

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

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## Abstract

This paper investigates the price elasticity of charitable giving utilizing South Korean tax reform in 2014, when the tax relief on charitable giving changed from tax deduction to tax credit. Although many research on the price elasticity of charitable giving use tax return data or ignore declaration cost for charitable giving to receive tax relief, this paper uses a survey panel data and considers the existence of declaration cost for tax reliefs on charitable giving. By considering the declaration of charitable giving and exploiting the different declaration cost between wage earners and self-employed workers as instrument variable (IV), we estimate the giving price elasticity on the donation. As a result, we find that the estimation about the price elasticity is almost -1 in terms of intensive margins. Moreover, our estimation suggest that the price elasticity for the extensive margins is , which implies that there is a fixed cost for charitable giving.

**Key words:** Charitable giving Giving price Tax reform South Korea

**JEL Codes:** D91I10I18

## 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. As Saez (2004) shows, it is known that the price elasticity of charitable donations is a key parameter to evaluate the welfare implication. To evaluate the effect of tax relief, many empirical papers investigate the elasticity of charitable donations with respect to their tax price and find that the price elasticity is around -1 in terms of intensive margin, using the data from tax record (Almunia et al., 2020; Auten et al., 2002; Bakija and Heim, 2011; Fack and Landais, 2010; Randolph, 1995).

However, there are two issues of the estimation as for the declaration of tax and charitable giving. First issue is about the sample selection. Most of the analysis based on tax record only

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captures the effect for tax filers, while charitable donation may also be conducted by those who do not declare their tax. Thus, as some papers such as Rehavi and Shack (2013) and Backus and Grant (2019) point out, the estimation based on the tax return data will contain the sample selection bias.

Second issue is that the declaration for charitable giving (not the declaration of tax) is endogenous to the price of charitable giving. This is because the declaration for charitable giving is required to apply for the tax relief on charitable giving, and the effect of giving price on the amount of giving may represent the difference of declaration costs for charitable giving. Since this issue does not resolved even if the data of non tax filers are available, few studies take this issue into account on the estimation<sup>1</sup>.

Considering these issues, this paper investigates the price elasticity of giving. To derive the elasticity, this paper utilizes the South Korean (Korea hereafter) 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. The Korean tax reform in 2014 started to allow 15% of the total amount of charitable giving as a tax credit for all taxpayers, which means that the giving price for 1 KRW donation is 0.85 KRW.<sup>2</sup> Since the giving price was determined according to the marginal tax rate of progressive income tax before 2014, this tax reform reduced the giving price for low income taxpayers while it increased the price for high income tax payers. Since the variation of giving price can be considered to be exogenous for taxpayers, we exploit this reform and conduct the difference-in-difference (DID) analysis for identification.

This paper contributes the literature about the charitable giving tax system for the following points. Firstly, to overcome the issue of tax declaration, this paper use the Korean survey panel data called the National Survey of Tax and Benefit (NaSTaB). Since NaSTaB data contains the data of charitable giving irrespective of declarations, the estimation should be free from the sample selection bias. Moreover, by using the survey data, we could consider the sample of low-income household, since the main part of tax return data is the data about wealthy people. This is particularly important for the estimation of the price elasticity in terms of the extensive margin since the propensity of donation by low-income households would be less than high-income households.

Secondly, for the issue of charitable giving declaration, we focus on the fact that wage earners can easily declare tax relief in their company while self-employed workers have to declare tax relief via tax agency in Korea. By utilizing this difference of declaration costs between wage earners and self-employed workers as an instrument variable (IV), we estimate the price elasticity eliminating

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<sup>1</sup>@Almunia2020 considers the existence of declaration cost by using structural estimation, but they use tax return data, the usage of which will cause the sample selection bias.

<sup>2</sup>1 KRW is approximately 0.001 USD. In other words, 1 USD is about 1,000 KRW.

endogeneity between declaration for charitable giving and price of charitable giving.

Thirdly, this paper is the first paper to examine the giving price elasticity in a non-Western country. While the giving behavior may be affected by the cultural matter such as the religious belief, the estimated price elasticity in this paper is in line with the result of the extant papers.

In addition, our paper considers several endogeneity issues which have been pointed out in the literature. As a result, we find that the estimated giving price elasticity is about -1, which many papers have shown and indicates.

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 price elasticity using the applicable giving price and section 6 shows the analysis using the effective giving price. Section 7 concludes.

## 2 Institutional background and Sources of endogeneity

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

### 2.1 Declaration of tax relief and giving price

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. Following (Andreoni1990?), consider that a household chooses private consumption ( $x_i$ ), charitable giving ( $g_i$ ), and the level of public good ( $G$ ).  $G$  is the total amount of public good, and  $G = \sum_i^N g_i + G_0$  holds, where  $N$  is the total number of individuals and  $G_0$  is the public good provision from the government. Let  $y_i$  and  $G_{-i}$  be pre-tax total income and public good provision from the others than  $i$ , respectively. Then, the objective and the budget constraint can be shown as

$$\begin{aligned} \max_{x_i, g_i, G, R_i} & U(x_i, g_i, G) \\ \text{s.t. } & x_i + g_i = y_i - R_i K - R_i T(y_i, g_i) - (1 - R_i) T(y_i), G = g_i + G_{-i}. \end{aligned}$$

$T$  is tax amount which depends on the pre-tax income and charitable giving.  $R_i$  is the dummy

which takes 1 if  $i$  declares the tax relief and 0 otherwise.  $K$  is a cost for the declaration of charitable giving, which may not be monetary cost but is converted to pecuniary terms.

