An Economic Model for Charitable Donations

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Abstract

This paper examines the effect of message characteristics on donation behavior using an economic model of giving behavior. The utility for giving can come from one's own contribution and possibly from the combined contributions of others. Donors are assumed to be constrained utility maximizers, and the message attributes affect the degree to which they react altruistically or egoistically. The model is estimated with data from an incentive-aligned study of South Korean consumers, and implications for message optimization and donor targeting are explored.

Keywords: Direct Utility, Hierarchical Bayes, Altruism
1 Introduction

The desire to help others is a naturally occurring trait of human behavior. Helping others and doing good is revealed when we make charitable donations, volunteer for community service and assist the elderly. Helping behaviors are important to non-profit organizations operating for the benefit of public welfare, education, health care, disaster relief and other social services. Voluntary donations in the form of money, time and expertise are essential resources that allow charitable organizations to achieve their goals and mission.

The factors affecting giving behavior have been extensively studied in marketing and psychology, where the concept of altruistic, or selfless, motivation is contrasted to egoistic motives for giving (Becker 1974, Bendapudi et al. 1996). Often, the characterization of the motivations is described as a trait-like aspect of one’s personality (Reed et al. 2007), or assumed to be dependent on situational factors that promote empathetic identification with recipients (Small et al. 2007). In reality, it is doubtful that donors act for purely altruistic or purely egoistic reasons during any specific instance of giving. Donors may identify with the recipient, for example, while simultaneously making an anonymous donation. Identifying with the recipient is an egoistic act, while the desire to remain anonymous is altruistic. In this paper we employ a model of giving that represents donors as having a mixture of altruistic and egoistic motivations, referred to as “warm-glow” giving by Andreoni (1989).

Our interest is in understanding aspects of an appeal for donations that drive more altruistic versus more egoistic responses from individual respondents. Appeals that prompt altruistic giving are more likely to be useful early in a donation campaign when it is uncertain if a fund-raising effort will reach its goal because altruistically motivated people give selflessly, and not because others have given or because they want to be associated with a winning campaign. Appeals that prompt egoistic motives will likely be more effective later in a campaign when a large portion of the goal has already been collected. The timing
and nature of appeals for donations are important aspects of campaign management.

We propose a model to study the impact of communication content and timing on individuals’ tendencies to act altruistically. Our model relates aspect of an appeal, such as the visual portrayal of the need, to the amount of giving. The model is similar to the impure altruistic model (Andreoni 1989, 1990) where donations are viewed as an economic outcome arising from an individual’s expenditure allocation between giving and private consumption, or non-giving. Our focus is on understanding factors that influence egoistic versus altruistic giving, and using this information to maximize campaign contributions. This is in contrast to previous literature in economics that focused on the effect of tax incentives on charitable giving. Because our analysis focuses on individual giving behavior, our model allows for both corner and interior solutions whereas the extant models allow for either interior solutions or corner solutions only. Sieg and Zhang (2012), for example, examine donation decisions but not donation amounts and assume that a single decision is made each quarter of the year.

We find that recipient-focused appeals, coupled with the absence of happiness and the high arousal levels result in the highest donation amounts. We also show the value of an appeal depends on when an individual is contacted. We show that appeal customization and timing can lead to a 7-8% lift in expected total donations. We also find that the proposed model leads to more accurate predictions than other, more descriptive models.

The rest of the paper is organized as follows. In next section, we briefly discuss literature related to communication attributes shown to influence charitable donations. We then present our model and present an empirical analysis involving experimental data. Implications of our model for communication timing are discussed, and we conclude with a discussion of issues requiring additional research.
2 Literature Review

Research on effective advertising attributes for prompting giving behavior is summarized in Table 1. Variables identified as often affecting donating behavior are i) the presence or absence of the person receiving the benefit (recipient focused); ii) whether the advertisement evokes an emotional response (emotional); iii) the presence of appeal elements that attempt to arouse the donor (arousal); and iv) the presence of information indicating the donating behavior of others (donation by others). Each of these attributes can be embedded into an advertising campaign and used to appeal to donors.

Table 1: Selected Studies with Donation Conditions

<table>
<thead>
<tr>
<th>Studies</th>
<th>Recipient Focused</th>
<th>Emotional</th>
<th>Arousal</th>
<th>Donations By Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andreoni (1990)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Bagozzi and Moore (1994)</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brunel and Nelson (2000)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cialdini et al. (1987)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dickert et al. (2011)</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Fisher et al. (2008)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Holländer (1990)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Kogut and Ritov (2005)</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Small and Verrochi (2009)</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silverman et al. (1984)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>White and Peloza (2009)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.1 Recipient Focused

example, an advertisement for the Africa Food Crisis can be designed to highlight the plight of African children to promote higher levels of empathy and prosocial behavior in the form of donations (Bagozzi and Moore 1994, Small and Verrochi 2009). Alternatively, an advertisement could focus on the pride and happiness of the donors themselves as they identify with, and support, the mission of the organization. In this case, the motivations for charitable giving may also depend on the donor’s mood (Smith et al. 1989), self-esteem (Batson 1987) and their image to others (Arnett et al. 2003, Baumeister 1982). While the effectiveness of any advertisement is dependent on personal aspects of donors, a substantial body of research has shown that consumers exhibit more donations in response to recipient focus campaign than non-recipient focus appeals (Goffman 1959, Leary and Kowalski 1990, White and Peloza 2009).

