

Charitable Giving, Tax Reform, and Government Efficiency^{*}

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Abstract

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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, n.d.). 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 someone 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

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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 $-1.07 \sim -1.26$, which is within the range of the extant research.

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 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.

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 (Almunia et al., 2020; Auten et al., 2002; Bakija and Heim, 2011; Fack and Landais, 2010; Randolph, n.d.). 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 represents 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 examine¹.

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 both of 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

¹This point may be important since @Kim2021 reports that the giving behavior is strongly affected by the cultural matter such as the religious belief.

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 XXX sections. Section 2 and 3 respectively explain the institutional background and data. Section 4 deals with the analysis of giving price elasticity and section 5 shows the analysis of perceptions toward the government. We discuss the result in section 6 and 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, that is,

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

where $\tau(\cdot)$ is the marginal income tax rate which is determined by $y_i - g_i$. 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,

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

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%			38%
(F) 30000 ~ 50000	35%	35%	35%	38%	38%	38%	40%
(G) 50000 ~					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.

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. Korean tax reform in 2014 (Need modification by Kim san)

The tax incentives for charitable giving in Korea started in 2000. Since the income tax deduction was initially used as a tax incentive and the marginal income tax rate was determined as Figure 1, the minimum giving price before 2014 was 0.62. In addition, the government set the limit of charitable giving deduction, which was initially the 5% of income. The government gradually expanded the limit and it finally became 30% in 2012.

However, the government reformed tax system again in 2014, 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.

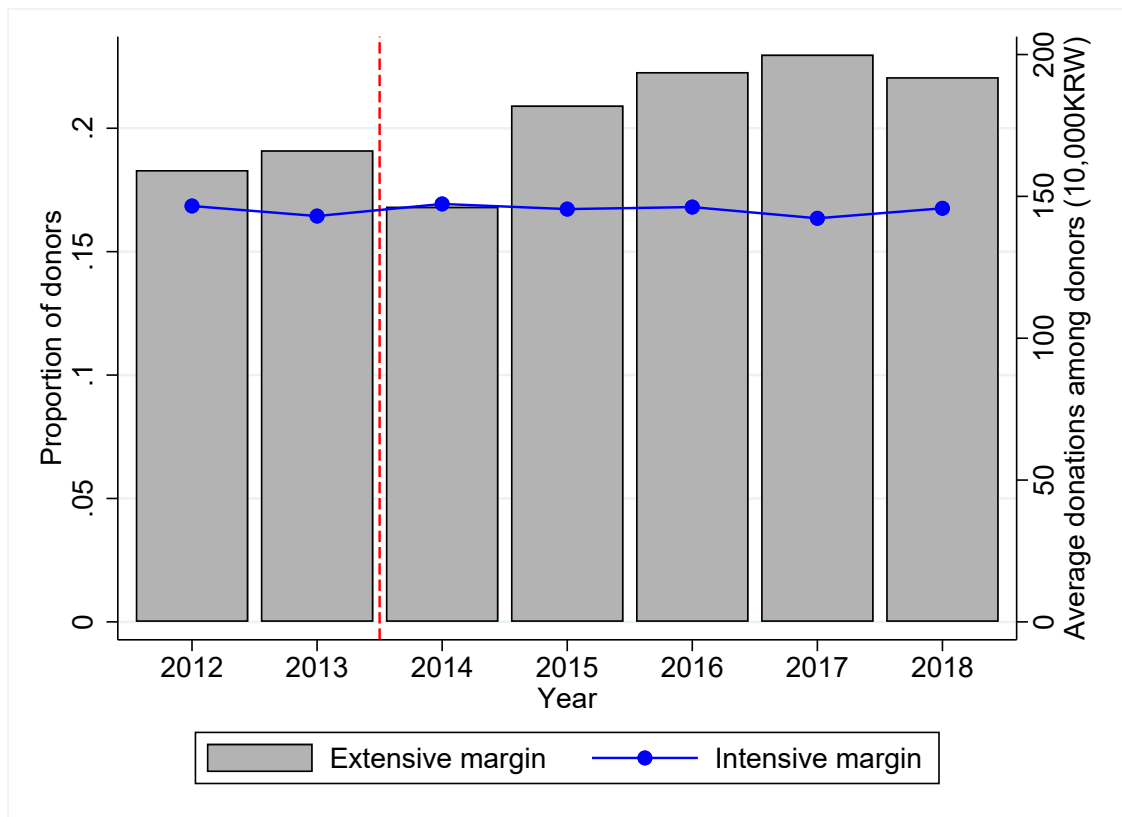


Figure 1: Proportion of Donors and Average Donations among Donors

Additional description needed:

- The limit of tax relief compared to income under the tax credit system (it was 30% in tax deduction system in 2012).
- The reason why the government execute the tax reform (short background)
- Description of donation market in Korea (what % of GDP is the donation market?/ what is the main outlet of the charity fund?)
- Political background