Tax payers declare their charitable giving if its benefit exceeds its cost, which means

$$R_i = \begin{cases} 1 & \text{if } T(y_i, g_i) - T(y_i) > K \\ 0 & \text{if } T(y_i, g_i) - T(y_i) \leq K. \end{cases} \quad (1)$$

This means that the decision of declaration depends on  $y_i$ ,  $g_i$  and  $K$ . For a while, we assume that  $K = 0$ , therefore  $R_i = 1$ .

Under the tax deduction, the amount of tax is

$$T(y_i, g_i) = T(y_i - g_i), \text{ where } T'_i(\cdot) > 0, T''_i(\cdot) > 0 \quad (2)$$

while the amount of tax under the tax credit system is

$$T(y_i, g_i) = T(y_i) - mg_i, \text{ where } T'_i(\cdot) > 0, T''_i(\cdot) > 0. \quad (3)$$

Therefore, the marginal giving price compared to private consumption is  $1 - R_i T'(y_i - g_i)$  in the tax deduction regime and is  $1 - R_i m$  in the tax credit regime<sup>3</sup>. Let us denote  $p$  and  $\tau$  to show the giving price compared to private consumption and the tax rate applied when the charitable giving is declared, respectively. Then, the budget constraint will be

$$y_i - \tau y_i = x_i + p(G - G_{-i}).$$

and the optimization problem can be rewritten as

$$\max_G U(y_i - \tau y_i - p(G - G_{-i}), G - G_{-i}, G).$$

Therefore, given  $y_i$ ,  $G_{-i}$ , and  $p$ ,  $G$  can be determined as

$$G = f\left(\frac{1}{p}y_i(1 - \tau) - G_{-i}, G_{-i}\right),$$

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<sup>3</sup>This can be derived from the total differentiation of the budget constraint by  $x_i$  and  $g_i$ , i.e.  $dx_i = (1 - R_i T_g(y_i, g_i))dg_i$ .

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.

and  $g_i$  will be<sup>4</sup>

$$g_i = f\left(\frac{1}{p}y_i(1 - \tau) - G_{-i}, G_{-i}\right) - G_{-i}. \quad (4)$$

The first and second arguments of  $f$  respectively come from the public goods dimension and the private goods dimension of the utility function. Suppose one unit of  $G_{-i}$  is reduced and simultaneously one unit of  $w_i$  is increased. For a pure-altruist, the second argument of the donations function will be missing and he increases  $g_i$  corresponding to the reduction of  $G_{-1}$ . However, the purely egoistic person will not do so because his first argument of the utility function is missing instead of the second one.

The derivative of this about giving price will be

$$\frac{\partial g_i}{\partial p} = -f_1 y_i (1 - \tau) \frac{1}{p^2} < 0,$$

which means that the giving price works only when people has a pure-altruistic portion in their utility function.

Moreover, we can see that people start to donate only when  $f > G_{-i}$ .

## 2.2 Korean tax reform in 2014

Korean tax system offers a tax relief for charitable giving in income tax. All tax payers have to declare their donation and submit the certificate of charitable giving to receive tax relief, while the taxation method and the way of tax declaration are different for wage earners and self-employed

<sup>4</sup>Strictly speaking,  $p$  and  $\tau$  are endogenous to  $g_i$  under the tax deduction system. We discuss endogenous problems like this later.

workers. Wage earners pay income tax by withholding tax and declare tax relief for charitable giving via their company. Self-employed workers pay income tax by tax-return and declare tax relief when they submit tax return to the National Tax Service. Therefore, there is a difference of declaration cost of tax relief since self-employed workers have to retain the certificate until they submit tax return although wage earners can submit the certificate at any time.

In 2014, aiming at the relaxation of regressivity of giving price, the Korean government reformed tax system, 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 KRW for each 1 KRW of donation 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.

### 2.3 Source of endogeneity

In the literature of giving tax relief, many papers care various issues on the estimation as Table XXX. Most of papers care the issues related to income tax and tax relief system using lead and lag data of income and giving price, and utilize the marginal tax rate when the first dollar of charitable giving is conducted, called “first giving price.”

However, compared to the issues about tax system, the treatment for the other issues varies in each paper. In particular, many paper do not consider the existence of declaration cost of charitable giving. Since those who face lower declaration cost are likely to enjoy tax relief and the giving price does not changed without the declaration for charitable giving, the difference of giving price may just represent the difference of declaration cost. This problem is not resolved even if survey data is used instead of tax return data<sup>5</sup>.

The usage of tax return data will amplify this problem. If charitable giving is declared, the marginal income tax rate is  $T'(y_i - g_i)$  under the tax deduction system and  $T'(y_i)$  under the tax credit system, while, if charitable giving is not declared, the marginal income tax rate is  $T'(y_i)$  under the both system. Therefore, for given  $g_i$ , the difference of the marginal income tax rate

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<sup>5</sup>This is because the usage of survey data does not mean the consideration of declaration cost of each observation.

between whether the declared or not is

$$T'(y_i) - T_y(y_i, g_i) = \begin{cases} T'(y_i) - T'(y_i - g_i) \geq 0 & \text{if tax deduction.} \\ mg_i > 0 & \text{if tax credit.} \end{cases} \quad (5)$$

Considering  $T''(\cdot) > 0$ , this implies that, when the higher marginal tax rate is applied (i.e. the higher  $y_i$  is), the declaration of tax relief mitigate tax payment and  $R_i = 1$  is likely to be hold for given  $x_i$  and  $g_i$  under the tax deduction system. Thus, the high income earners tend to declare charitable giving. Since the tax return data tend to represent the data of high income earners, the issue of declaration may be serious. Moreover, because the tax return data does not contain the information of non-declared charitable giving, the estimated elasticity should be different from the population elasticity, which Saez (2004) shows as a key parameter to obtain implications for welfare<sup>6</sup>.

