Charitable Behaviour and the Big Five Personality Traits: Evidence from UK Panel Data

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Abstract: This paper investigates the association between personality traits and charitable behaviour, namely donations of time and money using data from *Understanding Society*, the most recent large scale UK longitudinal household survey. Due to the censored nature of the outcome variables, i.e. some individuals do not engage in charitable behaviour, we employ tobit and censored quantile regression models. Personality traits are classified according to the 'Big Five' taxonomy: openness to experience; conscientiousness; extraversion; agreeableness and neuroticism. In general, after conditioning on an extensive set of controls, conscientiousness and neuroticism are found to be inversely related to donating time and money, whilst openness to experience, which has a positive effect, is the dominant trait in terms of magnitude. Interestingly, personality traits are found to have a stronger correlation with donations of time and money at the extreme points of the distribution of donations relative to that at the median, thereby highlighting the additional information revealed by the quantile approach.

Keywords: Charitable donations; Volunteering; Personality traits; Tobit model; Censored quantile regression.

JEL classification: C24; D03; H41; N3

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1. Introduction and Background

Recent figures from *Giving U.S.A. 2014* estimate total charitable contributions in the U.S. in 2013 at $335.17 billion, whilst, for the UK, the Charities Aid Foundation estimates total donations by adults in 2012/13 at £10.4 billion. According to the Corporation for National and Community Service (2012), about 64.5 million Americans, or 26.5% of the adult population, gave 7.9 billion hours of volunteer service worth $175 billion in 2012. Corresponding figures for volunteering time in the UK produced by the Office for National Statistics estimate that in 2012 2.29 billion hours were volunteered which equates to an average of 8 hours per individual,[1] see ONS (2013). Hence, it is not surprising that an extensive economics literature on charitable donations exists, which has focused on the decision to donate at the individual or household level, with much attention paid to the impact of tax deductibility and the associated price and income effects.

In contrast to the disciplines of psychology and sociology, the role of personality traits on charitable behaviour has arguably attracted limited attention in the economics literature. Personality traits are described by McCrae and Costa (1999) as 'enduring patterns of thoughts, feelings, and actions' (p. 140). Hence, it is not surprising that the implications of personality traits for economic outcomes such as earnings, employment status and financial decision-making, have started to attract the attention of economists (see, for example, Almlund et al., 2011, Caliendo et al., 2012, and Heineck and Anger, 2010). However, to date there is little evidence in the economics literature on the role of personality traits in influencing charitable behaviour. It is this gap in the existing economics literature, which this paper aims to contribute to.

In terms of reasons why individuals may choose to donate either time and/or money, in general, the economics literature has adopted a utility maximising framework, where utility

[1] Note that both figures are based upon those who volunteer at least once per year.

$U = U(h_v, m, h_w, l)$ is an increasing function of: hours volunteered (unpaid labour) h_v; monetary donations to charity m; hours worked in the labour market h_w; and hours not worked, i.e. leisure time, l. It is possible to think of two mechanisms by which time and money donations may impact upon utility in a positive way with both operating through the impure altruistic motive. The first is *warm glow* which arises as a feel good factor from donating, Andreoni and Payne (2013), whilst the second operates through perceived social image the *prestige motive* whereby social approval is sought by the individual, Ellingsen and Johannesson (2009) and Cappellari et al. (2011). Whilst a large number of both empirical and theoretical studies exist in the economics literature exploring why individuals make monetary contributions to charity, in contrast the economics literature on volunteering is much smaller. The following provides a brief discussion of the literature on money and time donations.

Andreoni (2006) and Andreoni and Payne (2013) provide extensive surveys of the influences on charitable donations established in the existing literature. Common findings are that donations are influenced by income (Auten et al., 2002) and that they fluctuate over the lifecycle: for example Glenday et al. (1986) found donations to be an increasing function of age. Similarly, Schokkaert (2006) finds that older and more educated individuals give more. Household composition has been found to play a role, where evidence from existing studies has generally shown that married households, households with dependent children, households with a female head and religious households give more in absolute terms.

Menchik and Weisbrod (1987) was one of the first papers in the economics literature to explicitly investigate the supply of volunteer labour. They found that in the U.S. price and income effects were important determinants of volunteering time, a finding similar to that of monetary donations (see, for example, Andreoni and Payne, 2013). An influential paper by Freeman (1997) noted that volunteering is a substantial economic activity in the U.S. yet it receives no monetary compensation. By adopting standard labour supply side analysis, he

argued that volunteering is a "conscience good or activity" which individuals feel morally obligated to undertake through, for example, peer and/or social pressure. Moreover, contrary to the labour supply model, he finds little evidence that the amount of time volunteered is influenced by the opportunity cost of time, i.e. in a standard labour supply model people should volunteer less when the wage offer is high.

Brown and Lankford (1992) was one of the first papers in the economics literature to explicitly investigate whether monetary and time donations were complements or substitutes, whereby they simultaneously estimated the determinants of both types of charitable behaviour allowing for censoring at zero, i.e. some individuals donate neither time and/or money. Based upon a unique U.S. sample, they found evidence in favour of complementarity. More recently, the literature has continued to investigate donations of time and money in a bivariate framework, for example Apinunmahakul et al. (2009), Cappellari et al. (2011) and Bauer et al. (2013), i.e. thereby allowing for potential simultaneous decision making. Based on a large cross sectional Canadian sample of individuals, Apinunmahakul et al. (2009) examine the number of hours volunteered and the amount donated to charity in 1997. They show that there is a positive correlation in the unobservables between time and money donations suggesting complementarity between the two forms of charitable behaviour. Using cross-sectional data for Italian individuals, Cappellari et al. (2011) also find evidence in favour of complementarity. In addition, they report differences across gender relating in particular to the responsiveness of males to changing opportunity costs. Using data from the European Social Survey for nineteen countries, Bauer et al. (2013) focus on the role of income and opportunity costs in influencing time and money donations and the extent to which the different types of charitable behaviour are interrelated. They report positive associations between monetary and time donations, although the extent of the correlation varies according to the type of charitable organisation – being largest for religious

organisations. In accordance with the existing literature, higher educational attainment, higher income and religious individuals are more likely to donate money. Whilst those with a lower opportunity cost of time, for example part-time workers or those without dependent children, are more likely to volunteer time.[2]

Other factors which may affect volunteering and monetary donations, which are typically difficult to isolate and until recently were generally absent from large scale sample surveys, are personality traits. The "Big Five" personality traits, which are analysed in this paper, have been increasingly incorporated in such surveys and, hence, have started to be incorporated into models of economic behaviour and decision-making. The Big Five personality trait taxonomy was developed by Costa and McCrae (1992) and has been widely used to classify personality traits in the psychology literature (see Gosling et al., 2003). This taxonomy classifies individuals according to five factors: openness to experience; conscientiousness; extraversion; agreeableness and neuroticism (emotional instability). Almlund et al. (2011), p. 18, comment that "the Big Five factors represent personality traits at the broadest level of abstraction."

Other disciplines, such as psychology, political science and sociology, have recognised the potential effects of personality traits on charitable behaviour and have tended to focus on volunteering and prosocial behaviour (rather than donations of money). Existing studies have found a positive relationship between extraversion and the likelihood of volunteering, see, for example, Bekkers (2010), Okun et al. (2007) and Omoto et al. (2010), whilst Bekkers (2005) finds that volunteering is related to openness, conscientiousness and extraversion. Such findings indicate the importance of the unobserved heterogeneity of individuals in determining charitable behaviour.

[2] Although not the primary focus of our analysis, ascertaining whether money and time donations are complements or substitutes is important for policy analysis. For example, if they are complements then tax deduction for cash gifts has the additional benefit of increasing the amount of time volunteered, Andreoni (2006). Interestingly, a recent paper employing a full structural model of time and money donations reports evidence that the two are substitutes, see Feldman (2010).

In this paper, we use *Understanding Society*, the UK Household Longitudinal Study (UKHLS), to investigate the relationship between the Big Five personality traits and charitable donations of both time (unpaid volunteering) and money from an empirical perspective. This paper makes three main contributions to the existing literature. Firstly, we are aware of no other empirical study for the UK which has analysed the relationship between the Big Five personality traits and charitable behaviour. Moreover, the sample is large scale and representative of the population whereas the literature to date, which has examined the role of personality on charitable behaviour for other countries, has tended to use small sample surveys or experiments which are arguably not representative of the population, e.g. Ben-Ner et al. (2004), where the empirical analysis is based on 50 observations. Our second main contribution relates to the fact that the UKHLS is panel survey, which allows us to track individuals over time. The existing literature, which has focused on both donations of time and money, has predominantly used cross-sectional data. The availability of panel data enables us to reduce the potential for reverse causality since the measurement of personality traits and charitable behaviour occurs at difference points in time.[3] Finally, as well as evaluating the effects of personality traits at the mean via the use of tobit estimators, which have been commonly used in the existing literature, we also explore their association with donations of time and money across the entire distribution of charitable behaviour using a censored quantile regression approach. The flexibility of such an approach potentially unveils a more detailed picture of the determinants of charitable behaviour.

2. Data

We use data drawn from *Understanding Society*, the UK Household Longitudinal Study (UKHLS), to investigate the relationship between the Big Five personality traits and charitable donations of time (i.e. unpaid volunteering) and money. The UKHLS is designed

[3] This approach to reduce causality by exploiting timing differences between personality traits and the outcome of interest is akin to that taken by Heineck and Anger (2010) who investigate the relationship between cognitive ability, personality and earnings.

to capture life in the UK and how it is changing over time. The survey builds upon its predecessor, the British Household Panel Survey (BHPS), which covered the period 1991 to 2008. Participants live in Scotland, Wales, Northern Ireland and England. The survey contains information about people's social and economic circumstances, attitudes, behaviours and health. In the first wave of the UKHLS, over 50,000 individuals were interviewed between 2009 and 2011, correspondingly in the latest wave (wave 4) over 47,000 individuals were interviewed between 2012 and 2014.

Interviews for wave 4 contain information on the monetary amount donated to charity over the last twelve months and the number of hours of unpaid labour volunteered in the last four weeks. Interviews for wave 3 of the UKHLS, which were conducted between 2011 and 2013, contain information on the Big Five personality traits, namely openness to experience, conscientiousness, extraversion, agreeableness and neuroticism. Matching the two waves, i.e. waves 3 and 4, and dropping observations with missing responses to the key questions yield a sample size of 31,409 individuals aged 16 and over.

We estimate models of: (i) the amount of charitable donations; (ii) the amount of charitable donations as a proportion of the individual's annual total income (from employment, benefits and other sources); and (iii) the number of hours volunteered, conditional on an extensive set of socio-economic covariates, $\boldsymbol{X}$, as well as the Big Five personality traits, T_j. The modelling approaches are detailed in Section 3 below. In order to mitigate against the potential problem of life cycle effects influencing personality traits and the subsequent measurement error this might induce, following the existing literature, we condition each personality trait T_j (i.e. one of the Big Five j=1,…,5) on a polynomial in age $\boldsymbol{A}$, i.e. $T_j = \theta_j \boldsymbol{A}_j + \omega_j$. The resulting residuals, i.e. $Z_j = \hat{\theta}_j \boldsymbol{A}_j$, are standardised (zero mean and unit standard deviation) and used as indicators of personality traits net of life cycle influences (see, for example, Nyhus and Pons, 2005, and Brown and Taylor, 2014).

Furthermore, as is common in the existing literature, we expect personality traits to be stable amongst adults, see, for example, Cobb-Clark and Schurer (2012, 2013) and, hence, fixed (i.e. time invariant), see Nyhus and Pons (2005) and Heineck and Anger (2010). This implies that they are not driven by the outcome of interest, i.e. in the current application charitable behaviour, and can effectively be deemed as plausibly exogenous.

Covariates in $\boldsymbol{X}$ include: gender; ethnicity, whether white British, black and Asian (other ethnicity is the reference category); age,[4] specifically aged 16-24, aged 25-29, aged 30-34, aged 35-39, aged 40-44, aged 45-49, aged 50-54, aged 55-59, aged 60-64, aged 65-69 and aged 70-74 (75 plus is the reference category); the number of children in the household, aged 2 or under, aged between 3-4, aged 5-11 and aged 12-15; the number of adults in the household; married or cohabiting; highest educational qualification, i.e. degree (undergraduate or postgraduate), further education, Advanced (A) level, General Certificate of Secondary Education (GCSE), and all other qualifications (no education is the omitted category);[5] the natural logarithm of monthly labour income; the natural logarithm of monthly non labour income; the natural logarithm of monthly savings; labour force status, specifically whether employed, self-employed, or unemployed (all other labour market states constitute the reference category);[6] housing tenure, whether the home is owned outright, owned via a mortgage or privately rented (all other types of tenure make up the omitted category); religious denomination, whether Church of England, Roman Catholic, Christian, Muslim, or other religion (no religion is the reference category); active membership of a church or religious group; to capture peer effects (see Andreoni and Payne, 2013, and Smith, 2012), the

[4] Whilst personality traits have been purged of life cycle effects, by also conditioning charitable outcomes on age this enables the age of the individual to have a direct influence upon their donating behaviour over and above the influence of age on the personality.

[5] GCSE level qualifications are taken after eleven years of formal compulsory schooling and approximate to the U.S. honours high school curriculum. The A level qualification is a public examination taken by 18 year olds over a two year period studying between one to four subjects and is the main determinant of eligibility for entry to higher education in the UK.

[6] This includes retirement, family care, full time students and the long-term sick or disabled.

number of friends the individual has and whether the individual currently belongs to a social website; current health state, specifically whether in excellent health, very good health, good health or fair health (with poor and very poor health the reference category); whether currently living in an urban area; eleven region of residence controls (with London as the reference category); and eleven month of interview binary controls (with January as the reference category).

Following Freeman (1997) and Bauer et al. (2013), additional variables are included in the vector $\boldsymbol{X}$ when modelling the number of hours volunteered to proxy the opportunity cost of time. In particular, we include the following controls: total hours per week spent in paid employment,[7] doing housework and travelling to work; being completely dissatisfied with the amount of leisure time; and the number of hours spent caring per week, specifically whether up to 4 hours, 5-9 hours, 10-19 hours, 20-34 hours, 35-49 hours, 50-99 hours and 100 hours or above (no time spent caring is the omitted category).

When modelling the level of charitable donations and donations as a proportion of total income, the additional covariates included in the vector $\boldsymbol{X}$ are: the frequency of using the internet, i.e. daily, weekly or monthly (never is the reference category). The logic behind its inclusion is to account for the individual's social networks, see Andreoni and Payne (2013). We also include controls for how the individual receives news, namely via the radio, television, internet or newspaper (with other means as the reference category); and the proportion of households donating by local area district (LAD) for age specific reference groups. The idea here is that individual donations may be influenced by the donations of those in the same social reference space, i.e. LAD-age group, see Andreoni and Scholz (1998).

