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TAX INCENTIVES AND CHARITABLE CONTRIBUTIONS: THE EVIDENCE FROM CENSORED QUANTILE REGRESSION

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Abstract. This paper investigates the relationship between tax price and charitable contributions using the censored quantile regression (QR) technique, which can provide a complete description of the whole distribution of giving, and data from US Internal Revenue Service individual tax returns. The findings of the present study are as follows. First, the price elasticities of charitable contributions are all negative and consistently decrease in absolute value along the quantiles. Second, donors at lower giving quantiles are price elastic but donors at higher quantiles are price inelastic. Third, the income elasticities are positive and increase along the quantiles. Lastly, the effects of wealth, age, marital status, and the number of dependents vary across quantiles. All the empirical results show that the censored QR offers better explanations on the relationship between tax incentives and charitable contributions.

1. INTRODUCTION

The study of charity contributions has been explored in fields as diverse as economics, sociology, psychology and political science. Economists have long paid attention to contribution behaviour because most households make charitable contributions in any given year. According to Giving USA 2010, the total amount of charitable contributions in the United States was approximately $US304bn in 2009, accounting for 2.1% of GDP. The primary donors were individuals, accounting for 75% of the total. Americans donate approximately 2% of their annual income to charities, and the average amount of contributions per household was $US1940 in 2009.[1] Contributions include cash and non-cash gifts, which may be property, stocks and other items of value. The federal and state governments subsidize this activity by allowing the amount of charitable contributions to approved charities to be deducted from taxable income by itemizing taxpayers.[2] Furthermore, tax laws permit taxpayers who donate appreciated property to take a full deduction for the fair market value of the property without paying capital gains tax on the appreciated component.

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[1] American Association of Fundraising Counsel, Giving USA 2010 (http://www.cfbroward.org/cfbroward/media/Documents/Sidebar%20Documents/GivingUSA_2010_ExecSummary_Print.pdf).

[2] The deduction amount of cash contributions cannot exceed 50% of adjusted gross income (30% for noncash contributions). Excess deductions can be carried into as many as 5 additional tax years if necessary.

Together, these two provisions of the tax law significantly lower the 'price' of charitable contributions to the taxpayer.

Steinberg (1990) argues that charity donations are similar to any other purchases a consumer makes. Thus, when the tax price of giving changes, so does the cost of any other consumption. The only difference is that the government will forgo tax revenues in exchange for charitable contributions. Therefore, understanding how the tax system affects the level of charity overall and by taxpayers in different groups is a major research area that is of interest to policy-makers and research scholars. The revenue cost of charitable deductions to the US Federal Government alone was $US46.8bn in 2008,[3] and much of this tax reduction accrued to high income taxpayers. Philanthropic organizations labour mightily to retain this tax preference, arguing that it significantly increases charitable giving. Although most people in the United States make donations each year, the bulk of the donations come from the rich. Havens and Schervish (1999) show that households in the top 4% of the income distribution gave over 40% of the charitable contributions in 1995. In many cases, wealthy people donate appreciated property to take advantage of double tax benefits.

Research into the effects of the tax system on charitable gifts typically focuses on how the tax system affects the price of charitable giving. For example, an itemizing taxpayer in the 28% tax bracket faces a net price of $US0.72 for a $1 gift. A taxpayer in a higher tax bracket faces a lower price, and a taxpayer in the highest bracket making a gift of appreciated property faces the lowest price of all. To measure the tax price effect, many researchers use the variation in the price of charity to taxpayers in different brackets as a means of estimating the impact of the tax system on the level of giving applying different econometric techniques, such as the least squares method or panel data analysis. In those studies, authors estimate the tax price effect based only on the mean of the conditional distribution of charitable contributions. However, the distribution of charitable contributions is typically asymmetric and heavy tailed. The phenomenon of the high-skewed distribution of charitable giving has been discovered in the literature. Schervish (2000) points out that this situation results from the fact that there are always a small number of families that donate a dramatically high proportion of total charitable giving. He argues that approximately 25% of families contributed 68% of all charitable dollars in 1997. More specifically, he shows that 0.22% of families with incomes of $US1m or more contributed 13% of all charitable dollars. This will make the distribution of giving highly right skewed. Therefore, the conventional regression technique is inadequate because it is unable to fully characterize the entire conditional distribution of giving.

In addition, there have been numerous studies estimating how tax incentives have affected private giving since the 1970s. Peloza and Steel (2005) provide a meta-analysis showing that estimates of the price elasticity of giving are generally negative but vary widely in existing studies, depending on the scope of the

[3] See: Budget of the U.S. Government, FY2010, Analytical Perspectives, Table 19.1 (http://www.gpo.gov/fdsys/pkg/budget-2010-per/pdf/budget-2010-per.pdf).

sample, the source of data, the specification of models and the characteristics of donors. More specifically, many studies demonstrate that the price elasticities of giving are different according to donors' income level, income source, education, gender, occupation, tax-filing status and so forth. However, very few studies estimate the price effect based on the level of charitable contributions of donors. In his celebrated paper, Clotfelter (1986) argues that there are systematic differences in price sensitivity between big givers and small givers at any income level. Although he first proposed the notion where big givers and small givers might have different price elasticities, he did not provide empirical evidence. Bekkers and Wiepking (2007) provide eight motives for charitable giving from both material and spiritual aspects, and Schervish (2000) further argues that the latter might play a more significant role as giving becomes larger. Schervish (2000, 2005) discusses how spiritual factors stimulate large contributions to charity; he states that when wealth holders choose to contribute, they want to provide enough philanthropic input to make a significant difference in the realm of allocation. According to Reinstein (2009), small givers might not value charitable contribution inherently and their giving could be mainly driven by temporary shocks and personal appeals; however, larger givers might be more committed to charitable giving. In addition, Smith *et al.* (1995) argue that high altruistic individuals might always give something regardless of their economic circumstances. If we consider high altruistic donors to be those who will make huge donations when they are able to do so, we then can expect them to be less sensitive to tax incentives.

From the above mentioned, because (i) the distribution of charitable giving is highly right skewed and (ii) big givers and small givers might respond to the tax price of giving differently, the present study investigates how tax incentives affect charitable donations at different levels of giving. We focus on certain quantiles of the conditional distribution of giving, which can provide more information on the price elasticities of giving. Quantile regression (QR), as proposed by Koenker and Bassett (1978), is a regression method that offers a complete description of the whole conditional distribution. By specifying a QR model and estimating various QR functions, the entire conditional distribution of charitable giving can be depicted. Therefore, central and tail behaviours can be analyzed together.[4] In addition, because the data of giving is censored at 0 dollars, the present paper investigates the heterogeneous relationship between tax price and charitable contributions using the censored QR of Powell (1984, 1986).

Using data from US Internal Revenue Service (IRS) individual tax returns, our findings are as follows. First, the price elasticities of charitable contributions are all negative and consistently decrease in absolute value along the quantiles. Second, the taxpayers at the lower quantiles (small givers) are more responsive to a change in the tax price of giving, but those at the upper quantiles (big givers) are more price inelastic. Third, the income elasticities are positive for all quantiles, and they also increase along the quantiles. Finally, the effects of wealth,

[4] For more detailed review, see Koenker (2005).

age, marital status and number of dependents vary across quantiles. The present paper also carried out robustness checks for data for exclusion of the borderline taxpayers, for exclusion of the alternative minimum tax (AMT) taxpayers, and for different income groups. The results are robust. After eliminating the borderline or AMT taxpayers, the price elasticities of giving still decrease in absolute value as the amount of giving becomes larger, which further supports our quantile estimates. All the empirical results show that using censored QR results in better explanations regarding the relationship between tax incentives and charitable contributions.

This paper is organized as follows. Section 2 discusses issues in the published literature. Section 3 describes the data. The regression method and empirical results are presented in Section 4. Section 5 concludes the study.

2. ISSUES IN THE LITERATURE

Two main questions are discussed extensively in the published literature on charitable contributions,: (i) why people donate; and (ii) how tax incentives affect charitable contributions. For the first question, Bekkers and Wiepking (2007) highlight eight mechanisms as the most important forces driving philanthropy: awareness of need, solicitation, costs and benefits, altruism, reputation, psychological benefits, values and efficacy. According to Bekkers and Wiepking (2007), these multiple motives are likely to operate simultaneously and the mix of these motives differs over time, and with the location, the organization and the donor. These eight mechanisms can be divided into material and spiritual motives. However, some studies argue that the latter might play a more significant role as giving becomes larger.

