I. INTRODUCTION

Decades of experiments with the classic voluntary public goods provision problem have dealt significantly with comparative static analysis over changes in both the environment and the institution. However, several recent papers have moved to an evolutionary mode by exploring the endogenous creation of public goods groups and group size (see Ahn, Isaac, and Salmon [2007]). Even in this recent research, the technology of the public goods provision process has remained a black box chosen by the experimenter. The question of where this technology comes from has not typically been part of the public goods research agenda.

It is our intent in two ongoing streams of research to explore questions regarding endogenous public goods technology. In the first series of experiments, we introduce the concept of what we call the “public goods enterprise.” This is a public goods environment in which the parameters of the public goods production process are chosen by an active manager. Our motivation for this paper stems from the optimal operation of a non-profit organization, and issues of command and control in a world without shareholders.

In our second series of experiments, potential contributors to a public good are, as in other papers, presented with a tax as an institutional option. Our research goes beyond this in the following ways. First, the tax option is inefficient in providing the public good relative to voluntary contributions. Second, we make the tax level endogenous using a median voter mechanism. Third, we choose a specific sequence of exposure to the institutional treatments to explore whether there are situations in which voluntary contributions can “reverse crowd out” the use of the tax mechanism, particularly when in the context of a shift in preferences towards providing the public good on the part of a minority of the community.

II. TRANSPARENCY AND CONTROL IN A NON-PROFIT ENTERPRISE

A. Background

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1 We thank Austin Boyle and Glenn Dutcher for programming the experiments reported here. All sessions were run using Z-Tree (Fischbacher [2007]).
Historically, not-for-profit organizations were viewed likewise as non-profit organizations; that is, their unique status derived not only from the absence of shareholders as the residual claimants on profits but equally from a non-traditional objective function, such as output maximization subject to a zero-profit constraint (Newhouse [1970]; Lakdawalla and Philipson [2006]). Both Weisbrod [1977] and Hansman (1978) likewise characterize the defining feature of the non-profit by the identification of its output with the collective or public good. New models of non-profits are emerging, such as the retained earnings maximizing non-profit organization [Norton (in progress)]. Such firms produce as output goods that are largely private in character. The non-profit status is used to channel retained earnings into a charitable organization or activity. For example, a coffee shop retains earnings from a menu indistinguishable from Starbucks; the retained earnings fund a check sent directly to BloodWater Missions to dig clean water wells in Africa. The objective function of such a firm (maximizing retained earnings) looks more like that of the traditional for-profit firm. However, the non-profit status of even the retained-earnings maximizing non-profit raises issues concerning command and control.

Our motivation for this research stems from the optimal operation of a non-profit organization. If a non-profit organization exists with a mission for charity and other well being it should want to know how to generate the greatest amount of wealth for its charitable subject. The hypothesis of Norton’s research is that in the absence of shareholders it is customers who exercise control functions over the non-profit enterprise, and that crucial tools for customers to exercise that command and control are transparency and openness. These hypotheses admit of experimental testing.

In Norton’s characterization of the retained-earnings maximizing non-profit, the firm operates as essentially a profit maximizer, (although nothing requires the market to be one of perfect competition). In addition, the firm may earn some quasi-rents from cost reductions from lower cost inputs. The consumers, by in large, make purchasing decisions on the basis of price and product characteristics as compared with rival companies. However, if enough customers have even the smallest preference for shopping at a firm whose retained earnings will be donated to a charitable activity, then Norton argues that these customers can become the agents of control over the non-profit managers. In Norton’s model, this requires two types of transparency:

1) Historical Information: In the historical information type we see the customer as an agent of accountability. The manager produces monetary or operational information in the form of financial reports to the customers and the customers make a decision to participate in part based on that information.

2) Outside Option: The other concept of transparency evaluates full disclosure by the manager of some outside option (presumably an attractive outside option) in the job market. The manager’s preference for employment in the non-profit firm is an indication that her values are aligned with the customers. In this case the customers are signal receivers that will decide their level of involvement.

After first formulating this concept of outside option signaling, we found that Espinola-Arrendondo and Munoz-Garcia [2007] had developed a game-theoretic model of an almost identical phenomenon. However, it appears that they posit a follower’s utility function incorporating a “concern” about whether a leader has surpassed some type of outside option; the source of the concern is not specified, but it does not appear to be inconsistent with the signaling motivation we report here.
B. Experimental Design and Hypotheses

Our experimental design builds upon the standard linear economic model of public goods provision dating to Isaac, Walker, and Thomas [1984]. Our “public goods enterprise” consists of five individuals: four “customers” and one “manager.”

From the point of view of each of the customers, the public goods enterprise looks like a standard linear public goods experiment. Each customer begins each period with 50 tokens. His task is to allocate those tokens between an individual account (returning one experimental dollar per token) and investing them in a group enterprise, whose return is the same to all customers regardless of many tokens each customer invested. Specifically, each customer earns from the group enterprise:

\[ G^* \text{ (sum of all investments in the group enterprise)}. \]

Note that because the return from the private investment is one, “G” is the same as the familiar marginal per capita return (MPCR), but for brevity we will continue with the shorter notation.

The novel features of our design begin at this point. First, G is unknown to the customers at the time they make their investment decisions. What the customers do know is that G is chosen by the manager and that the two possible choices for G are .3 and .75 (again, notice that these correspond to the low and high MPCRs from Isaac, Walker, and Thomas). This requires that we examine in more detail the role of the manager.

The manager also begins each period with 50 tokens, worth one experimental dollar each. In addition, the manager also consumes the return from the public goods enterprise at the same level as provided to the any one of the customers. This is true even though the manager has no option of adding tokens to the group enterprise collective pool. What the manager is permitted to do is to increase the value of G for one period from .3 (the default value) to .75 for a one period cost of 30 tokens.

Again, customers must make their decisions before knowing whether the manager has set G equal to .3 or .75. The customers cannot communicate with one another, nor can any customer communicate with the manager (or vice versa).

In our baseline experiments, we reveal another difference from previous public goods research. The only information provided to participants about the public enterprise is their earnings. They are not told how those earnings are determined by the components of customer investment decisions and the manager’s choice of G. Thus, a low level of earnings could come from low investment by other customers, or by a manger choosing G equal to .3, or by some combination thereof.

Clearly, a standard argument supports a suboptimal outcome as a Nash Equilibrium. Zero investment in the enterprise is a stage game dominant strategy regardless of whether G equals .3 or .75. If the customers follow this dominant strategy, then the best response of the manager is to choose G equal to .3. This is despite the fact that the group optimum is for the manager to choose G equal to .75 and for each customer to invest all tokens in the enterprise.

Over two decades of similar public goods experiments, it has become obvious that subjects do not play the linear public goods game as perfect game theorists. Contributions seldom are equal to the pure free riding prediction. However, even if subjects depart from formal game theoretic models and we look at empirical regularities from previous public
goods experiments, a pessimistic outlook may be supported. Most public goods experiments begin with some positive level of contribution by at least some agents, with a characteristic decline prior to a finite end period. Part of this standard result is there is less provision of the public good with a low MPCR. A pessimistic, suboptimal scenario for this new environment would have customers expecting the manager to set \( G = .3 \), responding with relatively low investment.

The problem for the more efficient outcome is the coordination problem in the absence of any explicit communication, given that customers must make their decisions without knowing the choice of the manager. This is where our two concepts of transparency come into play.

