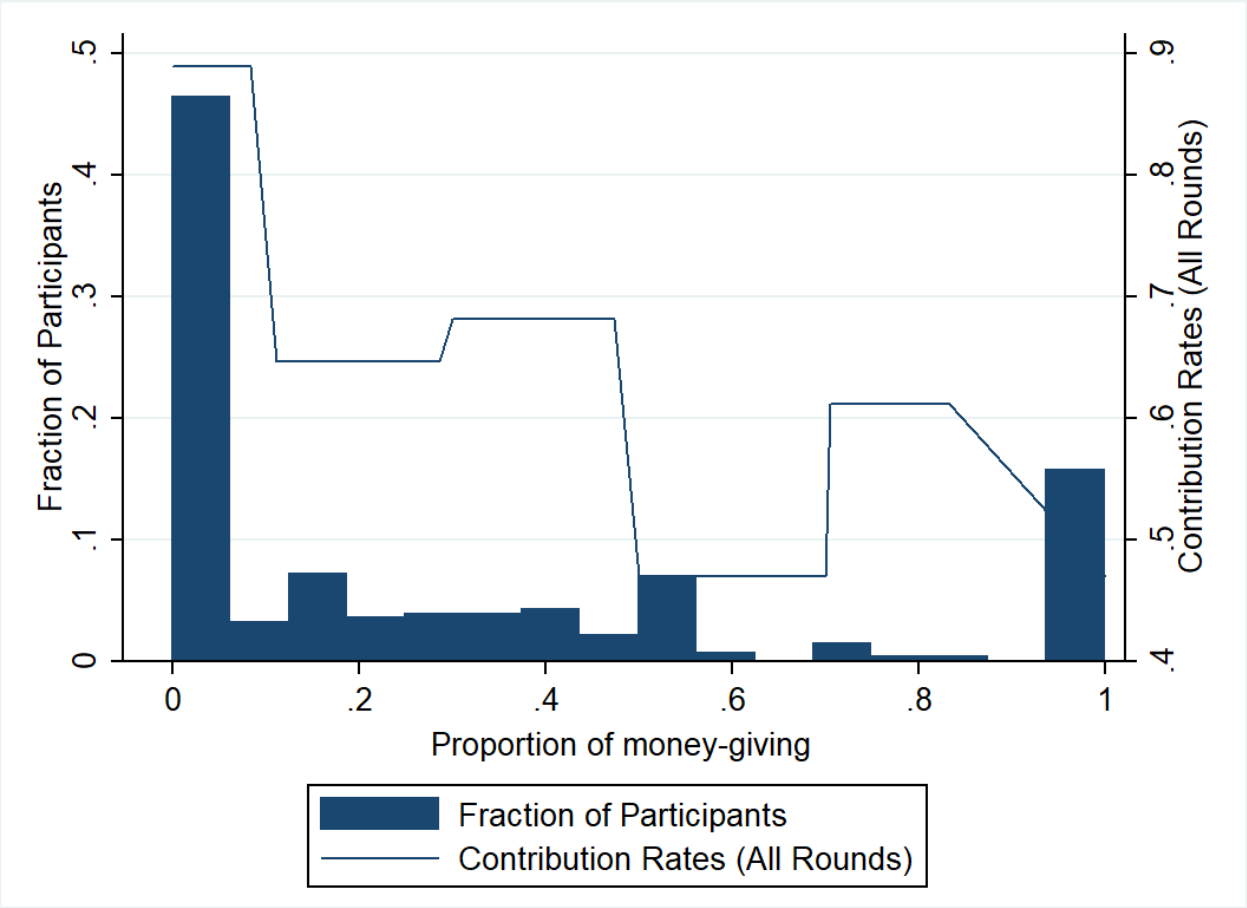

Figure 5: Contribution rates against contribution composition - The horizontal axis represents the proportion of contributions made through money-giving. A value of zero indicates that all contributions in that round were made exclusively through effort-giving, whereas a value of one signifies that contributions were made entirely through money-giving. The histogram, corresponding to the left vertical axis, displays the fraction of contributions according to the mixture of these contribution channels. The blue line, following the right vertical axis, illustrates the average contribution rate for each specific mixture of contribution channels.

group cooperation.