[7] If labour markets are imperfect then the individual's working hours become the theoretically relevant variable in determining voluntary labour supply, rather than the market wage since this is no longer measuring the opportunity cost of an additional hour of time, see Clotfelter (1985) and Brown and Lankford (1992).

Summary statistics are given in Table 1A for the three dependent variables.[8] The top part of the table reports the descriptive statistics including individuals who do not donate time and/or money. The average number of hours volunteered during the last 4 weeks is just over 2 and the natural logarithm of the monetary amount donated to charitable causes during the past year is 2.89 or approximately £142. Evaluated as a weekly amount, i.e. £2.73, this figure is comparable to that found by Smith (2012) using an alternative UK data source, the Living Costs and Food Survey (LCFS).[9] Charitable donations over the past year as a proportion of annual income are low, on average, at around 0.7% However, based on those who do donate to charity, this figure increases to over 1%, see final row of Table 1A. Focusing on each of the dependent variables for non-zero values, it can be seen from Table 1A that around 15% of individuals volunteer unpaid hours, with the mean at 12 hours over the last 4 weeks, and 67% of the sample made a monetary donation to charity during the past year with an average of 4.34 log units or approximately £213. Figures 1 to 3 show the distributions of the dependent variables conditional on non-zero values. In Table 1B, summary statistics are provided for the explanatory variables, where around 44% are male and 40% are aged between 35 and 54. Finally, Figure 4 shows the distribution of the standardised residuals for each personality trait where clearly both agreeableness and conscientiousness are skewed to the left hand side of the distribution compared to other elements of the 'Big Five'. Hence, even though personality traits have been standardised, in terms of their first and second moments, the presence of skew-ness might imply that they will have differential effects on charitable behaviour.

3. Methodology

Censored regression analysis is employed throughout given the substantial left hand censoring of each dependent variable. Specifically monetary donations to charity have 33.41% at zero and time volunteered has 85.35% at zero. Univariate tobit models are

[8] All monetary variables are deflated to 2009 constant prices.
[9] The LCFS was formerly known as the Expenditure and Food Survey and the Family Expenditure Survey.

employed as well as bivariate tobit models in order to explore the interaction and allow for the potential joint decision making between money and time donations.[10] In order to explore the robustness of the findings, we also conduct censored quantile regression analysis to ascertain the effects of the Big Five personality traits across the entire distribution of charitable behaviour, rather than just at the median. In a similar vein, Bekkers (2006) argues that "the relatively weak main effects of personality characteristics do not imply that personality is irrelevant for understanding prosocial behaviour" and finds that "personality characteristics often exert nonlinear effects on prosocial behaviour", p362. In addition, it may be the case that personality traits have different influences across the distribution of prosocial behaviour which may be masked by relatively weak effects at the median. In all models, the underlying specification can be viewed as a demand function, where giving money and/or time to charity is a direct source of utility, see, for example, Brown and Lankford (1992).

Univariate tobit models

Cross-sectional tobit models are initially estimated for each outcome of interest, Y_i, for individual i $(= 1, \dots, n)$, where there is a timing difference between the measurement of the Big Five personality traits and the dependent variables. The Big Five personality traits are measured *ex ante*, $T - K$, (at wave 3 of UKHLS), i.e. prior to the outcome of interest measured at period T (at wave 4 of UKHLS). The timing difference helps to reduce the potential for reverse causality since, as argued by Angrist and Pischke (2009), the Big Five personality traits are measured *ex ante*, that is, predating the outcome variable of interest:

$$Y_{iT}^{*} = \boldsymbol{\phi}' \boldsymbol{X}_i + \sum_{j=1}^{5} \pi_j Z_{jiT-K} + \varepsilon_i \qquad (1)$$

$$Y_{iT} = \max[0, Y_{iT}^{*}] \, .$$

[10] In terms of modelling the time of unpaid volunteering we follow the existing literature, e.g. Menchik and Weisbrod (1987), Brown and Lankford (1992) and Apinunmahakul et al. (2008), by employing a censored regression model, as detailed below.

Equation (1) is estimated as a tobit regression model, where Y_{iT}^{*} is the unobserved untruncated latent dependent variable and Y_{iT} is the censored dependent variable.

Wave 2 of UKHLS also provides comparable information on charitable behaviour. Specifically, there are two periods, $t = 1, 2$, waves 2 and 4, providing information on charitable behaviour, enabling us to track individuals over time. Hence, in order to explore the robustness of our cross-sectional findings, we construct an unbalanced panel of 66,193 observations (36,070 individuals) and estimate a random effects tobit model as follows:

$$Y_{it}^{*} = \boldsymbol{\gamma}'\boldsymbol{X}_{it} + \sum_{j=1}^{5} \psi_j Z_{ji} + \alpha_i + \upsilon_{it} \qquad (2)$$

$$Y_{it} = \max[0, Y_{it}^{*}]$$

where Y_{it}^{*} is the unobserved untruncated latent dependent variable and Y_{it} is the censored dependent variable. The individual specific unobservable effect in the error term is denoted by α_i, i.e. a random effect $\alpha_i \sim IID(0, \sigma_\alpha^2)$, and υ_{it} is a white noise error term, i.e. $\upsilon_{it} \sim IID(0, \sigma_{it}^2)$.[11] This specification allows for correlation between the error terms of individuals over time, i.e. $\rho = \sigma_\alpha^2/(\sigma_\alpha^2 + \sigma_\upsilon^2)$, which represents the proportion of the total unexplained variance in the dependent variable contributed by the panel level variance components. If the panel component of the data is important then we would expect $\rho \neq 0$, where the magnitude of the parameter indicates the extent of the unobservable intra-personal correlation in donating behaviour over time.

Bivariate tobit models

Following Brown and Lankford (1992), we also estimate bivariate tobit models to investigate whether there is a positive correlation in the unobservables driving monetary donations, Y_1, and volunteering, i.e. time donations, Y_2, as follows:

[11] It is not possible to estimate a fixed effects tobit model (see, for example Honoré, 1992, for a semi parametric approach) in this particular application whereby α_i is a fixed rather than a random effect, since personality traits Z_j are time invariant, which makes the estimation of the key parameters of interest, ψ_j, infeasible.

$$Y_{1iT}^{*} = \boldsymbol{\phi}_1' \boldsymbol{X}_{1i} + \sum_{j=1}^{5} \pi_{1j} Z_{jiT-K} + \varepsilon_{1i} \quad (3)$$

$$Y_{2iT}^{*} = \boldsymbol{\phi}_2{}' \boldsymbol{X}_{2i} + \sum_{j=1}^{5} \pi_{2j} Z_{jiT-K} + \varepsilon_{2i}$$

$$Y_{1iT} = \max[0, Y_{1iT}^{*}], Y_{2iT} = \max[0, Y_{2iT}^{*}]$$

where $\varepsilon_{1i}, \varepsilon_{2i} \sim N(0,0,\sigma_{1i}^2,\sigma_{2i}^2,\rho_{12})$ and the covariance between the error terms is denoted by $\sigma_{1i,2i} = \rho_{12}\sigma_{1i}\sigma_{2i}$. In the bivariate tobit model, the disturbance terms, ε_{1i} and ε_{2i}, are jointly normally distributed with variances σ_{1i}^2 and σ_{2i}^2, respectively. If the correlation term, ρ_{12}, is zero, then the amount donated to charity and the number of hours volunteered are independent. If $\rho_{12} \neq 0$, then this implies a degree of inter-dependence between charitable donations of time and money. For example, if ρ_{12} is positive, this accords with them being complements.[12]

In each of the above models, the parameters of interest are the estimates of: π_j (equation 1); ψ_j (equation 2); π_{1j} and π_{2j} (equation 3), which will inform us of the association between the individual elements of the Big Five personality traits and each outcome of interest, whilst controlling for an extensive set of explanatory variables.

Censored quantile regression models

As detailed in the previous section, many individuals in the sample do not make monetary or time donations and, hence, a significant proportion of the data is censored. The univariate and bivariate tobit models assume normality and homoscedasticity and the estimates are based at the mean of the outcome. An alternative estimator, which allows an examination of the complete distribution, is a censored quantile regression (CQR), see Powell (1986) and Chernozhukov and Hong (2002). The CQR is thus able to capture heterogeneous effects

[12] A statistically significant association between the error terms, i.e. $\rho_{12} \neq 0$, does not necessarily confirm whether the types of giving are substitutes or complements as per the traditional micro interpretation, although it is often construed as such in the literature, this is because it is not possible to disentangle general tastes for giving and changing relative prices, see Cappellari et al. (2011).

across the distribution by computing estimates at different quantiles (Koenker, 2005). The following discussion explains how the CQR model is estimated.

The quantile regression model of Koenker and Bassett (1978) is given by:

$$Q_\theta(Y_i|\boldsymbol{H}_i) = \boldsymbol{\beta}'_\theta \boldsymbol{H}_i \tag{4}$$

where Q_θ denotes the θ conditional quantile of the dependent variable Y_i and $\boldsymbol{H}_i \subseteq \{\boldsymbol{X}_i, Z_{ji}\}$. The estimator $\boldsymbol{\beta}_\theta$ is found by the following minimisation problem:

$$\min_{\boldsymbol{\beta}_\theta} \frac{1}{N} \left\{ \sum_{Y_i \geq \boldsymbol{\beta}'_\theta \boldsymbol{H}_i} \theta |Y_i - \boldsymbol{\beta}'_\theta \boldsymbol{H}_i| + \sum_{Y_i < \boldsymbol{\beta}'_\theta \boldsymbol{H}_i} (1-\theta)|Y_i - \boldsymbol{\beta}'_\theta \boldsymbol{H}_i| \right\} \tag{5}$$

The CQR estimator is found by solving the following (Powell, 1986):

$$\min_{\boldsymbol{\beta}_\theta} \frac{1}{N} \sum_{i=1}^{N} [\{\theta - I(Y_i < \max\{0, \boldsymbol{\beta}'_\theta \boldsymbol{H}_i\})\}(Y_i - \max\{0, \boldsymbol{\beta}'_\theta \boldsymbol{H}_i\})] \tag{6}$$

where I is a binary indicator equal to unity if the expression holds and zero otherwise. Powell (1986) showed that the CQR estimator is consistent, independent of the distribution of the error term, not based on the assumption of constant variance: so heteroscedasticity is not a problem and the model is robust to outliers. Whilst equation (5) is a linear function, $\max\{0, \boldsymbol{\beta}'_\theta \boldsymbol{H}_i\}$ in equation (6) is non-linear. In order to solve the model, we follow the three step approach of Chernozhukov and Hong (2002).[13] The resulting estimator $\widehat{\boldsymbol{\beta}}_\theta$ is shown by Chernozhukov and Hong (2002) to be both consistent and efficient. The CQR model is estimated in STATA using the '*cqiv*' routine and standard errors are obtained via a weighted bootstrap with 200 replications, see Chernozhukov et al. (2015).

[13] In the first step, the sub-sample of individuals who donated to charity (i.e. time or money) is predicted by a logit model. The sub-sample is defined as $J_0 = \{i: \hat{\boldsymbol{\gamma}}' \boldsymbol{H}_i^* > 1 - \theta - c\}$, where θ defines the quantile of interest, c is a trimming constant (set equal to 0.05, see Buchinsky and Hahn, 1998) and $\boldsymbol{H}_i^*$ is a desired transformation of $(\boldsymbol{H}_i, C)$, with C denoting the censoring points (see Chernozhukov and Hong, 2002). In the second step, the initial estimator $\widehat{\boldsymbol{\beta}}_\theta^0$ is determined from equation (5) for the sample J_0. The initial estimator is used to select the sub-sample $J_1 = \{\widehat{\boldsymbol{\beta}}_\theta^0 \boldsymbol{H}_i^* > 0\}$ and then the model is estimated in the third step with equation (5) for the sample J_1.

4. Results

In what follows, we present results for each outcome of interest based on univariate and bivariate tobit specifications followed by the results from the censored quantile regression analysis. For the univariate tobit models, we present average marginal effects (*dy/dx*) throughout based on the expected value of the dependent variable y for uncensored observations given a vector of covariates $\boldsymbol{H}$ and parameters $\boldsymbol{\beta}$, i.e. for a unit change in h_k, defined as follows:

$$\frac{\partial E[y|y>0,\boldsymbol{H}]}{\partial h_k} = \beta_k \left\{ 1 - \lambda\left(\frac{\boldsymbol{\beta}'\boldsymbol{H}}{\sigma}\right) - \lambda^2 \right\} \quad (7)$$

where $\lambda = \phi\left(\frac{\boldsymbol{\beta}'\boldsymbol{H}}{\sigma}\right) / \Phi\left(\frac{\boldsymbol{\beta}'\boldsymbol{H}}{\sigma}\right)$ and ϕ and Φ denote the density and cumulative distributions of the standard normal distribution, respectively, see Wooldridge (2010). This allows us to ascertain the association of covariates with the outcome of interest conditional on selection, i.e. making a monetary donation or volunteering time, i.e. $y > 0$.

Univariate tobit results – monetary donations

The estimates of equations (1) and (2) appertaining to cross sectional and panel tobit models, respectively, are reported in Tables 2A and 2B, which present the results for the natural logarithm of charitable donations, and Tables 3A and 3B, which present the equivalent estimates for charitable donations as a proportion of income. Finally, Tables 4A and 4B present the results relating to the number of hours volunteered. In each table, there are two columns, where the first column provides the estimates of the cross-sectional analysis and the second column shows the panel data results, which take into account intra-personal correlation in donating behaviour over time.

We initially focus on the results from modelling the natural logarithm of charitable donations. Table 2A reports the full results for both the cross-sectional and panel data specifications, where each of the Big Five personality traits are measured *ex ante*, i.e. at time

$T-K$. Before focusing on the association between personality traits and charitable donations, i.e. the estimates of π_j from equation (1) and ψ_j from equation (2), we briefly comment on the other covariates and how the findings relate to the existing literature.

Compared to the omitted age category of 75 and above, individuals in all other age categories donate a lower monetary amount. These findings are consistent with the evidence in the existing literature, such as Lankford and Wyckoff (1991), Auten and Joulfaian (1996) and Schokkaert (2006). With the exception of those aged 16-24, the effects are statistically significant. Evaluating the expected value function (from equation 1) of logged charitable donations, when all covariates, including the dummy variables, are equal to 0 (in the reference categories), then:

$$E\{Y_{iT}|\boldsymbol{X}_i = 0, Z_{jiT-K} = 0\} = \Phi(\phi_0/\sigma)\phi_0 + \sigma\phi(\phi_0/\sigma) \quad (8)$$

The intercept from the model is denoted by ϕ_0 and σ is the standard error of the regression equation. Hence, from Table 2A:

$$E\{Y_{iT}|\boldsymbol{X}_i = 0, Z_{jiT-K} = 0\}$$

$$= [\Phi(-5.34/2.91) \times -5.34] + [2.91 \times \phi(-5.34/2.91)] = 0.038$$

The log level of charitable donations is 0.038 for those aged 75 and over as compared to $\{0.038 + (-)0.86\} = -0.82$ for those aged 35 to 44. Thus, evaluated at the mean (see Table 1A), individuals in this mid-age category make monetary donations 22 times lower than those aged 75 and over, i.e. 0.134 compared to 2.891 log units or £6.58 compared to £142.