To overcome the issue about the existence of declaration cost, we use the different declaration cost for charitable giving between self-employed workers and wage earners as an identification source. Since the declaration cost for the self-employed is higher than wage earners in Korea, we use it as an IV in the estimation.

### 3 Data

The National Survey of Tax and Benefit (hereafter, NaSTab) 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 the government. The subjects of this survey are general households and household members living in 15 cities and provinces nationwide. This survey is based on a face-to-face interview.<sup>7</sup> The 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 taxpayer or income earner reflecting the population.

In the analysis, we use data from 2013 to 2017 since we focus on the 2014 tax reform. This is because, as Table 1 shows, the giving price before 2014 was changed frequently and incorporating the data before 2012 captures the effects of another tax reform than the reform in 2014. Note that, since tax credit was introduced after 2014 and the credit rate was unchanged since 2014, the giving

<sup>6</sup>Extending the model of @Saez2004 and @Fack2016, we show in appendix that the public good provision is efficient if the population giving price elasticity is -1 taking the existence of non-declared charitable giving into account.

<sup>7</sup>If it is difficult for investigators to meet subjects, another family member answers on behalf of him.

Table 2: Descriptive Statistics

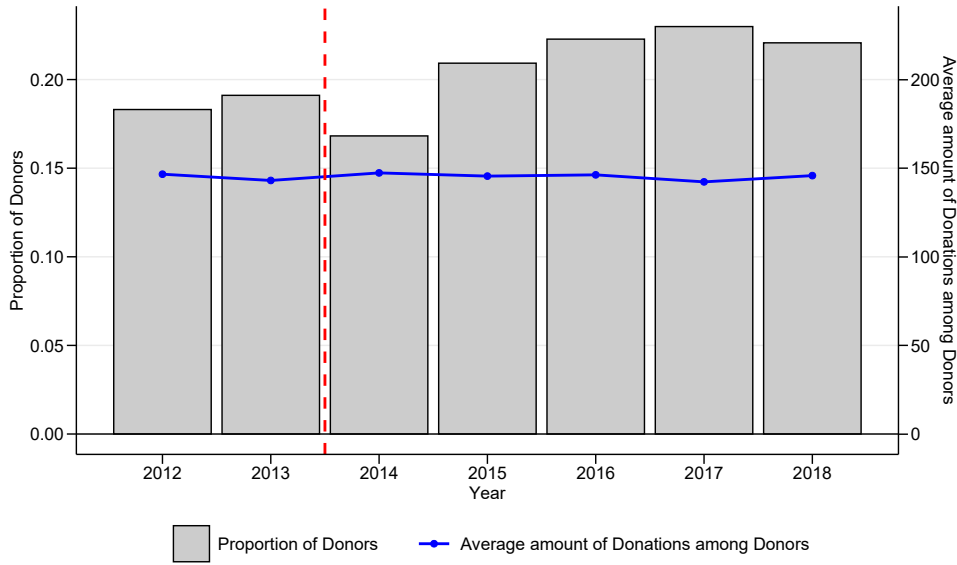
	N	Mean	Std.Dev.	Min	Median	Max
<b>Charitable Donations</b>						
Annual charitable giving (unit: 10,000KRW)	67848	29.52	132.91	0.00	0.00	10000.00
Dummy of Donation > 0	67848	0.20	0.40	0.00	0.00	1.00
<b>Income, giving price, and tax report</b>						
Annual taxable labor income (unit: 10,000KRW)	53269	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 declaration of a tax relief	12172	0.48	0.50	0.00	0.00	1.00
<b>Individual Characteristics</b>						
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

price does not depend on the income tax rate after 2014. In addition, we exclude the subject of the sample, whose age is under 23, since they are not likely to have income or assets.

Table 2 shows summary statistics of our data.<sup>8</sup> The first panel of this table shows variables about charitable giving. The NaSTaB asks respondents to answer the amount of donation last year. This is the first outcome variables. Using this, we make a dummy taking 1 if respondent donated last year. This is the second outcome variables to estimate the price effect on the decision of donations. Table 2 shows that the average amount of donation is almost 300,000 KRW (300 USD), and the proportion of donors is roughly 20%. Figure ?? 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 (1,500 USD), which is 7% of average annual taxable income. The gray bar shows the proportion of donors. After the tax reform, the proportion of donors decreases by 2 percentage points. After that, the proportion of donors is greter than 20%.

<sup>8</sup>Respondents answer the amount of donation for seven specific purposes last year. Seven specific purposes are polITICAL parties, educational organizations, social welfare organizations, organizations for culutre and art, religious groups, charity activies organaized by religious group, other purposes. We sum up the amount of donations, and consider it as the annual charitable giving.





