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Charitable giving and its persistent and transitory reactions to changes in tax incentives: evidence from the German taxpayer panel*

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Abstract

We estimate the elasticity of charitable giving with respect to price and income changes using a rich panel of income tax returns covering the period 2001 to 2006. Employing censored quantile regression and exploiting the panel structure, the advantage of our analysis is twofold: First, we derive results for different points in the underlying distribution of charitable giving and allow for giving to be heterogeneous. Thus, we do not only estimate responses of giving to prices and incomes but also where the incentives matter most. Second, we disentangle long-run responses to persistent changes in price and income from temporary reactions, consumption smoothing, or tax planning. Indeed, our results suggest that price elasticity is heterogenous across the distribution of donors and that the persistent price elasticity is close to one in absolute value at the upper and lower tail of the distribution of charitable giving.

Keywords: Charitable giving, price and income elasticity, censored quantile regression, taxpayer panel, administrative data

JEL-Classification: C31, H31, H53

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1 Introduction

A common feature of income tax codes is the favorable tax treatment of charitable giving. Whether these tax incentives are suitable to boost charitable giving and whether tax incentives are an efficient policy instrument is an ongoing debate (Peloza and Steel 2005).[1] On that account, the last decades have seen a lively interest in the theoretical, empirical and experimental analysis on the motives of charitable giving and responses of donors to the key issues of tax incentives. The scale to which tax incentives are suitable to raise donations depends if they are price elastic, and if so, to what extent. One straight forward reason to investigate price and income elasticities is to establish, whether tax reliefs are effective to stimulate giving to the extant that they offset forgone tax revenues, which could otherwise have been used to provide public goods directly (Feldstein and Clotfelter 1975, Feldstein 1980). However, this fiscal rule might be relaxed when taking an overall welfarist point of view and for example allowing the donor to derive utility from the act of giving per se (Andreoni 1990).[2]

Following Taussig's (1967) seminal study analyzing US tax return data, numerous approaches were conducted. A review of 69 empirical studies covering five decades conducted by Peloza and Steel (2005) leads to ambiguous findings, mainly due to a number of technical reasons. For example, a large share of taxpayers might not donate at all, thus the problem of censoring demands models like the Tobit. However, that comes at the price that potential individual fixed effects cannot be eliminated by first differences. Moreover, recent results suggest that donors behave very heterogenous along the distribution of donations and models like Tobit can only capture the conditional mean, but not to present the whole distribution of reactions. Furthermore, results from Tobit models might be only driven from a fraction of the population and could be only representative on average.[3] Peloza and Steel (2005) also highlight how results are driven from heterogenous data sources, statistical methods and different time periods. In addition, recent results are mainly obtained from panel data.[4]

In sum, most studies reviewed by Peloza and Steel (2005) support the hypothesis that tax deductions for charitable giving are treasury efficient. However, more recent studies have provided a different picture. Based on either panel data or alternative estimation methods,

[1] Donations to charity also offer a chance to investigate tax noncompliance (see Feldman and Slemrod (2007).

[2] There is a large literature estimating utility from giving, see for instance Crumpler and Grossman (2008) for an experimental investigation.

[3] Linear models like Tobit might also deliver inconsistent results in case of a non-linear process and results could be driven from outliers.

[4] See, for instance, Clotfelder (1980), Barrett (1991), Auten et al. (2002) for results for the US from analyses with panel data.

they find that previous studies might have overestimated the price elasticity (Bakija and Heim 2011) or even that giving behavior qualifies as price inelastic (Fack and Landais 2010).[5]
In the current study we use panel data recently available for Germany to complement the aforementioned research and previous studies investigating the German case. For Germany, several studies establish the giving behavior to be price and income elastic. Using aggregated cross-sectional income tax data, Paqué (1986) finds average giving behavior to be price and income elastic. These result are also supported by more recent findings of Auer and Kalusche (2010). Based on micro level cross-sectional income tax data they establish price and income elastic behavior for high and low income classes. They face the censoring issue by deploying Tobit and thus estimated elasticities are again population averages. Taking into account the possibility of heterogonous giving behavior, Bönke et al. (2013) derive estimates from a censored quantile regression approach which confirms price and income elastic behavior in parts of the distribution of donors. Adena (2014), in the spirit of Bakija and Heim (2011) and also making use of the recent available tax panel data, estimates a panel fixed effect OLS model for four different income groups. Her results suggest no income elastic behavior but very different price elasticities across income groups.
Exploiting the panel structure of our data, we estimate price and income elasticities while disentangling persistent and transitory effects of giving behavior. In addition, we follow Fack and Landais (2010) and Bönke et. al (2013) in applying the non-parametric estimation technique of quantile regression to derive estimates at different points of the conditional distribution of charitable giving. In short, our approach is not restricted to answer whether current tax incentives are suitable to foster charitable giving but also aims at determining for whom tax incentives matter most. The current study can thus complement former research in three ways. First, the estimation technique helps us to connect the amount given to income and price elasticities, rather than obtaining an estimate for the population average. This matters if giving behavior is indeed heterogenous as suggested by Bönke et al.(2013) and only the tails of the conditional distribution are price elastic. This has direct implications for the optimal design of tax incentives: the tax induced price of giving should hinge upon the amount given rather than the tax rate. Moreover, results confirm that the income elasticity of donations is declining with increasing donations which supports the general assumption that donations to charity are a normal good. Second, our data highly over-samples top incomes and presents results including the highest incomes.[6] Keeping in mind that there is a large literature suggesting severe differences in various aspects between top incomes and the

[5]Fack and Landais (2010) find price elasticities for French taxpayers to range between -0.2 and -0.6. Thus they are inelastic to price incentives and heterogenous.

[6]Bönke et. al (2013) do not include gross incomes above 153,000 Euro.

remaining income distribution, this is a valuable asset. For example, Bach et. al (2013) show income sources and effective taxation are distinct for top income earners in Germany. Hence, this might also suggest distinct behavioral responses to tax incentives (e.g. tax planning) and especially for donations to charity for this income group.
Third, for the first time we use panel data to differentiate between persistent and transitory changes in income and prices in this kind of econometric setting. The remainder of the chapter is organized as follows: Section 3.2 discusses briefly the conceptual framework regarding the efficiency of tax incentives. Section 3.3 describes the data and its preparation. Section 3.4 presents the main results of our econometric exercise and section 4.5 concludes by reviewing key findings.

2 Efficiency of Tax Incentives

The optimal theoretical design of tax incentives has been discussed in the literature extensively.[7] Depending on the modeling of philanthropy, a range of efficient setups to encourage charitable giving can be derived. The modeling may for instance allow for crowding out, impure altruism or warm glow of giving. Therefore, we will briefly review some theoretically founded results to define treasury-efficient policies relevant for our study. In the standard approach, individuals donate voluntarily some amount to the public good. In absence of government activity (no public contributions to the public good and no tax incentives regarding donations), the total of private donations amount to the level of the publicly provided good and, following Samuelson's famous rule (Samuelson 1954), this level will be inefficiently low. If government activities try to raise the privately provided charity to an efficient level, it faces the challenge of crowding out. Either crowding out will be next to complete or the individuals gain utility not only from the public good but from the act of giving per se (Andreoni 1990). Unfortunately, in contrast to Bönke et al. (2013), the case of crowding out can due to data limitations not be considered.[8]
Besides providing for the public good directly, the government can introduce tax incentives to boost voluntary contribution by lowering the price of giving. Hence, whether tax incentives work as desired hinges on the price elasticity of giving. Not taking the possibility of crowding out into account, this leads to Feldstein's rule of treasury efficiency (Feldstein 1975): Tax incentives are classified as effective in terms of "treasury efficient" if the tax-defined price elasticity is greater than one (in absolute value) and therefore more than offsets each dollar

[7] See for instance Feldstein and Clotfelter (1975), Feldstein (1980), Andreoni (1990) and Seaz (2004).
[8] Information on the federal state of residency which is needed to control for crowding out is due to confidential restrictions not available for taxpayers with an average total income above 165,000 Euro.

of forgone tax revenue. Accordingly, a price elasticity below minus one rules the tax incentives as treasury efficient.[9]

$$\frac{\partial[\text{donation}]}{\partial[\text{price of giving}]}\frac{\text{price of giving}}{\text{donation}} < -1 \tag{1}$$

To derive meaningful tax policy recommendation from an empirical exercise, some important assumptions regarding the underlying utility function are needed (Saez 2004). First, utility depends on net-of-tax gross income at the individual level and income effects arise only from net-of-tax gross income. Second, the level of the contributions to charity and the tax price of giving do not affect gross income before taxes. Third, changes of the tax rate affect income elastic responses of contributions only to the extent the net-of-tax gross income is affected. Under these assumption, in the presence of price elastic behavior and in the absence of crowding out, the rule for assessing the effectiveness of tax incentives follows the rule by Feldstein (e.g., Feldstein 1975 and Saez 2004). It is essential for the empirical assessment to identify if reactions to prices are persistent or transitory. Only persistent price elasticities can be used to indicate the efficiency of the tax treatment. While transitory adjustments are caused by the re-timing of giving due to non-permanent price or income shocks, efficiency hinges on the permanent responses to incentives. In the case of a diverging permanent and transitory price elasticity the optimal rule asks for the permanent price elasticity to be greater than one (in absolute value).