Males donate approximately 25 percentage points less than females, which is consistent with the existing literature, see, for example, Brown et al. (2012). Household composition is clearly of importance where having children aged 2 or under, in comparison to having no children, is inversely related to the level of donations. Interestingly, there are no statistically significant effects from having children aged between 3 and 15. Furthermore, the amount donated is inversely (positively) related to the number of adults in the household

(being married). The amount donated is monotonically increasing in the level of educational attainment, which is consistent with findings in the existing literature, see, for example, Schokkaert (2006) and Cappellari et al. (2011). Specifically, the log level of charitable donations is 0.038 (as calculated from equation 8) for those with no educational attainment compared to $\{0.038 + 1.22\} = 1.258$ for individuals with a degree. Hence, evaluated at the mean, an individual with a degree donates 33 times more money to charity than a corresponding individual with no qualifications, i.e. £4,686 compared to £142. These effects are independent of an income effect as we directly control for income.

In terms of the monetary controls, we find that the effects of labour, non-labour income and monthly savings are all statistically significant yet inelastic, which is consistent with Auten et al. (2002). Specifically, a 1 percent increase in labour (non-labour) income is associated with a 0.08 (0.02) percentage point higher monetary donation. Interestingly, the effect of monthly savings outweighs both income effects, where a corresponding change in savings is associated with a 0.1 percentage point increase in charitable donations. With respect to labour market status, when compared to the omitted category which is dominated by those in retirement (see Section 2), employees, the self-employed and the unemployed donate less to charity. White British individuals and those who are not in poor health give larger amounts to charity. In accordance with the existing literature, such as Feldman (2010), individuals who are homeowners, explicitly state a religious denomination, and are an active member of a religious group all donate more to charity. Muslims donate the most money to charity compared to those who do not have a religious affiliation. Those individuals who are active members of a religious group donate over twice as much to charity, where the latter finding is consistent with recent evidence for European countries, see Bauer et al. (2013).

Peer effects may influence charitable donations, operating, for example, through the prestige motive whereby individuals seek social approval, Ellingsen and Johannesson (2009).

The number of friends that the individual has is statistically significantly associated with the level of monetary donations, and the positive relationship is consistent with *a priori* expectations. Membership of social networks is also found to be important with those individuals who are a member of a social website donating 6.7 percentage points more to charity than those who do not belong to such a website. Similarly, the frequency of using the internet is positively related to the amount donated. For example, those who use the internet on a daily basis donate $\{0.038 + 0.29\} = 0.33$, i.e. 9 times the amount compared to those who do not use the internet. Evaluated at the mean, this equates to donations of £1,233 compared to £142. Such findings endorse the importance of social networks in influencing charitable behaviour, as discussed by Andreoni and Payne (2013).

Information sources, such as how news is acquired, may also be important for donating behaviour. For example, media coverage of natural disasters, such as the 2004 Indian Ocean tsunami or Hurricane Katrina, may raise awareness of the need for donations (sometimes including specific appeals for donations in news bulletins) thereby increasing donations to charity. We find that each key source of news is positively associated with the level of charitable donations. The proportion of individuals who donate to charity in the same local area district and age group also has a positive relationship with the level of money given, which is consistent with peer group effects from those in the same social reference space, see Andreoni and Scholz (1998). Specifically, a 1 percent increase in those donating to charity within the same LAD-age group is associated with a 1.08 percentage point increase in the donation level. Similarly, the social context has been shown to be an important factor in potentially influencing donation behaviour, where larger social networks seem to increase the propensity to volunteer (Okun et al., 2007).

With respect to the Big Five personality traits, we find that agreeableness, extraversion and openness to experience are all positively and significantly related to

monetary donations to charitable causes. The positive effect for agreeableness ties in with the description of agreeable individuals being altruistic and trusting (McCrae and Costa, 1999). The largest effect stems from openness to experience, where a one standard deviation increase is associated with a 6.4 percentage point rise in the amount given. Interestingly, this contrasts with the findings of Bekkers (2010), who found no role for openness to experience on influencing the probability of donating, but is consistent with the experimental evidence of Ben-Ner et al. (2004). Conscientiousness is inversely related to charitable donations, albeit, at the 10 percent level of statistical significance. This finding is consistent with the results of Donnelly et al. (2012), who report that individuals who are highly conscientious are more able to manage their money through greater levels of financial self-control.

Turning to the panel tobit results, the findings are very similar and clearly there is intra-personal correlation in donating behaviour over the period. The association between personality traits and charitable donations remains, but neuroticism becomes statistically significant and the point estimate of conscientiousness is now significant at the 1 percent level. Specifically, a one standard deviation increase in conscientiousness is associated with a 3.3 percentage point fall in the monetary amount donated to charity.

A sub-sample of the UKHLS respondents were also members of its predecessor, the British Household Panel Survey (BHPS).[14] In the 2005 BHPS, information was collected on the Big Five personality traits. As a robustness check, we re-estimate equation (1) extending the window between T (interviews conducted 2012-2014) and $T-K$ (with personality traits now measured in 2005). After conditioning on missing information for personality traits in 2005, this leaves a sample of 6,410 individuals. We argue that, given that personality traits have been argued to be largely time invariant, regardless of the length of the window between

[14] The BHPS was replaced by Understanding Society in 2009.

T and $T-K$, there should be similar effects from personality traits measured in 2005 in terms of their direction of influence, magnitude and statistical significance.[15]

Figure 5 shows the distribution of each of the Big Five personality traits measured in the UKHLS (i.e. 2011-2013) and the BHPS in 2005. Clearly, the distribution of each personality trait is very similar between the two time periods in which the individual is observed and consequently is suggestive of time invariance, which gives credence to the notion that the Big Five personality traits are exogenous. Table 2B has the same structure as Table 2A, and only coefficients and marginal effects associated with the Big Five personality traits are shown for brevity. The relationship between agreeableness, extraversion and openness to experience and charitable donations is similar for this sub-sample. For a one standard deviation increase in a given personality trait the largest differential in comparison to the full sample comes from openness to experience where the difference between the marginal effects of the full sample (Table 2A) and the sub-sample (Table 2B) is 0.029, for agreeableness and extraversion the corresponding differences are 0.006 and 0.0008, respectively. This suggests that personality traits are stable over time and can hence potentially be considered as exogenous. Similar effects are also apparent for when a panel is created from the sub-sample of individuals, where consistent with the analysis for the full

[15] Prevoo and ter Weel (2015) examine the role of conscientiousness upon a number of socio-economic outcomes, e.g. adult wages, employment, education, health and savings. Using British cohort data they argue that if a personality trait is measured at two intervals it may be possible to alleviate potential measurement error in personality traits. If measurement error does exist in the Big Five then this could bias our analysis. Hence, following Prevoo and ter Weel (2015) in the cross sectional models of equation (1) we have undertaken an instrumental variable approach to investigate the role of personality traits upon charitable donations. Under the assumption that measurement error in the Big Five at time $T-K$ (i.e. 2012-2014) is uncorrelated with measurement error at time $T-K$=2005, which would seem valid given the gap in the measurement of personality traits, it is possible to use the 2005 BHPS personality traits as instruments for those measured later from the UKHLS. Hence, in the first stage we regress the following model, for each personality trait j, $Z_{iT-K} = \alpha_0 + \alpha_1 Z_{i2005} + \omega_i$, obtaining $\hat{Z}_{jiT-K}$ which is standardised to have a zero mean and standard deviation of unity, then the second stage regression takes the form $Y_{iT}^{*} = \boldsymbol{\phi}'\boldsymbol{X}_i + \sum_{j=1}^{5} \pi_j \hat{Z}_{jiT-K} + \varepsilon_i$ where standard errors are bootstrapped with 200 repetitions given the generated nature of $\hat{Z}_{jiT-K}$. The first stage results yield F-statistics for each trait in excess of the threshold of 10 suggested by Stock et al. (2002). The results of the second stage are similar to those reported in Table 2 in terms of the ranking of magnitudes of the Big Five, direction of association with charitable donations, and statistical significance. Full results are available upon request from the authors.

sample, statistical precision is improved and there is clear evidence of intra-personal correlation in the unobservables over time.

We also consider charitable donations of money over the past twelve months as a proportion of annual income. The results are shown in Tables 3A and 3B, where, for brevity, only the parameters and marginal effects associated with personality traits are provided and both tables have the same structure as Tables 2A and 2B. Table 3A focuses on personality traits measured from wave 2 of the UKHLS at time $T-K$ with the dependent variable measured at time T, whilst Table 3B provides analysis with personality traits measured from the 2005 BHPS for the sub-sample of individuals who were interviewed in both the BHPS and UKHLS. The results are consistent with those found in Tables 2A and 2B when focusing on the level of monetary donations in that the personality trait which has the largest effect is openness to experience. For example, a one standard deviation increase in openness to experience is associated with a 2.7 percentage point increase in the proportion of annual income donated to charitable causes. The direction of correlation and ranking of the magnitude of the effects of the other personality traits are also in line with the results found when analysing the level of monetary donations.

Univariate tobit results – time donation

In Tables 4A and 4B rather than focusing on monetary contributions to charity, attention is turned to investigating the association between personality traits and the number of hours of unpaid volunteering during the past month. The tables are constructed as previously showing cross-sectional and panel results where Table 4A (4B) employs measures of personality traits at $T-K$ from the UKHLS (2005 BHPS). Before focusing on the relationship between personality traits and hours volunteered, i.e. the estimates of π_j from equation (1) and ψ_j from equation (2), we briefly comment on the other covariates and how the findings relate to the existing literature.

Considering Table 4A, contrary to the results obtained from modelling monetary donations, the effects of age, where statistically significant, are positive: relative to those aged over 75, individuals in the age groups covering ages 45 to 74 volunteer more of their time (this is evident in the results from the cross-section and panel data analysis). These findings are consistent with those of Menchik and Wiesbrod (1987) and Freeman (1997) for the U.S. Similarly, whilst there was no association found between the number of children and charitable donations of money, there is clearly a statistically significant relationship between the composition of the family and volunteering. It should be noted that this effect exists after controlling for time commitments. For example, the number of children aged 2 or under is inversely associated with the number of hours volunteered, whilst having children aged between 5 and 11 is positively related with volunteering. This finding, which is consistent with Bauer et al. (2013), may reflect a network effect once the child starts school and parents, for example, discuss issues with their contemporaries and/or participate in school clubs. Hence, it appears that the age of child is important and this helps to shed further light on the finding of Freeman (1997) that volunteering is positively associated with the number of children.

Volunteering is increasing in educational attainment, which is consistent with the findings of Cappellari et al. (2011) for Italy and Freeman (1997) for the U.S. In terms of monetary effects, there is a positive association between non labour income and volunteering, and between savings and time volunteered, where a 1 percent increase in monthly saving is associated with a 0.13 hour increase in volunteering (approximately 8 minutes). Perhaps surprisingly, labour income is statistically insignificant in determining time volunteered (yet was significantly positively associated with monetary donations). This may be because we explicitly control for the opportunity cost of time, which includes the number of hours in employment, although Bauer et al. (2013) still found a role for income (however their

measure is household labour income rather than that of the individual). We define the opportunity cost of time as the sum of the number of hours per week spent in paid employment, doing housework and commuting to work. As argued by Clotfelter (1985), if labour markets are imperfect focusing on hours in paid employment is relevant for determining volunteer labour supply rather than income from employment. In accordance with Bauer et al. (2013), we find a negative association between hours in paid employment and time volunteered which is as expected since this picks up the opportunity cost of volunteering. However, whether the individual is dissatisfied with the amount of leisure time they have is perhaps surprisingly unrelated to hours volunteered. Interestingly, in terms of time spent caring for others per week compared to the omitted category of zero hours, spending up to 19 hours caring for others is associated with a higher amount of hours volunteered. Consistent with the findings for monetary donations, social connections appear to be important as the number friends that the individual has, being an active member of a religious group, and being a member of a social website are all positively related to time spent volunteering. Whilst living in an urban area has no impact on charitable donations of money, those individuals who live in an urban area spend less time volunteering, which accords with the results of Bekkers (2010).

In terms of the role of the Big Five personality traits, we find that extraversion and openness to experience are both positively and significantly associated with the time spent volunteering, whilst neuroticism is inversely related to hours volunteered. The positive role found for extraversion is consistent with Bekkers (2010), Okun et al. (2007) and Omoto et al. (2010), and in accordance with the characteristics of extraversion put forward by McCrae and Costa (1999) including sociability and activity. The largest absolute effect stems from openness to experience, as found when focusing on monetary donations, where a one standard deviation increase is associated with 0.36 more hours volunteered, i.e.

approximately 20 minutes. These results hold in the panel data analysis, with the exception that agreeableness now becomes statistically significant, and when we focus upon the sub-sample of individuals where personality traits are measured from the 2005 BHPS. Specifically, as can be seen from Table 4B, a one standard deviation increase in neuroticism (openness to experience) is associated with 0.29 (0.42) less (more) hours volunteered, i.e. approximately 18 (25) minutes.

Bivariate tobit results – monetary and time donations

Estimates of equation (3) are reported in: Table 5 which shows the results of jointly modelling the natural logarithm of charitable donations, Y_1, and the number of hours volunteered, Y_2; whilst Table 6 provides the analysis of jointly modelling charitable donations as a proportion of annual income, Y_1, and of the number of hours volunteered, Y_2. Equation (3) is estimated by a Conditional (recursive) Mixed Process estimator in STATA using the '*cmp*' routine, see Roodman (2011).

We provide four sets of conditional average marginal effects:[16] (i) $\mathrm{dy/dx}|_{Y_2=0}$ denotes average marginal effects for log charitable donations (or donations as a proportion of income, see Table 6) conditional on covariates and hours volunteered, i.e. the other dependent variable, being equal to zero; (ii) $\mathrm{dy/dx}|_{Y_2\neq 0}$ denotes average marginal effects for log charitable donations (or donations as a proportion of income, see Table 6) conditional on covariates and hours volunteered, i.e. the other dependent variable, being non-zero (volunteers); (iii) $\mathrm{dy/dx}|_{Y_1=0}$ denotes average marginal effects for hours volunteered conditional on covariates and log charitable donations (or donations as a proportion of income, see Table 6), i.e. the other dependent variable, being equal to zero; and (iv) $\mathrm{dy/dx}|_{Y_1\neq 0}$ denotes average marginal effects for hours volunteered conditional on covariates and

[16] That is conditional on covariates and the value of the other dependent variable.

log charitable donations (or donations as a proportion of income, see Table 6), i.e. the other dependent variable, being non-zero (donators).