Transparency in our experiments is our primary experimental treatment, and it consists of two distinct channels of information. First there is historical information on what the manager has actually chosen. This allows at least the potential for a manager to engage in reputation-building. We have made a design choice that when historical information is available, it is not available instantaneously. Specifically, every three periods, the experimenter reveals the manager’s choices of \( G \) for the previous three periods (akin to a quarterly report).

Secondly, we enact an experimental treatment in which the manager is offered an outside option. The manager may shut down the enterprise for a period, and receive her 50 existing tokens plus an additional “salary” of 25 tokens. If the manager shuts down the enterprise for the period, the customers each earn only their 50 tokens automatically deposited in their individual exchange.

The motivation for the outside option is as follows. Non-profit organizations will typically receive donations in the course of their operations. This often includes managers whose skills, education, and credentials would justify a higher salary in the for-profit sector. Through information channels such as the internet, customers of a non-profit can observe which organizations’ managers are, in fact, forgoing such an “outside option.” The manager may be able to use the fact that she has foregone an outside option to signal that her values line up with those of the customers of the enterprise. Specifically, this would involve our managers foregoing the outside option to signal that they intend to choose \( G \) equal to .75.

Interestingly, by modeling the choice of the manager as a best response to the expected behavior of the customers, choosing \( G = .3 \) is never optimal once we add the outside option. If the manager expects low levels of contributions (fewer than 75 tokens), the best response is to take the outside option. For higher levels, the optimal choice is to set \( G = .75 \). (However, it must be noted that around the level of 75 tokens, the profits of setting \( G = .3 \) are not far below those of the other two options).

In principle, this provides for a 2x2 experimental design based upon historical data (Yes or No) and availability of an outside option (Yes or No). For practical and budgetary reasons, we begin this research with sessions employing both historical data and the outside option. Each session lasted 24 periods. Subjects were recruited through the standard XS/FS protocol at Florida State University, and were paid their known exchange rate calculation of their experimental earnings on top of a $10.00 show-up fee.

C. Experimental Results
We have not yet had an opportunity to evaluate the individual subject data, so we concentrate on aggregate results. Figures 1 – 4 display total tokens invested by the customers in the group enterprise in the first four sessions. In addition, these figures denote those periods in which the manager took the outside option (“X”) or chose the low MPCR (“L”). Thus, any un-notated periods involve the manager choosing the high MPCR. We report the following preliminary results:

**Result:** Managers usually choose MPCR = .75. Out of 96 periods, the managers chose the high MPCR in 84 periods, the low MPCR in 10 periods, and the outside option in two periods.

**Result:** The traditional result of decay across periods is less prevalent than might be expected in a standard VCM environment. Table 1 presents the results of simple regressions of tokens invested in the group enterprise regressed upon a constant and the period. In two of the sessions there is no significant decay across period. In Session 3, there is decay from a high initial starting level (83 percent), with the result that in the final (24th) period contributions remained at 42.5 percent. Only Session 4 would look entirely familiar as a traditional VCM, with contributions beginning at 39 percent, and following a significant decay pattern ending at 21 percent in the final period.

<table>
<thead>
<tr>
<th>SESSION (Adj R²)</th>
<th>CONSTANT (t-statistics)</th>
<th>PERIOD (t-statistics)</th>
<th>FINAL VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (-0.03)</td>
<td>151.32 (17.37)</td>
<td>-0.38 (-0.62)</td>
<td>142/200</td>
</tr>
<tr>
<td>2 (-0.04)</td>
<td>151.41 (26.38)</td>
<td>0.16 (0.38)</td>
<td>150/200</td>
</tr>
<tr>
<td>3 (0.52)</td>
<td>166.58 (15.95)</td>
<td>-3.75 (-5.13)</td>
<td>85/200</td>
</tr>
<tr>
<td>4 (0.12)</td>
<td>77.55 (9.15)</td>
<td>-1.22 (-1.97)</td>
<td>42/200</td>
</tr>
</tbody>
</table>

**TABLE 1**

An additional feature of the regression results above is that they explain very little. Obviously, something else is going on with these data, and the logical question is whether Norton’s concepts of command and control can serve as useful explanations. In advance of any detailed examination of the individual data, we decided to ask whether the actions of the manager provided any explanatory power. In doing so, we chose three aspects of the manager’s possible behavior to investigate.

First, basic to Norton’s hypothesis is the importance of the outside option. Does exercising the outside option, as was done by two of the managers, provide a sustained effect (beyond the subsequent one or two periods)? By exercising the outside option, a manager may be increasing the signaling credibility of subsequent decisions to choose the high MPCR.

On the other hand, as we mentioned, choosing the low MPCR is never a simple best response to expectations of the customers, yet our managers did so a number of times. Was this use of the low MPCR a clever strategy, or was it ultimately a mistake?

We posit that there are two avenues (in addition to the best response argument) by which choosing the low MPCR could be judged to be a mistake for the manager. Using the low MPCR immediately lowers customer profits, even in periods in which there is no
information. How do subjects respond to this negative hit on profits? It is possible that they respond by lowering their contributions in subsequent periods. Secondly, it would seem to us that a prudent manager would want to develop a reputation of choosing the high MPCR. When a manager chooses the low MPCR, it is, within three periods, revealed to the customers. A manager that repeatedly chooses the low MPCR may develop a reputation of being unreliable.

In order to test these conjectures, we expanded the regression reported above by adding the following three variables:

O/O = a dummy variable that is 1 if the manager has ever used the outside option. If the coefficient on this variable is positive, it indicates that using the outside option increase the credibility of the manager when she chooses to open the enterprise.

LOWMPCR = a dummy variable that is 1 if the manager chose the .3 MPCR in the immediately previous period. If the coefficient on the variable is positive, it indicates that the manager successfully increases contributions by choosing the low MPCR; if it is negative, it suggests that the manager makes a mistake by choosing the low MPCR.

INCONSIS = a consecutively updated variable measuring the proportion of periods in which the customers have seen (through the information channel) that the manager has chosen MPCR equal to .3. (We arbitrarily set the values for periods 1-3 equal to the null case of .5) Our expectation is that this coefficient would be negative. High levels of this variable mean that the quarterly reports showed to the customers that the manager was unreliable.

Before reporting the regression results, it should be noted the unique status of Session 1. This regression cannot be run on Session 1 because the Session 1 manager always chose the high MPCR and never used the outside option. But, as the previous regression results showed, this session is more or less an almost perfect case of a high production equilibrium, and thus serves as an interesting reference to the other three sessions. The results for the remaining three sessions are reported in Table 2.

<table>
<thead>
<tr>
<th>SESSION (Adj $R^2$)</th>
<th>CONSTANT (t-statistics)</th>
<th>PERIOD (t-statistics)</th>
<th>O/O (t-statistics)</th>
<th>LOWMPCR (t-statistics)</th>
<th>INCONSIS (t-statistics)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (0.654)</td>
<td>119.85 (8.32)</td>
<td>-0.69 (-2.09)</td>
<td>42.66 (6.18)</td>
<td>-7.19 (-1.90)</td>
<td>14.54 (0.55)</td>
</tr>
<tr>
<td>3 (0.592)</td>
<td>175.48 (14.67)</td>
<td>-3.90 (-5.26)</td>
<td>NA</td>
<td>-37.36 (-2.18)</td>
<td>-38.75 (-1.17)</td>
</tr>
<tr>
<td>4 (0.185)</td>
<td>21.49 (0.43)</td>
<td>-0.78 (-0.61)</td>
<td>30.96 (1.36)</td>
<td>-28.91 (-1.91)</td>
<td>135.26 (1.25)</td>
</tr>
</tbody>
</table>

**TABLE 2**

What do these results tell us? The adjusted $R^2$’s increase in every case. The coefficient on the outside option is positive and of impressive magnitudes in both cases,

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3 An F test on the additional power of the new model is significant at the 5% level for Session 2, significant at the 10% level for Session 3, and insignificant for Session 4.
but significant in only one case. Thus there is some, but not unequivocal, support for the conjecture that using the outside option once promotes a regime change in which the customers give more credibility to the manager’s decision to open the enterprise as being a signal of intending high future performance.