3 Data and Institutional Setting

All information generated in the process of taxation is documented in the taxpayer's income tax return. All relevant information on the family situation, the declaration of income from different sources, granted deductions (including donations) and exemptions, calculation of taxable income and personal income tax payment are included. We can observe several socio-economic characteristics of taxpayers such as age, number of children, church membership and marital status. Unfortunately, liable information about the gender of the taxpayer is not provided. Albeit recorded, validating the information for single and married tax units reveals the accuracy to be insufficient. The German Federal Statistical Office assembles the income tax returns electronically as *Income Tax Statistics*, providing the basis for the *German Taxpayer Panel* (TPP). The Income Tax Statistic is collected every year and in order to form the TPP, consecutive years are linked by exploiting the individual taxpayer's ID and a balanced panel is compiled. The panel contains individual income tax returns of 19 million observations, covering years 2001 to 2006. However, in very few cases this procedure

[9] In the case of crowding out or warm glow of giving this efficiency rule is relaxed (e.g. Saez, 2004).

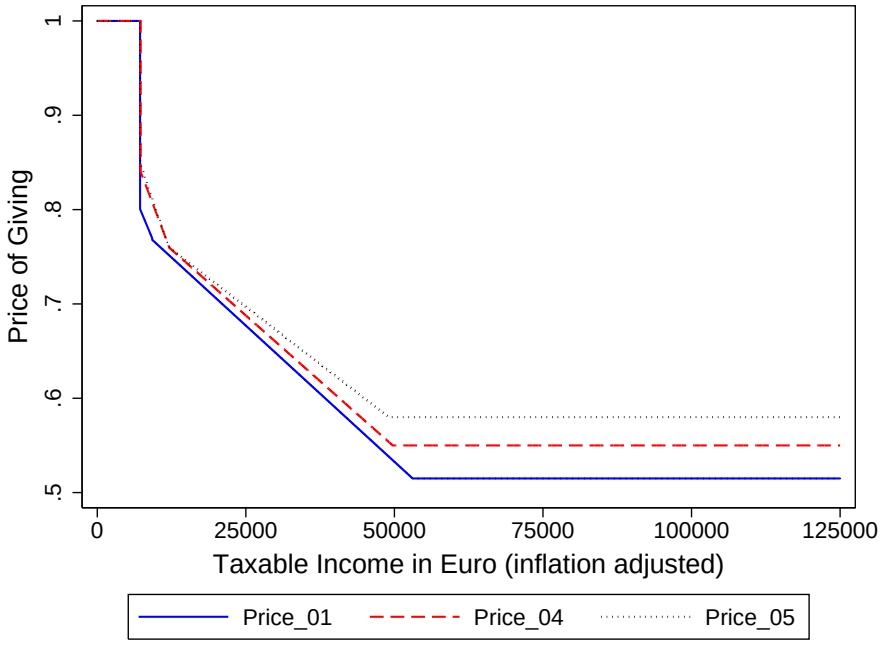
does not yield a perfect match. In the event of marriage, divorce or moving to another federal state, individual taxpayer's ID will be reissued or changed. On basis of four stratification criteria, i.e. federal state, assessment type, main type of income and total income, a 5% sample is drawn and made available for scientific purposes. The stratification procedure aims at optimizing the sample with regard to standard errors of total income over time and according observation weights are generated.

In Germany, two basic rules for donations are in place. The first rule applies to contribution that are regarded to be beneficial to the common good (e.g. donation to charity organisations, to churches, science or culture). In this case, donations are deductable from the tax base up to a certain limit.[10] Thus, the implicit price of giving one Euro equals one minus the marginal tax rate (see Figure 1). The second rule concerns donations to political parties. Here, for every donated Euro the donor gets a tax cut of fifty cents (and the price of giving is the same for all donors). For several reasons we are only concerned with the first rule and the resulting tax-defined prices of giving for 2001, 2004 and 2005 are presented in Figure 1.[11] The price of giving varies over time and across taxable income. For taxable incomes below the basic allowance the price is one, than it gradually decreases to almost 0.5 in 2001 for taxpayers in the highest income bracket. As the tax price of giving mirrors the tax tariff, the tax reforms of 2004 and 2005 increased the tax defined price of giving substantially and especially in the top income bracket from 0.515 in 2003 to 0.58 in 2005.

[10] In 2004, the maximal amount of charitable contributions eligible for deduction are 5% of total income (Gesamtbetrag der Einkünfte).

[11] Contribution to political parties have to be evaluated differently. For example, political parties are not considered per se a charity and most donation are from party members and the motive for party membership can hardly be considered charitable.

Figure 1: Tax-defined price of giving for a single taxpayer



Furthermore, the German tax code provides a blanket allowance for personal expenses and the tax price of giving is only lower one if itemized deductions exceed the blanket allowance.[12] Taxpayers that do not exceed their blanket allowance, thus do not itemize but donate have a tax price of giving of one. Consequently, those donations are not audited by tax authorities and the data on those donation are not reliable. The overall impact of this group can be considered negligible regarding the fiscal relevance, hence we exclude these observations. Further, we assume that they are not different from taxpayers that remain in the sample and our results do not suffer from selection bias.

Another sub-population of taxpayers, the borderline itemizers, are taxpayers that only exceed their blanket allowance because of their donations to charity. However, only the donations that exceed the blanket allowance are deductable from taxable income and only those have a tax price below one. We follow the literature by excluding those taxpayers which is standard and not harmful to our results since they are only a relatively small group of 0.18%.

Donations to charity can increase the marginal price of giving which induces a potential endogeneity of the price of giving for a progressive tax schedule.[13] The more an individual gives,

[12]The blanket allowance is relative small with 36 Euro for a single taxpayer and 72 Euro for a married taxpayer.

[13]See Triest (1998) about a discussion of possible ways for taxpayers to influence their marginal tax rate

the potentially lower is the marginal tax rate and higher the tax price. One way to avoid the potential endogeneity is taking the price of the first donated Euro (Peloza and Steel 2005). Another strategy is to calculate the (endogenous) average price and instrument it with the price of the first Euro donated. Both strategy are employed here and we find the results to be robust to both approaches. This does not come as a surprise as calculated prices do not differ very much and especially for tax payers in the top income bracket both strategies yield to the same tax price of giving. Following the literature we report only results based on the tax price for the first Euro donated. The core sample for the analysis consists of observation from four assessment years, 2002 to 2005. Thereby we obtain for every year one lag and one future year.[14] Each year consists of 928,993 taxpayers resulting in a balanced panel of 3,715,972 observations. Summing up, we exclude the following taxpayers to obtain a sample with reliable information: First, taxpayers with exceptional capital gains and taxpayers with incomes that are not fully taxed in Germany (2.45% or 91,244 observations). Further, taxpayers that have negative taxable income in one year (18.8% or 697,544 observations), boarderline itemizers (0.18% or 6,760 observations) and non-itemizing taxpayers (19.67% or 730,541 observations). All in all, pooling our balanced panel we obtain an unweighted sample containing 2,189,883 taxpayers for the period 2002 to 2005.[15]

Table 1 presents some sample descriptive statistics. The left panel shows mean and standard deviations including weighting factors for the weighted sample of 44 million taxpayers and the right panel shows unweighted descriptive results for the estimation sample only. 67.7% of taxpayers in the estimation sample donate to charity, which corresponds to 55% of weighted observations. 67% of taxpayers are married and the average marginal tax rate of donors equals the average marginal tax rate of taxpayers that do not donate with 0.30. The log price is on average -0.48, while log income is on average 11.

through economic activities.

[14]The sample encompasses assessment years 2001 to 2006.

[15]Note that the term *taxpayer* denotes both married and single tax units. In case of a married taxpayer, this refers to two persons.

Table 1: Sample Descriptives

	Weighted		Unweighted	
	Mean	(Std. Dev.)	Mean	(Std. Dev.)
Share of Donors	0.55	(0.497)	0.677	(0.467)
Share of Married	0.68	(0.466)	0.674	(0.469)
Share of Church Members	0.74	(0.439)	0.724	(0.447)
Share of Taxpayers with Children	0.80	(0.400)	0.795	(0.404)
Marginal tax rate	0.30	(0.106)		
Marginal tax rate of donors	0.30	(0.110)		
Donation	205.77	(1306)		
Income	48003	(172799)		
p_{it}	-0.48	(0.20)		
y_{it}	11.16	(0.98)		
Δp_{it}	0.01	(0.10)		
Δy_{it}	0.05	(0.37)		
Δp_{it+1}	0.02	(0.08)		
Δy_{it+1}	0.05	(0.29)		
Number of Observations	43,702,689		2,189,883	

Note: Descriptive Results are produced from the sample including weighting factors. p_{it} denotes the logarithm of the tax price of giving, y_{it} is the logarithm of the net-of-tax gross income, Δ denotes the growth rate.

Source: Own computation based on TPP 2001-2006.