Table 2: Summary Statistics

	N	Mean	Std.Dev.	Min	p25	p50	p75	Max
Income and Giving Price								
Annual taxable income (unit: 10,000KRW)	53269	1876.121	2700.965	0.00	0.00	900.00	2902.445	91772.00
Giving Price	62878	0.858	0.036	0.62	0.85	0.85	0.850	0.94
Charitable Donations								
Annual charitable giving (unit: 10,000KRW)	67849	29.522	132.914	0.00	0.00	0.00	0.000	10000.00
dummy of Donation > 0	67849	0.203	0.402	0.00	0.00	0.00	0.000	1.00
Government Efficiency								
Current Tax-Welfare Balance	29272	-0.137	0.889	-2.00	-1.00	0.00	0.000	2.00
Ideal Tax-Welfare Balance	29273	0.541	0.721	-2.00	0.00	0.00	1.000	2.00
Individual Characteristics								
Age	67848	51.348	15.806	24.00	39.00	50.00	62.000	104.00
Female dummy	67848	0.525	0.499	0.00	0.00	1.00	1.000	1.00
University graduate	67842	0.411	0.492	0.00	0.00	0.00	1.000	1.00
High school graduate	67842	0.350	0.477	0.00	0.00	0.00	1.000	1.00
Junior high school graduate	67842	0.238	0.426	0.00	0.00	0.00	0.000	1.00

Table 3: Main Results

	(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(aunaul taxable income)	5.392*** (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
R-sq	0.009	0.010	0.010	0.011	0.020

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.