Both Tables 5 and 6 have two panels where for brevity only the estimates of the Big Five personality traits are presented, i.e. the estimates of π_{1j} and π_{2j}, which are measured *ex ante*, i.e. at time $T-K$: in Panel A, the Big Five are obtained from the UKHLS, whilst in Panel B, we focus on a sub-sample where personality traits are merged in from the 2005 BHPS. Figure 6 shows two plots of charitable donations against the number of hours volunteered, where in Panel A the scatter plot is conditional on the presence of charitable behaviours, that is making a monetary donation or volunteering time, and in Panel B the scatter plot is conditional on individuals making both a monetary donation and volunteering. The positive correlation found (shown by the line of best fit) accords with complementarity between the two types of charitable behaviour. Further light is shed on this by the fact that, across all the results shown in Tables 5 and 6, we find that the correlation in the error terms of equation (3), ρ_{12}, is positive and statistically significant. Hence, there is a degree of inter-dependence between charitable donations of time and money which is consistent with complementarity and a result, which is in common with the much of the existing literature, such as Apinunmahakul et al. (2009), Hartmann and Werding (2012) and Bauer et al. (2013), but is at odds with Feldman (2010), who employs a full structural model of time and money donations to analyse the impact of a preferential tax price for monetary donations. Our results suggest that, even after conditioning upon an extensive set of controls, there are unobserved characteristics, such as an individual's altruistic attitude, that determine whether a person contributes to charity or not in terms of time or money. Alternatively, as argued by Freeman (1997), it may be the case that those individuals who provide voluntary labour to a specific organisation have more information about its activities than non-volunteers and hence have a higher probability of making a monetary donation.

Considering the joint estimation of log charitable donations and hours volunteered, the results in Table 5 indicate a role for agreeableness, extraversion, neuroticism and openness to experience. For example, focusing on the full sample in Panel A, the effect of a one standard deviation increase in extraversion (openness to experience) upon charitable donations conditional upon being a non-volunteer, i.e. $Y_2 = 0$, is for donations to increase by 3.74 (4.82) percentage points. Correspondingly, the same effect conditional on the individual also volunteering unpaid labour, i.e. $Y_2 \neq 0$, is for donations to increase by 3.9 percentage points for extraversion and 5.14 percentage points for openness to experience. Hence, not surprisingly, the effects of personality traits where statistically significant are larger when individuals undertake both types of charitable behaviour. Turning attention to the number of hours volunteered, it can be seen that extraversion and openness to experience are both positively associated with volunteer labour supply, whilst neuroticism has a statistically significant inverse relationship. Again the marginal effects are slightly larger when individuals undertake both types of charitable behaviour. For example, the effect of a one standard deviation increase in openness to experience on time spent volunteering, conditional on being a non-donator, i.e. Y_1=0, is to provide 0.33 hours (20 minutes). This compares to 0.38 hours or 23 minutes when we condition on donators, i.e. $Y_1 \neq 0$. Similar results are found when personality traits are measured from the 2005 BHPS, see Panel B of Tables 5 and 6.

Censored quantile regression results – money and time donations

Table 7 presents the results of estimating equation (6). For brevity, we only report the coefficients associated with the personality traits. The advantage of the CQR estimator is that it is robust to both heteroscedasticity and non-normality. In addition, it allows an examination of the entire distribution rather than focusing solely on the mean. In Panels A and B, coefficients are reported across each decile of the distribution from modelling the natural

logarithm of charitable donations and donations as a proportion of annual income, respectively. Panel C of Table 7 presents the results of estimating the model for the number of hours volunteered, where, given the extensive amount of censoring, we focus on conditional quantiles from the fortieth decile and above. For all estimates reported, we focus on the full sample of 31,409 individuals, where the dependent variable is measured at time T (2012-2014) and the Big Five personality traits are observed *ex ante* at time $T - K$ (2011-2013).[17]

Consistent with the results reported in Tables 2A and 2B, where statistically significant, conscientiousness has a negative association with charitable donations across the distribution, see Table 7 Panel A. Interestingly, agreeableness, extraversion and openness to experience have the largest associations with monetary donations to charity below the median, specifically, for each of the aforementioned personality traits, this is at the twentieth decile. For example, a one standard deviation increase in openness to experience is associated with an 11.75 percent increase in charitable donations at the twentieth decile. This effect is much larger than the corresponding increase at the median at around 7.5 percent, where the association at the median is in line with the tobit estimates of Table 2A based on the mean (at 6.4 percent).

Whilst the largest effects on monetary donations to charity are largely evident below the median, indeed towards the bottom end of the distribution, when we consider charitable donations as a proportion of income and the number of hours volunteered, see Panels B and C respectively, the largest correlations, where statistically significant, are observed above the median – usually at the eightieth or ninetieth decile. For example, a one standard deviation increase in agreeableness (openness to experience) is associated with a 2.85 (8.26) percent increase in donations as a proportion of income at the eightieth (ninetieth) decile. In

[17] For brevity, we do not report the results based on the sub-sample of 6,410 individuals, where personality traits are measured from the 2005 BHPS. In general, the results which follow are consistent with those based on this sub-sample. These results are available on request.

accordance with the tobit analysis of Tables 4A and 4B, neither agreeableness nor conscientiousness are found to have any statistically significant association with the number of hours volunteered across any point of the distribution. Neuroticism, where statistically significant, is negatively correlated with volunteer labour supply, whilst extraversion and openness to experience have a positive relationship with hours volunteered, which is again consistent with the tobit analysis of Tables 4A and 4B. The association between openness to experience and number of hours volunteered is large at the top end of the distribution, with a one standard deviation increase associated with 0.97 more of an hour, or 58 minutes, volunteered at the ninetieth decile. Similar effects are found from extraversion and neuroticism increasing and decreasing the number of hours volunteered in the top decile by 49 and 50 minutes, respectively.

In summary, the censored quantile regression results have revealed that, in general, personality traits have the largest association with each type of charitable behaviour away from the median, specifically at the extreme points of the distribution. Whilst the effects at the median are found to be similar to those from the tobit estimates, which are based on the mean, the correlation between personality traits and charitable donations of time and money are much larger in magnitude at the bottom and top of the respective distributions, thereby endorsing the use of the quantile regression approach to further our understanding of the determinants of charitable behaviour.

5. Conclusion

This paper has investigated the relationship between personality traits and charitable behaviour in the UK using the latest panel data available drawn from a large scale household survey, which is representative of the population. Our contribution to the existing literature is threefold. Firstly, we are aware of no other empirical study for the UK which has analysed the relationship between the Big Five personality traits and charitable behaviour. Our second

contribution relates to the fact that the UKHLS is a panel survey, which has allowed us to track individuals over time. The availability of panel data has enabled us to reduce the potential for reverse causality since the measurement of personality traits and charitable behaviour occurs at difference points in time. Finally, as well as evaluating the effects of personality traits at the mean via the use of tobit estimators, which have been commonly used in the existing literature, we have also explored their association with donations of time and money across the entire distribution of charitable behaviour using a censored quantile regression approach.

After including an extensive set of controls, personality traits are found to influence charitable behaviour. For example, based on the univariate tobit estimates, where statistically significant, conscientiousness and neuroticism are found to be inversely associated with donations of both time and money. Openness to experience is found to have the largest positive association with charitable donations and the number of hours volunteered. These results also hold when we focus on parts of the distribution of charitable behaviour other than the mean via censored quantile regression analysis. There is also some evidence that money and time donations are complementary which is consistent with recent findings in the literature for European countries, see Bauer et al. (2013). Hence, in terms of policy, tax breaks for monetary donations may be associated with an increase in volunteer labour supply. One area which we are unable to explore relates to whether the effects of personality traits differ across different charitable causes such as helping the homeless versus contributing to appeals for foreign aid. Unfortunately the UKHLS does not allow a decomposition of monetary donations and time donations by charitable cause. Thus, this remains an interesting potential avenue for future research.

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FIGURE 1: Number of hours volunteered in the last 4 weeks (volunteers only)

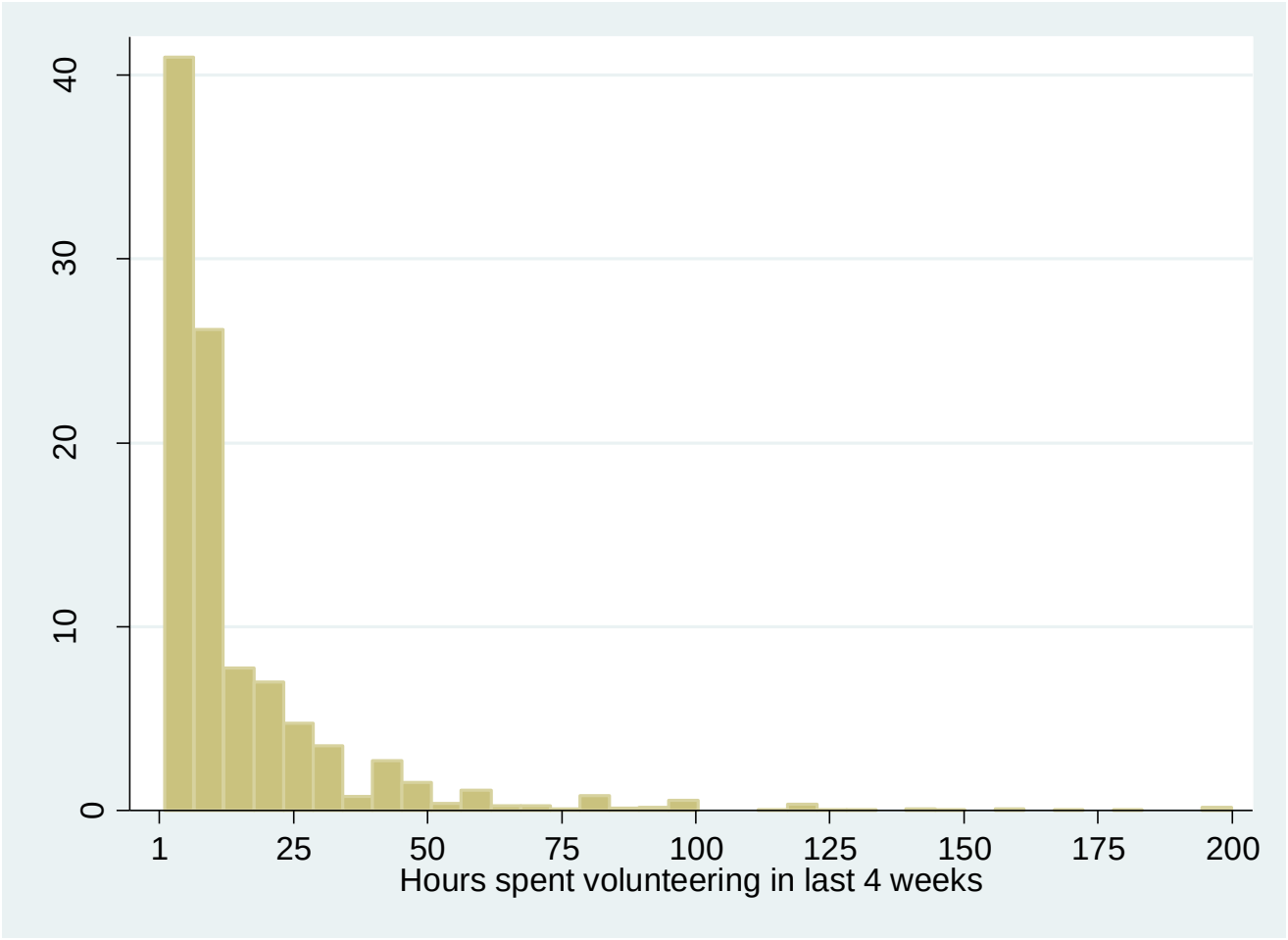


FIGURE 2: Natural logarithm of charitable donations over past 12 months (donators only)

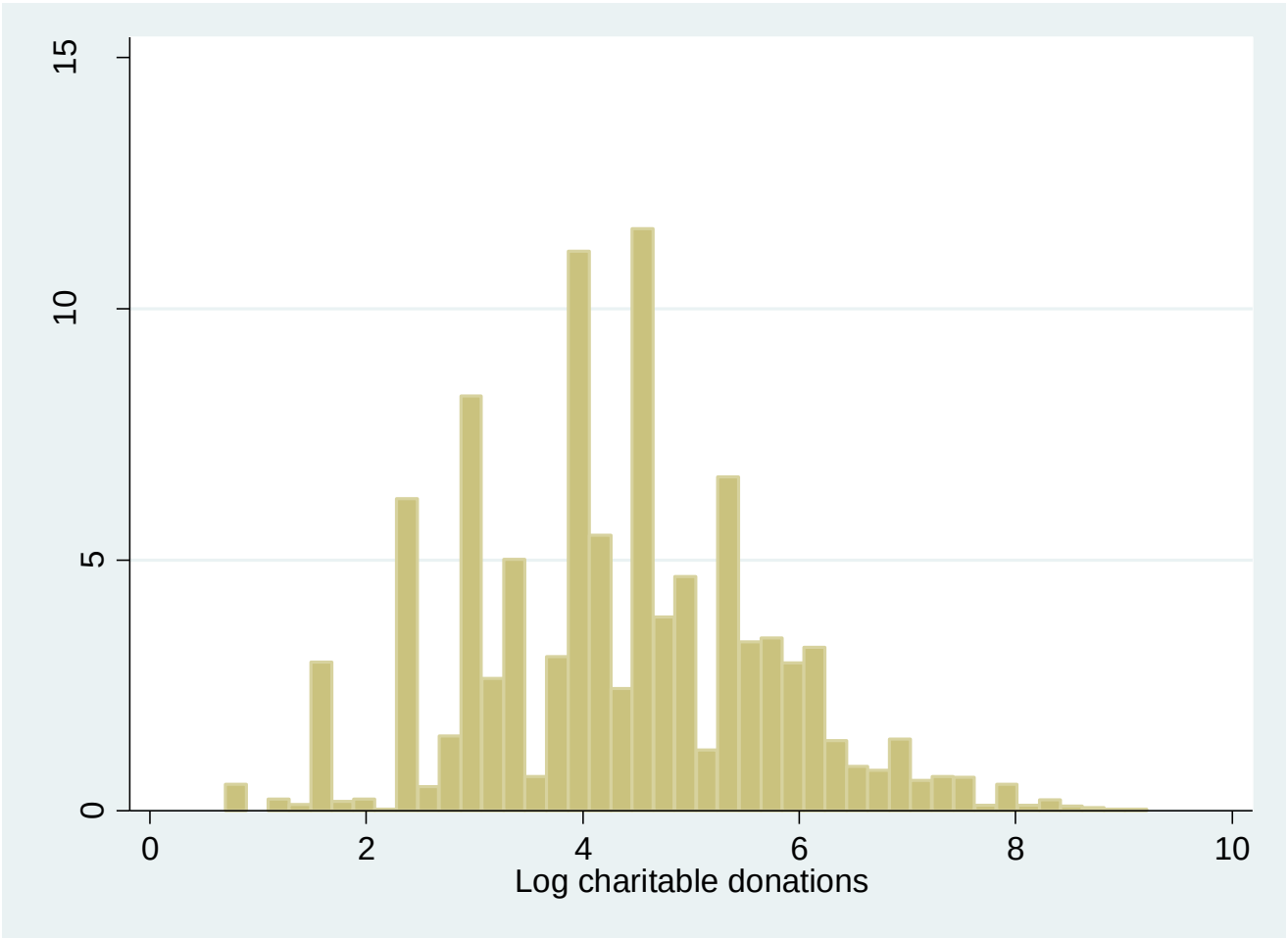


FIGURE 3: Charitable donations over past 12 months (donators only) as a proportion of total income

