Voluntary Funding for Generic Advertising Using a Provision Point Mechanism: An Experimental Analysis of Option Assurance

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Selected Paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Long Beach, California, July 23-26, 2006

Most agricultural commodities produced in the United States have mandatory checkoff programs that feature generic marketing and promotion activities designed to increase overall demand. By law, such programs are created via a referendum process: if a majority of producers vote in favor of the program, funding comes from a coercive tax on all firms in the industry collected at the point of sale. The nature of these programs is controversial because not all producers support mandatory checkoff programs, but they are still forced to contribute.

Despite an abundance of economic studies that suggest generic promotion programs are generally beneficial to firms (see Kaiser et al. and Ferrero et al. for a thorough summary of the literature), a vocal minority of producers oppose these mandatory programs for various reasons. For example, many organic producers oppose paying for the promotions of conventionally produced commodities because they believe that this undermines their efforts to differentiate their own production methods. Also, some large producers maintain that they would be better off by marketing their commodity on their own rather than collectively via a generic advertising campaign. Because of these and other concerns, there have been numerous legal challenges to mandatory checkoff programs, with three cases heard by the U.S. Supreme Court in the last decade. The diverse challenges raised in these cases have led to seemingly contradictory decisions handed down by the Court. In 1997, the Court ruled that the California peaches, plums, and nectarines checkoff program did not violate the plaintiff's rights to free speech since generic advertising was part of a larger set of regulations designed to help producers. In 2001, the Court ruled the mushroom checkoff program unconstitutional because it was a stand-alone checkoff advertising program and not part of a broader set of economic regulations. In 2005, the Court ruled the beef advertising checkoff program constitutional because the advertising was considered "government speech" and hence immune to First Amendment challenges.

Although the 2005 Supreme Court decision established a legal precedent in favor of the constitutionality of checkoff programs, such programs remain vulnerable for two reasons. First, a large number of cases are still being litigated and the history of this litigation suggests that as new arguments are raised and the composition of the court changes, the courts may yet rule against some mandatory checkoff programs.[1] Second, and perhaps more importantly, the 2005 Supreme Court decision did not end the fundamental problem that some producers strongly oppose these programs. Though mandatory programs for many commodities will likely continue to have the support of the majority of producers in the short term, support for these coercive programs may dwindle as producers increasingly seek to differentiate their product and identify niche markets, thereby reducing the perceived need for generic advertising. Furthermore, support for mandatory checkoffs may diminish if producers perceive that the benefits of generic advertising are not distributed uniformly, and those who benefit the most should provide the necessary funding.

The checkoff program for fresh cut flowers in the United States, PromoFlor, provides an example of a mandatory program that switched to being funded by a voluntary program. In June 1997, 58% of the industry voted against continuing the collection of mandatory assessments. Of note is that prior to this referendum, an economic evaluation was conducted by Ward (1997), which indicated a high benefit-cost ratio of 5.6 for the program. These results were widely distributed throughout the industry. Ward observed, however, that while the industry benefited from the advertising conducted by PromoFlor, equity concerns prevailed since flower growers paid *all* the costs of the program even though retailers benefited as well. Subsequent to the referendum, PromoFlor reorganized under the name Flower Promotion Organization and began collecting voluntary contributions from fresh cut flower growers and importers. After the reorganization in 2000, Ward (2005) continued to find high benefits relative to costs of the voluntary flower program.

Voluntary programs, however, suffer from well documented problems too. General economic theory (Samuelson) and empirical evidence (Messer, Kaiser and Schulze) from the commodity promotion economics literature suggest that even though a voluntary marketing program may yield aggregate net benefits to producers, self-interested producers have a strong incentive to "free-ride" by keeping their money for themselves and receiving the benefits from the contributions of others. In the case of cut flowers, annual expenditures decreased from an estimated $4.5 million to $2.5 million after it switched from mandatory assessment to collecting funds through a version of the traditional VCM.

In a seminal paper, Brubaker argued that free riding can be attributed to an "assurance" problem at an individual level. In group settings, an individual wants to be assured that:

> … he doesn't waste his own scarce resources supporting an ineffectual collective effort. Just as an individual consumer of a private good needs to be assured of its provision in a specified quantity and quality before he will be willing to make a payment, so a major concern for the individual consumer of a collective good will be a 'money back' guarantee that the good as offered will, in fact, be provided.

Anticipating what would later be referred to as a provision point mechanism (PPM) with a money-back-guarantee (MBG) rule (Marks and Croson, 1998), Brubaker suggested that modifying standard voluntary contribution approaches by setting a minimum threshold for contributions (either a percent or absolute amount) that must be met to implement the program could solve this individual assurance problem. Using commodity programs as an example, if contributions meet or exceed this threshold, the advertising campaign is implemented with the funds collected. If the threshold is not met, the advertising campaign is not conducted and all funds are returned to the contributors. Brubakers's conjecture that adding a PPM-MBG increases voluntary contributions relative to a standard voluntary contributions mechanisms in both a statistical and economic sense has been demonstrated empirically in a number of studies conducted over the last three decades.

(see Rapoport and Eshed-Levy; Cadsby and Maynes; Rondeau, Poe, and Schulze; and Messer, Kaiser, and Schulze, among others)[2].

In solving the individual assurance problem, however, the utilization of a PPM-MBG mechanism to provide group goods creates the possibility of complete efficiency loss in the current period. Rondeau, Poe and Schulze demonstrate in the general public goods case, and Norwood et al. note in the specific commodities marketing setting, that failure to reach the specified threshold of funding in a PPM-MBG could result in an inefficient outcome relative to a more conventional VCM. Whereas in a VCM, desirable, but under-funded, goods are partially implemented (e.g., a smaller than desired advertising program), no program is implemented if the PPM threshold is not achieved. Hence some aggregated positive efficiency level is achieved in a VCM for any positive contribution levels. In contrast, aggregate contribution levels below the PPM threshold result in the minimum possible efficiency for projects with favorable benefit-cost ratios.