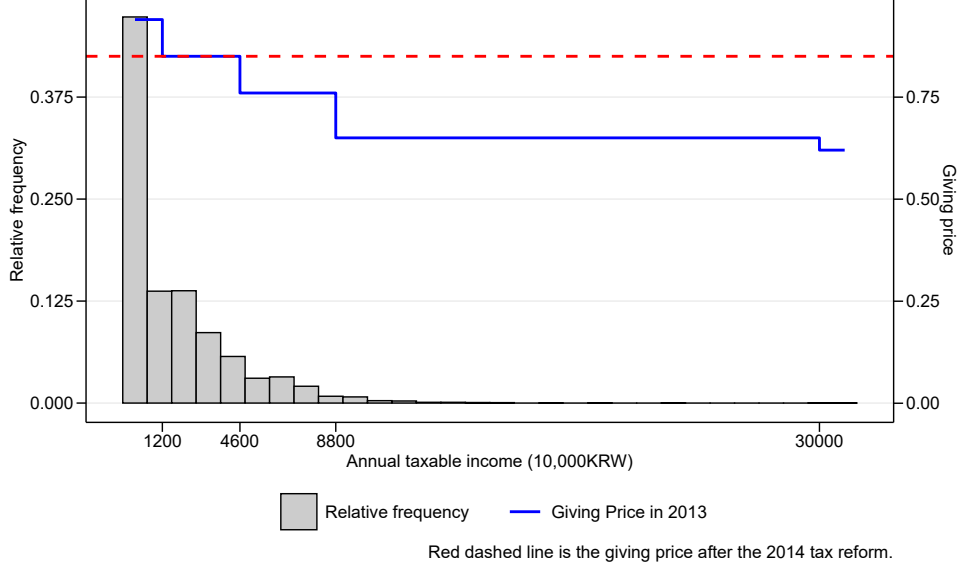
The second panel of Table 2 shows variables about income, tax report, and the giving price. NaSTaB asks respondents to answer the annual labor income last year. In our sample, the average annual taxable income is 18.76 million KRW (18,760 USD). According to the National Tax Statistical Yearbook published by Korean National Tax Service, the average annual taxable income is 32.77 million (32,770 USD) from 2012 to 2018 for employees who submitted the tax return. Since our sample includes subjects with no labor income, such as housewives, our sample mean of income is lower than the average income calculated by the public organizations. In Figure ??, the gray bars show the distribution of annual taxable income in 2013. The income distribution is right-skewed.

Using this variable, we construct the giving price under the tax deduction system (2012 and 2013).<sup>9</sup> After the tax reform (after 2014), the giving price is 0.85 regardless of labor income. as we explained in the section ??. In Figure ??, the blue line shows the 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 120,000,000 KRW (120,000 USD) in 2013 could receive benefit from the 2014 tax reform because the tax reform decreases the giving price. On the other hand, those whose annual income is greater than 460,000,000 KRW (460,000 USD) in 2013 had a loss by the 2014 tax reform since the tax reform increases the giving price.

The NaSTaB also asks respondents to answer whether they declared a tax relief of giving. Although this variable is unique, the sample size is relatively small due to unanswering. This survey investigates separately for the case of *total* income (for example, business income, dividend

<sup>9</sup>The giving price shown in Table 2 is the *first* giving price. The giving price can be manipulated by an amount of donation. To avoid this endogeneity, we use the giving price where the amount of donation is zero. We will discuss this issue in the next section.

income, rental income) and the case of *labor* income. We make a dummy taking one if respondents applied for a total income deduction of giving or a labor income deduction of giving. Table 2 shows the proportion of declaration is about 48%.



## 4 Empirical Strategy

To estimate the giving price elasticity for intensive margin and extensive margin, we use DID analysis which exploit the fact that the giving price was unified in 2014 while the price was different for tax payers with different incomes.

Following Almunia et al. (2020), we estimate the 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.

$$\ln g_{it} = \varepsilon_p^{int} R_{it} \ln p_{it} + \varepsilon_y^{int} \ln y_{it} + X_{it} \beta + \mu_i + \iota_t + u_{it}. \quad (6)$$

$g_{it}$ ,  $p_{it}$  and  $y_{it}$  respectively indicates the amount of giving, the giving price, and income of  $i$  in year  $t$ .  $R_{it}$  is a dummy taking one if individual  $i$  declared a tax relief in year  $t$ .  $\mu_i$ ,  $\iota_t$  and  $u_{it}$  are individual fixed effect, year fixed effect, and the 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 consist of age, education, and gender, and their interaction terms between year fixed effect. The interaction terms

between covariates and year fixed effect will control for events that affect subject with specific characteristics at the same time (Zeldow and Hatfield, 2021).

On the other hand, the elasticity of extensive margin is estimated using the linear probability model such as

$$D_{it} = \delta R_{it} \ln p_{it} + \gamma \ln y_{it} + X_{it}'\beta + \mu_i + \iota_t + v_{it}. \quad (7)$$

$D_{it}$  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  $\delta$  represents  $\hat{\delta} = \frac{\partial D_{it}}{\partial p_{it}} p_{it}$ . Also, the estimated coefficient  $\gamma$  represents  $\hat{\gamma} = \frac{\partial D_{it}}{\partial y_{it}} y_{it}$ . Thus, the implied extensive-margin price and income elasticity are calculated by  $\hat{\delta}/\bar{D}$  and  $\hat{\gamma}/\bar{D}$ , respectively, where  $\bar{D}$  is sample average of outcome variable  $D_{it}$ .