Another feature of this study is that I endogenized participants' income-generating ability by measuring how many addition questions they solved within 60 seconds. This feature allows me to explore several additional research questions: Do conditional cooperators (Fischbacher and Gächter [8]; Fischbacher et al. [9]) respond to the proportion or the dollar value of their group members' contributions in the previous round? Do our treatment effects operate on their proportional share or the dollar value of contributions? To avoid confusion, I have used the contribution rate — defined as the number of questions contributed divided by the total number of questions solved by a participant in each round — as my primary outcome variable. This choice represents a more

conservative approach. Testing the robustness of my results with alternative dependent variables helps address the questions posed above. Table 3 compares the 2SLS results using contribution rates versus contributions measured in questions. Models (1) and (2) show that ability measures and the number of questions solved per round do not affect contribution rates. Models (3) and (4) use the same regressors to explain contributions by question. Holding all else constant, on average, solving one additional question increases contributions to the group project by 0.281 to 0.344 questions. This finding is in line with the average contribution rates of 0.272 in the *Give-Money* treatment and 0.337 overall. Note that these regressions continue to use the effort-giving instrumented first-round "contribution rate." The results suggest that effort-giving robustly influences contributions, regardless of how contributions are defined, through its effect on the first-round contribution rate. Moreover, the fact that the first-round contribution rate predicts contributions even when controlling for the number of questions solved each round suggests that conditional cooperators in this experiment are responding to the proportional contributions of other group members in earlier rounds. Contribution results for each round are salient to all participants because they see, at the end of each round, how many questions each group member solved and how many they contributed. Here is my final result:

Result 6: People think in proportions rather than in absolute amounts when contributing to public goods, implying that perceptions of "fairness" in contributions are fundamentally proportional.

Variables	(1) Contribution (Rate)	(2) Contribution (Rate)	(3) Contribution (Questions-Solved)	(4) Contribution (Questions-Solved)
Contribution	0.985***	0.949***	13.420***	11.690***
(First-Round Rate)	(0.219)	(0.222)	(4.116)	(4.851)
Money	0.032	0.036	0.683	0.299
(Channel)	(0.043)	(0.043)	(0.717)	(0.936)
Round	-0.031***	-0.030***	-0.425***	-0.434***
(T)	(0.008)	(0.008)	(0.116)	(0.168)
Money × Round	0.023**	0.022**	0.275*	0.358*
(M × T)	(0.010)	(0.010)	(0.160)	(0.195)
Questions-Solved		-0.06	0.281***	0.344***
(Each Round)		(0.004)	(0.099)	(0.129)
Ability	-0.08			
	(0.05)			
Economic View				0.358
(Practice Round)				(0.346)
Constant	0.111	0.113	-3.703	-4.592
	(0.110)	(0.114)	(2.568)	(3.332)
Observations	1,240	1240	1,240	900
R-squared	0.365	0.379	0.386	0.441

Table 3: Regression Results on Alternative Outcomes - Standard errors, reported in parentheses, are clustered at the group level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5. Conclusion

In real-world settings, public goods contributions or provisions always occur within specific contexts, sometimes limited to a particular form. My results suggest that contribution levels may be sensitive to the form of contribution. This implies that if it is feasible to open additional ways or channels for people to contribute, doing so could enhance participation by allowing those with diverse preferences for the format of contribution to contribute to their maximum.

To the best of my knowledge, this is the first paper in the experimental public goods literature to demonstrate a change in cooperative behavior by altering the "format" of the experiment. Currently, no behavioral game theory model for public goods games can fully account for such differences. One could argue that the *Give-Money* and *Give-Effort* treatments are nearly identical, differing only in whether participants click a button before completing a task or use a dropdown menu after the task. I contend that this treatment difference captures the abstract and fundamental distinction between the two forms of contribution, enabling me to test the pure difference between contributing via effort versus money.

Conservatively, these findings can be seen as identifying conditions that can be applied in public goods experiments to increase participants' first-round contributions — potentially leading to full contributions — without fundamentally altering the game's structure. More broadly, my results suggest a context-based cooperation model, highlighting that the format of voluntary public goods provision plays a crucial role. Policymakers should recognize that both contribution levels and their dynamics may be inherently influenced by the form of the contribution itself.