Schervish (2000, 2005) discusses how spiritual aspects stimulate donors to make large contributes to charity. He concludes that the main spiritual motives for major donors are hyperagency, identification and association. According to his definition, hyperagency indicates the enhanced capacity of donors to establish or control substantially the conditions where they and others live. It is believed that when an individual contributes a gift, he or she does want it to make a difference, but the major donors want it to make a big difference.[5] Schervish (2005) thus argues that when wealth holders choose to contribute, they want to provide enough philanthropic input to make a significant difference in the realm of allocation, just as they did in the realm of accumulation. Second, from the identification model, Schervish finds that the spiritual foundation for charitable giving revolves around identification with the needs of others. According to Schervish, the key to the practice of philanthropy is how people link their destiny to the destiny of others. In other words, the cause of philanthropy is not the absence of self but the presence of self-identification with others. Third, Schervish (2005, p. 61) states that 'generosity of time and money derives not from one's level of income or wealth but from the physical and moral

[5] As stated by Schervish (2005), not every hyperagent is wealthy, but every wealthy holder is at potentially a hyperagent.

density of one's associational life and the horizons of identification'. This implies that the basis for greater giving is in large part a function of the mix and intensity of the network of formal and informal associations both within and beyond one's community. Reinstein (2009) states that small givers might not value charitable contributions inherently so that their giving could be mainly driven by temporary shocks and personal appeals; however, larger givers might be more committed to charitable giving. If donors become more devoted to giving or even consider giving to be a habit, they are more likely than other donors to contribute without considering economic conditions. Schokkaert (2006) argues that underlying motivations of giving will lead to differences in the level of tax awareness, and lower tax awareness makes the price elasticities of giving less significant or smaller in absolute value.

The present paper pays more attention to the second question of charitable contributions. The price elasticities and income elasticities of charitable contributions vary in earlier studies due to the different data sets, model specifications and econometric techniques employed. Feenberg (1987) uses cross-section data and employs state tax rates as the source of variation in the price of giving. He finds a price elasticity of –1.63 and an income elasticity of 0.735. Clotfelter (1980) and Broman (1989) use the first-differenced model to estimate the price and income elasticities of charitable contributions. They both conclude that the price and income elasticities are much smaller in the first-differenced model.[6] Barrett (1991) argues that the two-way dynamic fixed-effect model is the most appropriate model to use to analyse charitable contributions. Barrett *et al.* (1997) implement their dynamic specification incorporating habit effects, time shifting and consumption smoothing in the regression to estimate the price elasticity of giving for middle-class taxpayers. Their result indicates that tax deductions for charitable giving are not efficient because the full long-run price elasticity of giving is only –0.47.

Randolph (1995) finds that individuals' giving decision responds more to permanent income changes than to transitory income changes, while it seems to be less responsive to permanent price changes than transitory price changes. However, using panel data, Auten *et al.* (2002) provide the opposite result to that of Randolph (1995). Auten *et al.* (2002) conclude that persistent income and price effects both have greater impacts on charitable contributions than do transitory income and price effects. O'Neil *et al.* (1996) find that the price elasticities are different across income groups, and their results also show that asset gifts are price elastic only for high income groups. Tiehen (2001) constructs a cohort panel from a series of biennial survey data to estimate the income and price elasticities of charitable contributions.[7] His estimated income elasticity of giving is 0.24 and the price elasticity is –1.15, which is higher than the estimates

[6] From Clotfelter's (1980) first-differenced model, the price elasticity of giving is –0.33 and the income elasticity is 0.4. In Broman's (1989) study, the price elasticity and income elasticities of giving are –0.22 and 0.24, respectively.

[7] Unlike the conventional panel data following the same individual over different periods, the cohort panel tracks a cohort through a series of cross-sectional surveys.

from using conventional taxpayer-specific panel data, but lower than the estimates from using cross-sectional data analysis in the literature.

3. DATA

Data for the present study are drawn from the 1995 cross-sectional Individual Tax Model File from the IRS, maintained by the Office of Tax Policy Research at the University of Michigan. Individual Tax Model File data were compiled from a stratified probability of unaudited individual income tax returns to make these files representative of all returns filed for each year. A total of 103 117 returns were sampled from a population of 118.2 million returns in 1995. We basically follow Barrett (1991) and Wu (2001) to select our samples. First, late files are not included.[8] Second, tax returns typically provide no insight into nonitemizers' charitable giving because they do not itemize any deductions. Thus, only itemizers who face different tax prices of giving according to their marginal tax rates are considered in the present study.[9] Third, as observed by Barrett (1991), when a married couple decides to apply their tax returns separately, the high-bracket spouse usually declares the deductions. This indicates that the return of the low-bracket spouse contains misleading contribution and price information. The return of the high-bracket spouse understates the couple's total disposal income. Consequently, we only choose people who are single or married with joint returns. Wu (2001) suggests that the variation in the tax price of giving increases when AMT taxpayers are included in the sample, because AMT taxpayers face different marginal tax rates from those faced by regular taxpayers of the same income level. Therefore, AMT taxpayers are included in the sample.[10] The other variables we need in the estimation are described below.

3.1. *Charitable contributions*

Charitable contributions are the amounts of taxpayers' reported charitable deductions on their tax returns, including cash giving and non-cash giving.[11] Because some taxpayers report zero charitable deductions, to avoid taking the logarithm of zero values, we follow the standard practice of previous studies (Andreoni, 2006) to adjust reported charitable deductions upwards by $US1.

[8] In other words, we only consider tax returns for the year 1995. Approximately 2.6% of prior-year returns are deleted.

[9] Nonitemizers are usually excluded in the literature because they do not claim any deductions. However, it is worth noting that from 1982 to 1986, the US Government allowed nonitemizers to deduct different portions of their charitable giving from taxable income. Some studies have used these exogenous tax price changes to estimate the price elasticity of nonitemizers, but when the provision expired in 1987, nonitemizers could no longer deduct charitable contributions. Thus, we only include itemizers in our study (approximately 58% from the total samples).

[10] There are 5042 AMT taxpayers in our study.

[11] The carryover contributions are not considered in this study.

3.2. *Income*

The income measure used in the present study is the first-dollar disposable income, which is calculated here as adjusted gross income plus individual retirement account and Keogh plan contributions less the amount of tax liability had no charitable contrition been made. To avoid taking the logarithm of zero or a negative value, only taxpayers with positive first-dollar disposable income are included in the sample.

Price of giving: Conventionally, the prices of cash giving (P^{cash}) and non-cash giving ($P^{non-cash}$) per dollar have been defined as follows:

$$P^{cash} = 1 - t^I,$$

$$P^{non-cash} = 1 - t^I - gt^C,$$

where t^I is a taxpayer's marginal income tax rate, t^C is a taxpayer's marginal capital gains tax rate and g is the appreciation ratio in the year when asset donations are made.[12] Because charitable contributions are the sum of cash giving and non-cash giving, the weighted average price is used in the present study, which is defined as:

$$P^{giving} = a \times P^{cash} + (1-a) \times P^{non-cash},$$

where a is the percentage of total contributions made in cash and $1 - a$ is the percentage of total non-cash contributions. An endogeneity problem will arise when our explanatory variable depends on what we are explaining if we use the actual marginal tax rates in the regression. Several approaches are suggested to solve this endogeneity problem: see Clotfelter (1985). We apply the first-dollar marginal tax rates in the regressions, which are calculated by adding the amount of the charitable giving to the taxable income in order to find the corresponding tax rates from the tax schedule. The tax rate applying to the very first dollar of contributions is independent of the amount given. Thus, the explanatory variable (the price of giving) will not depend on the thing it is explaining (the amount of giving).

3.3. *Other explanatory variables*

In addition to the tax price and income, some variables available from tax return data are also important determinants of charitable contributions. Here, the

[12] The appreciation portion of the value of non-cash giving is not available from tax returns. Here, we make the standard assumption that 50% of the asset value represents appreciation; see Barrett *et al*. (1997).

Table 1. Summary statistics of variables

Variables	Mean	Standard deviation	Median	Minimum	Maximum
Charitable contributions	45 080	350 439	3 530	0	25 400 000
Price	0.663	0.100	0.629	0.464	1
Income	752 892	2 064 593	203 020	6	127 000 000
Wealth	205 785	956 645	16 940	1	59 100 000
Aged 65 years or over	0.172	0.378	0	0	1
Married	0.844	0.363	1	0	1
Dependents	2.778	1.39	2	0	19

Notes: There are 54 484 taxpayers in the sample.

variables include wealth,[13] age,[14] marital status and the number of dependents. We expect that taxpayers with larger amounts of wealth will make larger charitable contributions, *ceteris paribus*, because wealth serves as a signal of accumulated purchasing power from the past rather than from the current income. Thus, the estimate of this variable should be positive. Age has consistently been found to be an important factor explaining differences in personal giving propensities. Previous studies have proven that giving rises markedly with age (Tiehen, 2001; Wu, 2001). Researchers also believe that unmarried taxpayers have a different perspective about charitable contributions than do married taxpayers. Most studies find that married individuals make larger donations, *ceteris paribus*. As O'Neil *et al*. (1996) state, the number of dependents in a household has an indecisive influence on the amount of charitable giving. With more dependents, the income per capita in the household unit decreases, *ceteris paribus*, and, thus, we might expect charitable contributions to decline. However, households with more dependents are more likely to participate in church and educational non-profit organizations, allowing them greater chances to contribute more (O'Neil *et al*., 1996).