As shown in the section ??, the giving price  $p_{it}$  is defined as follows:

$$p_{it}(y_{it}, g_{it}) = \begin{cases} 1 - \tau_t(y_{it} - g_{it}) & \text{if } t < 2014 \\ 1 - m & \text{if } t \geq 2014 \end{cases}, \quad (8)$$

where  $\tau_t(\cdot)$  is average tax rate in year  $t$ .

Our identification assumption is that the *within* price variation is exogenous due to the fixed effect model. From the equation (8), the within price variation comes from the 2014 tax reform, the within variation of giving  $g_{it}$  and income  $y_{it}$ . Moreover, by the equation (6) and (7), the within price variation comes from tax report  $R_{it}$ . Since these three variables are self-selected, we need to solve three potential endogeneity problems to hold our identification assumption.

As a benchmark, we estimate the equation (6) and (7), assuming that  $R_{it} = 1$  for all  $i$  and  $t$ . This means that we see individuals who did not apply for a tax deduction as those who applied for a tax deduction. In the context of treatment effect literature, we can see the relative price of giving as a treatment assignment. However, individuals can choose whether to receive this treatment by applying for a tax deduction. Although assuming  $R_{it} = 1$  for all  $i$  and  $t$  can ignore this self-selection problem, the estimates of price effect includes the *true* price effect and effect of self-selection of a tax deduction. this treatment effect is sometimes called the “intention-to-treat” effect (ITT). Later, we relax this assumption, using the instrumental variable strategy.

Next, we deal with the possibility that the giving price is endogenous because the taxpayer can reduce their giving price by reducing 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 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 obtained by  $p_{it}^f = p_{it}(y_{it}, g_{it})$  evaluated at  $g_{it} = 0$ . As long as income  $y_{it}$  is exogenous, the within giving price  $p_{it}^f$  is also exogenous. Thus, assuming income  $y_{it}$  is exogenous variable, we first estimate the first-price elasticity with the equation (6) and (7) which replace  $\ln p_{it}$  with  $\ln p_{it}^f$ . Moreover, we also estimate the last-price elasticity, using the first price  $p_{it}^f$  as an instrument.

We can justify the first price method, assuming that income is exogenous. The second approach relaxes this assumption. 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 (Auten et al., 2002; Bakija and Heim, 2011; Randolph, 1995). Therefore, following Bakija and Heim (2011), we employ lagged values of taxable income and construct a variable for the change in the first price of giving as following:

$$\Delta^k \ln p_{it} = \ln \left( \frac{p_{it}^f(y_{it-k})}{p_{it-k}^f(y_{it-k})} \right), \quad (9)$$

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  $t - k$ , this variable 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.

Using this lagged variable, we estimate the  $k$ -th difference model formulated as follows:

$$\Delta^k \ln g_{it} = \varepsilon_p \Delta^k \ln p_{it} + \varepsilon_y \Delta^k \ln y_{it} + \Delta^k X_{it} \beta + \mu_i + \iota_t + v_{it}, \quad (10)$$

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 variation of  $\Delta^k \ln p_{it}$  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. 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.

## 5 Price and Income Elasticity: ITT Approach

In this section, as a benchmark, we first report the price effect on donations, using the ITT approach. Reducing the relative price of giving through a tax deduction includes self-selection of declaration. The ITT approach sees respondents who did not declare a tax relief in a specific year as those who applied for it. In our main results, we report estimation results of price effect, using the first price method. As robustness, we report the last price effect using the first price as an instrumental variable, the first price effect with short-period panel to focus on the 2014 tax reform more precisely, and the  $k$ -th difference model to avoid the problem that income affects the giving price.

### 5.1 Results

Before the estimation of giving price elasticities for intensive and extensive margin, we estimate the elasticity without distinguishing them. We call this elasticity overall elasticity. Table 3 shows estimation results of overall elasticity. Column (1) is the baseline estimation, which includes individual and time fixed effects. The price elasticity is roughly -1, which is statistically significantly different from zero. This implies that a 1% increase of giving price raises charitable giving by 1%. This result is in line with previous researches which focuses on Western countries. The income elasticity is about 5.3, which is statistically significantly different from zero. This implies that a 1% increase of annual income raises charitable giving by 5.3%. The remaining four columns control for events that affect subjects 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 4 shows the intensive-margin elasticities. Compared to the overall elasticity, the price and income elasticities are less elastic. Controlling individual and time fixed effects, the price and income elasticity are about -0.6 and about 2, respectively, which are statistically significantly different from zero (See 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, we conclude that the amount of donations is insensitive to the giving price among donors.

Table 5 shows the extensive-margin elasticities. As a result of overall elasticities and the intensive-margin elasticities, we expect that the extensive-margin price and income elasticity is

Table 3: 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: 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 5: 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  $D_{ijt}$ .

more elastic than the overall elasticities. In column (1), the coefficient of logged giving price and logged annual income are -0.257 and 1.175 respectively, which are statistically significantly different from zero. Due to the linear probability model, the coefficient of logged giving price and logged income represents the lower bound of price and income elasticity, respectively. 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 the outcome. The implied income elasticity is 5.778, which is slightly more elastic than the overall one. Although the implied price and income elasticity vary with covariates, the results are in line with our expectations. 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

*Last Price Elasticity.* 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 problem that giving price depends on an amount of giving. However, the first price elasticity is

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.

not realistic because people face the last marginal price when deciding on an amount of donation. Thus, we estimate the last price elasticity, using the first price as an instrumental variable. The last giving price is strongly correlated with the first one because major observation units are observed when the tax credit system is implemented, and the last price is equivalent to the first one in the case of the tax credit system.<sup>10</sup> Our estimates of the last price effect are not caused by a weak instrument problem. As a result, the intensive-margin elasticity of the last price takes a similar value to the case of the first price, while the overall elasticity and extensive-margin elasticity of the last price are more elastic than the case of the first price. Table 6 shows the overall last price elasticity. Compared to the main results, the last price elasticity is more elastic. The absolute value of the estimated coefficient is larger than 2.4, which is statistically significantly different from zero. This implies that a 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. the intensive-margin last price elasticity is a similar value to the main results. Its absolute value lies between 0.89 and 1.2. These results are statistically different from zero. About the extensive-margin elasticities, 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 significantly different from zero, and more elastic than the first price elasticity.

