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Informing Generic Advertising Programs by Investigating Income and Relative Return Heterogeneities in Voluntary Contributions Mechanisms

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The consistent appeals against mandatory checkoff programs stimulated a wave of research investigating voluntary contributions mechanisms (VCMs) as a potential alternative in the provision of generic advertising. Using a public goods experiment with heterogeneous income and marginal per capita returns (MPCR), we examine the interaction between high- and low-income individuals in VCMs, an understanding of which can help enhance the performance of voluntary generic advertising programs. While free-riders were present among both income types, the majority of low-income individuals were keen on stimulating higher contributions through cooperation. Conversely, high-income individuals tended to decrease their contributions in the presence of the low-income type.

Key words: income heterogeneity, public goods, varying relative returns. VCMs

Introduction

Public goods are an integral part of any society. They are highly important to consumers, producers, and policy makers. Generic advertising programs, which motivate this study, are a prominent example of public goods. By pooling funds from several producers of a commodity to finance generic advertisements that increase the overall demand in the industry, generic advertising programs clearly fit the definition of a public good. These programs are highly beneficial to producers (Williams, Capps, and Palma, 2008; Moore et al., 2009). It is estimated that every $1 invested in generic advertisements leads to an average of $3–$6 in additional revenue (Kaiser et al., 1992; Brester and Schroeder, 1995; Messer, Kaiser, and Schulze, 2008).

Tremendous amounts of money are spent annually on public goods in general and on generic advertising in particular. According to the congressional budget office, the U.S. government spends around $500 billion every year on public goods. More than $1 billion of this budget is allocated to generic advertising alone (Alston, Freebairn, and James, 2001). For instance, around $47 million is spent annually on generic advertising for cheese, $45 million on beef, $24 million on Florida orange juice, $15 million on cotton, and $14 million on pork (Liu and Forker, 1990; Chakravarti and Janiszewski, 2004).

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The predominant methods used to finance public goods and generic advertising are mandatory checkoff programs (MCPs) and voluntary contributions mechanisms (VCMs). As the names imply, MCPs depend on a specific policy that forces everyone to contribute, while VCMs rely on voluntary contributions to help finance the public good. Despite numerous arguments in favor of MCPs, they carry several disadvantages. For example, they are often considered rigid and costly, and in the particular case of generic advertising were ruled as unconstitutional by the federal appeals court across several industries, including mushrooms, milk, beef, and pork (Alston, Chalfant, and Piggott, 2000; Crespi and Marette, 2002; Isariyawongse, Kudo, and Tremblay, 2007; Messer, Kaiser, and Schulze, 2008; Norman, Pepall, and Richards, 2008). The failure of generic advertising under MCPs was driven by a public outcry from both larger and smaller producers in several industries to appeal to the U.S. Supreme Court against this mechanism. The plaintiffs often invoked the First Amendment and freedom of association when appealing against MCPs. While larger producers claimed the costs of forced investments to be triple what they incurred in advertising their own brands, small producers argued against being obligated to pay relatively high advertising costs considering their size in their industry (Crespi, 2003; Chung, Norwood, and Ward, 2006; Crespi and McEowen, 2006; Messer, Kaiser, and Poe, 2007). Chung, Norwood, and Ward (2006) survey a sample of Oklahoma cattle producers and report opposition rates to MCPs higher than 50% for large and small producers.

The numerous issues underlying MCPs draw attention to VCMs as a potential alternative in the provision of public goods. Although VCMs are susceptible to free-riding behavior, there is ample laboratory and real-world evidence of significant contributions under those mechanisms (Bohm, 1972; Kahneman and Knetsch, 1992; Andreoni, 1995a; Messer et al., 2007). This fact stimulated interest in determining the main motivations governing voluntary contributions to public goods. However, previous research has focused on settings with homogeneous income and relative returns. Lacking, therefore, is an understanding of how heterogeneities in these two factors influence voluntary contribution behavior. Our study addresses this point by investigating the behavior of high- and low-income individuals in VCMs under heterogeneous relative returns from the public good. This investigation can shed light on the interaction between large and small producers and changes in their behavior resulting from different expectations regarding their relative gain from the provision of the generic advertisement.

We conduct a between-subjects experiment in which we combine heterogeneity in income and relative return, or marginal per capita returns (MPCR). The study subjects were split into high- and low-income types and participated in a public goods environment in four-member mixed or separated income groups. Heterogeneity in MPCR was introduced in the mixed income groups, which consisted of two high- and two low-income individuals. Specifically, three types of mixed income groups were constructed: (i) homogeneous MPCR; (ii) increasing MPCR with income, where high-income individuals benefited more from the public good; and (iii) decreasing MPCR with income, where low-income individuals benefited more from the public good. By analyzing behavior across these treatments, we can shed light on some of the underlying forces that shape contributions under heterogeneous income and relative return settings.

We find a significant increase in the average contributions of low-income individuals when high-income individuals are present, even when the public good bears the same benefit to all members (i.e., the mere presence of high-income individuals causes low-income individuals to contribute more to the public good). On the other hand, there is a significant decline in high-income individuals' average contributions when low-income individuals are present, even when the public good bears the same benefit to all members (i.e., the mere presence of low-income individuals causes high-income individuals to contribute less to the public good). While there is evidence of free-riding under both income levels, the percentage of high-income free-riders is significantly lower than the percentage of low-income free-riders. Our framework was analyzed using a finite mixture model with different types of low- and high-income individuals. Low-income individuals were classified as either "free-riders" or "opportunists" (who strategically increase their contributions in the presence of high-income individuals to stimulate higher overall contributions and benefit from the resources of high-income members). High-income individuals were classified as either "free-riders" or "selfists" (who, due to self-centered interests, deliberately decrease their contributions in situations where low-income individuals are present and/or are in advantageous positions).

The significance of this study stems from the social importance of generic advertising programs and their crucial role in increasing social welfare. As argued by Messer, Kaiser, and Schulze (2008), generic advertising programs not only benefit producers and retailers but also carry substantial positive impacts on public health. The types of foods that currently benefit from generic advertising comprise the main components of a healthy diet; these products include fruits, vegetables, dairy, poultry, meat, and pork. Unlike food products that focus on branded advertising—like sweets, salty snacks, and sodas—they are usually high in vitamins and low in fat and salt (Messer, Kaiser, and Schulze, 2008).

The contributions herein lie in the high applicability of this study in the real-world and its potential in providing policy makers with a deeper understanding of the interaction between high- and low-income individuals and the dominant motivations determining their contributions to public goods. When considering generic advertising, for example, it is unreasonable to view producers as identical in income and/or the perceived benefit from the public good. In fact, this is one of the main issues raised by different types of producers when fighting MCPs. Small producers claim to be disadvantaged by this rigid mechanism, arguing that being forced to pay a specific amount of money leaves them worse off relative to larger producers (Zheng, Bar, and Kaiser, 2010). On the other hand, while larger producers have advocated expansions in generic advertising, they too argue against MCPs (Crespi, 2003). Hence, by constructing simplified environments to study the interaction of high- and low-income individuals in this setting, we can provide a better understanding of the behavior of larger and smaller producers under a voluntary mechanism, which will in turn enable us to investigate how to enhance this interaction and generate higher returns to all participants.

Literature Review

Early investigations of behavior in VCMs focused on determining the main motivations for the significant contributions, which violate the Nash equilibrium free-riding strategy. The predominant models explained giving in this setting to be a result of social preferences, namely altruism, warm glow, inequality aversion, and reciprocity (Becker, 1974; Sugden, 1984; Andreoni, 1989; Bolton and Ockenfels, 2000). It was believed that individuals derive utility from the consumption of others (Becker, 1974; Andreoni, 1989, 1990) or from the very act of giving (Kahneman and Knetsch, 1992; Andreoni, 1995b), that they dislike inequality (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), and that they act in a reciprocal fashion (Sugden, 1984; Fischbacher, Gächter, and Fehr, 2001; Croson, 2007).