2.2 Emotions

Negative emotions (e.g., anger, sadness, fear, and tension) associated with the recipient of a donation has been shown to lead to sympathetic responses (Loewenstein and Small 2007) and helping behavior in many studies (Coke et al. 1978, Bagozzi and Moore 1994, Batson et al. 1997). Previous studies have also found that charitable giving can be increased by increasing the level of sympathy for the recipient (Small and Loewenstein 2003, Kogut and Ritov 2005, Small and Simonsohn 2008). We therefore investigate the effect of emotions on giving behavior (Small and Verrochi 2009).

The positive emotion of empathic joy has also been found to be a key driver in establishing helping relationships. Smith et al. (1989) show that an empathic person is more likely to engage in helping behavior when they anticipate that their plight will be alleviated and that they will share in their joy. Fisher et al. (2008) propose that the effectiveness of a recipient-focused advertisement is enhanced by the recipient’s positive emotions, and that this effect is not present in non-recipient focused advertising.
2.3 Arousal

Arousal is generally seen as an important factor in human psychology. Reviewing a large body of literature, Lang 2000, 2006a,b proposes a model of human information processing in which arousing content evokes more cognitive resources that can be allocated to information processing, resulting in increased attention and improved memory for the subject. Arousal is also linked to immediate behavioral inclinations, backed by emotional responses and increase in reaction speed (Metcalfe and Mischel 1999). The effect of arousal on helping behavior in emergency conditions is reported in multiple studies (Krebs 1975, Gaertner and Dovidio 1977) and conceptualized in a model by Piliavin et al. (1981). However, a large portion of this literature tends to refer to arousal in terms of an intense emotion, which includes other emotions in certain contexts.

While there exists many studies establishing the relationship between arousal, cognition, and behavior in general, there exists fewer studies that relate the effects of arousal on giving behavior. Kogut and Ritov (2005) report that people have a greater willingness to help identified victims than anonymous ones, with identified victims evoking increase arousal and a greater tendency to donate. Dickert et al. (2011) show that mood is an important aspect of donation behavior, with people who experience strong negative arousal from information related to the victim being more likely to donate money.

2.4 Donations by Others

Many of our decisions are influenced by others. Herd behavior posits that individuals in a group imitate others’ behaviors by observing their decisions (Banerjee 1992). Silverman et al. (1984) find herd behavior in donations in their analysis of a 20 hour national telethon that announced the names of individuals pledging money and the total amount of money pledged. They found that contributions to the campaign were greater when contribution information was announced than when it was not provided. In economics, models of altruism incorporate the donations of others by admitting the possibility that utility can
be obtained by one’s own donation and also by the donations of others. These models are based on the assumption that people care about what others do and may alter their behavior based on this information (Holländer 1990, Andreoni 1990).

3 Model Development

In this section we propose an economic utility model for donation behavior and develop the model likelihood using the Kuhn-Tucker conditions associated with constrained optimization.

3.1 Utility Specification

Utility from individual \(i\)’s donation decision is defined as:

\[
    u(g_i, G, z_i) = \gamma_1 i \ln(g_i + 1) + \gamma_2 i \ln(G) + \gamma_3 i \ln(z_i + 1) \tag{1}
\]

subject to

\[
    g_i + z_i = w_i
\]

\[
    g_i + G_{-i} = G
\]

where \(g_i\) is the amount of money donated by person \(i\).

\(z_i\) is the amount of money not donated by person \(i\).

\(w_i\) is the charitable donation budget for person \(i\).

\(G_{-i}\) are the donations given prior to the donation by person \(i\), assumed exogenous.

\(G\) denotes the total donations.
Potential donors are assumed to allocate their charitable donations budget \( (w_i) \) between making a donation \( (g_i) \) and not making a donation \( (z_i) \). The utility function in (1) is additive, but allows for diminishing marginal returns to the donation amount. The offset terms “+1” allow zero allocation to the inside good \( g_i \) and the outside good \( z_i \). The relative strength among the utility parameters \( (\gamma_{1i} \geq 0, \gamma_{2i} \geq 0, \text{ and } \gamma_{3i} \geq 0) \) influences the donation amount, with donations increasing in \( \gamma_{1i} \) and \( \gamma_{2i} \) over the outside good \( \gamma_{3i} \) of private consumption.