The coefficient on the use of the low MPCR is negative and statistically significant in all three cases. Clearly, in these three sessions the immediate hit to profits caused by the manager’s choice of the low MPCR reduced the cooperativeness of the customers. This result says, in effect, managers should either show up and give full effort, or go away.

Finally, the inconsistency measure proved relatively uninformative. It was never significant, and was of differing signs. To get a feeling of one of the counterintuitive results, consider Session 4. That manager continued to choose the high MPCR throughout the final half of the experiment, but contributions decayed.

The results from Session 3 demonstrate the importance of coordinated signaling in this environment. Twice in that session the following happened. At a period with a quarterly report (period 9 and then period 18), the quarterly report revealed that the manager had chosen G = .75 in all three previous periods. In both cases, however, all three previous periods (that is 7, 8 and 9 and 16, 17, 18) had exhibited a dramatic decline in customer contributions. The quarterly report demonstrated to the customers that this decline was due to their actions, not due to “bad” choices by the manager. In both cases, the customers responded in the following period (10 and 19) with much higher levels of contributions. Unfortunately, in both cases the manager chose to “signal” or “punish” or “respond” to the previous decline in contributions with a reduced level of MPCR. Thus, the customers self-corrected their decline in contributions but inadvertently received quite negative feedback on that adjustment.

These are preliminary results. In addition to conducting more of these sessions, we need to tease apart three aspects of the role of the manager which are currently confounded: 1) the outside option, 2) the information, and 3) the simple existence of the manager herself. This constitutes our plan for our immediate future experiments.4

III. GOVERNMENT INEFFICIENCY AND REVERSE CROWDING OUT

A. Background

If government provision of public goods reduces the level of private provision of the same good, a process of “crowding out” has taken place. The theoretical channel by which crowding out may occur has been developed for many years (Bergstrom, Blume, and Varian [1986]). There seems little doubt that, as an empirical matter, crowding out exists at some level, but there is widely different empirical evidence as to its scale. Field studies include Payne [1998] Hungerman [2005] and Hungerman [2007]. Laboratory economics experiments (beginning with Andreoni [1993] and including Chan, et al. [1998] and Eckel, et al. [2004]) also have detected intermediate levels of crowding out.

Andreoni’s paper, in particular, was motivated by his theory of “warm glow” altruism in which individuals receive utility from the actual act of generosity. The

4 Another possibility that we are considering is a treatment in which the manager is chosen by the best performance on a pre-test on the experimental rules.
intermediate levels of crowding out found in Anreoni’s experiments are consistent with a warm-glow model, although that need not be the only explanation.

The empirical evidence on crowding out has taken on an important new dimension with a paper by Hungerman and Gruber study [forthcoming] of New Deal social service expenditures. Private, religious contributions for social services remained steady through the worst early years of the Great Depression, but began to tumble in the period of 1933-1934, eventually settling in at about 30 percent less than their earlier level. Hungerman and Gruber estimate that, even though the rate of crowding out was not large, the massive increase in federal social service expenditures can account for nearly all of the reduction in private religious transfers. If accurate, the Hungerman and Gruber results indicate that crowding out occurred with significant social consequences. Specifically, the role of private, religious activity in addressing social problems was profoundly changed by the New Deal.

However, we are a society that is in many ways different than the New Deal, in both political and religious dimensions. The political dimensions need not be accounted here, but it is important but less obvious how American religious attitudes have changed. The period of the Second Great Awakening, drawing to an end at the time of the New Deal, was a period of stark contrasts in social attitudes towards the provision of public goods. On the one hand, the religious revivalism sparked an impressive growth of faith-based charitable activities. For just one example, consider the example of homes for unwed mothers. The Home for Redeeming Love just outside Oklahoma City was one of several in the new state of Oklahoma. On their website, the successor agencies described the women of the Free Methodist Church who not only founded the home and cared for the women, but also farmed the land for produce to sell to support their activities.\(^5\)

On the other hand, the most visible political arm of the Second Great Awakening was the “Social Gospel” which combined religious fervor with a preference towards governmental activism. The Social Gospel was a key societal factor behind the populist, progressive, and socialist political movements that paved the way for the New Deal. (The Social Gospel was also foundational to the founding of the American Economic Association.) Walter Rauschenbusch, a leader in the theology of the Social Gospel, wrote the following:

“In the last resort the only hope is in the moral forces which can be summoned to the rescue. If there are statesmen, prophets, and apostles who set truth and justice above selfish advancement; if their call finds a response in the great body of the people; if a new tide of religious faith and moral enthusiasm creates new standards of duty and a new capacity for self-sacrifice; if the strong learn to direct their love of power to the uplifting of the people and see the highest self-assertion in self-sacrifice-then the intrenchments of vested wrong will melt away; the stifled energy of the people will leap forward; the atrophied members of the social body will be filled with a fresh flow of blood; and a regenerate nation will look with the eyes of youth across the fields of the future.”\(^6\)

\(^5\) [http://www.deaconessokc.com/AboutUs/Ministries/Heritage](http://www.deaconessokc.com/AboutUs/Ministries/Heritage)
Although Rauschenbusch and other proponents of the Social Gospel had great influence on Progressive and Populist programs such as antitrust legislation and the income tax, it was only in the national economic emergency of the New Deal that the federal government became a primary provider of public goods of charity and compassion, the topic of the Gruber and Hungerman paper. But an important question therefore needs to be addressed: “Is the historical crowding out of religious provision of public goods reversible?” In other words, “Is reverse crowding out possible, and what would it take to change the tide?” The purpose of this research is to address at least an initial part of this question using the techniques of laboratory experiments. We report a series of experiments in which participants experience, first, a fully voluntary cycle of the provision of public goods, followed by a cycle with provision through mandatory taxation. In the final two cycles, we offer participants a choice of using either voluntary contributions or the tax scheme (or both). Our basic research question is the following: having experienced several periods of purely voluntary contributions and then been similarly acclimated to an exogenously imposed taxation scheme, is it possible that participants will choose to return to a voluntary contributions scheme—can reverse crowding out be observed in our simple laboratory environment?

B. Experimental Design and Hypotheses

As noted, Andreoni’s initial experimental design was constructed to focus on his investigation of warm glow and the possibility of incomplete crowding out. He used a relatively small group (three subjects) with a concurrent “payoff chart” technology incorporating an interior optimum and equilibrium. Indeed, the term “crowding out” in Andreoni’s sense is an exercise in comparing equilibrium levels of contribution. In fact, it requires that there be a non-cooperative equilibrium in which each individual has a positive contribution to the public good. Furthermore, in the standard environment, there is no difference in the productivity of private and government provision. Government provision is observationally equivalent to a required “minimum contribution” in the voluntary contributions mechanism (indeed this is how it was explained to the subjects). Many other researchers, for purposes of comparability, have used this same structure.