The vast experimental research on VCMs has identified several other factors that affect levels of contribution to public goods. For instance, Isaac, Walker, and Williams (1994) reported that group size is directly proportional to contribution levels. Other research found that contributions might be a result of confusion (Andreoni, 1995a), are enhanced by the presence of institutions (Kosfeld, Okada, and Riedl, 2009) and altruistic punishment (Fehr and Gächter, 2002), and are influenced by the particular framing of the task (Park, 2000; Andreoni, 1995b).

Few papers have already considered the effect of income heterogeneity on contributions in linear (Isaac and Walker, 1988a; Kachelmeier and Shehata, 1997; Buckley and Croson, 2006) and nonlinear VCMs (Bergstrom, Blume, and Varian, 1986; Chan et al., 1996, 1999).[1] Kachelmeier and Shehata (1997) and Isaac and Walker (1988a) studied the effects of monitoring and communication, respectively, on contributions using heterogeneous incomes. However, these papers do not separately report the contributions across different income levels. Buckley and Croson (2006) constructed

[1] We only discuss literature pertaining to linear public goods here since it is pertinent to the paper. Buckley and Croson (2006) review some of the literature on nonlinear public goods.

mixed income groups consisting of two high-income members and two low-income members and showed that both types contribute similar amounts to the public good. We build on this work by examining changes in the behavior of high- and low-income individuals between separated and mixed income groups, uncovering the effect of the presence of the opposite income type on contribution levels.

Kinateder and Merlino (2017) theoretically investigated heterogeneous relative returns, or MPCR. Isaac and Walker (1988b), Fisher et al. (1995), and Cardenas, Stranlund, and Willis (2002) conducted experimental applications of this heterogeneity; they all report a positive correlation between MPCR and contribution levels. However, while Isaac and Walker and Fisher et al. varied MPCR by changing the return from the public good, Cardenas, Stranlund, and Willis introduced variations in MPCR by changing the valuations of the private good. We extend this literature by combining heterogeneity in income and MPCR and determining the interaction effect between the two factors. This will shed more light on how the interaction between high- and low-income individuals is affected by changes in the perception of the relative return from the public good.

Voluntary contributions have also been investigated in the context of generic advertising (Krishnamurthy, 2001; Messer, Schmit, and Kaiser, 2005; Norwood et al., 2006; Messer, Kaiser, and Poe, 2007; Messer, Kaiser, and Schulze, 2008). However, the main focus was on provision point mechanisms (PPMs), with the argument that they help alleviate the free-riding problem in VCMs. Proposed by Krishnamurthy (2001), the PPM works such that the public good is only provided if a certain percentage of individuals participate (or if voluntary contributions exceed a certain threshold). Despite the apparent advantages and significant support for PPMs, they have some drawbacks. Norwood et al. (2006) argued that PPMs might actually result in a more inefficient outcome compared to VCMs: If the contribution threshold is not met in a PPM, then the public good is not provided. Hence, while the VCM allows for partial provision in the case of an underfunded good (e.g., a smaller than desirable promotion campaign), the PPM could result in the most inefficient outcome, which is failure to provide the public good and a loss of welfare. Moreover, if administrative costs of setting up the PPM are significant, failure to meet the required threshold in a single period might hinder future efforts at reestablishing the program. Our paper contributes to this literature by examining some of the factors affecting the contributions of high- and low-income individuals in VCMs, an understanding of which can enhance the efficiency of voluntary checkoff programs.

Experimental Design

A total of 140 undergraduate students from a large public university in Texas were recruited to participate in the experiment, which consisted of a baseline and three treatment groups.[2] Following the common procedure in experimental studies with student subjects, the students were recruited through a bulk email service that sent out an invitation to the entire undergraduate student body at the university. This means that the students participating in this study spanned different majors and different school years (freshman, sophomore, junior, and senior). Subjects were paid $5 for their participation plus the amount of any earnings they made during the experiment (i.e., this was an incentivized study). Upon arrival to their session, subjects read and signed a consent form, after which they completed the public goods game (which differed based on the treatment), filled out a short questionnaire regarding demographic and socioeconomic characteristics, received their payments, and were escorted out of the session.[3]

[2] Student subjects are commonly used to investigate behavior in public goods settings. They are especially appropriate in this design. Their relative homogeneity allows for proper randomization across income levels (high and low) and relative return (high and low). Being able to manipulate the treatment factors in a way that is not affected by the subjects' real-world characteristics would improve our ability to isolate the treatment effects of interest.

[3] The public goods game and subsequent questionnaire were computerized using z-Tree (Fischbacher, 2007).

Subjects were randomly split into high- and low-income types, where each participated in 12 rounds of the public goods game (2 practice and 10 real rounds). High-income individuals were endowed with 750 tokens in each round, while low-income individuals were endowed with 250 tokens in each round. Participants were divided randomly into groups of four members; each group played the public goods game separately. Further, the groups were randomized across the treatments using a random number generating process in order to eliminate any confounding effects and allow for identification of the treatment effects of interest. In each round, subjects were required to decide how to divide their endowments between a private and a public account. Each token allocated to the private account yielded \$0.01 only to the person who invested it, while each token allocated to the public account yielded a return of less than \$0.01 to all members of the group.

The return from every token allocated to the public account differed by treatment, as did the group composition. Following each round, each subject received information about their own contribution to the public account, the total contribution of their group to the public account, their earnings from the private and public accounts, and their total earnings for the round. To induce incentives for truthful reporting, one of the ten real rounds was randomly selected as binding at the end of the experiment and subjects were paid according to their earnings in this binding round. The two practice rounds, along with various examples on how the private and public accounts work, were included to make sure that everyone understood the procedure. The instructions made it clear to the participants that the group members would remain anonymous to one another throughout the entire experiment and that at no point would the identity of any of the group members be revealed to the other members of the group. Moreover, subjects had an understanding that their investment decisions would be completely confidential, as would their earnings from each round.

The high- and low-income types played separately in the baseline group, hereafter "separated groups, homogeneous return" (SHR). That is, each four-member group was entirely made up of either high- or low-income individuals. Subjects were aware that each member in their group received the same endowment in each round (750 for high-income individuals and 250 for low-income individuals). Within each group, every token that any member invested in the public account yielded \$0.005 to each member of the group (i.e., the MPCR was 0.5 for all members).

In the other three treatments, the high- and low-income types were mixed together in the same group, and each group comprised two high- and two low-income individuals. The participants were aware that the group members had different endowments, but they were not given information on the individual endowments of each member in the group. They only knew their own endowment and the average group endowment, which was 500 tokens in all cases. Hence, they were able to classify themselves as belonging to the high- or low-income types.

The first treatment, hereafter "mixed groups, homogeneous return" (MHR), was identical to the baseline in that the MPCR was 0.5 for all members. The only difference was the group composition. In the second treatment, "mixed groups, increasing return" (MIR), subjects were told that the MPCR is increasing with the initial endowment. The instructions also specified the individual MPCR, which was 0.75 for high-income and 0.25 for low-income individuals. The opposite was true for the third treatment, "mixed groups, decreasing return" (MDR), in which the MCPR was 0.25 for high-income and 0.75 for low income individuals. Table 1 summarizes the main parameters in each treatment.