There are 54 484 taxpayers in the sample, including 2774 (5.09% of all) taxpayers not claiming deductions for donations. Summary statistics for variables from our sample are included in Table 1. It is worth noting that the mean and the median values of the variables are quite different. For example, the mean of charitable contributions is $US45 080, while the median is only $US3530. This shows that the distribution of these variables is not symmetric and one cannot rely only on the mean regression to analyze the behaviour of charitable giving. This is the motivation for using the censored QR to study the charitable giving. A histogram of charitable contributions less than $US20 000 is plotted in Figure 1. It can be seen that the distribution of charitable contri-

[13] O'Neil *et al*. (1996) mention that direct measures of wealth are not available from tax return data. Therefore, we follow their method of using gross interest income and dividend income as an indirect measure of wealth. Again, to avoid taking the logarithm of zero or a negative value, taxpayers with non-positive wealth are excluded from the sample. We also try adding $US1 to wealth, and then take the logarithm, to keep the individuals with no wealth. The estimation result is similar to the one in which we exclude the individuals with non-positive wealth.

[14] From tax returns, we only know whether he/she is aged 65 years or over.

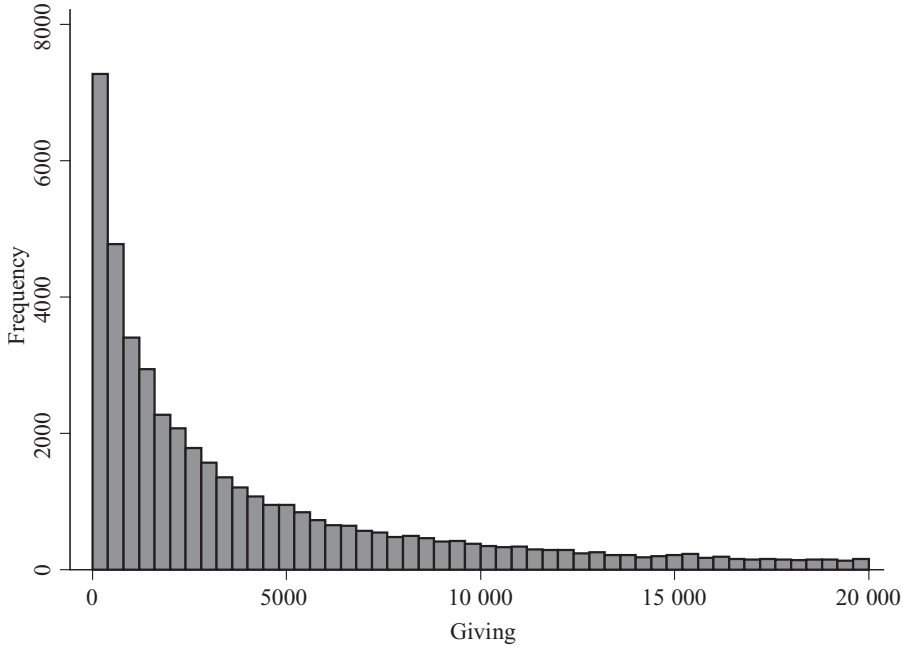

Figure 1. Histogram of the charitable contributions

Table 2. Charitable contributions at quantiles

Quantile (%)	5	10	15	20	25	30	35	40	45	50
Amount ($US)	0	247	467	686	980	1 300	1 705	2 192	2 790	3 530
Quantile (%)	55	60	65	70	75	80	85	90	95	99
Amount ($US)	4 480	5 700	7415	9 779	13 410	19 563	30 410	55 684	140 873	768 489

butions is skewed to the right. The charitable contributions at different quantiles are displayed in Table 2. Here, 25.56% of taxpayers contribute no more than $US1000. Taxpayers contributing up to $US10 000 make up 70.39% of the sample.

The standard estimations in the study of charitable behaviors usually take logarithms of variables. Thus, in this paper, logarithms are used for charitable contributions, price, income and wealth. By doing so, the coefficients of price, income and wealth capture the corresponding elasticities. Note that for the purpose of tax policy evaluation, the quantile estimates of the price effects will provide a better assessment of the tax expenditure, even though the distribution of the logarithm of charitable contributions becomes less skewed.[15] To investi-

[15] We thank the referee for pointing out that the reasons for the necessity of using QR for the study of charitable activities need to be elaborated.

gate whether different quantiles of the distribution of giving will have different behaviors, the censored QR is used and is introduced in the following section.[16]

4. EMPIRICAL STUDY

4.1. *Censored quantile regression*

This paper uses the censored QR model to analyze the relationship between tax incentives and charitable contributions for data with censoring points. The censored QR is as follows:

$$y_i = \begin{cases} y_i^*, & if\ y_i^* \geq y^0, \\ y^0, & if\ y_i^* < y^0, \end{cases}$$

where y^0 is the censoring point and

$$y_i^* = \boldsymbol{x}_i'\boldsymbol{\beta} + u_i,$$

where y_i^* is charitable contributions; $\boldsymbol{x}_i$ contains the tax price of giving, income level, wealth, age, marital status and number of dependents; and u_i as the error term. In this paper, all continuous variables are expressed in logarithm and the dependent variable is censored at zero. Given $\tau \in (0,1)$, the τth conditional quantile function of y given $\boldsymbol{x}$ is specified as:

$$Q_y(\tau \mid \boldsymbol{x}_i) = \max(y^0, \boldsymbol{x}_i'\boldsymbol{\beta}_\tau),$$

and the censored QR model is as follows:

$$y_i = \max(y^0, \boldsymbol{x}_i'\boldsymbol{\beta}_\tau) + e_{\tau i},$$

where $e_{\tau i}$ is the error term.

The censored QR estimator can be obtained by minimizing a weighted sum of absolute deviations between the dependent variables and the conditional quantile functions with a weight τ on positive errors and $1 - \tau$ on negative errors, with $\tau \in (0,1)$:

$$\begin{aligned} M_n(\boldsymbol{\beta}; \tau) &:= \frac{1}{n}\left[\tau \sum_{\{e_{\tau i} \geq 0\}} |y_i - \max(y^0, \boldsymbol{x}_i'\boldsymbol{\beta}_\tau)| + (1-\tau) \sum_{\{e_{\tau i} < 0\}} |y_i - \max(y^0, \boldsymbol{x}_i'\boldsymbol{\beta}_\tau)|\right] \\ &= \frac{1}{n}\sum_{i=1}^{n} \rho_\tau(y_i - \max(y^0, \boldsymbol{x}_i'\boldsymbol{\beta}_\tau)), \end{aligned}$$

[16] Fack and Landais (2010) also study the price elasticity of charitable giving in France using censored QR. However, there is heavy censoring in their data and they only estimate parameters above the 0.9th quantile.

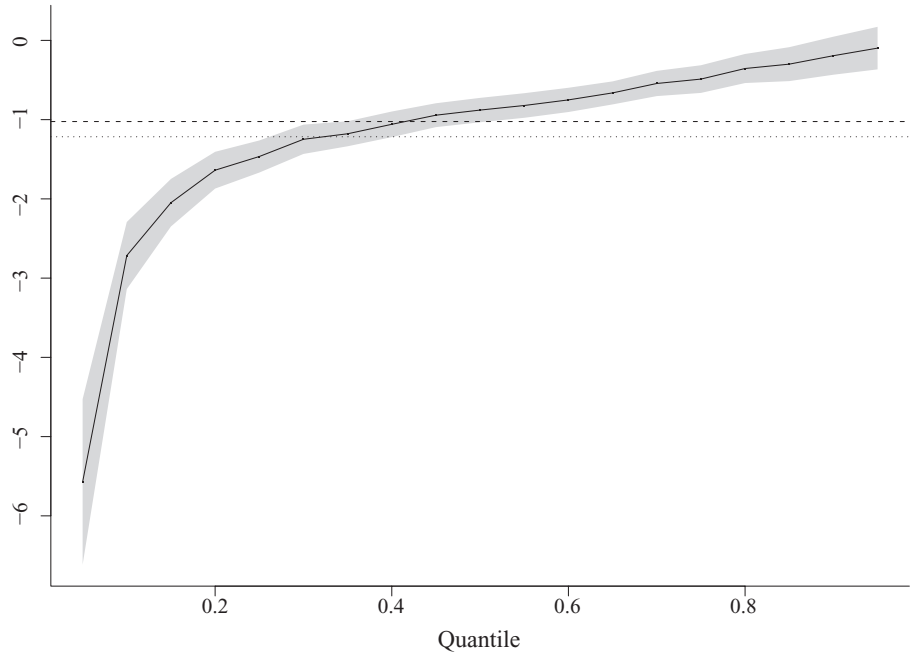

Figure 2. Price effect

where $\rho_\tau(e)$, the check function, is given by $(\tau - \mathbf{1}_{\{e<0\}}) \cdot e$ and $\mathbf{1}_{\{e<0\}}$ is the indicator function of $\{e < 0\}$. Note that the objective function $M_n(\boldsymbol{\beta};\tau)$ is not smooth and must be solved numerically. A linear programming technique is used to compute the censored QR estimator. We use STATA with the censored QR package[17] to compute the estimators in the paper. To compute the standard errors and confidence intervals, the bootstrap method is used and the repeated frequency is 1000.