Equation (1) allows for the possibility that utility is affected by the giving of others through \( G \). If \( \gamma_{1i} > 0 \) and \( \gamma_{2i} = 0 \), the utility function reflects egoistic behavior as the utility from the donation does not depend on others. If \( \gamma_{1i} = 0 \) and \( \gamma_{2i} > 0 \), then the utility function reflects purely altruistic behavior as the utility from making a donation arises entirely from the total donation amount \( G \), and not the individual’s donation \( g_i \). For \( \gamma_{1i} > 0 \) and \( \gamma_{2i} > 0 \), the function represents warm-glow utility that is a mixture of both egoistic and altruistic sources.

3.2 Incorporating Marketing Variables

We investigate the influence of variables identified as potentially influencing effectiveness of an appeal for a donation by relating them to parameters of the utility function. We denote the advertising attributes as \( d'_t = (d_{1t}, d_{2t}, d_{3t}) \), with \( d_{1t} = 1 \) if an advertisement \( (t) \) is focused on the recipient, \( d_{2t} = 1 \) if the advertisement is emotionally charged, and \( d_{3t} = 1 \) if the advertisement attempts to induce some form of arousal in the respondent, and zero otherwise. The advertising variables are incorporated into the model specification to allow for 2-way interactions:
\[
\ln(\gamma_{1it}) = \beta_{0i} + \beta_{1i}d_{1t} + \beta_{2i}d_{2t} + \beta_{3i}d_{3t} + \beta_{4i}d_{11t}d_{2t} + \beta_{5i}d_{11t}d_{3t} + \beta_{6i}d_{21t}d_{3t} \quad (2)
\]

\[
\ln(\gamma_{2it}) = 0
\]

\[
\ln(\gamma_{3it}) = \alpha_{0i}
\]

The coefficients in (2) measure the effects of the marketing variables on a respondent’s tendency to be egoistic in their donating behavior. Positive \(\beta_i\) coefficients indicate an increased tendency to be egoistic, and negative coefficients indicate the advertisement leads to an altruistic response. We fix \(\gamma_{2i} = 1\) to achieve statistical identification, and estimate \(\ln(\gamma_{3i}) = \alpha_{0i}\). Since \(\gamma_{2i}\) is set to one, the utility specification is technically a warm-glow specification in that no respondent can be purely egoistic in their response. However, as \(\gamma_{1i}\) and \(\gamma_{3i}\) become large, the utility function converges to a pure egoistic model of behavior. Larger values of \(\alpha_{0i}\) indicate that the respondent obtains greater utility from consuming the outside good (non-giving), holding fixed the other coefficients.

### 3.3 Likelihood

We derive the model likelihood using the Kuhn-Tucker (KT) conditions that assume respondents maximize their utility subject to a budget constraint. The marginal utilities associated with charitable giving \((g_{it})\) and non-giving \((z_{it})\) are:

\[
u_{g_{it}} = \frac{\partial u}{\partial g_{it}} = \frac{\gamma_{1it}}{g_{it} + 1} + \frac{\gamma_{2it}}{g_{it} + G_{-it}} \quad (3)
\]

\[
u_{z_{it}} = \frac{\partial u}{\partial z_{it}} = \frac{\gamma_{3it}}{z_{it} + 1} \quad (4)
\]

where the relative size of \(\gamma_{1it}\) to \(\gamma_{2it}\) reflects the relative strength of egoistic to altruistic utility. Since the price of making a donation is the same as keeping a donation, the KT
conditions associated with constrained utility maximization are:

\begin{align*}
    u_{gi} &= u_{zi} \quad \text{if } g_{it} > 0 \text{ and } z_{it} > 0 \\
    u_{gi} &< u_{zi} \quad \text{if } g_{it} = 0 \text{ and } z_{it} > 0 \\
    u_{gi} &> u_{zi} \quad \text{if } g_{it} > 0 \text{ and } z_{it} = 0 \\
\end{align*} 

(5)

A multiplicative error term is introduced to ensure that the marginal utility remains positive. The budgetary constraint \( g_i + z_i = w_i \) induces a singularity in the likelihood so that only one error term is needed. We associated the error with the marginal utility of a donation, i.e., \( u_{gi} \exp(\nu_{it}) \), with \( \nu_{it} \) assumed iid Normal(0,1). Taking logarithms results in the likelihood:

\begin{align*}
    \ln(u_{zi}) - \ln(u_{gi}) &= \nu_{it} \quad \text{if } g_{it} > 0 \text{ and } z_{it} > 0 \\
    \ln(u_{zi}) - \ln(u_{gi}) &< \nu_{it} \quad \text{if } g_{it} = 0 \text{ and } z_{it} > 0 \\
    \ln(u_{zi}) - \ln(u_{gi}) &> \nu_{it} \quad \text{if } g_{it} > 0 \text{ and } z_{it} = 0 \\
\end{align*} 

(6)

