

Charitable Giving, Tax Reform, and Self-selection of Tax Report: Evidence from South Korea

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Abstract

This paper investigates (1) the price elasticity of giving and (2) whether the different perception towards the government cause the different giving behavior using South Korean panel data. Our result classifies that the price elasticity of giving in Korea is $-0.59 \sim -1.01$ for intensive margin and $-1.17 \sim -1.48$ for extensive margin. We also show that the amount of donation is not different between those who regard government as inefficient and the others, though the giving price elasticity of the former is more elastic than the latter. This means that those who think of government as inefficient have more willingness to donate for 1% reduction of giving price.

1 Introduction

In many countries, governments set a tax relief for charitable giving. This is because, if subsidizing charitable giving induces a large increase in donations, it is desirable for public good provision. To evaluate the effect of tax relief, many papers investigate the elasticity of charitable donations with respect to their tax price (Almunia et al., 2020; Auten et al., 2002; Bakija and Heim, 2011; Fack and Landais, 2010; Randolph, 1995). Focusing on the tax deduction or tax credit on the charity, they show that the price elasticity of giving is about -1 or more in terms of absolute value, which means that the tax relief for the charitable giving is good in the sense that 1% tax relief derives more than 1% donation.

However, if the government can provide public good more efficiently than the direct donation, the donation may not be preferable because the public good provision via donation would be costly then. Moreover, when the government

is much more efficient than charities, people may not donate so much even if they have a warm-glow preference. Saez (2004) suggests that the change of the relative price between public good provision by donation and government will change the behavior of people and the price elasticity of donation. However, the evaluation about the efficiency of the government is usually subjective and different for people. If someones regard the government as efficient, the perceived relative price of giving would be high for them. Thus, the giving behavior would be affected by the subjective perception towards the government.

Considering these points, this paper investigates (1) the price elasticity of giving and (2) whether the different perception towards the government cause the different giving behavior using South Korean panel data. Our first main concern is the price elasticity of charity. South Korea (Korea hereafter) experienced the tax reform in 2014, from when the tax relief on charitable giving was conducted by tax credit, though tax deduction had been used before 2014. Thus, we exploit this tax reform as an exogenous policy change to derive the price elasticity of giving. Since the extant research focus on the tax reform within the scheme of tax deduction or tax credit, this paper firstly deals with the tax reform from tax deduction system to tax credit system. Our result classifies that the price elasticity of giving in Korea is $-0.59 \sim -1.01$ for intensive margin and $-1.17 \sim -1.48$ for extensive margin.

Our second concern is the relationship between the giving behavior and the perception towards the government. As we explained, people feeling administrative inefficiency would consider the direct donation is more efficient and would have more willingness to donate. Using the Korean field data, we investigate this and show that the giving price elasticity of those who regard government as inefficient is more elastic than the others. This means that those who think of government as inefficient have more willingness to donate for 1% reduction of giving price.

This paper contributes two strands of charitable giving literature: the elasticity of charitable donations with respect to their tax price and the perception of government's inefficiency. The examples of papers in the first strand are Randolph (1995), Auten et al. (2002), Fack and Landais (2010), Bakija and Heim (2011), and Almunia et al. (2020). They typically use the tax return data, the main part of which is the data about wealthy people. Since our data is based on survey, which reflects the income distribution of population, we believe that we can estimate the giving price elasticity of population more precisely. Using the data with low-income households may be difficult to estimate the giving price elasticity in terms of intensive margin since they are expected to donate less than high-income households. To address this issue, we estimate not only the elasticity of intensive margin, as most of papers do, but also the elasticity of extensive margin following Almunia et al. (2020). Moreover, we use the data of Korea, a non-Western country, which the extant research did not examine.¹

¹This point may be important since Kim (2021) reports that the giving behavior is strongly affected by the cultural matter such as the religious belief.

In the second strand, there are some experimental studies and papers considering the tax evasion. Using an experiment, Li et al. (2011) compare people's willingness to give money for private charities and government agencies whose missions are the same. They show that people tend to donate for private charities more than government agency though they do not directly investigate the relationship between people's perception toward the government and giving behavior. Sheremeta and Uler (2020) show that people increase the voluntary public good provision when they face the wasteful government spending in the experimental setting. Although the government in their setting does not provide public good, they suggest that the willingness for donation may increase if people perceive the inefficiency of government. In the tax evasion literature, several paper suggests the perceived inefficiency of government reduce tax morale (Anderson, 2017; Frey and Torgler, 2007; Hammar et al., 2009). We contribute on this literature by showing the relation between the perception of government efficiency and the giving behavior.

This paper consist of seven sections. Section 2 and 3 respectively explain the institutional background and data. Section 4 explains the estimation method. Section 5 deals with the analysis of giving price elasticity and section 6 shows the analysis of perceptions toward the government. Section 7 concludes.

2 Institutional background

In this section, we describe the income tax relief for charitable giving in Korea and used dataset.

2.1 Tax relief for charitable giving by tax deduction and tax credit

In the South Korea, the tax policy about charitable giving drastically changed in 2014. Before then, tax relief of charitable giving was provided by tax deduction while, from 2014, tax relief by tax credit was introduced instead of tax deduction.