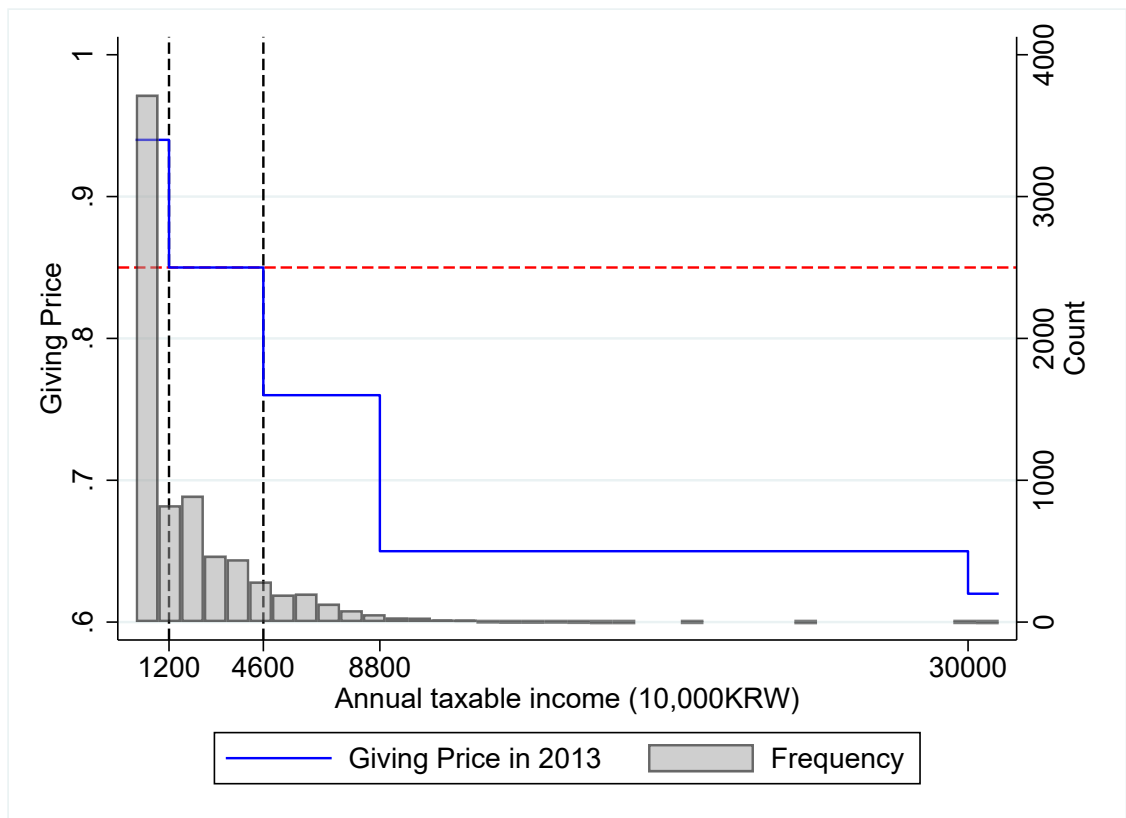


Figure 2: Income Distribution and Giving Price in 2013

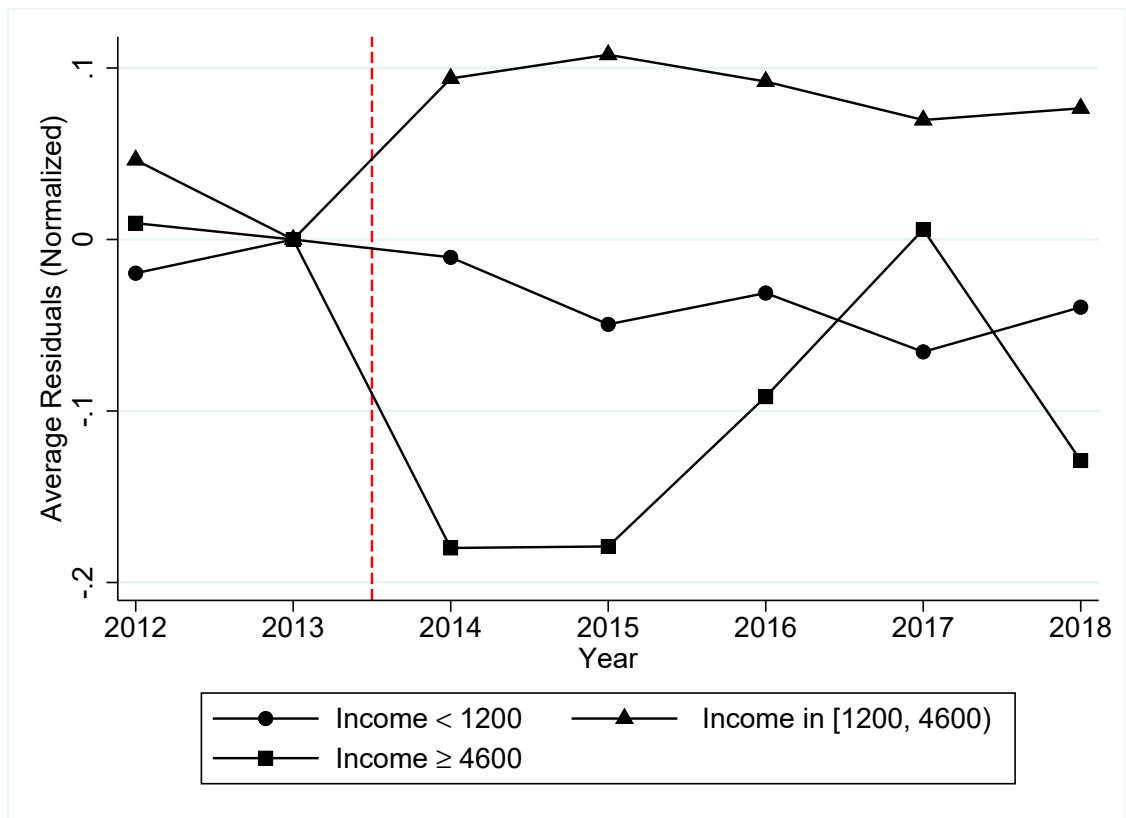


Figure 3: Average Residuals Grouped by Year and Tax-Reform Benefit Group

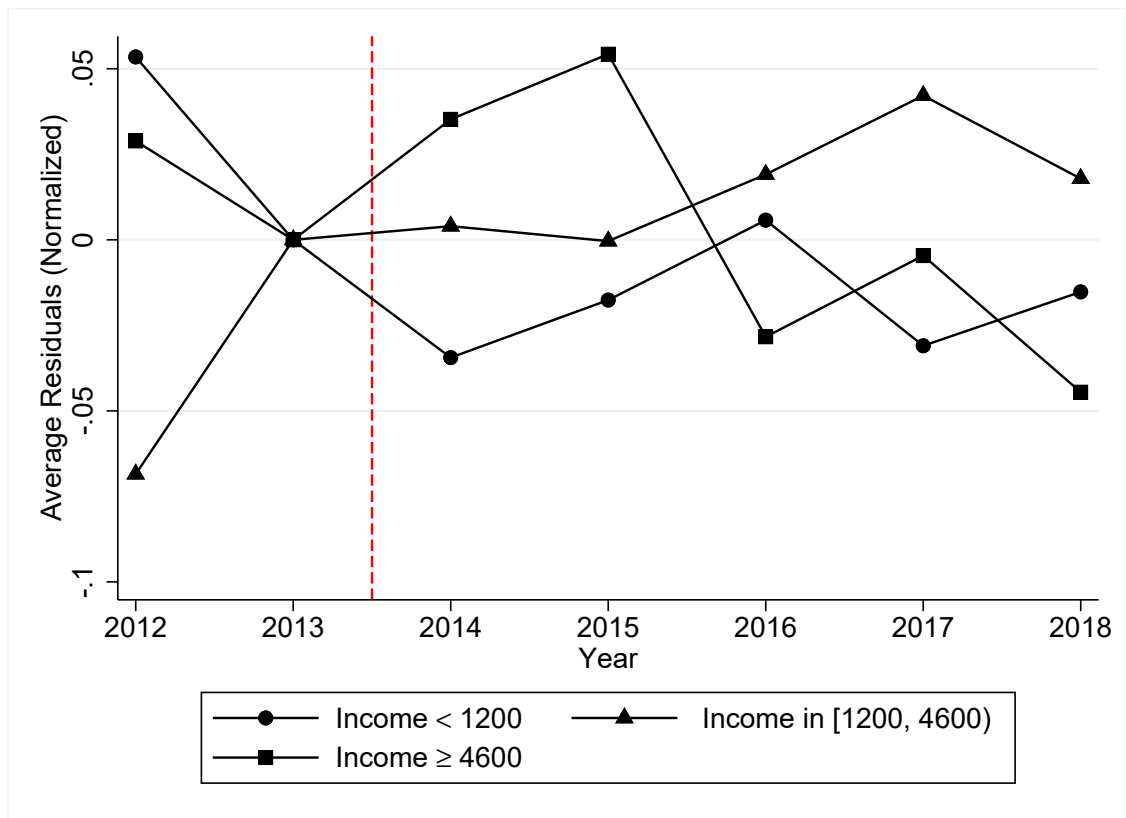


Figure 4: Average Residuals Grouped by Year and Tax-Reform Benefit Group (Intensive Margin)