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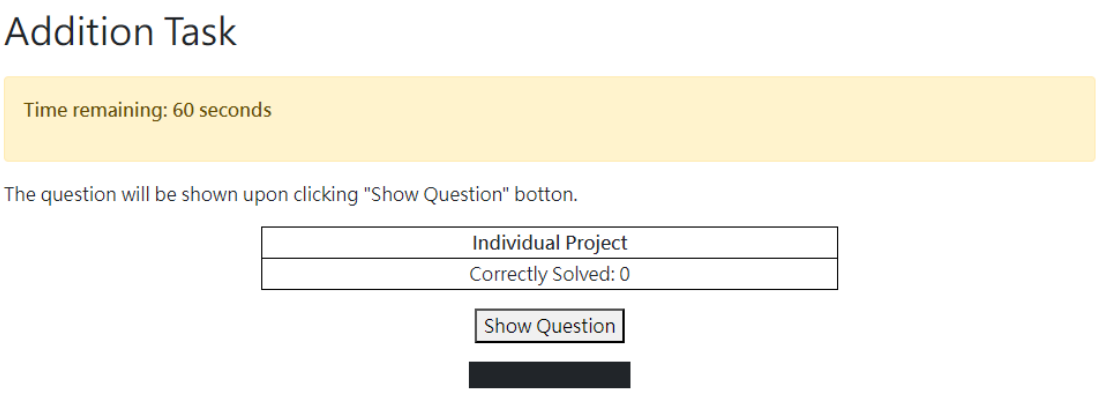
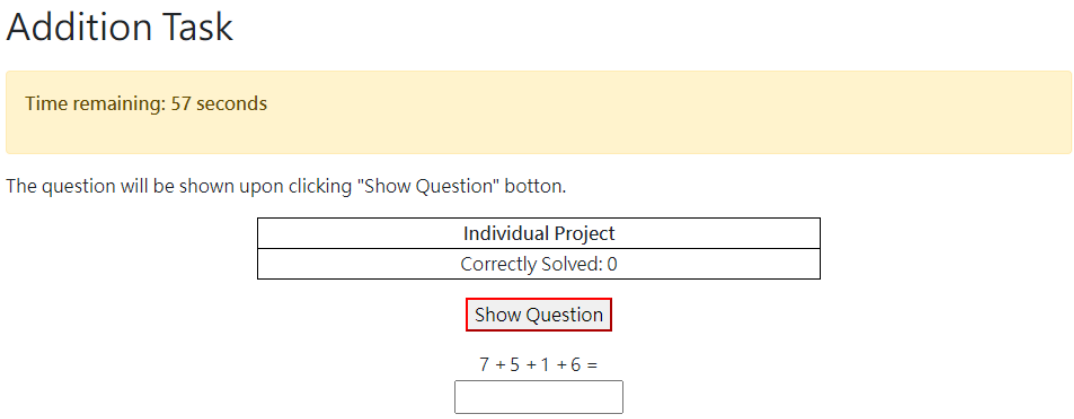
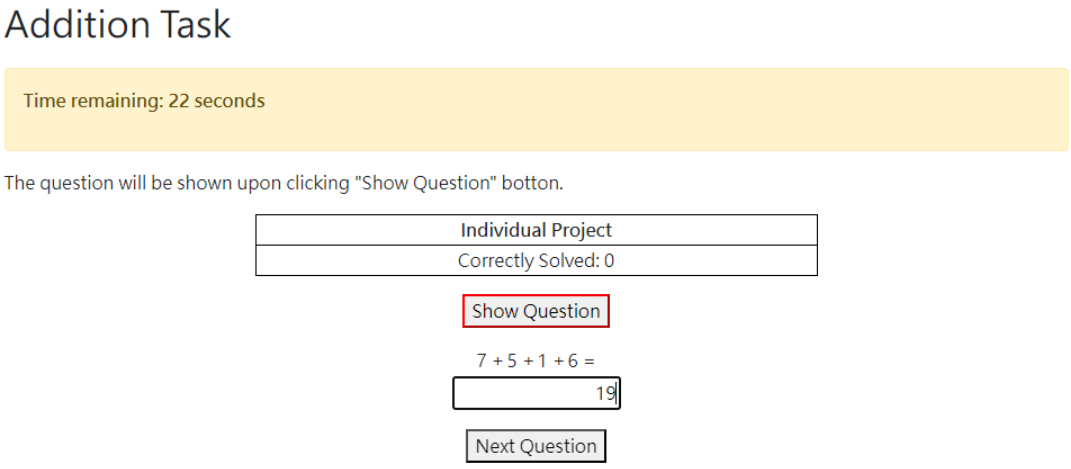
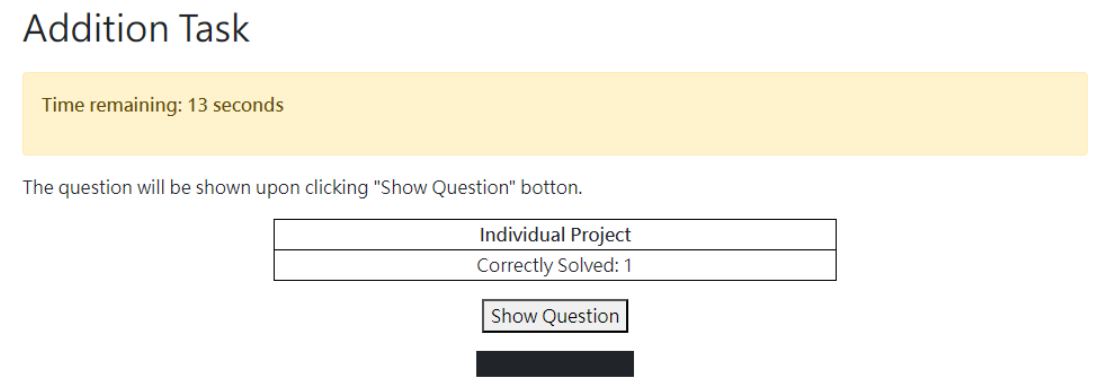
Appendix A. Supplementary Figures