Moreover, failure to fund a program in a given period may preclude the possibility of continuing these campaigns in subsequent periods for programs characterized by irreversible fixed costs. Such is the case of checkoff programs where administrative capacity is a necessary prerequisite for conducting an advertising campaign. Imagine, for example, the consequences of a situation in which contributions in the present year are insufficient to reach the threshold. Under the MBG system, the marketing program would not be implemented and all of the funds would be returned.[3] Afterwards, it would likely be prohibitively costly to sustain the administrative capacity needed for conducting a marketing program in the future, even if the commodity group hired outside agencies to create the advertising campaigns, as the start-up cost of establishing the underlying administrative organization anew would be substantial. Therefore, failure to achieve the PPM threshold in one year would likely hamper an effective generic advertising campaign in subsequent years regardless of the level of contributions in the future. Based on the within period efficiency risks and these between period consequences, Norwood et al. conclude that “Checkoff administrators may feel the gain in participation from using a [PPM-MBD] does not outweigh the risks” (p. 85).

Thus, for implementation of real world programs with significant shut down and start-up administrative costs, a second form of assurance in a PPM-MBG may be needed, such that the opportunity for a program in the future is not negated by a single failure to meet the threshold. This second form of assurance we call “option assurance” because it ensures that the option for future provision of the collective good remains open. Motivated by a practical need to address this intertemporal funding problem for checkoff programs, our research builds upon recent work on PPM-MBGs in the context of generic commodity advertising (Messer, Schmit and Kaiser) to use experimental economics to explore the effect of providing “option assurance” in a repeated fund raising setting.

The remainder of the paper is organized as follows. The next section briefly discusses the economic-theoretic foundations single and multiple-tier provision point mechanisms. The third section presents the experimental economic procedures and four alternative PPM-MBG designs we use to explore the funding and participation impact of providing option insurance. In the fourth section we report the results of the experiments and our comparative analysis of each mechanism in terms of contribution level and efficiency. The final section assesses these results from the perspective of implements such option assurance programs in real-world contexts.

Two-Tier Provision Point Thresholds

Translated into a commodity program funding framework, option assurance is the concept that when contributions fail to provide the full level of funding set by the PPM threshold, a minimum level of sustenance for the administrative organization is sought as a second threshold, thereby providing contributors the opportunity to reach full levels of advertising funding in the subsequent period. To explore the demand revelation features of option insurance we introduce a two-threshold PPM-MBG, in which a lower, threshold (*M*) corresponds to the minimum amount of funding needed to sustain the administrative capacity of a marketing program for another year, and a higher threshold (*F*) corresponds to the amount needed to provide full funding for the advertising campaign. Using an experimental platform calibrated to the funding of generic advertising for agricultural commodities we evaluate (i) whether contributions to the marketing program increase in these two-threshold PPM-MBG designs with option assurance relative to a conventional PPM-MBG scenario without assurance, and (ii) alternative ways of sequencing solicitation of funds for the two thresholds to examine if different strategies affect levels of contributions and producer surplus.

Economic theory provides little guidance about how to implement a two-threshold mechanism in real world settings. Examining the single unit, "one street light" case, Bagnoli and Lipman clearly establish that the PPM provides a second set of Nash Equilibria beyond the degenerate zero contributions equilibrium concept associated with the standard voluntary contributions mechanism. Under the assumption that the aggregate benefit-cost ratio of the program exceeds unity and that no one contributes more than their private value, the locus of contributions summing to the threshold provision level provide a set of Pareto Dominant Nash Equilibria.

That such a mechanism can obtain Pareto efficient outcomes for provision of a public good in natural settings is demonstrated in a subsequent paper by Bagnoli and McKee using data from a set of economics experiments. Recent experimental papers by Messer, Kaiser and Schulze, Krishnamurthy, and Messer, Schmit and Kaiser extend PPMs to decisions about how much to fund commodity marketing programs and explore the optimal relationship between the benefit-cost ratios of such programs and provision point levels.

Bagnoli and Lipman extended this single unit funding game to a "multiple streetlight problem" in which funding of each additional unit (streetlight) involves a sequential, increasing units PPM. Yet in a subsequent paper, Bagnoli and co-authors (Bagnoli, Ben-David, and McKee) conclude that the restrictive assumptions enabling Bagnoli and Lipman's positive results do "not adequately represent individual behavior" (p. 87). Even with these highly restrictive assumptions Bagnoli and Lipman were unable to provide theoretical support for non-zero Nash Equilibria for simultaneous provision points (i.e. a fund drive is conducted and the highest threshold exceeded indicates the level of provision) or sequential decreasing units fund drives. Hence, existing economic theory provides at best limited guidance regarding implementation of multiple-tiered provision point mechanisms. Thus, in this paper, we instead adopt Charles Plott's notion of using experiments to compare the effectiveness of alternative mechanism designs in situations when theory provides no direct guidance: i.e., "Like a wind tunnel to test airplane design, lab experiments provide a testbed for what is called *economic design* – the process of constructing institutions and mechanisms to examine resource allocation" (Shogren, p. 1218).

Experimental Design[4]

All experiments were conducted at the Cornell Lab for Experimental Economics and Decision Research. Subjects were recruited from undergraduate economics and business classes. Each experimental session lasted approximately seventy-five minutes and subjects earned an average of fifteen dollars. Each session was comprised of eleven subjects who were randomly assigned to a computer equipped with privacy screens to ensure confidentiality. Each subject assumed the role of a generic commodity producer and the experiment administrator was the buyer. Producers were informed of their unique production costs, and subjects recorded their decisions and received information regarding their profits via an Excel spreadsheet programmed with Visual Basic for Applications. The experiment consisted of two parts, Part I and Part II (Table 1). Producers were not informed about the number of parts of the experiment nor the number of rounds associated with each part. At the beginning of each part, subjects read the corresponding written instructions (Appendix) and, aided by a PowerPoint presentation, the administrator orally reviewed the instructions and answered all questions.

In Part I of the sessions, the producers learned via experience how their production costs and the stochastic demand interacted to create a uniform market price. Specifically, in the first five rounds, subjects indicated when they were ready to proceed and then demand was determined for that round. When notified by the administrator, subjects retrieved the uniform market price and learned which of their units were sold and how much profit they earned in that round. Each subject could potentially sell up to three units of the generic commodity and the producers' costs were constant throughout the experiment. Subjects only incurred the production costs if the units were sold – a simplification that ensured experimental control over the rate of return on advertising, which is the key economic factor in this study. Each of the subjects' first two units was relatively low cost, ranging from \$0.90 to \$1.00, and the third unit was more costly, ranging from \$1.19 to \$5.06. Since the minimum possible demand was 22 units, the costs of the steep upwardly-sloped third unit served as the relevant part of the supply curve to determine the market price. In this range, the own-price elasticity of supply was 0.25.