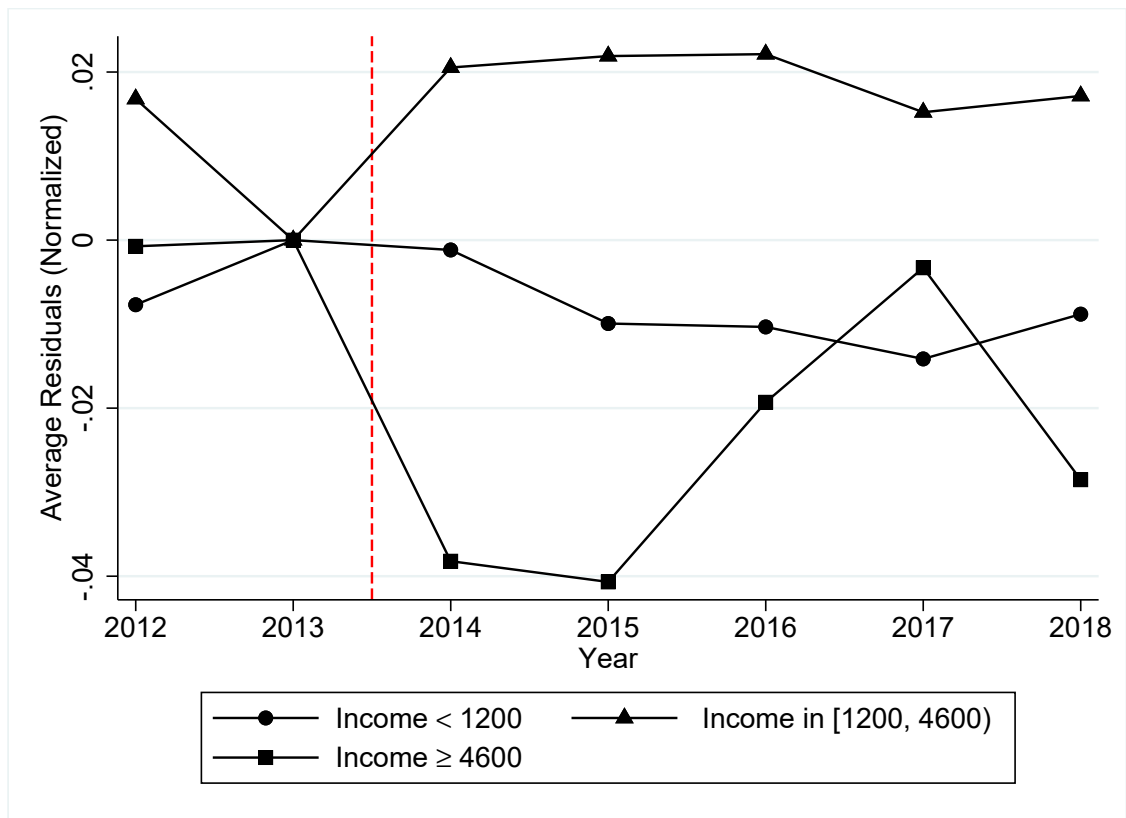


Figure 5: Average Residuals Grouped by Year and Tax-Reform Benefit Group (Extensive Margin)

Table 4: Main Results: Intensive- and Extensive-Margin Elasticity

	(1)	(2)	(3)	(4)	(5)
Intensive-Margin Elasticity					
ln(giving price)	-0.593*** (0.203)	-0.838*** (0.212)	-1.016*** (0.232)	-0.893*** (0.243)	-0.904*** (0.248)
ln(aunaul taxable income)	2.015*** (0.675)	1.562** (0.655)	1.445** (0.647)	1.528** (0.651)	1.571** (0.653)
N	11637	11637	11637	11637	11637
R-sq	0.006	0.009	0.012	0.013	0.034
Extensive-Margin Elasticity					
ln(giving price)	-0.257*** (0.046)	-0.288*** (0.048)	-0.273*** (0.052)	-0.237*** (0.052)	-0.267*** (0.051)
ln(aunaul 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	-1.264*** (0.226)	-1.418*** (0.237)	-1.343*** (0.256)	-1.167*** (0.256)	-1.312*** (0.253)
Implied income elasticity	5.778*** (1.099)	5.527*** (1.097)	5.531*** (1.099)	5.600*** (1.100)	5.420*** (1.080)
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
R-sq	0.008	0.009	0.009	0.010	0.019

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} .