Theoretical Framework

This section presents the main theoretical framework that explains potential changes in the behavior of high- and low-income individuals when heterogeneities in income and relative returns are introduced. The model presented here is based on the well-established evidence of positive contributions to public goods and on the fact that individual contributions are positively correlated with group average contributions (Bardsley, 2000; Fischbacher and Gächter, 2010). By

Table 1. Summary of Treatments

Treatment	Group Composition	MPCR
Separated groups, homogeneous returns (SHR)	4 high income or 4 low income	0.5¢ for all members
Mixed groups, homogeneous returns (MHR)	2 high income and 2 low income	0.5¢ for all members
Mixed groups, increasing returns (MIR)	2 high income and 2 low income	0.25¢ for low income, 0.75¢ for high income
Mixed groups, decreasing returns (MDR)	2 high income and 2 low income	0.75¢ for low income, 0.25¢ for high income

Notes: Separated income groups contained either four high-income or four low-income individuals, while mixed income groups contained two high-income and two low-income individuals. High-income individuals were endowed with 750 tokens, while low-income individuals were endowed with 250 tokens. MPCR in this table refers to the return per token invested in the public account. In homogeneous returns groups, all individuals earned the same return (0.5¢) from every token invested in the public account. In increasing returns groups, high-income individuals earned 0.75¢ and low-income individuals earned 0.25¢ from every token invested in the public account, while the opposite was true for decreasing returns groups.

incorporating those elements, we can write the payoff individual i realizes from the VCM as

$$(1) \qquad u_i = (w_i - g_i) + ag_i + a\sum_{j=1}^{3} g_j(\bar{g}),$$

where w_i is the initial endowment for individual i, g_i is own contribution to the public account, a is the MPCR, the first term on the right side represents the payoff from own investment in the private good, the second term is the payoff from own contribution to the public good, and the third term is the payoff from the contributions of other members to the public good. The positive correlation between individual contributions and group average contributions is captured by writing g_j as a function of $\bar{g}$, with $\frac{\partial g_j}{\partial \bar{g}} > 0$. Thus, we assume that individual i is aware of, or believes in, this relationship when deciding how much to invest in the public account.

Following this framework, we can represent the payoff of a low-income individual in a separated income group by

$$(2) \qquad u_i^P = \left(w_i^P - g_i^P\right) + ag_i^P + a\sum_{j=1}^{3} g_j^P(\bar{g}).$$

On the other hand, the payoff of a low-income individual in a mixed income group is given by

$$(3) \qquad v_i^P = \left(w_i^P - g_i^P\right) + ag_i^P + a\delta g_j^P(\bar{g}) + a\gamma\sum_{k=1}^{2} g_k^R(\bar{g}),$$

where δ and γ are reaction factor parameters that capture how low- and high-income individuals react to the general presence of members from the opposite income type. The idea behind those parameters is that, *ceteris paribus*, individuals might choose to change their contributions to the public good merely because they find themselves interacting with individuals from a different income class. For instance, the presence of high-income individuals might increase or decrease the low-income type's general aptitude for giving compared to what they would do in a separated income group. Over the course of the experiment, it is reasonable to assume that those parameters will depend positively on own MPCR and group average contributions. Hence, we can write them as $\delta(a, \bar{g})$ and $\gamma(a, \bar{g})$, with positive partial derivatives. If high- and low-income individuals are not responsive to the presence of the opposite income type, then γ and δ will take a value of 1. If they react positively (negatively) with a general increase (decrease) in contributions, then γ and δ will be greater (less) than 1.

Given this structure, we can consider the three possible behavioral changes a low-income individual can decide on as a result of playing with individuals from the opposite income type. Relative to what they would have done in a separated income group, low-income individuals can increase or decrease their contributions or keep them unchanged. We start with the change in payoff resulting from an increase in contributions. Assuming the individual contributes g_{oi}^P in the separated income group and g_{Hi}^P in the mixed income group (with $g_{Hi}^P > g_{oi}^P$), and denoting $\Delta g_{Hi}^P = \left(g_{Hi}^P - g_{oi}^P\right)$, we subtract equation (2) from equation (3) to get

$$\Delta u_i^P = (a-1)\,\Delta g_{Hi}^P + a\left[\delta g_j^P(\bar{g}_H) - g_j^P(\bar{g}_o)\right] + a\left[\gamma \sum_{k=1}^{2} g_k^R(\bar{g}_H) - \sum_{l=1}^{2} g_l^P(\bar{g}_o)\right]. \tag{4}$$

The first term on the right side is the change in payoff resulting from the increased investment in the public account and the decreased investment in the private account. This is straightforward since increasing one's contribution to the public good necessitates withdrawing that amount from the private account. The second term captures the gain or loss from the change in the behavior of the other low-income individual between separated and mixed income groups. Finally, the third term represents the gain or loss resulting from the difference in the contributions of the two remaining high-income individuals in the mixed income group and the two remaining low-income individuals in the separated income group.

Similarly, we denote $\Delta g_{Li}^P = \left(g_{Li}^P - g_{oi}^P\right)$ and write the change in payoff of low-income individuals if they decrease their contribution from g_{oi}^P to g_{Li}^P in the mixed income group as

$$\Delta u_i^P = (a-1)\,\Delta g_{Li}^P + a\left[\delta g_j^P(\bar{g}_L) - g_j^P(\bar{g}_o)\right] + a\left[\gamma \sum_{k=1}^{2} g_k^R(\bar{g}_L) - \sum_{l=1}^{2} g_l^P(\bar{g}_o)\right]. \tag{5}$$

Finally, the change in their payoff resulting from a no change in contribution can be written as

$$\Delta u_i^P = a\left[\delta g_j^P(\bar{g}_o) - g_j^P(\bar{g}_o)\right] + a\left[\gamma \sum_{k=1}^{2} g_k^R(\bar{g}_o) - \sum_{l=1}^{2} g_l^P(\bar{g}_o)\right]. \tag{6}$$

A payoff-maximizing agent will select the strategy that generates the most favorable change in outcome. While the first term is clearly negative in equation (4) and positive in equation (5), the outcome of the second and third terms depends on how the individual perceives δ and γ. It is straightforward to see that those terms are positively correlated with own contribution. Hence, they are higher in equation (4) than in equation (5). This creates the trade-off that defines the change in behavior. If individuals believe the benefits gained by increasing the contribution from g_{oi}^P to g_{Hi}^P (the last two terms in equation 4) outweigh the losses realized from the lower payoff generated by their own investments (the first term in equation 4), then they are better off increasing contributions in the mixed relative to the separated income group. If the opposite is true, then they are better off decreasing contributions. Finally, if they think the changes offset each other, then they are better off not changing their behavior. Similar logic can be applied to high-income individuals. This leads to our first hypothesis.

HYPOTHESIS 1. *The individual's perception of δ and γ dictates their preferred change in behavior when playing with members from the opposite income type. They will select the strategy that maximizes their payoff.*

Based on this model, we can investigate the effects of changing the return from the public good (i.e., changing a) to understand potential changes in behavior under heterogeneous MPCR. Looking at equation (4), we see that as a increases, the first term becomes less negative (less positive in equation 5), while the second and third terms are scaled up. Moreover, considering the experimental design, we note that $\delta(a,\bar{g})$ and $\gamma(a,\bar{g})$ move in opposite direction, since both are

Table 2. Average Contributions and Percentage Contributions by Treatment and Income Type

Separated Groups, Homogeneous Returns (SHR)	High Income	Low Income	Mixed Groups, Homogeneous Returns (MHR)	High Income	Low Income
Contribution	279.7	104.9	Contribution	224.5	124.6
	(258.136)	(78.968)		(205.234)	(99.422)
Percentage contribution	0.37	0.42	Percentage contribution	0.30	0.50
	(0.344)	(0.316)		(0.274)	(0.398)

Mixed Groups, Increasing Returns (MIR)	High Income	Low Income	Mixed Groups, Decreasing Returns (MDR)	High Income	Low Income
Contribution	424.5	107.8	Contribution	132.4	131.2
	(272.971)	(94.012)		(180.401)	(87.761)
Percentage contribution	0.57	0.43	Percentage contribution	0.18	0.52
	(0.364)	(0.376)		(0.241)	(0.351)

Notes: This table presents the average contributions and average percentage contributions of high- and low-income individuals to the pubic account for the baseline (SHR) and each treatment. High-income individuals were endowed with 750 tokens, while low-income individuals were endowed with 250 tokens. Separated income groups contained either four high-income or four low-income individuals, while mixed income groups contained two high-income and two low-income individuals. In homogeneous returns groups, all individuals earned the same return (0.5¢) from every token invested in the public account. In increasing returns groups, high-income individuals earned 0.75¢ and low-income individuals earned 0.25¢ from every token invested in the public account, while the opposite was true for decreasing returns groups. Numbers in parentheses are standard deviations.

positively correlated with a, which either increases for low-income individuals and decreases for high-income individuals or vice versa. Hence, the change in behavior when heterogeneity in MPCR is introduced depends on the individual's perception of potential changes in outcome resulting from alterations in $\delta(a,\bar{g})$ and $\gamma(a,\bar{g})$, which leads to the second hypothesis.

