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Sarah Brown
Mark N. Harris
Karl Taylor

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Sarah Brown
University of Sheffield
and IZA

Mark N. Harris
Monash University

Karl Taylor
University of Sheffield
and IZA

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

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ABSTRACT

Modelling Charitable Donations to an Unexpected Natural Disaster: Evidence from the U.S. Panel Study of Income Dynamics*

Using household-level data, we explore the relationship between donations to the victims of the 2004 Indian Ocean tsunami disaster and other charitable donations. The empirical evidence suggests that donations specifically for the victims of the tsunami are positively associated with the amount previously donated to other charitable causes, which accords with complementary rather than substitution effects. This relationship exists when we decompose overall charitable donations into different types of philanthropy, with charitable contributions to caring, needy and religious organizations having the largest positive association with donations to the victims of the tsunami. When we explore the impact of donations to the victims of the tsunami on future donations to charity, however, our findings suggest an inverse relationship with the largest inverse association with donations to needy and caring organizations.

JEL Classification: D19, H24, H41, H31

Keywords: charity, donations, system tobit, tobit

Corresponding author:

Sarah Brown
Department of Economics
University of Sheffield
9 Mappin Street
Sheffield S1 4DT
United Kingdom
E-mail: Sarah.Brown@sheffield.ac.uk

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I. Introduction and Background

A plethora of empirical and theoretical studies exist in the economics literature exploring why individuals make contributions to charity, with much of the existing research focusing on charitable donations in the US (see, for example, Andreoni, 2006). Given the economic significance of such donations and the government intervention in this area via tax regulation, such interest is not surprising. In 2005, for example, individuals in the US donated in excess of 260 billion dollars to charity, with 70-80% of individuals in the US making annual contributions to at least one charitable organisation and trends in charitable donations over the last three decades characterised by a steady increase (Chhacochharia and Ghosh, 2008). Andreoni (2006) however points out that charitable donations as a percentage of income have been stable in the US, varying from about 1.5% to 2.1% since 1968, whilst Kolm (2006) notes that private giving (outside of the family) accounts for approximately 5% of GNP in the US.

Over the last four decades, the literature on the economics of charity has focused on the supply-side with much attention paid to the impact of tax deductibility on charitable giving and the associated price and income effects.[1] The empirical analysis of charitable donations has been influenced by methodological advances with respect to econometric techniques as well as increased availability and quality of data. Andreoni (2006) presents a comprehensive survey of the influences on charitable donations established in the existing literature. For example, Auten et al. (2002) find that income is an important determinant of donor responsiveness, whilst, according to Glenday et al. (1986), donations are expected to vary over the lifecycle and increase with age. In a similar vein, Schokkaert (2006) finds that older and more educated individuals give

[1] The demand-side has been relatively under-researched (Andreoni, 2006). Recent contributions to the literature on the demand-side include Karlan and List (2007) who use a natural field experiment to test the effectiveness of a matching grant on charitable donations and Landry et al. (2006) who analyse a door-to-door fund-raising field experiment.

more. In general, the findings from existing studies suggest that married households, households with dependent children, households with a female head and religious households are expected to give more.

Our focus lies on the supply-side exploring charitable donations at the household, i.e. donor, level. As stated by Schokkaert (2006), who presents a comprehensive survey of the empirical literature on charitable giving, much of the existing research at the donor level focuses on total contributions made to charity without distinguishing between different recipient causes. In our empirical analysis, we aim to explore the relationship between donations specifically related to an unexpected adverse shock in the form of a natural disaster and donations to other charitable causes. Specifically, we focus on donations to the victims of the 2004 Indian Ocean tsunami. As stated by Athukorala and Resosudarmo (2005), who analyse the immediate economic impact of the tsunami and disaster management in its immediate aftermath, 'with a death toll of about 350 thousand, the Indian Ocean tsunami … is by far the worst natural disaster of that kind in the recorded human history', p.1. Hence, the unprecedented donor response is not surprising.

Brown and Minty (2008), who find that media coverage of disasters has a large impact on donations to relief agencies, cite five reasons for the high level of donations to US charities for the tsunami disaster relief (estimated at $1.6 billion in private donations). Firstly, the time of year coincided with a holiday period which may have increased the 'warm glow' associated with charitable giving; secondly, South East Asia has been an increasingly popular destination for US tourists; thirdly, tax incentives in the US motivate charitable giving and the tsunami occurred just before the deadline (31st December) for 2004 tax deductions and, furthermore, the tsunami Disaster Aid Tax

Relief Act extended the deadline to 31st January 2005; fourthly, the provision for online giving was extensive; and, finally, there was extensive media coverage.

The importance of one-off appeals for disaster relief as a means to raise significant funds from relatively small contributions made by many individuals was noted in an early contribution by Sugden (1982), who cites the Cambodia famine appeal in 1980 as an example. More recently Eckel et al. (2007) explore the impact of Hurricane Katrina upon charitable donations within the context of an experiment conducted in a laboratory environment. Such studies are particularly interesting in the context of claims put forward by Wright (2002) that the majority of donations in the US are regarded as a planned activity whereas in the UK donations tend to be more spontaneous. Hence, the novelty of our contribution to the literature on charitable giving lies in exploring the relationship between donations to a specific unexpected natural disaster, namely the 2004 Indian Ocean tsunami, and donations to other charitable causes.

One concern surrounding such disaster appeals relates to the possibility of donations being diverted away from existing charitable causes towards such relief funds, hence we are interested in exploring whether complementary or substitution effects exist across different types of donations. To be specific, in Section II we investigate what factors influence the level of donations to the victims of the tsunami including the role of donations to other charitable causes. Section III expands the analysis to explore the relationship between different types of charitable donations and donations to the victims of the tsunami. In Section IV we explore the effect of tsunami donations on future donations to other charitable causes in order to analyse whether donating to the victims of the tsunami diverts expenditure away from future donations to other causes.

II. Donations to the Victims of the Tsunami and Other Charitable Donations

Data and Methodology

We use data from the US *Panel Study of Income Dynamics* (*PSID*), which is a representative panel of individuals ongoing since 1968 conducted at the Institute for Social Research, University of Michigan.[2] In the *PSID* waves 2001, 2003, 2005 and 2007, there are a series of detailed questions relating to giving to charity.[3] Due to our focus on tsunami donations, we restrict ourselves to the 2005 *PSID* yielding a sample for analysis of 6,590 households. Households are asked about total donations to charity over the calendar year 2004. Excluding donations specifically related to the 2004 Indian Ocean tsunami, the average total value of the amount of donations in the calendar year 2004 is $1,557, with 39.58% of households not making any donations.[4] The average amount of donations amongst households who do donate to charity is $2,577. As a separate category, heads of household were asked to indicate the total dollar value of donations made between the end of December 2004 and the month of interview, to help the victims of the 2004 Indian Ocean tsunami (which occurred on the 26th December 2004). The average amount of these donations was $27.8, with 22.2% of households making such donations. The average amount of donations for the tsunami victims amongst those households who made such donations was $125.3.[5] Figure 1 presents the

[2] One key advantage of the *PSID* is that it includes households which itemize charitable donations in their annual tax return as well as those who do not. In contrast, some existing studies, such as, for example, Auten et al. (2002) analyse individual tax returns collected by the US Internal Revenue Service. One drawback of this data source, however, relates to the fact that the sample is restricted to those tax payers who itemized deductions. Consequently, the sample potentially suffers from sample selection bias given that itemizing charitable contributions leads to a lower price of making a donation (see footnote 8 below). Wilhelm et al. (2008) use the 2001 wave in the *PSID*, as a cross-section, to explore the relationship between the generosity of parents and the generosity of their adult children. Their findings suggest a positive correlation between charitable giving of parents and their children.

[3] The definition of a charitable organization in the *PSID* includes 'religious or non-profit organizations that help those in need or that serve and support the public interest'. It is clearly stated that the definition used does not include political contributions.

[4] All monetary values are given in 2005 prices, using a CPI deflator from the Bureau of Labor Statistics http://www.bls.gov/cpi/cpi_dr.htm#2007.