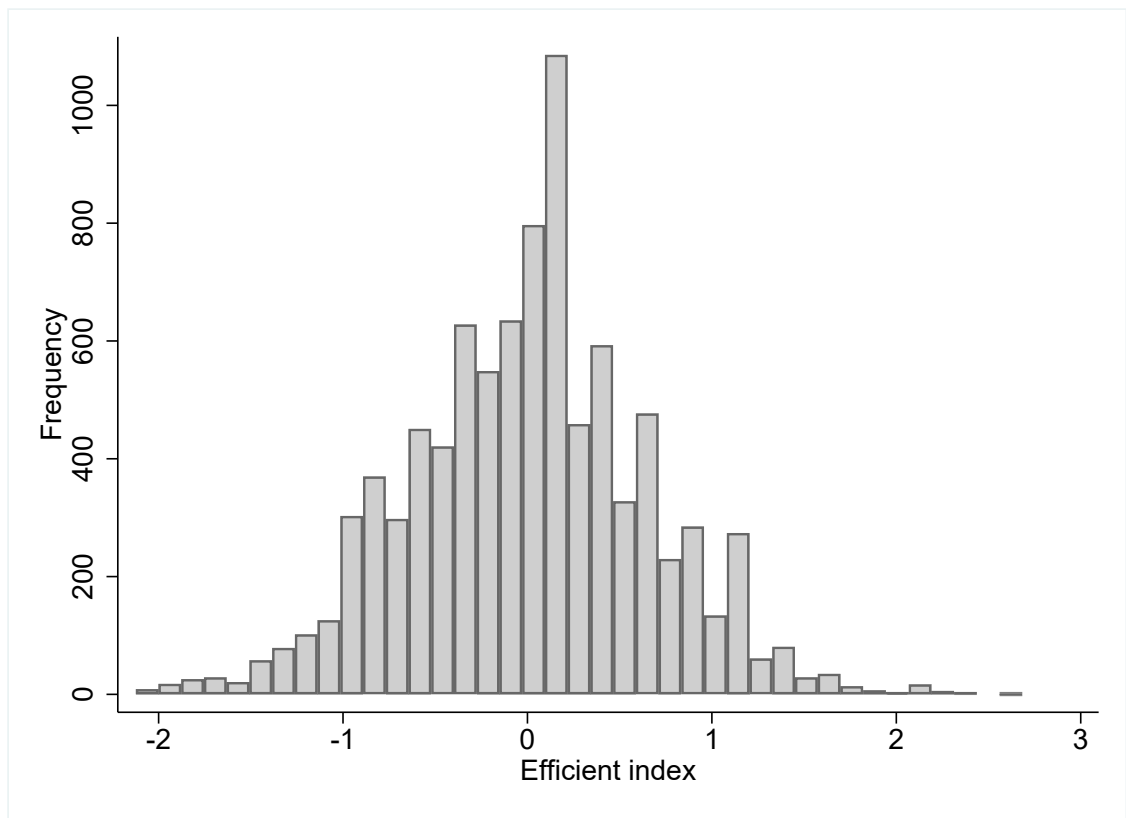


Figure 6: Histogram of Efficient Index

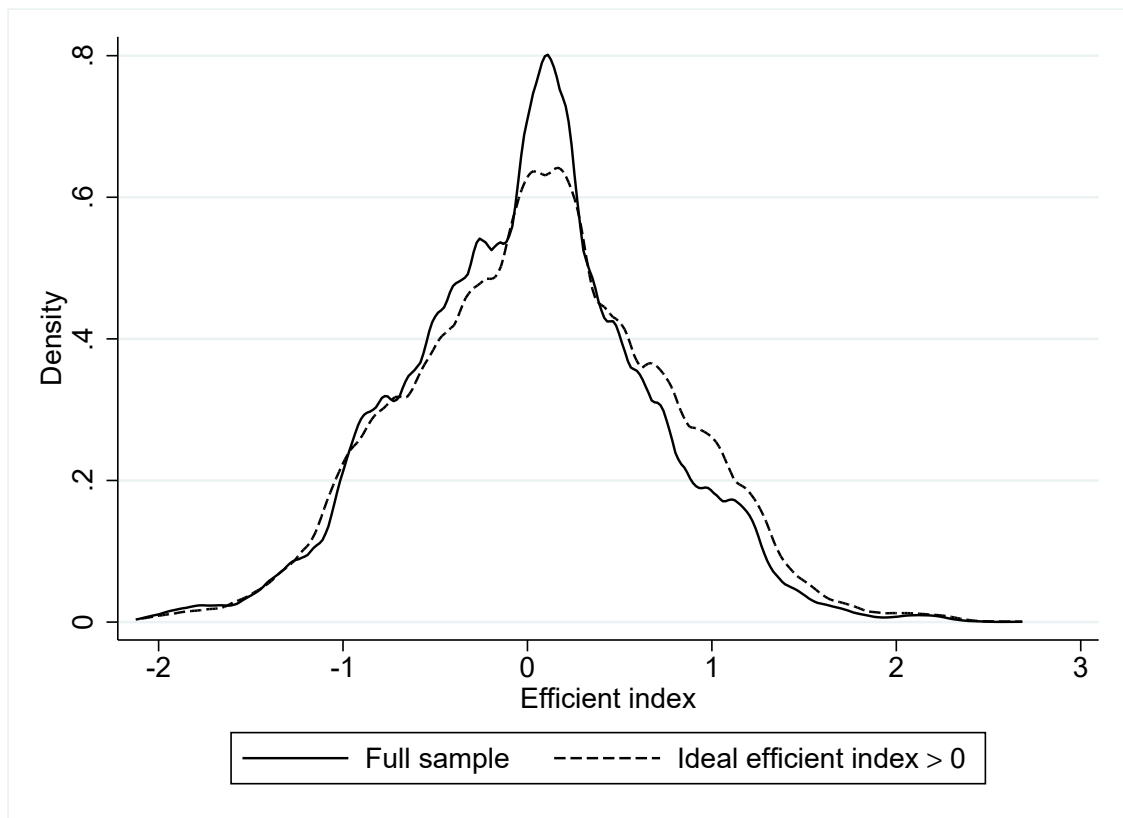


Figure 7: Density of Efficient Index Using those whose ideal efficient index > 0

Table 5: Last Price Elasticity: Panel IV

	(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(aunaul taxable income)	5.258*** (0.961)	5.071*** (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
F-statistics of IV	149708.36	133463.98	122042.55	119684.05	115742.55
N	52304	52304	52302	52302	52302

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.