Because we are asking different questions, we begin down a new path. First, we want a larger group dynamic, so our experiments consist of seven persons. Secondly, we are very much interested in a world of extensive free riding in equilibrium, and thus we drop the interior payoff structure and return to the equally traditional linear public goods model.

Thirdly, we model government provision as being less efficient than private provision. Thus, in our experiments, provision through government taxation is made to be moderately inefficient (twenty percent of tax receipts are lost). This could represent actually physical and organizational inefficiency in the government provision of social services, or population preferences that value government provision less. Either story fits our design.

Fourthly, the role of government and the levels of taxation are exogenous in most of the existing literature, while we are interested in endogenous mechanism choice.7

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7 One partial exception is Sutter and Weck-Hannemann [2004] in which subjects are allowed to vote yes/no by majority vote on an exogenously suggested tax scheme.
Finally, we are interested in how endogenous institutions respond to changes in individual preferences. Presumably, religious institutions may be most likely to reverse crowd out government provision if individuals in the community/society become more receptive to personal action.

Putting all of these features together, our research question is different from the standard crowding-out paradigm. In the traditional literature, the non-governmental state yields an interior equilibrium of private provision. As governments enforce what amount to exogenously determined minimum contributions, total provision of the public good (from both government and private sources) can be benchmarked against the private equilibrium.

In our research, the voluntary contributions equilibrium is defined by complete free riding. The empirical reality, as repeatedly demonstrated in laboratory experiments, is that of positive, but non-optimal, disequilibrium levels of public goods provision. In such an environment, a standard research question has been to examine those mechanism features that can maximize the efficiency of the system, (a classic example being face to face non-binding communication [Isaac and Walker, 1988]). We look at a specific mechanism sequence: purely voluntary contributions (VCM), exogenously determined forced government provision (taxation) combined with VCM, and then endogenously determined taxation combined with VCM.8

To implement this, we begin by using an [A, B, C, D] experimental design as follows. For the first seven periods (Stage 1), seven subjects participate in a standard VCM design. Each subject has the task of investing 100 tokens in either an individual or a group exchange. Investment in the individual exchange returns a one token payment with certainty, while the group exchange operates as a VCM process with MPCR = .5.

In the second round of seven periods (Stage 2), we come the closest to matching the Andreoni design. We impose a tax of 30 tokens upon every participant to fund a minimum level of the public good. The tax efficiency of 80 percent means that 24 tokens are actually transferred to the group exchange for each person; six tokens disappear. Voluntary contributions are allowed beyond the minimum through the VCM process.

In the third treatment (Stage 3), the individuals are now allowed to choose the tax level through a voting mechanism, again with VCM operating on their residual tokens. This experiment could be run with several different voting mechanisms, but in this experiment subjects will cast votes using the median voter process. Each participant will submit a number from 0 – 100 (the per-period endowment of tokens) and the experimenter chooses the median tax.9

In our fourth treatment (Stage 4) we introduce our “agents of grace”. Two of the seven participants our randomly chosen in advance to have their MPCRs changed to 1.43 (accomplished by lowering their return on their individual exchange).10 The fact that a change in incentives is possible, but not the exact form nor the distribution, is publicly announced to the individuals.

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8 Another stream of research into crowding-out has been to look at individual decisions in dictator game experiments (see Eckel, et al. [2004]).
9 See Holcombe and Kenney [2007] for information on actual field implementations of this voting mechanism in Florida school finance elections.
10 In the parlance of some public goods research, this would be known as raising only the “inside” MPCR.
We note that our initial experiments contain only this sequencing because this sequencing is of specific interest in the historical evolution of government involvement in charitable activity. We will return later to the issue of controls to this sequencing.

The underlying contributions game by itself admits of the standard theoretical properties. In the stage game, full investment in the individual exchange is the dominant strategy, while the group income maximizing outcome is for each participant to invest all tokens in the group exchange. Nothing changes when an exogenous tax is enacted. However, with the median voter tax mechanism, there are a multiplicity of equilibria.

Consider that the choice of a subject can be represented as the pair \(<t_i, p_i(T)\>\), meaning that each subject chooses a vote for a tax, \(t_i\), and, conditional on the tax rate actually chosen, \(T\), a proportion, \(p_i\), of his untaxed funds to contribute to the group good. In the stage game, whatever tax is chosen, it will remain a dominant strategy in the subgame to set \(p_i\) equal to zero. The only remaining question is what vector of tax choices support an equilibrium? The following provide a partial characterization of the outcomes in Stage 3.\(^{11}\)

Let \(V\) be any vector \((<t_1, 0>, \ldots, <t_7, 0>)\) with the properties that a) Each person contributes no remaining tokens to the group exchange regardless of the value of \(T\), and b) that no one person could have altered the median vote. Then \(V\) is an equilibrium.

The following is one category of outcomes that are not equilibria: For any vector \(V = (<t_1, p_1(T)>, \ldots, <t_7, p_7(T)>\)) if \(V\) has the property that the \(t_i\)s are strongly distinct, then \(V\) is not an equilibrium.

The first statement has the following corollary. The set of equilibrium vectors so characterized includes both the full tax outcome through the vector \((<100, 0>, \ldots, <100, 0>)\) and the full free riding outcome through the vector \((<0,0>,\ldots,<0,0>)\). The former Pareto dominates the latter. The idea of finding the maximum tax seems very focal (even though the 20 percent inefficiency means that it is not the group optimum), and the resulting stability might mean that the group would do little exploring over other alternatives. We call this scenario “full government lock-in.”

The first statement also suggests the manner in which this mechanism could become “stuck” at intermediate levels of taxation, perhaps at our initial level of 30 tokens per individual.

The second (disequilibrium) statement is important because it suggests a way in which the full tax outcome could be achieved. If intermediate levels of taxation occur with distinct votes, then one person can change the level of the tax. By assumption \(T < 100\), and a single unit increase in the tax will make that pivotal person better off. This might provide for a ratcheting up of the initial, exogenously imposed tax.

What, then, is the basis of what we call “reverse crowd out?” In Stage 4, the two agents of grace will have a dominant strategy to contribute all their tokens to the group exchange. Logically, they, like everyone else, would prefer that whatever contributions are made be made through the VCM process because it is more efficient.

\(^{11}\) The Stage 4 outcomes need only be adjusted by the change in the dominant strategies in the stage game.
The most complete manifestation of reverse crowd out would occur if tax rates fell and total contributions to the group exchange increased. An outcome such as this, with low or zero tax rates and significant contributions to the group good, would clearly fail as an equilibrium in the usual sense, but previous laboratory experiments in public goods provision have shown that non-equilibrium outcomes are the rule, rather than the exception.

C. Initial Results

The following were the preliminary conclusions based solely upon the aggregate results from only four sessions.

Result: We observed no session exhibiting a lock-in of full taxation. Figures 5 – 8 display the total tokens invested in the group exchange, together with the tax component of the group exchange. In only one session did tax rates come close to 100 percent, and then only after the change to Stage 4. (As an aside, none of the groups stayed locked-in at the additional tax level).