Following the design approach used in Messer, Schmidt and Kaiser, demand was assumed to be perfectly price inelastic. Since this research seeks to investigate the efficiency of various

PPM-MBG designs, this simplifying assumption was made to ensure that demand was transparent to subjects and to control the rate of return on the marketing program throughout the entire experiment. Furthermore, the assumption of perfectly inelastic demand is consistent with the inelastic demand frequently found for agricultural commodities. To mimic the price changes observed for most agricultural commodities, demand varied stochastically by having a volunteer subject draw a bingo ball from a bag with the number on the drawn ball representing the number of units sold. A symmetric triangular distribution was used that had three balls labeled with the average demand of 24, two balls each for 23 and 25, and finally one ball each for the extremes of 22 and 26. The units were purchased from lowest to highest cost. The market price was determined by the cost of the first non-purchased unit, thus the market price without advertising ranged from $1.19 to $2.27 with an average of $1.67.

The final five rounds of Part I included the mandatory marketing program so that subjects could experience the additional costs associated with the program and the benefits due to increased demand. The marketing program was funded by a mandatory twenty-five cent assessment collected on each unit sold. These assessments funded the marketing program that increased demand in the subsequent round, creating a one-round lag between the program's benefits and costs. To mimic the publicity associated with marketing programs that traditionally inform producers of the benefits of their program, subjects were informed that the increase in demand in "previous experiments" also resulted in higher prices and greater profits for sellers.

The marketing program consisted of two separate components, the administrative costs and the advertising campaign that directly affected the level of demand. To simulate guidelines for federal marketing orders that require a checkoff program's administrative expenses be limited to 5% of total program costs, the administrative costs in the experiments were set at fifty cents and did not vary with the stochastic demand.[5] From a programmatic perspective, the objective is to balance the desire to have administrative costs as low as possible (and thus the corresponding PPM threshold for the option assurance) with the need to obtain adequate funds to sustain the administrative capacity through the next funding cycle. In our experiments the administrative costs did not provide any direct benefit to producers as administrative capacity does not, by itself, increase demand. Consequently, by itself, the administrative costs resulted in a negative benefit-cost ratio. However, these expenses were necessary in order to have the advertising campaign.

Throughout the experiment, the demand increase in the next round, $I_{t+1,}$ due to the marketing program was determined as follows:

(2) $$I_{t+1} = \delta\left[A^*\left(D_t + I_t\right) - M\right].$$

where, D_t, is stochastic demand, I_t, is the previous round's increase in demand from advertising, A is the assessment rate, M is the administrative cost, and δ is a conversion factor. The benefit-cost ratio was constant throughout the experiments by setting δ equal to three-fifths, which established the benefit-cost ratio for the advertising campaign as roughly four-to-one. As detailed in Messer, Schmit, and Kaiser, a four-to-one benefit-cost ratio is well within the range of the rates of return observed in a broad array of generic commodities. The written instructions provided subjects with estimates of the price that would result from the various amounts of assessments collected. For each round, in addition to the market price, the administrator announced the total assessments collected and the corresponding increase in demand.

To examine the efficiency of funding alternatives in a Promo-Flor type setting in which mandatory programs are terminated, Part II of the experiment used one of four different PPM-MBG designs, which will be discussed in greater detail later in this section. Part II lasted for twenty rounds (the subjects were unaware of the actual number of rounds) and subjects only participated in one design. To mimic the democratic decision-making process that occurs among producers participating in generic advertising programs, subjects were asked to submit a confidential vote indicating if they would like (a) to have no marketing program, or (b) to have a marketing program funded by the PPM-MBG design that was pre-selected for that experiment session.[6] Before the producers cast their votes, subjects were permitted to discuss for up to five minutes the referendum and possible contribution strategies. Such non-binding discussion is commonly referred to as "cheap talk," since only multilateral promises are possible, the decisions are still confidential, and no binding deals are allowed.

If a majority of producers supported the marketing program using a PPM-MBG, subjects experienced a contribution process similar to that commonly used by generic marketing programs. To mimic the assessment process frequently employed with agricultural commodities, assessments for the marketing program were automatically deducted from producer profits in the round in which the profits were accrued. Then producers were allowed to confidentially request a refund of these assessments. Thus, producers contribute to the marketing program by *not* requesting a refund of their assessment.[7] Subjects could choose the amount of their contributions by completing a confidential one-sentence request stating the amount of the desired refund. The request could be any amount between zero and the maximum of seventy-five cents, if three units were sold. If a subject did not want to request a refund (i.e., they wanted to contribute to the program), no message was required. All refund requests were granted and the amount of the request was added to the subject's profits for that round. After each round, the administrator informed the subjects of the level of contributions made by announcing the percentage of the total possible assessments that were actually collected and how this would affect demand in the next round.

The four alternative PPM-MBG mechanisms involved the use of two different thresholds. A threshold of 5% was set to equal the minimum administrative costs, *M*, as described previously.

The full funding threshold, *F*, was set at 80% based on Messer, Schmit and Kaiser's research on the PPM-MBG threshold for a marketing program with a similar benefit-cost ratio that maximized contributions and producer surplus. If total contributions collected meet or exceed the 80% threshold the funds are dedicated to the marketing program that would effectively shift demand outward for the product. Funds in excess of *F* are used to extend "benefits" by investing further in a market program to shift demand.[8]

Since the parameters of the experiment were set to ensure a four-to-one benefit-cost ratio for advertising, the average marginal per capital return (MPCR) for the marketing program was 0.32. In the experimental economics literature, this MPCR is considered to be low and has been shown to lead to significant free riding in VCMs (Davis and Holt).

In settings where the marginal per capita return is less than one and the aggregate and individual benefits exceed their respective costs at *F*, a dominant Nash equilibrium of aggregate contributions equaling the 80% threshold exists for the Conventional PPM-MBG without option assurance.[9] If group contributions exactly equal the threshold, then, under the conditions stated above it is in no one's best interest to deviate unilaterally by reducing their contributions. In the case of extended benefits, contributions exceeding the threshold are subject to the same incentives as a VCM since there is no MBG for the monies given above the 80% threshold. Thus, beyond the 80% threshold, subjects have the incentives to cheap-ride, providing them with the highest possible net earnings in any particular round.