*Short-Period Panel.* The second robustness check try to control the manipulation of giving price by adjusting income level, using two datasets whose ranges are (i) from 2013 to 2018 and

<sup>10</sup>In fact, in any specifications, the coefficient of the first price is greater than 0.952, and its F-statistics is greater than 6425.96. We do not show the first stage results of the panel IV using the first price as an instrument.



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.

(ii) from 2013 to 2014. Under the tax deduction system, the giving price can be manipulated by income level, though it cannot be under the tax credit system. Therefore, if we use the dataset which contains data under 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 a 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 a 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 their interaction with year dummies. This value is statistically significantly different from zero. Table 10 and 11 shows the intensive-margin and the extensive-margin first price 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 insignificantly different from zero. By controlling covariates and their interaction with year dummies, the intensive-margin price elasticity is -0.712, which is statistically significant. About the extensive-margin price effect, 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  $D_{ijt}$ .

*k-th difference model.* The third robustness check is to estimate the  $k$ -th difference model. As explained in section 4, the giving price depends on income. Thus, there are two paths that income affects charitable giving: (i) income effect; (ii) giving price via manipulation. To tackle with this endogeneity problem, we employ lagged value of giving price fixing income at year  $t - k$ , that is,  $\Delta^k \ln p_{it} = \ln p_{it}(y_{it-k}) - \ln p_{it-k}(y_{it-k})$ .<sup>11</sup> By fixing income, the variation of this lagged variable completely depends on tax reform. Using this variable, we estimate the  $k$ -th difference model (10) shown in the section 4. Table 12 and 13 shows results of  $k$ -th difference model. About 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. About 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 years 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.

### 5.3 Summary of the results in this section

In this section, the results show 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.

These results are obtained by the ITT approach. This means that our estimates obtained in this section reflect not only the true price effect of tax incentive but also the effect of self-selection of declaration. Since the tax reform affects not the only relative price of giving but also the decision-making of a declaration, previous results have some policy implications. If we explicitly control the self-selection of a declaration, we may obtain further policy implications about the tax incentive of charitable giving. In the next section, we report the results of the panel IV method which controls the self-selection of a declaration.

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<sup>11</sup>Under 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 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  $\text{Price}_{ijt}^k$  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 13: Estimation of Intensitve-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  $\text{Price}_{ijt}^k$  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 14: Descriptive Statistics of Declaration among Donors

Year	Declaring a tax relief		Not declaring a tax relief	
	Labor income	Labor and Total income	Labor income	Labor and Total income
2012	53	740	142	136
2013	67	778	157	156
2014	14	443	159	150
2015	21	520	199	191
2016	23	555	211	201
2017	17	657	224	211

## 6 Price Elasticity with Tax Report

### 6.1 Instrumental Variable of Declaration of a Tax Relief

Before describing the strategy of instrumental variables in detail, we show descriptive statistics of a declaration of a tax relief. NaSTaB asks respondents to answer whether to declare a tax relief in the case of labor income and total income separately. Table 14 shows the number of tax deduct among donors in our sample.<sup>12</sup> When we only use information about declaration in the case of labor income, the majority of respondents did not declare a tax relief (see the first and third columns). When we use information about declaration in the case of both labor and total income, we make a dummy taking 1 if respondents declared a tax relief in the case of either labor or total income. As a result, more than half of the respondents declared a tax relief.

If there is no (physical or psychological) cost to declare a tax relief, then all individuals should declare a tax relief. However, as shown in Table 14, declaring a tax relief may incur some costs because some respondents did not declare a tax relief. Employment status is one dimension of variation of applied cost. For the declaration, self-employed workers have to retain the certificate until they submit tax return although wage earners can declare tax relief and submit the certificate through their company at any time. Figure 1 shows that the proportion of declaring a tax relief among employees is higher than the others. Thus, we use employment status as an instrument of a declaration.

Our estimation strategy is the panel IV method to estimate the true price effect. The equation of the first stage is as follows:

$$R_{it} = \alpha_{1i} + \lambda \text{Employed}_{it} + X_{it}\beta_1 + \mu_{i1} + \nu_{t1} + \eta_{it} \quad (11)$$

<sup>12</sup>Due to the small sample, we rule out observations in 2018.