The tax deduction and tax credit may have different effects on giving behavior. This subsection summarize the difference of tax deduction and tax credit. Consider that a household has a choice between private consumptions (x_i) and charitable giving (g_i). Let y_i be pre-tax total income. Then, the budget constraint is

$$x_i + g_i = y_i - T_i(y_i, g_i).$$

T_i is tax amount which depends on the pre-tax income and charitable giving. On one hand, tax deduction reduces taxable income by giving. The amount of tax is

$$T_i = \tau(y_i - g_i) \cdot (y_i - g_i),$$

where $\tau(\cdot)$ is the income tax rate which is determined by $y_i - g_i$.² The budget constraint will be

$$x_i + [1 - \tau(y_i - g_i)]g_i = [1 - \tau(y_i - g_i)]y_i.$$

Thus, the giving price compared to the price of private consumption is $p_i^d \equiv 1 - \tau(y_i - g_i)$ in tax deduction system. Since the giving price in tax deduction scheme varies depending on (1) the income level and (2) the amount of charitable giving, it is endogenous to them, i.e. (1) and (2).

On the other hand, tax credit reduces tax amount directly, that is,

$$T_i = \tau(y_i) \cdot y_i - mg_i,$$

where $m \in [0, 1]$ is the tax credit rate. Under the tax credit system, the budget constraint is

$$x_i + (1 - m)g_i = [1 - \tau(y_i)]y_i.$$

Thus, the giving price of tax credit system will be $p_i^c = 1 - m$, which is only dependent on the tax credit rate m , which is exogenously determined by the government. Therefore, the giving price in the tax credit system would not be manipulated by donors.

2.2 Our Identification Strategy

In 2014, aiming at the relaxation of regressivity of giving price, the Korean government reformed tax system again, where the tax credit was introduced instead of tax deduction. Since then, 15% of the total amount of charitable giving has been allowed as a tax credit, which means that the giving price from 2014 is 0.85 irrelevant to the income level.

Summarizing this, compared to tax credit system, the high income household, whose (average) income tax rate is more than 15%, get benefit from charitable giving under the tax deduction system. However, middle or low income households would enjoy tax relief in tax credit system more than tax deduction system. We exploit this policy change as an identification strategy.

² $\tau(\cdot)$ here is a function which shows the average tax rate, which is determined progressively. Since the price elasticity of giving shows the marginal and additional increment for one unit of price reduction increase, we use not average but marginal tax rate to construct the giving price following the literature. Usage of the function of the average tax rate here is for explanatory simplicity.

Table 1: Marginal Income Tax Rate

Income/Year	2008	2009	2010 ~ 2011	2012 ~ 2013	2014 ~ 2016	2017	2018
(A) ~ 1200	8%	6%	6%	6%	6%	6%	6%
(B) 1200 ~ 4600	17%	16%	15%	15%	15%	15%	15%
(C) 4600 ~ 8800	26%	25%	24%	24%	24%	24%	24%
(D) 8800 ~ 15000					35%		35%
(E) 15000 ~ 30000				35%		35%	38%
(F) 30000 ~ 50000	35%	35%	35%		38%	38%	40%
(G) 50000 ~				38%		40%	42%

Notes: Marginal income tax rates applied from 2008 to 2018 are summarized. The income level is shown in terms of 10,000 KRW, which is approximately 10 United States dollars (USD) at an exchange rate of 1,000 KRW to one USD.

2.3 Korean tax reform in 2014

The tax incentives for charitable giving in Korea started in 1967 and the market of charitable giving in Korea totaled 10.9 trillion KRW (approximately 1.09 billion USD, 0.761% of GDP) in 2012 according to the national tax statistics. Since the income tax deduction was initially used as a tax incentive and the marginal income tax rate was determined as Table 1, the minimum giving price before 2014 was 0.62.

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3 Data

In this paper, we use panel data from the National Survey of Tax and Benefit (NasTaB). NasTaB survey is an annual financial panel survey implemented by The Korea Institute of Taxation and Finance to study the tax burden of households and the benefits that households receive from government. The subjects of this survey are general household and household members living in 15 cities and provinces nationwide. This survey is based on a face-to-face interview. If

Table 2: Descriptive Statistics

	N	Mean	Std.Dev.	Min	Median	Max
Charitable Donations						
Annual charitable giving (unit: 10,000KRW)	67848	29.52	132.91	0.00	0.00	10000.00
Dummy of Donation > 0	67848	0.20	0.40	0.00	0.00	1.00
Income, giving price, and tax report						
Annual taxable income (unit: 10,000KRW)	53269	1876.12	2700.97	0.00	900.00	91772.00
First giving price	62877	0.86	0.04	0.62	0.85	0.94
Dummy of tax report	12172	0.48	0.50	0.00	0.00	1.00
Individual Characteristics						
Age	67848	51.35	15.81	24.00	50.00	104.00
Female dummy	67848	0.53	0.50	0.00	1.00	1.00
Employee dummy	42362	0.53	0.50	0.00	1.00	1.00
University graduate	67842	0.41	0.49	0.00	0.00	1.00
High school graduate dummy	67842	0.35	0.48	0.00	0.00	1.00
Junior high school graduate dummy	67842	0.24	0.43	0.00	0.00	1.00

it is difficult for investigators to meet subjects, another family member answers on behalf of him.³

In the analysis, we use data from 2013 to 2019 since we focus on the 2014 tax reform. By this restriction, the most giving price variation relies on the 2014 tax reform because the marginal income tax rate is same in 2012 and 2013. In addition, we exclude the subject of the sample, whose age is under 23, since they are not likely to have income or asset.

