CROWDING OUT IN PUBLIC GOODS WITH A PROVISION POINT TECHNOLOGY

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I. Introduction

SOCIETY HAS COME TO RELY INCREASINGLY on the provision of public goods by government. However, the following quote from Richard Cornuelle reveals that this was not always the case: "Americans once proudly solved most of our common problems outside of government, through a rich array of institutions, neither commercial nor governmental, which I am suggesting we call the independent sector" (Cornuelle 1993). As consumption of government provided public goods increases, governments face greater challenges to finance public goods through increased tax revenues and debts. Furthermore, Thomas Sowell argues that implementation of solutions to social problems by government changes the nature of decision making from reciprocal interactions among people to unilateral or hierarchical directives chosen by a subset of the population and applied to the whole population by force (Sowell 1980). Sowell's argument suggests that more government services could lead to less individual freedom and less cooperation, a reciprocal interaction replaced by government intervention. Finally, some have questioned the efficiency of providing numerous goods and services through a large government bureaucracy. This paper adds to our understanding of voluntary provision as an alternative to government

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provision of public goods by using controlled experiments to examine the effect of government provision on voluntary contributions.

Previous research argues that a centralized government provider may provide public goods more efficiently when there is a large externality affecting people who are separated from each other spatially attached to the good (Oates 1972). However, in many cases the comparative advantage in provision of a public good lies with smaller agencies that benefit from increased local knowledge while avoiding diseconomies of scale in provision (Crook and Sverrisson 2001). Efficiency gains from decentralizing the provision of public goods and services may be attributed to an improved responsiveness of local governments to "tailoring levels of public goods to the preferences of smaller, more homogeneous groups," (Wallis and Oates 1988) while accommodating differences in the tastes and levels of public goods and services (Tiebout 1956; Oates 1972; Wallis and Oates 1988). Cornuelle argued that the independent sector played a much larger role when the government played a smaller role in the provision of public goods within the United States. He also stressed that the public sector and independent sector are in competition for the provision of public goods (Cornuelle 1993).[1]

Contrary to the observations of Cornuelle and others, the prevailing Neoclassical economic theory of the voluntary provision of public goods predicts individuals will free-ride on the contributions of others to maximize their earnings, resulting in provision failure. While there is evidence of free-riding to support the Neoclassical theory, there is also evidence of altruism and cooperation through individuals volunteering and making charitable donations to non-profit, civic, and religious organizations. Evidence in the field of successful voluntary provision of public goods is found in studies of developing economies that lack a strong central government provider of public goods and services. Examples include successful risk sharing, managing of common pool resources, and provision of public goods in the absence of a government backstop or government intervention (Ostrom 1990; Townsend 1994; Kinnan and Townsend 2012). Kinnan and Townsend's studies of Thai villages find that individual villagers may be insured against negative shocks by other members of the same village or neighboring villages, through informal and implicit arrangements rather than a government backstop or other explicit insurance contracts. Ostrom's research shows how informal institutions arise in many situations to

[1] The first edition of *Reclaiming the American Dream* was published in 1965, so this phenomenon is not new, and has become increasingly relevant over time.

effectively and efficiently manage common pool resources such as grazing lands, watersheds, fisheries, and others.

The aforementioned research shows that both government intervention and voluntary action are viable solutions to many public good and common resource problems, and are thus unlikely to be independent alternatives. When the government provides public goods, financed by taxes and debt, incentives to contribute and free-ride are affected in ways that may crowd out voluntary provision. There are at least two previously researched channels through which government provision could crowd out voluntary provision: income effects and free-riding on other taxpayers. This study identifies and explores how moral hazard is a novel third channel of crowding out. Each of the three channels is described below.

1.1 Income effects

One possibility is that government provision could crowd out voluntary provision because taxes reduce disposable incomes. Previous research has found evidence of crowding out via income effects on donors (Andreoni 1993; Chan et al. 2002) and fundraisers (Andreoni and Payne 2003; Andreoni and Payne 2011). Government grants to private charities may also crowd out fundraising efforts by reducing incentives for a charity to undertake costly fundraising efforts. Andreoni and Payne (2011) examined crowding out among donors and fundraisers jointly and found significant crowding out (75% reduction in funds), with most of it (70-100%) explained by fundraising crowd-out rather than donations crowd-out (0-30%).