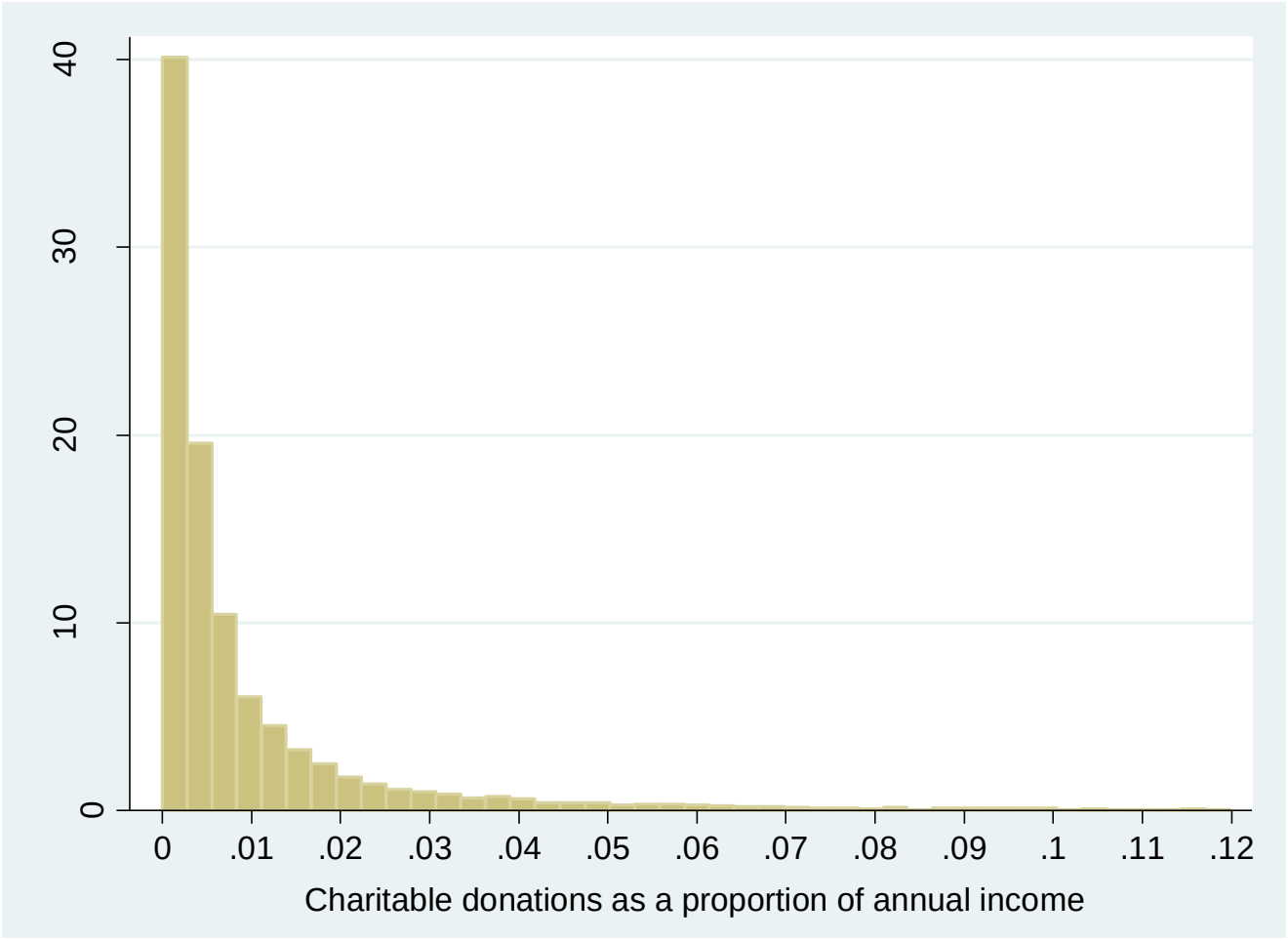


FIGURE 4: Distributions of the standardised Big5 personality traits (residuals)

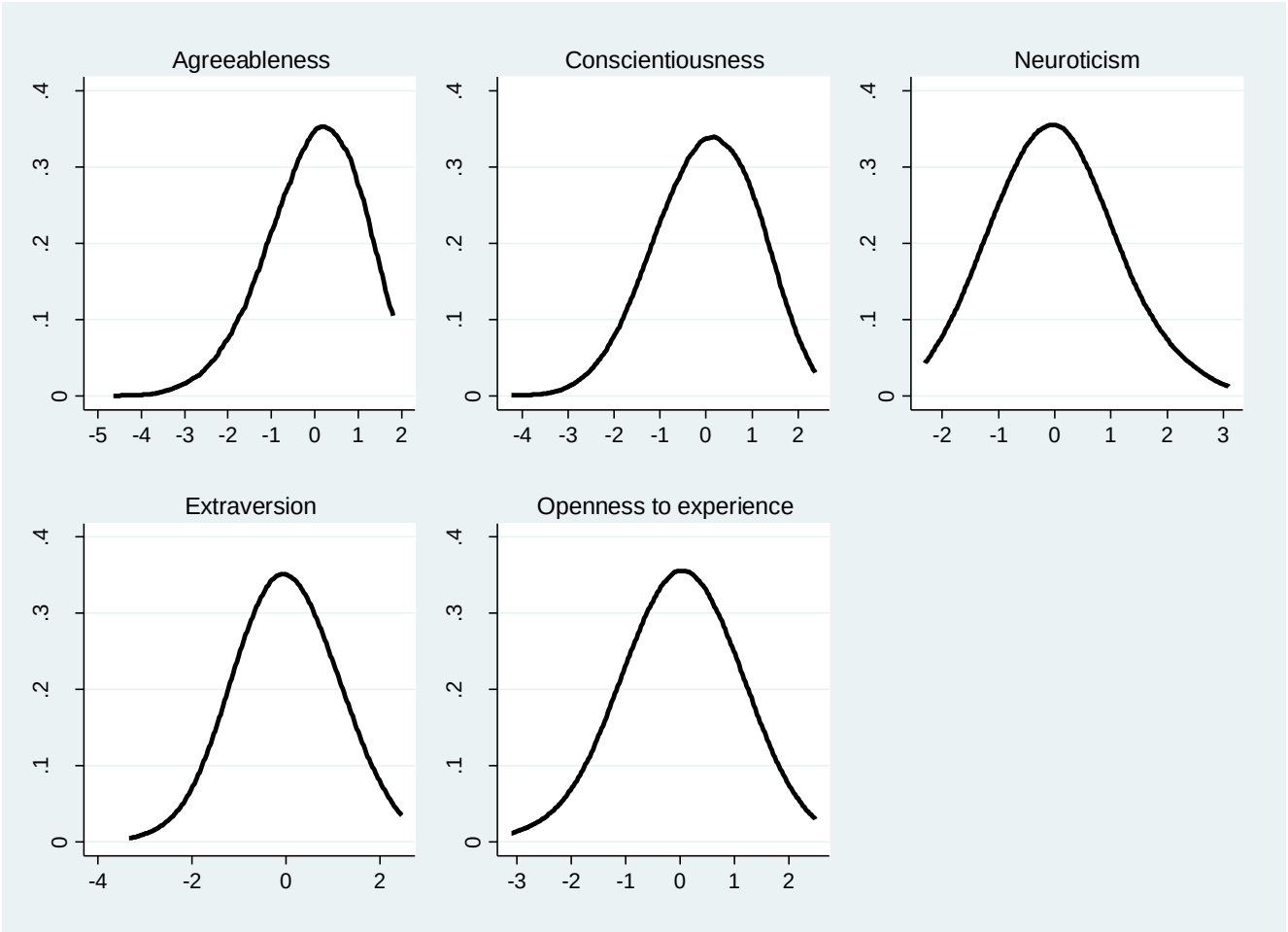


FIGURE 5: Distributions of the Big 5 personality traits in the UKHLS and BHPS 2005: sub-sample of 6,410 individuals

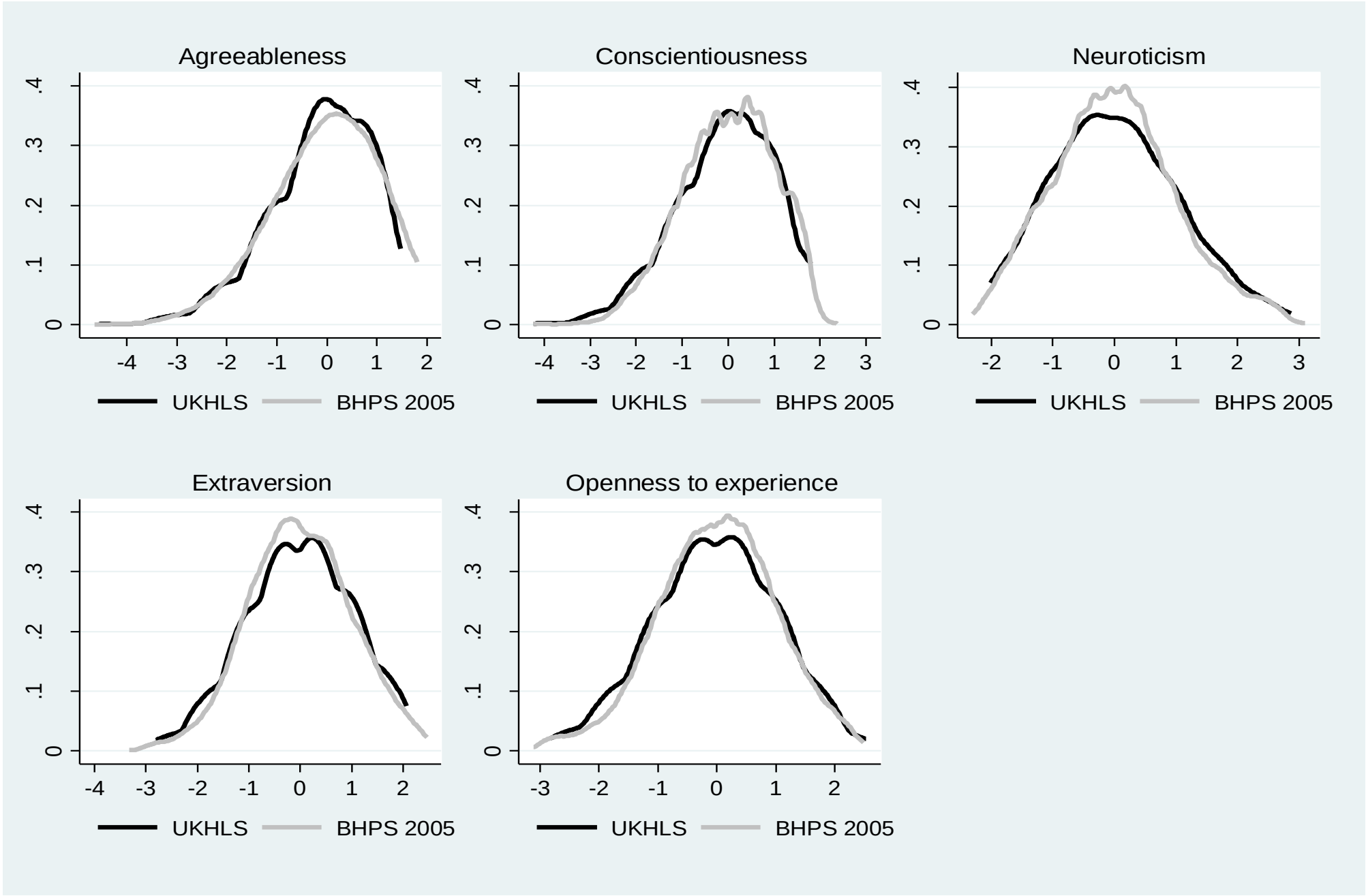
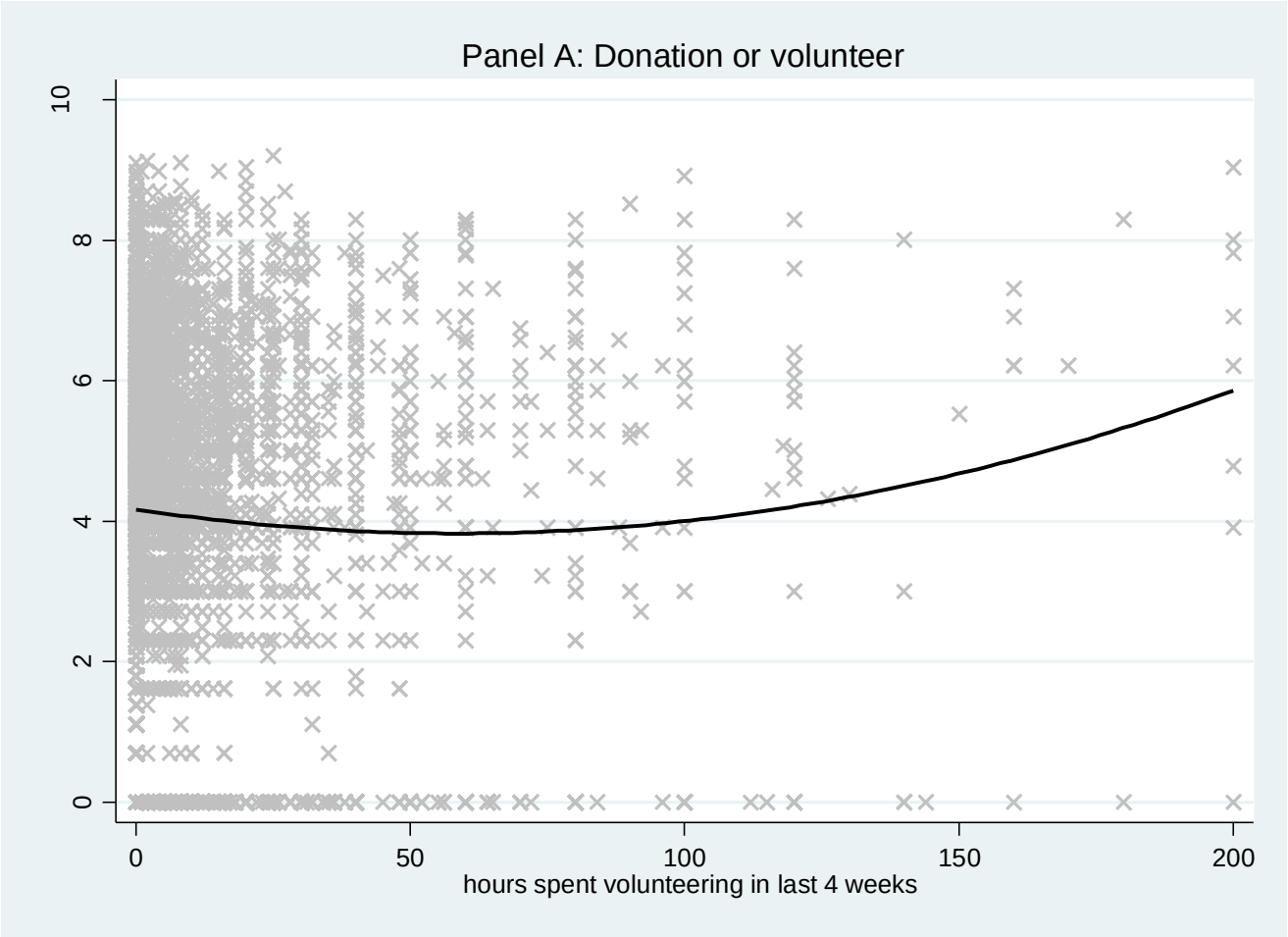