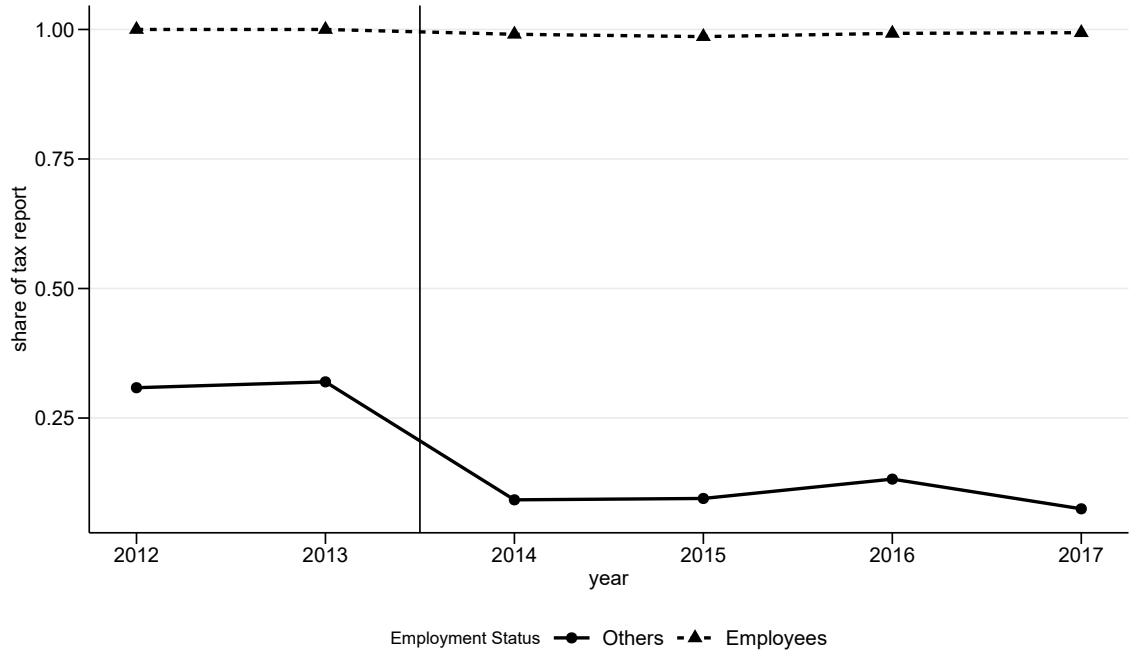


Figure 1: Proportion of declaring a tax relief Grouped by Employment Status. Notes: We restrict sample to those who donated.

where  $R_{it}$  is a dummy of declaration, and  $\text{Employed}_{it}$  is a dummy of employee. After estimating this equation, we calculate the fitted value of  $R_{it}$  denoted by  $\hat{R}_{it}$ . Using the fitted value  $\hat{R}_{it}$ , we estimate the following second-stage equation:

$$Y_{it} = \varepsilon_p^{int} \hat{R}_{it} \ln p_{it}^f + \varepsilon_y^{int} \ln y_{it} + X_{it}\beta + \mu_i + \iota_t + u_{it}. \quad (12)$$

where  $Y_{it}$  is an outcome variable. When we estimate the extensive-margin elasticity, an outcome variable  $Y_{it}$  is a dummy of giving,  $D_{it}$ . When we estimate the intensive-margin elasticity, an outcome variable  $Y_{it}$  is a logged value of giving,  $\ln g_{it}$ . The variable  $\ln p_{it}^f$  is the first price of charitable giving to avoid the problem that the giving price depends on charitable giving.

The instrumental variable  $\text{Employed}_{it}$  must hold independence of  $u_{it}$  conditional on covariates. There are two potential sources to violate this assumption. First, the employment status may produce income variation. If this is true, then the employment status affects charitable giving through an income effect. Second, an opportunity of giving may depend on employment status. For example, a doctor and a public servant may tend to donate than the others. If so, the instrument is correlated with  $u_{it}$ . To avoid this problem, we control incomes and the interaction between year dummies and industry dummies.

Table 15: First-Stage Result: Effect of Employee on Declaration

	(1)	(2)	(3)
employee	0.508*** (0.047)	0.464*** (0.049)	0.457*** (0.050)
Individual and time FE	Y	Y	Y
log(income)	N	Y	Y
Age	N	Y	Y
Year x Education	N	Y	Y
Year x Gender	N	Y	Y
Year x Resident Area	N	Y	Y
Year x Dummy of industry	N	N	Y
F-stat of a dummy of employee	117.23	90.55	84.96
N	11088	11085	10942
Adjusted R-squared	0.918	0.919	0.920

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.

## 6.2 Results

Table 15 shows estimation results of the first stage. As a result, the employed dummy is strongly positively correlated with declaring a tax relief. In any specification, employed dummy increases the probability of declaration by more than 45 percentage points. Moreover, the ratio of coefficient to standard error is greater than nine. This implies that the F-statistics of the instrument is greater than 81 for any specification. Thus, our panel IV method does not have a weak instrument problem. For the second stage, we obtain the predicted value of  $R_{it}$ , using the model (3).

Table 16 reports overall elasticities controlling the self-selection of the tax report. The estimated elasticities are similar value to the benchmark results shown in Table 3. When we only include individual and time fixed effects, the overall elasticity is -2.364. When we control the same covariates as the model (5) in Table 3, the overall elasticity is -1.710. These values are statistically significant, and slightly more elastic than the benchmark results (see the column (1) and (5) in Table 3). Since those who did not apply for the Declaration did not receive the tax incentive actually, these results can be naturally interpretable. Furthermore, when we control the interaction term between year dummies and industry dummies, the result does not change.