1.2 Free-riding on other taxpayers

Another possibility for the crowding out of voluntary provision occurs if the group receiving the benefits of a public good does not pay its full cost. This situation gives group members an incentive to free-ride by consuming goods and services provided by the tax payments of others. One example of this kind of *inter-group* free-riding is the national flood insurance program (NFIP), which provides flood insurance to individuals at rates below those offered by private insurers. A recent study suggests that the NFIP reduces the costs to homeowners for building in ecologically sensitive flood plains because their insurance costs are widely distributed across all taxpayers (Holladay and Schwartz 2010). Moreover, the program benefits are found to fall primarily on wealthy counties and vacation home owners in coastal states. Another way to illustrate this issue is given by Roberts' example of a hypothetical restaurant in which the tab "is split not at each table but across the 100 diners at all the tables" (Roberts 1995). In this restaurant, diners are able to free-ride on the contributions of other customers by ordering a more expensive meal than they would have in a restaurant where each individual paid her own tab. While this example may at first appear to illustrate *intra-group* free riding in which all the diners become members of a single group, it is actually *inter-group* free riding because each diner is paying a fraction of the other diners' menu items, from which they receive no benefits. From the perspective of public goods provision, the diner is analogous to a group that chooses its own level of provision based on the expectation that part of the cost will be shifted onto other groups.

1.3 Moral hazard

Finally, crowding out via moral hazard may occur when the guarantee of a government backup makes *intra-group* free-riding in voluntary provision less risky. This differs from the *free-riding on other taxpayers* channel mentioned above because the group bears the full tax bill of the government backup. Here, the potential providers of a public good may reduce their voluntary contributions because the consequences of failure are less severe when the public good will be provided anyway. This may create a negative feedback loop in which the presence of a backup provider reduces voluntary contributions, which increases the likelihood of backups. For example, consider a group of homeowners evaluating whether or not to build a community playground. It is not difficult to imagine how each homeowner's willingness to undertake this endeavor could be affected by a government's plan to potentially build a municipal playground a few miles away. Although the municipal playground may be more costly to visit because of its distance from the homeowners, the idea that it might be built in the future could reduce the likelihood that each homeowner would contribute toward the community playground in the present. Numerous other examples involving local cooperation could be easily constructed to illustrate this channel of crowding out. The experiments conducted in this study are the first tests of this third channel, which we call moral hazard crowding out of the voluntary provision of public goods.

The experiments in this study used a provision point mechanism (PPM) to ask for voluntary contributions to a public good instead of the commonly-used voluntary contributions mechanism (VCM). Under a VCM setup, any amount contributed increases the value of the public good, whereas a PPM setup requires a minimum threshold contribution in order for the public good to be produced at all. Although the PPM is more complex theoretically than the VCM, it provided a focal point for subjects to coordinate successful provision. Specifically, the focal point made it clear to subjects when and under what circumstances backup provision would occur. Varying treatments incorporated a backup provider in the event of a failure to achieve voluntary provision. Backup provision was described as being achieved through either government provision or through costly trade with a distant partner. The description of backup provision changed across treatments to allow for a test of framing effects stemming from subject bias toward government provision. The Baseline treatment had no backup if total contributions did not meet the provision point.

Results indicate the presence of moral hazard crowd-out of voluntary provision when the trade and government backup treatments are pooled for comparison against the baseline. However, non-pooled backup treatment regressions reveal two weak framing effects. First, statistically significant evidence of moral hazard crowd-out is observed in the government framing treatment but not in the trade framing treatment (possibly due to lower sample size). Second, subject contributions increase over time in the government framing treatment but not in the trade framing treatment. This suggests that moral hazard crowd out may be sensitive to repeated play as subjects learn to cooperate, and are perhaps more motivated to cooperate when the penalty is framed as a tax.

II. Related Experiments on Public Goods

In addition to the abovementioned field research, there is also laboratory evidence of cooperation in public goods games. Findings from public goods game experiments are important, as subjects' decisions in the game have predicted their charitable giving and volunteer activities in the field (de Oliveira, Eckel and Croson 2012). Ledyard's 1994 survey of public goods experiments shows that many treatment parameters such as group size, marginal per capita return, and communication interact with each other in complex ways to affect contribution behavior. This complexity highlights the need for new experimental designs to enhance understanding of these processes (Ledyard 1994). Chaudhuri's later survey looks at more recent public goods experiments that explore conditional cooperation and the effects of punishment on cooperation (Chaudhuri 2011).