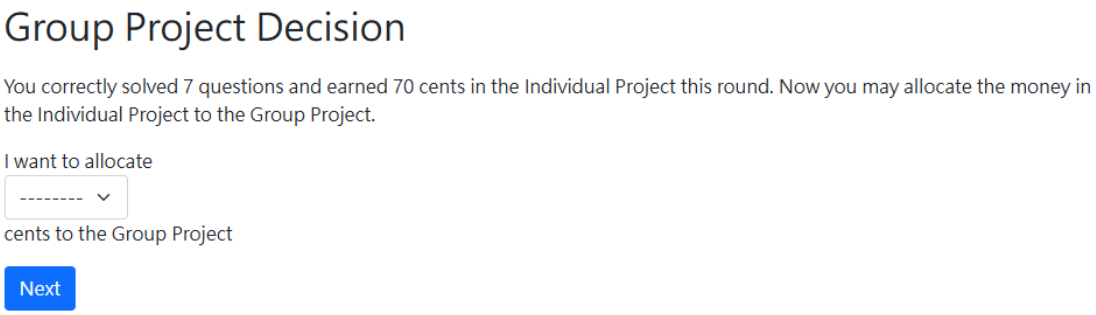
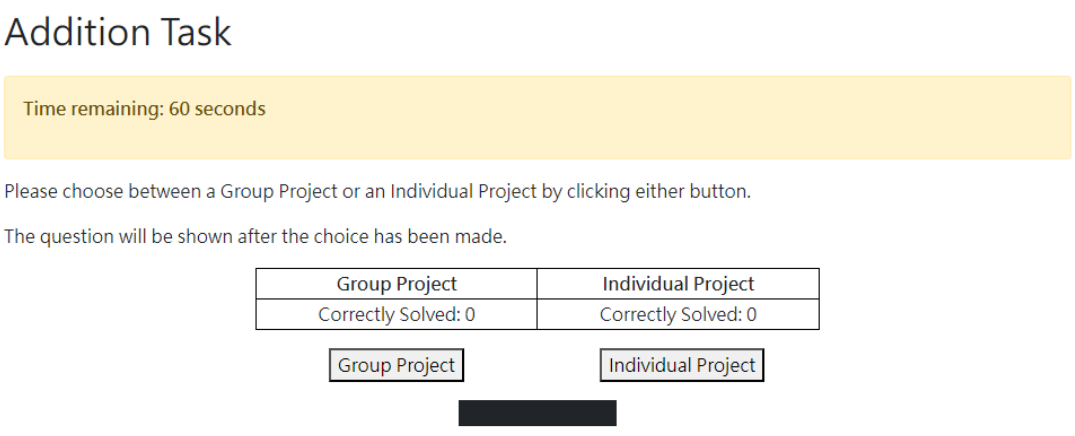