[5] Given the nature of the question related to the tsunami donations, it is not surprising that there is some variability in the level of donations across the month of interview, which is as follows for those who do

distributions of the (natural logarithm of the) total amount donated for the victims of the tsunami and total donations to other causes, both in the censored data, i.e. including non contributors (since there are no donations between zero and unity, for households reporting a zero donation, the value is recoded to zero), and for all those who make positive contributions.

Initially, we investigate what factors are associated with making a donation after an unforeseen disaster, i.e. to the victims of the tsunami. Let ts_{iT}^{*} denote the underlying latent propensity to donate to the victims of the tsunami disaster of household *i*, at time *T* (that is post 26th December 2004 through to the month of interview in 2005). In linear form, this latent propensity, which is defined over the whole real number line $(-\infty, \infty)$, can be written as:

$$ts_{iT}^{*} = \boldsymbol{X}_i'\lambda + \pi y_{i(T-1)} + \nu_i \quad (1)$$

where $\boldsymbol{X}$ is a vector of covariates, which are thought to influence the level of tsunami donations and ν is a normally distributed random error term. If this latent propensity is negative or zero, we observe individuals at the corner solution point of zero, otherwise observed donations equal the latent propensity $\left(ts_{iT} = ts_{iT}^{*}\right)$. Accordingly, this model is estimated as a univariate tobit model with censoring (from below) at zero (Maddala, 1983).

We include household donations to other charities, $y_{i(T-1)}$, in order to explore the relationship between donations to the victims of the tsunami and donations to other causes. The subscript *T-1* denotes the timing difference as compared to tsunami donations in that other donations are made over the calendar year 2004. If $\hat{\pi} > 0$ this

make such donations (all individuals): March interview, \$137 (\$32); April interview \$118 (\$27); May interview \$119 (\$27); June interview \$109 (\$25); July interview \$77 (\$13); August interview \$299 (\$46); September interview \$129 (\$25). Hence, we control for the month of interview throughout the empirical analysis that follows.

suggests complementarity between donations to the unexpected disaster and those made to other causes. Hence, a novelty of our contribution to the literature lies in exploring the relationship between different types of giving within the context of a large representative sample drawn from the *PSID*.

The following demographic variables, which have previously been employed in the literature (see, for example, Andreoni 1996 and Auten and Joulfaian, 1996), are included in $\boldsymbol{X}$: dummy variables for the head of household's age (with over 60 as the base category); the number of adults in the household; the number of children in the household; the years of completed schooling of the head of household; the natural logarithm of household labour income; the gender of the head of household; the marital status of the head of household (with all states other than married or cohabiting as the base); whether the head of household is currently employed, self employed or unemployed (not currently in the labour market is the reference category); the natural logarithm of household wealth;[6] the natural logarithm of household non-labour income (including benefit income); whether the house is owned outright or with a mortgage (rental and other types of housing tenure form the base category); and the ethnicity of the head of household (where groups other than white and black form the reference category).

Auten et al. (2002) highlight the importance of distinguishing between permanent and transitory income effects. Their findings suggest that persistent price and income changes have much larger impacts on charitable donations than transitory changes. Hence, we include a measure of permanent income. To construct this, we follow Wilhelm et al. (2008), averaging family income over the recent past (using up to

[6] Wealth is proxied by the summation of: dividend payments; interest payments; trust funds; inheritance; and other sources.

eight years depending on whether the household was in the panel over the period). We also include a control for the variance in permanent income over the period.

In an early contribution, Schwartz (1970) analyses the price of donating to charity, which is determined by taxation as income donated to recognised charities in the US is not subject to income tax. As a consequence, disposable income falls by less than the full amount donated: the price of the donation becomes the donation net of the saving in tax since each dollar donated to a recognised charity leads to less than one dollar sacrificed for consumption purposes.[7] The extent of the tax saving is determined by which marginal tax bracket the individual is in (Schwartz, 1970). In the context of the US, individuals who itemize deductions in their tax return reduce their taxable income in accordance with the level contributed to tax-exempt organisations. Hence, tax deductibility affects the price of donating to charity (Auten et al., 2002). Thus, we also control for the price of making a donation to charity. For households who itemize charitable donations in their tax return, the price of the donation is defined as one minus the household's marginal tax rate on the contribution made, whereas for households who do not itemize charitable donations, the price of the donation is one: donating one dollar means that there is one dollar less for consumption.[8]

Additional controls included in $\boldsymbol{X}$ are: health status of the head of household over the last 12 months (0=poor health; 1= fair health; 2=good health; 3=very good health; and 4=excellent health); and religious denomination of the head of household (with no religion as the base category). We also include binary controls for the month of

[7] US tax laws specify an upper bound to deductibility with a maximum deductible percentage of the income tax base: 50% of gross income in 2006.

[8] In the *PSID*, households are asked to indicate whether they made an itemized deduction for charitable contributions. Hence, for these households the price of making a donation is less than one, which is the price of donating for those households who did not itemize such donations. Households which itemize are assigned the relevant average tax rate using the 'Tax Table' from Internal Revenue Service (US Department of the Treasury) website, http://www.irs.gov, conditional upon total pre tax family income and marital status.

interview and a binary indicator signifying whether the household donated to a disaster cause in 2003. Full summary statistics for the variables used in our empirical analysis are presented in Table 1, where the majority of household heads are: male (67%); aged between 40 and 50 (24%); employees (73%); white (67%); in good health (31%); protestant (64%); and own their home either outright or with a mortgage (61%).

It is apparent however that donations to other charitable causes may potentially be endogenous in the tsunami donations model, hence we then investigate what factors are associated with total charitable donations to other causes (that is, excluding donations to the victims of the tsunami disaster). As before, let $y^*_{i(T-1)}$ denote the latent, partially observed, propensity to donate to all other charitable sources of household *i*; and again $y_{i(T-1)}$ is the observed realization of this (zero) corner solution model. This is determined by household characteristics $\boldsymbol{X}$ (as defined above). This model is also estimated as a univariate tobit specification of the form:

$$y^*_{i(T-1)} = \boldsymbol{X}_i'\alpha + \omega_i \tag{2}$$

where ω is a normally distributed random error term. To explore the robustness of our results with respect to modelling donations to the victims of the tsunami with total donations being potentially an endogenous regressor, we then re-estimate equations (1) and (2) simultaneously as a bivariate recursive tobit model, i.e.

$$\begin{aligned} y^*_{i(T-1)} &= \boldsymbol{X}_i'\alpha_1 + \varepsilon_{1i} \\ ts^*_{iT} &= \boldsymbol{X}_i'\alpha_2 + \pi y_{i(T-1)} + \varepsilon_{2i} \end{aligned} \tag{3}$$

where the endogenous variable $y_{i(T-1)}$ can be ignored in formulating the likelihood function under the assumption of joint normality of the disturbances (Maddala, 1983). Moreover, due to the timing differential between standard charitable donations and donations to the victims of the tsunami, arguably conventional giving is a pre-

determined covariate, and, hence exogenous. Thus the error terms follow a bivariate normal distribution such that: $\varepsilon_1, \varepsilon_2 \sim N\left(0, 0, \sigma_1^2, \sigma_2^2, \rho\right)$, and the covariance is given by $\sigma_{12} = \rho\sigma_1\sigma_2$, so $\rho = \sigma_1\sigma_2 / \sigma_{12}$. Due to the timing differential and, hence, potentially independent decision making processes, we would predict that the error terms are uncorrelated, i.e. $\rho = 0$.

Results

Table 2 presents the results of estimating equation (1), the tsunami donations model, in the first column, and the results of estimating equation (2), all other charitable donations, in the second column. Throughout the analysis, inference is based upon heteroscedastic robust standard errors. Whilst estimated coefficients are reported, marginal effects can be found by multiplying the estimated coefficients through by the scaling factor. Defining σ as the standard error of the regression and Φ as the cumulative distribution function of the standard normal, an approximation to the scaling factor, in the case of equation (1), $\Phi\left(\left\{\boldsymbol{X}_i'\lambda + \pi y_{i(T-1)}\right\} / \sigma\right)$, is the proportion of uncensored observations. In the univariate tobit model, the proportion of uncensored observations is approximately 0.22 for the tsunami model and 0.60 for all other charitable donations.