Table 2 is summary statistics of our sample. We used four types of variables in this paper: sets of variables about Income and Giving Price, Charitable Donations, Government Efficiency, and Individual Characteristics. A set of variables about Government Efficiency is constructed from the value survey of NasTaB data. Current Tax-Welfare Balance shows how the subject perceives the balance between tax burden and received welfare from the government, while Ideal Tax-Welfare Balance indicates what is the ideal balance between tax burden and received welfare for the subject. The higher values of them means that received welfare from the government is higher than tax burden. We explain the details and constructions of these variables later. The variables about Individual Characteristics, which consist from age, gender and final education levels, are used as control variables.

In the next two subsections, we describe the first two set of variables in detail.

³Note that NasTaB data is constructed as the subjects represent the population of Korean society. This enables us to derive giving price elasticity of population without re-weighting samples, which is used in the extant research. Moreover, note that subjects are not limited to the tax payer or income earner reflecting the population.

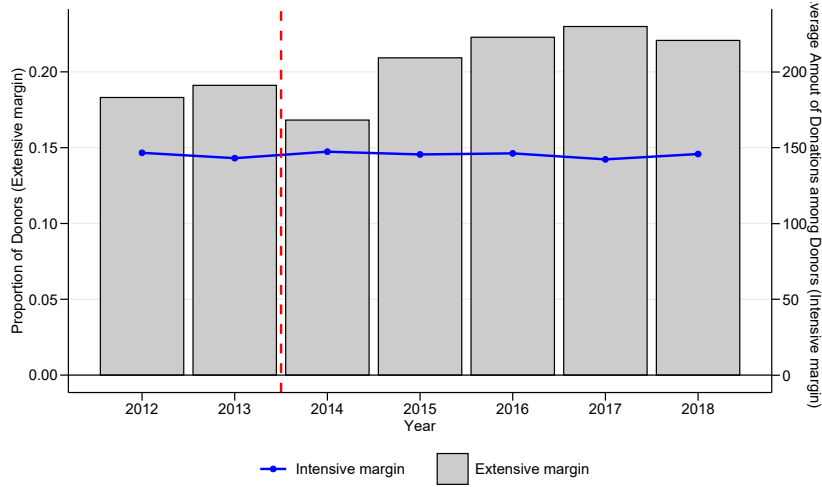


Figure 1: Proportion of Donors and Average Donations among Donors. Notes: The left and right axes respectively measure proportion of donors and the average amount donations among donors. Authors made this graph based on NaSTaB data.

3.1 Charitable Giving

NaSTaB asks respondents to answer the amount of donation.⁴ We use this variable as a first outcome variable when estimating the price effect on the amount of donations among donors (intensive margin). Using this variable, we make a dummy variable taking 1 if respondents donate (Dummy of Donation). This is the second outcome variable to estimate the price effect on the decision of donations (extensive margin).

Table 2 shows that the average amount of donation is almost 300,000 KRW, and the proportion of donors is roughly 20%. Figure 1 shows the time-series of two variables. The blue line shows the average amount of donation among donors. In each year, its value is nearly 1.5 million KRW, which is 7% of average annual taxable income. The grey bar shows the proportion of donors. After the tax reform, the proportion of donors decreases by 2%. After that, the proportion of donors is greater than 20%.

⁴Respondents answer the amount of donation for seven specific purposes last year. Seven specific purposes are political parties, educational organizations, social welfare organizations, organizations for culture and art, religious groups, charity activities organized by religious group, other purposes. We sum up the amount of donations, and consider it as the annual charitable giving.

