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

Sarah Brown
Karl Taylor

DISCUSSION PAPER SERIES

I Z A

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

Sarah Brown
*University of Sheffield
and IZA*

Karl Taylor
*University of Sheffield
and IZA*

ABSTRACT

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

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 household longitudinal survey. Due to the censored nature of the outcome variables, i.e. some individuals do not engage in charitable behaviour, we employ censored quantile regression models. Personality traits are classified according to the 'Big Five' taxonomy: openness to experience; conscientiousness; extraversion; agreeableness; and neuroticism. The quantile approach allows us to explore the effect of personality traits across the entire distribution of charitable behaviour rather than just at the mean, which has generally been the case in the existing literature. 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 association 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 quantile approach.

Corresponding author:

Karl Taylor
Department of Economics
University of Sheffield
9 Mappin Street
Sheffield S1 4DT
United Kingdom
E-mail: k.b.taylor@shef.ac.uk

---

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 (ONS) 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, financial decision-making and learning, have started to attract the attention of economists (see, for example, Almlund et al., 2011, Caliendo et al., 2012, Heineck and Anger, 2010, and Gill and Prowse, 2015). 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, e.g. Ribar and Wilhelm (2002), 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).

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 monetary donations are influenced by income (Auten et al., 2002) and that they fluctuate over the lifecycle: for example Glenday et al. (1986) found monetary 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.

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.

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 a 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 different points in time.[2] Finally, we extend the literature by allowing for heterogeneity across the distribution of charitable donations and time volunteered conditional on the covariates by employing a non-parametric estimator. Specifically, we evaluate the effects of personality traits and 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 which would not necessarily be revealed by focusing solely upon the mean. We also undertake a number of robustness measures in order to ascertain the generality of the results and the role of personality traits.

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

---

[2] 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 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 approach is 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. $T_j = \psi_j \boldsymbol{A}_j + \omega_j$. The resulting residuals, i.e. $Z_j = \hat{\psi}_j \boldsymbol{A}_j$, 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. charitable behaviour, and can effectively be deemed as plausibly exogenous.

Covariates in X include: gender; ethnicity, whether white British, black and Asian (other ethnicity is the reference category); age,[3] specifically aged 16-24, aged 25-34, aged 35-44, aged 45-54, aged 55-64, and aged 65-75 (over 75 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), Advanced (A) level, General Certificate of Secondary Education (GCSE), and all other qualifications (no education is the omitted category);[4] 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);[5] 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, other 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 number of friends the individual has and whether the individual

---

[3] 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 in addition to the influence of age on personality traits.

[4] 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.

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

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 as 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 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,[6] 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 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), plus monetary donations may be given online. 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).

---

[6] 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.[7] 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).[8] 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 39% 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 personality traits. Hence, even though personality traits have been standardised, in terms of their first and second moments, the presence of skewness suggests that they may have differential effects on charitable behaviour.

3. Methodology

Censored regression analysis is employed given the substantial left hand censoring of each dependent variable. Specifically, monetary donations to charity have 33% of observations at

---

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

zero and time volunteered has 85% of observations at zero. We conduct censored quantile regression analysis to ascertain the effects of the Big Five personality traits across the entire distribution of charitable behaviour, rather than focusing solely at the mean (or median), which has generally been the approach adopted in the existing literature. Such an approach may have led to weak effects being identified for certain covariates. For example, 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. The tobit estimator has typically been used by researchers when modelling charitable behaviour which assumes normality and homoscedasticity where estimates are based at the mean of the outcome. An alternative estimator, which allows an examination of the complete distribution and is not based upon strict parametric assumptions, is a censored quantile regression (CQR), see Powell (1986) and Chernozhukov and Hong (2002).[9] The CQR estimator is thus able to capture heterogeneous effects across the distribution by computing estimates at different quantiles (Koenker, 2005). 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, i.e. extreme values. The following discussion explains how the CQR model is estimated, where the underlying specification can be viewed as a demand function, whereby giving money and/or time to charity is a direct source of utility, see, for example, Brown and Lankford (1992).

_____

[9] It should be noted that the second wave of the UKHLS also provides comparable information on charitable behaviour. Hence, an alternative strategy would be to employ a fixed effects quantile regression estimator, e.g. see Canay (2011). However, we do not undertake this approach due to the fact that the explicit focus of the analysis, i.e. personality traits, is time invariant heterogeneity which would be subsumed in the fixed effect.

Models are estimated for each censored outcome of interest, $Y_{iT} = \max[0, Y_{iT}^*]$ where Y_{iT}^* is the unobserved untruncated latent dependent variable, for individual i $(= 1, \ldots, n)$, 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 predate the outcome variable of interest:

$$Y_{iT} = f\left(X_i, \sum_{j=1}^{5} Z_{jiT-K}\right) = f(H_i) \tag{1}$$

$$H_i \subseteq \{X_i, Z_{jiT-K}\}.$$

Omitting time subscripts for brevity, the quantile regression model of Koenker and Bassett (1978) is given by:

$$Q_\theta(Y_i | H_i) = \boldsymbol{\beta}_\theta' H_i \tag{2}$$

where Q_θ denotes the θ conditional quantile of the dependent variable Y_i. The estimator $\boldsymbol{\beta}_\theta$ is found by the following minimisation problem:

$$\min_{\boldsymbol{\beta}_\theta} \frac{1}{N} \left\{ \sum_{Y_i \geq \boldsymbol{\beta}_\theta' H_i} \theta |Y_i - \boldsymbol{\beta}_\theta' H_i| + \sum_{Y_i < \boldsymbol{\beta}_\theta' H_i} (1 - \theta)|Y_i - \boldsymbol{\beta}_\theta' H_i| \right\}. \tag{3}$$

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

$$\min_{\boldsymbol{\beta}_\theta} \frac{1}{N} \sum_{i=1}^{N} [\{\theta - I(Y_i < \max\{0, \boldsymbol{\beta}_\theta' H_i\})\}(Y_i - \max\{0, \boldsymbol{\beta}_\theta' H_i\})] \tag{4}$$

where I is a binary indicator equal to unity if the expression holds and zero otherwise. Whilst equation (3) is a linear function, $\max\{0, \boldsymbol{\beta}_\theta' H_i\}$ in equation (4) is non-linear. In order to solve the model, the estimator we employ is based upon the three step approach of Chernozhukov and Hong (2002). In the first step, the sub-sample of individuals who donated to charity (i.e.

11

time or money) is predicted by a logit model. The sub-sample is defined as $J_0 = \{i: \hat{\gamma}' H_i^* > 1 - \theta - c\}$, where θ defines the quantile of interest, c is a trimming constant (set equal to 0.05, see Buchinsky and Hahn, 1998) and H_i^* is a desired transformation of (H_i, C), with C denoting the censoring points (see Chernozhukov and Hong, 2002). In the second step, the initial estimator $\hat{\beta}_\theta^0$ is determined from equation (3) for the sample J_0. The initial estimator is used to select the sub-sample $J_1 = \{\hat{\beta}_\theta^0 H_i^* > 0\}$ and then the model is estimated in the third step with equation (3) for the sample J_1. The resulting estimator $\hat{\beta}_\theta$ 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).

4. Results

In what follows we firstly consider CQR estimates at the median for monetary donations and time volunteered. We then explore the robustness of the analysis in two ways. Firstly, for a sub-sample of individuals we have information on personality traits measured in 2005 BHPS and hence we are able to exploit a longer window between the measurement of the Big Five and observed charitable behaviour and to explore whether the effect of personality traits is robust over this longer time horizon. As our second robustness check, we instrument personality traits measured in the UKHLS between the period 2011-13 with those recorded in the 2005 BHPS in an attempt to overcome measurement error. In the final subsection, we exploit the fact that the CQR analysis, in addition to having advantages over parametric estimators, such as the tobit model, allows us to consider the full conditional distribution of monetary and time donations. Hence, we explore the effect of personality traits across the distribution of charitable behaviour. Throughout the results discussion, we report average quantile marginal effects for the censored dependent variable, see Chernozhukov et al. (2015).

Monetary donations – results at the median

The estimates are reported in Table 2. In the first column the results for the natural logarithm of charitable donations are shown whilst in the second column the equivalent estimates for charitable donations as a proportion of income are presented. Table 2 reports the full results where each of the Big Five personality traits are measured *ex ante*, i.e. at time $T - K$. We initially focus on the results from modelling the natural logarithm of charitable donations. Before focusing on the association between personality traits and charitable donations, 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). Males donate approximately 34 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). Increasing levels of educational attainment have a positive monotonic relationship with monetary donations, which is consistent with findings in the existing literature, see, for example, Schokkaert (2006) and Cappellari et al. (2011). Specifically, individuals with a degree donate over twice the amount to charity than corresponding individuals with no qualifications. 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 0.141 (0.025) percentage point higher monetary donation. Interestingly, the effect of monthly savings is approximately as large as the labour income effect, where a corresponding change in savings is associated with a 0.137 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, or 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 almost 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 4 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 where 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 5.8 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 7.2 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.