4.2. *Empirical results*

The estimation results of the censored QR are illustrated in Figures 2–5. Each graph depicts the coefficient estimates of 19 censored QR, with quantiles 0.05, 0.10, 0.15, ···, 0.95. In these figures, the horizontal axis is the quantile and the vertical axis is the values of regression estimates. We plot the estimated regression coefficients using a solid line and their 95% confidence intervals in the shaded area against quantiles, together with the least squares estimates using a dashed line and their 95% confidence intervals using a dotted line. The Appendix

[17] We used the Stata command 'qcenreg', developed by Robert Vigfusson at Northwestern University, to compute censored QR estimates.

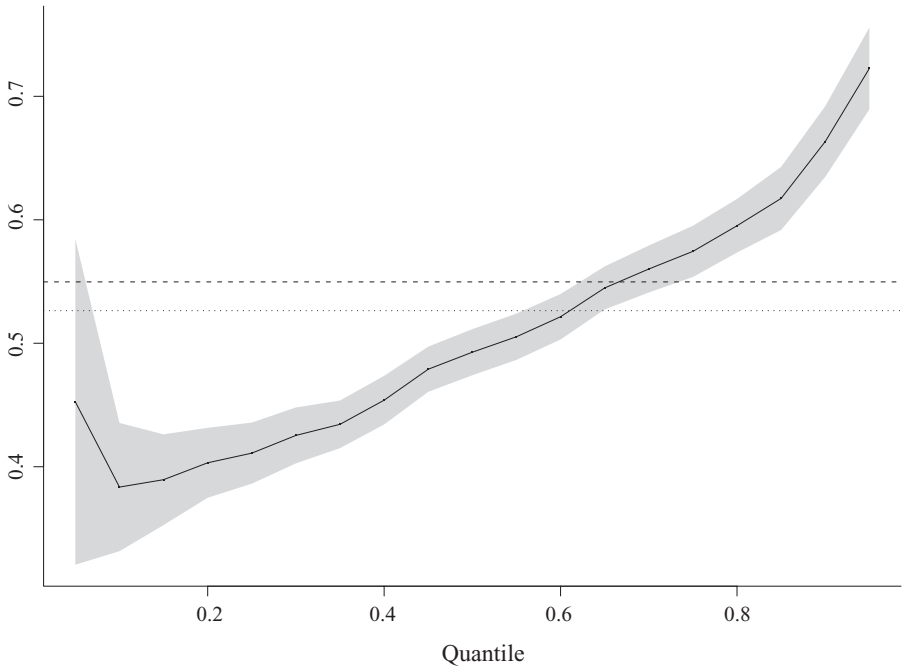

Figure 3. Income effect

summarizes the coefficient estimates of the censored QR and the least squares method.

The regression coefficient estimate of price is presented in Figure 2. For most censored QR, the price coefficient estimates are significantly negative at the 1% significant level. This implies that taxpayers will decrease their charitable contributions as the price of giving increases; however, the magnitude of price elasticities varies across quantiles. This result indicates that taxpayers contributing different amounts of charitable contributions respond differently to tax price changes. For the 0.05–0.40 quantiles, the censored QR estimates are smaller than −1, which means that the price elasticities are significantly larger than 1 in absolute value. That is, the taxpayers in the lower quantiles are price elastic. From Table 2, the 0.4 quantile of charitable contributions is $US2192, and, thus, we may conclude that for taxpayers who contribute less than $US2000 a year, when the price of giving decreases by 1%, their charitable contributions will increase more than 1%. In contrast, for the upper (0.45 up) quantiles, the price elasticities are significantly smaller than 1 in absolute value, implying that they are price inelastic. The policy implication here is that a decrease in the price of giving will increase the upper-quantile taxpayers' contributions, but the increased amount of giving will be less than the tax revenue lost to the government due to deductions for charity. Therefore, it is not fiscally efficient to stimulate those individuals' charitable contributions by decreasing their tax price of giving.

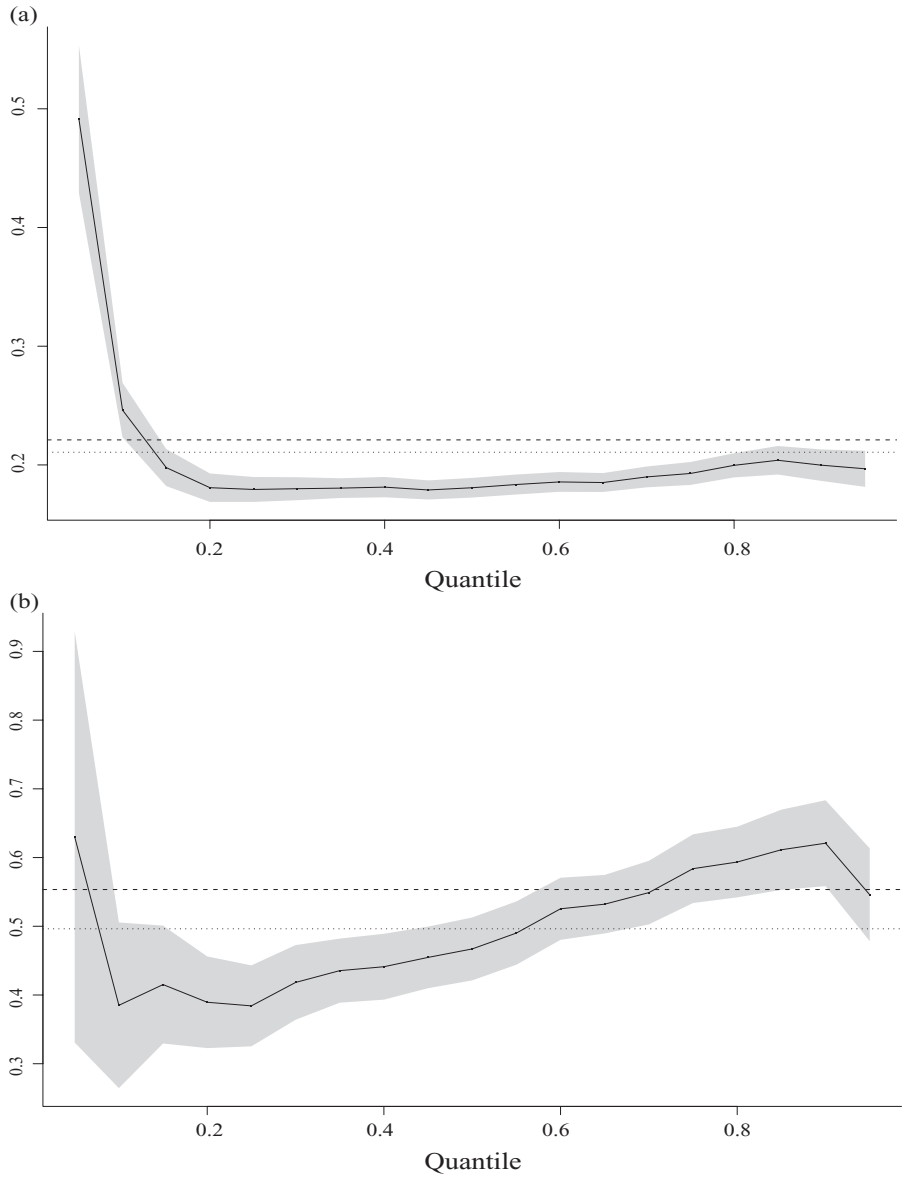

Figure 4. Wealth and age effects: (a) wealth effect and (b) age effect

In previous studies, the price elasticities of giving have been proven to be different according to income class, although there are no conclusive results. For example, O'Neil *et al*. (1996) demonstrate that the price elasticities of giving follow a U-shaped pattern, where the lowest and highest income classes have more elastic estimates. Greenwood (1993) illustrates that the price elasticity of