Result: We observed only one session that could even partially be interpreted as reverse crowding out. In Session 2 (Figure 6) taxes dropped to zero in Stage 3 and remained there for the remainder of the experiment. Furthermore, total contributions increase during Stage 4. They settle in the neighborhood of 300 tokens, far below the social optimum but above the Stage 4 dominant strategy prediction of 200 tokens.

Result: Overall, the behavior in these experiments looks different than typically expected from a VCM process. In three of the four experiments there is a reversal of the usual tendency for a decay in contributions in the final periods (specifically, in Stage 4).

The problem with the previous result is that the data in Figures 5-8 include the contributions of the agents of grace. But we have adjusted the agents of grace incentives toward full contribution to the group good in Stage 4, so perhaps it is not surprising that there is no decay in contributions. A more focused question is: “What effect did the agents of grace have on the other five participants?” To address this question, we present in Figures 9-12 the contributions to the group exchange with the contributions of the agents of grace removed from all 24 periods. In particular, these figures post the actual data together with the estimates from a regression with the following functional form:

\[ Tokens = \beta_0 + \beta_1 PER + \beta_2 MVTAX + \beta_3 STG2 + \beta_4 STG3 + \beta_5 STG4 + \beta_6 STG2*PER + \beta_7 STG3*PER + \beta_8 STG4*PER \]

where
PER = Period
MVTAX = median voter tax chosen that period
STGX = a fixed effect for Stage X (Stage 1 excluded)
STGX*PER = an interactive dummy for Stage X and Period.\(^\text{12}\)

\(^\text{12}\) The full regression table is included in the Appendix.
The F statistic displayed in each of Figures 9-12 tests our complete model against a restricted model with only the constant and the period (a standard VCM formulation). Notice that even with the agents of grace excluded, the slope of contributions flattens in Stage 4. In three of the four cases this model is statistically significant. These results indicate that the non-standard behavior of these sessions extends beyond the contributions behavior of the agents of grace themselves.

However, at this point our analysis is still not complete. The agents of grace may still be having an effect in Stage 4 through a number of channels: by influencing others contributions or by influencing others tax levels, or both. Moreover, the effects of the agents of grace may be through their own tax choices as well as through their own contributions. We cannot fully distinguish these effects because we have not yet had a chance to model individual voting and contribution behavior. However, when we conducted an out-of-sample simulation of Stage 4 using Stage 3 parameters, in some of the sessions the choices of which tax levels to assume make a large difference, and in others they don’t.

If tax choices are important in modeling overall contribution levels, this raises the question of why taxes matter. One possibility is that the participants are choosing taxes for the standard reasons of risk reduction: enact a binding mechanism to insure an increase in group profits. But, just from a visual examination of the total results in Figures 1–4, it seems possible that there may be a correlation between tax levels and contributions indicating that taxes serve as a coordination device or signal of residual cooperation. If the later effect is true, then we should see that the cooperativeness of individuals over their residual tokens (that is, tokens remaining after any tax) is positively correlated with the tax. To examine this conjecture, we consider two parts of the data. First, in the regression discussed above, the coefficients on MVTAX (the tax rates in stages 3 and 4) are never greater than 1.00, the direct effect of a one unit increase in the tax rate. Furthermore, as a check on this result we restricted the dependent variable to “percent of after-tax tokens invested by participants other than the agents of grace” in all 28 periods, and ran the same regression discussed above. In none of the four experiments was the coefficient on the tax variable statistically significantly different from zero, leading to the following:

Result: the tax appears to be serving as a commitment device, not a signaling mechanism.

These results are interesting in that these groups generally behave differently than we would expect would be the case in standard public goods experiments. Specifically, the contributions near the end of a 28 period sequence are higher than we would guess that most readers would predict. We have on our list of upcoming research the conduct of control experiments designed to disentangle the effects of the Stage 2, 3, and 4 sequencing. However, before we left this “baseline” design, we decided to investigate the fact that we had not observed either of the two most interesting boundary conditions: a complete tax lock-in, or highly successful reverse crowd out.

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13 The tax measure was scaled to take account of the efficiency loss. The coefficients in the four experiments were .6975, -.05873, .6626, and .5527. The upper limits of the 95% confidence intervals were 1.09, .77, 1.24, and .92 respectively.
D. Results From a Special Subject Pool (Or “Rauschenbusch” Vs. “Redeeming Love”)

The results from the first four sessions were somewhat different than we had expected. The pattern was more idiosyncratic, suggesting that group composition and/or path dependence were determining factors. In particular, we did not see convincing evidence of any of three categories of boundary results: the full taxation outcome, the reverse crowd-out, or even a simple replication of the familiar VCM pattern of decay towards the free-riding equilibrium.

Because of the issues of equilibrium versus non-equilibrium behavior inherent in the basic public goods design, plus the added effects of equilibrium selection derived from the addition of the voting mechanism, we became convinced that issues of the level of group expectations might be an important additional factor. Because these expectations could be different when home-grown among naturally-occurring groups rather than groups created randomly in the laboratory, we decided to investigate our design with subjects drawn from a naturally occurring intentional community with incentives generating strong common values and expectations.

To do this, we recruited enough subjects for two sessions from the FSU Wesley Foundation campus ministry community. The experiments were conducted as already noted, with the following exception. We announced (in a public announcement available in the Appendix) that at the end of the experiment we would match each person’s earnings with a contribution to the New Life Children’s Home, an orphanage in Guatemala. The FSU Wesley Foundation has been active in supporting the NLCH, and it is likely that every subject in the experiment either had participated in a mission project at the orphanage, knew someone who had participated in a mission project at the orphanage, or had plans to go on a mission project to the orphanage.

It is important to distinguish what we did in this experiment from what has been done in similar uses of non-standard subject pools in laboratory experiments. Specifically, we emphasize that we did not tie payments to the orphanage to the provision of the experimental group exchange, but rather to the total earnings of the subjects. This is because in these sessions we were not interested in homegrown preferences per se; rather, we were interested in homegrown expectations.

If we had tied payments to the orphanage to the provision of only the group good, then we would have substituted the subjects’ home grown preferences for the orphanage for the induced preference structure of our experimental design. Suppose we had found, for example, that contributions to the public good had increased. This could quite logically have been interpreted as deriving from a de facto increase in the “own marginal per capita return” for the public good. But the fact that increases in the MPCR drive behavioral increases in provision of the public good has been known since the work of Isaac and Walker in the 1980s.

Instead, by tying payments to the orphanage to total earnings, at one level the incentive structure of our design is preserved. A subject wanting to provide more of his funds to the orphanage would have to consider the tension between the stage game
dominant strategy and the social optimum of full group contributions.\textsuperscript{14} But our design changed the incentive structure of the game in other ways.

Consider the choice of an individual in the stage game. If he increases his contribution to the group exchange by one token, the following happens:

His personal token earnings decrease by .5 tokens
His personal contributions to the orphanage decrease by .5 tokens

At this point, incentives from the contributions to the orphanage exactly mirror those of the incentives in cash from the existing game. However, this person should also consider how his additional token affects contributions to the orphanage via other subjects' earnings. Suppose we adopt the natural conjectural variation that this subject believes that the \textit{token allocation of other subjects do not change}. Then, in addition, this subject calculates that contributions to the orphanage via others' earnings increase by 3 tokens.