At this time, there appear to be no public goods experiments that have looked directly at how the prevalence of government provision affects voluntary provision. Such an experiment must contain a point at which government provision substitutes insufficient voluntary provision. This can be set up as a natural extension to a public good with a provision point technology. A traditional provision point public goods game requires that a minimum threshold of tokens is contributed in order for the public good to be produced. These kinds of PPM public goods games are sometimes called 'assurance contract' games, 'threshold' public goods games, or 'discrete' public goods games (Isaac, Schmidtz and Walker 1989; Bagnoli and McKee 1991; Marks and Croson 1998). In the latter case, the term "discrete" refers to the level of the public good, typically all or nothing, while subjects make continuous contribution decisions.[2] In the PPM game, the number of Nash equilibria will vary based on the threshold level and other design features. Multiple Nash equilibria lie at contribution combinations that just meet the minimum threshold, because subjects are assumed to have an incentive to cheap-ride by contributing as little as they can without losing voluntary provision based on their expectation of others' contributions (Isaac, Schmidtz and Walker 1989). This feature of PPM games may be contrasted with approaches taken by other researchers testing for crowding out from income effects. For example, Andreoni and Payne (2011) and Chan et al. (2002) use a protocol in which a single interior Nash equilibrium is selected to allow for the identification of crowding out. With a provision point technology, crowding out is identified by the levels of provision failures and group contributions across treatments.

Three central design choices made in PPM games involve threshold levels, refunds, and handling of excess contributions. With respect to the threshold level, Croson and Marks (2000) develop the notion of a step-return, equal to the individual benefit from meeting the threshold exactly divided by a subject's equal contribution share needed to meet the threshold. They find that greater step-returns increase contributions, just as a greater marginal per capita return (MPCR) increases contributions (Croson and Marks 2000). Another design choice is whether or not to refund tokens if the threshold is not met. Under a zero- or partial-refund protocol, there is an additional Nash equilibrium to contribute zero tokens if a single player cannot alone contribute enough to meet the threshold. Under a full-refund protocol there are additional Nash equilibria consisting of all combinations where a single player cannot alone contribute enough to meet the threshold. Studies of PPM games with a full-refund design have found that contributions converge toward the threshold instead of decaying to zero, which is a common feature

[2] The "discrete" games should not to be confused with experiments in which subjects make discrete or binary contribution decisions. This review is focused on experiments in which subjects made continuous contribution decisions, a design feature used in this study.

of public goods games without refunds (Isaac, Schmidtz and Walker 1989; Marks and Croson 1998). Lastly, experimenters must decide how to handle contributions that exceed the threshold. Isaac, Schmidtz, and Walker (1989) use a "utilization" protocol in which excess contributions are utilized to further improve the benefits of the public good. Marks and Croson (1998) compare the "utilization" protocol with "no rebate" and "proportional rebate" protocols (all rebate protocols included a full refund) and find that more Nash equilibria are observed at the threshold outcomes when there is no rebate as opposed to a proportional rebate or utilization rebate.

Comparing rebate protocols, they find that total group contributions are highest under the utilization protocol, although subjects meet the threshold with equal contributions less often under a utilization rather than a proportional rebate. Hence, it is possible that the utilization rebate protocol chosen in this study could make voluntary provision more likely than a proportional rebate.

III. Experiment Design

Our experiments were conducted with undergraduates from High Point University and Georgia State University.[3] A single-blind payoff protocol was used which prevented the subjects (but not the experimenters) from being able to personally identify any subject's decisions and payments. After signing in, subjects entered a computer lab and began reading instructions (complete instructions are included in the appendix).

An across-subjects treatment design was used to avoid any order effects, so each subject participated in only one of the following treatments in a single session. Procedures common to all treatments are as follows:

1. The experiments were conducted using the z-Tree computer software (Fischbacher 2007). Each round consisted of a decision-making stage and a review stage.

[3] Students from High Point University were recruited in the classroom for this experiment. None of these students had any experience participating in economic experiments. Undergraduate students at Georgia State University were recruited by e-mail using the Experimental Economics Center (E*x*CEN) recruiter software. They were originally recruited in the classroom, but not for this experiment in particular. Most of the participants had participated in one or more economic experiments prior to participation. No undergraduates from either university were excluded for any reason.

2. Subjects were placed randomly and anonymously into groups of four, and remained with the same group for the entire session in which they participated.