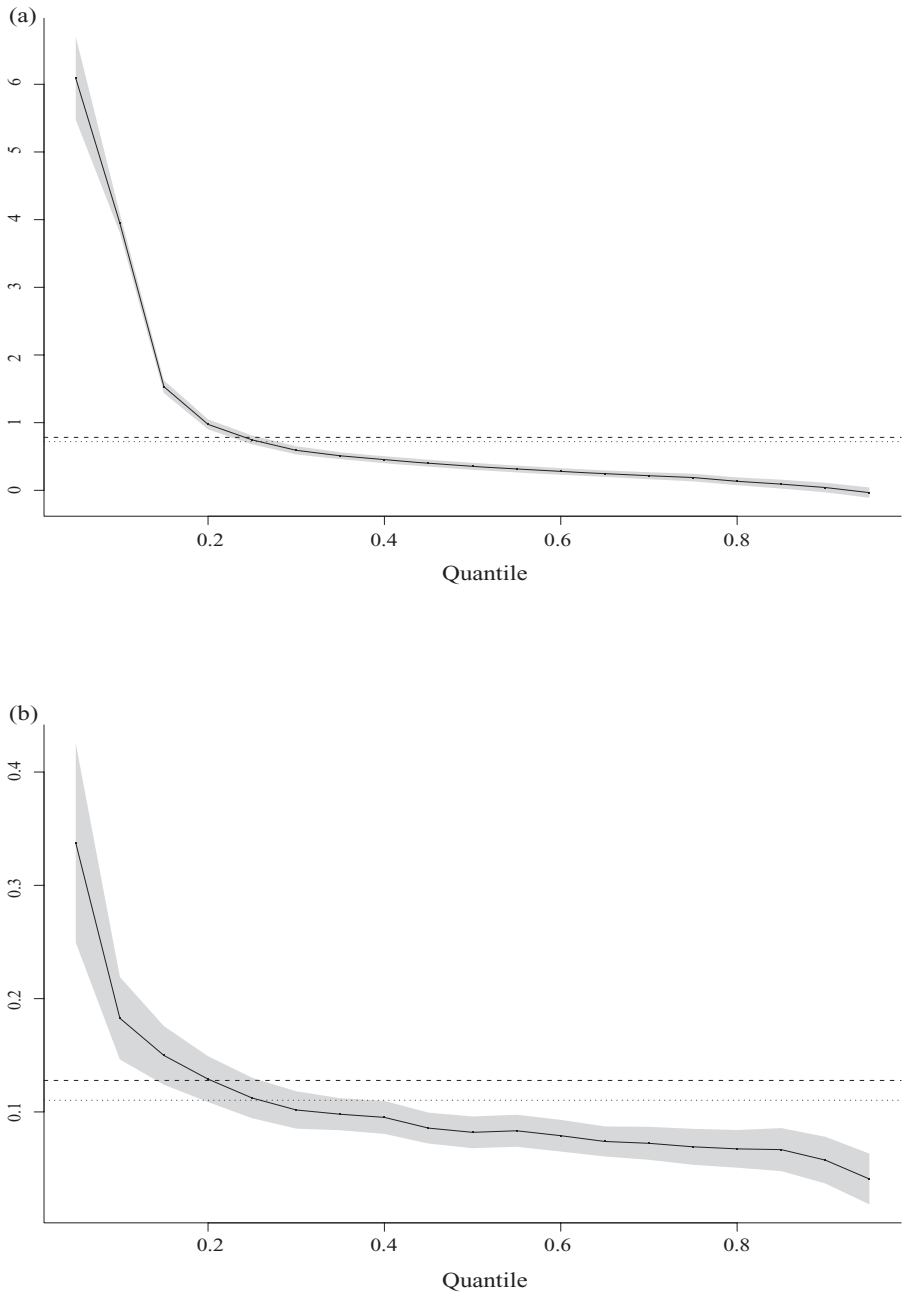

Figure 5. Marital status and dependents effects: (a) marital status effects and (b) dependent effects

the high income group is smaller than that of the low income class in absolute value. In contrast, Auten *et al.* (1992) conclude that high income earners are more sensitive to changes in the tax price of giving. Our study further shows that price elasticities will be different not only by income level, but by giving amount. This result is consistent with the notion, suggested by Clotfelter (1986), that there are systematic differences in price sensitivity between big givers and small givers at any income level. Moreover, if we use the conventional least squares regression technique, the estimated price elasticity is –1.22, which is similar to the estimates in most previous studies. However, if we only rely on the mean regression results for inference, we may conclude that taxpayers are sensitive to the change of price of giving; however, we will disregard the different responses of the taxpayers with different contribution amounts.

Our empirical result raises an interesting question: why do big givers become insensitive to the tax price of giving? As the existing published studies do not have concrete theoretical explanations for this finding, we attempt to provide some possible answers. First, as mentioned by Schervish (2000, 2005), due to hyperagency, identification and association, spiritual motives have greater influence on big givers' charity decisions than do material motives. Once spiritual motivations become more relevant, big givers care less about the cost and benefit of their donations, such as the price of giving, leading to smaller price elasticity. Second, Schokkaert (2006) argues that tax awareness is related to underlying motivations for giving, and lower tax awareness will mean that the estimated tax price elasticities are insignificant or smaller in absolute value. Thus, if their underlying motives lead big givers to have lower tax awareness, they would become less sensitive to the tax price. Third, Reinstein (2009) states that because small givers may not value charitable contribution inherently, their giving decisions could be mainly stimulated by temporary shocks and personal appeals. In contrast, larger givers could be more committed to charitable giving as they may have multi-charity 'warm-glow preferences'. If donors become more devoted to giving or even consider giving to be a habit, they are more likely than other donors to contribute without considering economic conditions or tax incentives. Fourth, Smith *et al.* (1995) argue that highly altruistic individuals migh always give something regardless of their economic circumstances. If we consider highly altruistic donors to be those who will contribute huge donations when they are able to do so, we then could expect that they become less sensitive to tax incentives.

The income elasticities are plotted in Figure 3. The graph shows that the income elasticities are all significantly positive, and vary across quantiles as the price elasticities do. Income elasticities increase along the quantiles, except for the 0.05 quantile (see Table A1 in the Appendix). For the upper (0.55 up) quantiles of the contributors, the income elasticities are greater than 0.5. In particular, for the taxpayers who contribute more than $US140 873 per year (see Table 2), their income elasticities are approximately 0.7. In contrast, for the lower (below 0.5) quantiles, the income elasticities are below 0.5. In other words, for the taxpayers contributing less than $US3530 a year (see Table 2), their income elasticities are less than 0.5. Moreover, for the 0.65 quantiles and above,

the confidence interval of the coefficient estimate is larger than that of the least squares estimate. In other words, the income elasticities of the upper quantiles of charitable contributions are significantly larger than the average income elasticity, whereas for the lower quantiles the income elasticities are significantly smaller than the average estimate. One can conclude that taxpayers who contribute different amounts of charity also have different responses to changes in income. Thus, we cannot rely only on the mean regression results for an inference.

The coefficient estimates of other explanatory variables are shown in Figures 4–5. All censored QR estimates of wealth indicate that wealth is positive and a significant determinant of charitable giving in every quantile, which is consistent with the result of O'Neil *et al.* (1996). However, the wealth effect of those taxpayers who make a small amount of charitable contributions is larger than the mean wealth effect estimated from the conventional mean regression. The estimated coefficients of age are all positive, as in previous studies (e.g. Barrett *et al.* (1997). The effect of marital status decreases along the quantiles, and, therefore, it also has different impacts on giving decisions. From Figure 5, we find that the married effect is significantly positive for all quantiles except the 0.9 and 0.95 quantiles. This shows that in most quantiles, married people will contribute more than single people. Finally, like most studies (e.g. Choe and Jeong, 1993; Wu, 2001), the effect of the number of dependents is significantly positive; however, the impact decreases along the quantiles of charitable giving. This shows that the effect of dependents on charitable contributions decreases as the amount of giving increases.

4.3. *Robustness check*

In this subsection, four robustness checks are considered. Clotfelter (1980) suggests excluding borderline taxpayers, whose status of having itemized deductions would have changed had they not contributed, to correct the selection bias associated with the status of deduction. For these borderline itemizers, charitable contributions will tend to be large to make taxpayers' itemized deductions greater than standard deductions. Therefore, we exclude the borderline taxpayers (4063 observations) from our data to investigate the behaviour of charitable contributions. Comparing Figure 6 with Figures 2–5, the results with or without borderline itemizers are very similar; all conclusions do not change. Thus, the empirical results in the paper are robust with respect to the issue of borderline itemizers.