FIGURE 6: Scatter plot of log charitable donations against number of hours volunteered



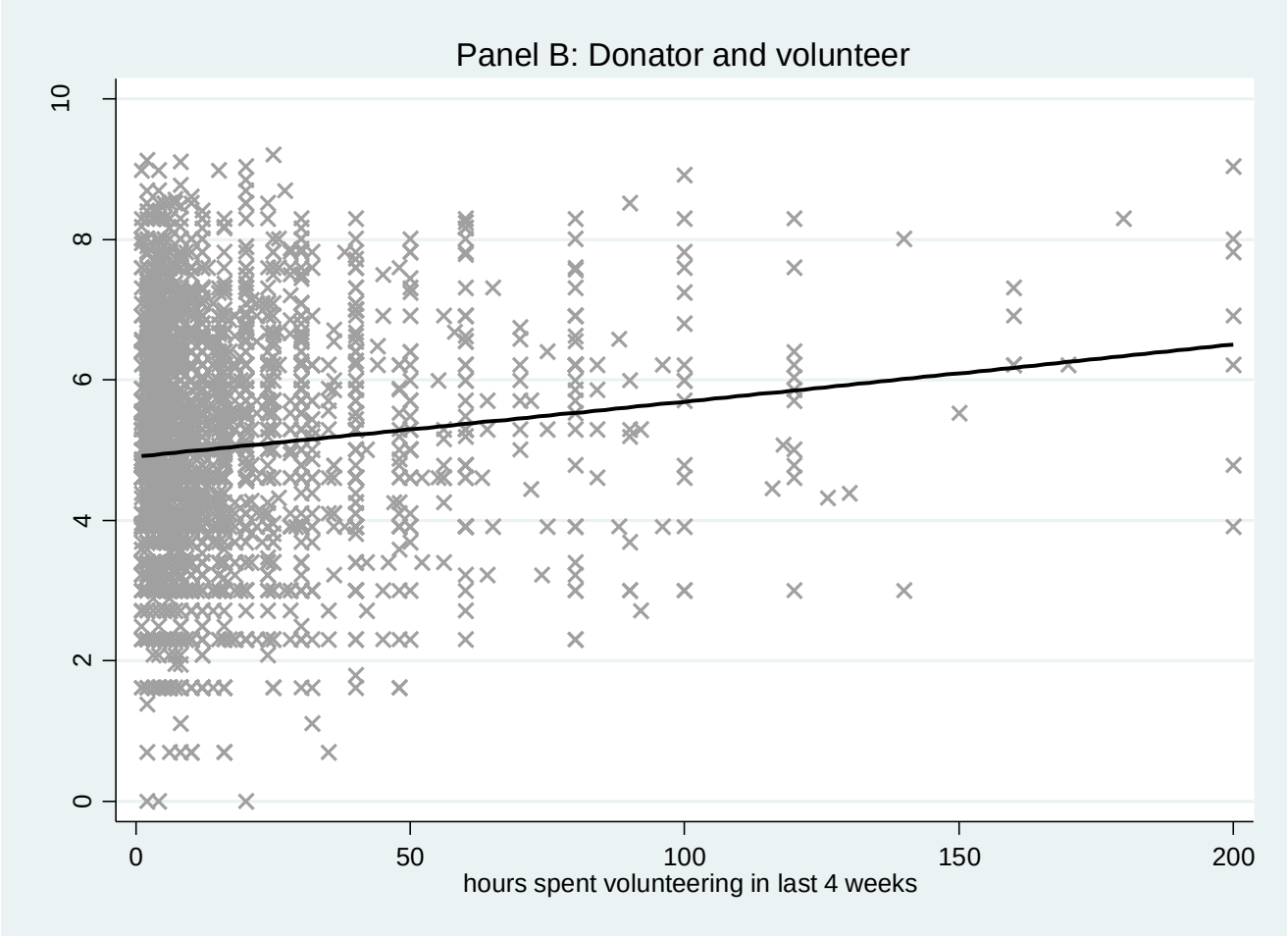


TABLE 1A: Summary statistics – dependent variables

	MEAN	STD. DEV.	MIN	MAX
Number of hours volunteered in last 4 weeks	2.2265	9.5639	0	200
Natural logarithm of charitable donations over past 12 months	2.8905	2.3418	0	9.2100
Charitable donations as a proportion of annual income	0.0067	0.0145	0	0.1259
OBSERVATIONS		31,409		

IF NOT EQUAL TO ZERO	MEAN	STD. DEV.	MIN	MAX
Number of hours volunteered in last 4 weeks	12.1995	18.6712	1	200
OBSERVATIONS (% non-zero)		4,601 *(14.65%)*		

IF NOT EQUAL TO ZERO	MEAN	STD. DEV.	MIN	MAX
Natural logarithm of charitable donations over past 12 months	4.3410	1.3926	0.6931	9.2100
OBSERVATIONS (% non-zero)		20,914 *(66.59%)*		

IF NOT EQUAL TO ZERO	MEAN	STD. DEV.	MIN	MAX
Charitable donations as a proportion of annual income	0.0102	0.0168	$7.25e^{-5}$	0.1259
OBSERVATIONS (% non-zero)		20,914 *(66.59%)*		

TABLE 1B: Summary statistics – explanatory variables

*Common variables in **X** across models*	MEAN	STD. DEV.	MIN	MAX
Aged 16-24	0.0763	0.2654	0	1
Aged 25-34	0.1385	0.3454	0	1
Aged 35-44	0.1942	0.3956	0	1
Aged 45-54	0.1952	0.3964	0	1
Aged 55-64	0.1645	0.3708	0	1
Aged 65-75	0.1461	0.3532	0	1
Male	0.4365	0.4960	0	1
Number of children aged 2 or under	0.0988	0.3298	0	3
Number of children aged 3-4	0.0741	0.2757	0	3
Number of children aged 5-11	0.2547	0.5928	0	5
Number of children aged 12-15	0.1534	0.4223	0	5
Number of adults in household	1.9915	0.9080	1	15
Married or cohabiting	0.5477	0.4977	0	1
GCSE	0.2017	0.4013	0	1
A level	0.1980	0.3985	0	1
Degree	0.3686	0.4824	0	1
Other qualification	0.0991	0.2988	0	1
Natural logarithm of labour income	4.4467	3.5979	0	9.6158
Natural logarithm of non-labour income	4.4003	3.0683	0	11.9476
Natural logarithm of monthly savings	1.8073	2.2499	0	10.1266
Employee	0.5108	0.4999	0	1
Self-employed	0.0764	0.2657	0	1
Unemployed	0.0373	0.1895	0	1
Home owned outright	0.3370	0.4727	0	1
Home owned on a mortgage	0.3922	0.4883	0	1
Home privately rented	0.0997	0.2997	0	1
White British	0.6091	0.4880	0	1
Black	0.0259	0.1589	0	1
Asian	0.0501	0.2181	0	1
Church of England	0.2157	0.4113	0	1
Roman Catholic	0.0743	0.2622	0	1
Christian	0.0345	0.1825	0	1
Muslim	0.0355	0.1850	0	1
Other religion	0.1135	0.3172	0	1
Active member of religious group	0.1269	0.3329	0	1
Number of friends	4.1689	2.0866	0	7
Health excellent	0.1576	0.3643	0	1
Health very good	0.3417	0.4743	0	1
Health good	0.2957	0.4564	0	1
Health fair	0.1421	0.3492	0	1
Member of social website	0.4497	0.4975	0	1
Lives in an urban area	0.7366	0.4405	0	1
OBSERVATIONS		31,409		

TABLE 1B: Summary statistics – explanatory variables (cont.)

X *variables only in number of hours volunteered models*	MEAN	STD. DEV.	MIN	MAX
Opportunity cost of time[#]	27.7783	18.5194	0	168
Dissatisfied with leisure time	0.0458	0.2092	0	1
Cares up to 4 hours per week	0.0703	0.2557	0	1
Cares 5-9 hours per week	0.0365	0.1875	0	1
Cares 10-19 hours per week	0.0286	0.1667	0	1
Cares 20-34 hours per week	0.0232	0.1506	0	1
Cares 35-49 hours per week	0.0055	0.0742	0	1
Cares 50-99 hours per week	0.0045	0.0671	0	1
Cares 100+ hours per week	0.0158	0.1248	0	1
X *variables only in charitable donations models*				
Use the internet daily	0.4926	0.5000	0	1
Use the internet weekly	0.1909	0.3930	0	1
Use the internet monthly	0.0658	0.2480	0	1
Main source of news via paper	0.1265	0.3324	0	1
Main source of news via television	0.4193	0.4935	0	1
Main source of news via radio	0.1076	0.3099	0	1
Main source of news via internet	0.1213	0.3265	0	1
% donating at LAD level by age (16+)	73.0751	15.0885	35.7143	100
OBSERVATIONS		31,409		

[#] This is calculated as the sum of total hours spent per week in: employment; doing housework and commuting to work.

TABLE 2A: Modelling the natural logarithm of charitable donations at time T

	TOBIT – BIG 5 EX ANTE				PANEL TOBIT			
	COEF.	*t-stat*	dy/dx	*t-stat*	COEF.	*t-stat*	dy/dx	*t-stat*
Intercept	-5.3388	*9.68*			-4.6055	*15.83*		
Aged 16-24	-0.3424	*1.37*	-0.1946	*1.37*	-0.4621	*3.20*	-0.2582	*3.20*
Aged 25-34	-0.7439	*5.26*	-0.4228	*5.25*	-0.8378	*8.97*	-0.4681	*8.97*
Aged 35-44	-0.8605	*7.54*	-0.4890	*7.53*	-0.9025	*11.04*	-0.5043	*11.03*
Aged 45-54	-0.7331	*7.31*	-0.4166	*7.30*	-0.7769	*10.41*	-0.4341	*10.41*
Aged 55-64	-0.5779	*6.55*	-0.3284	*6.55*	-0.6546	*10.08*	-0.3658	*10.08*
Aged 65-75	-0.3101	*4.19*	-0.1762	*4.19*	-0.3672	*6.24*	-0.2052	*6.24*
Male	-0.4314	*11.09*	-0.2452	*11.10*	-0.4757	*15.41*	-0.2658	*15.41*
Number of children aged 2 or under	-0.2062	*3.29*	-0.1172	*3.29*	-0.1961	*5.09*	-0.1096	*5.09*
Number of children aged 3-4	-0.1207	*1.67*	-0.0686	*1.67*	-0.0706	*1.64*	-0.0395	*1.64*
Number of children aged 5-11	0.0072	*0.21*	0.0041	*0.21*	0.0098	*0.39*	0.0055	*0.39*
Number of children aged 12-15	0.0179	*0.39*	0.0102	*0.39*	-0.0119	*0.38*	-0.0067	*0.38*
Number of adults in household	-0.2299	*8.16*	-0.1306	*8.15*	-0.2607	*14.50*	-0.1457	*14.50*
Married or cohabiting	0.3832	*9.19*	0.2178	*9.20*	0.4430	*14.26*	0.2475	*14.26*
GCSE	0.5816	*8.27*	0.3305	*8.27*	0.4990	*9.40*	0.2788	*9.40*
A level	0.8237	*11.44*	0.4681	*11.43*	0.7605	*13.93*	0.4250	*13.93*
Degree	1.2216	*17.54*	0.6943	*17.49*	1.1651	*21.98*	0.6511	*21.96*
Other qualification	0.2755	*3.51*	0.1566	*3.51*	0.2301	*3.87*	0.1286	*3.87*
Natural logarithm of labour income	0.1385	*9.56*	0.0787	*9.56*	0.1087	*11.85*	0.0607	*11.84*
Natural logarithm of non-labour income	0.0291	*3.55*	0.0165	*3.55*	0.0305	*5.23*	0.0170	*5.23*
Natural logarithm of monthly savings	0.1796	*22.48*	0.1021	*22.53*	0.1683	*20.19*	0.0940	*20.08*
Employee	-0.3384	*3.09*	-0.1923	*3.09*	-0.1111	*1.55*	-0.0621	*1.55*
Self employed	-0.4821	*4.82*	-0.2740	*4.82*	-0.2344	*3.73*	-0.1310	*3.73*
Unemployed	-0.8496	*7.02*	-0.4828	*7.01*	-0.7517	*10.54*	-0.4200	*10.54*
Home owned outright	0.8264	*13.00*	0.4696	*12.98*	0.7954	*16.99*	0.4445	*16.98*
Home owned on a mortgage	0.7252	*11.90*	0.4121	*11.89*	0.6707	*15.22*	0.3748	*15.21*
Home privately rented	0.1590	*2.02*	0.0904	*2.02*	0.2289	*4.24*	0.1279	*4.24*
White British	0.2049	*4.80*	0.1164	*4.80*	0.2117	*9.67*	0.1183	*9.66*
Black	-0.5285	*3.89*	-0.3003	*3.89*	-0.1036	*1.03*	-0.0579	*1.03*
Asian	-0.0623	*0.55*	-0.0354	*0.55*	0.1270	*1.78*	0.0709	*1.78*
Church of England	0.1809	*3.82*	0.1028	*3.82*	0.2485	*6.72*	0.1389	*6.72*
Roman Catholic	0.2868	*4.15*	0.1630	*4.15*	0.2920	*5.26*	0.1631	*5.26*
Christian	0.4070	*3.90*	0.2313	*3.90*	0.3858	*4.89*	0.2156	*4.89*
Muslim	1.3313	*10.19*	0.7566	*10.17*	1.2306	*14.98*	0.6876	*14.97*
Other religion	0.4189	*6.61*	0.2380	*6.60*	0.3270	*6.83*	0.1827	*6.83*
Active member of religious group	1.1147	*20.80*	0.6335	*20.70*	0.9785	*22.41*	0.5468	*22.39*
Number of friends	0.0993	*11.08*	0.0564	*11.07*	0.1088	*15.57*	0.0608	*15.56*
Health excellent	0.5696	*6.12*	0.3237	*6.12*	0.3252	*5.06*	0.1817	*5.06*
Health very good	0.5375	*6.27*	0.3055	*6.27*	0.3305	*5.58*	0.1847	*5.58*
Health good	0.4804	*5.65*	0.2730	*5.65*	0.3098	*5.31*	0.1731	*5.31*
Health fair	0.3568	*3.95*	0.2028	*3.95*	0.2529	*4.25*	0.1413	*4.25*
Member of social website	0.0670	*1.51*	0.0381	*1.51*	0.0116	*0.33*	0.0065	*0.33*
Use the internet daily	0.2920	*5.25*	0.1659	*5.25*	0.5427	*12.49*	0.3033	*12.49*
Use the internet weekly	0.3165	*5.36*	0.1799	*5.36*	0.5137	*10.92*	0.2870	*10.91*
Use the internet monthly	0.1811	*2.33*	0.1029	*2.33*	0.3626	*5.78*	0.2026	*5.78*
Main source of news via paper	0.5030	*7.91*	0.2859	*7.91*	0.5052	*10.04*	0.2823	*10.03*
Main source of news via television	0.3130	*6.46*	0.1779	*6.47*	0.2756	*7.38*	0.1540	*7.38*
Main source of news via radio	0.6031	*9.19*	0.3427	*9.19*	0.6276	*11.79*	0.3507	*11.79*
Main source of news via internet	0.6179	*9.18*	0.3512	*9.18*	0.5719	*10.90*	0.3196	*10.90*
% donating by LAD and age (16+)	4.1866	*9.17*	1.0841	*9.18*	3.2701	*15.71*	0.5036	*15.70*
Lives in an urban area	-0.0663	*1.62*	-0.0377	*1.62*	-0.0463	*1.41*	-0.0259	*1.41*
Agreeableness [T-K]	0.0714	*3.59*	0.0405	*3.59*	0.0664	*4.34*	0.0371	*4.34*
Conscientiousness [T-K]	-0.0337	*1.71*	-0.0192	*1.71*	-0.0598	*3.87*	-0.0334	*3.87*
Extraversion [T-K]	0.0774	*4.05*	0.0440	*4.05*	0.0994	*6.59*	0.0556	*6.59*
Neuroticism [T-K]	0.0200	*1.05*	0.0114	*1.05*	0.0290	*1.93*	0.0162	*1.93*
Openness to experience [T-K]	0.1128	*5.73*	0.0641	*5.73*	0.1140	*7.35*	0.0637	*7.35*
F(79, 31,330); p-value	98.71; *p=[0.000]*				–			
Wald chi-squared (77); p-value	–				12,359.09; *p=[0.000]*			
σ	2.91				2.14			
ρ; p-value	–				0.4547; *p=[0.000]*			
OBSERVATIONS	31,409				66,193			