3. Subjects made one decision in each of two practice and ten paid rounds.

4. Subjects' decision earnings were accumulated each round and expressed as tokens, with the exchange rate of 1 token = $0.10.

5. Each session lasted roughly one hour.

In each round, subjects played a PPM public goods game in which they decided how to allocate their 10 token endowments between themselves and the public good. The game was explained to the subjects using the following story:

> *Background: In this experiment you will play one of four members in Village A. Each member owns and works a farm. Each farm yields enough food for the whole year. Unfortunately, the food not eaten during the harvest season spoils between harvest seasons.*
>
> *Silo Proposal: An engineer proposes to build a silo to keep Village A's food from spoiling. The engineer asks the villagers for a minimum contribution of 32 tokens to cover the costs of building the silo. If total contributions exceed 32, the engineer promises to build an even better silo which will improve food quality.*

The last line of the Silo Proposal explains the "utilization rebate" protocol to the subjects. When excess contributions actually improve the group's outcome, it is more likely some subjects will contribute more than 8 tokens. However, greater group contributions create more opportunities for cheap-riding. For example, if three of the four group members contribute 10, then the cheap-rider can contribute as little as 2 to maximize his earnings.

An MPCR = 0.75 was used in all treatments for tokens contributed to the group fund. This means that the total group contribution will be tripled before it is divided equally between the four group members. The MPCR is conditional on total contributions of 32 or greater, a case known as "Outcome 1" to subjects. Treatments vary based on what happens if the total is less than 32, "Outcome 2." The equation below summarizes how a subject's payoff (Pi) varies in different treatments:

$$P_i = \begin{Bmatrix} 10 - C_i + 0.75\sum_{i=1}^{4} C_i & if \sum_{i=1}^{4} C_i \geq 32 \\ 10 + 8b & if \sum_{i=1}^{4} C_i < 32 \end{Bmatrix}$$

Parameter *b* is 0 in the Baseline treatment and 1 in the treatments which contain a backup plan.[4] C_i represents the subject's tokens contributed and $\sum_{i=1}^{4} C_i$ represents the total contributions of the group.

The backup plan treatments have the same payoff structure, but vary in the way in which the backup is described if "Outcome 2" occurs. The description of the backup presented to subjects in each case is included below.

> *Trade Framing: If contributions are less than 32, the engineer will give back all tokens contributed and the silo will not be built. As a result, villagers will have to sell their surplus to Village B (which has an opposite harvest season to Village A) during the harvest season and buy Village B's surplus during the planting season. Each villager will have to spend 16 tokens traveling to buy and sell with Village B. Village A's total travel costs are twice the minimum cost of building the silo, but you will still receive the individual benefit of 24 tokens because you will have food between harvest seasons from trade.*

> *Government Framing: If contributions are less than 32, the engineer will give back all tokens contributed and the silo will not be built. However, the Chief of Village A will recognize the food savings and build the silo anyways. Each villager will have to pay a flat fee of 16 tokens to build the silo and to cover the Chief's costs of traveling to collect the flat fees. The sum of the flat fees is twice the original minimum cost of building the silo, but you will still receive the individual benefit of 24 tokens because you will have food between harvest seasons from the silo.*

When "Outcome 2" occurs in the backup treatments, the minimum level of the public good is still provided, but it is twice as expensive. Specifically, it takes 64 tokens in travel costs in the Trade treatment (or in fees collected in the Government treatment) to provide the same level of a public good that would be achieved through a voluntary group contribution of 32 tokens. As a result, a subject's earnings in Outcome 2 are 18 tokens ($10+ 32*0.75 – 64/4 = 18$) when there is a backup, and 10 tokens when there is no backup. If Outcome 2 occurs, then 100% of tokens contributed are given back in all treatments. This design feature eliminates any risk from contributing, aside from the potential disutility of knowing others are cheap-riding. The only remaining risky behavior is cheap-riding itself, which increases the probability of a less desirable "Outcome 2." By comparing cheap-riding under a full refund design with and without backup provision, we were able to examine effects on successful voluntary provision and test for moral hazard crowding out.

[4] Although not shown in the equation, treatments also vary in framing design.

The utilization rebate, high MPCR (.75), and high threshold for success (80% of the group endowment) increase the incentives to contribute in all treatments, and allow for a stronger test for moral hazard crowd-out by increasing the separation between payoff outcomes in the event of provision failure across treatments. This seems to be a reasonable starting point for a test of moral hazard crowding out. However, future research designs could reveal whether or not lowering the salience of the failure outcome—by reducing either the MPCR or the PPM threshold—would have a significant effect on subject behavior.