Factors associated with a positive and statistically significant effect across the two models are: years of schooling of the head of household; a married or cohabiting head of household; a head of household in good health; a head of household who has a catholic faith; household non-labour income; and permanent income. Income effects are, however, found to be inelastic throughout. The only covariate which has a statistically significant inverse relationship with both types of charitable donations is gender where males donate less on average than females. For example, males donate

around 17 per cent less to the victims of the tsunami and 34 per cent less to other charitable causes.[9]

Noticeable differences, in comparison to the amount donated to other charitable causes, are that age effects are apparent for all other charitable donations but not in the case of donations to the victims of the tsunami. Specifically, compared to heads of household aged over 60, there is a monotonic decrease in the level of donations across younger households. For example, a household with a head aged less than 20 donates 140 percentage points less to charity than a corresponding household with a head aged over 60.[10] Other differences are that the level of giving to the tsunami victims is generally less sensitive to price effects, which may reflect the unplanned spontaneous nature of such donations. Moreover, price effects are only statistically significant at the 10 per cent level in the tsunami donations model. Whether the household donated to a disaster cause in 2003 is positively associated with the amount donated to the victims of the tsunami. Correspondingly, whether the household donated to charity in 2003 has a small yet positive relationship with the amount donated to other charitable causes in 2005. Clearly, the amount donated to other charities has a positive association with the amount donated to the victims of the tsunami. A one per cent increase in donations to all other charities is associated with a 0.12 per cent increase in tsunami donations, indicating a positive, yet inelastic, relationship.

The estimation results relating to the bivariate recursive model, equation (3), are summarised in Table 2 Panel B, where only the results of the potentially endogenous covariate, i.e. other charitable donations, are reported, which reveal that the positive

[9] Calculated by multiplying the scaling factor, 0.22 (0.6), by the estimated coefficient on the gender dummy variable, -0.7841 (-0.5611).

[10] Interestingly, housing tenure has a differential association with the types of giving. Owning the home outright or via a mortgage is inversely related to the amount donated to the victims of the tsunami, albeit only at the 10 per cent level of statistical significance, yet is positively related to donations to all other forms of philanthropy.

association with the amount donated to the victims of the tsunami remains. The finding of a statistically significant positive relationship between donations to the natural disaster and the level of other charitable donations is consistent with the experimental evidence of Eckel et al. (2007) focusing on the influence of Hurricane Katrina on charitable donations. Furthermore, due to the timing of the tsunami (late December 2004), and the fact that donations to other causes are measured over the calendar year 2004, this arguably minimises any potential reverse causality with the direction of causality implying that general philanthropy causes an increase in donations to unexpected natural disasters such as the 2004 Indian Ocean tsunami. Moreover, the null hypothesis of independence of the error terms cannot be rejected thereby implying separate donation decision-making processes, as shown in panel B of Table 2.

III. Donations to the Victims of the Tsunami and Types of Charitable Donation

Data and Methodology

In the *PSID* there is detailed information on the types of charitable donation made over the calendar year 2004 and so we are able to explore the relationship between donations specifically related to the victims of the tsunami and charitable donations to the following categories: religious purposes or spiritual development (46.7%); combined purpose organizations (12.8%); organizations that help people in need of food shelter or other basic necessities (12.2%); donations for caring purposes – health care or medical research organizations, educational purposes, organizations that provide youth or family services, and organizations that support or promote the arts, culture or ethnic awareness (14.5%); and all other forms of donations, including donations to organizations that provide international aid or promote world peace and organizations associated with preserving the environment (12.2%). The percentages given in parenthesis indicate the proportion each category represents within the total amount donated, with donations for

religious purposes clearly being the dominant category. Figure 2 presents the distributions of each type of charitable donation for all households as well as for positive contributors only.

In Table 3, we present simple bivariate correlations between the different types of charitable donations. There are positive associations between all types of charitable donations and these are statistically significant at the 1 per cent level. The positive association between donations to the victims of the tsunami and all other types of charitable donations in 2005 suggests that complementarity exists between the different types of donation.

Total donations in 2005 are then decomposed in order to examine how donations to different causes are related to donations specifically to the victims of the tsunami. Initially we re-estimate equation (1) as a univariate tobit model controlling for the five separate types of charitable donation (*j*):

$$ts_{iT}^{*} = \boldsymbol{X}_i'\lambda + \sum_{j=1}^{5} \pi_j y_{ji(T-1)} + \upsilon_i \qquad (4)$$

where υ is a normally distributed random error term. If the estimated parameters on the types of charitable donation are positive, this suggests that donations to the other charitable causes are complementary to donating to an unforeseen natural disaster.

We then explore the determinants of the five types of donation. In order to explore the determinants of charitable donations across the five types of charitable causes, it is important to allow for joint decision making between the five 'standard' categories of charitable donations, which is estimated as a system tobit model. That is, the unobservables that determine donations to one category, are highly likely to be correlated to those of another. Let $y_{ji(T-1)}^{*}$ denote the latent propensity for charitable donation of type *j* of household *i* (*j=1,...,k*), $y_{ji(T-1)}$ is the observed amount of the type *j*

charitable donation, $\boldsymbol{X}$ are variables which are thought to influence these propensities (defined in Section II above). It is then possible to construct the following system of tobit equations:

$$\begin{aligned} y^{*}_{1i(T-1)} &= \boldsymbol{X}_i'\beta_1 + \varepsilon_{1i} \\ y^{*}_{2i(T-1)} &= \boldsymbol{X}_i'\beta_2 + \varepsilon_{2i} \\ \vdots \quad \vdots \quad & \quad \vdots \quad \vdots \\ y^{*}_{ki(T-1)} &= \boldsymbol{X}_i'\beta_k + \varepsilon_{ki} \end{aligned} \tag{5}$$

To consider the influence of each type of potentially endogenous donation upon the amount donated to the victims of the tsunami, equation (5) is re-estimated as a multivariate recursive model as follows:

$$\begin{aligned} y^{*}_{1i(T-1)} &= \boldsymbol{X}_i'\beta_1 + \varepsilon_{1i} \\ y^{*}_{2i(T-1)} &= \boldsymbol{X}_i'\beta_2 + \varepsilon_{2i} \\ \vdots \quad \vdots \quad & \quad \vdots \quad \vdots \\ y^{*}_{ki(T-1)} &= \boldsymbol{X}_i'\beta_k + \varepsilon_{ki} \\ ts^{*}_{iT} &= \boldsymbol{X}_i'\lambda + \sum_{j=1}^{5}\pi_j y_{ji(T-1)} + \varepsilon_{(k+1)i} \end{aligned} \tag{6}$$

where the parameters of interest are π_j. Both equations (5) and (6) are estimated via a system approach following Huang (1999). Given that each of the *k* dependent variables has left hand censoring, there are 2^k possible combinations at their censoring points. Assuming $\varepsilon \sim MVN(0,\Omega)$, focusing upon equation (6), Huang (1999) shows that the likelihood function which encapsulates all censoring combinations is given by:

$$L(Y;\beta,\pi,\Omega) = \prod_{i=1}^{n} L_i^{S_q}(y_i;\beta,\pi,\Omega) \tag{7}$$

where $Y = (y_1'\, y_2', \cdots, y_k', ts')$ and $L_i^{S_q}$ gives the likelihood of the case that the i^{th} observation falls into regime *q*. Following Barslund (2007), equations (5) and (6) are estimated via simulated maximum likelihood using the MVTOBIT command in STATA 10. As Yen (2002) notes, allowing for possible interaction amongst the

different types of giving is potentially important and the approach allows for correlations to occur in the error terms. Allowing for such interactions is particularly appropriate in our application given that over 24% of households donate to three or more charities over and above donations to victims of the tsunami disaster. Given that equation (6) is recursive and that donations other than those to the victims of the tsunami are arguably pre-determined, one might expect that the error terms between the tsunami and all other donations are uncorrelated, i.e. $\rho_{j6} = 0$, where *j*=1,…5, implying consistency of the univariate approach. [11]

Results

We firstly comment on the results of the system tobit analysis before discussing the tsunami donations model. In Table 4, the results of the system estimation are shown, which allows for joint determination across the five different types of charitable donation, as shown in equation (5) above. Focusing upon the relationship between the head of household's age and charitable donations, relative to those heads of household aged over 60 (the omitted category) the level of the donation tends to increase with the age of the head of household, which is consistent with the findings in the existing literature, such as Lankford and Wyckoff (1991), Auten and Joulfaian (1996), and Schokkaert (2006). However, this relationship is not uniform across the *j* types of charitable donation. For example, no significant age effects are found for donations for the needy, as found above for donations to the victims of the tsunami, and the association between age and religious donations would appear to be larger in magnitude than any other type of age profile-donation relationship. Across the different types of charitable donations, donations are inversely associated with having a male head of

[11] Evidence which is consistent with the notion that giving of type *j* is not influenced by tsunami donations is the finding that the average contribution within a category and also summed across all categories is not statistically significantly different in 2005 compared to 2003 at the 10 per cent level. In addition, the difference in the proportion that each category contributes to total donations between 2005 and 2003 is also statistically insignificant, i.e. constant over time.

household and the price of making a donation, which is in accordance with the findings of Glenday et al. (1986).