Notes: (i) Other controls include region, month and year dummies. (ii) Time T (T-K) interviews conducted 2012-2014 (2011-2013).

TABLE 2B: Modelling the natural logarithm of charitable donations at time T – Big 5 measured in 2005

	TOBIT – BIG 5 EX ANTE				PANEL TOBIT – BIG 5 EX ANTE			
	COEF.	*t-stat*	dy/dx	*t-stat*	COEF.	*t-stat*	dy/dx	*t-stat*
Intercept	-5.5339	*4.78*			-4.7502	*7.64*		
Agreeableness [2005]	0.0816	*2.84*	0.0465	*2.84*	0.1039	*2.94*	0.0583	*2.94*
Conscientiousness [2005]	-0.0359	*0.82*	-0.0205	*0.82*	-0.0676	*1.91*	-0.0379	*1.91*
Extraversion [2005]	0.0786	*1.90*	0.0448	*1.90*	0.0890	*2.62*	0.0499	*2.62*
Neuroticism [2005]	0.0459	*1.07*	0.0262	*1.07*	0.0434	*1.26*	0.0243	*1.26*
Openness to experience [2005]	0.1636	*3.69*	0.0933	*3.69*	0.1887	*5.34*	0.1058	*5.34*
F(79, 6,334); p-value	92.87; *p=[0.000]*				–			
Wald chi-squared (77); p-value	–				2,247.89; *p=[0.000]*			
σ	2.93				2.09			
ρ; p-value	–				0.4845; *p=[0.000]*			
OBSERVATIONS	6,410				13,519			

Notes: other controls as in Table 2A.

TABLE 3A: Modelling charitable donations as a proportion of total income at time T

	TOBIT – BIG 5 EX ANTE				PANEL TOBIT			
	COEF.	*t-stat*	dy/dx	*t-stat*	COEF.	*t-stat*	dy/dx	*t-stat*
Intercept	-3.4803	*9.85*			-6.7599	*14.55*		
Agreeableness [T-K]	0.0492	*4.21*	0.0195	*4.21*	0.0256	*4.36*	0.0107	*4.36*
Conscientiousness [T-K]	-0.0255	*2.04*	-0.0101	*2.04*	-0.0181	*3.04*	-0.0076	*3.04*
Extraversion [T-K]	0.0121	*1.01*	0.0048	*1.01*	0.0325	*5.59*	0.0135	*5.59*
Neuroticism [T-K]	-0.0179	*1.54*	-0.0071	*1.54*	0.0153	*2.65*	0.0064	*2.65*
Openness to experience [T-K]	0.0665	*5.53*	0.0264	*5.53*	0.0419	*7.09*	0.0175	*7.03*
F(79, 31,330); p-value	38.87; *p=[0.000]*				–			
Wald chi-squared (77); p-value	–				8,742.63; *p=[0.000]*			
σ	1.74				0.67			
ρ; p-value	–				0.4280; *p=[0.000]*			
OBSERVATIONS	31,409				66,193			

Notes: other controls as in Table 2A.

TABLE 3B: Modelling charitable donations as a proportion of total income at time T – BIG5 measured in 2005

	TOBIT – BIG 5 EX ANTE				PANEL TOBIT – BIG 5 EX ANTE			
	COEF.	*t-stat*	dy/dx	*t-stat*	COEF.	*t-stat*	dy/dx	*t-stat*
Intercept	-3.3227	*4.28*			-1.7292	*6.30*		
Agreeableness [2005]	0.0409	*2.51*	0.0163	*2.51*	0.0126	*2.10*	0.0044	*2.10*
Conscientiousness [2005]	-0.0325	*1.15*	-0.0130	*1.15*	-0.0122	*2.03*	-0.0042	*2.03*
Extraversion [2005]	0.0150	*0.54*	0.0060	*0.54*	0.0087	*1.52*	0.0030	*1.52*
Neuroticism [2005]	0.0243	*0.89*	0.0097	*0.89*	-0.0012	*0.21*	-0.0004	*0.21*
Openness to experience [2005]	0.1052	*3.58*	0.0419	*3.58*	0.0241	*4.03*	0.0084	*4.03*
F(79, 6,334); p-value	21.27; *p=[0.000]*				–			
Wald chi-squared (77); p-value	–				1,428.22; *p=[0.000]*			
σ	1.80				0.42			
ρ; p-value	–				0.3179; *p=[0.000]*			
OBSERVATIONS	6,410				13,519			

Notes: other controls as in Table 2A.

TABLE 4A: Modelling the number of hours volunteered at time T

	TOBIT – BIG 5 EX ANTE				PANEL TOBIT			
	COEF.	*t-stat*	dy/dx	*t-stat*	COEF.	*t-stat*	dy/dx	*t-stat*
Intercept	-71.4039	*19.25*			-72.1747	*31.65*		
Aged 16-24	4.1946	*1.95*	0.7735	*1.95*	1.1200	*0.70*	0.2046	*0.70*
Aged 25-34	2.8262	*1.52*	0.5211	*1.52*	-1.6007	*1.15*	-0.2924	*1.15*
Aged 35-44	2.9270	*1.70*	0.5397	*1.70*	-0.1474	*0.11*	-0.0269	*0.11*
Aged 45-54	6.3010	*4.00*	1.1619	*4.00*	2.8630	*2.38*	0.5230	*2.38*
Aged 55-64	7.5975	*5.44*	1.4009	*5.45*	4.3318	*4.09*	0.7912	*4.09*
Aged 65-75	8.5470	*6.88*	1.5760	*6.89*	5.8783	*6.08*	1.0737	*6.08*
Male	-0.3627	*0.55*	-0.0669	*0.55*	-0.7689	*1.46*	-0.1405	*1.46*
Number of children aged 2 or under	-10.6478	*7.50*	-1.9634	*7.51*	-8.3856	*10.75*	-1.5317	*10.76*
Number of children aged 3-4	-0.5703	*0.49*	-0.1052	*0.49*	-0.5723	*0.74*	-0.1045	*0.74*
Number of children aged 5-11	1.7650	*3.25*	0.3254	*3.25*	1.8247	*4.32*	0.3333	*4.32*
Number of children aged 12-15	1.5680	*2.12*	0.2891	*2.12*	1.7496	*3.33*	0.3196	*3.33*
Number of adults in household	-1.1304	*2.53*	-0.2084	*2.53*	-0.9256	*2.87*	-0.1691	*2.87*
Married or cohabiting	2.4891	*3.58*	0.4590	*3.59*	2.3826	*4.37*	0.4352	*4.37*
GCSE	8.1123	*6.56*	1.4959	*6.57*	8.8174	*9.03*	1.6106	*9.03*
A level	11.2396	*8.66*	2.0725	*8.69*	11.5488	*11.65*	2.1095	*11.65*
Degree	17.7127	*14.05*	3.2661	*14.16*	18.4785	*19.65*	3.3752	*19.66*
Other qualification	5.6525	*4.00*	1.0423	*4.01*	5.5465	*4.99*	1.0131	*4.99*
Natural logarithm of labour income	-0.2860	*1.22*	-0.0527	*1.22*	-0.3588	*2.38*	-0.0655	*2.38*
Natural logarithm of non-labour income	0.5010	*3.64*	0.0924	*3.64*	0.5009	*4.97*	0.0915	*4.97*
Natural logarithm of monthly savings	0.6803	*5.27*	0.1254	*5.27*	0.5755	*7.07*	0.1051	*7.07*
Employee	-5.3250	*3.23*	-0.9818	*3.24*	-3.9024	*3.74*	-0.7128	*3.74*
Self employed	-2.8617	*1.63*	-0.5277	*1.63*	-0.7515	*0.64*	-0.1373	*0.64*
Unemployed	1.4299	*0.75*	0.2637	*0.75*	-0.0820	*0.07*	-0.0150	*0.07*
Home owned outright	5.2068	*4.86*	0.9601	*4.87*	4.6386	*5.59*	0.8473	*5.59*
Home owned on a mortgage	2.1888	*2.12*	0.4036	*2.12*	2.5643	*3.24*	0.4684	*3.24*
Home privately rented	0.5281	*0.41*	0.0974	*0.41*	0.6960	*0.72*	0.1271	*0.72*
White British	1.8523	*2.64*	0.3416	*2.64*	0.1903	*0.51*	0.0348	*0.51*
Black	-6.6744	*3.28*	-1.2307	*3.28*	-4.2240	*2.52*	-0.7715	*2.52*
Asian	-5.1627	*2.83*	-0.9520	*2.83*	-3.2929	*2.48*	-0.6015	*2.48*
Church of England	2.1924	*2.76*	0.4043	*2.76*	0.8798	*1.42*	0.1607	*1.42*
Roman Catholic	-0.1068	*0.09*	-0.0197	*0.09*	-1.3104	*1.37*	-0.2394	*1.37*
Christian	8.5864	*6.18*	1.5833	*6.19*	6.5237	*5.53*	1.1916	*5.53*
Muslim	4.1007	*1.98*	0.7561	*1.98*	0.5287	*0.36*	0.0966	*0.36*
Other religion	6.2182	*6.00*	1.1466	*6.01*	4.1612	*5.48*	0.7601	*5.48*
Active member of religious group	18.3135	*21.01*	3.3769	*21.30*	19.1574	*29.32*	3.4993	*29.22*
Number of friends	1.3486	*8.93*	0.2487	*8.96*	1.4335	*11.95*	0.2618	*11.95*
Health excellent	12.1132	*6.98*	2.2336	*7.00*	12.0467	*9.87*	2.2004	*9.87*
Health very good	12.3524	*7.54*	2.2777	*7.56*	11.5207	*10.02*	2.1043	*10.02*
Health good	11.8809	*7.32*	2.1908	*7.34*	11.2735	*9.90*	2.0592	*9.90*
Health fair	9.2795	*5.51*	1.7111	*5.52*	8.3524	*7.14*	1.5256	*7.14*
Member of social website	4.5892	*6.46*	0.8462	*6.47*	4.7828	*8.29*	0.8736	*8.29*
Opportunity cost of time	-0.1098	*3.84*	-0.0202	*3.85*	-0.1049	*5.54*	-0.0192	*5.54*
Dissatisfied with leisure time	0.7924	*0.58*	0.1461	*0.58*	-0.4978	*0.48*	-0.0909	*0.48*
Cares up to 4 hours per week	6.7620	*6.92*	1.2469	*6.93*	5.4271	*7.94*	0.9913	*7.94*
Cares 5-9 hours per week	6.4850	*4.66*	1.1958	*4.66*	4.8231	*5.08*	0.8810	*5.08*
Cares 10-19 hours per week	4.4868	*2.65*	0.8273	*2.65*	4.7341	*4.37*	0.8647	*4.37*
Cares 20-34 hours per week	0.7621	*0.36*	0.1405	*0.36*	3.3236	*2.48*	0.6071	*2.48*
Cares 35-49 hours per week	-2.2414	*0.64*	-0.4133	*0.64*	1.7952	*0.74*	0.3279	*0.74*
Cares 50-99 hours per week	-1.5196	*0.35*	-0.2802	*0.35*	1.6449	*0.59*	0.3004	*0.59*
Cares 100+ hours per week	0.8385	*0.33*	0.1546	*0.33*	1.2080	*0.69*	0.2207	*0.69*
Lives in an urban area	-3.7647	*5.55*	-0.6942	*5.55*	-3.7342	*6.80*	-0.6821	*6.80*
Agreeableness [T-K]	-0.3731	*1.20*	-0.0688	*1.20*	-0.6649	*2.51*	-0.1214	*2.51*
Conscientiousness [T-K]	-0.2283	*0.71*	-0.0421	*0.71*	-0.2213	*0.83*	-0.0404	*0.83*
Extraversion [T-K]	0.8473	*2.71*	0.1562	*2.71*	1.1579	*4.49*	0.2115	*4.49*
Neuroticism [T-K]	-0.8486	*2.70*	-0.1565	*2.70*	-0.4089	*1.87*	-0.0747	*1.87*
Openness to experience [T-K]	1.9370	*5.89*	0.3572	*5.89*	2.2425	*8.37*	0.4096	*8.38*
F(80, 31,329); p-value	14.15; *p=[0.000]*				–			
Wald chi-squared (78); p-value	–				3,536.86; *p=[0.000]*			
σ	32.18				20.43			
ρ; p-value	–				0.6167; *p=[0.000]*			
OBSERVATIONS	31,409				66,193			

Notes: (i) Other controls include region, month and year dummies. (ii) Time T (T-K) interviews conducted 2012-2014 (2011-2013).