4 Empirical estimation

The standard model of donations to charity, G_{it} in time period t for taxpayer i, models giving depending on the adjusted net-of-tax gross income $Y_{it} - T(X_{it})$,[16] the price of giving P_{it} and socio-demographics contained in z_{it}.[17]

$$G_{it} = G\left(Y_{it} - T(X_{it}), P_{it}, z_{it}\right) \tag{2}$$

Note that this equation models donations to charity as a consumption good including income effects arising from the adjusted net-of-tax gross income (henceforth referred to as net income) and price effects from the tax price of giving. However, to identify both, the net income cannot be perfectly correlated with prices but needs sufficient variation. We ensure that variation by constructing an adjusted income by re-including individual tax reliefs, allowances and specific depreciations, tax free earnings and tax motivated losses. This approach is similar to Bach et. al (2009), Bönke et. al (2013) and Bönke et. al (2007). Further information

[16] Y_{it} depicts adjusted gross income, X_{it} taxable income and $T(\cdot)$ is tax liability.

[17] See Table 2 for an overview of the dependent, the control and the socio-demographic variables.

on the construction of the adjusted income is provided in Table A.3.
The correlation coefficient between the tax price of giving and the net income confirms medium sized correlation with a correlation coefficient of -0.596. Thus we assume, that we can interpret estimated coefficients of price and income as partial effects.
In case of income- or price shocks triggering exceptional or one-time donations, estimating equation (2) might not deliver consistent elasticities. To disentangle those transitory responses from persistent effects, panel data offers the inclusion of the income and price growth rates from years surrounding the donation. Empirically, this extents equation (2) in the following way:

$$G_{it} = G\left(Y_{it} - T(X_{it}), \Delta(Y_{it} - T(X_{it})), \Delta(Y_{it+1} - T(X_{it+1})), P_{it}, \Delta P_{it}, \Delta P_{it+1}, z_{it}\right) \tag{3}$$

In order to control for transitory effects, we start with a strictly non-dynamic model that only uses cross-sectional data following equation (2) in a log-log design, allowing to interpret coefficients directly as elasticities:

$$g_{it} = \alpha + \beta_1 p_{it} + \gamma_1 y_{it} + \theta' z_{it} + \epsilon_{it}. \tag{4}$$

with $ln(G_{it}) = g_{it}$ as the log of giving for taxpayer i at time t, p_{it} is the log of the price of the first donated Euro and y_{it} is the log of the net income net taxes, ϵ_{it} represents some white noise error. β_1, γ_1 and θ' are price, income elasticity and coefficient vector of socio-demographic control variables of giving. This model is similar to Bönke et. al (2013) and allows the comparison to their results.
Subsequently, we compute a quasi-dynamic specification that controls for the growth rate of prices and incomes surrounding the donation. This enables us to compute next to the permanent elasticities also transitory elasticities:

$$g_{it} = \alpha + \beta_1 p_{it} + \beta_2 \Delta p_{it} + \beta_3 \Delta p_{it+1} + \gamma_1 y_{it} + \gamma_2 \Delta y_{it} + \gamma_3 \Delta y_{it+1} + \theta' z_{it} + \epsilon_{it} \tag{5}$$

where Δ denominates the first difference such as $\Delta p_{it} = p_{it} - p_{it-1}$ and $\Delta p_{it+1} = p_{it+1} - p_{it}$. As suggested by Bakjia and Heim (2011) this specification allows to differentiate between the persistent price (income) elasticity β_1 (γ_1) and the transitory price (income) elasticity which takes the form: $\beta_1 + \beta_2 - \beta_3$ ($\gamma_1 + \gamma_2 - \gamma_3$).[18]
The transitory price or income elasticity implies, how the donor would react to a temporary

[18]Bakjia and Heim compute more dynamic effects by adding another lagged difference for price and income elasticities. Due to data limitations of the TPP our panel is too short to include extensive controls like Bakjia and Heim (2011) in the estimation model.

change of tax prices or income between periods $t-1$ and t and a subsequential return in $t+1$ to the level of $t-1$. Note, that equation (5) demands assumptions regarding the future income and price growth rates. In our preferred quasi-dynamic estimation approach we imply perfect foresight, hence we assume the donor has complete knowledge of income and prices that are actually realized in $t+1$. As a test of robustness, in a second scenario we relax the assumption of perfect foresight and predict future incomes and prices with the information available in t. Results for the model of imperfect foresight are presented in Table A.1 in the appendix of this chapter.

Donations to charity are very heterogenous for given prices and income levels, promoting to allow for a more heterogenous estimation technique that is not based on strong assumptions about homogeneity. Therefore, following Feldstein and Lindsey (1981), Fack and Landaise (2010) and Bönke et al. (2013) we allow price and income elasticities to depend on the amount given to charity. Additionally, we observe heavy left censored observations with a high fraction of taxpayers who do not donate. However, according to Randolph (1995), the exclusion of the censored taxpayers would raise the issue of endogenous selection. Thus, following Boskin and Feldstein (1977) we assign a fictitious gift to all taxpayers by adding 1 Euro to the donations of each taxpayer. Boskin and Feldstein (1977) also discuss the sensitivity of the adjustments to charitable giving in the econometric context, promoting the use of 1 unit as adjustment entity. Since estimated price and income elasticities refer to marginal changes, this data modification poses only a minor influence. Given only the censoring problem, one could easily implement a standard estimation technique such as the prominent Tobit model. However, for suitable policy analysis the Tobit demands some form of homogeneity within the error terms which could be violated given our heterogenous observations or a non-linear data process. Moreover, we are interested in the shape of the distribution of giving, conditional on price and income. Chernozhukov and Hong (2002) propose a well behaved three step estimation procedure deploying quantile regressions which are able to derive efficient estimates.[19]

Quantile regressions were first introduced by Koenker and Bassett (1978) and are a non-parametric estimation technique. They allow for covariates to shift location, scale and shape according to the dependent variables distribution. It has the advantage that the error term only needs to obey the relative weak assumption of white noise with $E[\epsilon] = 0$.[20] Given that the conditional quantile regressions can vary for different quantiles of the dependent variable,

[19] Efficient estimates are derived after performing two selection steps. Find a detailed description of the procedure and an empirical application in their paper.

[20] In contrast to linear regression models, this approach does not require assumptions about the errors distribution, variance and correlation of observations.

it allows for heterogenous behavior and is robust to censoring.
According to Koenker and Hallock (2001), with respect to β_q the sample regression quantiles for the q^{th} quantile can be expressed as the solution the minimum of the (as-) symmetric sum of:[21]

$$Q(\beta_q) = \sum_{t=1}^{T} \sum_{i:g_{it} \geq X'_{it}\beta}^{N} q|g_{it} - X'_{it}\beta_q| + \sum_{t=1}^{T} \sum_{i:g_{it} \leq X'_{it}\beta}^{N} (1-q)|g_{it} - X'_{it}\beta_q| \tag{6}$$

Where the set of explanatory variables including p_{it}, y_{it} and z_{it} are captured in matrix X_{it}. Accordingly, the β_q-vector comprises of coefficients described in equation (4) or (5) depending on the chosen estimation equation including price and income elasticities.

Controlling for time effects, we use year dummies, additionally, we include socio-demographic control variables such as age, age squared and dummy variables for children, church membership, employment status and marriage.[22] Table 2 introduces the dependent and the explanatory variables.

5 Results

5.1 Cross-sectional Estimation

Due to data limitations, the majority of the literature is restricted to use control variables from contemporary data. Usually, these studies rely on pooled cross sections (e.g. Bönke et al. 2013). To assess, whether this non-dynamic approach yields reliable estimates of price and income elasticities and to test our data, we treat the panel years as repeated cross sections

[21] A prominent case is the median regressor for $q = 0.5$, where the quantile regression estimator minimizes the sum of absolute values of error.

[22] Since we use tax return data, we are limited to information relevant to a tax report. Hence, data irrelevant for tax assessment such as gender or education of the taxpayer are either not included in the data or may not be reliable.

Table 2: Dependent variables and covariates

Variable	Decription	Coding/construction
g_{it}	Charitable giving plus 1 Euro	Log of charitable giving
p_{it}	Tax defined price of giving	Log of tax defined price of giving for the first Euro of donation
Δp_{it}	$p_{it} - p_{it-1}$	Log of first difference of price
Δp_{it+1}	$p_{it+1} - p_{it}$	Log of first difference of price
y_{it}	gross income	Log of net income
Δy_{it}	$y_{it} - y_{it-1}$	Log of first difference of net income
Δy_{it+1}	$y_{it+1} - y_{it}$	Log of first difference of net income
D child	Taxpayer has children	Dummy variable (1=children;0=else)
D married	Taxpayer opts for spouse splitting	Dummy variable (1=yes;0=else)
D church	Taxpayer pays church tax	Dummy variable (1=yes;0=else)
Age	Age of taxpayer	Age in Years
Age^2	Age of taxpayer squared	Age in Years; squared
D limit	Donating more than taxable accountable	Dummy variable (1=yes;0=else)
Base year income	Gross income from first year of panel	In 2001 Euro
D West Germany	Taxpayer lives in East or West Germany	Dummy variable (1=yes;0=else)
D $year_t$	Assessment year	Dummy variable (1=t;0=else) t is 2002 to 2004 (base category 2005)
Main $income_k$	Main income source of taxpayer	The taxpayer can have three different main income sources: $k = 1$ is dependent employment income, $k = 2$ is business income $k = 3$ is other income sources (base category)

and estimate the model outlined in equation (4). The estimation results for the 0.35 until 0.99 quantile are displayed in Table 3. Since quantiles are sorted according to the size of donations, quantiles 0 to 0.34 consist only of non-donors which are censored and quantile regressions do not allow to compute the according effects.