The evaluation of the likelihood is straightforward. For a given parameter vector \( \theta_i' = (\alpha_{0i}, \beta_{0i}, \beta_{1i}, \ldots, \beta_{6i}) \) we evaluate the left side of (6) and equate it to either the pdf or cdf of a standard Normal. The pdf evaluation requires a Jacobian to transform the density of the error term \( \nu_{it} \) to the density of the observed data \( g_{it} \):

\begin{equation*}
    J = \frac{\partial \nu_{it}}{\partial g_{it}} = \left[ \frac{\gamma_{1it}}{(g_{it}+1)^2} + \frac{\gamma_{2it}}{(g_{it}+G_{it})^2} \right] + \frac{\gamma_{3it}}{(z_{it}+1)} 
\end{equation*} 

(7)

Heterogeneity is introduced through a continuous random effects distribution:

\begin{equation*}
    \theta_i \sim N(\mu, \Sigma) 
\end{equation*} 

(8)

Estimation is carried out using a Bayesian MCMC algorithm (Rossi et al. 2005) with
default, non-informative priors. In the analysis discussed below we ran the Markov chain for 20,000 iterations, using the first 15,000 iterations for burn-in. The chain converges quickly from multiple starting points.

4 Empirical Analysis

Data were collected as part of an incentive-aligned lottery experiment (Ding et al. 2005) in South Korea. Respondents were recruited from a campus population, representing a typical ‘20-something’ population of young adults. Sixty percent of the participants were male with an average age of 22.5 years. Participants were provided with a probable windfall of KRW 100,000 (South Korean Won), about $100, and invited to make a donation to a charity. They were told that if they won the lottery, all money not given to the charity would be paid directly to them at the end of the study. Each of 206 respondents were provided with 16 descriptions of charities, described below. Results of the lottery for each round were announced after the respondent indicated the amount of their intended donation ($g_{it}$).

“In case you win this round, you may donate money to the organization above. The amount you commit to donate does not affect the chance of winning. Should you win this round, how much of the KRW 100,000 would you like to donate? If you dont want to donate, please enter ‘0’ in the box.”

Participants were informed about winning the lottery after each of the 16 rounds of the experiment. For each round, we assume that $w_{it} = \text{KRW} 100,000$. All money not donated to a charity ($\sum z_{it}$) was paid directly to the respondent at the conclusion of the study. Each participant won the lottery four times.
4.1 Attributes and Levels

Table 2 provides a summary of the manipulated attributes in the study. In addition to the three attributes discussed above coded as dummy variables, i.e., recipient focused, emotional valance and arousal, the amount of donations by others was used as a fourth design variable and included as a continuous variable in the model specification ($G_{-it}$). The amount donated by others took on either high and low values plus some random error so that the amount reported was different over the $2^4 = 16$ design points.

Table 2: Message Attribute-Levels and Coding

<table>
<thead>
<tr>
<th>Attribute Levels</th>
<th>Recipient Focused ($d_1$)</th>
<th>Emotional ($d_2$)</th>
<th>Arousal ($d_3$)</th>
<th>Donations By Others ($G_{-it}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recipient focused</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-recipient focused</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>1</td>
<td></td>
<td></td>
<td>~ KRW 1,000,000,000</td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
<td></td>
<td></td>
<td>~ KRW 500,000</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1 is an appeal that is not focused on the recipient and is not emotionally charged, but does attempt to arouse the reader in the lower right portion of the figure with the use of optimistic statements and exclamation points. In contrast, Figure 2 is recipient focused and makes an emotional appeal by showing a happy school child. This appeal does not attempt to arouse the reader. The attributes levels displayed in Table 2 were systematically varied across the 16 experimental conditions, with half reporting a high level of donations by others and the other half reporting lower levels.
Figure 1: Non-recipient focused, non-emotional, arousal advertisement.

Your $0.50 contribution is worth of $10,000!

United Nations (UN) Stats
Total Fund Raised:
KRW 534,000
Total Donors:
25 people

Envoy of Hope Co.

* 'Envoy of Hope' is participating in vaccination in Africa.
* The Malaria vaccine costs only $0.50 per person!!
* One vaccine today can save $10,000 in medical costs tomorrow!

Figure 2: Recipient-focused, emotional, non-arousal advertisement.

"I get to go to school by bus"

United Nations (UN) Stats
Total Fund Raised:
KRW 1,222,455,000
Total Donors:
13,471 people

Han-Ah Development Fund

* Long commute to school is fun now.
* Your donation can change the lives of children.
4.2 Descriptive Statistics

206 individuals participated in the experiment, each providing 16 responses to charitable appeals for a total of 3296 observations with which to estimate the model. Approximately 16% of the observations were corner solutions where respondents donated either nothing or all of their budget to the charity. Respondents mostly allocated their budget as a mixture of donation \((g_{it})\) and non-donation \((z_{it})\), i.e., an interior solution. Figure 3 displays the distribution of donations in our data. The average donation was KRW 27,400, or about $27.00. The maximum and minimum were KRW 100,000 and 0, respectively. On average, participants elected to make a donation 84% of the time.