3. Data

3.1. Time Series of Charitable Giving

3.2. Summary Statistics

4. Main Results

5. Government Efficient and Price Elasticity

6. Conclusions

6.1. Conclusions

Table 6: Intensive- and Extensive-Margin Last Price Elasticity: Panel IV

	(1)	(2)	(3)	(4)	(5)
Intensive-Margin Elasticity					
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(auunaul taxable income)	2.023*** (0.694)	1.638** (0.678)	1.460** (0.667)	1.530** (0.670)	1.572** (0.667)
F-statistics of IV	8861.30	8893.12	7522.05	6585.00	6426.96
N	10672	10672	10672	10672	10672
Extensive-Margin Elasticity					
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(auunaul taxable income)	1.125*** (0.221)	1.113*** (0.223)	1.103*** (0.223)	1.121*** (0.223)	1.090*** (0.220)
Implied last price elasticity	-3.063*** (0.227)	-3.100*** (0.240)	-3.167*** (0.259)	-2.917*** (0.258)	-3.046*** (0.254)
Implied income elasticity	5.532*** (1.088)	5.472*** (1.096)	5.426*** (1.096)	5.513*** (1.098)	5.361*** (1.082)
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
F-statistics of IV	149708.36	133463.98	122042.55	119684.05	115742.55
N	52304	52304	52302	52302	52302

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. The instumental 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 7: Elasticity with Short-Period Data

	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(aunaul 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
R-sq	0.009	0.018	0.013	0.024

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 8: Intensive- and Extensive-Margin Elasticity with Short-Period Data

	After 2012		2013 and 2014	
	(1)	(2)	(3)	(4)
Intensive-Margin Elasticity				
ln(giving price)	-0.647*** (0.236)	-1.129*** (0.291)	-0.394 (0.310)	-0.712** (0.363)
ln(aunaul taxable income)	1.943*** (0.662)	1.714*** (0.649)	1.440 (2.975)	1.047 (3.072)
N	10158	10158	2922	2922
R-sq	0.006	0.034	0.004	0.046
Extensive-Margin Elasticity				
ln(giving price)	-0.235*** (0.058)	-0.269*** (0.065)	-0.331*** (0.065)	-0.383*** (0.076)
ln(aunaul taxable income)	1.093*** (0.230)	1.024*** (0.226)	0.801* (0.428)	0.574 (0.447)
Implied price elasticity	-1.136*** (0.279)	-1.300*** (0.314)	-1.845*** (0.364)	-2.131*** (0.422)
Implied income elasticity	5.287*** (1.114)	4.954*** (1.094)	4.457* (2.381)	3.196 (2.488)
Individual FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
Other Controls	N	Y	N	Y
N	45994	45992	14893	14893
R-sq	0.008	0.018	0.013	0.022

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 9: Estimation of Elasticity: k -difference model

lag k	$k = 1$	$k = 2$	$k = 3$
	(1)	(2)	(3)
Overall Elasticity			
Lagged difference of first price (log)	-1.894*** (0.389)	-2.170*** (0.355)	-1.752*** (0.346)
Lagged difference of annual income (log)	2.737*** (1.042)	4.685*** (1.141)	5.307*** (1.174)
N	49014	46610	44205
R-sq	0.010	0.015	0.015
Intensive-Margin Elasticity			
Lagged difference of first price (log)	-1.854** (0.763)	-2.282*** (0.621)	-2.163*** (0.550)
Lagged difference of annual income (log)	2.229 (1.715)	4.675*** (1.791)	5.582** (2.178)
Individual FE	Y	Y	Y
Time FE	Y	Y	Y
Other Controls	Y	Y	Y
N	10939	10505	10043
R-sq	0.066	0.073	0.055

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 10: Heterogenous Elasticity by Perceived Government Efficiency

	Overall	Extensive	Intensive
	(1)	(2)	(3)
ln(giving price)	-1.356*** (0.336)	-0.284*** (0.076)	-0.952*** (0.334)
ln(giving price) X 2Q Efficient Group	-0.032 (0.423)	-0.059 (0.098)	0.292 (0.489)
ln(giving price) X 3Q Efficient Group	0.353 (0.417)	0.095 (0.097)	-0.285 (0.545)
ln(aunaul taxable income)	4.943*** (0.959)	1.104*** (0.222)	1.589** (0.657)
Implied price elasticity (1Q efficient group)	-1.356*** (0.336)	-1.396*** (0.374)	-0.952*** (0.334)
Implied price elasticity (2Q efficient group)	-1.388*** (0.330)	-1.686*** (0.378)	-0.661* (0.394)
Implied price elasticity (3Q efficient group)	-1.002*** (0.327)	-0.930** (0.374)	-1.237*** (0.468)
Implied income elasticity	4.943*** (0.959)	5.429*** (1.093)	1.589** (0.657)
Individual FE	Y	Y	Y
Time FE	Y	Y	Y
Other Controls	Y	Y	Y
N	50455	50455	11327
R-sq	0.020	0.020	0.034

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. The 2Q (3Q) Efficient Group is a dummy variable taking 1 if individual i belongs to the second (third) quantile of efficient index. 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 elasticity is evaluated at the sample mean of D_{ijt} .