A decision-tree depiction of the alternative PPM-MBGs is provided in Figure 1:

Design 1 – Ascending, Sequential Thresholds with Option Assurance. The first mechanism considered, referred to as "Ascending," closely approximates the Bagnoli and Lipman sequentially increasing PPM. In this design, in the first stage, subjects decide how much to donate to the 5% threshold. If the first-stage 5% threshold is achieved, subjects next decide how much to contribute to the second-stage 80% threshold.[10] If the 80% threshold is achieved then the collected funds are expended on the advertising campaign and subjects retain the PPM-MBG in the next round, which operates as just described, and do not receive a rebate of their contributions (Outcome 1).

In the case where the first-stage 5% threshold is achieved, but the second-stage 80% threshold is not, then the advertising campaign is not implemented and demand will not increase in the next round (Outcome 2). Subjects are informed whether the threshold was met, but do not learn of the actual contribution percentages until the end of the round. While the advertising is not implemented and producers earn a negative return due to the administrative costs, the producers still retain the option assurance for the next round (the option of funding the advertising with the PPM-MBG in the next round, but not beyond the next round). Additionally, all producers receive, as their money-back guarantee, a "proportional rebate" based on their contributions to the first-stage 5% threshold. An individual's proportional rebate, R_i, is calculated based on the percentage of the total contributions from producer *i*, according to the following:

(1)
$$R_i = \frac{C_i * (C_i + \sum_{i \neq j} C_j - M)}{(C_i + \sum_{i \neq j} C_j)},$$

where C_i indicates individual *i*'s contribution to the 5% threshold and M represents the 5% threshold, which is based on the administrative costs. For example, if the contribution, C_i, from producer *i* is \$0.25, *M* is \$0.50, and the sum of the contributions from the other ten producers in the group, $\sum_{i \neq j} C_j$, is \$2.25, then the subject would receive a proportional rebate, R_i, of \$0.20, which is 10% of the amount of contributions that exceed the administrative costs of *M*. Note that if a producer does not contribute anything to the 5% threshold ($C_i = 0$), then the producer does not receive a proportional rebate (Outcome 3).

The third possible outcome occurs when the first-stage 5% threshold is not initially achieved. In this case, subjects do not face the decision regarding the second-stage threshold and receive a complete refund of their contributions, if any. The advertising does not get funded, and thus, demand does not increase in the next round. As a result of missing this 5% threshold, producers permanently forgo the option assurance -- the opportunity to fund the marketing program with a PPM-MBG for subsequent rounds. In this case, the funding mechanism switches to become a standard VCM.[11] To simulate the historic experience of generic marketing programs funded by a VCM, subjects are informed that in "previous experiments" where the marketing program was funded by a VCM, contributions "decreased over time." That such a decrease does occur in a VCM commodity marketing setting is demonstrated in Messer, Kaiser and Schulze.

The primary reason why the VCM was assumed to be the default alternative instead of other funding mechanisms, such as mandatory funding or no funding, was that this change would most likely mimic the real world transition in the funding structure of checkoff programs in the event that a PPM-MBG threshold was not met and a loss of efficiency occurred. The historical example of PromoFlor supports this assumption as this program switched to a VCM after the previous funding system failed to receive enough producer support.

Design 2 – Descending, Sequential Thresholds with Option Assurance. The second PPM-MBG design, referred to as "Descending," operates much in the same way as the first design, except that the order of the thresholds is reversed. Thus, producers in the first stage decide on how much to contribute to the 80% threshold. If the first-stage 80% threshold is achieved (and therefore also the 5% threshold), the funds are expended on the advertising, no rebate is provided (Outcome 1), and subjects retain the opportunity to fund the thresholds in the subsequent round. If the first-stage 80% threshold is not achieved, subjects next decide on how much to contribute to the second-stage 5% threshold. Similar to Ascending, subjects are informed only whether the threshold was achieved and do not learn of the actual amount of contributions until the end of the round. If total contributions exceed only the second-stage, 5% threshold, no advertising is implemented in the present round but producers retain the option of achieving the thresholds in the next round and receive the money-back guarantee of a proportional rebate (Outcome 2). If neither the first-stage 80% threshold nor the second-stage 5% threshold are achieved, then no marketing program is undertaken, subjects receive a complete rebate of their contributions, and all future funding for the marketing program is made by a VCM, as previously discussed (Outcome 3). While economic theory does not provide expectations of whether the ordering of the thresholds makes a difference in producer contributions, this descending order offers the real world advantage of being simpler to implement as the second stage of donations is only needed if the initial 80% threshold is not achieved.

Design 3 - Simultaneous Thresholds with Option Assurance. The third design, referred to as "Simultaneous," further simplifies the administration of the checkoff program by combining both thresholds into a single decision. Subjects decide on only one contribution amount in the first stage. If the total contributions exceed the first-stage 80% threshold, the advertising campaign is implemented and demand in the subsequent round increases (Outcome 1). Producers receive no refunds and the PPM-MBG is again employed in the next round. If total contributions are sufficient to achieve only the first-stage 5% threshold, no advertising campaign is implemented (Outcome 2). In this case, subjects receive a proportional rebate as in equation 1 and are given the opportunity to achieve the PPM-MBG thresholds in the next round. Otherwise, if subjects fail to contribute enough to reach either first-stage threshold, subjects get a complete rebate of their contributions and the marking program relies on a VCM funding for all future rounds (Outcome 3).

Design 4 - Conventional PPM-MBG without Option Assurance. To provide a baseline, the fourth mechanism, referred to as "Conventional," corresponds with the single-threshold PPM-MBG that does not provide for option assurance, i.e. the conventional PPM-MBG widely used in the experimental economics literature. Administration of this program is made less onerous by including only the first-stage 80% threshold. With this design, if donations exceed the 80% threshold, they are used for the marketing program as previously described, and producers have the opportunity to achieve the PPM-MBG threshold in the next round and no refund is provided (Outcome 1). If the 80% threshold is not met, producers receive a complete rebate of their contributions and, in the next round, the funding mechanism switches permanently to the VCM (Outcome 3). As described above, the VCM default was set to mimic the likely funding transition, and in contrast to having no program once the PPM-MBG threshold is not achieved, the VCM offers a more rigorous test of the import of option assurance in alternative PPM-MBG designs.