Because the AMT taxpayers may be different from regular taxpayers, data without the AMT taxpayers are also considered. Figure 7 presents the estimation results for censored QR. Comparing Figure 7 with Figures 2–5, it is evident that the results from the data excluding AMT taxpayers are similar to those from the data including AMT taxpayers. All conclusions hold and the empirical results are robust regardless of whether AMT taxpayers are excluded. Moreover, Fack and Landais (2010) study the price elasticity of charitable giving in France using censored QR. Note that the estimates of Fack and Landais (2010)

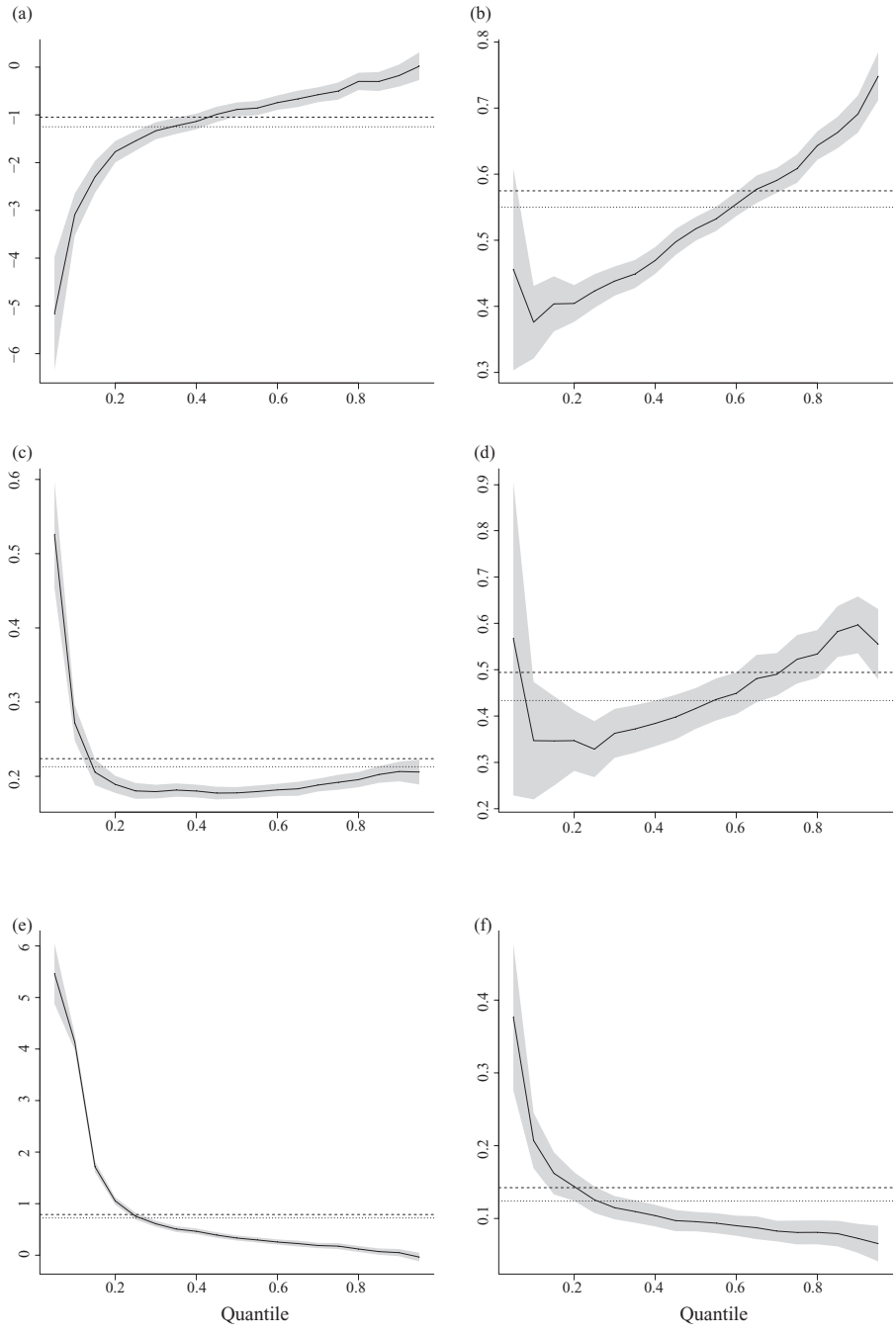

Figure 6. Estimation without borderline taxpayers: (a) price; (b) income, (c) wealth, (d) age, (e) married and (f) dependents

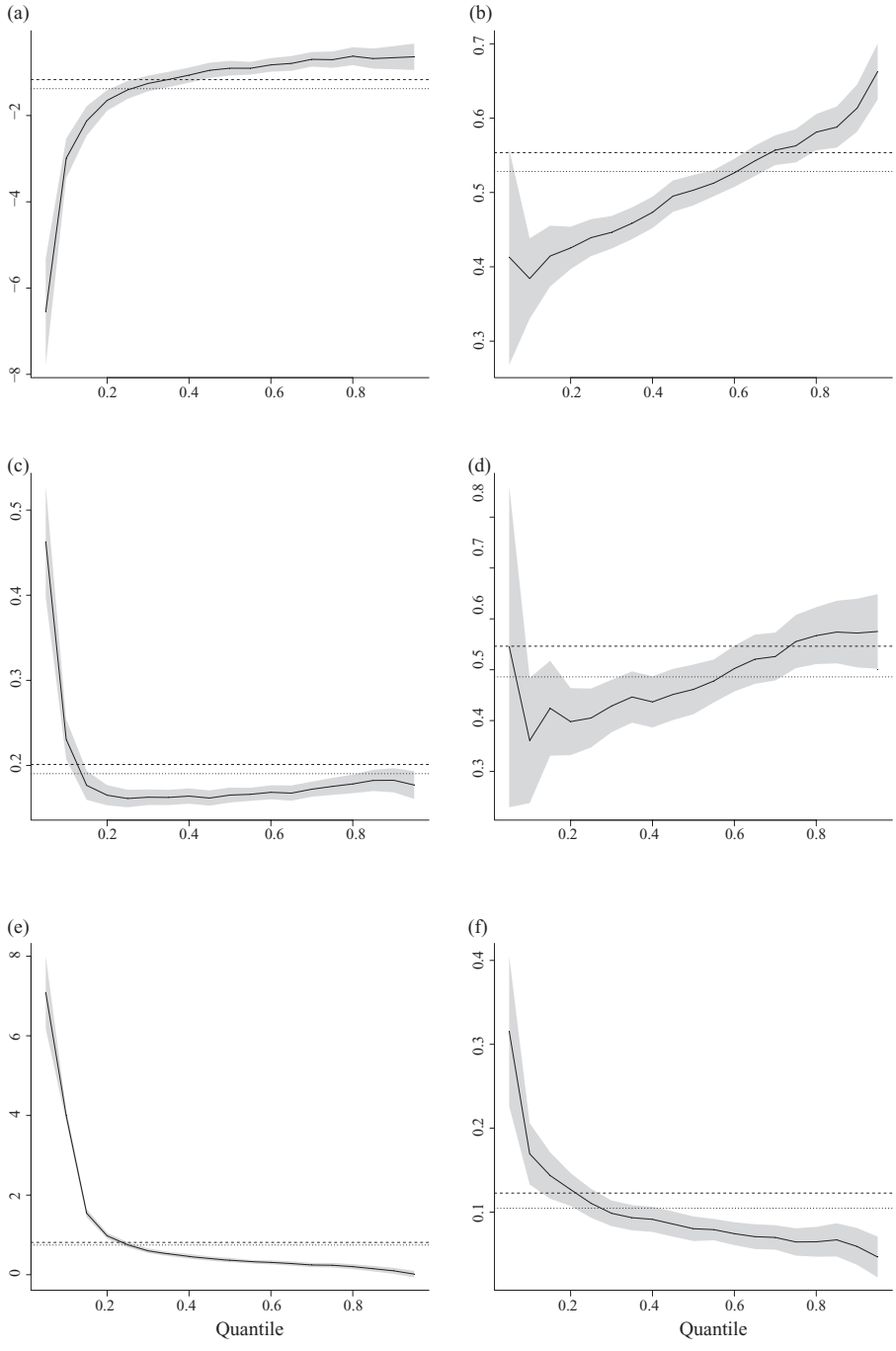

Figure 7. Estimation without alternative minimum tax taxpayers: (a) price; (b) income, (c) wealth, (d) age, (e) married and (f) dependents

are between –0.2 and –0.6, while our estimates for high quantiles also lie in the same interval (between –0.2 and –0.6). Thus, the conclusions of Fack and Landais (2010) are the same as those in our paper for high quantiles. Furthermore, from the left upper panel in Figure 7, it is interesting to see that for the data excluding AMT taxpayers, the coefficient estimates of price at quantiles 0.8, 0.85, 0.9 and 0.95 are –0.625, –0.68, –0.660 and –0.639, respectively. The estimates first decrease and then increase along the quantiles; which is similar to the results of Fack and Landais (2010, Fig. 2). There is no AMT in France; therefore, the estimates of price for data excluding AMT taxpayers in our paper are consistent with those in Fack and Landais (2010).

Many previous studies have found that high and low income people have different responses to the tax price of charitable contributions. Although high income people are not certain to be big givers, it is plausible that they are at least potential big givers. Because the amount of giving is highly correlated with income, different subsamples based on the income level of givers are selected. Estimates of the price effect are presented in Table 3.[18] It is evident that high income givers tend to be more price elastic than low income givers. For example, for givers with incomes greater than $US50 000, and income between $US20 000 and $US50 000, all estimates for censored QR are significantly negative. The estimates are all bigger than 2.5 in absolute value for high income givers, and are only between 0.6 and 1.4 for middle income givers in absolute value. Thus, from the point of view of income, our results are still consistent with existing studies, showing that high income people are more sensitive to changes in the tax price of giving (Auten *et al*., 1992).

In the present paper, the last dollar price is an endogenous variable and is replaced by the first dollar price in the censored QR. Another possible method to apply is the two-stage method. The first step of the two-stage method is to obtain the fitted value of the last dollar by regressing the last dollar price on the first dollar price. In the second step, the fitted value is used in the model with the censored QR estimation. Figure 8 plots the coefficient estimates on charitable giving. We find that the empirical outcomes are very similar to the original results. Clotfelter (1985) and O'Neil *et al*. (1996) also present conclude that there is little difference between the two estimation techniques. Thus, our quantile estimates are still very robust.