Conversely, factors, which are positively related to charitable donations, are the years of schooling of the head of household, household wealth, household non-labour income, permanent household income, having a married or cohabiting head of household and owning a home either outright or with a mortgage. These findings are consistent with Glenday et al. (1986). As found by Auten et al. (2002), labour income, which might reflect transitory income effects, has no influence upon any of the types of charitable donation. Hence, our findings suggest that it is permanent income that matters. The religious denomination of the head of household only influences donations to religious or spiritual development and donations to combined purpose organizations. The model is estimated with dependent errors and this specification is confirmed by the rejection of the hypothesis that the error terms in equation (5) are uncorrelated, i.e. $\rho_{gh} \neq 0$ where g=1,…,4, h=2,…,5 and $g \neq h$. This is revealed by the χ^2 statistic, which tests the null hypothesis of independence. Moreover, it would appear that there is a positive association between the error terms, conditional on the covariates, implying complementarity between donations to the different types of charities, which is consistent with the findings of Yen (2002).

Table 5 reports the results of estimating the univariate tsunami donations model, equation (4), where Panel A includes the log amount of each type of donation, and Panel B reports a specification based upon the multivariate recursive system tobit model of equation (6). There is a positive, yet inelastic, statistically significant relationship between the level of the donations for the victims of the tsunami and the level of each type of charitable donation reported in Table 5 Panels A and B, although the magnitudes of the estimated effects are somewhat larger in Panel B. In line with a priori

expectations, the correlations between the error terms of the tsunami donations equation and all other types of donation are not significantly different from zero. Thus, whilst it would appear that complementary effects exist between the different types of donation, as suggested by the raw sample correlations shown in Table 3, the decision making process of donating to victims of the tsunami is independent of that of donations to other charitable causes. The results suggest that the strongest positive association exists between the tsunami donations and those in the caring and needy categories, which might reflect similar motivations for giving.

IV. Donations to the Victims of the Tsunami and Future Donations to Charity

Data and Methodology

The *PSID* 2007 includes information on donations to charity over the 2006 calendar year, i.e. 1st January 2006 to 31st December 2006, where the average donation was $1,369 in 2005 prices with 43.9% of households not making any donations. The average donation amongst those households donating to charity in 2006 is $2,441. Hence, we are able to explore the implications of tsunami donations in 2005 (*T*) for future donations to charity in 2006 (*T+1*). This is potentially important in that donating to an unplanned event might divert spending away from other charitable causes, i.e. substitution effects may arise following a natural disaster. Initially, we investigate what factors influence total charitable donations in 2006. Let $y^*_{i(T+1)}$ denote the latent propensity for total charitable donations of household *i* at time *T+1*, 2006, then

$$y^*_{i(T+1)} = \boldsymbol{X}_i'\gamma + \phi ts_{iT} + \omega_i \tag{8}$$

where $\boldsymbol{X}$ is a vector of covariates as defined in Section II and ω is a normally distributed random error term. The model is estimated as a univariate tobit model with censoring at zero. Including the level of tsunami donations made at time *T* (i.e. 2005), ts_{iT}, allows an investigation into possible substitution effects. Indeed, a negative value

for ϕ is consistent with substitution effects. As with the above analysis in order to allow for the potential endogeneity of tsunami donations, ts_{iT}, we also estimate a recursive bivariate tobit model as follows:

$$\begin{aligned} ts_{iT}^{*} &= \boldsymbol{X}_i'\gamma_1 + \varepsilon_{1i} \\ y_{i(T+1)}^{*} &= \boldsymbol{X}_i'\gamma_2 + \phi ts_{iT} + \varepsilon_{2i} \end{aligned} \tag{9}$$

Thus the error terms follow a bivariate normal distribution such that: $\varepsilon_1, \varepsilon_2 \sim N\left(0, 0, \sigma_1^2, \sigma_2^2, \rho\right)$, and the covariance is given by $\sigma_{12} = \rho\sigma_1\sigma_2$, so $\rho = \sigma_1\sigma_2 / \sigma_{12}$. Given that substitution effects may occur it is possible that not only will $\phi \neq 0$ but also that the error terms may be correlated, i.e. independent decision making does not occur once the tsunami has taken place as future planned expenditure is influenced, so $\rho \neq 0$. Due to the recursive nature of the system, as in Section II, the potentially endogenous variable ts_{iT} can be ignored in formulating the likelihood function.

Finally, we explore whether the tsunami donations have a different impact across the five types of donations in 2006. Specifically, defining the types of giving to be consistent with those in Section III, charitable donations in 2006 (*T+1*) are modelled via a multivariate recursive model. Let $y_{ji(T+1)}^{*}$ denote the latent propensity for charitable donation of type *j* of household *i* (*j=1,...,k*) and $y_{ji(T+1)}$ is the observed amount of the type *j* charitable donation, then:

$$\begin{aligned} ts_{iT}^{*} &= \boldsymbol{X}_i'\lambda + \varepsilon_{0i} \\ y_{1i(T+1)}^{*} &= \boldsymbol{X}_i'\beta_1 + \phi_1 ts_{iT} + \varepsilon_{1i} \\ y_{2i(T+1)}^{*} &= \boldsymbol{X}_i'\beta_2 + \phi_2 ts_{iT} + \varepsilon_{2i} \\ &\vdots \quad \vdots \quad \vdots \quad \vdots \quad \vdots \\ y_{ki(T+1)}^{*} &= \boldsymbol{X}_i'\beta_k + \phi_k ts_{iT} + \varepsilon_{ki} \end{aligned} \tag{10}$$

Covariates which are thought to influence the level of charitable contributions are included in $\boldsymbol{X}$ (defined in Section II above). Given that equation (10) is recursive and that in 2006 donations to victims of the tsunami have already been made, one might predict that the error terms between the tsunami donations and all other donations are now correlated, i.e. $\rho_{0j} \neq 0$. The parameter of interest is ϕ_j, which indicates the effect of donating to the victims of the tsunami on future donations to charity of type *j*.

Results

Table 6 Panel A focuses upon the determinants of total donations in 2006 and presents the parameter estimate of ϕ within the univariate context. In Panel B the analysis is repeated within a recursive bivariate framework and hence the correlation in the errors is also reported. The results of the multivariate analysis are given in Table 7 which explores the effect of the tsunami donations differs across each type of donation.

The results in Table 6 Panel A imply a positive association between donating to the victims of the tsunami at time *T* and future charitable donations at time *T+1*. However, once potential endogeneity is accounted within a recursive bivariate system, equation (9), the effect of the level of donations to the victims of the tsunami is negatively associated with future donations. Moreover, the magnitude of the impact is large and is approximately unit elastic given that a one per cent increase in donations to victims of the tsunami is associated with a 0.95 per cent decrease in giving to all other charities.[12] Such evidence suggests that donating to the victims of the tsunami has diverted future household expenditure away from donating to other charitable causes.