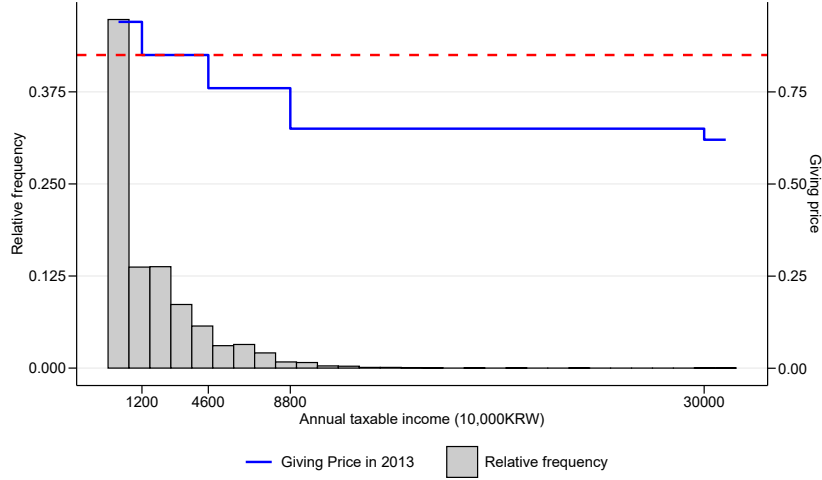


Figure 2: Income Distribution and Giving Price in 2013

3.2 Income and Giving Price

NaSTaB asks respondents to answer the annual income last year. For example, in the 2014 survey, respondents answer the annual income at 2013. In our sample, the average annual taxable income is 18.76 million KRW. According to the National Tax Statistical Yearbook published by Korean National Tax Service, the average annual taxable income is 32.77 million from 2012 to 2018 for employees who submitted the tax return. Since our sample includes subjects with no labor income, such as housewife, our sample mean of income is lower than average income calculated by the public organizations. In Figure 2, the grey bars show the distribution of annual taxable income in 2013. The income distribution is left-skewed.

Using this variable, we construct the giving price under the tax deduction system (2012 and 2013). After the tax reform (after 2014), the giving price is 0.85 under the tax credit system, as we explained in the section 2. In Figure 2, the blue line shows giving price in 2012 and 2013, while the red dashed line shows the giving price after 2014. From this figure, those whose annual income is less than 1200 in 2013 could receive benefit by the 2014 tax reform because the tax reform decreases the giving price. On the other hand, those whose annual income is greater than 4600 in 2013 had a loss by the 2014 tax reform since the tax reform increases the giving price.

4 Estimation

Following Almunia et al. (2020), we estimate giving price elasticity for intensive margin and extensive margin. The elasticity of intensive margin shows how much donors additionally donates reacting to the marginal increase of giving price, while the elasticity of extensive margin shows how much the probability to donate changes reacting to marginal increase of giving price.

We estimate the elasticity of intensive margin using the following specification:

$$\ln g_{it} = \varepsilon_{INT} \ln p_{it} + g_{INT} \ln y_{it} + X_{it}\beta + \mu_i + \iota_t + u_{it}. \quad (1)$$

g_{it} , p_{it} and y_{it} respectively indicates the amount of giving, the giving price, and income of i in year t . μ_i , ι_t and u_{it} are individual fixed effect, year fixed effect and error term, respectively. The individual fixed effect controls for time-invariant individual characteristics. The year fixed effect controls for events that affect all subjects at the same time. X_{it} is a vector of covariates which include variables about education and gender. Moreover, we add some interaction terms between year fixed effect and control variables into X_{it} , since they will control for events that affects subject with specific characteristics at the same time following Zeldow and Hatfield (2019).

The elasticity of extensive margin is estimated using the linear probability model such as

$$D_{it} = \delta \ln p_{it} + \gamma \ln y_{it} + X_{it}\beta + \mu_i + \iota_t + v_{it}. \quad (2)$$

D_{it} is a dummy variable taking 1 if individual i donates at year t and 0 otherwise. Since we use the linear probability model, the estimated coefficient δ represents $\hat{\delta} = \frac{\partial D_{it}}{\partial p_{it}} p_{it}$. Also, the estimated coefficient γ represents $\hat{\gamma} = \frac{\partial D_{it}}{\partial y_{it}} y_{it}$. Thus, the extensive-margin price and income elasticity are $\hat{\delta}/D_{it}$ and $\hat{\gamma}/D_{it}$, respectively. We evaluate the extensive-margin price and income elasticity at sample mean of D_{it} .

Our identification assumption is the *within* price variation is exogenous because we use the fixed effect model. This assumption may be hold if the major *within* price variation comes only from the 2014 tax reform. After the 2014 tax reform (the tax credit system), the giving price is constant across individuals and there is no room for manipulation by donations and income. However, before the 2014 tax reform, the giving price has two potential endogeneity problem: (A) endogeneity of giving price and (B) simultaneous determination of income and donations.

To tackle these problems, we take two methods. The first method deals with the possibility that the giving price is endogenous because the tax payer can reduce their giving price by increasing their amount of donation and shifting

themselves to the lower tax bracket in the tax deduction system. Since this issue does not happen for the first one unit of donation, whose price (“first price”) cannot be changed by adjusting the donation, we use this first price as the giving price in the estimation. The first price is formally defined as the giving price $p_i^d \equiv 1 - \tau(y_i - g_i)$, evaluated at $g_i = 0$. Moreover, this issue does not happen in the tax credit system because the giving price in the tax credit system is exogenously determined by the rate of tax credit allowance. Therefore, we construct the giving price in the tax credit system based on the rate of tax credit allowance.