So, there is a well defined trade-off of a decrease in personal earnings of .5 tokens with an increase in token earnings for the orphanage of 2.5 tokens, assuming that the individual values tokens contributed to the earnings the same regardless of whether they come from him or from the other individuals. As long as this person values the contributions to the orphanage “enough” the stage game looks like it admits a dominant strategy for contributions.\textsuperscript{15} But what could go wrong with this scenario?

One, maybe the individual does not value contributions to the orphanage “enough.”

Two, the dominant strategy in the stage game could fail if individuals value contributions that they make much more than contributions that others make. (This is essentially the same distinction as the “Basic Charity” vs. “See and Be Seen” preferences in Isaac, Pevnitskaya, and Salmon [2008]).

Three, there could be intertemporal effects in this set-up. Subjects in this experiment carry over a portfolio of cash earnings and contribution earnings from period to period, unlike the case in the standard VCM. What if these preferences are not separable? What if I think that your preferences for the contributions to the orphanage are subject to some type of crowding-out? That is, if I add one token to the public good, I conjecture that you will decrease your contributions in future periods. In an extreme sense, this might approach a very different conjectural variation: I assume that you keep your \textit{contributions to the orphanage constant}, and not your token allocations.

What we valued in these subjects was not so much their home-grown preferences for contributions to the orphanage, but rather, but rather their common expectations that everyone else in the room also had strong reasons to want to maximize the total earnings of the group, and that they had strong reasons to believe that everyone else knew this to be true, and so forth. Essentially, we believed that all of the conditions of a dominant

\textsuperscript{14} In fact, casual comments by the subjects after the experiment indicated that they were aware of this tension.

\textsuperscript{15} Recall that because these are the home grown preferences of the subjects, they need not be additively separable, so “enough” may be a more complex relationship than a ratio of one value to another.
strategy in the stage game above are likely to be met, and we believed that this was known with something approaching common expectations.

The incentives that we induced are strong, but they are ones that are likely overlooked as we consider how naturally occurring groups actually make decisions about public goods compared to our standard models. When there have been unexpectedly large amounts of cooperation in a standard VCM experiment, research conjectures have centered on either models that essentially retain the concept of the public good as an instrument to individual maximization (reciprocity) or on models that presume that these strangers care about each others’ earnings (altruism). What we propose here is a model in which individuals’ preferences and expectations are aligned in a way so that everyone recognizes that it is in everyone’s interests to provide the public good. While this does not rule out altruism or reciprocity, we believe that it is a distinct social phenomenon.

We conjectured that if we were ever to see something approaching a reverse crowding out scenario, it ought to be here. Nevertheless, the scenario is falsifiable. Perhaps, contrary to our expectations, these individuals did not value contributions to the orphanage “enough.” Perhaps they value only their own contributions, but not those of other members of the group. Perhaps they are concerned that other people will adjust their decisions in ways that offset their own generosity.

The results of these two sessions are striking. We observed one each of two of the boundary outcomes that we had failed to see in the first four sessions. In Session 5, the tax system was “crowded out” and replaced by a purely voluntary regime of substantial, stable, although not quite optimal, levels of contribution. In Session 6, on the other hand, the subjects embraced the tax system and ratcheted the tax level up to the full tax regime. (Recall that the assignment of the two groups was made randomly by the computer from the 14 participants). Charts of tokens to the group and of the tax levels are presented in Figures 13 and 14.

Using the same decomposition techniques as in the first four sessions, we modeled the behavior of the five stable-preference participants. In Session 5, the level public goods provision is best explained by the constant term of 483 tokens. In Session 6, on the other hand, including the dummy variables for the stages significantly improves the predictive power of the model. Setting aside the issue of the size of the confidence intervals, in both sessions the period decay in Stage 4 is approximately zero. (See Figures 15 and 16.)

So a single subject homogenous pool randomly divided into two groups produces two very different boundary outcomes (albeit two outcomes that each have the property of substantial provision of the public good). We suspect that part of the difference can be explained by the different behavior in Stage 1. In Session 5, the coefficient on the Stage 1 period decay in contributions the group good is only -2.7 tokens per period, only 25 percent of the next-smallest decay of any of the groups. In Session 6, however, the measured decay in Stage 1 is -34.3 tokens, the largest decay of any of the six sessions16. It should not be surprising, therefore, that Session 6 used the tax as a means of funding the public good. (As in the previous sessions, the coefficient on MVTAX suggests that the tax was used as a commitment device and not as a signal).

How did these two very different stable patterns differ in how much they provided to the orphanage? This information is provided in Figure 17. Both groups did very well,

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16 Recall that these numbers are from the five-person subgroup.
with the full tax group slightly beating out the reverse crowd-out group. The irony of this conclusion is that the two agents of grace in Session 5, the no tax session, diverged, to different extents, from the dominant strategy. One agent of grace, in particular, played the new dominant strategy for two periods, and then switched to a choice of voting for a 100 percent tax, but choosing zero contributions when the tax was revealed to be zero. If either of these two agents of grace had chosen the dominant strategy, the payment to NLCH would have been virtually identical, if not reversed.

E. Conclusions on the Reverse Crowding Out Experiments

What do we draw from these experiments? First, we note that when individuals have the option of combining a voluntary contributions mechanism for the provision of public goods with affiliated decision institutions such as a voting mechanism (that is not, in and of itself, a punishment and reward mechanism), they may do so and with different results than we would expect from the VCM by itself. Secondly, we conclude that a period of stable exogenously imposed tax rates does not generate a single model of outcomes when those taxes are made endogenous. Specifically, we did not observe either reverse crowding out of government activity or a full tax lock in as dominant observations. Thirdly, we conclude that to the extent that participants used the tax mechanism, it appeared to be as a commitment rather than as a signaling device. Fourthly, we observed that a transformation of individual preferences on the part of just over one-quarter of the group typically, although not universally, affected the behavior of the non-transformed individuals. The creation of agents of grace with a dominant strategy of full contributions tended to move the behavior of the other participants. All of these conclusions are tentative until we can conduct appropriate control experiments.

Finally, we believe that the special subject pool sessions contribute additional insight. We conjectured that the special common valuations and expectations of this group might produce different results than in the first sessions from the randomly chosen members of the undergraduate pool. We were correct. These two groups, through different paths, did very well in producing the public good (both in the experiment and for contributions to the orphanage). Nevertheless, even with the strongest of possible conditions of common expectations and valuations, the group in Session 6 generated the steepest decline (in token terms) in contributions in Stage 1 of any of our six groups. The difference is that this group used the tax to overcome whatever was the source of these problems and actually ended upon slightly out-performing the other group.

We mentioned the agent of grace in Session 5 that returned to zero contributions but voted consistently for a 100 percent tax. There was also a mirror image agent of grace in Session 6. That individual consistently voted for 0 tax, but always contributed a high percent of residual tokens. This suggests that further exploration of this experimental design in a Tiebout-type environment, in which individuals can vote on tax levels and change groups, is an interesting area for further research (see Ahn, Isaac, and Salmon [2007]).

The fact the same subject pool yielded two groups which had substantially different early period behavior, and then used two very different mechanisms to obtain very similar final results, should reinforce the idea that economic outcomes occur through a combination of people and institutions. A good economic mechanism can help to
provide good outcomes in bad situations (although the disappointing results of some demand-revealing mechanisms for the provision of public goods suggest that this need not always be the case). We economists may say that it is obvious that if men were angels then our choices of economic mechanism design would be less relevant, but our use of a non-standard subject pool shows that even when men are “a little lower than the angels” they can adapt to economic institutions that are not themselves perfect. In particular, we believe that our subject pool and payment structure in Sessions 5 and 6 reflect a neglected model of how preferences and expectations about public goods provision can be formed in naturally and intentionally occurring groups. We believe that the study of public goods provision by such self-selected, intentional groups is a fruitful area for further study, especially when we are discussing how naturally-occurring, probably self-selected, probably intentional, groups might provide an increased share of compassionate activity in a society.