Figure A.1: Button-clicking features of the *Give-Money*



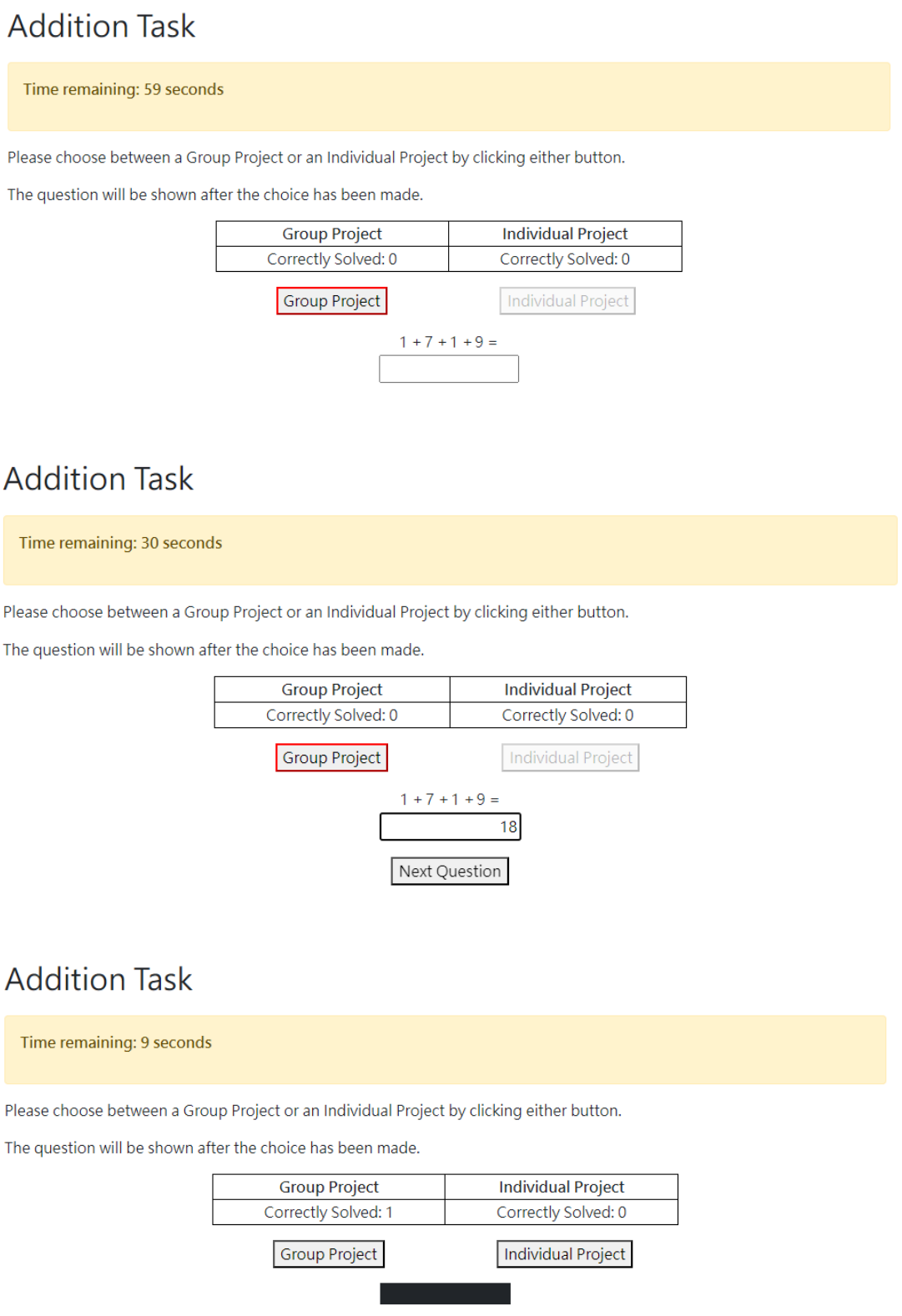
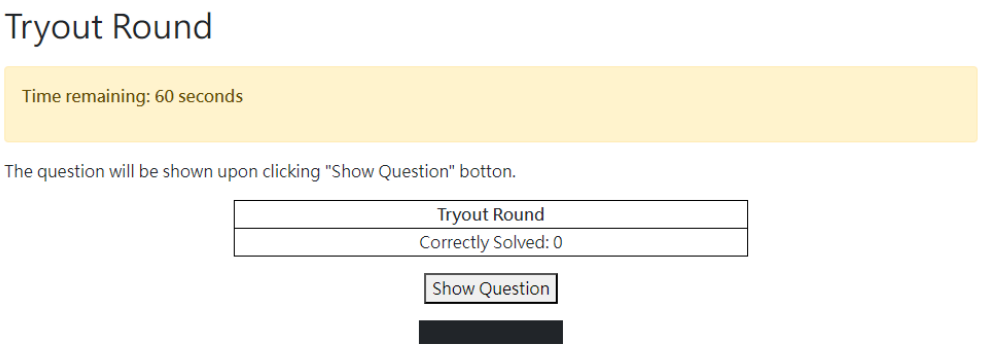
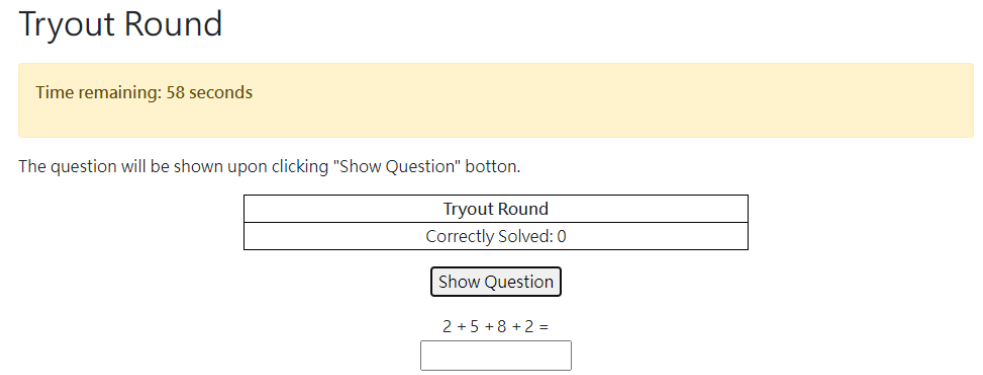
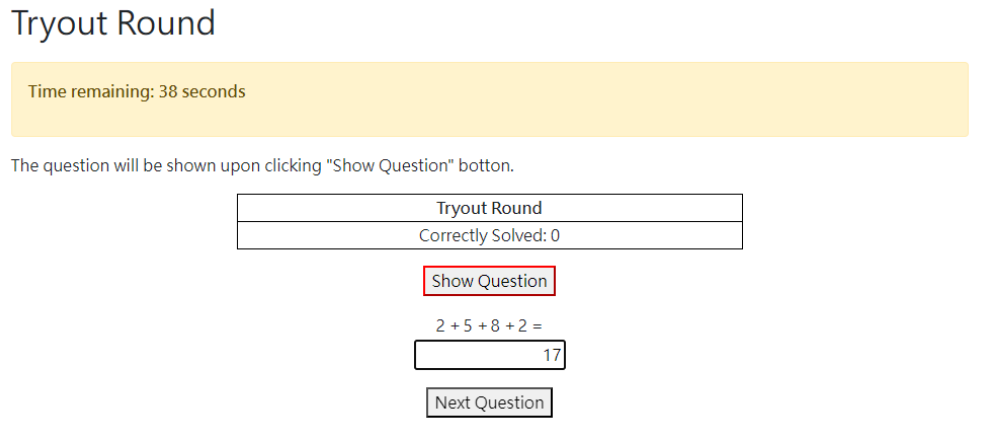