We also consider charitable donations of money over the past twelve months as a proportion of annual income (from all sources). The results are shown in the second column of Table 2 and are broadly consistent with those found when focusing on the level of monetary donations in terms of the effects of the covariates. The notable exception to this is that the share of income donated to charitable causes is inversely associated with the level of income (from both labour and non-labour sources) whilst the total monetary amount donated was found to be increasing in income. This finding is consistent with the existing literature, for example List (2011) and recent evidence from UK Giving (2015), which might suggest that those individuals with a lower income, e.g. retirees, contribute to charity out of accumulated wealth rather than their current income.[10] With respect to personality traits, openness to experience is again found to have the largest effect in terms of magnitude although it is roughly comparable to the influence of agreeableness. For example, a one standard deviation increase in openness to experience (agreeableness) is associated with a 1.50 (1.48) 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.

Time donations – results at the median

In Table 3 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, where personality traits are measured at $T - K$. Initially, prior to focusing on the relationship between personality traits and hours volunteered, we briefly comment on the other covariates and how the findings relate to the existing literature.

---

[10] Interestingly, in the UK the growth in the share of charitable donations given by the over sixties has been much faster than the growth in their share of total spending (see Smith 2012).

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 25 to 74 volunteer more of their time. These findings are consistent with those of Menchik and Weisbrod (1987) and Freeman (1997) for the US. Similarly, a statistically significant relationship is apparent 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 to 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 the 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 in accordance with the findings of Cappellari et al. (2011) for Italy and Freeman (1997) for the US. Consistent with the findings for monetary donations, there is a positive association between savings and time volunteered, where a 1 percent increase in the amount of monthly savings is associated with a 0.23 increase in the number of hours of unpaid labour volunteered (approximately 14 minutes). In terms of income effects, 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 based on 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), as expected *a priori*, we find a negative association between the proxy for the opportunity cost of time and hours volunteered. 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 9 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 and being an active member of a religious group are both positively related to time spent volunteering. However, contrary to the findings for monetary donations to charity, whether the individual is a member of a social website has no significant association with 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 0.64 more hours volunteered, i.e.

approximately 38 minutes. Interestingly, in comparison to monetary donations, agreeableness and conscientiousness are insignificant. This implies that different personality traits influence money and time donations in distinct ways.

To summarise, after including an extensive set of controls, personality traits are found to influence charitable behaviour, i.e. donating money and/or volunteering time, and the effects are arguably not trivial in terms of economic magnitude. To evaluate the role of personality traits on model performance, we consider alternative specifications where the Big Five personality traits are omitted from the analysis and we compare the pseudo R-squared between the specifications. The results are shown in the lower panel of Tables 2 and 3. Clearly, across each outcome of charitable behaviour, the pseudo R-squared is higher when personality traits are included as covariates revealing that they improve model performance in terms of explaining charitable behaviour.

Monetary and time donations – robustness analysis

A sub-sample of the UKHLS respondents were also members of its predecessor, the British Household Panel Survey (BHPS).[11] In the 2005 BHPS, information was collected on the Big Five personality traits. As an initial robustness check, we re-estimate equation (4) extending the window between T (interviews conducted 2012-2014), i.e. when information on charitable behaviour is observed, 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 hypothesise that, given that personality traits have been argued to be largely time invariant, regardless of the length of the window between 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.

---

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

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 4 Panel A presents the results for monetary donations to charitable causes and the first column of Table 5 provides the corresponding results for the number of hours of unpaid labour volunteered, where only the marginal effects associated with the Big Five personality traits are shown for brevity. The relationship between agreeableness, openness to experience and monetary donations remains for this sub-sample suggesting that the effect of personality traits are stable over time. However, only openness to experience remains statistically significant when examining the association between personality traits measured in 2005 and the amount of time volunteered.[12]

Measures of an individual's personality might capture some other unobserved variable or even random noise. Consequently, any such measurement error existing in the Big Five personality traits could bias our analysis. Hence, as an alternative robustness strategy, following Prevoo and ter Weel (2015), we have undertaken an instrumental variable approach to investigate the effect of personality traits on charitable donations.[13] 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

---

[12] Arguably, although the direction of influence of the personality traits on the amount of time of unpaid labour volunteered remains, the reason why the majority of the Big Five personality traits are driven to statistical insignificance is due to the smaller sample size and the extreme censoring at zero hours which is more acute than in the full sample.

[13] Prevoo and ter Weel (2015) examine the role of conscientiousness on 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 distinct intervals it may be possible to alleviate potential measurement error in personality traits.

instruments for those measured at a later point in time from the UKHLS. Hence, in the first stage we regress the following model by OLS, for each of the Big Five personality traits j, $Z_{iT-K} = \pi_0 + \pi_1 Z_{i2005} + \varepsilon_i$, obtaining $\hat{Z}_{jiT-K}$, which is standardised to have a zero mean and standard deviation of unity. The predictions are then used in the second stage regression of equation (4), i.e. the CQR analysis. The first stage results yield F-statistics which are well in excess of the minimum threshold of 10 suggested by Stock et al. (2002).[14] The results for monetary donations are presented in Table 4 Panel B, whilst the second column of Table 5 reports the corresponding results for time volunteered. Focusing upon monetary donations for both the amount donated and the donation as a proportion of income, we find that agreeableness and openness to experience remain statistically significant, where again the latter is found to be the dominant personality trait in terms of magnitude. With respect to the effect of personality traits on the amount time volunteered, the second column reveals that the only personality trait which remains statistically significant is openness to experience.

Monetary and time donations – examining the full distribution

So far we have considered CQR analysis at the median in terms of exploring the effect of personality traits on monetary donations to charity and the number of hours volunteered. The findings suggest a role for personality traits in determining charitable behaviour and that the results are robust to alternative identification strategies. It should be acknowledged, however, that the evidence regarding time volunteered is less sanguine, where only openness to experience is found to consistently have an effect. The analysis in this subsection extends this analysis at the median and explores the role of personality across the entire conditional distribution for each type of charitable behaviour.

Table 6 presents the results of estimating equation (4) where we focus on the entire distribution of money and time donations. For all estimates reported in Table 6, we focus on

---

[14] All F-statistics are in excess of 150 for each personality trait. Full first stage results are available upon request.

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). Consistent with the results reported in Table 2, where statistically significant, conscientiousness has a negative association with charitable donations across the distribution, see Table 6 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 7.23 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 associations, 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. Neuroticism, where statistically significant, is negatively correlated with volunteer labour supply, whilst extraversion and openness to experience have a positive relationship with hours volunteered. The association between openness to experience and the 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.

Figures 6 and 7 show the parameter estimates from the CQR model based upon a number of robustness checks which focus solely upon the sub-sample of 6,410 individuals observed in both the 2005 BHPS and the UKHLS. Figure 6 shows analysis for the log level of the monetary donation, whilst Figure 7 provides the corresponding analysis for charitable donations as a proportion of income.[15] Each figure is arranged into five rows, each one for a given personality trait: agreeableness; conscientiousness; extraversion; neuroticism and openness to experience. There are four columns in each figure, in the first column for the sub-sample of individuals we show the effect of personality traits measured in the UKHLS on charitable behaviour. The second column replaces personality traits measured in the UKHLS with those obtained from the 2005 BHPS; whilst the third column provides the two step IV analysis in order to account for measurement error based on the approach of Prevoo and ter Weel (2015). The final column considers the potential endogeneity of personality traits which may arise from measurement error.

The conditional quantile instrumental variable (CQIV) estimator of Chernozhukov et al. (2015) allows us to address endogeneity with a control function approach based on an instrumental variable identification strategy, whereby personality traits in the UKHLS are instrumented by those from the 2005 BHPS. The CQIV model is based upon a triangular system of quantile regression equations as follows: [16]

$$Y_{iT} = \max[C, Y_{iT}^*] \tag{5a}$$

$$Y_{iT}^* = Q_{Y_{iT}^*}\big(U_i \big| Z_{jiT-K}, \boldsymbol{X}_i, V_i\big) \tag{5b}$$

$$Z_{jiT-K} = Q_{Z_{jiT-K}}\big(V_i \big| \boldsymbol{X}_i, Z_{ji2005}\big). \tag{5c}$$

In our application the censoring point is at zero, i.e. $C = \boldsymbol{0}$, Z_{jiT-K} is a Big Five personality trait measured in the UKHLS, which is potentially endogenous due to measurement error as

---

[15] Due to the extensive censoring observed for the number of hours volunteered, we do not undertake these robustness checks for the sub-sample in the case of hours volunteered.