We find that giving behavior is (very) heterogeneous and, therefore, our results confirm the suitability of censored quantile regressions to detect that heterogeneity. Albeit signs of coefficients do not change across quantiles, magnitudes vary significantly. Looking at the influence of socio-demographic characteristics first, the coefficients show the expected signs: The impact of children, marriage and age is positive; if the taxpayers pays church taxes (D church=1), less is donated. This is plausible as church taxes are voluntary and are treated by the German income tax code very similar to donations. Hence, paying a church tax is likely to be regarded as a donation from the taxpayer's perspective. Coefficients for the three subsequent assessment years (D $year_1$, D $year_2$, D $year_3$ with base year 2005) are negative for all quantiles. Amongst others, these year effects are likely to capture two mayor events boosting donations: First, in the summer of 2002, the flooding of the East German river Oder.

Table 3: Quantile regression results for pooled cross sections

Parameter	$Q = 0.35$	$Q = 0.40$	$Q = 0.45$	$Q = 0.5$	$Q = 0.55$	$Q = 0.6$	$Q = 0.65$
C	-13.31***	-12.22***	-11.41***	-10.59 ***	-9.44***	-7.86***	-6.69***
y_{it}	1.12***	1.07***	1.02***	0.97***	0.91***	0.86***	0.84***
p_{it}	-1.97***	-1.34***	-1.02***	-0.96***	-1.00***	-0.93***	-0.82***
D child	0.19***	0.23***	0.28***	0.31***	0.30***	0.23***	0.17***
D married	0.33***	0.56***	0.63***	0.59***	0.48***	0.31***	0.19***
D church	-0.59***	-0.58***	-0.56***	-0.55***	-0.52***	-0.43***	-0.36***
Age	0.06***	0.06***	0.06***	0.07***	0.06***	0.05***	0.04***
Age^2	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
D limit	4.27***	3.97***	3.78***	3.64***	3.55***	3.47***	3.38***
Base year income	0.00***	0.00***	0.00**	0.00	0.00***	0.00***	0.00***
D West Germany	0.66***	0.54***	0.42***	0.33***	0.31***	0.26***	0.21***
D $year_1$	-0.22***	-0.13***	-0.07***	-0.05***	-0.06***	-0.06***	-0.05***
D $year_2$	-0.46***	-0.35***	-0.27***	-0.25***	-0.26***	-0.23***	-0.19***
D $year_3$	-0.17***	-0.12***	-0.08***	-0.08***	-0.08***	-0.07***	-0.06***
Main $income_1$	-0.02	0.00	0.10***	0.17***	0.19***	0.18***	0.15***
Main $income_2$	-0.85***	-0.68***	-0.50***	-0.38***	-0.31***	-0.26***	-0.25***
Number of observations	2156937	2179630	2185528	2187696	2188925	2189514	2189759

Parameter	$Q = 0.70$	$Q = 0.75$	$Q = 0.8$	$Q = 0.85$	$Q = 0.9$	$Q = 0.95$	$Q = 0.99$
C	-5.92***	-5.33***	-4.84***	-4.32***	-3.67***	-2.48***	-0.66***
y_{it}	0.82***	0.81***	0.81***	0.80***	0.77***	0.72***	0.70***
p_{it}	-0.77***	-0.77***	-0.77***	-0.81***	-0.91***	-1.15***	-1.43***
D child	0.14***	0.12***	0.10***	0.09***	0.09***	0.10***	0.06***
D married	0.11***	0.07***	0.04***	0.04***	0.06***	0.10***	0.13***
D church	-0.31***	-0.28***	-0.26***	-0.24***	-0.25***	-0.27***	-0.18***
Age	0.04***	0.03***	0.03***	0.03***	0.03***	0.02***	0.01***
Age^2	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
D limit	3.30***	3.20***	3.08***	2.92***	2.72***	2.37***	1.89***
Base year income	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
D West Germany	0.18***	0.15***	0.13***	0.11***	0.08***	0.05***	-0.01
D $year_1$	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.07***	-0.08***
D $year_2$	-0.18***	-0.16***	-0.15***	-0.14***	-0.12***	-0.12***	-0.10***
D $year_3$	-0.06***	-0.06***	-0.05***	-0.05***	-0.05***	-0.05***	-0.04***
Main $income_1$	0.12***	0.09***	0.07***	0.05***	0.07***	0.05***	-0.02*
Main $income_2$	-0.26***	-0.28***	-0.30***	-0.30***	-0.26***	-0.19***	-0.07***
Number of observations	2189841	2189869	2189875	2189879	2189882	2189883	2189883

Note: Three-step censored quantile regression parameters estimates. Standard errors are bootstrapped with 200 replications, asterisks denote the respective significance level at 95% (*), 99% (**), and 99.9% (***). Number of observations vary due to the selection process accounting for the censoring.

Source: Own computation based on TPP 2001-2006.

Second, in late 2004 the tsunami hitting East Asia, causing donation to peek afterwards in 2004 and especially 2005. In sum, we find that our estimation yields similar results regarding socio-demographic characteristics to previous studies (e.g. Bönke et al. 2013).

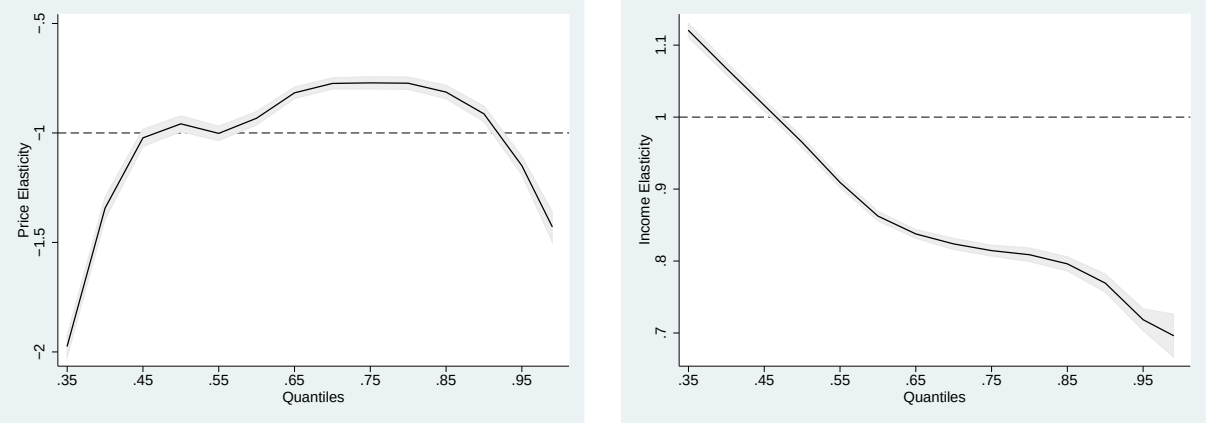
Estimates for income and price elasticities, y_{it} and p_{it}, pose the central results. Again, we find estimates to vary across quantiles in a pattern reassembling Bönke et al. (2013) in general, who found price elasticities between -1.44 and -0.45 and income elasticities 1.49 and 0.78. However, results differ in magnitude, especially regarding the price elasticity of giving. This finding is important as Bönke et al. (2013) use different data. Unlike our data, they draw on three cross sections which are representative for the whole population of German taxpayers below incomes of 153,000 Euro. As mentioned above, the data we use might not be

representative due to the balanced panel design and in addition highly over-samples taxpayers with high incomes. Finding similar patterns to Bönke et al. (2013) therefore suggests that we may draw valid general conclusions from our empirical exercise for giving behavior in Germany.[23]

In order to present our central results in a more convenient manner, estimations displayed in Table 3 for the elasticities of prices and incomes are rehashed in Figure 2 where the quantile specific point estimates are represented by the solid lines and the grey shaded areas denote the according confidence interval. We comment on the price elasticity pictured in the left panel first. As mentioned above, results confirm the heterogenous behavior following an inverse u-shaped pattern. This allows us to categorize taxpayers into three different groups. (1) Price elastic contributors with estimates ranging from minus two to close to minus one and comparably low donations (35^{th} until 55^{th} quantile); (2) price inelastic taxpayers with contributions between the 60^{th} and the 95^{th} quantile; and (3) price elastic taxpayers with contributions close to minus one and high contributions above the 95^{th} quantile of the distribution of charitable giving. Hence, we find the price elasticity to exceed one in absolute value at the tails of the distribution. In sum, taxpayers with high amounts of charitable giving confirm the prominent interpretations to be more sensitive to tax incentives as itemizing their donations potentially results in a considerable tax relief and, hence, tax planning pays off. In contrast, the behavior in the middle of the distribution of giving is rather price inelastic with price elasticities below .8 in absolute values and tax incentives are not treasure efficient (Feldstein 1975) to boost giving. Those medium donors are driven rather by income than by tax incentives. The very price and income elastic behavior at the lower tail of the distribution may reflect purposely decisions in case of rather small donations. According to theory, here the marginal utility pay off is very high and thus prone to be elastic to changes in prices, tax reliefs and income.