For clear identification of any moral hazard crowd-out effects, the design controls for the potential influence of other channels of crowding out. Crowd-out from income effects on the donors is not present because subjects are only taxed if voluntary provision fails. There is also no crowd out from income effects on fundraisers because the fundraising goal of 32 tokens is held constant. Inter-group free riding is controlled for because group participants bear the full cost of the government backup. This leaves moral hazard crowd out as the remaining potential channel that may be identified by comparing the baseline to backup treatments and finding:

1. Lower mean group contributions in the backup treatments.
2. An increase in voluntary provision failures in the backup treatments.

IV. Results

4.1 Analysis of voluntary contributions to the public good

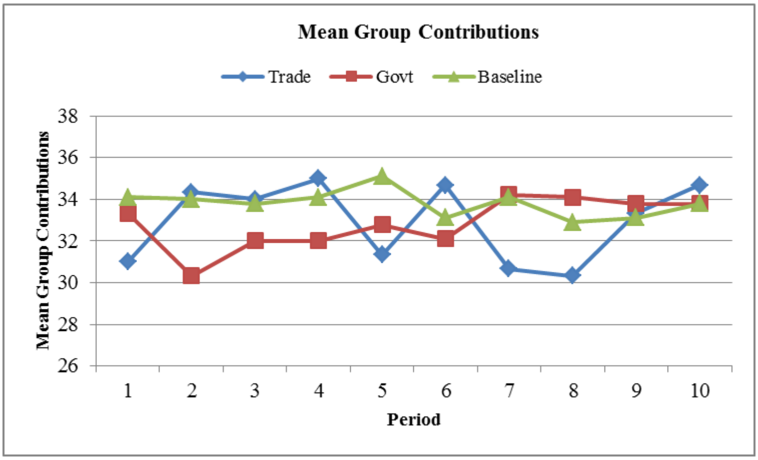
The mean total group contributions and failure proportions across treatments are reported in Table 1. The failure proportion in the Baseline treatment sessions is lowest at 15.6% versus 28.9% in the Government framing sessions and 33.3% in the Trade framing sessions.

Table 1. Summary of group contribution and voluntary failure proportion+

Treatment	N^+	MPCR	Backup *(b)*	Mean contribution	Failure proportion
Baseline	90	0.75	0	33.81 (0.41)	0.156 (0.038)
Trade	30	0.75	1	32.93 (0.55)	0.333 (0.088)
Government	90	0.75	1	32.84 (0.41)	0.289 (0.048)

+ Analytic standard errors are shown in parentheses ( ).

Figure 1 shows the mean total group contributions for each treatment in each of the 10 paid periods of the experiment. Looking at the figure, it appears as though mean contributions are lowest in the early periods of the Government treatment.



Regression results reported in Table 2 reveal a separation in mean contributions, a trend in contributions over time, and weak evidence of a framing effect. These findings are discussed below.

Finding 1: There is moral crowding out of voluntary provision when a backup is present.

Probit results reported in regression 1 of Table 2 reveal that there is a substantial (.81) and statistically significant (α=.05) increase in the likelihood of voluntary provision failure in the backup treatments. Tobit results reported in regression 3 show that mean group contributions are also lower in the backup treatments (-1.98), although this result is only weakly significant (α=.1) when the backup treatments are pooled. Regressions 2 and 4 separate the backup treatments and show that these effects are stronger and more significant in the Government treatment. For example, the coefficient for an increase in the likelihood of failure is 1.08 (α=.01) in the Government treatment, while it is -.06 and statistically insignificant for the Trade treatment. Similarly, the coefficient for a reduction in mean contributions in the Government treatment is -2.75 (α=.01), while it is .18 and statistically insignificant in the Trade treatment. This potential framing effect is discussed below as finding 2.

Finding 2: There is weak evidence of a framing effect.

The difference in statistical significance between the Government and Trade treatment comparisons and the baseline discussed above is somewhat surprising. However, there is a relatively small sample size for the Trade treatment (n=30) compared to the Government treatment (n=90).