Figure 3: Distribution of Donations \((g_{it})\)
The marginal utility of giving, \( u_{g,t} \), in equation (3) decreases when donors are informed of high donation amounts by others, \( G_{-it} \). Table 3 displays donation amounts in our data for high and low values of \( G_{-it} \). We find that the experimental data agree with this property, providing evidence in line with our utility specification.

Table 3: Donations by Other’s Giving (\( G_{-it} \))

<table>
<thead>
<tr>
<th>Condition</th>
<th>Total Donations (KRW 1000)</th>
<th>Mean Donation (KRW 1000)</th>
<th>Median Donation (KRW 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( G_{-it} ) low</td>
<td>46,642</td>
<td>28.3</td>
<td>20</td>
</tr>
<tr>
<td>( G_{-it} ) high</td>
<td>43,909</td>
<td>26.6</td>
<td>15</td>
</tr>
</tbody>
</table>

4.3 Alternative Models

Fourteen observations per respondent were used to estimate the model and two observations were reserved for predictive testing. We compared our proposed model to four alternative specifications. The first two models are nested within our proposed model. The first (M1) is a model of pure altruism where the utility function is specified as:

\[
u(g_i, z_i) = \gamma_2i \ln(g_i + G_{-i}) + \gamma_3i \ln(z_i + 1)\] (9)

The second model (M2) reflects pure egoistic behavior in that the contribution amount of others does not factor into one’s giving behavior:

\[
u(g_i, z_i) = \gamma_1i \ln(g_i + 1) + \gamma_3i \ln(z_i + 1)\] (10)

For the first two alternative models, message attributes where used to allow for variation in the marginal utility parameters.

The third (M3) and fourth (M4) models are purely descriptive models of the data and employ a regression specification that does not distinguish corner from interior solutions. The third alternative model specifies a log-linear model of the data with a slight offset
added to the dependent variable so that the logarithmic specification is valid:

$$\ln(g_{it} + .01) = \beta_0i + \beta_1i d_{1t} + \beta_2i d_{2t} + \beta_3i d_{3t} +$$

$$\beta_4i d_{1t} d_{2t} + \beta_5i d_{1t} d_{3t} + \beta_6i d_{2t} d_{3t} + \beta_7i \ln(G_{-i}) + \varepsilon_{it}$$

The fourth alternative model is a saturated log-linear model that allows for a three-way interaction:

$$\ln(g_{it} + .01) = \beta_0i + \beta_1i d_{1t} + \beta_2i d_{2t} + \beta_3i d_{3t} +$$

$$\beta_4i d_{1t} d_{2t} + \beta_5i d_{1t} d_{3t} + \beta_6i d_{2t} d_{3t} +$$

$$\beta_7i d_{1t} d_{2t} d_{3t} + \beta_8i \ln(G_{-i}) + \varepsilon_{it}$$

All models employed a Normal distribution of heterogeneity and were estimated with Bayesian MCMC using the same default priors.

The results of the model fit for the proposed model and benchmark models are summarized in table 4. The proposed model and the first two benchmark models (M1 and M2) are based on likelihoods that are a combination of mass points and density contributions. We report the log marginal densities (LMD) for these models. The two descriptive models (M3 and M4) have likelihoods that only involve densities, and therefore cannot be directly compared to the other models in terms of in-sample fit. However, a comparison of all models is possible using the holdout data, which we compare using the mean absolute deviation (MAD) and mean squared error (MSE).

<table>
<thead>
<tr>
<th>Model</th>
<th>Coefficients per Respondent</th>
<th>In-Sample</th>
<th>Out-of-Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LMD</td>
<td>LMD</td>
</tr>
<tr>
<td>M0: Proposed Model</td>
<td>8</td>
<td>-10,992</td>
<td>-1,996</td>
</tr>
<tr>
<td>M1: Pure Altruistic</td>
<td>7</td>
<td>-29,373</td>
<td>-14,439</td>
</tr>
<tr>
<td>M2: Pure Egoistic</td>
<td>7</td>
<td>-11,081</td>
<td>-2,024</td>
</tr>
<tr>
<td>M3: Log-Linear</td>
<td>8</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>M4: Saturated Log-Linear</td>
<td>9</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
The proposed model outperforms all the benchmark models in both in-sample and out-of-sample log marginal density (LMD). Comparison of M0 to M1 and M2 indicates that an individual’s donation decision cannot be explained entirely by either the purely altruistic or purely egoistic models. Comparison of M0 to M3 and M4 supports the use of the proposed economic framework relative to a flexible model for predicting donations. We note that the fit of the proposed model M0 to the pure egoistic model M2 is similar, with M0 favored using the out-of-sample LMD, but not favored using the MAD and MSE fit criteria. We further examine the benefit of employing the proposed model in the discussion section below.