Experiment Results

The results of sixteen experimental sessions involving eleven subjects each are presented below (N=176). Since the referendum passed in each of the sessions, the results of all of the experimental sessions are included. This section will first examine contribution behavior for all four different PPM-MBG designs, including both the 5% administrative cost threshold and the 80% advertising campaign threshold. Then an evaluation of how overall efficiency differs amongst the four PPM-MBG designs is provided. In both parts, econometric analyses will be presented that examine the performance of the three designs with option assurance relative to the baseline Conventional design.

Contributions to the 5% Administrative Cost Threshold. As described above, the four designs each collected contributions for the 5% threshold in different manners. The Ascending design had subjects first make contributions to the 5% threshold, while the Descending design had subjects make contributions to the 5% threshold only if they had failed to achieve the 80% threshold (31.8% of the time). For the Simultaneous design, the subjects submitted just one contribution that was evaluated against both thresholds. The Conventional design did not include a specific threshold for the administrative costs, but had the same benefits function that included the administrative costs. In each of the three designs with option assurance, subjects achieved the 5% threshold in 100% of the rounds. The amount of contributions given in the 5% threshold funding scenarios varied significantly, however, even though all of the designs theoretically had the same economic incentives and the contributions decisions were independent from decisions made for the 80% threshold.[12] Regardless, procedural invariance appears to be violated by path dependency.

Contributions to the 80% Advertising Campaign Threshold. As described above, the advertising campaign threshold was set at 80% and contributions were collected by the four designs in a variety of ways. Ascending collected contributions once the lower threshold was met (which it was 100% of the rounds). Descending, Simultaneous, and Conventional had contributions for the 80% threshold collected first or concurrently. Subjects in all sessions had twenty opportunities to achieve the 80% threshold. In general, subjects usually decided to give either all of their assessments as contributions (67.3%) or to request a refund of all of their contributions (12.1%). Thus, only 20.6% of the contributions were partial.

In general, achievement of the 80% threshold was quite high for the designs with option assurance. As indicated in Table 2, Simultaneous contributions met or exceeded the threshold 86.3% of the time. The threshold achievement rate for Descending (68.8%) was statistically lower than Simultaneous, but Ascending (77.5%) was not. Descending and Ascending threshold achievement rates were not significantly different from each other. The threshold achievement rate for Conventional (41.3%) was significantly lower than the other three design variants.[13]

Average contributions to the 80% threshold followed the same rank order: all three of the PPM-MBG designs with option assurance had average contributions higher than 80% and higher than the average contributions of Conventional (Table 2). As can be seen in Table 2 and Figure 2, Simultaneous had average contributions of 91.8% and yielded the highest average contributions in 19 of the 20 rounds. Similarly, Ascending had average contributions of 86.1% and was higher than Descending in 16 of the 20 rounds and Conventional in 17 of the 20 rounds. While having the lowest level of contributions of the three designs with the option assurance, Descending still averaged 82.4% contributions for each round. This was statistically higher than the 68.2% achieved by Conventional, corresponding with the observation that it was higher in 17 of the 20 rounds.

Econometric models were applied to explore the impact of different PPM-MBG designs on contributions both initially and over time. Since contributions were limited between 0% and 100%, a Tobit model was employed. Furthermore, since subjects were able to interact during cheap talk, the referenda, and through contribution behavior over rounds, group-level data were used.[14] Since group contributions were never 0%, the Tobit model used only a single limit at the upper bound of 100%. Explanatory variables included a constant, three dummy variables for the PPM-MBG designs, round, and interaction terms between the dummy variables and the round variable. Following a mixed model structure, we specify the empirical model as:

$$
\begin{aligned}
(3) \qquad & PERCENT\_CONT_{it} = \beta_0 + \beta_1 SIMULTANEOUS_i + \beta_2 ASCENDING_i + \\
& \beta_3 DESCENDING_i + \beta_4 ROUND_{it} + \beta_5 SIMULTANEOUS_i * ROUND_{it} + \\
& \beta_6 ASCENDING_i * ROUND_{it} + \beta_7 DESCENDING_i * ROUND_{ik} + Z_i u_i + e_{it},
\end{aligned}
$$

where $PERCENT\_CONT_{it}$ is the percentage of contributions for group i in round t, $ROUND_{it}$ is the round number for group i, which accounts for the change in contribution behavior over time that is not captured by the random, mean zero, normally distributed errors of $Z_i u_i$ and e_{it}. To address the autocorrelation within groups across rounds, the model assumes a compound symmetric, within-subject covariance structure consistent with Messer, Schmit, and Kaiser.

As seen in Table 3, β_0, representing the Conventional design baseline, was statistically significant and *SIMULTANEOUS* was statistically higher at the 0.01 level, indicating that the estimated first round contributions in the Simultaneous design were statistically higher. The other two dummy treatment variables, *ASCENDING* and *DESCENDING*, were positive but not statistically different than the baseline. *ROUND* was significant and negative, implying that the contributions for the Conventional design were decreasing over time. In contrast, the three interaction terms of *ROUND* and the treatment dummy variables were all positive and significant, indicating that these treatments slowed the rate of decay in contributions relative to the baseline Conventional design. When similar Tobit models were run with each of the other three PPM-MBG designs were the baseline, none of them experienced a decay in contributions that was statistically significant at the 0.05 level.

Using the results from the Tobit analysis, estimated contribution levels can be provided for the four designs. These estimates again support the finding that the highest initial contributions come from Simultaneous and that both Ascending and Descending provide higher initial contributions than Conventional (Table 4). Analyses of the estimates for the last round reveal a similar pattern. In Simultaneous, contributions are significantly greater than in Descending and Conventional and all three PPM-MBGs with option assurance again have estimated contribution levels greater than Conventional.

Measures of Efficiency. A second important area for analysis is whether the PPM-MBG designs with option assurance matches or exceeds the efficiency levels achieved with the Conventional design. While efficiency is ultimately dependent upon the functional form of the benefits, the results from this research permit an analysis of what systematic directions may exist amongst the PPM-MBG designs. This research defines efficiency, *EFF*, for group *i* in round *t* as $EFF_{it} = \frac{PS_{it}}{Max(PS_t)}$, where PS_{it} is the producer surplus for group *i* in round *t* in the voluntary PPM-MBG setting and $Max(PS_t)$ is the maximum possible producer surplus, given the random demand for that round, that could have been achieved if the funding was either compulsory or contributions were always 100%. For example, in the rounds of the first part of the experiment that did not have the marketing program, producer surplus averaged \$18.59 per round, while in the rounds with the mandatory marketing program producer surplus averaged \$41.80 per round.[15] Overall, the rounds without the marketing program had an average efficiency of 44.5%.