The second method deals with the issue related to the simultaneous determination of income and donations. Under the tax deduction system, the change of income have effects on both donations through the income effect and the giving price through the marginal tax rate. Therefore, we employ lagged values of taxable income and construct a variable for the change in the first price of giving as following:

$$\ln \left(\frac{p_{it}(y_{it-k} - g_{it-k})}{p_{it-k}(y_{it-k} - g_{it-k})} \right).$$

where $g_{it-k} = 0$. The numerator is the first price that individual i would have faced in year t if she had declared her year $(t - k)$ taxable income at that year. By fixing the income at year $t - k$, the instrument isolates changes in price from income responses to the tax reform. Note that this problem does not happen for the tax credit system, where the giving price is the same across all individuals.

5 Main Results

5.1 Price and Income Elasticity

Before the estimation of giving price elasticities for intensive and extensive margin, we estimate the elasticity without distinguishing them. We call this elasticity as overall elasticity. Table 3 shows estimation results of overall elasticity. The column (1) is the baseline estimation, which include individual and time fixed effects. The price elasticity is roughly -1, which is statistically significant different from zero. This implies that 1% increase of giving price raise charitable giving by 1%. This result is in line with previous researches which focus on Western countries. The income elasticity is about 5.3, which is statistically significant different from zero. This implies that 1% increase of annual income raise charitable giving by 5.3%. The remaining four columns control for events that affects subject with specific characteristics at the same time. As a result, the price elasticity is more elastic than the baseline result. The price elasticity lies between -1.3 and -1.1. On the other hand, the income elasticity is less elastic than the baseline result. The income elasticity lies between -5.1 and -4.9.

Table 3: Main Results: Overall Elasticity of First Price

	(1)	(2)	(3)	(4)	(5)
ln(giving price)	-1.072*** (0.202)	-1.264*** (0.213)	-1.291*** (0.230)	-1.114*** (0.229)	-1.241*** (0.227)
ln(annual taxable income)	5.393*** (0.970)	5.080*** (0.964)	5.047*** (0.964)	5.116*** (0.966)	4.946*** (0.949)
Individual FE	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
Age	N	Y	Y	Y	Y
Year x Education	N	N	Y	Y	Y
Year x Gender	N	N	N	Y	Y
Year x Resident Area	N	N	N	N	Y
N	53269	53269	53267	53267	53267
Adjusted R-squared	0.526	0.526	0.526	0.527	0.530

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. When controlling age, we also include its squared term.

Table 4: Main Results: Intensive-Margin Elasticity of First Price

	(1)	(2)	(3)	(4)	(5)
ln(giving price)	-0.593*** (0.203)	-0.838*** (0.212)	-1.016*** (0.232)	-0.893*** (0.243)	-0.904*** (0.249)
ln(annual taxable income)	2.015*** (0.675)	1.562** (0.655)	1.445** (0.647)	1.528** (0.651)	1.571** (0.653)
Individual FE	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
Age	N	Y	Y	Y	Y
Year x Education	N	N	Y	Y	Y
Year x Gender	N	N	N	Y	Y
Year x Resident Area	N	N	N	N	Y
N	11637	11637	11637	11637	11637
Adjusted R-squared	0.675	0.675	0.676	0.676	0.678

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. When controlling age, we also include its squared term.

Table 4 shows the intensive-margin and the extensive-margin elasticities. The first panel shows the intensive-margin elasticity. Compared to the overall elasticity, the price and income elasticity are less elastic. Controlling individual and time fixed effects, the price and income elasticity is about -0.6 and about 2, which are statistically significant different from zero (See the column (1)). Moreover, when we include the interaction term between individual characteristics and year dummies, these values vary. The price elasticity lies between -1.1 and -0.8, and the income elasticity lies between 1.4 and 1.6. Anyway, our conclusion is that the amount of donations is insensitive to the giving price among donors.

Table 5 shows the extensive-margin elasticity. By results of overall elasticities and the intensive-margin elasticities, we expect that the extensive-margin price and income elasticity is more elastic than the overall elasticities. In the column

Table 5: Main Results: Extensive-Margin Elasticity of First Price

	(1)	(2)	(3)	(4)	(5)
ln(giving price)	-0.257*** (0.046)	-0.288*** (0.048)	-0.273*** (0.052)	-0.237*** (0.052)	-0.267*** (0.051)
ln(annual taxable income)	1.175*** (0.223)	1.124*** (0.223)	1.125*** (0.223)	1.139*** (0.224)	1.102*** (0.220)
Implied price elasticity	-1.176*** (0.210)	-1.320*** (0.221)	-1.250*** (0.239)	-1.086*** (0.238)	-1.221*** (0.235)
Implied income elasticity	5.379*** (1.023)	5.145*** (1.021)	5.148*** (1.023)	5.212*** (1.024)	5.045*** (1.005)
Individual FE	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
Age	N	Y	Y	Y	Y
Year x Education	N	N	Y	Y	Y
Year x Gender	N	N	N	Y	Y
Year x Resident Area	N	N	N	N	Y
N	53269	53269	53267	53267	53267
Adjusted R-squared	0.458	0.458	0.458	0.458	0.462

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. When controlling age, we also include its squared term. The implied extensive-margin price elasticity is evaluated at the sample mean of D_{ijt} .