4.4 Parameter Estimates

Posterior estimates of parameters for the proposed model are reported in Table 5. Reported are the posterior mean and posterior standard deviation of the mean of the random-effects distribution ($\mu$) along with the random-effects covariance matrix ($\Sigma$). The posterior standard deviation of all coefficients is approximately 0.10. Covariances (off-diagonal elements) in the random-effect distribution are near zero, indicating that the model is well-identified. Diagonal elements of $\Sigma$ are approximately equal to one, indicating heterogeneity in all model parameters.

<table>
<thead>
<tr>
<th>Parm.</th>
<th>Mean</th>
<th>$\alpha_0$</th>
<th>$\beta_0$</th>
<th>$\beta_1$</th>
<th>$\beta_2$</th>
<th>$\beta_3$</th>
<th>$\beta_4$</th>
<th>$\beta_5$</th>
<th>$\beta_6$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha_0$</td>
<td>-0.56</td>
<td>1.44</td>
<td>0.01</td>
<td>-0.02</td>
<td>-0.07</td>
<td>-0.22</td>
<td>-0.06</td>
<td>0.08</td>
<td>-0.05</td>
</tr>
<tr>
<td>$\beta_0$</td>
<td>-2.41</td>
<td>1.44</td>
<td>-0.04</td>
<td>0.09</td>
<td>-0.03</td>
<td>0.00</td>
<td>-0.02</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>$\beta_1$</td>
<td>0.55</td>
<td>0.95</td>
<td>-0.02</td>
<td>-0.11</td>
<td>-0.17</td>
<td>-0.04</td>
<td>-0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\beta_2$</td>
<td>0.09</td>
<td>0.94</td>
<td>0.05</td>
<td>-0.17</td>
<td>-0.07</td>
<td>-0.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\beta_3$</td>
<td>0.50</td>
<td>0.87</td>
<td>0.04</td>
<td>-0.21</td>
<td>-0.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\beta_4$</td>
<td>-0.42</td>
<td>0.95</td>
<td>-0.09</td>
<td>-0.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\beta_5$</td>
<td>-0.14</td>
<td>0.98</td>
<td>-0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\beta_6$</td>
<td>-0.74</td>
<td>0.90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Estimates of the mean of the random-effect matrix ($\mu$) indicates the following. First,
the estimate of $\beta_1$ and $\beta_3$ are both positive, indicating that main-effects for advertisements that are recipient-focused and attempt to arouse the respondent leading to more egoistic responses and greater giving. The positive effect of a recipient-focused effect in advertising is consistent with existing literature (Goffman 1959, Leary and Kowalski 1990, White and Peloza 2009), although its distinction as egoistic has not been made.

Two of the two-way interaction terms ($\beta_4$ and $\beta_6$) are estimated to be negative. The coefficient $\beta_4$ is associated with the interaction between a recipient focused advertisement ($d_1$) and it being positively valanced ($d_2$). The negative coefficient means that the relative marginal utility for making a donation, $u_{git}$, becomes more altruistic when these effects are present. Thus, recipient focused advertisements lead to greater egoistic giving, primarily in the presence of negative emotional valance (e.g., showing recipients in distress) but not in the presence of positive emotional valance (e.g., showing thankful recipients).

The coefficient $\beta_6$ is also negative and associated with the interaction between positive emotional valance ($d_2$) and arousal ($d_3$). The presence of arousal in an advertisement is only effective, on average, when emotional valance is negative. In other words, a call to immediate action in an advertisement is more effective when showing recipients in distress. This finding is consistent with previous research showing that the effectiveness of a recipient-focus advertisement is enhanced by a recipients negative emotions (Fisher et al. 2008, Small and Verrochi 2009), and that empathic arousal leads to altruistic helping (Davis 1994a).

Table 6 displays the estimated contribution of the altruistic to egoistic sources of marginal utility for each of the experimental conditions. From equation (3) we see that the marginal utility of making a donation has two terms – an egoistic term not dependent on the amount that other have given, $G_{-it}$, and an altruistic term that is dependent on the contributions to date. The entries in table 6 are the median values of marginal utility calculated over the posterior distribution of individual-level parameters. As expected, we find that for high values of $G_{-it}$ the altruistic motivation for making a donation is near
zero. Respondents with an altruistic motivation can already see that the need depicted in the appeal is already taken care of when $G_{-it}$ is high, reducing their incentive to make a donation. However, when contributions to date are low, the altruistic motive becomes more pronounced, producing a contribution to marginal utility that is similar in magnitude to the egoistic effect.