[23]Our data originates from the same source Bönke et al. (2013) use. However, the panel is designed to be balanced per construction. Thus we are missing taxpayers with irregular income tax reports in our sample.

Figure 2: Price and Income Elasticities from the non-dynamic specification



Source: Own calculations based on TPP. Solid lines denote point estimates for the respective quantile; grey areas denote the 95th confidence interval computed by bootstrap.

The income elasticities pictured in the right panel of Figure 2 show heterogenous behavior as well. Income elasticities are strictly downward sloping from an income elastic range (35^{th} until 45^{th} quantile) with estimates exceeding one, a semi elastic range estimates where after an initial steep decrease oscillate around .8 for medium to up to high donors. The income effect on all is positive and high for all quantiles. Estimates for income elasticities are in line with the theoretical assumption classifying giving as a normal good with decreasing marginal utility, along the distribution of donors.

However, this non-dynamic approach does not exploit the panel structure of our data and does not allow to disentangle persistent and transitory behavior from changes in prices or incomes (e.g. transitory income shocks could be exceptional high (low) incomes through short periods of unemployment or capital gains, transitory price shocks arise from temporary law changes affecting the taxable income composition.)

5.2 Exploiting the Panel Structure

The indications from the non-dynamic specification are plausible and confirm previous findings. However, only in a more dynamic set up one can validate, if the elasticities are indeed linked to permanent responses and not biased from transitory effects. Indeed, to correctly judge the treasure efficiency of tax incentives, the evaluation of the persistence effect is needed and therefore, a more dynamic framework.

Table 4: Quantile regression results: quasi-dynamic model with perfect foresight

Parameter	$Q = 0.35$	$Q = 0.4$	$Q = 0.45$	$Q = 0.5$	$Q = 0.55$	$Q = 0.60$	$Q = 0.65$
C	-13.80***	-12.75***	-11.84***	-10.91***	-9.71***	-8.19***	-7.03***
y_{it}	1.16***	1.12***	1.06***	1.00***	0.94***	0.90***	0.87***
Δy_{it}	-0.20***	-0.21***	-0.20***	-0.20***	-0.22***	-0.24***	-0.24***
Δy_{it+1}	0.45***	0.43***	0.40***	0.36***	0.32***	0.28***	0.25***
y_{it} *transitory*	0.52***	0.52***	0.47***	0.44***	0.41***	0.38***	0.38***
p_{it}	-2.16***	-1.44***	-1.06***	-1.00***	-1.07***	-1.00***	-0.88***
Δp_{it}	0.92***	0.54***	0.41***	0.46***	0.64***	0.58***	0.47***
Δp_{it+1}	-0.58***	-0.43***	-0.31***	-0.29***	-0.25***	-0.27***	-0.29***
p_{it} *transitory*	-0.67***	0.52***	-0.33***	-0.25***	-0.17***	-0.15 ***	-0.11***
D child	0.18***	0.22***	0.27***	0.30***	0.28***	0.22***	0.16***
D married	0.31***	0.53***	0.60***	0.56***	0.46***	0.30***	0.18***
D church	-0.59***	-0.58***	-0.56***	-0.55***	-0.52***	-0.44***	-0.36***
Age	0.06***	0.06***	0.06***	0.06***	0.06***	0.05***	0.04***
Age^2	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
D limit	4.19***	3.89***	3.71***	3.58***	3.48***	3.40***	3.33***
Base year income	0.00***	0.00***	0.00***	0.00***	0.00***	0.00	0.00***
D West Germany	0.62***	0.52***	0.40***	0.32***	0.29***	0.24***	0.20***
D $year_1$	-0.20***	-0.12***	-0.06***	-0.05***	-0.06***	-0.06***	-0.05***
D $year_2$	-0.44***	-0.35***	-0.28***	-0.25***	-0.25***	-0.23***	-0.19***
D $year_3$	-0.19***	-0.13***	-0.10***	-0.10***	-0.10***	-0.09***	-0.08***
Main $income_1$	-0.07***	-0.04***	0.05***	0.12***	0.15***	0.13***	0.11***
Main $income_2$	-0.86***	-0.69***	-0.51***	-0.39***	-0.33***	-0.28***	-0.27***
Number of observations	2149437	2176035	2184801	2187896	2189129	2189594	2189789

Parameter	$Q = 0.70$	$Q = 0.75$	$Q = 0.8$	$Q = 0.85$	$Q = 0.9$	$Q = 0.95$	$Q = 0.99$
C	-6.24***	-5.67***	-5.16***	-4.65***	-3.97***	-2.73***	-0.75***
y_{it}	0.86***	0.85***	0.84***	0.83***	0.80***	0.74***	0.70***
Δy_{it}	-0.23***	-0.23***	-0.22***	-0.22***	-0.20***	-0.17***	-0.05***
Δy_{it+1}	0.24***	0.23***	0.22***	0.20***	0.18***	0.13***	0.03***
y_{it} *transitory*	0.39***	0.40***	0.41***	0.42***	0.42***	0.44***	0.62***
p_{it}	-0.83***	-0.83***	-0.85***	-0.92***	-1.03***	-1.33***	-1.58***
Δp_{it}	0.42***	0.39***	0.38***	0.34***	0.29***	0.34***	0.28***
Δp_{it+1}	-0.29***	-0.30***	-0.31***	-0.34***	-0.37***	-0.43***	-0.34***
p_{it} *transitory*	-0.11***	-0.14***	-0.16 ***	-0.23***	-0.37***	-0.56***	-0.95***
D child	0.13***	0.11***	0.09***	0.08***	0.08***	0.09***	0.05***
D married	0.10***	0.06***	0.03***	0.02***	0.04***	0.09***	0.13***
D church	-0.32***	-0.28***	-0.26***	-0.25***	-0.25***	-0.29***	-0.19***
Age	0.04***	0.03***	0.03***	0.03***	0.03***	0.02***	0.01***
Age^2	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
D limit	3.25***	3.16***	3.05***	2.92***	2.71***	2.38***	1.89***
Base year income	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
D West Germany	0.16***	0.14***	0.11***	0.09***	0.07***	0.04***	-0.02*
D $year_1$	-0.05***	-0.05***	-0.04***	-0.05***	-0.06***	-0.08***	-0.09***
D $year_2$	-0.17***	-0.16***	-0.14***	-0.13***	-0.12***	-0.12***	-0.10***
D $year_3$	-0.07***	-0.06***	-0.06***	-0.06***	-0.05***	-0.05***	-0.04***
Main $income_1$	0.09***	0.06***	0.03***	0.02**	0.02***	0.01	-0.04***
Main $income_2$	-0.27***	-0.29***	-0.31***	-0.31***	-0.27***	-0.20***	-0.07***
Number of observations	2189861	2189876	2189879	2189882	2189883	2189883	2189883

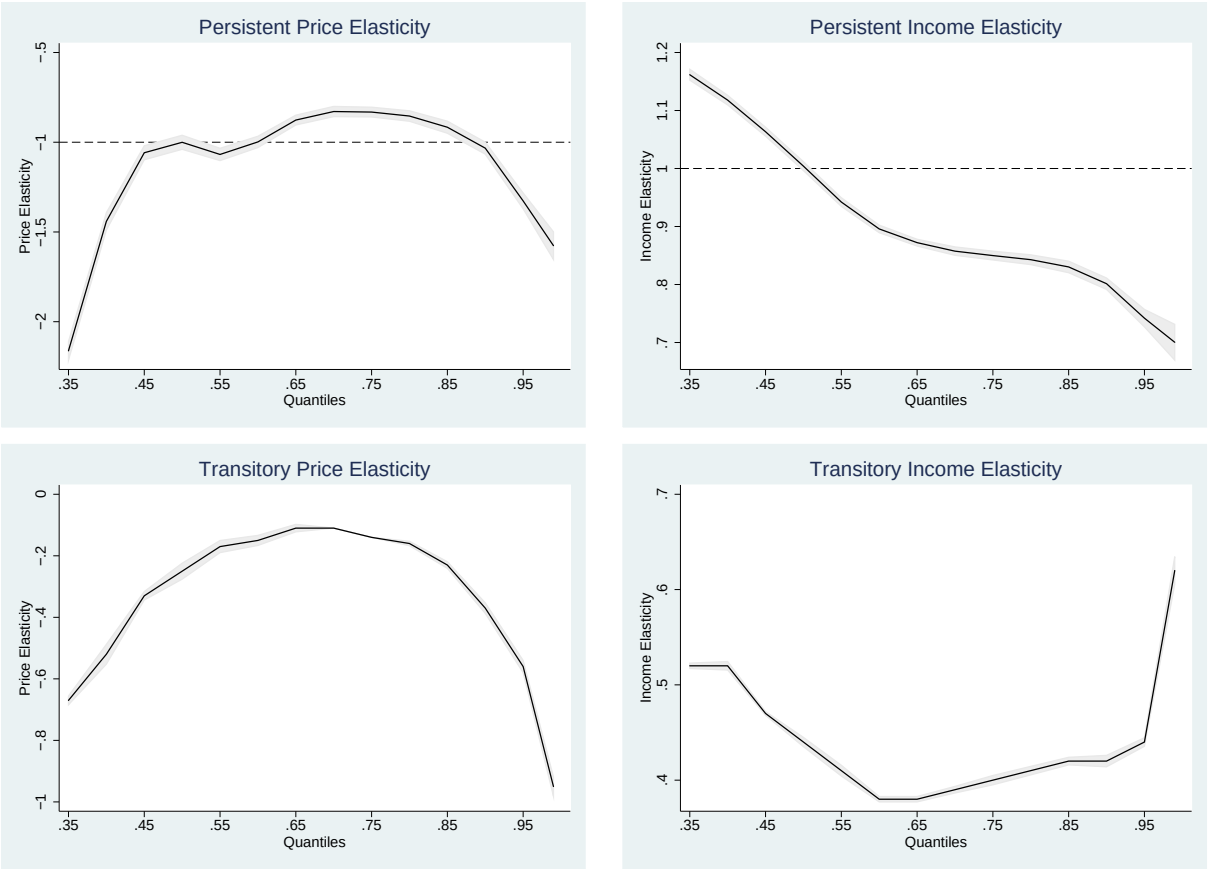
Note: Three-step censored quantile regression parameters estimates. Standard errors are bootstrapped with 200 replications, asterisks denote the respective significance level at 95% (*), 99% (**), and 99.9% (***). Number of observations vary due to the selection process accounting for the censoring.