Table 2. Probit and Tobit random-effects panel regressions on failures and group contributions+

	All data included (189 observations, 21 groups)				Only backup treatments (108 observations, 12 groups)	
Dependent Variable	Failure		Group contributions		Failure	Group contributions
Regression #	(1)	(2)	(3)	(4)	(5)	(6)
Model	Probit	Probit	Tobit	Tobit	Probit	Tobit
Failure lag	0.153 (0.231)	0.144 (0.233)	1.22 (0.816)	1.017 (0.814)	-0.063 (0.280)	1.18 (1.029)
Group contribution lag	---	---	0.398*** (0.126)	0.354*** (0.126)	---	0.378*** (0.129)
Backup (=1 if backup present, 0 otherwise)	0.810** (0.365)	---	-1.979* (0.855)	---		
Backup*Period	-0.077 (0.051)	---	0.215* (0.117)	---		
Government (=1 if Government treatment, 0 otherwise)	---	1.082*** (0.408)	---	-2.749** (0.975)	0.826* (0.452)	-2.240* (1.173)
Government*Period	---	-0.120* (0.060)	---	0.330* (0.135)	-0.124** (0.060)	0.326** (0.149)
Trade (=1 if Trade treatment, 0 otherwise)	---	-0.059 (0.712)	---	0.181 (1.570)		
Trade*Period	---	0.054 (0.104)	---	-0.11 (0.231)		

+ Marginal effects are shown. Significance of one sided p-values are indicated as * at the 10% level, ** at the 5% level, and *** at the 1% level. Analytic standard errors are shown in parentheses ( ).

Regressions 5 and 6 test for framing effects using only backup treatment data to see if framing affects failure likelihood and mean contributions. Although the results are statistically insignificant at the 95% confidence level, there is a weakly significant effect (α=.1) for both dependent variables.

Finding 3: There is an increase in contributions over time in the Government treatment.

The regression term *Government*Period* multiplies the period with an indicator variable equal to 1 in the Government treatment sessions. A coefficient of -.12 on this term in regressions 2 and 5 reveals that there is a reduction in the likelihood of failure as subjects make repeated contribution decisions in the Government treatment (α=.1 when all data are considered and α=.05 when observations are restricted to the backup treatments). Similarly, the coefficient of .33 on this term reported in regressions 4 and 6 reveals there is an increase in mean contributions as subjects make repeated contribution decisions in the Government treatment (α=.1 when all data are considered and α=.05 when observations are restricted to the backup treatments). As mentioned earlier, this trend is to be expected during repeated play of PPM games with full refund, as subject contributions converge toward the threshold needed to provide the good. Somewhat surprisingly, this trend is statistically insignificant in the Trade treatment sessions. Finally, the variable *Failure lag* (equal to 1 if provision failed in the previous period, 0 otherwise) is included in the regressions to see if subjects responded to a failure in the previous period. The lack of statistical significance of this variable in all specifications indicates that for these experiments, prior failure is not a major determinant of subject contributions in the next period.

V. Conclusion

In an era of increasing public spending and tight public budgets, understanding the full impact of government provision on voluntary provision is of critical importance. This study explores the moral hazard effects present when government provision is available as a backup plan to failed voluntary provision. These effects are a type of crowding out (moral hazard crowding out) of voluntary provision that have not previously been studied in the experimental economics literature. Furthermore, moral hazard crowding out adds to rather than replaces other known crowding out channels, such as income effects from taxation and free-riding on taxpayers who do not directly benefit from the good provided. The results presented above reveal the presence of moral hazard crowding out of voluntary contributions when backup treatments are compared to the baseline. A backup option appears to lower the risk of free-riding (also known as cheap-riding for PPM games) which results in fewer voluntary contributions and more failures. These effects are strongest in the earlier rounds of the experiment and when the backup provision is described as government provision. Although contributions to public goods increased over rounds under the government framing treatment, this could be because the repeated play design feature made it easy for groups to rally in order to "beat the tax." Actual decisions to voluntarily provide public goods outside of the lab may have fewer chances for repetition.

In the classroom, the public goods problem is often explained as a "market failure," with government provision as the default backup option. The results shown here indicate that the prevalence of government provision actually increases the likelihood of this "market failure." Further investigation of this form of crowding out under different institutions and parameters is warranted and would improve our understanding of how this channel affects outcomes in other domains. Perhaps the classroom description of voluntary provision failure could incorporate these new findings and emphasize a discussion of "market and government failure." If so, future policymakers and voters will be better informed of the interaction between voluntary and government provision of public goods.