HYPOTHESIS 2. *Changes in MPCR can stimulate further changes in contribution through their impact on* $\delta(a,\bar{g})$ *and* $\gamma(a,\bar{g})$.

Results

Table 2 presents a breakdown of average total contributions and average percentage contributions by treatment and income type. The average contributions of low-income individuals are significantly higher in the MHR and MDR treatments than in the SHR and MIR treatments. In fact, besides the comparison between MHR and MIR, which was marginally significant (t-test, p-value = 0.09), all cross comparisons of MHR and MDR with SHR and MIR were significant at the 95% confidence level (t-test, p-value <0.05). This is evidence that low-income individuals contribute more to the public good when high-income individuals are present and the public good bears equal or more benefit to them. More importantly, the result indicates that the mere presence of high-income individuals causes low-income individuals to increase their contributions to the public good even when MPCR is left unchanged. Perhaps this behavior represents a deliberate attempt by low-income individuals to signal low free-riding tendencies to the high-income type, thus encouraging them to increase their contributions to the public good. By pooling in the resources of the high-income type, low-income individuals can increase their overall return by reaping the benefits generated from the public good.

Table 3 presents the payoffs that would arrive from the two extreme strategies: full cooperation (*FC*), where everyone contributes their entire endowment to the public good, and free-riding (*FR*), where everyone contributes nothing to the public good. This adds perspective to our results and helps explain the lack of change in contributions of low-income individuals between the SHR and MIR treatments. As we can see, the cooperative outcome carries the same return to low-income

Table 3. Expected Payoff Summary by Treatment and Endowment Type

Separated Groups, Homogeneous Returns (SHR)			Mixed Groups, Homogeneous Returns (MHR)		
	FC	*FR*		*FC*	*FR*
Low income	$5	$2.5	Low income	$10	$2.5
High income	$15	$7.5	High income	$10	$7.5
Mixed Groups, Increasing Returns (MIR)			**Mixed Groups, Decreasing Returns (MDR)**		
	FC	*FR*		*FC*	*FR*
Low income	$5	$2.5	Low income	$15	$2.5
High income	$15	$7.5	High income	$5	$7.5

Notes: This table presents the payoffs that would arise from the full cooperation (*FC*) and free-riding (*FR*) strategies. *FC* refers to the strategy in which every member in the group contributes all of their endowment to the public good, and *FR* is the strategy in which every member in the group completely free-rides and contributes nothing to the public good. High-income individuals were endowed with 750 tokens, while low-income individuals were endowed with 250 tokens. Separated income groups contained either four high-income or four low-income individuals, while mixed income groups contained two high-income and two low-income individuals. In homogeneous returns groups, all individuals earned the same return (0.5¢) from every token invested in the public account. In increasing returns groups, high-income individuals earned 0.75¢ and low-income individuals earned 0.25¢ from every token invested in the public account, while the opposite was true for decreasing returns groups.

individuals in the SHR and MIR treatments. It is important to highlight that following our previous reasoning, low-income individuals are only keen on encouraging higher contributions from high-income individuals when the presence of those individuals provides an added benefit that could potentially be realized from the public good. In other words, low-income individuals should only contribute more in the MHR and MDR treatments since the presence of high-income individuals in those two treatments inflates their potential return from the public good to $10 and $15, respectively. This is exactly what we observe.

For high-income individuals, it is clear that average contributions are significantly lower in the MHR and MDR treatments than in the SHR and MIR treatments. Besides the comparison between SHR and MHR, which was significant at the 95% confidence level (*t*-test, *p*-value = 0.024), all cross comparisons of MHR and MDR with SHR and MIR were significant at the 99% confidence level (*t*-test, *p*-value = 0.000). In this sense, high-income individuals contribute less to the public good when low-income individuals are present and the public good bears equal or less benefit to them. More importantly, this result implies that the mere presence of low-income individuals causes high-income individuals to decrease their contributions to the public good even when MPCR is left unchanged. This can be driven by both self-centered interest and a precautionary tendency that becomes more prominent in the presence of the low-income type. Again, the payoff matrix in Table 3 provides more insight into this hypothesis. Under altruism and inequality aversion, we would expect no change, or even an increase, in the contributions of high-income individuals in the MHR and MDR treatments, since that would benefit low-income individuals and help decrease the earnings gap between the two types. However, the fact that contributions by high-income individuals significantly decreased in those treatments implies that even though altruism and/or inequality aversion might still hold some effect, they are overshadowed by motivations of self-interest and mistrust.

From the perspective of high-income individuals, the probability of free-riding is higher when the low-income type is present. This is because it is more likely that someone with a low income would free-ride and depend on high-income individuals to contribute to the public good. Therefore, driven by a self-centered interest not to be taken advantage of, high-income individuals decrease their contributions to the public good. The fact that contribution levels of the high-income type are lowest in the MDR treatment favors self-interest as the dominant force driving their behavior. Here, the public good carries more value to low-income individuals, which significantly decreases their free-riding motivations. Generous contributions by high-income individuals in this treatment can only be explained by altruism and/or inequality aversion, since the high-income type is better off with the *FR* scenario in this case. However, the sharp decrease in their average contributions to a