V. OVERALL CONCLUSIONS

While our results are preliminary, we believe that the results so far have made an important demonstration effect. First, the long standing research paradigm into the provision of public goods can be usefully extended to areas explicitly motivated by issues of actual policy questions in the economics of compassionate activity --- the areas here being retained-earnings maximizing non-profit organizations and reverse crowding out of governmental charitable activity. Secondly, these questions can be addressed when important parts of the public goods enterprise mechanism itself are endogenous to the decisions of the participants.

17 Hebrews 2:7
REFERENCES


FIGURE 1
FIGURE 2
FIGURE 3
Session 4

Tokens

Period

FIGURE 4
FIGURE 5
FIGURE 6
FIGURE 7
Line Fit Plot Session 1; NO AOG

F = 12.5*

FIGURE 9
Line Fit Plot Session 2; NO AOG

Period

0 5 10 15 20 25 30

0 100 200 300 400 500

F = 1.67

FIGURE 10
Line Fit Plot Session 3; NO AOG

FIGURE 11
Line Fit Plot Session 4; NO AOG

$F = 11.22^*$

FIGURE 12
FIGURE 13
FIGURE 14
Line Fit Plot Session 5; NO AOG

$F = .2923$

FIGURE 15
Line Fit Plot Session 6; NO AOG

\[ F = 11.06^* \]

FIGURE 16
FIGURE 17
APPENDIX: EXPERIMENTAL INSTRUCTIONS
INTRODUCTION

This is an experiment in the economics of decision making. If you follow the instructions carefully you could earn a considerable amount of money which will be paid to you in a check at the end of the experiment.

You and four other participants are members of a five-person group. Throughout this session, four of you will be customers of a group enterprise and one of you will be the manager of the same group enterprise. Whether you will be a customer or the manager will be determined randomly by the computer. The profit opportunities for the customers and the manager are different and will be explained in turn. In today’s experiments there are 24 periods. From this point on, everything on your screen is your own private information and there should be no communication with any other participant except as you are directed in these instructions.

All costs, profits, and so forth during the experiment today are denominated in experimental dollars. You will be paid one U.S. dollar for every 100 experimental dollars that you earn.

INSTRUCTIONS FOR CUSTOMERS

Each customer begins each decision period with 50 tokens. The decision for each customer is how many tokens to invest in his/her individual account and how many tokens to invest in the group enterprise. Each customer may invest all 50 of his/her tokens in the individual account, or all 50 tokens in the group enterprise, or any combination in between. The only restriction is that the sum of the two must equal 50 tokens. Tokens may not be carried over from one period to the next.

Tokens invested in a customer’s individual exchange earn 1 experimental dollar per token with certainty.

Tokens invested in the group enterprise earn profits for each customer in a different fashion. Each customer earns profits in experimental dollars from the group enterprise based upon the total number of tokens invested by all four customers in the group enterprise, according to the following rule:

\[
\text{Customer earnings from the group enterprise} = G \times S
\]

where \( G \) will be explained in the next paragraph, and \( S \) equals the sum of all of the tokens invested in the group enterprise.
In today’s experiment, G will be either .3 or .75, depending upon the decision of the manager. Customers will not, in general, know whether G equals .3 or .75 at the time they make their investment decisions.

Notice that this part of each customer’s earnings depends only on the total of all of the tokens invested by all four customers. Whether a single customer invested zero, one, two...or 50 tokens is irrelevant once the sum is determined. All customers earn an equal amount from the group enterprise.

INSTRUCTIONS FOR THE MANAGER

The manager in each group begins a decision period also with 50 tokens. The manager, just as the customers, earns a profit in experimental dollars from the group enterprise based upon the following rule:

\[ \text{Manager earnings from the group enterprise} = G \times (\text{sum of all tokens invested by customers}) \]

It is important to notice that managers do not have the opportunity to invest tokens in the group enterprise. The sum of all tokens invested refers only to tokens invested by the customers. What the manager does choose, however, is the value of G, which can be either .3 or .75. If the manager keeps all of his tokens in his/her individual exchange, then the value of G is .3. However, the manager may make a “management investment decision” to increase G to .75. This involves paying 30 tokens out of the manager’s individual account. Tokens retained in the manager’s individual account earn the manager one experimental dollar per token. The manager has the opportunity to choose G at the beginning of each period.

INSTRUCTIONS FOR EVERYONE

Managers have, at the beginning of each period, the option of closing the enterprise for that period. If a manager closes the enterprise, no customer has any opportunity to invest tokens, and no one receives any payment from the group enterprise. Each person, both customer and manager, receives 50 experimental dollars for their stock of tokens which are automatically invested in the private exchange. The manager, however, by closing the group enterprise, also receives a certain “outside salary” of 25 tokens. In such an instance, the manager’s total earnings for that period are 50 + 25 = 75 experimental dollars.

HOW EACH PERIOD PROCEEDS

At the beginning of each period, the manager must decide whether to close or open the enterprise for that period. If the manager decides to close the enterprise and take the additional outside salary of 25 tokens, the customers will be so notified. If the manager
decides to open the enterprise he/she will have to choose whether $G = .3$ or .75. If the manager chose $G = .75$, he/she will be charged 30 tokens. The customers do not initially know whether the $G$ chosen is .3 or .75, although as we will discuss below, they will be told later.

If the manager chooses to open the enterprise, the customers will make their investment decisions. After all of the investment decisions are made, all participants will be shown their earnings. The customers will be told their earnings from their individual exchange and from the group enterprise. They will not know the total number of tokens invested in the group enterprise. The manager will be told the total number of tokens invested in the group enterprise.

ADDITIONAL INFORMATION

Every three periods, the customers will receive a “quarterly report” that reveals the manager’s choice of $G$ for the previous three periods.

FINAL SUMMARY

Customer tokens invested in the individual exchange earn a certain return of one experimental dollar. Customer tokens invested in the group enterprise earn for each customer and for the manager an amount of experimental dollars based upon both 1) whether the manager choose $G = .3$ or to .75, and 2) the total number of tokens invested in the group exchange by the customers.

The manager earns one experimental dollar for each token kept in his/her individual exchange. The manager can spend 30 tokens to increase $G$ from .3 to .75. The manager has the option of closing the enterprise and taking an additional outside salary option of 25 experimental dollars for that period (which is in addition to the 50 experimental dollars in his/her individual exchange).
REVERSE CROWD OUT

INTRODUCTION

This is an experiment in the economics of decision making. If you follow the instructions carefully you could earn a considerable amount of money which will be paid to you in a check at the end of the experiment. In today’s experiment, all of your earnings on the computer will be denominated in experimental dollars, which will be translated into U.S. dollars at the end of the experiment. The translation rate today will be that 400 experimental dollars equals one U.S. dollar. From this point on, everything on your screen is your own private information and there should be no communication with any other participant except as you are directed in these instructions.