[16] A control function approach is appropriate when a simultaneous system can be expressed in a triangular form and can conveniently be adopted in parametric and semi or non-parametric form, e.g. see Blundell et al. (2013).

discussed above, and X_i is the vector of covariates as defined in Section 2. The function $u \mapsto Q_{Y^*_{iT}}(u|Z_{jiT-K}, X_i, V_i)$ is the conditional quantile function of Y^*_{iT} given (Z_{jiT-K}, X_i, V_i) and $v \mapsto Q_{Z_{jiT-K}}(v|X_i, Z_{ji2005})$ is the conditional quantile function of Z_{jiT-K} given (X_i, Z_{ji2005}). Using Z_{ji2005}, the Big Five personality trait observed in the 2005 BHPS, as an instrument is valid if the measurement error in personality traits measured in the UKHLS (i.e. 2012-2014) and BHPS are uncorrelated, which would seem reasonable given the gap between the two surveys. The disturbance terms are given by U_i which satisfies the full independence assumption $U_i \sim \{U_i(0,1)|Z_{jiT-K}, X_i, Z_{ji2005}, V_i, C\}$ and V_i which satisfies the following condition $V_i \sim \{U_i(0,1)|X_i, Z_{ji2005}\}$. In order to recover the conditional quantile function of the latent response variable in equation (5b), Chernozhukov et al. (2015) show that it is necessary to condition on an unobserved regressor V_i which is a control variable. The unobserved control variable is recovered in equation (5c) as a residual which explains the movements in Z_{jiT-K} conditional on a set of covariates and the instrumental variable. The advantage over the two step IV approach is that CQIV does not rely on the strong parametric assumptions imposed by the first stage OLS estimator.[17] The intuition behind the CQIV analysis is that by conditioning on a particular personality trait measured in 2005, the primary covariate of interest, the personality trait measured in the UKHLS and the unobservable effects become independent. In both Figures 6 and 7, error bars for quantile coefficients correspond to the 95% confidence interval based upon weighted bootstrap with 200 replications.

In terms of the robustness analysis based upon the sub-sample of individuals observed in the UKHLS and the 2005 BHPS, we are particularly interested in whether: (i) heterogeneity still exists across the distribution (as found when focusing on the full sample,

---

[17] Kowalski (2015) has recently used the CQIV estimator to examine the price elasticity of expenditure on medical care, where there is censoring in expenditure and price is endogenous.

see Table 6); and (ii) whether personality traits have similar effects across the distribution under each alternative specification. Both figures reveal that considerable heterogeneity stemming from personality traits remains present and that typically the Big Five personality traits have larger effects upon charitable behaviour at deciles away from the median. For example, focusing on Figure 6 and the IV results from the CQIV estimator, a one standard deviation increase in extraversion raises monetary donations to charity at the thirtieth decile by approximately 10 percentage points (similar to the effects reported in Table 6 Panel A for the full sample). In terms of the association between personality traits and the amount of money donated to charity as a proportion of income, consistent with the analysis of the full sample shown in Table 6 Panel B, openness to experience has the largest effect, see Figure 7. The effect increases monotonically across the distribution culminating at the ninetieth decile, where a one standard deviation increase in openness to experience is associated with an 11 percentage point increase in the proportion of income donated to charity.

In summary, the censored quantile regression results have revealed that, in general, personality traits have the largest association with each type of charitable behaviour at the extreme points of the distribution, and that these findings are robust, thereby endorsing the use of the quantile regression approach, in particular CQR and CQIV, 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 different points in time, as well as incorporating a number of robustness checks. Finally, rather than basing the analysis on the tobit model, which has been adopted by numerous studies in the existing literature and which relies on a number of strict assumptions, we use a censored quantile regression estimator which relaxes the traditional assumptions associated with parametric models and evaluates the effects of personality traits and their association with donations of time and money across the entire distribution of charitable behaviour.

After including an extensive set of controls, personality traits are found to influence charitable behaviour. For example, where statistically significant, conscientiousness and neuroticism are found to be inversely associated with donations of both time and money at the median and 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 median. Indeed, the magnitude stemming from personality traits is found to be larger at extreme points of the charitable behaviour. This finding is important given that the literature to date has typically focused solely on the role of covariates at the mean.

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.

References

Almlund, M., Duckworth, A. L., Heckman, J. and Kautz, T. (2011). Personality psychology and economics. IZA DP. Number 5500.

Andreoni, J. (2006). Philanthropy. In The handbook of the economics of giving, altruism and reciprocity, (eds) Kolm, S. C. and Ythier, J. M., Chapter 18, pages 1201-69. Elsevier North Holland.

Andreoni, J. and Payne, A. (2013). Charitable giving. In Handbook of public economics, Volume Five, (eds) Auerbach, A. J., Chetty, R., Feldstein, M. and Saez, E., Chapter 1, pages 1-50. Elsevier North Holland.

Andreoni, J. and Scholz, J. (1998). An econometric analysis of charitable giving with interdependent preferences. *Economic Inquiry*, 36, 410-28.

Angrist, J. and Pischke, J.-S. (2009). Mostly harmless econometrics: An empiricists companion. Princeton: Princeton University Press.

Auten, G. E. and Joulfaian, D. (1996). Charitable contributions and intergenerational transfers. *Journal of Public Economics*, 59, 55-68.

Auten, G. E., Sieg, H. and Clotfelter, C. T. (2002). Charitable giving, income, and taxes: An analysis of panel data. *American Economic Review*, 92, 371-82.

Bauer, T. K., Bredtmann, J. and Schmidt, C. M. (2013). Time vs. money – The supply of voluntary labor and charitable donations across Europe. *European Journal of Political Economy*, 32, 80-94.

Bekkers, R. (2005). Participation in voluntary associations: Relations with resources, personality, and political values. *Political Psychology*, 26, 439-54.

Bekkers, R. (2006). Traditional and health-related philanthropy: The role of resources and personality. *Social Psychology Quarterly*, 69, 349-66.

Bekkers, R. (2010). Who gives what and when? A scenario study of intentions to give time and money. *Social Science Research*, 39, 369-81.

Ben-Ner, A., Putterman, L., Kong, F. and Magan, D. (2004). Reciprocity in a two-part dictator game. *Journal of Economic Behavior and Organization*, 53, 333-52.

Blundell, R., Kristensen, D. and Matzkin, R. (2013). Control functions and simultaneous equations methods. *American Economic Review: Papers and Proceedings*, 103, 563-9.

Brown, V. and Lankford, H. (1992). Gifts of money and gifts of time: Estimating the effects of tax prices and available time. *Journal of Public Economics*, 47, 321-41.

Brown, S., Harris, M. N. and Taylor, K. (2012). Modelling charitable donations to an unexpected natural disaster: Evidence from the U.S. Panel Study of Income Dynamics. *Journal of Economic Behavior and Organization*, 84, 97-110.

Brown, S. and Taylor, K. (2014). Household finances and the 'big five' personality traits. *Journal of Economic Psychology*, 45, 197-212.

Buchinsky, M. and Hahn, J. (1998). An alternative estimator for the censored quantile regression model. *Econometrica*. 66, 653-71.

Caliendo, M., Fossen, F. and Kritikos, A. (2012). Trust, positive reciprocity, and negative reciprocity: Do these traits impact entrepreneurial dynamics? *Journal of Economic Psychology*, 33, 394-409.

Canay, I. A. (2011). A simple approach to quantile regression for panel data. *Econometrics Journal*, 14, 368-86.

Cappellari, L., Ghinetti, P. and Turati, G. (2011). On time and money donations. *Journal of Socio-Economics*, 40, 853-67.

Chernozhukov, V. and Hong, H. (2002). Three-step censored quantile regression and extramarital affairs. *Journal of the American Statistical Association*, 97, 872-82.

Chernozhukov, V., Fernández-Val, I. and Kowalski, A. (2015). Quantile regression with censoring and endogeneity. *Journal of Econometrics*, 186, 201-21.

Clotfelter, C. T. (1985). Federal tax policy and charitable giving. University of Chicago Press, Chicago IL.

Cobb-Clark, D. and Schurer, S. (2012). The stability of Big-Five personality traits. *Economics Letters*, 115, 11-5.

Cobb-Clark, D. and Schurer, S. (2013). Two economists' musings on the stability of locus of control. *Economic Journal*, 123, F358-400.

Corporation for National and Community Service (2012). Research brief: Volunteering in America research highlights. https://www.independentsector.org/volunteer_time.

Costa, P. T. and McCrae, R. R. (1992). Revised NEO personality inventory (NEO-PI-R) and NEO five factor inventory (NEO-FFI) professional manual. Odessa, FL: Psychological Assessment Resources.

Donnelly, G., Iyer, R. and Howell, R. (2012). The big five personality traits, material values, and financial well-being of self-described money managers. *Journal of Economic Psychology*, 33, 1129-42.

Ellingsen, T. and Johannesson, M. (2009). Time is not money. *Journal of Economic Behavior and Organization*, 72, 96-102.