Source: Own computation based on TPP 2001-2006.

In the model specification in equation (5), the panel structure is exploited by integrating lagged and future first differences for the price and the income elasticity and results are presented in Table 4. With this approach we are able to disentangle giving behavior into

reactions to persistent and transitory changes of income and prices. Thereby, responses to transitory changes may include consumption smoothing, short-run timing, learning and tax-planning behavior (Bakija and Heim, 2011). First difference including future prices and incomes build on the assumption of perfect foresight, which implies that taxpayers know their income and tax price of giving in the year following the donation. In this specification, p_{it} and y_{it} denote the persistent price, respectively the persistent income elasticity, the responses to transitory changes in income and prices are calculated as $p_{it} + \Delta p_{it} - \Delta p_{it+1}$ and $y_{it} + \Delta y_{it} - \Delta y_{it+1}$. The according sums are displayed in the respective lines *transitory*. Else, socio-economic and time co-variates have a similar influence like in the non-dynamic set up. Accordingly, we solely focus on the analysis of price and income elasticities. Again, we plot the main results from our estimation to visualize the pattern over the quantiles which are provided in Figure 3. The two upper graphs show results for p_{it} and y_{it} and are directly comparable to Figure 2. However, we interpret them in this econometric setting as persistent income and persistent price elasticities. Overall, the patterns for the persistent elasticities reassemble the findings reported for the non-dynamic approach with price elastic behavior at the tails of the distribution but price inelastic behavior for medium donors. The persistent income elasticity shows again a downward sloping curve with elasticities exceeding one for the lowest quantiles and elasticities below .8 for the top quantiles. The transitory elasticities are depicted in the two lower panels of Figure 3. The estimates for the transitory price elasticity are in absolute value (much) smaller than the permanent price elasticities. Furthermore, the transitory price elasticity resembles the same inverse u-shaped pattern of their permanent counterparts over the distribution of quantiles. The magnitude however differs substantially, estimates are close to zero in absolute value for all quantiles but for the highest donors. The transitory income elasticities are presented in the right lower panel of Figure 3. Showing a reversed pattern to their permanent counterparts, they are all positive with values around .4 for lower quantiles and increasing in the amount given. Estimates for the highest quantile amount to .7. In sum, we find transitory income elasticities to be all well below one, with the high donors to be relative more elastic than lower donors.

Figure 3: Price and Income Elasticities from the quasi-dynamic specification



Source: Own calculations based on TPP. Solid lines denote point estimates for the respective quantile; grey areas denote the 95th confidence interval computed by bootstrap.

To ensure robustness, we compare the estimates for price and income elasticities derived from the quasi-dynamic specification with perfect foresight with three alternative approaches: the non-dynamic specification presented above, a quasi-dynamic approach controlling for permanent and transitory incomes (Table A.2) and a quasi-dynamic specification with imperfect foresight (Table A.1). Comparing the estimates to our non-dynamic model first, we find, both the permanent income and price elasticity show the same pattern and confirm results from equation (4). While price elasticities tend to be slightly higher (in absolute value) in this quasi-dynamic model, income elasticities are very similar. Overall, the patterns for the persistence elasticities reassemble the findings reported for the non-dynamic approach. This complements the hypothesis that high donors are more responsive to tax incentives than medium donors and supports the usage of quantile regression. Although differences between the models are marginal, the transitory component should not be neglected and especially

high donors tend to react more elastic with regard to transitory changes in prices and incomes. The second test of sensitivity is the inclusion of a permanent and transitory income component. Following standard approaches in the literature (e.g. Gottschalk and Moffitt 1994), permanent income is computed as the individual average over the whole panel length and transitory incomes are the respective yearly deviations. Decomposing income into this two components leaves the estimates for the permanent income elasticities and price elasticities virtually unchanged, hence resembling the same pattern across quantiles and confirming our preferred specification. Results and an detailed description of the empirical approach are presented in Table A.2 in the appendix.

Comparing the preferred model to the third specification aims at testing the assumption of perfect foresight. As mentioned above, results in Table 4 assume that taxpayers have complete knowledge of future prices and incomes. To relax that somewhat strong assumption, we perform an alternative scenario following Bakjia and Heim (2012), called *imperfect foresight*, in which taxpayers know only on average their incomes and according prices in the future. Estimates based on the imperfect foresight assumption are listed in Table A.1 and confirm results from Table 4 with virtually unchanged permanent price and income elasticities for most of the distribution. Only transitory income and price elasticities at the lower tail increase in absolute value significantly and are greater than one in absolute values. Another study based on the same data but relying on a different econometric modeling of donations to charity is Adena (2014). Here, individual fixed effects estimation is employed. Estimating the conditional mean of price and income elasticities, Adena's (2014) results are unbiased in case of no censoring. Then again, her results are robust against individual fixed effects, while the interpretation of quantile regressions is hard once fixed effects are eliminated.[24] In short, Adena's (2014) results complement our findings and imply that the price elasticity of giving is heterogenous along the income distribution: low incomes are not price elastic with relative small elasticities but medium and high incomes have a price elasticity greater one (in absolute value). The income elasticity is rather constant for the income classes around .2 which is however, significantly smaller than our estimates. Adena's (2014) results have direct implications for the optimal design of the tax subsidization of donations within the German tax code: the tax favoring of donations should depend on the income level of the taxpayer. Only donations of taxpayers with incomes above 30,000 Euro should have lower prices than one and receive a tax subsidy. Our results have different implications for the optimal design

[24]We believe that our results confirm that donations to charity are not strongly driven by individual fixed effects. If taxpayers donations follow a fixed effect, those fixed effects are likely to be larger for high donors than for small donors. That would contradict our inverse u-shaped pattern of the permanent price elasticity.

of the tax subsidizes: the tax induced price of giving should hinge upon the amount given rather than the tax rate which in turn is a progressive function of total income. Moreover, our results confirm the consumption character of donations as normal good.

5.3 New donors

To close the circle, we now look how tax incentives are suited to activate new donors and concentrate on the heterogeneity of donations at the extensive margin. This is especially important if policy makers desire to broaden the base of donors.[25] Therefore, we select a sample of 640,134 observations (compared to about 2.2 million in the quasi-dynamic case) consisting only of non-donors in a given year and re-estimate equation (4) for the subsequent year. The results for the new donors are displayed in Table 5. Roughly 20% of taxpayers who did not donate in a given year change their status from non-donors to donors in the subsequent year, thus estimates start at the 80th quantile and go up to the 99th quantile (for the quasi-dynamic model, the lowest quantile is the 35th). Comparing the results for these new donors with the overall population of taxpayers reveals several differences. Comparing the results of the control variables with estimation results from the quasi-dynamic model, coefficients for socio-demographic characteristics (age, children, married, etc.) and assessment years exceed the results from the quasi-dynamic case but exhibit the same sign. Again, we are most interested in income and price elasticities. Estimates for price elasticities for the new donors are all well below the absolute value of one and even insignificant for the 95th and 99th quantile. The downward sloping pattern for income elasticities slightly mirrors the previous findings: at the lower tale, donors exhibit income elastic behavior with estimates between 1.27 to 0.95 for quantiles .8 to .9 and semi elastic behavior at the very top. Hence it shows clearly, that the propensity to become a donor is mostly income related. Thus, the policy maker needs to consider that tax incentives are not suited to activate donors but only the taxpayers income is. Winning taxpayers over to become donors obviously calls for other instruments than price subsidization.

[25] Unlike in the US where most taxpayers donate, German taxpayers are less likely to donate. Our estimation sample consists of 67.7% donors, which corresponds only to 55% of the weighted observations. This is in line with Bönke et. al (2013) have 55% of donors in their representative sample.