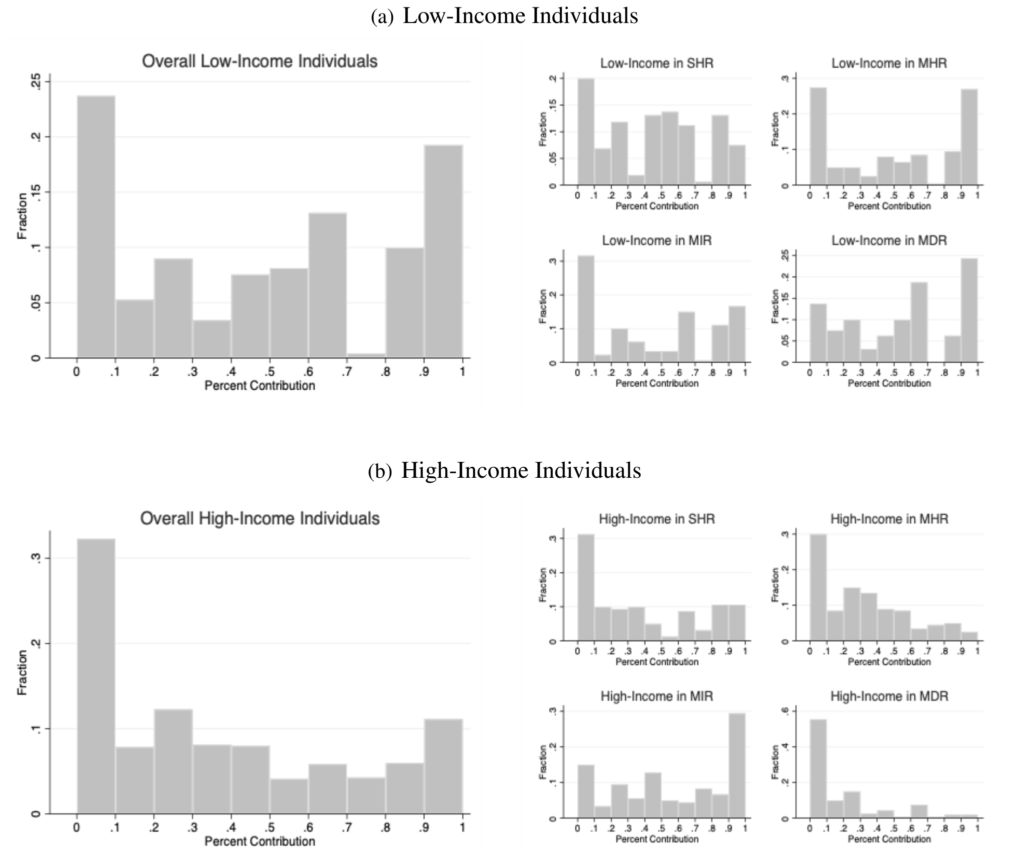

Figure 1. Histograms of Percent Contribution by Treatment and Endowment Type

Notes: SHR, MHR, MIR, and MDR refer to the separated groups homogeneous returns, mixed groups homogeneous returns, mixed groups increasing returns, and mixed groups decreasing returns treatments, respectively. In the SHR treatment, each group contained four high-income or four low-income individuals. In the MHR, MIR, and MDR treatments, each group contained two high-income and two low-income individtuals. High-income individuals were endowed with 750 tokens and low-income individuals were endowed with 250 tokens. In the SHR and MHR treatments, each group member received 0.5¢ per token invested in the public account. In the MIR treatment, high-income individuals received 0.75¢ and low-income individuals received 0.25¢ for every token invested in the pubic account, while the opposite was true in the MDR treatment.

mere 18% supports the hypothesis regarding self-interest as one of the main motivations driving the behavior of the high-income type.

Histograms of percentage contributions for low- and high-income individuals are presented in Panels A and B of Figure 1, respectively. The left side of the panels separates percentage contribution into 10 categories ranging from 0% to 100% and shows the fraction of the overall low- and high-income samples in each category. The right side of the panels shows a breakdown by treatment. The clustering of observations in the 0–0.1 interval for both income types under all treatments is evidence of free-riding behavior, at least among some individuals. However, it is also important to note the clustering at the 0.9–1 interval in most cases. For low-income individuals, we observe a significant rightward shift in the histogram of contributions under the MHR and MDR treatments (Kolmogorov-Smirnov test, p-value <0.027). On the other hand, we also observe a leftward shift in the histogram of contributions for high-income individuals under those treatments (Kolmogorov-Smirnov test, p-value <0.013). This supports our previous results.

Table 4 estimates the effects of the different treatments on the percentage contribution of high- and low-income individuals using several Tobit regression specifications in order to ensure robustness of the above results. The specification in column 1 combines the treatment effects across high- and low-income individuals and reports the overall effect of each treatment on percentage

Table 4. Tobit Model Capturing Average Treatment Effects for High- and Low-Income Types (*N*=1,400)

Variable	Parameter 1	Parameter 2	Parameter 3	Parameter 4
Constant	0.434***	0.398***	0.506***	0.262***
	(0.030)	(0.037)	(0.044)	(0.047)
High income	−0.149***	−0.073	−0.073	−0.066
	(0.026)	(0.052)	(0.052)	(0.052)
MHR	0.022	0.121**	0.120**	0.081*
	(0.037)	(0.050)	(0.050)	(0.051)
MIR	0.140***	−0.008	−0.007	−0.045
	(0.038)	(0.052)	(0.051)	(0.052)
MDR	−0.041	0.160***	0.160***	0.137***
	(0.039)	(0.053)	(0.052)	(0.053)
MHR × high income		−0.197***	−0.197***	−0.195***
		(0.071)	(0.070)	(0.070)
MIR × high income		0.291***	0.290***	0.312***
		(0.073)	(0.072)	(0.073)
MDR × high income		−0.407***	−0.408***	−0.409***
		(0.075)	(0.075)	(0.074)
period		–	−0.020***	–
			(0.004)	
male		–	–	0.049*
				(0.026)
schoolyr		–	–	0.049***
				(0.012)
Sigma	0.478***	0.460***	0.456***	0.456***
	(0.012)	(0.011)	(0.011)	(0.011)
Log likelihood	−1,117.188	−1,068.572	−1,058.503	−1,057.963

Notes: The data contain 258 left-censored and 175 right-censored observations. Single, double, and triple asterisks (*,**,***) indicate statistical significance at the 10%, 5%, and 1% level. MHR, MIR, and MDR refer to the mixed groups homogeneous returns, mixed groups increasing returns, and mixed groups decreasing returns treatments, respctively. In all these treatments, each group contained two high-income and two low-income individuals, in which high-income individuals were endowed with 750 tokens and low-income individuals were endowed with 250 tokens. In the MHR treatment, each group member received 0.5¢ per token invested in the public account. In the MIR treatment, high-income individuals received 0.75¢ and low-income individuals received 0.25¢ for every token invested in the group account, while the opposite was true in the MDR treatment. *period* refers to the round number, *male* is an indicator variable that takes the value 1 if the subject is a male, and *schoolyr* refers to whether the subject is a freshman, sophomore, junior, or senior student.

contributions. The treatment effects are investigated separately for high- and low-income individuals in column 2 by interacting each treatment variable with an indicator variable for the high-income type. Learning effects are examined in column 3 by including the variable period, which represents the round number, while column 4 controls for the demographic effects of gender and school year.

Our results are consistent with the universal finding in the literature concerning the presence of a learning effect. We observe a significant, albeit small, downward trend across periods as shown by the negative coefficient on the variable period in column 2. More importantly, looking at the treatment effects for high- and low-income individuals (columns 2–4), it is clear that the results in Table 4 strongly support our conclusions. Low-income individuals contribute significantly more in the MHR and MDR treatments, while high-income individuals contribute significantly less in those treatments under all specifications. This increases our confidence regarding the hypothesized opportunistic and self-centered motivations of low- and high-income individuals respectively.

Looking at the combined treatment effects in column 1, the estimate was only significant for the MIR treatment, where overall contributions under this treatment were higher than in the baseline. This might be due to the relatively large contributions by the high-income type under this treatment. On the other hand, the lack of significance in the combined treatment effects under the MHR and MDR treatments can be explained by the offsetting effects of those treatments on the contributions of high- and low-income individuals. Although the higher overall contributions to the public good under the MIR treatment might signal a more efficient outcome, the fact that the bulk of those contributions come from high-income individuals indicates a disproportionate degree of free-riding under this treatment. Finally, concerning demographic effects, the results indicate a slightly higher contribution rate among males relative to females and among upper-school relative to lower-school year students.

Finite Mixture Model

The robust findings presented in the previous section allow for the modeling of various types of high- and low-income individuals. Specifically, the high- and low-income types were each classified into two categories based on the observed behavior across treatments.[4] Given the observed clustering of observations on the lower and upper limits, it is appropriate to consider a two-limit censored model, where we define the latent variable y^* as desired contribution. Low-income individuals were modeled as either "free-riders" or "opportunists." Although free-riders are typically individuals who always contribute 0 to the public good, the term was used more loosely here to allow for the possibility of mistakes and/or loss of concentration. This was done using a tremble parameter to include individuals who contribute very low amounts on most occasions among free-riders. Opportunists are defined as individuals who contribute more in the presence of the high-income type, but only when this presence carries potential benefits to them. Hence, while the desired contribution of free-riders is consistently near 0 and is not related to other variables, the desired contribution of opportunists was assumed to depend linearly on a set of explanatory variables as follows:

$$y^*_{opp} = \beta_0 + \beta_1 \times T + \beta_2 \times period + \beta_3 \times male + \beta_4 \times schoolyr + \varepsilon, \tag{7}$$

where y^*_{opp} is the desired contribution of opportunists, T is a binary variable that takes a value of 1 if the high-income type is present and the situation is beneficial for low-income individuals (i.e., in the MHR and MDR treatments) and 0 otherwise, and $\varepsilon \sim N\left(0,\ \sigma^2\right)$. The other explanatory variables are as described in Table 4.