When the producer surplus measures are converted into efficiency measures and the random element in the stochastic demand is controlled for, it is evident that the Conventional design did considerably better with regard to efficiency than it did for contributions. This result is due to the previously noted fact that PPM-MBGs achieve minimum efficiency whenever contributions fall short of the 80% threshold, while in the VCM whatever contributions are given are used for the marketing program and therefore partial efficiency is achieved. Subject-level efficiency in Conventional averaged 72.7%, which was statistically indistinguishable from 72.3% with Descending and 75.6% from Ascending (Table 2). However, the superiority of the Simultaneous design is again evident, with the average efficiency being a significantly higher 84.2%, and statistically different from the other designs.

A Tobit model with an upper-limit of 100%, similar to equation 3, was used to model how group-level efficiency, EFF_{it}, was affected by the treatments and how efficiency changed over time. As shown in Table 3, when compared with the baseline of Conventional, none of the PPM-MBG designs with option assurance were statistically worse and Simultaneous exhibited significantly higher initial efficiency. While it is impossible to prove the null hypothesis, the results are encouraging signs that the inclusion of option assurance does not result in lower efficiency.[16]

A more nuanced comparison of the various designs can be seen by testing linear restrictions of the coefficient vectors in Table 3. These tests show that in comparison to Simultaneous, the Conventional, Ascending, and Descending designs all have lower initial efficiency at the 0.01 significance level. This analysis further suggests that contributions in Simultaneous have a statistically significant level of decay, albeit from a statistically initial level. This finding is consistent with other experimental tests of the PPM-MBG, such as Messer, Kaiser, and Schulze, which show that when contributions start out high a pattern of decay toward the Nash equilibrium of the threshold level is often evident. None of the other designs have a significant rate of decay. Nevertheless, as shown in Table 4, even after 20 rounds, contributions from Simultaneous are estimated to be the highest (90.8%) of all the designs considered.

Conclusion

Economic-theoretic presentations and empirical evidence provide compelling evidence that provision point mechanisms with money-back-guarantee offer an improvement over the application of standard voluntary contribution approaches to funding generic commodity advertising programs. And, should mandatory programs ever be declared unconstitutional or voted down, such mechanisms provide a relatively efficient contribution collection back up for existing check-off programs.

However attractive provision point mechanisms may be in theoretical presentations or the experimental economics laboratory setting, a practical concern with applying such mechanisms to commodity promotions programs is that effective advertising and marketing programs involve costly investment in administrative infrastructure. Even a slight shortfall in contributions relative to the designated funding threshold in one period could engender an irreversible shutdown of administrative capacity with negative consequences for subsequent periods. Such a risk is likely to be deemed unacceptable by commodity program institutions.

Our exploration of an option assurance addition to repeated provision point mechanism settings, such as those characteristic of ongoing commodity promotions, obviate this concern about irreversible shut down resulting from failure to achieve a threshold provision level. This paper uses an experimental setting germane to the context of commodity marketing to explore alternative two-threshold provision point funding mechanisms that would separately fund the minimum administrative capacity and the more costly full marketing program. In such settings, even if funding falls short for the full marketing program, the option of continuing the administrative capacity remains. The results presented herein are suggestive, indicating that concerns about assurance can be overcome while still retaining the provision point benefits of increased contributions and resulting producer surplus. While it would be premature to design a promotion program based solely on a single set of experiments, these experimental results do provide a solid basis for not ruling out provision point mechanisms from consideration as a viable alternative to existing voluntary and mandatory approaches. Indeed, based on our results here and those reported previously related to funding generic advertising, the two-threshold PPM-MBG approach may emerge as a preferred alternative.

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Table 1. Experimental Design.

Total Subjects:	176 (44 per each treatment type)
Group Size:	11 for each session
Average Earnings:	$15 for 75 minutes
Part I:	5 rounds without advertising 5 rounds with mandatory funding for advertising
Part II:	Up to 5 minutes of "cheap talk" at the start of Part II Group vote on whether to implement the specified PPM-MBG 20 rounds with voluntary funding for advertising

Table 2. Results by treatment.

	5% Admin. Cost		**80% Ad. Campaign**		**Efficiency**[4]
	Threshold Achieved[1]	Average Contributions[2]	Threshold Achieved[3]	Average Contributions[4]	
Ascending	100%	84.9%[d,s]	77.5%[c]	86.1%[d,s,c]	75.6%[s]
Descending	100%	49.4%[a,s]	68.8%[s,c]	82.4%[a,s,c]	72.3%[s]
Simultaneous	100%	91.8%[a,d]	86.3%[d,c]	91.8%[a,d,c]	84.2%[a,d,c]
Conventional	- NA -	- NA -	41.3%[a,d,s †]	68.2%[a,d,s]	72.7%[s]

[a] Different than Ascending design (0.05 level)

[c] Different than Conventional design (0.05 level)

[d] Different than Descending design (0.05 level)

[s] Different than Simultaneous design (0.05 level)

[1] N = 80 Simultaneous and Ascending designs and N = 25 for Descending design

[2] N = 185 (Tobit models with Round as a class variable)

[3] N = 80 for each treatment (Two Sample Test of Proportions)

[4] N = 320 (Tobit models with Round as a class variable)

[†] Percentage of times that the Conventional design met or exceeded 80% contributions.

Table 3. One-limit Tobit results for group level contributions and efficiency.

Variable	Dependent Variable: Contributions to 80% Advertising Threshold (%)	Dependent Variable: Efficiency (%)
INTERCEPT	0.8226**	0.8746**
	(0.0349)	(0.0885)
ASCENDING	0.0583	-0.0332
	(0.0502)	(0.1263)
DESCENDING	0.0416	0.0242
	(0.0498)	(0.1257)
SIMULTANEOUS	0.2034**	0.4001**
	(0.0524)	(0.1396)
ROUND	-0.0152**	-0.0093
	(0.0031)	(0.0077)
*ASCENDING*ROUND*	0.0157**	0.0118
	(0.0045)	(0.0110)
*DESCENDING*ROUND*	0.0115**	-0.0007
	(0.0045)	(0.0109)
*SIMULTANEOUS*ROUND*	0.0090*	-0.0148
	(0.0047)	(0.0117)
Log Likelihood	52.03	-158.84
Wald χ^2	154.48	26.43
Uncensored	259	193
Left-censored	0	0
Right-censored	61	111

Note: Standard errors in parentheses.