Table 5: Quantile regression results: new donors

Parameter	$Q = 0.8$	$Q = 0.85$	$Q = 0.9$	$Q = 0.95$	$Q = 0.99$
C	-11.22***	-9.95***	-6.27***	-4.65***	-3.34***
y_{it}	1.27***	1.15***	0.95***	0.93***	0.91***
p_{it}	-0.51***	-0.86***	-0.47***	-0.07	-0.18
D child	0.19***	0.23***	0.10***	0.06***	0.10***
D married	0.56***	0.69***	0.11***	-0.10***	-0.14***
D church	-0.28***	-0.35***	-0.24***	-0.22***	-0.31***
Age	0.00	0.02***	0.01***	0.00***	0.00***
Age^2	0.00	0.00***	0.00***	0.00***	0.00***
D limit	6.40***	5.93***	4.63***	4.05***	3.48
Base year income	0.00	0.00	0.00	0.00**	0.00**
D West Germany	-0.10***	-0.02	-0.01	-0.01	-0.01
D $year_1$	-0.09***	-0.10***	-0.06***	-0.02	0.03
D $year_2$	-0.36***	-0.68***	-0.49***	-0.23***	-0.06*
D $year_3$	-0.10***	-0.13***	-0.09***	-0.07***	-0.03
Main $income_1$	0.61***	0.39***	0.37***	0.33***	0.27***
Main $income_2$	-0.82***	-0.79***	-0.43***	-0.38***	-0.44***
Number of observations	638536	639527	640110	640131	640134

Note: Three-step censored quantile regression parameters estimates. Standard errors are bootstrapped with 200 replications, asterisks denote the respective significance level at 95% (*), 99% (**), and 99.9% (***). Number of observations vary due to the selection process accounting for the censoring.

Source: Own computation based on TPP 2001-2006.

6 Conclusion

We apply the fairly new estimation technique of censored quantile regressions for the first time in a balanced panel setting to investigate donation behavior with administrative income tax data. The German taxpayer panel (TPP) itself is only recently available to researchers, heavily over-samples high incomes and provides rich demographic information on nearly one million taxpayers for six consecutive years. In addition and contrary to the bulk of previous empirical studies on giving, censored quantile regressions allow to assume non-constant price and income elasticities along the distribution of donors. Moreover, the panel setting enables us to disentangle persistent from transitory effects. Altogether, we present estimates for five specifications and perform in addition several tests of robustness. Based on the whole population of donors, the preferred specification represents the quasi-dynamic approach assuming perfect foresight regarding future prices and incomes. This quasi-dynamic model is complemented by three alternative specifications: First, a non-dynamic approach which does not utilize the panel structure but mirrors the procedure and data limitations of previous studies. Second, a quasi-dynamic approach with imperfect foresight shedding some light on the sensitivity of results with respect to the perfect foresight assumption. Third, a

quasi-dynamic approach which includes a transitory and permanent income component and thus serves as a robustness exercise for permanent and transitory responses. Last, the results derived for the whole distribution of donors are complemented with estimates for new donors by restricting the sample. All our modeling builds on the underlying theoretical assumption that giving is a function of prices and income. Hence, a full dynamic approach which includes giving as an autocorrelated process is not considered.

Our main results are derived from the quasi-dynamic specification with perfect foresight. Estimates reveal giving behavior to be very heterogenous with coefficient estimates varying substantially across the conditional distribution of donors. Hence, the adoption of censored quantile regressions in this kind of econometric setting is justified and confirms previous works that model giving behavior as heterogenous (e.g. Bönke et al. 2013, Fack and Landaise 2011). In case of persistent income elasticities, taxpayers in the lower conditional distribution of donors show relatively high values in excision of one, while donors in the upper part of the distribution qualify as inelastic. Thus, the downward sloping pattern of income elasticities suggests that donations can be categorized as a normal consumption good, a finding which is also supported by the transitory income elasticity oscillating around .4 for all quantiles. Consequently, donations do not hinge on one-time income fluctuations but rather permanent income changes. Of particular interest due to the direct policy implication for the design of tax incentives are the price elasticities. Across the whole distribution of donors, the permanent price elasticities imply only in parts an elastic behavior: tax incentives matter at the very top and lower tail of the whole distribution of donors. Turning to Feldstein's (1975) rule of treasure efficiency, tax incentives are not efficient to boost giving behavior for a substantial portion of donors in the middle of the distribution. For the new donors, we can establish giving behavior not to be price elastic at all. All of the results above are robust against alternative specifications, including the relaxation of taxpayers foresight on future income and prices or the splitting income into a permanent and transitory component.

We complement the findings and policy recommendation of previous studies in several ways. Amongst others, we extant the previous work by Bönke et al. (2013) and Fack and Landaise (2011) and close a research gap by providing estimates for income and price elasticities in a dynamic set up allowing for heterogonous responses. Of special interest in this matter is the comparison between the quasi-dynamic approaches and the non-dynamic specification which confirms, that estimates provided by previous cross-sectional studies not utilizing panel information due to data limitations are not overly distorted. Then again, some recent panel studies estimate average responses to tax incentives (e.g. Adena 2014, Bakija and Heim 2011). Following our findings, average price elasticities for the whole distribution give a rather inaccurate picture. For example, estimators that provide average elasticities may be

driven by behavioral responses of small parts in the distribution and may imply inaccurate measure of treasure efficiency and optimality of tax incentive design. Confirming Bönke et al. (2013) that giving behavior in Germany is price elastic at both tails of the distribution of donors, tax incentives to boost giving behavior have to vary with the amount given and not, as it is currently designed, with income. Hence, more ideal tax incentives have to take the actual amount given into account. In addition, we provide estimates that show that the current design of tax incentives is not likely to activate new donors. The propensity to give is for new donors solely depending on income.

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8 Appendix

Table A.2 and Table A.2 provide alternative specifications and serve as robustness check for quasi-dynamic approache. Results in Table 4 are based on perfect foresight, i.e. taxpayers know their future income and their future price when itemizing their donating. To relax that somewhat strong assumption, results in Table A.1 are based on imperfect foresight. As a sensitivity analysis, taxpayers are only assumed to know their future income and price on average. Following Bakija and Heim (2011), we predict the future income and price using lagged incomes and prices as explanatory variables. Both these estimations have very strong explanatory power with R^2s above .9.

Results with impeferct foresight in Table A.1 strongly resemble results from perfect foresight presented in Table 4. The estimates for the permanent income and the permanent price elasticities remain virtually unchanged, so is the lagged income growth, the lagged price growth and the control variables. The only noticeable difference are the estimated elasticities of the future income and future price growth rate. The elasticities of the future income growth are significantly smaller for the model with imperfect foresight for all quantiles. Moreover, all quantiles but the first (.35) have negative elasticities of future income growth, which increases the transitory income elasticity for the medium quantiles above one. The elasticity of the future price growth is significantly larger for the model of imperfect foresight for all quantiles. Estimates are now large and positive, especially for the lower tail resulting into transitory price elasticities exceeding one in absolute value for quantiles between .35 and .5. All in all, results for imperfect foresight appear much less smooth and transitory price elasticities are unreasonable high at the lower tail. This could arise from the estimation process of the future income and price, which might have low explanatory power at the lower tail.

Table A.1: Quantile regression results from the dynamic model with imperfect foresight

Parameter	$Q = 0.35$	$Q = 0.4$	$Q = 0.45$	$Q = 0.5$	$Q = 0.55$	$Q = 0.60$	$Q = 0.65$
C	-13.58***	-12.44***	-11.50***	-10.54***	-9.36***	-8.02***	-6.90***
y_{it}	1.13***	1.09***	1.04***	0.99***	0.94***	0.89***	0.87***
Δy_{it}	-0.28***	-0.30***	-0.29***	-0.29***	-0.29***	-0.31***	-0.30***
Δy_{it+1}	0.15***	-0.02	-0.27***	-0.45***	-0.58***	-0.54***	-0.37***
y_{it} *transitory*	0.71***	0.81***	1.02***	1.15***	1.22***	1.12***	0.94***
p_{it}	-2.07***	-1.37***	-1.10***	-1.10***	-1.21***	-1.17***	-0.99***
Δp_{it}	1.14***	0.65***	0.46***	0.44***	0.59***	0.59***	0.49***
Δp_{it+1}	2.18***	2.58***	1.69***	0.90***	0.11	-0.33***	-0.17 **
p_{it} *transitory*	-3.11***	-3.31***	-2.32***	-1.55***	-0.72***	-0.26***	-0.33***
D child	0.20***	0.23***	0.27***	0.29***	0.27***	0.22***	0.16***
D married	0.33***	0.54***	0.60***	0.56***	0.46***	0.31***	0.19***
D church	-0.59***	-0.58***	-0.56***	-0.55***	-0.52***	-0.45***	-0.37***
Age	0.06***	0.06***	0.06***	0.06***	0.05***	0.05***	0.04***
Age^2	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
D limit	4.25***	3.95***	3.75***	3.62***	3.51***	3.42***	3.35***
Base year income	0.00***	0.00***	0.00***	0.00***	0.00**	0.00	0.00***
D West Germany	0.64***	0.54***	0.40***	0.31***	0.28***	0.24***	0.20***
D $year_1$	-0.15***	-0.12***	-0.14***	-0.17***	-0.21***	-0.21***	-0.16***
D $year_2$	-0.48***	-0.38***	-0.30***	-0.26***	-0.25***	-0.23***	-0.19***
D $year_3$	-0.23***	-0.15***	-0.09***	-0.07***	-0.06***	-0.05***	-0.05***
Main $income_1$	-0.06***	-0.04***	0.06***	0.13***	0.15***	0.14***	0.12***
Main $income_2$	-0.87***	-0.71***	-0.51***	-0.38***	-0.31***	-0.27***	-0.26***
Number of observations	2132841	2165267	2175345	2179841	2181960	2182821	2183158