Feldman, N. E. (2010). Time is money: Choosing between charitable activities. *American Economic Journal: Economic Policy*, 2, 103-30.

Freeman, R. (1997). Working for nothing: The supply of volunteer labor. *Journal of Labor Economics*, 15, S140-66.

Gill, D. and Prowse, V. (2015). Cognitive ability, character skills and learning to play equilibrium: A level-k analysis. *Journal of Political Economy*. Forthcoming.

Glenday, G., Gupta, A. K. and Pawlak, H., (1986). Tax incentives for personal charitable donations. *Review of Economics and Statistics*, 68, 688-93.

Gosling, S., Rentfrow, P. and Swann, W. (2003). A very brief measure of the big-five personality domains. *Journal of Research in Personality*, 37, 504-28.

Heineck, G. and Anger, S. (2010). The returns to cognitive skills abilities and personality traits in Germany. *Labour Economics*, 17, 535-46.

Koenker, R. and Bassett Jr., G. (1978). Regression quantiles. *Econometrica*, 46, 33-50.

Koenker, R. (2005). Quantile Regression. Cambridge University Press.

Kowalski, A. (2015). Censored quantile instrumental variable estimates of the price elasticity of expenditure on medical care. *Journal of Business and Economic Statistics*. Forthcoming.

Lankford, R. H. and Wyckoff, J. H. (1991). Modeling charitable giving using a Box–Cox standard tobit model. *Review of Economics and Statistics*, 73, 460-70.

List, J. (2011). The market for charitable giving. *Journal of Economic Perspectives*, 25, 157-80.

McCrae, R. R., and Costa, P. T. (1999). A five-factor theory of personality. In Handbook of personality: Theory and research (2nd ed.), (eds) Pervin, L. A. and John, O. P., Chapter 5, pages 139-53. New York: Guilford Press.

Menchik, P. L. and Weisbrod, B. A. (1987). Volunteer labor supply. *Journal of Public Economics*, 32, 159-83.

Nyhus, E. K. and Pons, E. (2005). The effects of personality on earnings. *Journal of Economic Psychology*, 26, 363-84.

Okun, M. A., Pugliese, J. and Rook, K. S. (2007). Unpacking the relation between extraversion and volunteering in later life: The role of social capital. *Personality and Individual Differences*, 42, 1467-77.

Omoto, A., Snyder, M. and Hackett, J. (2010). Personality and motivational antecedents of activism and civic engagement. *Journal of Personality*, 78, 1703-34.

ONS, (2013). Household satellite accounts: Valuing voluntary activity in the UK http://www.ons.gov.uk/ons/rel/wellbeing/household-satellite-accounts/valuing-voluntary-activity-in-the-uk/art--valuing-voluntary-activity-in-the-uk.html.

Powell, J. L. (1986). Censored regression quantiles. *Journal of Econometrics*. 32, 143-55.

Prevoo, T. and ter Weel, B. (2015). The importance of early conscientiousness for socio-economic outcomes: Evidence from the British Cohort Study. *Oxford Economic Papers*. Forthcoming.

Ribar, D. and Wilhelm, M. O. (2002). Altruistic and joy-of-giving motivations in charitable behaviour. *Journal of Political Economy*, 110, 425-57.

Schokkaert, E. (2006). Empirical analysis of transfer motives. In The handbook of the economics of giving, altruism and reciprocity, (eds) Kolm, S. C. and Ythier, J. M., Chapter 2, pages 127-81. Elsevier North Holland.

Smith, S. (2012). Increasing charitable giving: What can we learn from economics? *Fiscal Studies*, 33, 449-66.

Stock, J. H., Wright, J. H. and Yogo, M. (2002). A survey of weak instruments and weak identification in Generalized Method of Moments. *Journal of Business and Economic Statistics*, 20, 518-29.

UK Giving (2015). An overview of charitable giving in the UK during 2014. Charities Aid Foundation. https://www.cafonline.org/docs/default-source/about-us-publications/caf-ukgiving2014.