The analysis of estimating the influence of tsunami donations on donations to different causes essentially decomposes this overall effect in order to ascertain whether the relationship is uniform across donations to different causes. The results of

[12] This is calculated by multiplying the proportion of uncensored observations in the total donation equation, 0.56, by the coefficient on tsunami donations.

estimating equation (10) are shown in Table 7. The correlation in the error terms between the tsunami donations and donations to all the other causes is statistically significant, i.e. $\rho_{0j} \neq 0$, which is in line with a priori expectations given that in *T+1* the tsunami is no longer an exogenous shock. There is evidence that donating to the victims of the tsunami at time *T* diverts expenditure away from donating to the other causes in the future (*T+1*), although the effect is not uniform across the different charitable causes, with the largest impacts in terms of magnitude being for needy and caring donations.[13]

IV. Conclusions

We have investigated the relationship between charitable donations related to an unexpected adverse event and donations to other types of charity. The importance of one-off appeals for disaster relief as a way to raise significant funds has been documented in the existing literature. A concern surrounding such appeals relates to the possibility of donations being diverted from existing charitable causes towards such relief funds. Our empirical evidence allows us to investigate not only whether the level of charitable donations prior to the natural disaster are associated with the amount donated to the victims of the natural disaster, but also to consider whether donating to the victims of the tsunami influences the level of future charitable donations.

The empirical evidence supports a complementary relationship between donations specifically for the victims of an unforeseen natural disaster and other forms of charitable donations at the household level which were made prior to the disaster. Moreover, the finding of such a complementary relationship is robust to a range of modelling approaches including a system approach based on distinguishing between donations to different charitable causes. However, there is evidence to suggest that

[13] A test of the null hypothesis that the size of the tsunami donations coefficient is equal across the *j* types of charitable donations is rejected at the one per cent level.

donating to an unexpected natural disaster diverts expenditure away from donating to other charitable causes in the future.

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Figure 1: The Distributions of Tsunami Donations and All Other Charitable Donations

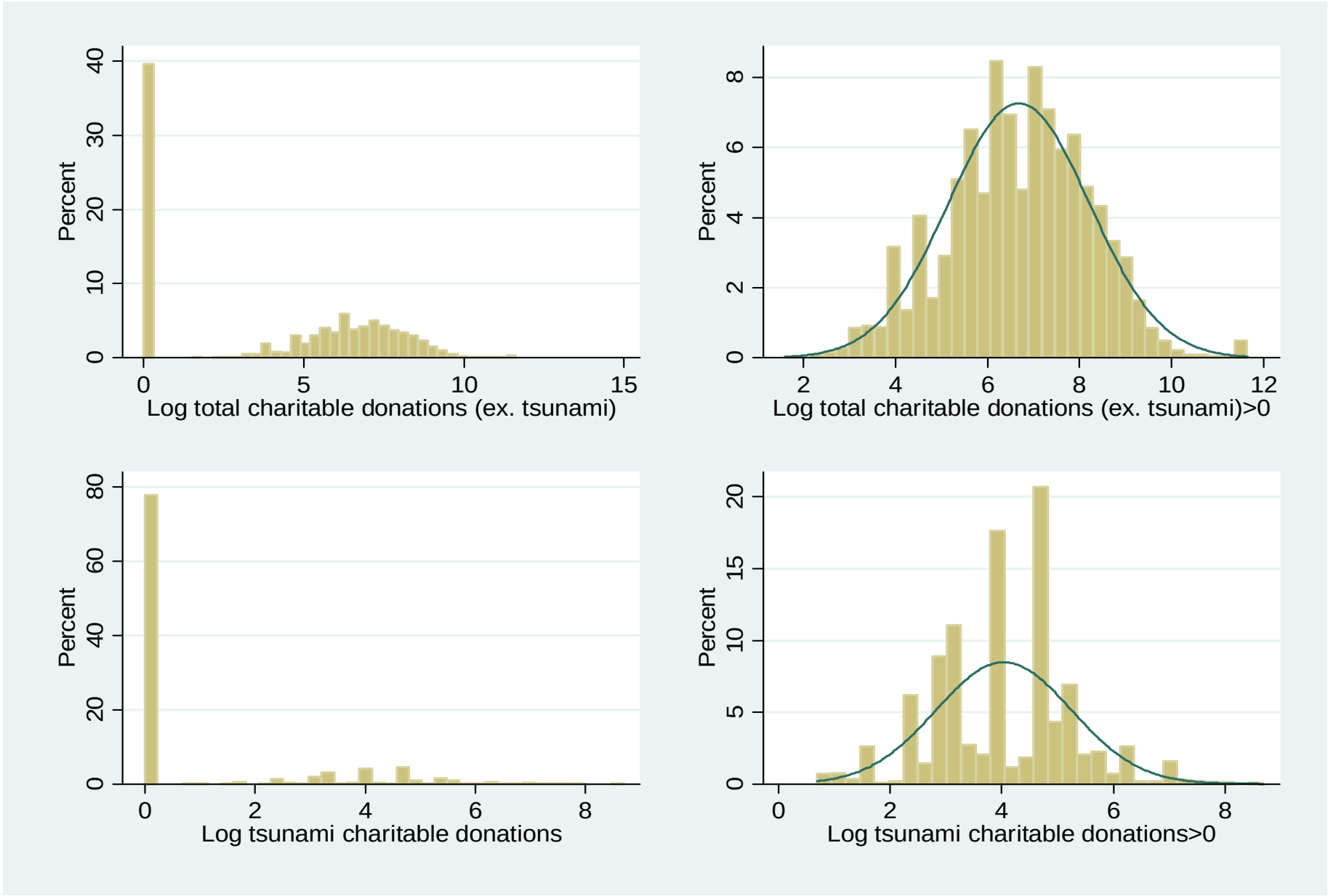

Figure 2: The Distributions of the Five Different Types of Charitable Donations in 2004

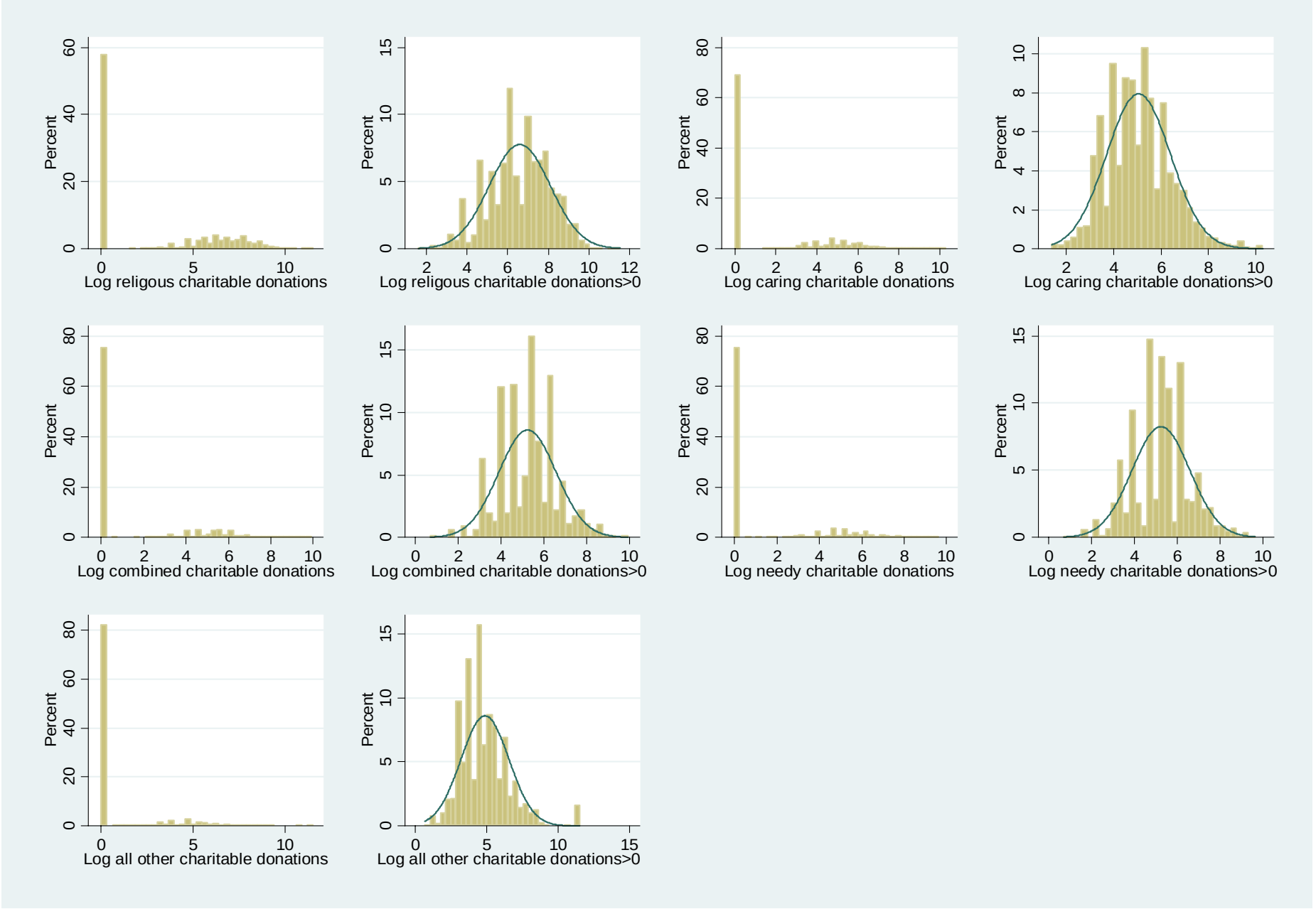

Figure 3: The Distributions of Total Donations and the Five Different Types of Charitable Donations in 2006