In Table 17 and Table 18, we show the intensive-margin elasticity and the extensive-margin elasticity. The estimated elasticities are quite similar to the benchmark results shown in Table 4 and Table 5. Column (2) of Table 17 uses the same covariates as in the benchmark result, the estimated value is similar to the benchmark one (the fifth column of Table 4). About the extensive-margin elasticity, column (2) of Table 18 uses the same covariates as in the benchmark result, the estimated value is similar to the benchmark one (the fifth column of Table 5). When we further control for the



Table 16: Second-Stage Result (Overall Price Elasticity)

	(1)	(2)	(3)
Propensity of Deduction x log(first price)	-2.364*** (0.401)	-1.710*** (0.447)	-1.603*** (0.466)
Individual and time FE	Y	Y	Y
log(income)	N	Y	Y
Age	N	Y	Y
Year x Education	N	Y	Y
Year x Gender	N	Y	Y
Year x Resident Area	N	Y	Y
Year x Dummy of industry	N	N	Y
N	16946	16946	16946
Adjusted R-squared	0.511	0.513	0.514

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. Propensity of Deduction is the predicted value of  $R_{it}$  calculated by the model (3) in Table 15.

Table 17: Second-Stage Result (Intensive-Margin Price Elasticity)

	(1)	(2)	(3)
Propensity of Report x log(first price)	-1.161*** (0.284)	-0.947*** (0.318)	-0.987*** (0.342)
Individual and time FE	Y	Y	Y
log(income)	N	Y	Y
Age	N	Y	Y
Year x Education	N	Y	Y
Year x Gender	N	Y	Y
Year x Resident Area	N	Y	Y
Year x Dummy of industry	N	N	Y
N	5840	5840	5840
Adjusted R-squared	0.696	0.698	0.697

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. Propensity of Deduction is the predicted value of  $R_{it}$  calculated by the model (3) in Table 15.

interaction between year dummies and industry dummies, we can obtain similar estimated values.

We estimate the true price effect using panel IV. As a result, we obtain similar results to the benchmark results shown in Table 3, Table 4, and Table 5.

## 7 Conclusions

In this paper, we investigate the giving price elasticity using South Korean panel data. As a result, we obtain the following findings.

Firstly, our baseline estimation shows that the giving price elasticity in Korea is around -1 even if we take into account the existence of the undeclared charitable giving. Since the literature of

Table 18: Second-Stage Result (Extensive-Margin Price Elasticity)

	(1)	(2)	(3)
Propensity of Deduction x log(first price)	-0.506*** (0.090)	-0.347*** (0.104)	-0.319*** (0.110)
Implied price elasticity	-1.469*** (0.262)	-1.008*** (0.301)	-0.926*** (0.320)
Individual and time FE	Y	Y	Y
log(income)	N	Y	Y
Age	N	Y	Y
Year x Education	N	Y	Y
Year x Gender	N	Y	Y
Year x Resident Area	N	Y	Y
Year x Dummy of industry	N	N	Y
N	16946	16946	16946
Adjusted R-squared	0.426	0.427	0.428

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. Propensity of Deduction is the predicted value of  $R_{it}$  calculated by the model (3) in Table 15. The implied extensive-margin price elasticity is evaluated at the sample mean of  $D_{ijt}$ .

the tax expenditure for charitable giving suggests that the price elasticity is around -1, the result suggests that the effect coming from the existence of the undeclared charitable giving cost may be limited.

Secondly, we find that the estimated price elasticity using the effective giving price takes the similar values from the estimated elasticity in the extant research. It implies that the effect from the declaration cost, which has been ignored, is not so large. Moreover, as well as the baseline result, this result shows that the price elasticity is around -1, which derives the same conclusions as the baseline result.

From the results, we firstly show the giving price elasticity in Korea. However, many things to be considered are remaining. To understand the giving behavior and to contribute the policy making, more sophisticated research is needed.

## References

- Almunia, M., Guceri, I., Lockwood, B., Scharf, K., 2020. More giving or more givers? The effects of tax incentives on charitable donations in the UK. *Journal of Public Economics* 183. doi:10.1016/j.jpubeco.2019.104114
- Auten, G.E., Sieg, H., Clotfelter, C.T., 2002. Charitable giving, income, and taxes: An analysis of panel data. *American Economic Review* 92, 371–382.
- Backus, P.G., Grant, N.L., 2019. How sensitive is the average taxpayer to changes in the tax-price of giving? *International Tax and Public Finance* 26, 317–356. doi:10.1007/s10797-018-9500-9
- Bakija, J., Heim, B.T., 2011. How does charitable giving respond to incentives and income? New estimates from panel data. *National Tax Journal* 64, 615–650. doi:10.17310/ntj.2011.2S.08
- Fack, G., Landais, C., 2010. Are tax incentives for charitable giving efficient? Evidence from france. *American Economic Journal - Economic Policy* 2, 117–141. doi:10.1257/pol.2.2.117
- Randolph, W.C., 1995. Dynamic income, progressive taxes, and the timing of charitable contributions. *Journal of Political Economy* 103, 709–738. doi:10.1086/262000
- Rehavi, M., Shack, D., 2013. Partial reporting: An example from charitable giving. Working paper of University of British Columbia.
- Saez, E., 2004. The optimal treatment of tax expenditures. *Journal of Public Economics* 88, 2657–2684. doi:10.1016/j.jpubeco.2003.09.004
- Zeldow, B., Hatfield, L.A., 2021. Confounding and regression adjustment in difference-in-differences studies. *Health Services Research* n/a. doi:https://doi.org/10.1111/1475-6773.13666