FIGURE 1: Number of hours volunteered in the last 4 weeks (volunteers only)
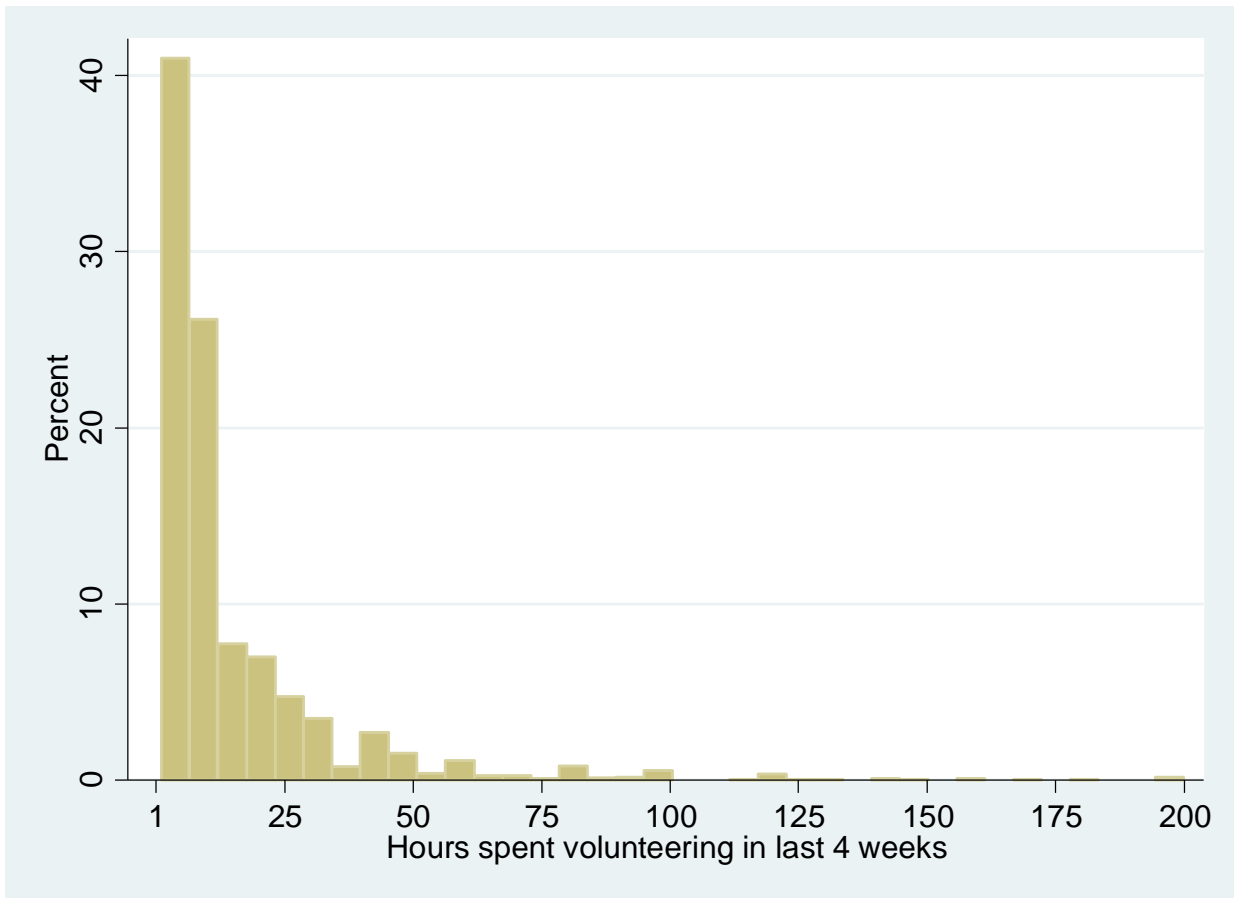
FIGURE 2: Natural logarithm of charitable donations over past 12 months (donators only)
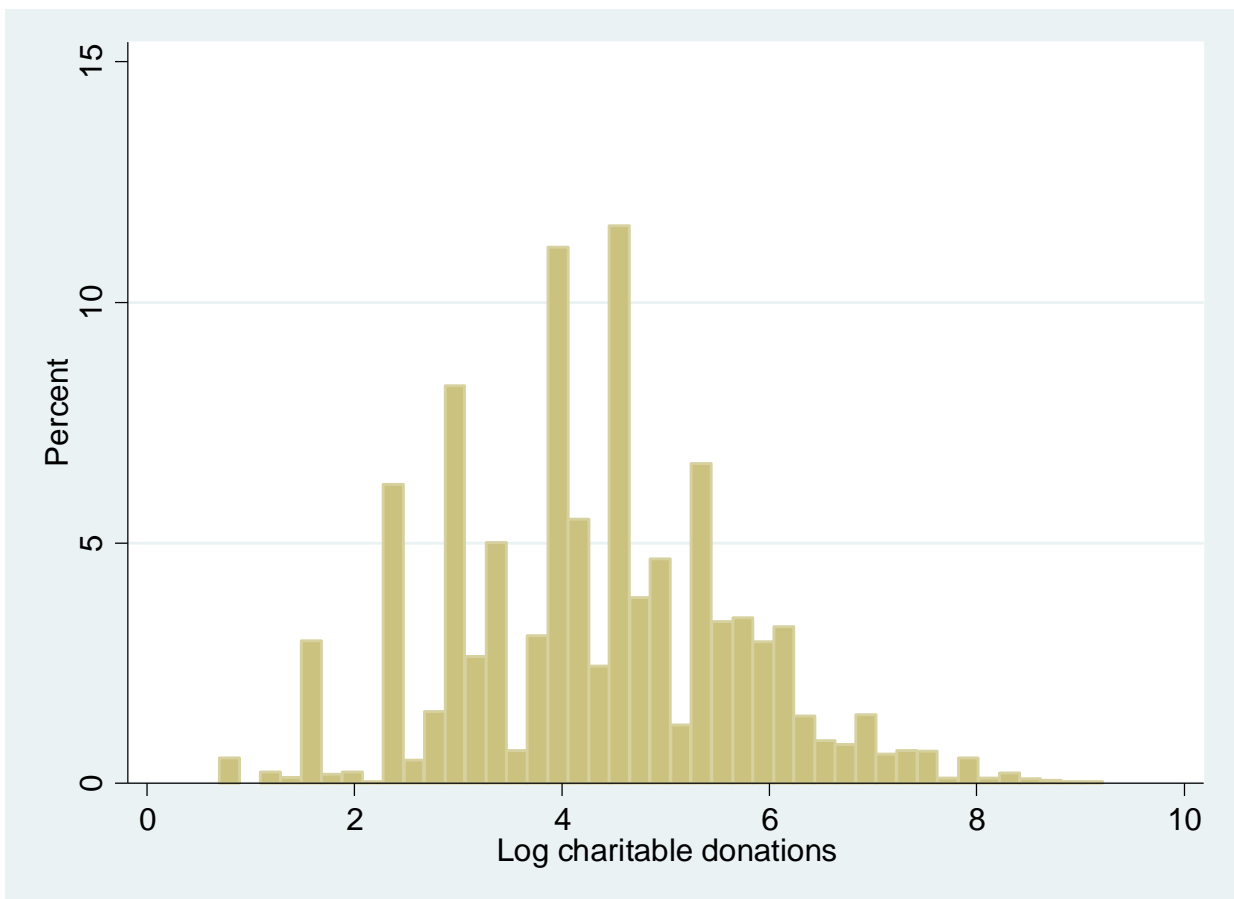
FIGURE 3: Charitable donations over past 12 months (donators only) as a proportion of total income
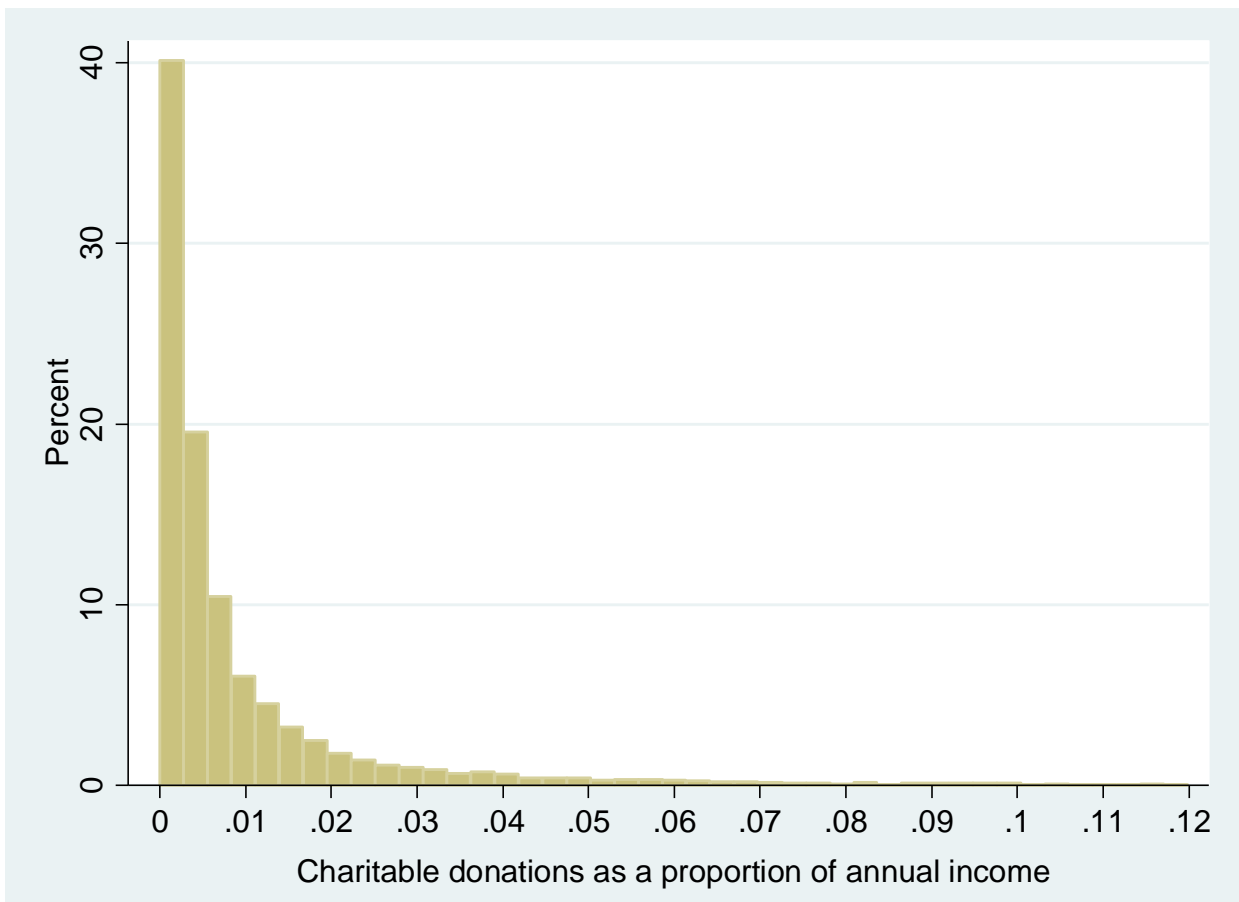
FIGURE 4: Distributions of the standardised Big5 personality traits (residuals)
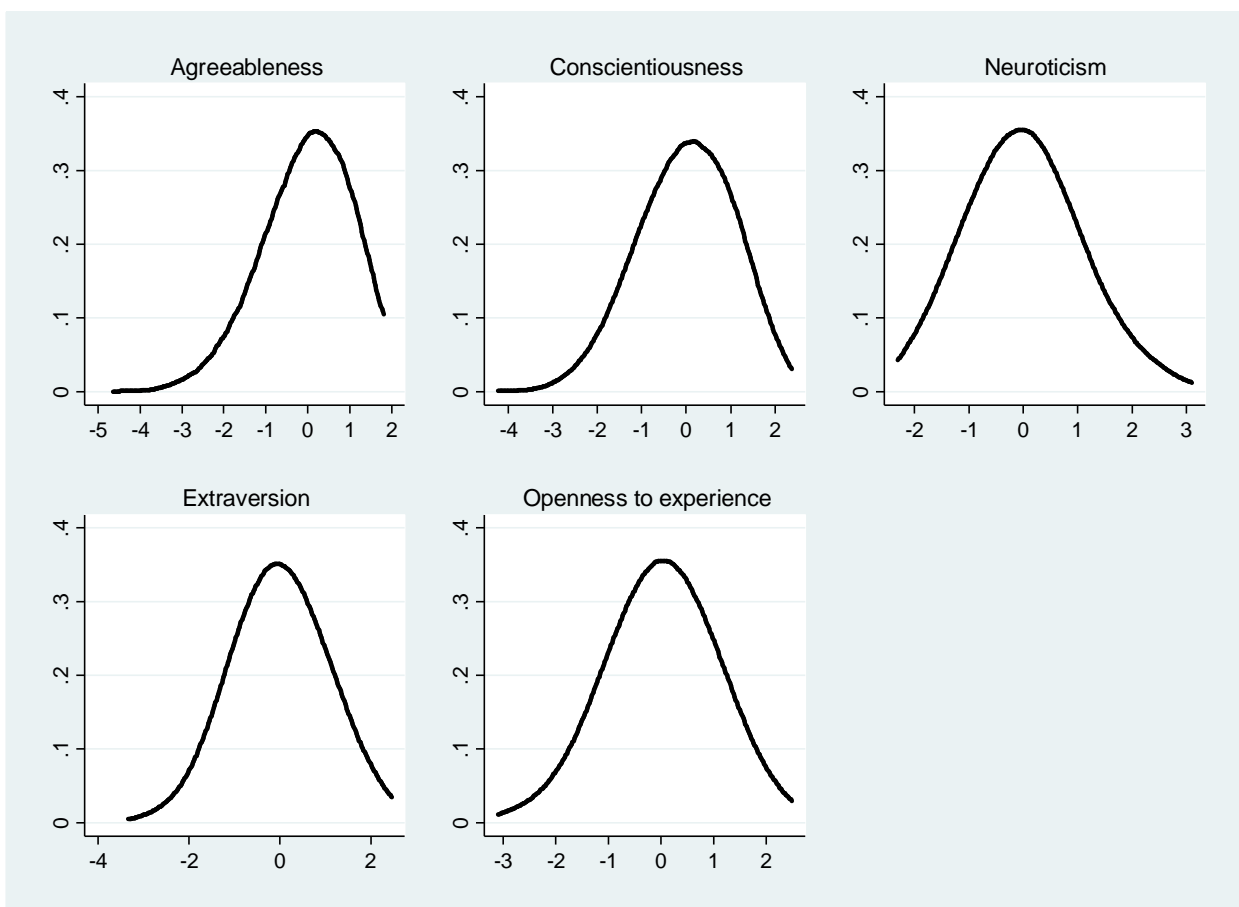
FIGURE 5: Distributions of the Big 5 personality traits in the UKHLS and BHPS 2005: sub-sample of 6,410 individuals
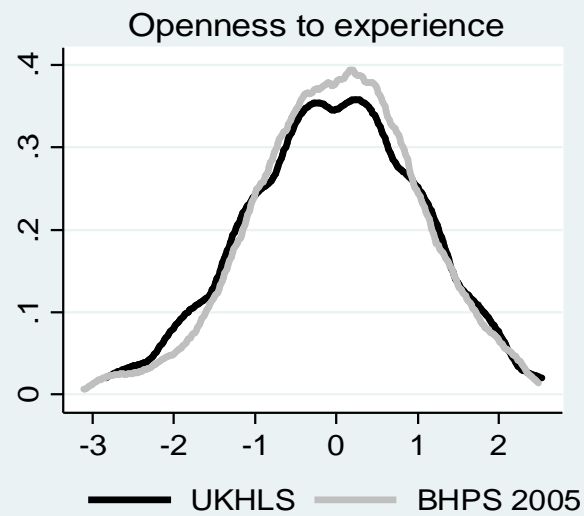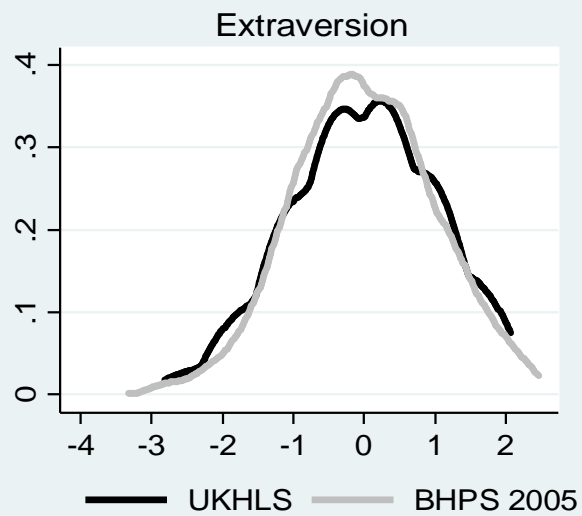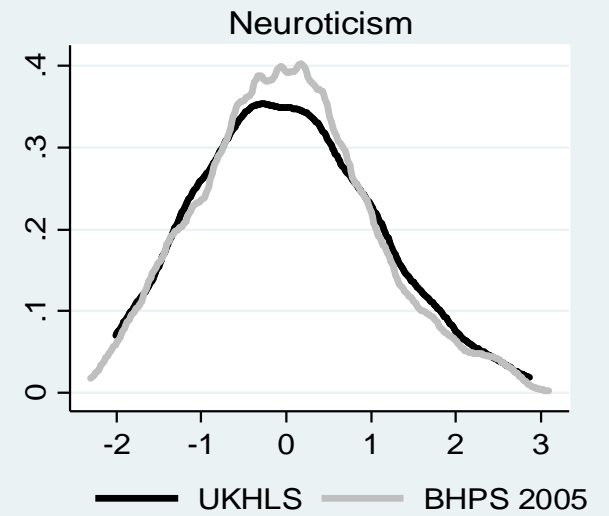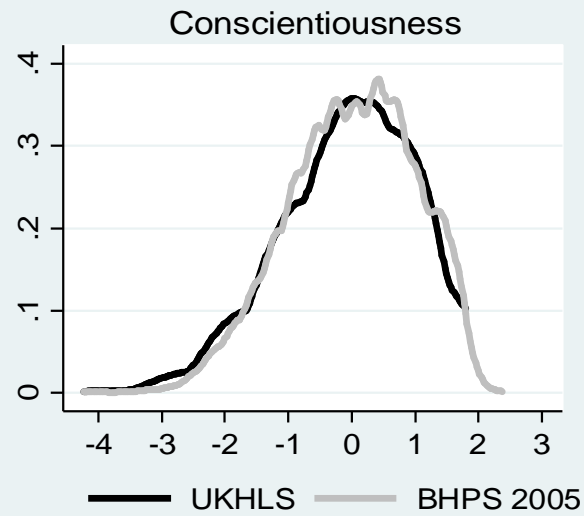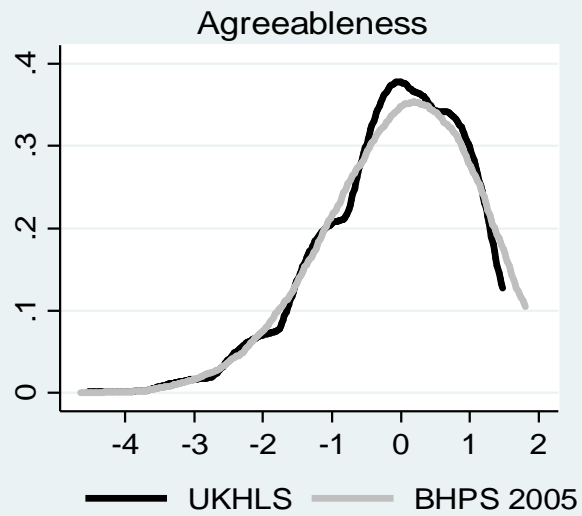
FIGURE 6: Log charitable donations and the Big Five across the full distribution – robustness analysis
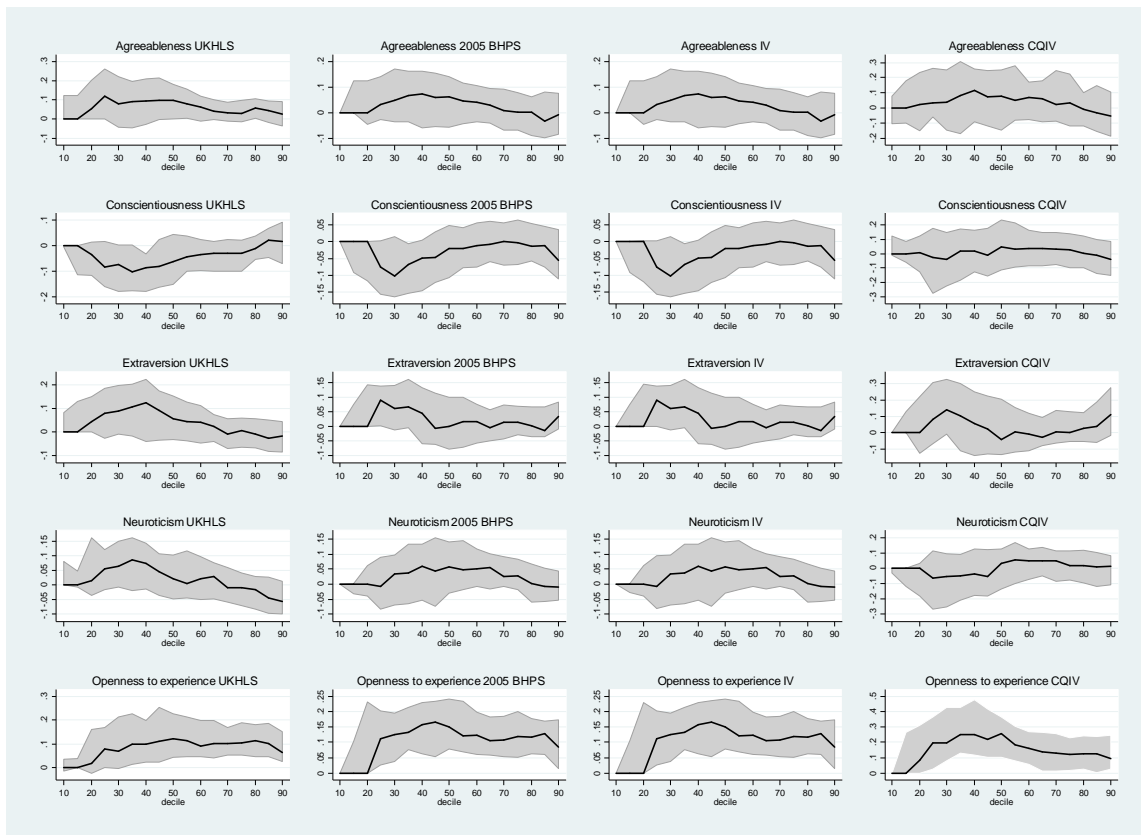
The solid black lines are average marginal effects and the shaded grey area is the 95% confidence interval.