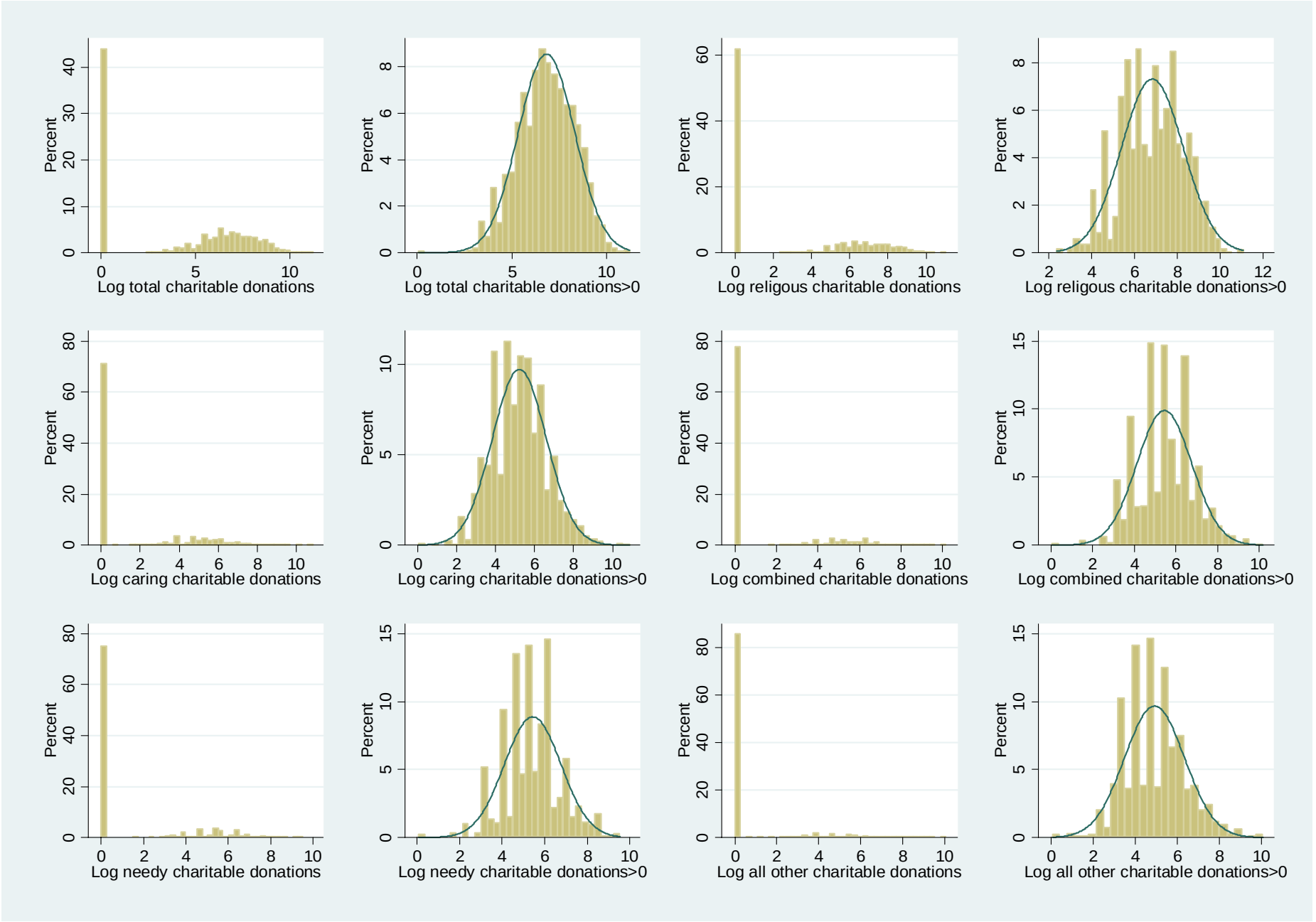

Table 1: Summary Statistics

	MEAN	STD. DEV	MIN	MAX
Log tsunami victims donation 2005 (*T*)	0.8957	1.7717	0	8.69
Log total other charitable donations 2004 (*T-1*)	4.0378	3.4783	0	11.64
Log religious charitable donation 2004 (*T-1*)	2.7730	3.3990	0	11.51
Log needy charitable donation 2004 (*T-1*)	1.2813	2.3470	0	9.62
Log combined charitable donation 2004 (*T-1*)	1.2953	2.3546	0	9.90
Log caring charitable donation 2004 (*T-1*)	1.5548	2.4489	0	10.32
Log other charitable donations 2004 (*T-1*)	0.8662	1.9925	0	11.52
Log total charitable donations 2006 (*T+1*)	3.8281	3.5765	0	11.22
Log religious charitable donation 2006 (*T+1*)	2.5941	3.4307	0	11.07
Log needy charitable donation 2006 (*T+1*)	1.3516	2.4410	0	9.54
Log combined charitable donation 2006 (*T+1*)	1.2078	2.3456	0	10.19
Log caring charitable donation 2006 (*T+1*)	1.5111	2.4846	0	10.88
Log other charitable donations 2006 (*T+1*)	0.6985	1.8010	0	10.11
HoH: Aged <20	0.0058	0.0757	0	1
HoH: Aged 20-30	0.1674	0.3733	0	1
HoH: Aged 30-40	0.1912	0.3933	0	1
HoH: Aged 40-50	0.2420	0.4283	0	1
HoH: Aged 50-60	0.1953	0.3965	0	1
HoH: Aged >60 (reference category)	0.1983	0.3988	0	1
HoH: Years of schooling	12.8618	2.7128	0	17
HoH: Male	0.6718	0.4696	0	1
HoH: Married/cohabiting	0.4921	0.4999	0	1
HoH: Unmarried (reference category)	0.5079	0.4999	0	1
HoH: Employee	0.7288	0.4446	0	1
HoH: Unemployed	0.0470	0.2117	0	1
HoH: Self employed	0.0970	0.2959	0	1
HoH: Not in labour market (reference category)	0.2187	0.4134	0	1
HoH: White	0.6728	0.4696	0	1
HoH: Black	0.3319	0.4709	0	1
HoH: Other ethnic group (reference category)	0.0486	0.2150	0	1
HoH: Health index[#]	2.4662	1.0993	0	4
HoH: Catholic	0.1903	0.3926	0	1
HoH: Jewish	0.0118	0.1359	0	1
HoH: Protestant	0.6436	0.4790	0	1
HoH: Other religion	0.0164	0.1270	0	1
HoH: Non religious (reference category)	0.1310	0.3374	0	1
Number of adults in household	1.8205	0.7850	1	7
Number of children in household	0.8220	1.1558	0	8
Log household labour income	7.9826	4.3458	0	14.81
Log household wealth	2.3846	3.8057	0	16.38
Log household non-labour income	1.7988	3.4951	0	16.21
Price = (1-tax rate)	0.9326	0.0959	0.65	1
Own home outright or via a mortgage	0.6149	0.4867	0	1
Home rented or other (reference category)	0.3851	0.4867	0	1
Log HPI[*]	10.6190	0.7656	7.18	14.03
Log variance of HPI	9.6925	0.8678	5.67	14.44
Whether donated to a disaster cause in 2003	0.0364	0.1873	0	1
OBSERVATIONS	6,590			

Notes: HoH denotes Head of Household. [#] 0=poor health; 1= fair health; 2=good health; 3=very good health; and 4=excellent health. [*] HPI denotes Household Permanent Income.