(1), the coefficient of logged giving price and logged annual income are -0.257 and 1.175 respectively, which are statistically significant different from zero. Since we use the linear probability model, we need to calculate $\epsilon_{EXT}^p = -0.257/D_{it}$ and $\epsilon_{EXT}^y = 1.175/D_{it}$ to obtain the price and income elasticity, respectively. Especially, the coefficient of logged giving price represents the lower-bound of price elasticity because the variable D_{it} takes either 0 or 1. When we evaluate the price elasticity at the sample mean of D_{it} , the implied price elasticity is -1.264, which is slightly more elastic than the overall one. Also, we evaluate the income elasticity at the sample mean of outcome. The implied income elasticity is 5.778, which is slightly more elastic than the overall one. Although the implied price and income elasticity varies with covariates, results are in line with our expectation. Thus, the decision of donations is sensitive to the giving price and annual income.

In summary, our first conclusion is that the decision of donations is sensitive to the giving price, and the amount of donations is insensitive to the giving price once they decide to donate. In the next subsection, we check the robustness of our first conclusion, using three methods.

5.2 Robustness Check

The first robustness check estimates the last price elasticity using the first price of giving as an instrument. Our main results show that *first* price elasticity to avoid the endogeneity of giving price. However, the first price elasticity is not realistic because people face the *last* marginal price when deciding amount

Table 6: Overall Elasticity of Last Price

	(1)	(2)	(3)	(4)	(5)
ln(last giving price)	-2.421*** (0.204)	-2.536*** (0.216)	-2.750*** (0.233)	-2.529*** (0.231)	-2.650*** (0.229)
ln(annual taxable income)	5.258*** (0.961)	5.072*** (0.961)	4.981*** (0.959)	5.058*** (0.961)	4.910*** (0.948)
Individual FE	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
Age	N	Y	Y	Y	Y
Year x Education	N	N	Y	Y	Y
Year x Gender	N	N	N	Y	Y
Year x Resident Area	N	N	N	N	Y
N	52304	52304	52302	52302	52302
Adjusted R-squared	0.529	0.529	0.529	0.530	0.533

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. The instrumental variable is the first giving price in year t . When controlling age, we also include its squared term.

of donations. Thus, we estimate the *last* price elasticity, using the Panel IV method.

There is one caution to interpret the last price elasticity. Under the tax credit system, the last price elasticity is equivalent to the first one. Since major observation units are observed when the tax credit system is implemented, the last giving price is strongly correlated with the first one. In other words, covariates between the last and first giving price is roughly equal to one. In the first stage, the coefficient of first giving price is roughly 0.98 in any specifications.⁵ Thus, our last price elasticity may be upper bound of true price elasticity.

The last price elasticity is in line with our first conclusion. Table 6 shows overall last price elasticity. Compared to the main results, the last price elasticity is more elastic. The absolute value of estimated coefficient is larger than 2.4, which is statistically significant different from zero. This implies that 1% increase of last price decreases charitable contributions by 2.4% or more. Table 7 and 8 shows the intensive-margin and extensive-margin last price elasticity. In the first panel, the intensive-margin last price elasticity is similar value to the main results. Its absolute value lies between 0.89 and 1.2. These results are statistically different from zero. In the second panel, the coefficient of logged last price, which represents the lower bound of last price elasticity, lies between -0.63 and -0.59. The implied last price elasticity evaluated at the sample mean of D_{it} is roughly -3. These results are statistically significant different from zero, and more elastic than the first price elasticity.

In the second robustness check, we try to control the manipulation of giving price by adjusting income level using two datasets whose ranges are (i) from 2013 to 2018 and (ii) from 2013 to 2014. Under the tax deduction system, the

⁵We do not show the first-stage results. Instead, we show the F-statistics of the instrument variable.

Table 7: Intensive-Margin Elasticity of Last Price

	(1)	(2)	(3)	(4)	(5)
ln(last giving price)	-0.898*** (0.271)	-0.961*** (0.271)	-1.197*** (0.307)	-0.998*** (0.325)	-1.074*** (0.332)
ln(annual taxable income)	2.024*** (0.694)	1.638** (0.678)	1.460** (0.667)	1.530** (0.670)	1.572** (0.667)
Individual FE	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
Age	N	Y	Y	Y	Y
Year x Education	N	N	Y	Y	Y
Year x Gender	N	N	N	Y	Y
Year x Resident Area	N	N	N	N	Y
N	10672	10672	10672	10672	10672
Adjusted R-squared	0.671	0.671	0.672	0.672	0.674

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. The instrumental variable is the first giving price in year t . When controlling age, we also include its squared term.