FIGURE 7: Charitable donations as a proportion of income and the Big Five across the full distribution – robustness analysis
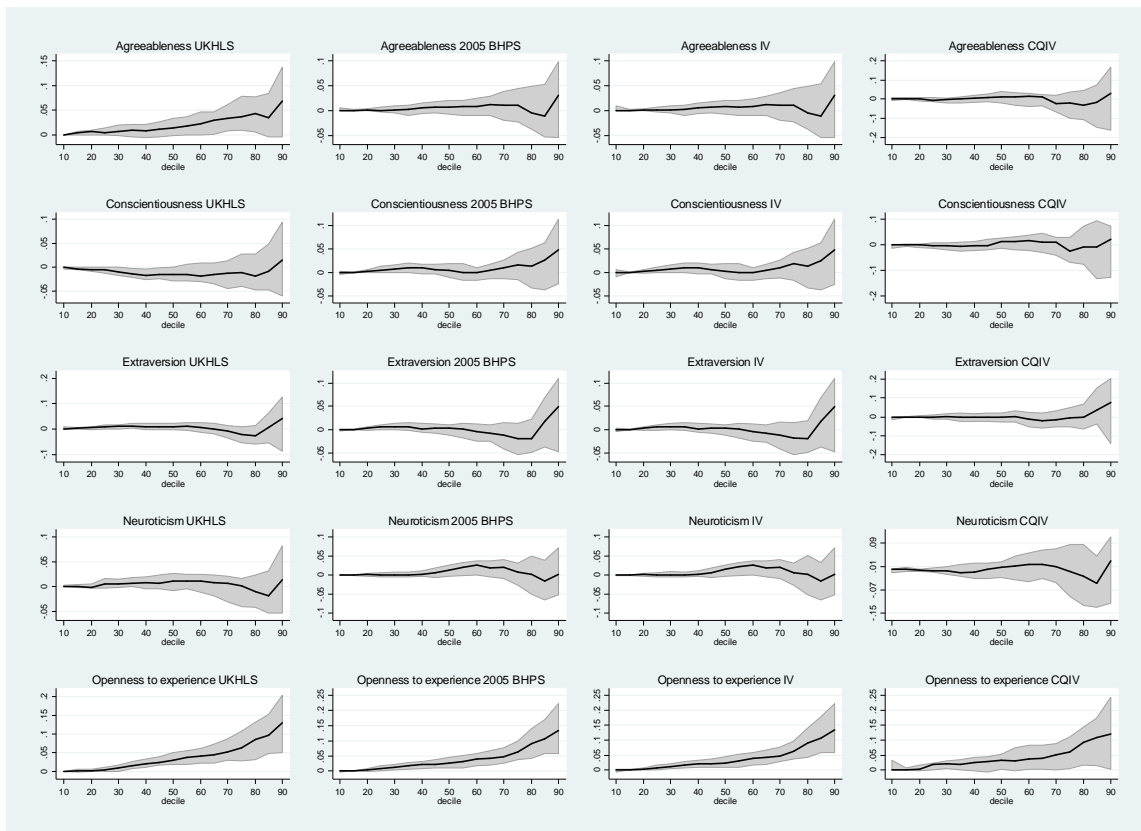
The solid black lines are average marginal effects and the shaded grey area is the 95% confidence interval.