Table 2: The Determinants of Tsunami Donations and All Other Charitable Donations

PANEL A: UNIVARIATE TOBIT	TSUNAMI DONATIONS		ALL OTHER DONATIONS	
	COEF	TSTAT	COEF	TSTAT
HoH: Aged <20	0.0409	*(0.03)*	-2.3243	*(2.38)*
HoH: Aged 20-30	-0.2497	*(0.62)*	-2.0946	*(8.05)*
HoH: Aged 30-40	-0.5721	*(1.53)*	-1.1545	*(4.93)*
HoH: Aged 40-50	-0.0702	*(0.21)*	-0.9161	*(4.40)*
HoH: Aged 50-60	-0.3582	*(1.14)*	-0.6584	*(3.47)*
HoH: Years of schooling	0.1468	*(3.56)*	0.2579	*(9.84)*
HoH: Male	-0.7841	*(2.78)*	-0.5611	*(3.04)*
HoH: Married/cohabiting	0.7836	*(2.58)*	1.2968	*(6.73)*
HoH: Employee	-0.0859	*(0.21)*	0.3112	*(1.22)*
HoH: Unemployed	-0.7599	*(1.24)*	-0.8267	*(2.08)*
HoH: Self employed	-0.1283	*(0.44)*	-0.1429	*(0.76)*
HoH: White	-0.6499	*(1.61)*	0.2882	*(1.06)*
HoH: Black	-0.2406	*(0.56)*	0.1362	*(0.46)*
HoH: Health index	0.2372	*(2.60)*	0.2324	*(3.94)*
HoH: Catholic	0.5916	*(1.84)*	0.6825	*(3.25)*
HoH: Jewish	2.1539	*(4.22)*	0.4651	*(1.28)*
HoH: Protestant	-0.1923	*(0.68)*	1.1513	*(6.06)*
HoH: Other religion	1.7945	*(2.64)*	0.0749	*(0.14)*
Number of adults in household	0.0612	*(0.44)*	-0.2029	*(2.16)*
Number of children in household	0.1737	*(1.97)*	0.0379	*(0.65)*
Log household labour income	0.0740	*(1.95)*	0.0090	*(0.37)*
Log household wealth	0.0238	*(0.99)*	0.0643	*(4.33)*
Log household non-labour income	0.0689	*(2.78)*	0.0798	*(5.06)*
Log HPI	0.8659	*(3.49)*	1.8930	*(11.56)*
Log variance of HPI	-0.1190	*(0.72)*	-0.6415	*(6.14)*
Price = (1- tax rate)	-1.8701	*(1.72)*	-8.2671	*(12.37)*
Own home outright or on a mortgage	-0.4697	*(2.00)*	1.1819	*(7.48)*
Whether donated to a disaster cause in 2003	2.1951	*(6.47)*	–	
Log all other charitable donations	**0.5677**	***(17.00)***	–	
Whether donated to charity in 2003	–		0.0008	*(5.38)*
F(*d*, 6,554)[#], p value	39.16, *p=[0.000]*		109.90, *p=[0.000]*	
Pseudo R Squared	0.0841		0.1008	

PANEL B: BIVARIATE RECURSIVE TOBIT	TSUNAMI DONATIONS	
	COEF	TSTAT
Log all other charitable donations	**0.7425**	***(5.30)***
Chi2 (71), p value	5,291.32, *p=[0.000]*	
ρ, p value	-0.1072, *p=[0.191]*	
CONTROLS	As in panel A	
OBSERVATIONS	6,590	

Notes: Month of interview controls are included. [#] *d*=36 in tsunami equation and *d*=35 in all other donations equation.

Table 3: The Correlation between Different Types of Charitable Donations

	TSUNAMI	RELIGION	NEEDY	COMBINED	CARING	ALL OTHER
TSUNAMI	1					
RELIGION	0.2797 *p=[0.000]*	1				
NEEDY	0.2828 *p=[0.000]*	0.2726 *p=[0.000]*	1			
COMBINED	0.2555 *p=[0.000]*	0.2833 *p=[0.000]*	0.2591 *p=[0.000]*	1		
CARING	0.3426 *p=[0.000]*	0.3490 *p=[0.000]*	0.4214 *p=[0.000]*	0.3461 *p=[0.000]*	1	
ALL OTHER	0.2519 *p=[0.000]*	0.1848 *p=[0.000]*	0.2849 *p=[0.000]*	0.1853 *p=[0.000]*	0.3416 *p=[0.000]*	1

Notes: needy donations consist of organizations that help people in need of food shelter or other basic necessities; caring donations consist of donations to health care or medical research organizations, educational purposes, organizations that provide youth or family services, and organizations that support or promote the arts, culture or ethnic awareness; all other donations consist of organizations that provide international aid or promote world peace, organizations associated with preserving the environment, and organizations with all other purposes.