Significance is indicated by * for 5% significance level; ** for 1% significance level or less.

Table 4. Estimated contributions to the 80% advertising threshold by treatment.

Design	1st Round	20th Round
Ascending	0.8809[s,c]	0.8906[c]
	(0.0361)	(0.0359)
Descending	0.8642[s,c]	0.7949[s,c]
	(0.0355)	(0.0349)
Simultaneous	1.0261[a,d,c]	0.9087[d,c]
	(0.0392)	(0.0373)
Conventional	0.8226[a,d,s]	0.5342[a,d,s]
	(0.0349)	(0.0348)

Notes: Based on the estimates from the Tobit model

Estimated standard errors in parentheses

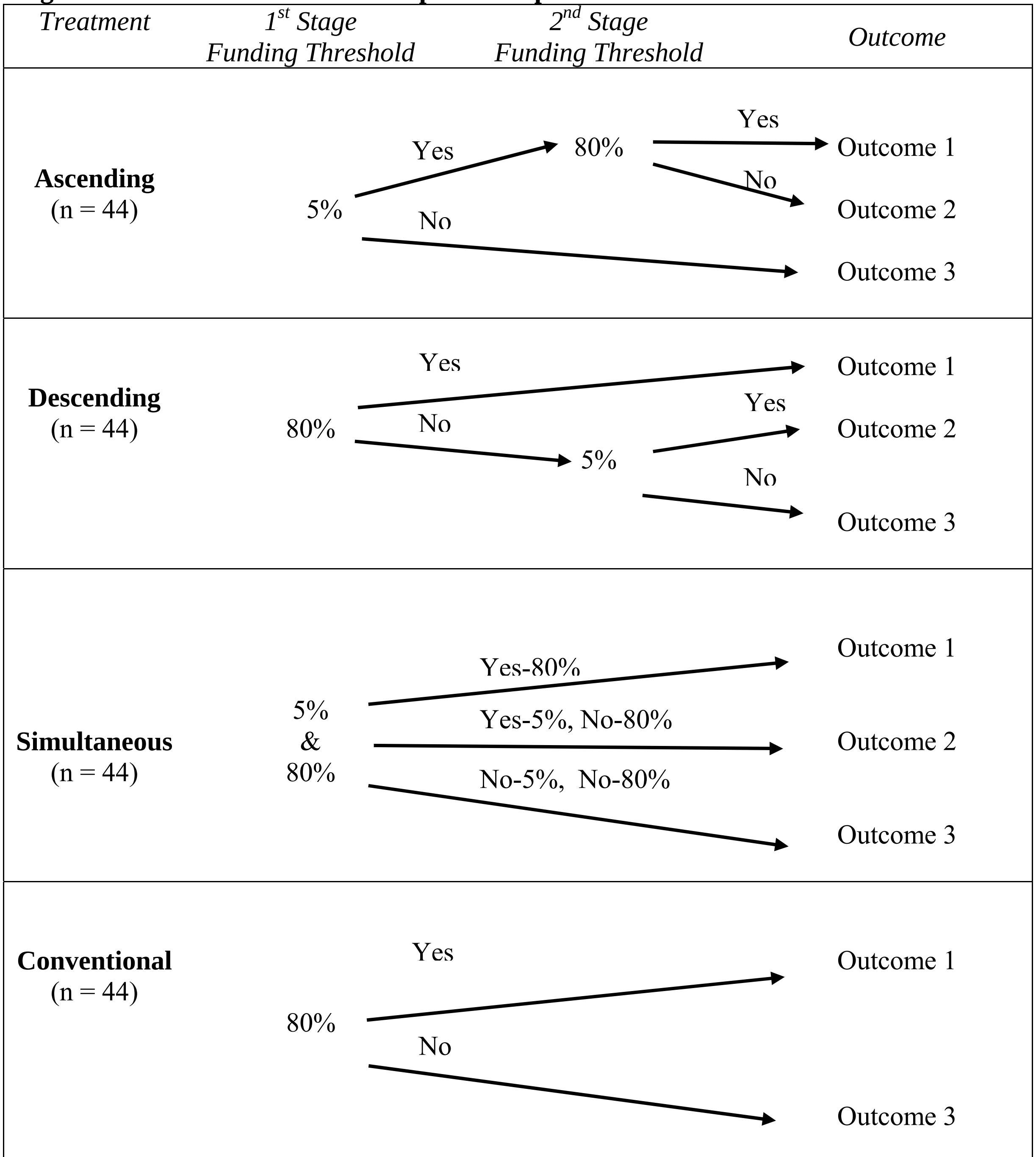
[a] Different than Ascending design (0.05 level)

[c] Different than Conventional design (0.05 level)

[d] Different than Descending design (0.05 level)