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 monthly labour income	4.4467	3.5979	0	9.6158
Natural logarithm of monthly non-labour income	4.4003	3.0683	0	11.9476
Natural logarithm of monthly savings	1.8073	2.2499	0	10.1266
Employed	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 newspaper	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 2: Modelling monetary donations at time T – CQR estimates at the median

	LOG CHARITABLE DONATION		CHARITABLE DONATION / INCOME	
	dy/dx	*t-stat*	dy/dx	*t-stat*
Aged 16-24	-1.0115	*3.52*	-0.0125	*0.31*
Aged 25-34	-0.8783	*5.29*	-0.1018	*3.98*
Aged 35-44	-0.9209	*8.11*	-0.1065	*4.69*
Aged 45-54	-0.8254	*7.85*	-0.0907	*4.57*
Aged 55-64	-0.6363	*6.62*	-0.0684	*3.54*
Aged 65-75	-0.3660	*5.35*	-0.0375	*2.02*
Male	-0.3358	*8.89*	-0.1049	*5.53*
Number of children aged 2 or under	-0.2209	*3.34*	-0.0105	*1.28*
Number of children aged 3-4	-0.0889	*1.25*	-0.0146	*1.38*
Number of children aged 5-11	-0.0341	*0.93*	-0.0030	*0.63*
Number of children aged 12-15	-0.0057	*0.12*	-0.0021	*0.01*
Number of adults in household	-0.2440	*6.28*	-0.0158	*3.49*
Married or cohabiting	0.3433	*8.12*	0.0501	*7.53*
GCSE	0.5442	*6.79*	0.0842	*6.47*
A level	0.8340	*9.65*	0.1058	*7.94*
Degree	1.1511	*14.89*	0.1365	*10.18*
Other qualification	0.2806	*3.07*	0.0421	*6.47*
Natural logarithm of monthly labour income	0.1412	*9.90*	-0.0194	*7.64*
Natural logarithm of monthly non-labour income	0.0250	*3.04*	-0.0058	*4.07*
Natural logarithm of monthly savings	0.1372	*19.77*	0.0191	*12.97*
Employee	-0.3707	*3.28*	0.0673	*3.37*
Self employed	-0.5038	*5.48*	0.0202	*1.15*
Unemployed	-1.0491	*3.88*	-0.1393	*2.85*
Home owned outright	0.9167	*11.58*	0.1324	*13.19*
Home owned on a mortgage	0.8610	*11.91*	0.0923	*10.26*
Home privately rented	0.2005	*1.90*	0.0209	*1.78*
White British	0.1431	*3.58*	-0.0229	*3.63*
Black	-0.6209	*3.77*	-0.1049	*3.65*
Asian	-0.0039	*0.03*	-0.0054	*0.32*
Church of England	0.0774	*1.67*	-0.0034	*0.39*
Roman Catholic	0.1945	*2.73*	0.0121	*1.01*
Christian	0.5146	*5.23*	0.0763	*3.48*
Muslim	1.1839	*6.63*	0.1767	*6.59*
Other religion	0.3195	*5.56*	0.0399	*3.28*
Active member of religious group	0.9554	*19.46*	0.3110	*16.32*
Number of friends	0.0941	*10.84*	0.0136	*9.99*
Health excellent	0.5787	*5.42*	0.0839	*4.97*
Health very good	0.5566	*5.29*	0.0881	*5.57*
Health good	0.5244	*4.86*	0.0828	*5.33*
Health fair	0.3776	*3.31*	0.0539	*2.87*
Member of social website	0.0400	*1.96*	0.0055	*1.75*
Use the internet daily	0.3077	*5.29*	0.0386	*3.39*
Use the internet weekly	0.3365	*5.72*	0.0472	*4.26*
Use the internet monthly	0.2069	*2.45*	0.0317	*2.36*
Main source of news via paper	0.4711	*7.47*	0.0519	*4.55*
Main source of news via television	0.2736	*5.20*	0.0254	*2.99*
Main source of news via radio	0.5921	*9.78*	0.0771	*6.52*
Main source of news via internet	0.5715	*8.14*	0.0590	*5.67*
% donating by LAD and age (16+)	5.7698	*7.55*	0.8941	*6.63*
Lives in an urban area	-0.0624	*1.79*	-0.0049	*0.74*
Agreeableness [T-K]	0.0616	*2.81*	0.0148	*4.35*
Conscientiousness [T-K]	-0.0324	*1.71*	-0.0099	*3.09*
Extraversion [T-K]	0.0633	*3.26*	0.0079	*2.48*
Neuroticism [T-K]	-0.0029	*0.16*	0.0009	*0.31*
Openness to experience [T-K]	0.0723	*3.41*	0.0150	*4.65*
Pseudo R-squared including (excluding) Big5	0.1449 (0.1446)		0.0522 (0.0517)	
OBSERVATIONS		31,409		