High-income individuals were modeled as "free-riders" or "selfists." Here, selfists are defined as individuals who contribute less in the presence of low-income individuals, when this presence brings a potential disadvantage to them. Again, the less rigid definition of free-riders was adopted here, and their desired contribution was assumed not to depend on other variables. On the other hand, the desired contribution of selfists was specified linearly as follows:

$$y^*_{slf} = \beta_0 + \beta_1 \times T + \beta_2 \times period + \beta_3 \times male + \beta_4 \times schoolyr + \varepsilon, \tag{8}$$

where y^*_{slf} is the desired contribution of selfists, T is a binary variable that takes a value of 1 if the low-income type is present and the situation is disadvantageous for high-income individuals (i.e., in the MHR and MDR treatments) and 0 otherwise, and $\varepsilon \sim N\left(0,\ \sigma^2\right)$.

[4] The model used in this analysis is similar to that in Bardsley and Moffatt (2007).

While the latent variable y^* can take any value, the observed contribution y is restricted to values within the allowable range [0, endowment]. The relationship between actual contribution y and desired contribution y^* is as follows:

For opportunists and selfists:

$$y = \begin{cases} 0 & \text{if } y^* \leq 0 \\ y^* & \text{if } 0 \leq y^* \leq y^{\max} \\ y^{\max} & \text{if } y^* \geq y^{\max} \end{cases}. \tag{9a}$$

For free-riders:

$$y = 0, \tag{9b}$$

where $y^{\max}$ is 750 tokens for high-income individuals and 250 tokens for low-income individuals.

A tremble parameter, ω, was introduced to account for possible loss of concentration. In any round, there is a probability ω that the individual will lose concentration and choose his/her contribution randomly. The tremble parameter has been previously used in the literature (Bardsley and Moffatt, 2007; Loomes, Moffatt, and Sugden, 2002) and is specified similarly here, where it is allowed to decay throughout the experiment as follows:

$$\omega = \omega_0 \times \exp\left[\omega_1 \times (period - 1)\right]. \tag{10}$$

With this specification, ω_0 represents the tremble at the beginning of the experiment, while ω_1 represents the rate of decay in the tremble parameter as subjects accumulate experience throughout the experiment. Hence, we expect ω_0 to be positive and ω_1 to be negative.

Table 5 presents the estimated parameters for low- and high-income individuals. As expected, the coefficient on the variable T was positive for opportunists and negative for selfists. This proves that a substantial proportion of low-income individuals behave opportunistically by trying to stimulate more contributions from the high-income type, while the overruling majority of high-income individuals behave in a self-centered manner by keeping the bulk of their endowment rather than sharing it with the low-income type. Interestingly, the fraction of free-riders was significantly higher among low-income individuals. Approximately one-third of low-income individuals were estimated as free-riders compared to only 3% of high-income individuals. Hence, the self-interest exhibited by high-income individuals in the MHR and MDR treatments might be justified by the significant free-riding tendencies of the low-income type.

The two tremble parameters were significant for both income types. While we observe a significant probability that individuals will lose focus at the beginning of the experiment and contribute randomly, this probability declines as subjects gain more experience throughout the experiment. We find that low-income individuals are more prone to losing focus at the start of the experiment and also acquire experience more slowly than high-income individuals. This is most likely due to the task being somewhat more complicated for the low-income type, whose dominant motivation pushes them away from the Nash equilibrium by contributing more, unlike high-income individuals, whose primary motivation is aligned with the Nash equilibrium strategy. Thus, it is reasonable to think that a low-income individual might have a higher tendency to contribute randomly, perhaps in the spirit of exploration. Again, the coefficient on the variable period conforms to the universal finding for both income types, and the coefficients on the demographic variables are in line with the results in Table 4.

Discussion

The observed behavior of high- and low-income individuals provides interesting insights that can potentially explain some of the issues underlying MCPs in generic advertising. For instance, the

Table 5. Finite Mixture, Two-Limit Tobit Model with Tremble (*N*=840)

	Low-Income Individuals		High-Income Individuals	
Variable	Parameter	Std. Error	Parameter	Std. Error
Constant	56.595***	(38.955)	405.630***	(50.793)
T (1 if MHR or MDR)	136.528***	(35.113)	−233.583***	(39.777)
period	−7.938**	(3.885)	−16.731***	(3.728)
male	116.366***	(26.259)	63.897*	(33.639)
schoolyr	43.537***	(12.777)	12.536	(11.202)
Sigma	84.606***	(13.236)	299.148***	(17.952)
Tremble 0	0.619***	(0.037)	0.187*	(0.107)
Tremble 1	−0.031**	(0.013)	−0.368**	(0.188)
P_{opp}/P_{slf}	0.654***	(0.035)	0.973***	(0.043)
Log likelihood	−3,774.451		−4,684.720	

Notes: Single, double, and triple asterisks (*,**,***) indicate statistical significance at the 10%, 5%, and 1% level. The variable T takes a value of 1 for the MHR and MDR treatments and 0 otherwise. In both MHR and MDR, each group is made up of two high-income and two low-income individuals. High-income individuals were endowed with 750 tokens and low-income individuals were endowed with 250 tokens. In the MHR treatment, each group member received 0.5¢ per token invested in the public account. In the MDR treatment, high-income individuals received 0.25¢ and low-income individuals received 0.75¢ for every token invested in the group account. *Period* refers to the round number, *male* is an indicator variable that takes a value of 1 if the subject is a male, and *schoolyr* refers to whether the subject is a freshman, sophomore, junior, or senior student. Sigma is the standard deviation of the error term in the regression. Tremble 0 reflects the probability of losing concentration at the beginning of the experiment, while tremble 1 reflects the change in this probability as individuals accumulate experience throughout the rounds. The variable P_{opp}/P_{slf} represents the fraction of low-income "opportunists" and high-income "selfists."

strong opposition to MCPs among large producers might be driven by their undervaluation of the relative gains from the public good. As we show, high-income individuals drastically decrease their contributions when they perceive their gains as smaller than those of the low-income type. This can shed light on the importance of relative benefit (as opposed to absolute benefit) in this setting, where the lower relative gains perceived by large producers could act as the underlying reason for their lack of support for MCPs. This resonates with the larger producers' claim that the cost of generic advertising is higher than the cost of advertising their own brands. For small producers, their opposition to MCPs might stem from the fact that they perceive themselves as voluntary contributors who are willing to cooperate in a voluntary setting but who are being disadvantaged when forced contributions hold them to the same standards as larger producers.

The positive contributions by low-income individuals, and their opportunistic behavior in the presence of the high-income type, is a promising result that could be used to inform the design of more efficient VCMs that ensure higher overall contributions. With mistrust being one of the hypothesized reasons for the lower contributions of high-income individuals in the presence of the low-income type, knowledge that low-income individuals are actually contributing more can be an important factor in resolving this trust issue in the VCM. This being said, the relatively higher free-riding tendency among low-income individuals is a concern that deserves further attention. More studies are needed to examine design elements that can discourage free-riding among low-income individuals as this has the potential to lead to significant improvements in the efficiency of VCMs.

When considering the potential implications of the observed results, it is important to note a few ways in which the details of this experimental study depart from the real-world environment of generic advertising programs. First, there was an absence of context in the VCM investigated here, where subjects invested generic tokens into private and public accounts that yielded back dollars. While this is useful in isolating the pure effect of income and relative return heterogeneities on contribution behavior, introducing context related to generic advertising, which attaches a stronger meaning to the public good and emphasizes the stronger attachment to industry and peers, will most likely have a significant effect on decisions. Indeed, there is a long stream of research proving the effect of context on individual decisions (Andreoni, 1995b; Cookson, 2000; LeBoeuf and Shafir, 2003; Dreber et al., 2013). In this sense, the present study can be viewed as a benchmark that builds a behavioral framework to explain contributions under income and relative return heterogeneities in VCMs. This can hopefully motivate future studies to build on this background by incorporating contextual details into the economic environment.