Parameter	$Q = 0.70$	$Q = 0.75$	$Q = 0.8$	$Q = 0.85$	$Q = 0.9$	$Q = 0.95$	$Q = 0.99$
C	-6.09***	-5.52***	-5.04***	-4.52***	-3.88***	-2.64***	-0.70***
y_{it}	0.85***	0.84***	0.84***	0.82***	0.80***	0.74***	0.70***
Δy_{it}	-0.29***	-0.28***	-0.26***	-0.26***	-0.24***	-0.20***	-0.07***
Δy_{it+1}	-0.24***	-0.15***	-0.09***	-0.07***	-0.08***	-0.15***	-0.14***
y_{it} *transitory*	0.81***	0.71***	0.66***	0.64***	0.64***	0.70***	0.78***
p_{it}	-0.89***	-0.85***	-0.83***	-0.87***	-0.97***	-1.27***	-1.55***
Δp_{it}	0.46***	0.45***	0.44***	0.40***	0.38***	0.42***	0.33***
Δp_{it+1}	-0.02	0.12*	0.18**	0.18***	0.09	-0.06	-0.64***
p_{it} *transitory*	-0.41***	-0.52***	-0.57***	-0.65***	-0.68***	-0.79***	-0.58***
D child	0.13***	0.11***	0.09***	0.08***	0.08***	0.09***	0.05***
D married	0.11***	0.06***	0.03***	0.02***	0.04***	0.08***	0.13***
D church	-0.32***	-0.28***	-0.26***	-0.25***	-0.26***	-0.29***	-0.20***
Age	0.03***	0.03***	0.03***	0.03***	0.03***	0.02***	0.01***
Age^2	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
D limit	3.27***	3.18***	3.07***	2.92***	2.72***	2.37***	1.88***
Base year income	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
D West Germany	0.16***	0.14***	0.12***	0.10***	0.07***	0.04***	-0.01*
D $year_1$	-0.12***	-0.09***	-0.07***	-0.07***	-0.08***	-0.11***	-0.13***
D $year_2$	-0.17***	-0.16***	-0.15***	-0.14***	-0.12***	-0.12***	-0.10***
D $year_3$	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.04***	-0.03***
Main $income_1$	0.09***	0.06***	0.04***	0.02***	0.03***	0.02**	-0.04***
Main $income_2$	-0.27***	-0.29***	-0.31***	-0.31***	-0.28***	-0.20***	-0.07***
Number of observations	2183294	2183354	2189879	2189882	2189883	2189883	2189883

Note: Three-step censored quantile regression parameters estimates. Standard errors are bootstrapped with 200 replications, asterisks denote the respective significance level at 95% (*), 99% (**), and 99.9% (***). Number of observations vary due to the selection process, accounting for censoring.

Source: Own computation based on TPP 2001-2006.

Results in Table A.2 employ an alternative strategy for identifying the persistent and transitory income elasticity. Following Gottschalk and Moffitt (1994), we compute a permanent income as the average income over our panel data with transitory income as the annual deviation from the permanent income.[26] Then, the permanent income $\overline{Y_i}$ for taxpayer i is:

$$\overline{Y_i} = ln(\frac{1}{6}\sum_{t=1}^{6} Y_{it})$$

Accordingly, the transitory income $\widetilde{Y_{it}}$ for taxpayer i in period t is the yearly deviation from the average income:

$$\widetilde{Y_{it}} = ln(Y_{it}) - \overline{Y_i}$$

Results from Table A.2 are remarkable similar to the results from the preferred specification in Table 4. Estimates for the permanent income elasticity $\overline{Y_i}$ are only somewhat larger than the estimates for the persistent income elasticities y_{it} in Table 4 and show the same downward sloping trend. Transitory income elasticities $\widetilde{Y_{it}}$ in Table A.2 also follow the same pattern like the transitory income elasticities in Table 4.
Results for the price elasticity are somewhat smaller in magnitude than from the preferred specification and resemble the price elasticities from the non-dynamic model.

[26]Note that our data contain six straight years. However, results are not sensitive when estimating the permanent income on basis of less years.

Table A.2: Quantile regression results from model with permanent and transitory income

Parameter	$Q = 0.35$	$Q = 0.40$	$Q = 0.45$	$Q = 0.5$	$Q = 0.55$	$Q = 0.6$	$Q = 0.65$
C	-14.46***	-13.17***	-12.20***	-11.34***	-10.26***	-8.58***	-7.39***
$\overline{Y_i}$	1.22***	1.16***	1.10***	1.04***	0.99***	0.93***	0.90***
$\widetilde{Y_{it}}$	0.40***	0.40***	0.38***	0.32***	0.28***	0.29***	0.29***
p_{it}	-1.85***	-1.24***	-0.92***	-0.84***	-0.90***	-0.83***	-0.72***
D child	0.19***	0.22***	0.27***	0.30***	0.29***	0.22***	0.16***
D married	0.31***	0.53***	0.60***	0.56***	0.46***	0.30***	0.17***
D church	-0.58***	-0.57***	-0.55***	-0.53***	-0.51***	-0.43***	-0.35***
Age	0.06***	0.06***	0.06***	0.06***	0.06***	0.05***	0.04***
Age^2	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
D limit	4.17***	3.87***	3.70***	3.58***	3.48***	3.40***	3.32***
Base year income	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00
D West Germany	0.62***	0.52***	0.39***	0.30***	0.28***	0.23***	0.19***
D $year_1$	-0.01	0.05***	0.10***	0.12***	0.11***	0.10***	0.11***
D $year_2$	-0.35***	-0.26***	-0.19***	-0.16***	-0.16***	-0.14***	-0.11***
D $year_3$	-0.12***	-0.08***	-0.05***	-0.04***	-0.04***	-0.03***	-0.02***
Main $income_1$	-0.07***	-0.05***	0.04***	0.12***	0.15***	0.14***	0.12***
Main $income_2$	-0.81***	-0.67***	-0.49***	-0.37***	-0.30***	-0.25***	-0.23***
Number of observations	2146623	2176918	2185852	2188547	2189451	2189738	2189832

Parameter	$Q = 0.70$	$Q = 0.75$	$Q = 0.8$	$Q = 0.85$	$Q = 0.9$	$Q = 0.95$	$Q = 0.99$
C	-6.61***	-6.06***	-5.59***	-5.12***	-4.46***	-3.27***	-1.03***
$\overline{Y_i}$	0.89***	0.88***	0.88***	0.87***	0.85***	0.79***	0.73***
$\widetilde{Y_{it}}$	0.29***	0.28***	0.28***	0.28***	0.27***	0.28***	0.55***
p_{it}	-0.68***	-0.68***	-0.70***	-0.75***	-0.87***	-1.14***	-1.42***
D child	0.13***	0.11***	0.09***	0.08***	0.08***	0.10***	0.05***
D married	0.10***	0.05***	0.02***	0.01***	0.03***	0.08***	0.12***
D church	-0.30***	-0.27***	-0.25***	-0.24***	-0.24***	-0.27***	-0.19***
Age	0.04***	0.03***	0.03***	0.03***	0.03***	0.02***	0.01***
Age^2	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
D limit	3.24***	3.15***	3.05***	2.91***	2.71***	2.38***	1.87***
Base year income	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
D West Germany	0.16***	0.13***	0.11***	0.08***	0.06***	0.03***	-0.01*
D $year_1$	0.10***	0.11***	0.11***	0.10***	0.09***	0.06***	-0.03***
D $year_2$	-0.09***	-0.07***	-0.06***	-0.05***	-0.04***	-0.05***	-0.07***
D $year_3$	-0.02***	-0.02***	-0.01***	-0.01**	-0.01	-0.01*	-0.02***
Main $income_1$	0.09***	0.06***	0.03***	0.01*	0.02**	0.01	-0.03***
Main $income_2$	-0.24***	-0.26***	-0.28***	-0.28***	-0.25***	-0.17***	-0.06***
N	2189872	2189882	2189883	2189883	2189883	2189883	2189883

Note: Three-step censored quantile regression parameters estimates. Standard errors are bootstrapped with 200 replications, asterisks denote the respective significance level at 95% (*), 99% (**), and 99.9% (***). Number of observations vary due to the selection process, accounting for censoring.

Source: Own computation based on TPP 2001-2006.

Table A.3: Net income

Income from business activity
(including income from agriculture and forestry, from unincorporated business enterprise and from self-employed activities)
+ wage income, income from renting and leasing and other income
+ earnings from capital investments (imputation of missing data on an average level)
+ all tax reliefs and tax allowances for income from business activity as far as identifiable
+ allowable expenses for wage and other income (consumptive character)
+ age relief
+ tax-exempted income from foreign countries
+ loan and income indemnification
+ life annuity income less income component (flat 70% of life annuity income)
+ tax shelters: losses from equity holdings
+ losses from business activity income and renting and leasing income, if the modified income class and the sum of income until this point is still negative (negative consumption is not possible)
- fixed income tax and solidarity surcharge
- alimony / child support
+ child benefit
= Net Income (net-of-tax adjusted gross income)

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