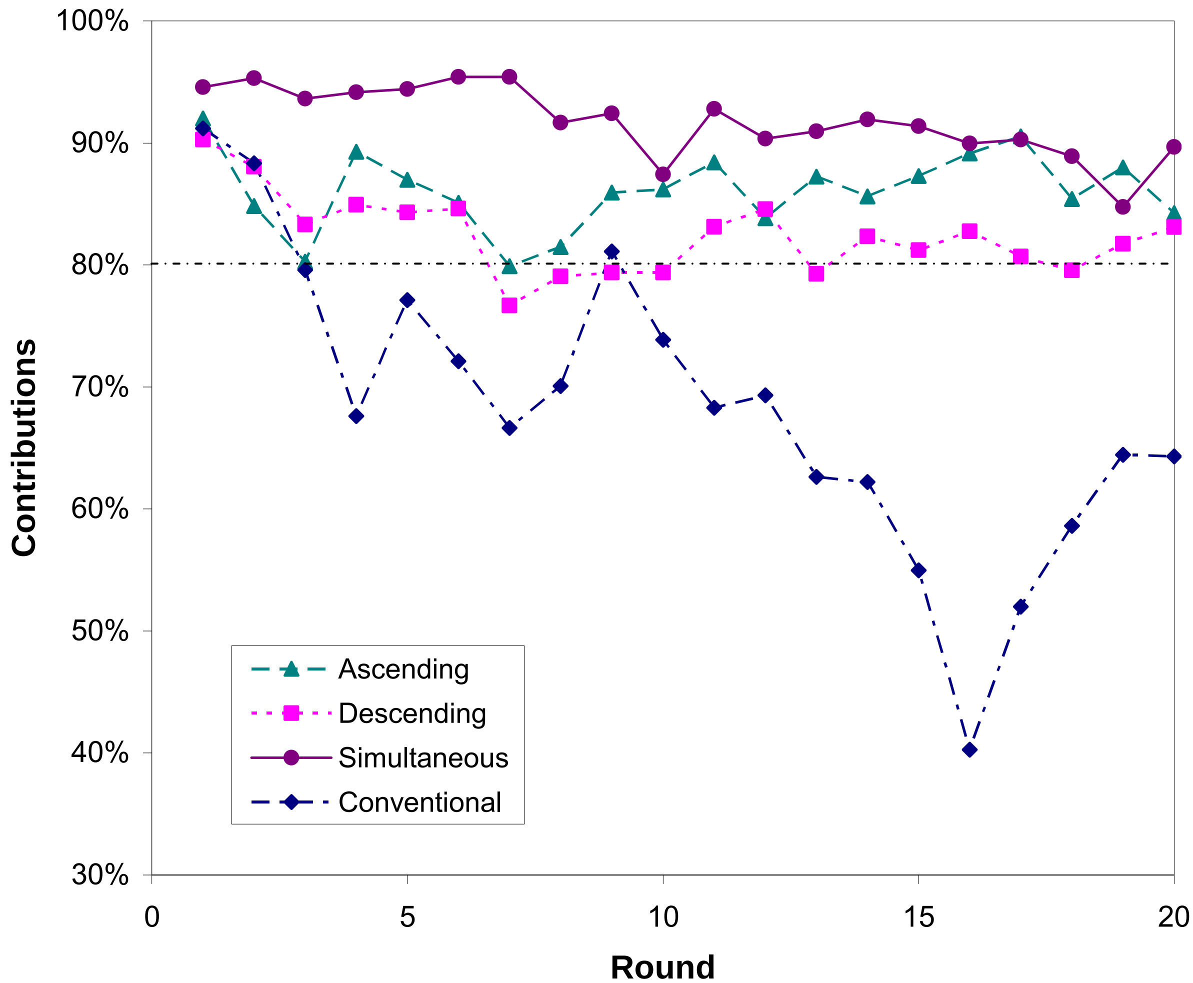
[s] Different than Simultaneous design (0.05 level)

Figure 1c. Flow chart for the four provision point mechanisms.



Outcome 1	Positive advertising affect in round *i* + 1 No rebate given in round *i* PPM-MBG in round *i* + 1
Outcome 2	No Advertising affect in round *i* + 1 Proportional rebate given in round *i* based on 5% threshold. PPM-MBG in round *i* + 1
Outcome 3	No Advertising affect in round *i* + 1 Complete rebate given in round *i*. VCM starts in round *i* + 1

Figure 2. Contributions to 80% advertising threshold by treatment.



Endnotes

[1] Former Justices O'Connor and Rehnquist voted with the majority 6-3 decision in the 2005 Johanns v. Livestock Marketing Association "beef advertising" decision.
[2] Examples of PPM-MBG funding applications in real world settings include local parks (e.g. Brookshire and Coursey), sports arenas (Marks and Croson, 1999) and Green Electricity Programs (Rose et al.).
[3] For a real-world example of a provision point program that failed to reach the stated threshold and did return the contributions see Poe et al.'s discussion of the Niagara Mohawk Power Company GreenChoice™ program.
[4] In addition to the new PPM-MBG designs outlined here, this research had three primary procedural differences from Messer, Schmit, and Kaiser. First, groups were comprised of eleven instead of twenty producers and producers did not submit offer prices and instead took price as a given. Finally, the thresholds were based on percentage of actual contributions from the total possible assessments, instead of percentage of producers not requesting refunds. All of the relevant economic factors were adjusted to keep the advertising rate-of-return consistent.
[5] The amount for the administrative costs was fixed slightly above 5% to ease transparency, to avoid the cognitive challenges related to a stochastic demand, and to be a conservative estimate of the potential administrative costs.
[6] As shown in Messer, Schmit, and Kaiser this type of referendum process can lead to higher contributions in voluntary settings and since referenda are a common component to generic commodity programs, this element was included in all experiments to more closely parallel real world conditions.
[7] As shown by Messer, Kaiser, Schulze, this refund-by-request feature tends to increase contributions.
[8] In a single-threshold public good funding case, Marks and Croson (1998) argue that the extended benefits beyond the threshold do not change the individual incentives to contribute to the marketing program.
[9] The notion that zero contributions by all subjects remains a Nash equilibrium is sustained by the additional realistic assumption that no one individual has an endowment exceeding the designated threshold and/or it is not in an individual's self interest to unilaterally contribute F (a natural consequence of the marginal per capita rate of return less than one). Hence, no individual can deviate unilaterally from zero contributions and be better off.
[10] In the Ascending and Descending PPM-MBG designs, if a contribution decision was required in the second stage, subjects could enter any amount of contribution and were not bound to their decision in the first stage. Likewise, subjects are informed only whether the first-stage threshold was met and do not learn of the actual contribution percentages for all thresholds until the end of the round.
[11] So as to retain experimental control, the contributions for the VCM were also collected via a refund-by-request feature, so as to not change the status quo of the donation, which has been show to be an important context feature for contributions (Messer, Kaiser, and Schulze).
[12] A significant difference existed between Ascending and Descending, in which subjects' contributed 84.9% and 49.4% of the total possible assessments for the 5% threshold, respectively (Table 2). A potential explanation for this difference is that subjects may have tried to signal future promises (or threats) to others in their group, since the highest contributions occurred when the 5% threshold was *prior* to the attempt at the 80% threshold and the lowest contributions *after* an unsuccessful attempt at the 80%.
[13] On average, contributions in the Conventional design failed to achieve the 80% threshold by the sixth round, thus it subsequently became a VCM. Therefore, as described in Table 2, this number of 41.3% includes the percentage of times that the Conventional design met or exceeded 80% contributions in either its PPM-MBG or VCM forms.
[14] A similar analysis predicting individual contributions yields very similar results and is available from the authors upon request.

[15] The producer surplus measures are designed to facilitate the analysis of the key treatment effects and should not be interpreted as predictions on the magnitude of change in producer surplus that might be expected.
[16] Reduced forms of these models that do not include the non-significant treatments, according to joint effect tests, do not change the results presented in Table 3 and are available from the authors upon request.