Appendix (all supplemental materials are available on request from the authors)

Trade Framing Treatment Instructions

Welcome

Thank you for participating in this experiment. We ask that you remain seated and silent for the remainder of the experiment. If you have a question, please raise your hand so the experimenter can answer your question in private.

Background

In this experiment you will play one of four members in Village A. Each member owns and works a farm. Each farm yields enough food for the whole year. Unfortunately the food not eaten during the harvest season spoils between harvest seasons.

Silo Proposal

An engineer proposes to build a silo to keep Village A's food from spoiling. The engineer asks the villagers for a minimum contribution of 32 tokens to cover the costs of building the silo. If total contributions exceed 32, the engineer promises to build an even better silo which will improve food quality.

Your Decision

You have earned 10 tokens from your last season's harvest. You can contribute none, some, or all of your tokens in single-token amounts towards building the silo.

Privacy

Your identity and your decisions will remain private from all members of your group. Your name will never appear in a study next to your decisions. Your decisions will be known to the experimenter, solely so he can know how much to pay you at the end of the experiment.

Outcome 1: Total Contributions are Greater than or Equal to 32

If contributions are greater than or equal to 32, then the silo is built. Any tokens you do not contribute are yours to keep and you receive an individual benefit from the silo because you will have food between harvest seasons. Your payoffs will be determined by the following equation:

$$Payoff = 10 - tokens\ contributed + individual\ benefit\ from\ the\ silo$$
$$individual\ benefit\ from\ the\ silo = 0.75 * total\ group\ contributions$$

Outcome 2: Total Contributions are Less than 32

If contributions are less than 32, the engineer will give back all tokens contributed and the silo will not be built. As a result, villagers will have to sell their surplus to Village B (which has an opposite harvest season to Village A) during the harvest season and buy Village B's surplus during the planting season. Each villager will have to spend 16 tokens traveling to buy and sell with Village B. Village A's total travel costs are twice as high as the minimum cost of building the silo, but you will still receive the individual benefit of 24 tokens because you will have food between harvest seasons from trade. Your payoffs will be determined by the following equation:

$$Payoff = 10 - travel\ costs + individual\ benefit\ from\ trade$$

$$Payoff = 10 - 16 + 24 = 18$$

Your payoff in Outcome 2 will be automatic, for you will not literally have to trade with Village B.

Payoff Table

The table below displays your Payoff, in tokens, based on your contributions and the average contributions of the other three villagers in your group.

Others' average Contri-butions	Your contributions										
	0	1	2	3	4	5	6	7	8	9	10
0	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
1	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
2	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
3	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
4	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
5	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
6	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
7	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
8	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	26.00	25.75	25.50
9	18.00	18.00	18.00	18.00	18.00	29.00	28.75	28.50	28.25	28.00	27.75
10	18.00	18.00	32.00	31.75	31.50	31.25	31.00	30.75	30.50	30.25	30.00

10 Rounds of Decision Making

Village A has to build a new silo for every round of harvest and non-harvest seasons. You will be a member of Village A for 10 seasons (10 rounds).

Earnings and Payment Procedure

You will be paid the sum of your earnings for the 10 rounds. Tokens are worth $0.10 each, and will be converted into cash for payment.

Government Framing Treatment Instructions

Welcome

Thank you for participating in this experiment. We ask that you remain seated and silent for the remainder of the experiment. If you have a question, please raise your hand so the experimenter can answer your question in private.

Background

In this experiment you will play one of four members in Village A. Each member owns and works a farm. Each farm yields enough food for the whole year. Unfortunately the food not eaten during the harvest season spoils between harvest seasons.

Silo Proposal

An engineer proposes to build a silo to keep Village A's food from spoiling. The engineer asks the villagers for a minimum contribution of 32 tokens to cover the costs of building the silo. If total contributions exceed 32, the engineer promises to build an even better silo which will improve food quality.

Your Decision

You have earned 10 tokens from your last season's harvest. You can contribute none, some, or all of your tokens in single-token amounts towards building the silo.

Privacy

Your identity and your decisions will remain private from all members of your group. Your name will never appear in a study next to your decisions. Your decisions will be known to the experimenter, solely so he can know how much to pay you at the end of the experiment.