TABLE 4B: Modelling the number of hours volunteered at time T – Big 5 measured in 2005

	TOBIT – BIG5 EX ANTE				PANEL TOBIT – BIG5 EX ANTE			
	COEF.	*t-stat*	dy/dx	*t-stat*	COEF.	*t-stat*	dy/dx	*t-stat*
Intercept	-74.9801	*8.37*			-78.0132	*13.53*		
Agreeableness [2005]	-0.0740	*0.09*	-0.0134	*0.09*	-0.6549	*0.10*	-0.0119	*0.10*
Conscientiousness [2005]	0.0753	*0.10*	0.0136	*0.10*	-0.1765	*0.27*	-0.0319	*0.27*
Extraversion [2005]	0.2646	*0.36*	0.0479	*0.36*	0.5269	*1.87*	0.0953	*1.87*
Neuroticism [2005]	-1.6256	*2.12*	-0.2946	*2.12*	-1.0898	*2.75*	-0.1972	*2.75*
Openness to experience [2005]	2.3078	*2.95*	0.4183	*2.95*	2.9225	*4.56*	0.5288	*4.56*
F(80, 6,333); p-value	11.28; *p=[0.000]*				–			
Wald chi-squared (78); p-value	–				781.57; *p=[0.000]*			
σ	33.72				20.58			
ρ; p-value	–				0.6504; *p=[0.000]*			
OBSERVATIONS	6,410				13,519			

Notes: other controls as in Table 4A.

TABLE 5: Bivariate tobit model of log charitable donations and hours volunteered at time T

PANEL A: BIG 5 EX ANTE	LOG CHARITABLE DONATION Y_1				HOURS VOLUNTEERED Y_2			
	$dy/dx\|_{Y_2=0}$	*t-stat*	$dy/dx\|_{Y_2\neq0}$	*t-stat*	$dy/dx\|_{Y_1=0}$	*t-stat*	$dy/dx\|_{Y_1\neq0}$	*t-stat*
Agreeableness [T-K]	0.0452	*4.10*	0.0455	*4.07*	-0.0865	*1.61*	-0.0858	*1.44*
Conscientiousness [T-K]	-0.0164	*1.49*	-0.0169	*1.52*	-0.0323	*0.58*	-0.0398	*0.65*
Extraversion [T-K]	0.0374	*3.54*	0.0390	*3.64*	0.1204	*2.24*	0.1426	*2.40*
Neuroticism [T-K]	0.0167	*1.59*	0.0161	*1.50*	-0.1447	*2.67*	-0.1571	*2.62*
Openness to experience [T-K]	0.0481	*4.41*	0.0514	*4.65*	0.3296	*5.88*	0.3779	*6.10*
Wald chi-squared (115); p-value	8,351.12; *p=[0.000]*							
ρ_{12}; p-value	0.1239; *p=[0.000]*							
OBSERVATIONS	31,409							
PANEL B: BIG 5 2005	LOG CHARITABLE DONATION Y_1				HOURS VOLUNTEERED Y_2			
	$dy/dx\|_{Y_2=0}$	*t-stat*	$dy/dx\|_{Y_2\neq0}$	*t-stat*	$dy/dx\|_{Y_1=0}$	*t-stat*	$dy/dx\|_{Y_1\neq0}$	*t-stat*
Agreeableness [2005]	0.0573	*2.34*	0.0581	*2.34*	-0.0362	*0.27*	-0.0271	*0.19*
Conscientiousness [2005]	-0.0143	*0.59*	-0.0145	*0.59*	0.0138	*0.11*	0.0121	*0.09*
Extraversion [2005]	0.0437	*1.90*	0.0448	*1.93*	0.0367	*0.30*	0.0505	*0.37*
Neuroticism [2005]	0.0428	*1.81*	0.0417	*1.74*	-0.2983	*2.26*	-0.3204	*2.21*
Openness to experience [2005]	0.0675	*2.76*	0.0712	*2.88*	0.3878	*2.98*	0.4443	*3.11*
Wald chi-squared (109); p-value	1,853.32; *p=[0.000]*							
ρ_{12}; p-value	0.1187; *p=[0.000]*							
OBSERVATIONS	6,410							

Notes: (i) Other controls as in Tables 2A and 4A. (ii) $dy/dx|_{Y_2=0}$ ($dy/dx|_{Y_2\neq0}$) denotes marginal effects for log charitable donations conditional upon covariates and hours volunteered, i.e. the other dependent variable, being equal to zero (non-zero i.e. volunteer). (iii) $dy/dx|_{Y_1=0}$ ($dy/dx|_{Y_1\neq0}$) denotes marginal effects for hours volunteered conditional upon covariates and log charitable donations, i.e. the other dependent variable, being equal to zero (non-zero i.e. donator).

TABLE 6: Bivariate tobit model of charitable donations as a proportion of annual income and hours volunteered at time T

PANEL A: BIG 5 EX ANTE	CHARITABLE DONATION / INCOME Y_1				HOURS VOLUNTEERED Y_2			
	$dy/dx\|_{Y_2=0}$	*t-stat*	$dy/dx\|_{Y_2\neq 0}$	*t-stat*	$dy/dx\|_{Y_1=0}$	*t-stat*	$dy/dx\|_{Y_1\neq 0}$	*t-stat*
Agreeableness [T-K]	0.0238	*4.70*	0.0244	*4.68*	-0.0809	*1.47*	-0.0760	*1.30*
Conscientiousness [T-K]	-0.0100	*1.84*	-0.0105	*1.88*	-0.0400	*0.70*	-0.0475	*0.78*
Extraversion [T-K]	0.0026	*0.52*	0.0032	*0.60*	0.1367	*2.47*	0.1479	*2.51*
Neuroticism [T-K]	-0.0050	*1.01*	-0.0057	*1.10*	-0.1374	*2.49*	-0.1499	*2.54*
Openness to experience [T-K]	0.0226	*4.35*	0.0246	*4.58*	0.3334	*5.82*	0.3683	*6.04*
Wald chi-squared (115); p-value	4,027.56; *p=[0.000]*							
ρ_{12}; p-value	0.0601; *p=[0.000]*							
OBSERVATIONS	31,409							
PANEL B: BIG 5 2005	CHARITABLE DONATION / INCOME Y_1				HOURS VOLUNTEERED Y_2			
	$dy/dx\|_{Y_2=0}$	*t-stat*	$dy/dx\|_{Y_2\neq 0}$	*t-stat*	$dy/dx\|_{Y_1=0}$	*t-stat*	$dy/dx\|_{Y_1\neq 0}$	*t-stat*
Agreeableness [2005]	0.0230	*1.95*	0.0238	*1.96*	-0.0190	*0.15*	-0.0105	*0.08*
Conscientiousness [2005]	-0.0120	*0.97*	-0.0124	*0.98*	-0.0076	*0.06*	-0.0133	*0.10*
Extraversion [2005]	0.0056	*0.47*	0.0061	*0.49*	0.0729	*0.60*	0.0805	*0.62*
Neuroticism [2005]	0.0184	*1.54*	0.0181	*1.48*	-0.2886	*2.28*	-0.3015	*2.24*
Openness to experience [2005]	0.0368	*2.89*	0.0393	*2.99*	0.3409	*2.81*	0.3812	*2.94*
Wald chi-squared (109); p-value	930.86; *p=[0.000]*							
ρ_{12}; p-value	0.0672; *p=[0.000]*							
OBSERVATIONS	6,410							

Notes: (i) Other controls as in Tables 2A and 4A. (ii) $dy/dx|_{Y_2=0}$ ($dy/dx|_{Y_2\neq 0}$) denotes marginal effects for log charitable donations conditional upon covariates and hours volunteered, i.e. the other dependent variable, being equal to zero (non-zero i.e. volunteer). (iii) $dy/dx|_{Y_1=0}$ ($dy/dx|_{Y_1\neq 0}$) denotes marginal effects for hours volunteered conditional upon covariates and log charitable donations, i.e. the other dependent variable, being equal to zero (non-zero i.e. donator).

TABLE 7: Censored quantile regression estimates of charitable donations (of time and money) and the Big 5 personality traits

PANEL A: Log charitable donations [T]

	AGREEABLENESSS [T-K]			CONSCIENTIOUS-NESS [T-K]			EXTRAVERSION [T-K]			NEUROTICISM [T-K]			OPENNESS TO EXPERIENCE [T-K]		
	COEF.	S.E.	*t-stat*	COEF.	S.E.	*t-stat*	COEF.	S.E.	*t-stat*	COEF.	S.E.	*t-stat*	COEF.	S.E.	*t-stat*
10th decile	0.0242	0.0801	*0.30*	-0.0067	0.0531	*0.13*	0.0111	0.0746	*0.15*	0.0061	0.0581	*0.10*	0.0326	0.1198	*0.27*
20th decile	0.1049	0.0526	*2.01*	-0.0639	0.0432	*1.48*	0.1033	0.0429	*2.41*	0.0242	0.0333	*0.73*	0.1175	0.0513	*2.29*
30th decile	0.0962	0.0311	*3.10*	-0.0405	0.0294	*1.38*	0.0929	0.0276	*3.36*	0.0322	0.0279	*1.15*	0.0915	0.0276	*3.32*
40th decile	0.0647	0.0225	*2.87*	-0.0359	0.0238	*1.51*	0.0843	0.0253	*3.33*	0.0251	0.0239	*1.05*	0.0815	0.0201	*4.05*
50th decile	0.0567	0.0209	*2.71*	-0.0384	0.0188	*2.04*	0.0653	0.0210	*3.10*	-0.0043	0.0214	*0.20*	0.0752	0.0174	*4.31*
60th decile	0.0408	0.0180	*2.27*	-0.0209	0.0172	*1.22*	0.0398	0.0177	*2.25*	-0.0083	0.0158	*0.53*	0.0723	0.0162	*4.45*
70th decile	0.0299	0.0137	*2.19*	-0.0264	0.0141	*1.88*	0.0208	0.0141	*1.48*	-0.0190	0.0139	*1.37*	0.0728	0.0128	*5.71*
80th decile	0.0194	0.0169	*1.15*	-0.0281	0.0144	*1.95*	0.0107	0.0129	*0.83*	-0.0260	0.0118	*2.21*	0.0661	0.0150	*4.40*
90th decile	0.0064	0.0161	*0.40*	-0.0300	0.0141	*2.13*	-0.0098	0.0145	*0.67*	-0.0416	0.0161	*2.58*	0.0660	0.0139	*4.75*

PANEL B: Charitable donations as a proportion of total income [T]

	AGREEABLENESSS [T-K]			CONSCIENTIOUS-NESS [T-K]			EXTRAVERSION [T-K]			NEUROTICISM [T-K]			OPENNESS TO EXPERIENCE [T-K]		
	COEF.	S.E.	*t-stat*	COEF.	S.E.	*t-stat*	COEF.	S.E.	*t-stat*	COEF.	S.E.	*t-stat*	COEF.	S.E.	*t-stat*
10th decile	0.0007	0.0005	*1.35*	-0.0001	0.0004	*0.29*	0.0001	0.0001	*1.00*	-0.0004	0.0024	*0.16*	0.0010	0.0036	*0.27*
20th decile	0.0096	0.0055	*1.73*	-0.0061	0.0036	*1.71*	0.0072	0.0038	*1.88*	-0.0005	0.0040	*0.14*	0.0088	0.0050	*1.75*
30th decile	0.0082	0.0038	*2.20*	-0.0076	0.0046	*1.67*	0.0096	0.0037	*2.56*	0.0037	0.0038	*0.97*	0.0135	0.0048	*2.84*
40th decile	0.0039	0.0036	*3.20*	-0.0122	0.0041	*2.96*	0.0121	0.0040	*3.03*	0.0065	0.0033	*1.95*	0.0161	0.0039	*4.18*
50th decile	0.0161	0.0048	*3.35*	-0.0135	0.0044	*3.09*	0.0104	0.0041	*2.52*	0.0017	0.0033	*0.50*	0.0203	0.0050	*4.08*
60th decile	0.0184	0.0050	*3.67*	-0.0145	0.0049	*2.93*	0.0126	0.0047	*2.66*	-0.0033	0.0051	*-0.65*	0.0261	0.0054	*4.80*
70th decile	0.0211	0.0050	*3.51*	-0.0163	0.0068	*2.41*	0.0081	0.0067	*1.21*	-0.0045	0.0068	*0.66*	0.0388	0.0082	*4.72*
80th decile	0.0285	0.0101	*2.83*	-0.0186	0.0095	*1.96*	-0.0055	0.0078	*0.71*	-0.0113	0.0095	*1.19*	0.0560	0.0102	*5.50*
90th decile	0.0256	0.0180	*1.42*	-0.0119	0.0183	*0.65*	-0.0174	0.0188	*0.93*	-0.0264	0.0178	*1.48*	0.0826	0.0183	*4.50*

PANEL C: Number of hours volunteered [T]

	AGREEABLENESSS [T-K]			CONSCIENTIOUS-NESS [T-K]			EXTRAVERSION [T-K]			NEUROTICISM [T-K]			OPENNESS TO EXPERIENCE [T-K]		
	COEF.	S.E.	*t-stat*	COEF.	S.E.	*t-stat*	COEF.	S.E.	*t-stat*	COEF.	S.E.	*t-stat*	COEF.	S.E.	*t-stat*
40th decile	0.0368	0.1189	*0.31*	-0.0230	0.0681	*0.34*	0.0216	0.0755	*0.29*	-0.500	0.1695	*0.29*	0.0210	0.0844	*0.25*
50th decile	0.0824	0.2702	*0.31*	-0.0730	0.2513	*0.29*	0.1586	0.2638	*0.60*	-0.4122	0.3654	*1.13*	0.1941	0.2632	*0.74*
60th decile	0.0673	0.2137	*0.32*	-0.1328	0.1519	*0.87*	0.1445	0.2043	*0.71*	-0.5033	0.3069	*1.64*	0.3532	0.2205	*1.60*
70th decile	-0.0382	0.1590	*0.24*	-0.1480	0.1752	*0.84*	0.1306	0.1942	*0.67*	-0.5947	0.2061	*2.89*	0.4090	0.2277	*1.80*
80th decile	-0.2179	0.1772	*1.23*	-0.0915	0.1891	*0.48*	0.2693	0.2338	*1.15*	-0.4994	0.2355	*2.12*	0.9109	0.2707	*3.37*
90th decile	-0.4469	0.2924	*1.52*	0.2067	0.3127	*0.66*	0.8138	0.3312	*2.46*	-0.8324	0.3049	*2.73*	0.9721	0.3038	*3.20*

Notes: (i) Other controls as in Tables 2A and 4A. (ii) Standard errors are obtained by weighted bootstrap with 200 replications. (iii) Dependent variables (Big5) measured at time T (T-K).