Table 11: Heterogenous Elasticity Using Those whose Ideal Efficient Index > 0

	Overall	Extensive	Intensive
	(1)	(2)	(3)
ln(giving price)	-1.831*** (0.538)	-0.316*** (0.115)	-1.303** (0.571)
ln(giving price) X 2Q Efficient Group	0.339 (0.657)	0.045 (0.146)	0.308 (0.807)
ln(giving price) X 3Q Efficient Group	1.295** (0.586)	0.237* (0.135)	0.236 (0.834)
ln(aunaul taxable income)	5.686*** (1.272)	1.202*** (0.273)	3.225* (1.880)
Implied price elasicity (1Q efficient group)	-1.831*** (0.538)	-1.555*** (0.565)	-1.303** (0.571)
Implied price elasicity (2Q efficient group)	-1.492*** (0.505)	-1.335** (0.561)	-0.995 (0.622)
Implied price elasicity (3Q efficient group)	-0.536 (0.416)	-0.392 (0.500)	-1.067 (0.680)
Implied income elasticity	5.686*** (1.272)	5.913*** (1.344)	3.225* (1.880)
Individual FE	Y	Y	Y
Time FE	Y	Y	Y
Other Controls	Y	Y	Y
N	23366	23366	5004
R-sq	0.020	0.019	0.057

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. The 2Q (3Q) Efficient Group is a dummy variable taking 1 if individual i belongs to the second (third) quantile of efficient index. 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. We drop units whose the ideal efficient index is less than or equal to zero. The implied extensive-margin elasticity is evaluated at the sample mean of D_{ijt} .

Table 12: Heterogenous Last Price Elasticity: Panel IV

	Full Sample			Ideal Efficient Index > 0		
	Overall	Extensive	Intensive	Overall	Extensive	Intensive
	(1)	(2)	(3)	(4)	(5)	(6)
ln(last giving price)	-2.604*** (0.342)	-0.586*** (0.077)	-1.166*** (0.438)	-2.984*** (0.551)	-0.579*** (0.116)	-1.681** (0.778)
ln(last giving price) X 2Q Efficient Group	-0.272 (0.417)	-0.104 (0.095)	0.043 (0.591)	-0.108 (0.645)	-0.063 (0.141)	0.239 (1.019)
ln(last giving price) X 3Q Efficient Group	-0.010 (0.420)	-0.038 (0.096)	0.111 (0.709)	0.894 (0.588)	0.056 (0.132)	1.285 (1.071)
ln(aunaul taxable income)	4.892*** (0.958)	1.087*** (0.222)	1.597** (0.670)	5.313*** (1.282)	1.141*** (0.277)	2.743 (1.947)
Implied last price elasticity (1Q efficient group)	-2.604*** (0.342)	-2.883*** (0.377)	-1.166*** (0.438)	-2.984*** (0.551)	-3.097*** (0.621)	-1.681** (0.778)
Implied last price elasticity (2Q efficient group)	-2.876*** (0.318)	-3.395*** (0.362)	-1.122** (0.488)	-3.092*** (0.491)	-3.432*** (0.583)	-1.442* (0.776)
Implied last price elasticity (3Q efficient group)	-2.614*** (0.328)	-3.071*** (0.371)	-1.055* (0.639)	-2.091*** (0.414)	-2.796*** (0.533)	-0.396 (0.892)
Implied income elasticity	4.892*** (0.958)	5.345*** (1.094)	1.597** (0.670)	5.313*** (1.282)	6.097*** (1.481)	2.743 (1.947)
Individual FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y	Y	Y
N	49575	49575	10447	22974	22974	4612

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. The 2Q (3Q) Efficient Group is a dummy variable taking 1 if individual i belongs to the second (third) quantile of efficient index. 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 instrumental variables are the first giving price in year t and its interaction with the 2Q (3Q) Efficient Group. We drop units whose the ideal efficient index is less than or equal to zero in column (4)-(6). The implied extensive-margin elasticity is evaluated at the sample mean of D_{ijt} .

Table 13: Heterogenous Price Elasticity with Data after 2012

	Full Sample			Ideal Efficient Index > 0		
	Overall	Extensive	Intensive	Overall	Extensive	Intensive
	(1)	(2)	(3)	(4)	(5)	(6)
ln(giving price)	-1.116*** (0.425)	-0.197** (0.096)	-1.175*** (0.380)	-1.526** (0.650)	-0.187 (0.146)	-1.301* (0.713)
ln(giving price) X 2Q Efficient Group	-0.499 (0.544)	-0.198 (0.124)	0.164 (0.558)	0.064 (0.863)	-0.090 (0.192)	-0.094 (0.974)
ln(giving price) X 3Q Efficient Group	-0.125 (0.530)	-0.060 (0.124)	-0.167 (0.630)	0.448 (0.733)	-0.036 (0.175)	0.197 (0.941)
ln(aunaul taxable income)	4.777*** (1.002)	1.034*** (0.229)	1.757*** (0.652)	6.126*** (1.414)	1.239*** (0.305)	2.903 (2.188)
Implied price elasticity (1Q efficient group)	-1.116*** (0.425)	-0.951** (0.464)	-1.175*** (0.380)	-1.526** (0.650)	-1.000 (0.780)	-1.301* (0.713)
Implied price elasticity (2Q efficient group)	-1.615*** (0.431)	-1.910*** (0.470)	-1.011** (0.455)	-1.462** (0.730)	-1.480* (0.835)	-1.394* (0.755)
Implied price elasticity (3Q efficient group)	-1.240*** (0.413)	-1.242*** (0.470)	-1.342** (0.549)	-1.078* (0.550)	-1.193* (0.722)	-1.103 (0.739)
Implied income elasticity	4.777*** (1.002)	4.998*** (1.107)	1.757*** (0.652)	6.126*** (1.414)	6.622*** (1.632)	2.903 (2.188)
Individual FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y	Y	Y
N	44115	44115	9967	20441	20441	4419
R-sq	0.018	0.019	0.034	0.018	0.018	0.061