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

TABLE 3: Modelling hours volunteered at time T – CQR estimates at the median

	NUMBER OF HOURS VOLUNTEERED	
	dy/dx	t-stat
Aged 16-24	1.7479	0.65
Aged 25-34	4.4572	2.75
Aged 35-44	2.8723	2.19
Aged 45-54	3.4345	2.56
Aged 55-64	4.3666	2.86
Aged 65-75	4.2810	2.87
Male	-0.8645	1.42
Number of children aged 2 or under	-7.9198	2.68
Number of children aged 3-4	0.0436	0.04
Number of children aged 5-11	0.5506	2.26
Number of children aged 12-15	0.4131	0.77
Number of adults in household	-0.2906	0.47
Married or cohabiting	1.5337	2.29
GCSE	4.4731	1.71
A level	5.2092	1.84
Degree	7.6625	2.40
Other qualification	4.6183	1.38
Natural logarithm of monthly labour income	-0.0525	0.30
Natural logarithm of monthly non-labour income	0.0501	0.38
Natural logarithm of monthly savings	0.2313	2.04
Employee	-2.4554	1.81
Self employed	-2.7014	2.10
Unemployed	-1.7115	1.03
Home owned outright	2.0365	1.64
Home owned on a mortgage	-0.5806	0.47
Home privately rented	-2.6356	1.54
White British	0.9849	1.74
Black	-2.1295	1.19
Asian	0.0105	0.01
Church of England	1.8014	2.29
Roman Catholic	-1.4632	1.56
Christian	2.7119	2.28
Muslim	0.6761	0.41
Other religion	2.2040	2.38
Active member of religious group	8.4477	3.92
Number of friends	0.6365	2.85
Health excellent	6.5870	2.87
Health very good	6.0337	2.85
Health good	5.8845	2.65
Health fair	4.6018	2.24
Member of social website	0.4167	0.75
Opportunity cost of time	-0.0406	2.45
Dissatisfied with leisure time	-0.5782	0.61
Cares up to 4 hours per week	2.1574	2.39
Cares 5-9 hours per week	5.0049	3.05
Cares 10-19 hours per week	1.8560	1.18
Cares 20-34 hours per week	-3.1978	2.83
Cares 35-49 hours per week	1.3349	0.33
Cares 50-99 hours per week	-2.4077	0.87
Cares 100+ hours per week	-1.5229	0.51
Lives in an urban area	-1.1752	1.85
Agreeableness [T-K]	-0.1228	0.42
Conscientiousness [T-K]	-0.2954	1.17
Extraversion [T-K]	0.1172	2.43
Neuroticism [T-K]	-0.8213	2.89
Openness to experience [T-K]	0.6374	2.36
Pseudo R-squared including (excluding) Big5	0.0533 (0.0323)	
OBSERVATIONS	31,409	

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

TABLE 4: Modelling monetary donations at time T – robustness analysis CQR estimates at the median

	LOG CHARITABLE DONATION		CHARITABLE DONATION / INCOME	
PANEL A: BIG5 measured in 2005	dy/dx	*t-stat*	dy/dx	*t-stat*
Agreeableness	0.0192	*2.47*	0.0138	*2.47*
Conscientiousness	-0.0137	*0.30*	-0.0063	*0.81*
Extraversion	0.0191	*0.47*	-0.0009	*0.11*
Neuroticism	0.0206	*0.43*	0.0053	*0.64*
Openness to experience	0.0734	*4.08*	0.0321	*3.68*
Pseudo R-squared	0.1577		0.0603	
OBSERVATIONS		6,410		
	LOG CHARITABLE DONATION		CHARITABLE DONATION / INCOME	
PANEL B: BIG5 instrumented	dy/dx	*t-stat*	dy/dx	*t-stat*
Agreeableness	0.0697	*2.39*	0.0152	*1.97*
Conscientiousness	-0.0378	*0.93*	-0.0046	*0.61*
Extraversion	-0.0079	*0.21*	0.0031	*0.40*
Neuroticism	0.0588	*1.24*	0.0111	*1.60*
Openness to experience	0.0631	*3.22*	0.0242	*2.86*
Pseudo R-squared	0.1414		0.0638	
OBSERVATIONS		6,410		

Notes: other controls as in Table 2.

TABLE 5: Modelling the number of hours volunteered at time T – robustness analysis CQR estimates at the median

	BIG5 2005		BIG5 INSTRUMENTED	
	dy/dx	*t-stat*	dy/dx	*t-stat*
Agreeableness	-0.0784	*0.19*	-0.0082	*0.20*
Conscientiousness	0.2868	*0.27*	0.0239	*0.40*
Extraversion	0.0576	*0.12*	0.0030	*0.08*
Neuroticism	-0.0159	*1.40*	-0.0059	*1.18*
Openness to experience	0.0676	*2.58*	0.0219	*2.52*
Pseudo R-squared	0.0240		0.0226	
OBSERVATIONS		6,410		

Notes: other controls as in Table 3.

TABLE 6: Censored quantile regression estimates of charitable donations (of time and money) and the Big Five personality traits – full distribution

PANEL A: Log charitable donations [T]

	AGREEABLENESSS [T-K]		CONSCIENTIOUS-NESS [T-K]		EXTRAVERSION [T-K]		NEUROTICISM [T-K]		OPENNESS TO EXPERIENCE [T-K]	
	dy/dx	t-stat	dy/dx	t-stat	dy/dx	t-stat	dy/dx	t-stat	dy/dx	t-stat
10th decile	0.0242	0.30	-0.0067	0.13	0.0111	0.15	0.0061	0.10	0.0326	0.27
20th decile	0.1049	2.01	-0.0639	1.48	0.1033	2.41	0.0242	0.73	0.1175	2.29
30th decile	0.0962	3.10	-0.0405	1.38	0.0929	3.36	0.0322	1.15	0.0915	3.32
40th decile	0.0647	2.87	-0.0359	1.51	0.0843	3.33	0.0251	1.05	0.0815	4.05
50th decile	0.0616	2.81	-0.0324	1.71	0.0633	3.26	-0.0029	0.16	0.0723	3.41
60th decile	0.0408	2.27	-0.0209	1.22	0.0398	2.25	-0.0083	0.53	0.0723	4.45
70th decile	0.0299	2.19	-0.0264	1.88	0.0208	1.48	-0.0190	1.37	0.0728	5.71
80th decile	0.0194	1.15	-0.0281	1.95	0.0107	0.83	-0.0260	2.21	0.0661	4.40
90th decile	0.0064	0.40	-0.0300	2.13	-0.0098	0.67	-0.0416	2.58	0.0660	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]	
	dy/dx	t-stat	dy/dx	t-stat	dy/dx	t-stat	dy/dx	t-stat	dy/dx	t-stat
10th decile	0.0007	1.35	-0.0001	0.29	0.0001	1.00	-0.0004	0.16	0.0010	0.27
20th decile	0.0096	1.73	-0.0061	1.71	0.0072	1.88	-0.0005	0.14	0.0088	1.75
30th decile	0.0082	2.20	-0.0076	1.67	0.0096	2.56	0.0037	0.97	0.0135	2.84
40th decile	0.0039	3.20	-0.0122	2.96	0.0121	3.03	0.0065	1.95	0.0161	4.18
50th decile	0.0148	4.35	-0.0099	3.09	0.0079	2.48	0.0009	0.31	0.0150	4.65
60th decile	0.0184	3.67	-0.0145	2.93	0.0126	2.66	-0.0033	-0.65	0.0261	4.80
70th decile	0.0211	3.51	-0.0163	2.41	0.0081	1.21	-0.0045	0.66	0.0388	4.72
80th decile	0.0285	2.83	-0.0186	1.96	-0.0055	0.71	-0.0113	1.19	0.0560	5.50
90th decile	0.0256	1.42	-0.0119	0.65	-0.0174	0.93	-0.0264	1.48	0.0826	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]	
	dy/dx	t-stat	dy/dx	t-stat	dy/dx	t-stat	dy/dx	t-stat	dy/dx	t-stat
40th decile	0.0368	0.31	-0.0230	0.34	0.0216	0.29	-0.5001	0.29	0.0210	0.25
50th decile	-0.1228	0.42	-0.2954	1.17	0.1172	2.43	-0.8213	2.89	0.6374	2.36
60th decile	0.0673	0.32	-0.1328	0.87	0.1445	0.71	-0.5033	1.64	0.3532	1.60
70th decile	-0.0382	0.24	-0.1480	0.84	0.1306	0.67	-0.5947	2.89	0.4090	1.80
80th decile	-0.2179	1.23	-0.0915	0.48	0.2693	1.15	-0.4994	2.12	0.9109	3.37
90th decile	-0.4469	1.52	0.2067	0.66	0.8138	2.46	-0.8324	2.73	0.9721	3.20

Notes: (i) Other controls as in Tables 2 and 3 (ii) Standard errors are obtained by weighted bootstrap with 200 replications. (iii) Dependent variables (Big5) measured at time T (T-K).