5. CONCLUSION

In previous studies, authors have tended to estimate the price effect of giving based only on the mean of the conditional distribution of charitable contributions. If there are a few individuals who donate a huge amount, the distribution of charitable giving then becomes asymmetric and extremely tailed. Thus, the conventional regression technique is not appropriate because it does not fully characterize the entire conditional distribution of giving. This paper

[18] In Table 3, we categorize the sample by income level, not giving amount. However, for each income class, we still use the censored QR method to estimate price elasticities.

Table 3. Price elasticities at different income levels

Dependent variable: Charitable contributions

		Quantile								
	Tobit	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Income < $US10 000	−0.14	0.41	−0.09	−0.13	0.01	−0.01	0.16	0.37	0.50***	0.58***
	(0.22)	(0.72)	(0.30)	(0.20)	(0.18)	(0.14)	(0.15)	(0.13)	(0.15)	(0.18)
$US10 000 < income	0.44	−0.20	0.20	0.49*	0.46**	0.57***	0.67***	0.40*	0.32	0.16
< $US20 000	(0.28)	(0.55)	(0.32)	(0.28)	(0.22)	(0.17)	(0.21)	(0.23)	(0.27)	(0.30)
$US20 000 < income	−1.10***	−1.38***	−1.22***	−0.87***	−1.02***	−0.85***	−0.73***	−0.61***	−0.72***	−0.83***
< $US50 000	(0.24)	(0.47)	(0.27)	(0.25)	(0.20)	(0.19)	(0.19)	(0.18)	(0.21)	(0.27)
$US50 000 < income	−3.56***	−2.52***	−3.79***	−4.53***	−4.76***	−4.70***	−4.49***	−4.43***	−4.04***	−3.08***
	(0.18)	(0.31)	(0.20)	(0.17)	(0.16)	(0.15)	(0.19)	(0.19)	(0.22)	(0.28)

***, ** and* indicate significance at the 1, 5 and 10% level, respectively. Standard errors are in parenthesis.

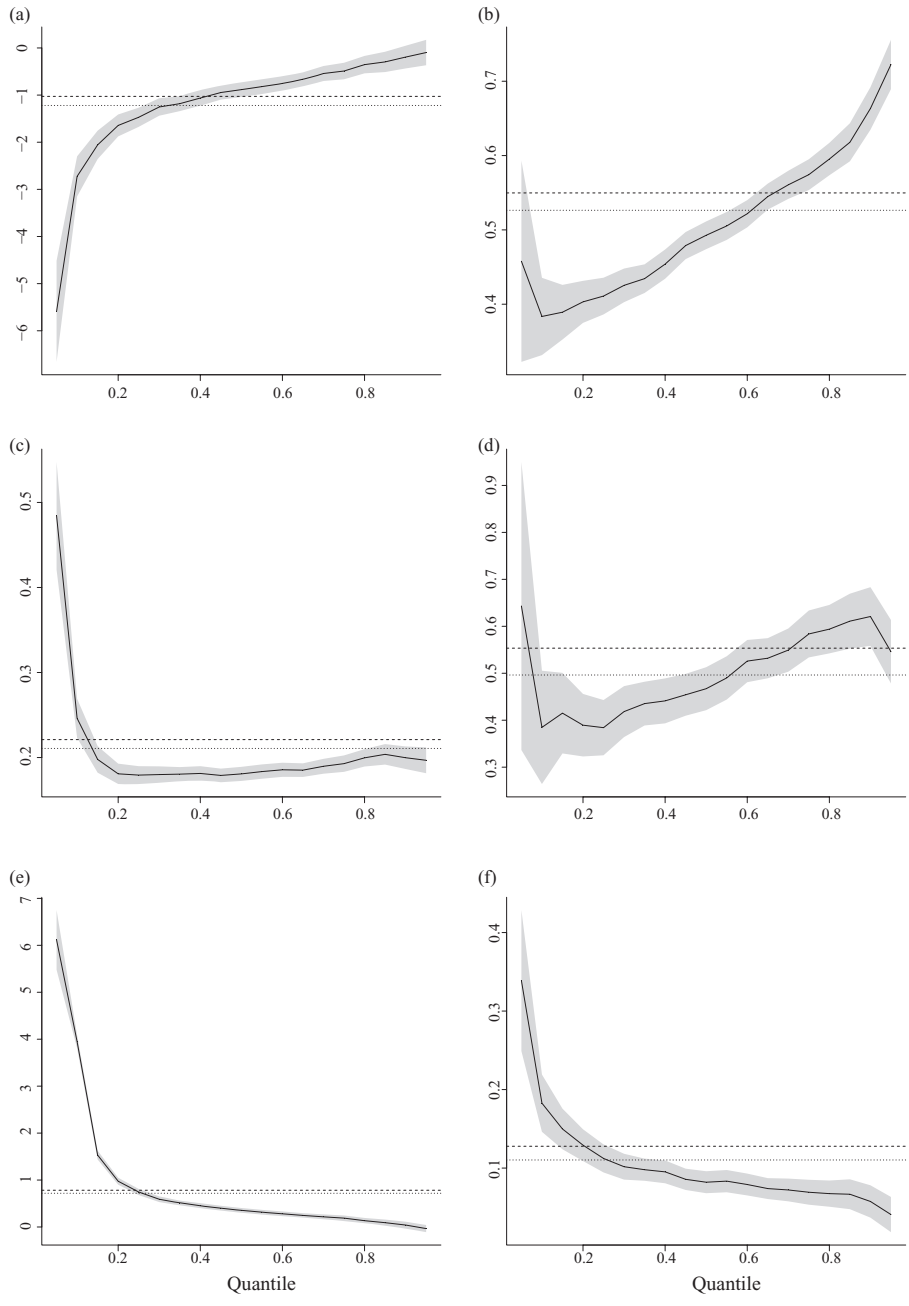

Figure 8. Two-stage estimation: (a) price; (b) income, (c) wealth, (d) age, (e) married and (f) dependents

adopts the censored QR, which provides a complete description of the entire distribution of giving, to investigate the relationship between tax price and charitable donations.

The results of this study provide some remarkable conclusions and policy implications. The price elasticities of giving are negative for all taxpayers but decline along the quantiles in absolute value. More importantly, the upper-quantile contributors are very price inelastic. Thus, with regard to the purpose of tax policy evaluation, the quantile estimates of the tax price effects will to provide a better assessment of tax expenditures. In the past, policy-makers only used one estimate of price elasticity measured by the mean value of the whole sample to estimate the tax expenditure associated with deductions for charity. However, we demonstrate that various types of donors will respond to tax incentives differently. Thus, our quantile estimates provide governments a more precise alternative to predict the amount of tax expenditure. Second, tax expenditure in the form of deductions are only justified when private expenditure is price elastic. If charitable giving is price inelastic, the induced private donations do not offset the loss of government revenues. Hence, our results further indicate that uniform policy for tax deductions to all types of donors is not justified, especially for big givers. Third, as stated by Cermak *et al.* (1994, p. 123), in many markets, segmentation based on benefits, needs or motivations has proven to be more powerful than demographic factors in understanding market dynamics. They thus argue that such segmentation would enable non-profit organizations to determine which subsegments of the donor population are the best fit for their organization, and target their marketing strategy toward that group. According to our results, small donors and big donors have different giving behaviour; hence, nonprofit organizations could follow more productive marketing strategies to target donors.

The present paper concludes that the empirical results from the censored QR provide comprehensive explanations and rich information on taxpayers' giving decisions and fully characterize the entire distribution of giving. However, some questions still need to be answered in the future. First, in this study, we have found that big givers are less responsive to the tax price of giving than small givers. We also provide some possible explanations for this finding, such as the role of spiritual motives, the lower tax awareness, the commitment to giving and the higher altruism. However, more research is necessary to identify how these factors work solely or simultaneously. Second, as suggested by Auten *et al.* (2002), using cross-sectional data, the permanent and transitory influence of price and income effects are not separated; hence, in future research, we intend to apply our censored QR technique using panel data.

REFERENCES

Andreoni, J. (2006) 'Philanthropy', in S. C. Kolm and Y. J. Mercier (eds), *Handbook of Giving, Reciprocity and Altruism*, Amsterdam: North Holland.

Auten, G., J. Cilke and W. Randolph (1992) 'The Effects of Tax Reform on Charitable Contributions', *National Tax Journal* 45, 267–90.