The lack of information on individual subjects' contributions is another way in which this design abstracts from the real-world. Although subjects were given information regarding total group contributions to the public account in each round, the individual contributions of each member remained confidential and were not disclosed to the other members in the group. This runs counter to the public knowledge structure of checkoff programs, where contributions could be acquired through a Freedom of Information Act (FOIA) request. To the extent that this study serves as a benchmark for understanding behavior under income and relative return heterogeneities, this specific design feature was implemented to facilitate comparison with previous studies on giving behavior in VCMs that apply anonymity to eliminate reputation effects (Isaac and Walker, 1988b; Buckley and Croson, 2006; Reeson and Tisdell, 2008; Koukoumelis, Levati, and Weisser, 2012). Building on this work, it would be interesting to investigate how access to individual contributions affects the behavior of high- and low-income individuals as this can hold important implications for policies advocating VCMs in generic advertising programs. Perhaps learning about the increasing contributions of opportunists can encourage high-income individuals to contribute more to the public good. Additionally, the awareness that individual contributions are part of public knowledge might stimulate more opportunistic behavior from low-income individuals. In this way, relaxing anonymity might lead to further improvements in the efficiency of the VCM.

Conclusion

The strong opposition facing MCPs, and the recent court rulings against their use in generic advertising across several industries, draw interest toward voluntary mechanisms, which offer a convenient and viable alternative. The vast evidence of sizable positive contributions in VCMs motivated a large body of work to investigate the underlying drivers of this behavior. This article examines the interplay between income and relative return heterogeneities and the role of these factors in determining voluntary contributions to public goods.

A control and three treatments were constructed, in which high- and low-income individuals were allowed to play separately and in mixed groups with homogeneous and heterogeneous marginal per capita returns (MPCR). On average, low-income subjects displayed higher cooperative behavior in the presence of the high-income type, but only in situations where this presence carried potential advantages to them. On the other hand, high-income subjects displayed lower cooperation in the presence of the low-income type when this presence carried potential disadvantages to them. Moreover, there was evidence of free-riding behavior among both income types, which stimulated the structural modeling of different behavioral classifications within each income type and the estimation of the main characteristics of those classifications.

The overall behavior of low-income individuals can be well explained by the presence of free-riders, who in most cases contribute very small amounts to the public good, and opportunists, who strategically try to attract and benefit from higher contributions by the high-income type. As for high-income individuals, their behavior was explained by the presence of free-riders and selfists, who deliberately try to segregate from the low-income type mainly due to a self-centered interest coupled with a sense of caution. It seems that the low-income type has a substantially higher propensity to free-ride compared to the high-income type, which might justify the inclination toward self-interest exhibited by high-income individuals.

In conclusion, this paper provides insights on the motivations driving the behavior of high- and low-income individuals in VCMs. The value of this paper derives from its relevance in real-world applications and its usefulness in informing policy makers about potential interactions between large and small producers in voluntary generic advertising programs. Understanding the dynamic relationship between income and relative returns and how they affect behavior in public goods settings can help us devise more efficient programs that enable higher voluntary contributions to public goods, hence alleviating the conflict over mandatory generic advertising programs. While more work might be necessary to provide a better understanding of the forces that govern behavior in situations with heterogeneous income levels and relative returns, this article serves as a first step in uncovering important ways of targeting the critical elements that can help enhance the efficiency of VCMs.

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References

Alston, J. M., J. A. Chalfant, and N. E. Piggott. "The Incidence of the Costs and Benefits of Generic Advertising." *American Journal of Agricultural Economics* 82(2000):665–671. doi: 10.1111/0002-9092.00058.

Alston, J. M., J. W. Freebairn, and J. S. James. "Beggar-Thy-Neighbor Advertising: Theory and Application to Generic Commodity Promotion Programs." *American Journal of Agricultural Economics* 83(2001):888–902. doi: 10.1111/0002-9092.00217.

Andreoni, J. "Giving with Impure Altruism: Applications to Charity and Ricardian Equivalence." *Journal of Political Economy* 97(1989):1447–1458. doi: 10.1086/261662.

———. "Impure Altruism and Donations to Public Goods: A Theory of Warm-Glow Giving." *Economic Journal* 100(1990):464–477. doi: 10.2307/2234133.

———. "Cooperation in Public-Goods Experiments: Kindness or Confusion?" *American Economic Review* 85(1995a):891–904.

———. "Warm-Glow versus Cold-Prickle: The Effects of Positive and Negative Framing on Cooperation in Experiments." *Quarterly Journal of Economics* 110(1995b):1–21. doi: 10.2307/2118508.

Bardsley, N. "Interpersonal Interaction and Economic Theory: The Case of Public Goods." *Annals of Public and Cooperative Economics* 71(2000):191–228. doi: 10.1111/1467-8292.00140.

Bardsley, N., and P. G. Moffatt. "The Experimetrics of Public Goods: Inferring Motivations from Contributions." *Theory and Decision* 62(2007):161–193. doi: 10.1007/s11238-006-9013-3.

Becker, G. S. "A Theory of Social Interactions." *Journal of Political Economy* 82(1974):1063–1093. doi: 10.1086/260265.

Bergstrom, T., L. Blume, and H. Varian. "On the Private Provision of Public Goods." *Journal of Public Economics* 29(1986):25–49. doi: 10.1016/0047-2727(86)90024-1.

Bohm, P. "Estimating Demand for Public Goods: An Experiment." *European Economic Review* 3(1972):111–130. doi: 10.1016/0014-2921(72)90001-3.

Bolton, G. E., and A. Ockenfels. "ERC: A Theory of Equity, Reciprocity, and Competition." *American Economic Review* 90(2000):166–193. doi: 10.1257/aer.90.1.166.

Brester, G. W., and T. C. Schroeder. "The Impacts of Brand and Generic Advertising on Meat Demand." *American Journal of Agricultural Economics* 77(1995):969–979. doi: 10.2307/1243820.

Buckley, E., and R. Croson. "Income and Wealth Heterogeneity in the Voluntary Provision of Linear Public Goods." *Journal of Public Economics* 90(2006):935–955. doi: 10.1016/j.jpubeco.2005.06.002.

Cardenas, J. C., J. Stranlund, and C. Willis. "Economic Inequality and Burden-Sharing in the Provision of Local Environmental Quality." *Ecological Economics* 40(2002):379–395. doi: 10.1016/S0921-8009(01)00285-3.

Chakravarti, A., and C. Janiszewski. "The Influence of Generic Advertising on Brand Preferences." *Journal of Consumer Research* 30(2004):487–502. doi: 10.1086/380284.

Chan, K. S., S. Mestelman, R. Moir, and R. A. Muller. "The Voluntary Provision of Public Goods under Varying Income Distributions." *Canadian Journal of Economics* 29(1996):54–69. doi: 10.2307/136151.

———. "Heterogeneity and the Voluntary Provision of Public Goods." *Experimental Economics* 2(1999):5–30. doi: 10.1023/A:1009984414401.

Chung, C., F. B. Norwood, and C. E. Ward. "Producer Support for Checkoff Programs: The Case of Beef." *Choices* 21(2006):79–82.

Cookson, R. "Framing Effects in Public Goods Experiments." *Experimental Economics* 3(2000):55–79. doi: 10.1023/A:1009994008166.

Crespi, J. M. "The Generic Advertising Controversy: How Did We Get Here and Where Are We Going?" *Review of Agricultural Economics* 25(2003):294–315. doi: 10.1111/1467-9353.00140.

Crespi, J. M., and S. Marette. "Generic Advertising and Product Differentiation." *American Journal of Agricultural Economics* 84(2002):691–701. doi: 10.1111/1467-8276.00328.

Crespi, J. M., and R. McEowen. "The Constitutionality of Generic Advertising Checkoff Programs." *Choices* 21(2006):6–65.