Table 6: Source of Marginal Utility

<table>
<thead>
<tr>
<th>Campaign</th>
<th>Recipient Focused</th>
<th>Emotional Valence</th>
<th>Arousal</th>
<th>Average Ratio of Altruistic to Egoistic Marginal Utility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$(d_1)$</td>
<td>$(d_2)$</td>
<td>$(d_3)$</td>
<td>$(G_{-it} \text{ low})$</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.2537</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.2113</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.2330</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.2055</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0.2219</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0.1658</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.2540</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.2298</td>
</tr>
</tbody>
</table>

5 Policy Experiments

Our economic model for donation behavior fits the data best and yields results that are consistent with previous findings in the literature regarding effective attributes for increased giving, egoistic and altruistic behavior. The advantage of our model, however, is that it provides individual-level estimates of the effects of appeal attributes on these aspects of giving behavior. In this section we explore use of these individual-level estimates to improve campaign donations. We examine three issues of interest to campaign managers: i) configuring the best message; ii) message timing; and iii) determining an optimal targeting of donors to maximize receipts.
5.1 Message Configuration

We find in our analysis that the focus of the appeal (recipient or non-recipient), its emotional appeal (present or absent) and arousal factors (present or absent) had an effect on the marginal value of egoistic utility. We define the best advertisement as the one that generates the greatest contribution amount across respondent \((i)\) over different combinations of these effects:

\[
\arg \max_d \sum_i g_i(d_1, d_2, d_3)
\]  

(13)

We calculate the expected contribution of each individual assuming that donors are contacted in descending order of contribution. That is, the first person contacted is identified as having the greatest value of \(g_i\) for \(G_{-i,t=1} = 0\). The second person has the greatest value of \(g_i\) for the remaining respondents with \(G_{-i,t=2} = g_1\), where \(g_1\) is the contribution of the first respondent. The third person has the greatest value of \(g_i\) among those not yet contributing when we set \(G_{-i,t=3} = g_1 + g_2\), and so on.

<table>
<thead>
<tr>
<th>Table 7: Optimal Campaign Message</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recipient Focused</strong></td>
</tr>
<tr>
<td><strong>Campaign</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
</tbody>
</table>

Campaign message six is found to produce the greatest total donation. This message is focused on the recipient, is non-emotional and has elements of arousal that call respondents to action. In general, we find there are large differences among the different
campaigns, and that the coefficient estimates reported in table 5 result in large variation in the expected donations of respondents. In addition, we find that the optimal campaign message six is the campaign that has the lowest ratio of altruistic to egoistic marginal utility (see table 6). This advertisement graphically shows the plight of malnourished and neglected children.

5.2 Timing

Our analysis of the source of marginal utility in table 6 indicates that altruistic motivations for giving are diminished as it becomes known that others have already made contributions to a charitable cause. This raises the issue of the value of sequencing a series of appeals to prospective donors that first appeals to altruistic individuals, and then later to egoistic individuals so that altruistic people don’t feel that people haven’t already contributed enough to cause.

We value the altruistic component of utility by comparing campaign contributions from a sequence of appeals that either begin with an advertisement that is relatively more appealing to an egoistic motive versus an altruistic motive as measured in table 6. Table 8 displays results for alternative sequences comprises of two egoistic campaigns (1 and 3) and two altruistic campaigns (2 and 4). For each sequence, the respondent with the highest contribution amount, \( g_1 = g^* \), is considered to be the first contributor, and we set \( G_{1,1} = g_1 \) as before. The values of \( g^* \) are recalculated for each remaining respondent, with the highest contribution amount set equal to \( g_2 \) and \( G_{1,2} = g_1 + g_2 \), and so on. When the number of respondents with highest contribution equals half the sample, the appeal for donations is changed to that of the second campaign and associated contributions are determined for each respondent.

The top portion of table 8 displays results for the first campaign having relatively higher marginal utility from egoistic motives (high \( \gamma_1 \)) than from the second campaign (see table 6). We note that the average differences of the ratio of altruistic to egoistic
Table 8: Optimal Campaign Timing

<table>
<thead>
<tr>
<th>First Campaign</th>
<th>Second Campaign</th>
<th>Total Donations (KRW 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High $\gamma_1$: 2</td>
<td>Low $\gamma_1$: 1</td>
<td>5,248</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>5,382</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>5,274</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>5,373</td>
</tr>
<tr>
<td>Low $\gamma_1$: 1</td>
<td>High $\gamma_1$: 2</td>
<td>5,332</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>5,456</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>5,406</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5,578</td>
</tr>
</tbody>
</table>

marginal utility among the campaigns is relatively small. Yet, these differences translate into consistently higher total donations when the campaign is lead with a less egoistic appeal, ranging from 1-4%. These results are due to heterogeneity in the population, and people selected for inclusion in a campaign when their contribution $g_i$ is high. The results are also dependent on aspects of the appeals and will vary depending on their quality. Our goal, here, is to demonstrating value in leading campaigns with an altruistically-oriented versus an egoistic-oriented appeal.

5.3 Targeting

A more aggressive estimate of the value of knowing the underlying motivation for making a contribution is revealed when it is possible to fully customize offers to the individual. This may occur when a firm has a history of interaction with respondents and can use past information to calibrate our model.