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. The 2Q (3Q) Efficient Group is a dummy variable taking 1 if individual i belongs to the second (third) quantile of efficient index. 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. We drop units whose the ideal efficient index is less than or equal to zero in column (4)-(6). The implied extensive-margin elasticity is evaluated at the sample mean of D_{ijt} .

Table 14: Heterogenous Price Elasticity: k -difference Model

Lag k	Overall Elasticity			Intensive-Margin Elasticity		
	$k = 1$	$k = 2$	$k = 3$	$k = 1$	$k = 2$	$k = 3$
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged difference of first price (log)	-1.778*** (0.553)	-2.884*** (0.520)	-2.467*** (0.509)	-1.401 (1.074)	-2.320** (0.970)	-2.549*** (0.788)
X 2Q Efficient Group	-0.204 (0.747)	0.970 (0.687)	0.755 (0.648)	-0.113 (1.548)	-0.035 (1.331)	0.942 (1.128)
X 3Q Efficient Group	-0.346 (0.704)	1.316** (0.644)	1.440** (0.624)	-1.439 (1.610)	0.218 (1.319)	0.302 (1.196)
Lagged difference of annual income (log)	2.685** (1.045)	4.641*** (1.149)	5.274*** (1.185)	2.208 (1.712)	4.849*** (1.816)	5.471** (2.189)
Implied price elasticity (1Q efficient group)	-1.778*** (0.553)	-2.884*** (0.520)	-2.467*** (0.509)	-1.401 (1.074)	-2.320** (0.970)	-2.549*** (0.788)
Implied price elasticity (2Q efficient group)	-1.982*** (0.611)	-1.914*** (0.546)	-1.712*** (0.508)	-1.515 (1.230)	-2.355** (0.986)	-1.607* (0.885)
Implied price elasticity (3Q efficient group)	-2.123*** (0.550)	-1.568*** (0.494)	-1.027** (0.485)	-2.840** (1.317)	-2.102** (0.995)	-2.248** (0.973)
Implied income elasticity	2.685** (1.045)	4.641*** (1.149)	5.274*** (1.185)	2.208 (1.712)	4.849*** (1.816)	5.471** (2.189)
Individual FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y	Y	Y
N	46661	44448	42198	10675	10257	9811
R-sq	0.010	0.016	0.015	0.066	0.073	0.055

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. The 2Q (3Q) Efficient Group is a dummy variable taking 1 if individual i belongs to the second (third) quantile of efficient index. The lagged difference of first price (log) is $\ln(\text{Price}_{ijt}^k) - \ln(\text{Price}_{ij(t-k)}^k)$, 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 15: Heterogenous Price Elasticity: k -difference Model Using Those whose Ideal Efficient Index > 0

Lag k	Overall Elasticity			Intensive-Margin Elasticity		
	$k = 1$	$k = 2$	$k = 3$	$k = 1$	$k = 2$	$k = 3$
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged difference of first price (log)	-2.215** (0.872)	-3.269*** (0.794)	-2.647*** (0.821)	-0.841 (1.936)	-4.928*** (1.780)	-2.227 (1.588)
X 2Q Efficient Group	0.078 (1.233)	0.900 (1.070)	0.604 (0.972)	-0.752 (2.841)	1.312 (2.329)	-0.954 (1.992)
X 3Q Efficient Group	-0.666 (1.024)	2.307*** (0.894)	2.242** (0.875)	-3.101 (2.646)	3.154 (2.219)	2.071 (2.081)
Lagged difference of annual income (log)	3.048** (1.319)	5.197*** (1.564)	5.749*** (1.419)	3.692 (4.077)	6.587** (3.120)	8.671** (3.406)
Implied price elasticity (1Q efficient group)	-2.215** (0.872)	-3.269*** (0.794)	-2.647*** (0.821)	-0.841 (1.936)	-4.928*** (1.780)	-2.227 (1.588)
Implied price elasticity (2Q efficient group)	-2.137** (1.064)	-2.369*** (0.869)	-2.042*** (0.725)	-1.592 (2.238)	-3.616** (1.656)	-3.182** (1.336)
Implied price elasticity (3Q efficient group)	-2.881*** (0.795)	-0.962 (0.633)	-0.404 (0.590)	-3.942* (2.032)	-1.775 (1.514)	-0.156 (1.461)
Implied income elasticity	3.048** (1.319)	5.197*** (1.564)	5.749*** (1.419)	3.692 (4.077)	6.587** (3.120)	8.671** (3.406)
Individual FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y	Y	Y
N	21583	20516	19422	4686	4474	4245
R-sq	0.012	0.020	0.020	0.074	0.088	0.091

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. The 2Q (3Q) Efficient Group is a dummy variable taking 1 if individual i belongs to the second (third) quantile of efficient index. 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. We drop units whose the ideal efficient index is less than or equal to zero.

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