Figure A.2: Button-clicking features of the *Give-Effort*


Tryout Round
Time remaining: 60 seconds
The question will be shown upon clicking "Show Question" botton.
Tryout Round
Correctly Solved: 0
Show Question


Tryout Round
Time remaining: 58 seconds
The question will be shown upon clicking "Show Question" botton.
Tryout Round
Correctly Solved: 0
Show Question
2 + 5 + 8 + 2 =


Tryout Round
Time remaining: 38 seconds
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Tryout Round
Correctly Solved: 0
Show Question
2 + 5 + 8 + 2 =
17
Next Question

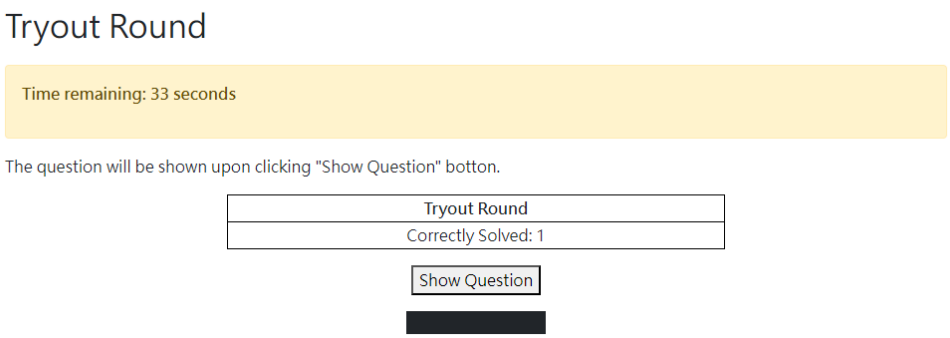

Figure A.3: Practice round