Auten, G. E., H. Sieg and C. T. Clofelter (2002) 'Charitable Giving, Income, and Taxes: An Analysis of Panel Data', *The American Economic Review* 92, 371–82.
Barrett, K. S. (1991) 'Panel Data Estimates of Charitable Giving: A Synthesis of Technique', *National Tax Journal* 94, 365–81.
Barrett, K. S., A. M. McGuirek and R. Steinberg (1997) 'Further Evidence on the Dynamic Impact of Taxes on Charitable Giving', *National Tax Journal* 100, 321–34.
Bekkers, R. and P. Wiepking (2007) 'Generosity and Philanthropy: A Literature Review', *SSRN Working paper*, Series No. 1015507.
Broman, A. J. (1989) 'Statutory Tax Rate Reform and Charitable Contributions: Evidence from a Recent Period of Reform', *Journal of the American Tax Association* 11, 7–20.
Cermak, D. S. P., K. M. File and R. A. Prince (1994) 'A Benefit Segmentation of the Major Donor Market', *Journal of Business Research* 29, 121–30.
Choe, Y. S. and J. Jeong (1993) 'Charitable Contributions by Low-And-Middle-Income Taxpayers: Further Evidence with a New Method', *National Tax Journal* 46, 33–9.
Clotfelter, C. T. (1980) 'Tax Incentives and Charitable Giving: Evidence from a Panel of Taxpayers', *Journal of Public Economics* 13, 319–40.
Clotfelter, C. T. (1985) *Federal Tax Policy and Charitable Giving*. Chicago: The University of Chicago Press.
Clotfelter, C. T. (1986) 'The Effect of Tax Simplification on Educational and Charitable Organizations', *Economic Consequences of Tax Simplification*, Boston: Federal Reserve Bank of Boston.187–215.
Fack, G. and C. Landais (2010) 'Are Tax Incentives for Charitable Giving Efficient? Evidence from France', *American Economic Journal: Economic Policy* 2, 117–41.
Feenberg, D. (1987) 'Are Tax Price Models Really Identified: The Case of Charitable Giving', *National Tax Journal* 40, 629–33.
Greenwood, D. T. (1993) 'Price and Income Elasticities of Charitable Giving: How Should Income Be Measured?', *Public Finance Quarterly* 21, 196–209.
Havens, J. J. and P. G. Schervish (1999) 'Millionaires and the Millenium: New Estimates of the Forthcoming Wealth Transfer and the Prospects for a Golden Age of Philanthropy', Boston: Social Welfare Research Institute Boston College.
Koenker, R. (2005) *Quantile Regression*. Cambridge: Cambridge University Press.
Koenker, R. and G. Bassett (1978) 'Regression Quantile', *Econometrica* 46, 33–50.
O'Neil, C. J., R. Steinberg and R. Thompson (1996) 'Reassessing the Tax-Favored Status of the Charitable Deduction for Gifts of Appreciated Assets', *National Tax Journal* 49, 215–33.
Peloza, J. and P. Steel (2005) 'The Price Elasticities of Charitable Contributions: A Meta-Analysis', *Journal of Public Policy & Marketing* 24, 260–72.
Powell, J. (1984) 'Least Absolute Deviations Estimation for the Censored Regression Model', *Journal of Econometrics* 25, 303–25.
Powell, J. (1986) 'Censored Regression Quantiles', *Journal of Econometrics* 32, 143–55.
Randolph, W. C. (1995) 'Dynamic Income, Progressive Taxes, and the Timing of Charitable Contributions', *The Journal of Political Economy* 103, 709–38.
Reinstein, D. (2009) 'Does One Contribution Come at the Expense of Another? Empirical Evidence on Substitution Between Charitable Donations', University of Essex, Department of Economics, *Economics Discussion Papers*, 618.
Schervish, P. G. (2000) 'The Spiritual Horizons of Philanthropy: New Directions for Money and Motives', *New Directions for Philanthropic Fundraising* 29, 17–31.
Schervish, P. G. (2005) 'Major Donors, Major Motives: The People and Purposes behind Major Gifts', *New Directions for Philanthropic Fundraising* 47, 59–87.
Schokkaert, E. (2006) 'The Empirical Analysis of Transfer Motives', *Handbook of the Economics of Giving, Altruism and Reciprocity*, Volume I, 127–81.
Smith, V. H., M. R. Kehoe and M. E. Cremer (1995) 'The Private Provision of Public Goods: Altruism and Voluntary Giving', *Journal of Public Economics* 58, 107–26.
Steinberg, R. (1990) 'Taxes and Giving: New Findings', *Voluntas* 1, 61–79.
Tiehen, L. (2001) 'Tax Policy and Charitable Contributions of Money', *National Tax Journal* 54, 707–23.
Wu, S.-Y. (2001) 'The Role of the Alternative Minimum Tax in Improving the Estimation of Tax Effects', Seminar paper, Institute of Economics, Academia Sinica, October, Taipei.

APPENDIX

Table A1. Estimated coefficients of censored quantile regressions

τ	Price	Income	Wealth	Age	Married	Dependents	Constant
Mean	–1.22***	0.53***	0.21***	0.50***	0.72***	0.11***	–2.03***
	(0.10)	(0.01)	(0.01)	(0.03)	(0.03)	(0.01)	(0.10)
0.05	–5.57***	0.45***	0.49***	0.63***	6.09***	0.34***	–15.67***
	(0.53)	(0.07)	(0.03)	(0.15)	(0.31)	(0.04)	(0.73)
0.1	–2.72***	0.38***	0.25***	0.39***	3.95***	0.18***	–6.61***
	(0.22)	(0.03)	(0.01)	(0.06)	(0.07)	(0.02)	(0.23)
0.15	–2.05***	0.39***	0.20***	0.42***	1.53***	0.15***	–2.80***
	(0.15)	(0.02)	(0.01)	(0.04)	(0.05)	(0.01)	(0.16)
0.2	–1.64***	0.40***	0.18***	0.39***	0.97***	0.13***	–1.66***
	(0.12)	(0.01)	(0.01)	(0.03)	(0.04)	(0.01)	(0.12)
0.25	–1.47***	0.41***	0.18***	0.38***	0.75***	0.11***	–1.12***
	(0.10)	(0.01)	(0.01)	(0.03)	(0.03)	(0.01)	(0.11)
0.3	–1.25***	0.43***	0.18***	0.42***	0.59***	0.10***	–0.81***
	(0.09)	(0.01)	(0.01)	(0.03)	(0.03)	(0.01)	(0.10)
0.35	–1.18***	0.43***	0.18***	0.44***	0.51***	0.10***	–0.60***
	(0.08)	(0.01)	(0.00)	(0.02)	(0.03)	(0.01)	(0.08)
0.4	–1.06***	0.45***	0.18***	0.44***	0.45***	0.10***	–0.54***
	(0.08)	(0.01)	(0.00)	(0.02)	(0.03)	(0.01)	(0.08)
0.45	–0.94***	0.48***	0.18***	0.45***	0.40***	0.09***	–0.52***
	(0.08)	(0.01)	(0.00)	(0.02)	(0.03)	(0.01)	(0.08)
0.5	–0.88***	0.49***	0.18***	0.47***	0.35***	0.08***	–0.45***
	(0.08)	(0.01)	(0.00)	(0.02)	(0.03)	(0.01)	(0.08)
0.55	–0.82***	0.51***	0.18***	0.49***	0.31***	0.08***	–0.40***
	(0.08)	(0.01)	(0.00)	(0.02)	(0.03)	(0.01)	(0.08)
0.6	–0.75***	0.52***	0.19***	0.53***	0.28***	0.08***	–0.37***
	(0.08)	(0.01)	(0.00)	(0.02)	(0.03)	(0.01)	(0.08)
0.65	–0.66***	0.54***	0.19***	0.53***	0.25***	0.07***	–0.39***
	(0.07)	(0.01)	(0.00)	(0.02)	(0.02)	(0.01)	(0.07)
0.7	–0.54***	0.56***	0.19***	0.55***	0.22***	0.07***	–0.35***
	(0.08)	(0.01)	(0.00)	(0.02)	(0.03)	(0.01)	(0.08)
0.75	–0.49***	0.57***	0.19***	0.58***	0.19***	0.07***	–0.29***
	(0.09)	(0.01)	(0.00)	(0.03)	(0.03)	(0.01)	(0.09)
0.8	–0.35***	0.60***	0.20***	0.59***	0.13***	0.07***	–0.26***
	(0.09)	(0.01)	(0.01)	(0.03)	(0.03)	(0.01)	(0.09)
0.85	–0.30***	0.62***	0.20***	0.61***	0.09***	0.07***	–0.22**
	(0.11)	(0.13)	(0.01)	(0.03)	(0.03)	(0.01)	(0.11)
0.9	–0.19	0.66***	0.20***	0.62***	0.04	0.06***	–0.26**
	(0.12)	(0.01)	(0.01)	(0.03)	(0.04)	(0.01)	(0.12)
0.95	–0.10	0.72***	0.20***	0.55***	–0.03	0.04***	–0.30**
	(0.14)	(0.02)	(0.01)	(0.03)	(0.04)	(0.01)	(0.14)

***, ** and* indicate significance at 1, 5 and 10% level. There are 54 484 taxpayers in the sample. Standard errors are in parenthesis.