You are one of seven persons in a group. The decision that you must make during each decision period is how to divide a stock of tokens between an individual and a group exchange. There are four stages in today’s experiment, each consisting of seven periods, for a total of 28 periods. Because the rules of the exchanges are somewhat different, we will go over first the rules for the first stage (the first seven periods). We will continue with the instructions for the second stage and the end of the first seven periods and so forth.

INSTRUCTIONS FOR STAGE 1

In stage one, each of you receives, at the beginning of each period, 100 tokens. You must decide how to invest the tokens: either in your own Individual Exchange, or in a Group Exchange. The tokens earn money differently in the two exchanges, so we will go over them in turn.

*The individual exchange:* Each token that you invest in your own individual exchange earns exactly 1 experimental dollar for that period.

*The group exchange:* The rule for earnings in the group exchange is different. After each of you has made your investment decision, the computer sums all of the tokens that each of you has invested in the group investment exchange. It then pays each one of you one-half times the number of summed tokens invested in the group exchange *regardless of how many tokens you have invested*. For example, if the seven of you invest a total of 200 tokens in the Group Exchange, each one of you would earn 100 experimental dollars from the Group Exchange. If the seven of you invested a total of 500 tokens in the Group Exchange, each of you would earn 250 experimental dollars from the Group Exchange, and so forth. In either of these two examples, your total earnings would equal your earnings from the Group Exchange plus your earnings from tokens invested in your Individual Exchange. We have provided a payoff chart for other values of possible investments in the Group Exchange.
You must use all of your tokens in each period, that is, the number of tokens invested in your Individual Exchange added to the number of tokens you invest in the Group Exchange must equal 100. You may not carry tokens over from one period to another.

If you will now look at your computer screen, you will see that we are displaying a practice round in which you can familiarize yourself with the process of investing your tokens. This practice round has no impact at all on your final earnings. Please go to your screen and try making different types of investments. When you are done, please hit the CONTINUE button.

If you will look at your screen now, you will see the results for this practice round. The screen shows you

Your earnings from your individual exchange
The total number of tokens invested in the group exchange
Your earnings from the group exchange
Your total earnings

To summarize, tokens invested in your Individual Exchange earn a certain return of one experimental dollar. Earnings from the Group Exchange depend upon the total of the investments in the Group Exchange from your group. Are there any questions?

Finally, please notice that we are handing each of you a sealed envelope. This contains some additional information for later in the experiment. Please do not open the envelope before we instruct you to do so.
INSTRUCTIONS FOR STAGE 2

The earnings rules of the Individual Exchange and the Group Exchange are the same in Stage 2 as they are in Stage 1. However, in this stage we begin each round with a computer enacted tax of 30 tokens on each one of you. Of this tax, 80 percent will be invested in the group exchange for you, while 20 percent will disappear. In other words, of the 30 tokens that are taken from you as a tax, 24 will be invested in the group exchange, 6 disappear. That means that across all seven of you, 210 tokens will be taken as a tax, and 168 tokens will be automatically invested in the group exchange.

At the beginning of each period, each of you then has the decision of how to invest your remaining 70 tokens. As before, you may divide them between your Individual Exchange and the Group Exchange. Your Individual Exchange continues to earn 1 experimental dollar per token, and the group exchange continues to earn one-half times the sum of all tokens invested in the group exchange. Remember that this sum includes the 168 tokens automatically invested from the tax plus any additional amount that you decide to invest.

On the next page of the handout, you will see a screen print of how your token investment screen will look.

Are there any questions?
INSTRUCTIONS FOR STAGE 3

In the next stage, the rules for investment in the individual and group exchanges will be the same as in Stage 2 except that the tax will no longer automatically be 30 tokens. Instead you and the other six members of your group will determine the tax for your group. This will be done by a voting process. As before, whatever tax you as a group choose, 80 percent will be invested in the group exchange and 20 percent will disappear.

Here is how the voting will proceed for you to choose your tax rate. You will submit to the computer what level you would like the tax to be. The computer will rank all the nominations from highest to lowest and choose the median, or middle, amount. In your case, this will be the 4th highest number. That tax rate will be the one chosen for all seven members of your group.

As an example, suppose that your group nominated the tax levels of: 98 tokens, 77 tokens, 60 tokens, 40 tokens, 39 tokens, 18 tokens, and 0 tokens. Then the winning tax would be 40 tokens because it is the median, or 4th highest. (Notice that 40 is NOT the average). Using the same rule as before, if the tax is 40 tokens then 80 percent (that is, 32 tokens) would be invested in the group exchange from each of you, for a total investment of 224 tokens.

As before, after the tax has been determined and you have been informed of its value for this period, you will have the opportunity to make an additional investment decision with your remaining tokens. You will have the opportunity to vote on a new tax level in each period in this stage.

Investment in your individual exchange continues to earn one experimental dollar per token. Investment in the group exchange continues to earn for each person .5 * (the sum of all tokens invested in the group exchange) including the 80 percent of the total from the tax.

On the following page is a print of the screen in which you are asked to submit your preferred tax level.

Are there any questions?
INSTRUCTIONS FOR STAGE 4

In Stage 4, all of the rules are the same as in stage 3. The only difference is that some of you will have a different return from the individual exchange than you did before, while others of you will continue to earn one experimental dollar per token invested in your individual exchange. To the extent that some participants’ values have changed, the identities of these participants were chosen anonymously and at random by the computer before any of your decisions were made. You may now open the envelope we gave you at the beginning of the experiment which contains a piece of paper telling you what your return from the individual exchange will be for the next seven periods. Please do not share this information with anyone.

The rules for choosing the group’s tax level do not change.

The rule that the tax will be 80 percent invested in the group exchange does not change.

The payoff to each person from the group exchange stays at one-half times (the sum of all tokens invested in the group exchange).

Are there any questions?
SPECIAL ANNOUNCEMENT

In today’s experiment, in addition to paying you your final earnings from today’s experiment, the experimenters will also make a contribution to the New Life Children’s Home in Guatemala equal to each of your final earnings in today’s experiment (excluding the $10 show up fee). That is, to use some arbitrary examples, if you make $1.00 in earnings in the experiment, you will receive that $1.00 in earnings, and we will make a contribution of $1.00 to New Life Children’s Home. If you make $5.00 in earnings in the experiment, you will receive that $5.00 in earnings and we will make a $5.00 contribution to New Life, and so forth for any amount of earnings that you make.

Please note that this applies to the total earnings you make in the experiment. This specifically includes your earnings from the group account and your earnings from your individual account. We match your total earnings at the end of the experiment (excluding the show-up fee). Another way of saying the same thing is that at the end of experiment we will add-up each of your earnings (excluding show-up fees) and write a single check to New Life Children’s Home for that amount. You will be shown this check.

New Life Children’s home operates a home in Guatemala. From their web-page the following information is obtained: “NLCH is truly a ‘home’ for these needy children, where their physical, emotional, and spiritual needs are addressed.” Each child is provided a “sound academic Christian education.” Members of the Wesley Foundation of FSU have participated in mission trips to the New Life Children’s home in Guatemala.

Are there any questions?
### APPENDIX: FULL REGRESSION TABLES

<table>
<thead>
<tr>
<th>Variable</th>
<th>EXP 1</th>
<th>P-value</th>
<th>EXP 2</th>
<th>P-value</th>
<th>EXP 3</th>
<th>P-value</th>
<th>EXP 4</th>
<th>P-value</th>
<th>EXP 5</th>
<th>P-value</th>
<th>EXP 6</th>
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