Table 4: The Determinants of Charitable Donations: Multivariate Tobit Analysis

	TYPE OF CHARITABLE DONATION									
	RELIGION		COMBINED		NEEDY		CARING		ALL OTHER	
	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
HoH: Aged <20	-1.3668	*(1.05)*	-4.7629	*(1.77)*	-2.4992	*(1.12)*	-4.5701	*(1.94)*	-2.5045	*(0.94)*
HoH: Aged 20-30	-2.2710	*(6.37)*	-1.4278	*(2.92)*	-0.6723	*(1.37)*	-1.9076	*(5.09)*	-2.7413	*(4.29)*
HoH: Aged 30-40	-1.2938	*(4.11)*	-0.8614	*(1.95)*	-0.0727	*(0.16)*	-0.8573	*(2.60)*	-1.7471	*(3.09)*
HoH: Aged 40-50	-1.2213	*(4.45)*	-0.2683	*(0.70)*	0.0608	*(0.15)*	-0.7705	*(2.66)*	-0.6079	*(1.21)*
HoH: Aged 50-60	-0.6921	*(2.79)*	-0.3749	*(1.06)*	-0.3511	*(0.94)*	-0.6272	*(2.34)*	-0.0989	*(0.22)*
HoH: Years of schooling	0.1588	*(4.62)*	0.2603	*(5.56)*	0.3571	*(7.24)*	0.3306	*(8.67)*	0.1096	*(4.75)*
HoH: Male	-0.3439	*(1.36)*	-1.0615	*(3.21)*	-1.1200	*(3.21)*	-0.8977	*(3.32)*	-0.7365	*(1.69)*
HoH: Married/cohabiting	1.3848	*(5.21)*	1.1722	*(3.43)*	1.2970	*(3.50)*	1.0616	*(3.90)*	0.9029	*(1.91)*
HoH: Employee	0.0457	*(0.14)*	1.1687	*(2.38)*	0.5667	*(1.19)*	0.4635	*(1.33)*	0.2135	*(0.36)*
HoH: Unemployed	-0.2736	*(0.52)*	0.3759	*(0.50)*	0.0589	*(0.08)*	-1.8337	*(3.10)*	-1.6382	*(1.54)*
HoH: Self employed	0.2202	*(0.91)*	-1.5307	*(4.29)*	-0.5634	*(1.58)*	-0.1981	*(0.75)*	-0.3390	*(0.77)*
HoH: White	-0.5858	*(1.56)*	2.1840	*(3.75)*	1.6427	*(2.91)*	0.6529	*(1.58)*	0.2567	*(0.41)*
HoH: Black	0.1445	*(0.36)*	2.6010	*(4.23)*	1.2526	*(2.11)*	0.3228	*(0.73)*	-1.3807	*(2.03)*
HoH: Health index	0.2641	*(3.34)*	0.0131	*(0.12)*	0.0425	*(0.38)*	0.1657	*(1.97)*	0.0732	*(0.55)*
HoH: Catholic	2.4699	*(7.51)*	1.1815	*(3.02)*	-0.5106	*(1.34)*	-0.0320	*(0.11)*	-0.5378	*(1.16)*
HoH: Jewish	1.7569	*(3.13)*	1.5814	*(2.37)*	-0.5699	*(0.79)*	1.0538	*(2.25)*	0.1460	*(0.18)*
HoH: Protestant	2.8240	*(9.29)*	0.9625	*(2.75)*	-0.3210	*(0.96)*	-0.1352	*(0.53)*	-0.6191	*(1.52)*
HoH: Other religion	0.3208	*(0.45)*	1.4640	*(1.61)*	-0.7719	*(0.93)*	0.3149	*(0.45)*	-0.1463	*(0.15)*
Number of adults in household	-0.1487	*(1.18)*	-0.1100	*(0.69)*	-0.1687	*(0.95)*	-0.2298	*(1.78)*	-0.3183	*(1.44)*
Number of children in household	0.1156	*(1.48)*	0.1162	*(1.10)*	-0.0410	*(0.36)*	0.1466	*(1.79)*	0.1096	*(0.75)*
Log household labour income	0.0151	*(0.49)*	0.0036	*(0.08)*	-0.0219	*(0.48)*	-0.0031	*(0.09)*	-0.0302	*(0.53)*
Log household wealth	0.0326	*(1.64)*	0.0798	*(2.84)*	0.0968	*(3.33)*	0.0925	*(4.42)*	0.1171	*(3.38)*
Log household non-labour income	0.0434	*(2.03)*	0.0205	*(0.70)*	0.1309	*(4.40)*	0.0748	*(3.40)*	0.1883	*(5.23)*
Log HPI	1.0042	*(4.66)*	2.0928	*(6.95)*	1.8569	*(6.08)*	1.6459	*(7.07)*	1.4700	*(3.84)*
Log variance of HPI	-0.5498	*(3.97)*	-0.6049	*(3.14)*	-0.3611	*(1.81)*	-0.3482	*(2.34)*	-0.0792	*(0.33)*
Price = (1- tax rate)	-5.8277	*(6.31)*	-8.0335	*(6.51)*	-8.2663	*(6.48)*	-6.9278	*(7.24)*	-7.5843	*(4.68)*
Own home outright or on a mortgage	1.0204	*(4.87)*	0.9495	*(3.45)*	0.9713	*(3.31)*	1.0108	*(4.58)*	0.8290	*(2.17)*
Donated to charity type *k* in 2003	5.9519	*(8.39)*	4.2382	*(21.35)*	2.9889	*(14.23)*	2.9592	*(18.47)*	3.4989	*(13.32)*
Wald chi2 (175), p value	8,729.03, *p=[0.000]*									
$\rho_{12}, \rho_{13}, \rho_{14}, \rho_{15}, \rho_{23}, \rho_{24}, \rho_{25}, \rho_{34}, \rho_{35}, \rho_{45}$	0.2499*, 0.4009*, 0.3871*, 0.2416*, 0.3174*, 0.2954*, 0.2413*, 0.3937*, 0.2676*, 0.2125*									
Chi2 (10) $\rho_{12} = \rho_{13} = \cdots = \rho_{45} = 0$, p value	1,493.50, *p=[0.000]*									
OBSERVATIONS	6,590									

Notes: Month of interview controls are included. * Denotes significance at the 1 per cent level.

Table 5: The Determinants of Tsunami Donations and Different Types of Charitable Donations

PANEL A: UNIVARIATE TOBIT	TSUNAMI DONATIONS	
	COEF	TSTAT
HoH: Aged <20	-0.0472	*(0.03)*
HoH: Aged 20-30	-0.0259	*(0.07)*
HoH: Aged 30-40	-0.3424	*(0.94)*
HoH: Aged 40-50	0.0144	*(0.04)*
HoH: Aged 50-60	-0.3351	*(1.08)*
HoH: Years of schooling	0.1129	*(2.80)*
HoH: Male	-0.6419	*(2.36)*
HoH: Married/cohabiting	0.6859	*(2.32)*
HoH: Employee	-0.0896	*(0.23)*
HoH: Unemployed	-0.9357	*(1.59)*
HoH: Self employed	-0.0524	*(0.18)*
HoH: White	-0.7987	*(2.02)*
HoH: Black	-0.5271	*(1.25)*
HoH: Health index	0.2432	*(2.73)*
HoH: Catholic	0.3530	*(1.11)*
HoH: Jewish	1.6851	*(3.14)*
HoH: Protestant	-0.1598	*(0.57)*
HoH: Other religion	1.5629	*(2.36)*
Number of adults in household	0.0545	*(0.40)*
Number of children in household	0.1195	*(1.37)*
Log household labour income	0.0763	*(2.03)*
Log household wealth	-0.0074	*(0.31)*
Log household non-labour income	0.0691	*(2.83)*
Log HPI	0.7474	*(3.09)*
Log variance of HPI	-0.1476	*(0.92)*
Price = (1- tax rate)	-1.1535	*(1.07)*
Own home outright or on a mortgage	-0.3877	*(1.68)*
Whether donated to a disaster cause in 2003	1.5770	*(4.44)*
Log religious charitable donation	**0.2303**	***(9.95)***
Log needy charitable donation	**0.2734**	***(6.45)***
Log combined charitable donation	**0.1881**	***(5.33)***
Log caring charitable donation	**0.3003**	***(7.83)***
Log other charitable donations	**0.2114**	***(5.28)***
F(40, 6,550), p value	45.64, *p=[0.000]*	
Pseudo R Squared	0.0928	

PANEL B: MULTIVARIATE RECURSIVE TOBIT	TSUNAMI DONATIONS	
	COEF	TSTAT
Log religious charitable donation	**0.1646**	***(3.48)***
Log needy charitable donation	**0.5625**	***(7.27)***
Log combined charitable donation	**0.2518**	***(3.47)***
Log caring charitable donation	**0.6626**	***(7.72)***
Log other charitable donations	**0.2599**	***(3.16)***
Chi2 (215), p value	10,214.39, *p=[0.000]*	
Chi2 (10) $\rho_{12} = \rho_{13} = \cdots = \rho_{15} = \rho_{23} = \cdots = \rho_{45} = 0$, p value	1,493.50, *p=[0.000]*	
Chi2 (5) $\rho_{16} = \rho_{26} = \cdots = \rho_{56} = 0$, p value	2.75, *p=[0.738]*	
CONTROLS	As in panel A	
OBSERVATIONS	6,590	

Notes: Month of interview controls are included.

Table 6: Tsunami Donations and Future Charitable Donations

PANEL A: UNIVARIATE TOBIT	TOTAL DONATIONS	
	COEF	TSTAT
Log tsunami donation	**0.1814**	***(6.08)***
F(38, 6,552), p value	116.06, *p=[0.000]*	
Pseudo R Squared	0.1193	
CONTROLS	As in Table 2	
PANEL B: BIVARIATE RECURSIVE TOBIT	TOTAL DONATIONS	
	COEF	TSTAT
Log tsunami donation	**-1.6790**	***(4.55)***
Chi2 (75), p value	4,163.21, *p=[0.000]*	
ρ, p value	0.8252, *p=[0.000]*	
CONTROLS	As in Table 2	
OBSERVATIONS	6,590	

Table 7: Tsunami Donations and Future Charitable Donations by Type

MULTIVARIATE RECURSIVE TOBIT	TYPE OF CHARITABLE DONATION									
	RELIGIOUS		NEEDY		COMBINED		CARING		ALL OTHER	
	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT	COEF	TSTAT
Log tsunami donation	-1.6416	*(11.52)*	-2.4234	*(11.68)*	-1.4648	*(8.00)*	-1.7353	*(11.49)*	-1.2632	*(4.54)*
Chi2 (227), p value	9,153.59, *p=[0.000]*									
Chi2 (10) $\rho_{gh} = 0$ [#], p value	2,327.98, *p=[0.000]*									
Chi2 (5) $\rho_{01} = \rho_{02} = \cdots = \rho_{05} = 0$, p value	1,418.39, *p=[0.000]*									
CONTROLS	As in Tables 4 and 5									
OBSERVATIONS	6,590									

Notes: [#] g=1,…,4, h=2,…,5 and $g \neq h$.