Croson, R. T. A. "Theories of Commitment, Altruism and Reciprocity: Evidence from Linear Public Goods Games." *Economic Inquiry* 45(2007):199–216. doi: 10.1111/j.1465-7295.2006.00006.x.

Dreber, A., T. Ellingsen, M. Johannesson, and D. G. Rand. "Do People Care about Social Context? Framing Effects in Dictator Games." *Experimental Economics* 16(2013):349–371. doi: 10.1007/s10683-012-9341-9.

Fehr, E., and S. Gächter. "Altruistic Punishment in Humans." *Nature* 415(2002):137–140. doi: 10.1038/415137a.

Fehr, E., and K. M. Schmidt. "A Theory of Fairness, Competition, and Cooperation." *Quarterly Journal of Economics* 114(1999):817–868. doi: 10.1162/003355399556151.

Fischbacher, U. "z-Tree: Zurich Toolbox for Ready-Made Economic Experiments." *Experimental Economics* 10(2007):171–178. doi: 10.1007/s10683-006-9159-4.

Fischbacher, U., and S. Gächter. "Social Preferences, Beliefs, and the Dynamics of Free Riding in Public Goods Experiments." *American Economic Review* 100(2010):541–556. doi: 10.1257/aer.100.1.541.

Fischbacher, U., S. Gächter, and E. Fehr. "Are People Conditionally Cooperative? Evidence from a Public Goods Experiment." *Economics Letters* 71(2001):397–404. doi: 10.1016/S0165-1765(01)00394-9.

Fisher, J., R. M. Isaac, J. W. Schatzberg, and J. M. Walker. "Heterogeneous Demand for Public Goods: Behavior in the Voluntary Contributions Mechanism." *Public Choice* 85(1995):249–266. doi: 10.1007/BF01048198.

Isaac, R., J. M. Walker, and A. W. Williams. "Group Size and the Voluntary Provision of Public Goods: Experimental Evidence Utilizing Large Groups." *Journal of Public Economics* 54(1994):1–36. doi: 10.1016/0047-2727(94)90068-X.

Isaac, R. M., and J. M. Walker. "Communication and Free-Riding Behavior: The Voluntary Contribution Mechanism." *Economic Inquiry* 26(1988a):585–608. doi: 10.1111/j.1465-7295.1988.tb01519.x.

———. "Group Size Effects in Public Goods Provision: The Voluntary Contributions Mechanism." *Quarterly Journal of Economics* 103(1988b):179–199. doi: 10.2307/1882648.

Isariyawongse, K., Y. Kudo, and V. J. Tremblay. "Generic and Brand Advertising in Markets with Product Differentiation." *Journal of Agricultural & Food Industrial Organization* 5(2007). doi: 10.2202/1542-0485.1179.

Kachelmeier, S. J., and M. Shehata. "Internal Auditing and Voluntary Cooperation in Firms: A Cross-Cultural Experiment." *Accounting Review* 72(1997):407–431.

Kahneman, D., and J. L. Knetsch. "Valuing Public Goods: The Purchase of Moral Satisfaction." *Journal of Environmental Economics and Management* 22(1992):57–70.

Kaiser, H., O. D. Forker, J. E. Lenz, and C.-H. Sun. "Evaluating Generic Dairy Advertising impacts on Retail, Wholesale, and Farm Milk Markets." *Journal of Agricultural Economics Research* 44(1992):3–17.

Kinateder, M., and L. P. Merlino. "Public Goods in Endogenous Networks." *American Economic Journal: Microeconomics* 9(2017):187–212. doi: 10.1257/mic.20140276.

Kosfeld, M., A. Okada, and A. Riedl. "Institution Formation in Public Goods Games." *American Economic Review* 99(2009):1335–1355. doi: 10.1257/aer.99.4.1335.

Koukoumelis, A., M. V. Levati, and J. Weisser. "Leading by Words: A Voluntary Contribution Experiment with One-Way Communication." *Journal of Economic Behavior & Organization* 81(2012):379–390. doi: 10.1016/j.jebo.2011.11.007.

Krishnamurthy, S. "The Effect of Provision Points on Generic Advertising Funding." *Marketing Letters* 12(2001):315–325. doi: 10.1023/A:1012268221707.

LeBoeuf, R. A., and E. Shafir. "Deep Thoughts and Shallow Frames: On the Susceptibility to Framing Effects." *Journal of Behavioral Decision Making* 16(2003):77–92. doi: 10.1002/bdm.433.

Liu, D. J., and O. D. Forker. "Optimal Control of Generic Fluid Milk Advertising Expenditures." *American Journal of Agricultural Economics* 72(1990):1047–1055. doi: 10.2307/1242636.

Loomes, G., P. G. Moffatt, and R. Sugden. "A Microeconometric Test of Alternative Stochastic Theories of Risky Choice." *Journal of Risk and Uncertainty* 24(2002):103–130. doi: 10.1023/A:1014094209265.

Messer, K. D., H. M. Kaiser, and G. L. Poe. "Voluntary Funding for Generic Advertising Using a Provision Point Mechanism: An Experimental Analysis of Option Assurance." *Review of Agricultural Economics* 29(2007):612–631. doi: 10.1111/j.1467-9353.2007.00375.x.

Messer, K. D., H. M. Kaiser, and W. D. Schulze. "The Problem of Free Riding in Voluntary Generic Advertising: Parallelism and Possible Solutions from the Lab." *American Journal of Agricultural Economics* 90(2008):540–552. doi: 10.1111/j.1467-8276.2007.01114.x.

Messer, K. D., T. M. Schmit, and H. M. Kaiser. "Optimal Institutional Mechanisms for Funding Generic Advertising: An Experimental Analysis." *American Journal of Agricultural Economics* 87(2005):1046–1060. doi: 10.1111/j.1467-8276.2005.00787.x.

Messer, K. D., H. Zarghamee, H. M. Kaiser, and W. D. Schulze. "New Hope for the Voluntary Contributions Mechanism: The Effects of Context." *Journal of Public Economics* 91(2007):1783–1799. doi: 10.1016/j.jpubeco.2007.08.001.

Moore, E. D., G. W. Williams, M. A. Palma, and L. Lombardini. "Effectiveness of State-level Pecan Promotion Programs: The Case of the Texas Pecan Checkoff Program." *HortScience* 44(2009):1914–1920. doi: 10.21273/HORTSCI.44.7.1914.

Norman, G., L. Pepall, and D. Richards. "Generic Product Advertising, Spillovers, and Market Concentration." *American Journal of Agricultural Economics* 90(2008):719–732. doi: 10.1111/j.1467-8276.2008.01133.x.

Norwood, F. B., C. Winn, C. Chung, and C. E. Ward. "Designing a Voluntary Beef Checkoff." *Journal of Agricultural and Resource Economics* 31(2006):74–92. doi: 10.22004/ag.econ.10149.

Park, E.-S. "Warm-Glow versus Cold-Prickle: A Further Experimental Study of Framing Effects on Free-Riding." *Journal of Economic Behavior & Organization* 43(2000):405–421.

Reeson, A. F., and J. G. Tisdell. "Institutions, Motivations and Public Goods: An Experimental Test of Motivational Crowding." *Journal of Economic Behavior & Organization* 68(2008):273–281. doi: 10.1016/j.jebo.2008.04.002.

Sugden, R. "Reciprocity: The Supply of Public Goods Through Voluntary Contributions." *Economic Journal* 94(1984):772–787. doi: 10.2307/2232294.

Williams, G. W., O. Capps, and M. A. Palma. "Effectiveness of Marketing Promotion Programs: The Case of Texas Citrus." *HortScience* 43(2008):385–392. doi: 10.21273/HORTSCI.43.2.385.

Zheng, Y., T. Bar, and H. M. Kaiser. "Generic Advertising in an Asymmetric Cournot Oligopoly." *American Journal of Agricultural Economics* 92(2010):740–754. doi: 10.1093/ajae/aap032.