Table 9 reports results from using each of the various campaigns for the entire population, and the fraction of the population for which each campaign is best. Results are reported for two strategies – one in which the donations of others ($G_{-it}$) is accumulated by first approaching people with highest contributions $g_i$ and another where appeals are first made to those with smallest contributions. As reported in Table 8, we again find value in approaching people with smaller donation amounts first so that their altruistic
motive is not diminished by the donations of others.

Table 9: Donations from a Fully Customized Campaign

<table>
<thead>
<tr>
<th>Campaign</th>
<th>Number of Respondents as the Best Campaign</th>
<th>Descending Order in $g_i$ (KRW 1000)</th>
<th>Ascending Order in $g_i$ (KRW 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 (.5%)</td>
<td>4,162</td>
<td>4,317</td>
</tr>
<tr>
<td>2</td>
<td>14 (7%)</td>
<td>5,597</td>
<td>5,773</td>
</tr>
<tr>
<td>3</td>
<td>7 (3%)</td>
<td>4,625</td>
<td>4,779</td>
</tr>
<tr>
<td>4</td>
<td>13 (6%)</td>
<td>5,509</td>
<td>5,736</td>
</tr>
<tr>
<td>5</td>
<td>18 (9%)</td>
<td>4,944</td>
<td>5,092</td>
</tr>
<tr>
<td>6</td>
<td>138 (67%)</td>
<td>7,598</td>
<td>7,798</td>
</tr>
<tr>
<td>7</td>
<td>10 (5%)</td>
<td>4,408</td>
<td>4,625</td>
</tr>
<tr>
<td>8</td>
<td>5 (2%)</td>
<td>5,019</td>
<td>5,200</td>
</tr>
<tr>
<td>Fully Customized</td>
<td></td>
<td>8,221</td>
<td>8,371</td>
</tr>
</tbody>
</table>

We find that the best campaign (6) is not uniformly favored among all respondents. Sixty-seven percent of the respondents are predicted to have maximum donation when exposed to this campaign, with the remaining 33% spread over the other seven campaigns. The total amount of giving is increased to about 8300 (KRW 1000) under full customization, or about a 7-8% increase over using campaign six alone.

6 Concluding Remarks

In this paper we present an economic model for charitable donations that nests altruistic and egoistic aspects of giving. We relate characteristics of appeals to model parameters and find that recipient focused appeals with elements of arousal lead to heightened levels of giving, consistent with past research. We find that emotional aspects of an advertisement plays an interactive role with being recipient-focused and arousal so that their effects are primarily present in advertisements with negative valance.

The results of our study serve to validate the use of the proposed utility function (equation 1) for understanding donation behavior. We find that it fits better than descriptive models, being able to better capture altruistic giving where donations decline when re-
spondents know that other donors have already given to a cause. This effect is difficult to capture in a descriptive linear model without including all possible interactions, where we find that parameter estimates become unstable. We find that the altruistic giving effect (reduced giving when others are known to have already given) is more efficiently captured with our utility-based model.

We find substantial within-respondent variation in giving that can be attributed to variation in altruistic versus egoistic sources of utility. While prior research has documented the presence of situational factors influencing altruistic giving (Small et al. 2007), effects due to the campaign message has not previously been measured in a way that separates within- from across-respondent variation in response. We find that coefficients associated with aspects of the campaign to be large and heterogeneous among respondents (see table 5). Our model allows us to show value in the customization and timing of different appeals for donations.

We also find that altruistic donors tend to give smaller amounts, and that there is economic value in first soliciting donations from them than from egoistic donors who tend to give more. We note that this strategy is counter to many donation campaigns that first attempt to line-up big donors before reaching out to others. An interesting topic of future research would be whether the decision to go after big donors first is driven by demand-side considerations of giving by the donors, or by supply-side considerations of the firm who wants to ensure success of the campaign.

There are many other extensions to our model that can be addressed in future research. One avenue is the exploration of variation in the social environment of giving behavior, and comparing the size of this effect to those associated with the appeal. Our data came from an experimental setting where this variation was not observed, and the effect of year-end giving during the holidays, or alternatively at the end of the tax year, are interesting extensions to the model.

Another extension is the issue of complementarity in a person’s utility for donation
behavior. Complementarity reflects synergistic effects among different donation opportunities. Given that it is not surprising to see individuals who donate to different charities, or volunteer across multiple activities, modeling the complementarity among giving behaviors is an important contribution to campaign management by identifying likely prospects based on their contributions to related campaigns.

Finally, our empirical analysis is based on consumer reactions to appeals requiring a one-time, immediate response. We believe that appeals for forming an on-going relationship with the recipient (e.g., World Vision http://www.worldvision.org/) will likely be more successful with stimuli showing the recipients happy and smiling rather than sad and starving. Our empirical findings may not translate to settings where the nature of the interaction with the donor is long-term, and additional research is needed in applying the model to other settings.
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