Table 8: Extensive-Margin Elasticity of Last Price

	(1)	(2)	(3)	(4)	(5)
ln(last giving price)	-0.623*** (0.046)	-0.630*** (0.049)	-0.644*** (0.053)	-0.593*** (0.052)	-0.619*** (0.052)
ln(annual taxable income)	1.125*** (0.221)	1.113*** (0.223)	1.103*** (0.223)	1.121*** (0.223)	1.090*** (0.220)
Implied price elasticity	-3.052*** (0.227)	-3.090*** (0.239)	-3.156*** (0.258)	-2.907*** (0.257)	-3.035*** (0.254)
Implied income elasticity	5.514*** (1.084)	5.453*** (1.092)	5.407*** (1.092)	5.494*** (1.095)	5.343*** (1.078)
Individual FE	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
Age	N	Y	Y	Y	Y
Year x Education	N	N	Y	Y	Y
Year x Gender	N	N	N	Y	Y
Year x Resident Area	N	N	N	N	Y
N	52304	52304	52302	52302	52302
Adjusted R-squared	0.464	0.464	0.464	0.465	0.469

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. The instrumental variable is the first giving price in year t . When controlling age, we also include its squared term. The implied extensive-margin price elasticity is evaluated at the sample mean of D_{ijt} .

Table 9: Overall Elasticity with Short-Period Panel

	After 2012		2013 and 2014	
	(1)	(2)	(3)	(4)
ln(giving price)	-1.014*** (0.255)	-1.286*** (0.290)	-1.398*** (0.289)	-1.686*** (0.338)
ln(annual taxable income)	5.108*** (1.009)	4.743*** (0.990)	4.013** (1.948)	3.035 (1.992)
Individual FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
Other Controls	N	Y	N	Y
N	45994	45992	14893	14893
Adjusted R-squared	0.535	0.538	0.590	0.592

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. Other controls are age (its squared value), the interaction between year dummies and education dummies, the interaction between year dummies and gender dummies, and the interaction between year dummies and resident area.

giving price can be manipulated by income level, though it cannot under the tax credit system. Therefore, if we use the dataset which contains data under the the tax deduction system, the estimator may capture the effect of price change which is caused not by tax reform but by price manipulation by income adjustment. To address this issue, we use dataset in which the time range under the tax deduction system is shorter than the baseline analysis. By doing this exercise, we try to suppress the effect which comes from the price change due to the change of income.

Table 9 shows the overall first giving price elasticity. When we use data from 2013 to 2018, the estimated price elasticity is similar value to the main results. On the other hand, when we use data from 2013 to 2014, the estimated price elasticity is more elastic than the main results. The estimated absolute value is roughly -1.7 when we control covariates and its interaction with year dummies. This value is statistically significant different from zero.

Table 10 and 11 shows the intensive-margin and the extensive-margin first price elasticity. The first panel shows the intensive-margin elasticity. When we use data from 2012 to 2018, the intensive-margin price elasticity is similar to the main results, which is statistically significant from zero. However, when we use data from 2013 to 2014 and include only individual and time fixed effects, the estimated coefficient is statistically insignificant different from zero. By controlling covariates and its interaction with year dummies, the intensive-margin price elasticity is -0.712, which is statistically significant. The second panel shows the extensive-margin elasticity. When we use data from 2012 to 2018, the extensive-margin price elasticity is similar to the main results, which is statistically significant. When we use data from 2013 to 2014, the extensive-margin price elasticity is more elastic than the main results. Its absolute value is roughly -2, which is statistically significant.

Table 10: Intensive-Margin Elasticity with Short-Period Panel

	After 2012		2013 and 2014	
	(1)	(2)	(3)	(4)
ln(giving price)	-0.647*** (0.236)	-1.129*** (0.291)	-0.394 (0.310)	-0.712** (0.363)
ln(annual taxable income)	1.943*** (0.662)	1.714*** (0.649)	1.440 (2.975)	1.047 (3.072)
Individual FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
Other Controls	N	Y	N	Y
N	10158	10158	2922	2922
Adjusted R-squared	0.684	0.687	0.735	0.737

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. Other controls are age (its squared value), the interaction between year dummies and education dummies, the interaction between year dummies and gender dummies, and the interaction between year dummies and resident area.

Table 11: Extensive-Margin Elasticity with Short-Period Panel

	After 2012		2013 and 2014	
	(1)	(2)	(3)	(4)
ln(giving price)	-0.235*** (0.058)	-0.269*** (0.065)	-0.331*** (0.065)	-0.383*** (0.076)
ln(annual taxable income)	1.093*** (0.230)	1.024*** (0.226)	0.801* (0.428)	0.574 (0.447)
Implied price elasticity	-1.064*** (0.262)	-1.217*** (0.294)	-1.689*** (0.333)	-1.951*** (0.387)
Implied income elasticity	4.951*** (1.043)	4.638*** (1.024)	4.082* (2.181)	2.926 (2.279)
Individual FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
Other Controls	N	Y	N	Y
N	45994	45992	14893	14893
Adjusted R-squared	0.465	0.469	0.524	0.525

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. Other controls are age (its squared value), the interaction between year dummies and education dummies, the interaction between year dummies and gender dummies, and the interaction between year dummies and resident area. The implied extensive-margin price elasticity is evaluated at the sample mean of D_{ijt} .