Outcome 1: Total Contributions are Greater than or Equal to 32

If contributions are greater than or equal to 32, then the silo is built. Any tokens you do not contribute are yours to keep and you receive an individual benefit from the silo because you will have food between harvest seasons. Your payoffs will be determined by the following equation:

$$Payoff = 10 - tokens\ contributed + individual\ benefit\ from\ the\ silo$$
$$individual\ benefit\ from\ the\ silo = 0.75 * total\ group\ contributions$$

Outcome 2: Total Contributions are Less than 32

If contributions are less than 32, the engineer will give back all tokens contributed and the silo will not be built. However, the Chief of Village A will recognize the food savings and build the silo anyways. Each villager will have to pay a flat fee of 16 tokens to build the silo and to cover the Chief's costs of traveling to collect the flat fees. The sum of the flat fees is twice the original minimum cost of building the silo, but you will still receive the individual benefit of 24 tokens because you will have food between harvest seasons from the silo. Your payoffs will be determined by the following equation:

$$Payoff = 10 - flat\ fee + individual\ benefit\ from\ the\ silo$$
$$Payoff = 10 - 16 + 24 = 18$$

Your payoff in Outcome 2 will be automatic, for you will not literally have to pay flat fees to the Chief.

Payoff Table

The table below displays your Payoff, in tokens, based on your contributions and the average contributions of the other three villagers in your group.

Others' average contri-butions	Your contributions										
	0	1	2	3	4	5	6	7	8	9	10
0	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
1	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
2	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
3	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
4	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
5	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
6	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
7	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
8	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	26.00	25.75	25.50
9	18.00	18.00	18.00	18.00	18.00	29.00	28.75	28.50	28.25	28.00	27.75
10	18.00	18.00	32.00	31.75	31.50	31.25	31.00	30.75	30.50	30.25	30.00

10 Rounds of Decision Making

Village A has to build a new silo for every round of harvest and non-harvest seasons. You will be a member of Village A for 10 seasons (10 rounds).

Earnings and Payment Procedure

You will be paid the sum of your earnings for the 10 rounds. Tokens are worth $0.10 each, and will be converted into cash for payment.

Baseline Treatment Instructions

Welcome

Thank you for participating in this experiment. We ask that you remain seated and silent for the remainder of the experiment. If you have a question, please raise your hand so the experimenter can answer your question in private.

Background

In this experiment you will play one of four members in Village A. Each member owns and works a farm. Each farm yields enough food for the whole year. Unfortunately the food not eaten during the harvest season spoils between harvest seasons.

Silo Proposal

An engineer proposes to build a silo to keep Village A's food from spoiling. The engineer asks the villagers for a minimum contribution of 32 tokens to cover the costs of building the silo. If total contributions exceed 32, the engineer promises to build an even better silo which will improve food quality.

Your Decision

You have earned 10 tokens from your last season's harvest. You can contribute none, some, or all of your tokens in single-token amounts towards building the silo.

Privacy

Your identity and your decisions will remain private from all members of your group. Your name will never appear in a study next to your decisions. Your decisions will be known to the experimenter, solely so he can know how much to pay you at the end of the experiment.

Outcome 1: Total Contributions are Greater than or Equal to 32

If contributions are greater than or equal to 32, then the silo is built. Any tokens you do not contribute are yours to keep and you receive an individual benefit from the silo because you will have food between harvest seasons. Your payoffs will be determined by the following equation:

$$Payoff = 10 - tokens\ contributed + individual\ benefit\ from\ the\ silo$$
$$individual\ benefit\ from\ the\ silo = 0.75 * total\ group\ contributions$$

Outcome 2: Total Contributions are Less than 32

If contributions are less than 32, the engineer will give back all tokens contributed and the silo will not be built. The villagers survive, but with meager food portions. Your payoffs will be determined by the following equation:

$$Payoff = 10$$

Payoff Table

The table below displays your Payoff, in tokens, based on your contributions and the average contributions of the other three villagers in your group.

Others' average contri-butions	Your contributions										
	0	1	2	3	4	5	6	7	8	9	10
0	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
1	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
2	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
3	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
4	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
5	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
6	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
7	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
8	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	26.00	25.75	25.50
9	10.00	10.00	10.00	10.00	10.00	29.00	28.75	28.50	28.25	28.00	27.75
10	10.00	10.00	32.00	31.75	31.50	31.25	31.00	30.75	30.50	30.25	30.00

Rounds of Decision Making

Village A has to build a new silo for every round of harvest and non-harvest seasons. You will be a member of Village A for 10 seasons (10 rounds).

Earnings and Payment Procedure

You will be paid the sum of your earnings for the 10 rounds. Tokens are worth $0.10 each, and will be converted into cash for payment.

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