Table 12: Estimation of Overall Elasticity with k -th Difference Model

	(1)	(2)	(3)
1-year lagged difference of first price (log)	-1.894*** (0.389)		
1-year lagged difference of annual income (log)	2.737*** (1.042)		
2-year lagged difference of first price (log)		-2.158*** (0.355)	
2-year lagged difference of annual income (log)		4.661*** (1.139)	
3-year lagged difference of first price (log)			-1.805*** (0.345)
3-year lagged difference of annual income (log)			5.422*** (1.181)
Individual FE	Y	Y	Y
Time FE	Y	Y	Y
Other controls	Y	Y	Y
N	49014	46587	44142
Adjusted R-squared	-0.153	-0.082	-0.024

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. The lagged difference of first price (log) is $\ln(\text{Price}_{ijt}^k) - \ln(\text{Price}_{ij(t-k)})$, where Price_{ijt}^k calculates the giving price under the tax system in year t , using annual taxable income in year $t - k$, $\text{Income}_{ij(t-k)}$. The lagged of annual income (log) is $\ln(\text{Income}_{ijt}) - \ln(\text{Income}_{ij(t-k)})$. Other controls are lagged difference of age, lagged difference of squared age, the interaction between year dummies and education dummies, the interaction between year dummies and gender dummies, and the interaction between year dummies and resident area.

The third robustness check is to estimate the k -th difference model. The tax reform may have impacts on the giving price in two ways: one is direct giving price change by tax reform and the other is indirect change via wealth effect, which is induced by tax reform. Thus, to isolate the direct effect of the tax reform, we use the information of income level k years before. Concretely speaking, we estimate the k -th difference model formulated as follows:

$$\Delta^k \ln g_{it} = \delta \Delta^k \ln p_{it} + \gamma \Delta^k \ln y_{it} + \Delta^k X_{it} \beta + \mu_i + \iota_t + v_{it},$$

where $\Delta^k \ln g_{it} = \ln g_{it} - \ln g_{it-k}$ and $\Delta^k \ln y_{it} = \ln y_{it} - \ln y_{it-k}$.

The variable $\Delta^k p_{it}$ is defined as $\Delta^k p_{it} \equiv \ln p_{it}(y_{it-k}) - \ln p_{it}(y_{it-k})$.⁶ The variation of this variable comes from the tax reform because we fix the annual income at year $t - k$. Therefore, we can interpret this coefficient as the giving price elasticity due to the tax reform. In particular, the estimated δ implies that 1% increase of the change of giving price leads to $\hat{\delta}\%$ increase of the change of charitable giving. Note that we do not estimate the extensive-margin elasticity because it is hard to interpret this estimation equation when we use $\Delta^k D_{it}$ as an outcome variable.

⁶Under the tax credit system, the giving price does not depend on income y_{it-k} . If the tax credit system is implemented in year t and $t - k$, then the value of $\Delta^k p_{it}$ takes zero.

Table 13: Estimation of Intensive-Margin Elasticity with k th Difference Model

	(1)	(2)	(3)
1-year lagged difference of first price (log)	-1.852** (0.763)		
1-year lagged difference of annual income (log)	2.222 (1.715)		
2-year lagged difference of first price (log)		-2.274*** (0.621)	
2-year lagged difference of annual income (log)		4.601** (1.789)	
3-year lagged difference of first price (log)			-2.243*** (0.550)
3-year lagged difference of annual income (log)			5.826*** (2.166)
Individual FE	Y	Y	Y
Time FE	Y	Y	Y
Other controls	Y	Y	Y
N	10939	10505	10040
Adjusted R-squared	0.137	0.191	0.220

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. The lagged difference of first price (log) is $\ln(\text{Price}_{ijt}^k) - \ln(\text{Price}_{ij(t-k)})$, where Price_{ijt}^k calculates the giving price under the tax system in year t , using annual taxable income in year $t-k$, $\text{Income}_{ij(t-k)}$. The lagged of annual income (log) is $\ln(\text{Income}_{ijt}) - \ln(\text{Income}_{ij(t-k)})$. Other controls are lagged difference of age, lagged difference of squared age, the interaction between year dummies and education dummies, the interaction between year dummies and gender dummies, and the interaction between year dummies and resident area.

Table 12 and 13 shows results of k -th difference model. The first panel shows the overall elasticity. When we take the one year lag ($k = 1$), the overall price elasticity is roughly -1.9, which is statistically significant. This elasticity slightly varies when we take the two or more year lag ($k > 1$). The overall price elasticity lies between -2.1 and -1.7, which is statistically significant. This implies that the overall price elasticity obtained by this model is more elastic than the main results. The second panel shows the intensive-margin elasticity. When we take the one year lag ($k = 1$), the intensive-margin price elasticity is roughly -1.8, which is statistically significant. The absolute value of the price elasticity is more than 2 when we take two or more year lag ($k > 1$). Thus, contrary to our first conclusion, this model implies that the amount of donations is sensitive to the giving price once we decide to donate.

In summary, the result shows that the size of estimated elasticity may vary depending on the estimation methods. This may be because the sample size is small compared to the extant research. However, our three robustness checks are in line with the baseline result, which shows that the price elasticity of intensive margin is less elastic than one of extensive margin. Thus, the obtained results suggest that the decision to donate is sensitive to the giving price, though the amount of donations is insensitive to the giving price once they decide to donate.

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