Estimating Effect of Tax Incentives on Charitable Giving Considering Self-Selection of Tax Relief in South Korea

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Introduction

- In many countries, tax relief for charitable giving are implemented.
- The elasticity of giving tax relief is known as a key parameter to evaluate the welfare implication (Saez, 2004).
  - Intuitively, if the elasticity is more than 1 in absolute value, \$1 of tax relief make more than \$1 of charitable giving.
- Many papers investigate the elasticity based on tax return data (Almunia et al., 2020; Auten et al., 2002).

Introduction

- However, the tax return data record only the declared charitable giving.
  - First issue: **Actual donations is different from declared donations.** (Fack and Landais, 2016; Gillitzer and Skov, 2018)
  - We use panel survey data in South Korea to deal with this issue.
- Tax payers decide the amount of donation and whether to declare tax relief based on the size of tax incentive and declaration cost.
  - Second issue: Neglect of this declaration cost may bias the estimations of elasticity.
  - We use instrumental variable (IV) and control function approach for this issue.
- Based on DID as an identification strategy, we investigate the giving price elasticity of South Korea.

Introduction

Result

1. Baseline results show that the giving price elasticity is less than -1.4 in terms of intensive margins and less than -1.7 in terms of extensive margins in Korea.
2. The estimated giving price elasticity for those who declare charitable giving is around -1.2 -1.6.
   - These estimates are more elastic than the estimates in the extant research, many of which show around -1.
3. By reducing application cost, we can increase charitable giving.
4. Given our estimates, increasing the subsidy on charitable giving will be desirable in Korea.

Conceptual Framework

Optimization Problem

Following Almunia et al. (2020), consider allocation problem between private consumption (x_{it}) and charitable giving (g_{it})

$$\max_{x_{it}, g_{it}, R_{it}} U(x_{it}, g_{it}, G_t) = u_i(x_{it}, g_{it}, G_t) - R_{it}K(Z_{it}), \tag{1}$$

$$\text{s.t. } x_{it} + g_{it} = y_{it} - R_{it}T_{it}(y_{it}, g_{it}) - (1 - R_{it})T_{it}(y_{it}), \tag{2}$$

$$G_t = g_{it} + G_{-it}, \tag{3}$$

where y_{it} is pre-tax total income, R_{it} is a dummy of declaration of tax relief and $T_{it}(y_{it})$ and $T_{it}(y_{it}, g_{it})$ are respectively the amount of tax when i does not declare tax relief and when i declares tax relief in year t. G_{-it} is public goods supplied by others. $K(Z_{it})$ is application cost which is a function of instrument Z_{it}.

Remarks on Optimization Problem

We assume

- No saving
- G_{-it} is large enough to $\frac{\partial u_i}{\partial G}(x, g, G) \approx 0$

Given R_{it}, optimal level of donations sloves

$$\max_{g_{it}} u_i(y_{it} - R_{it}T_{it}(y_{it}, g_{it}) - (1 - R_{it})T_{it}(y_{it}) - g_{it}, g_{it}, g_{it} + G_{-it}). \tag{4}$$

- We can ignore application cost $K(Z_{it})$ when solving optimal giving level because the application cost does not depend on g_{it}

First-Order Condition

$$-\frac{\partial u_i}{\partial x_{it}}\left(R_{it}\frac{\partial T_{it}}{\partial g_{it}}(y_{it}, g_{it}) + 1\right) + \frac{\partial u_i}{\partial g_{it}} = 0 \tag{5}$$

- $\partial T_{it}/\partial g_{it} < 0$ is tax incentive of charitable giving.
  - Let $s_{it} \equiv |\partial T_{it}/\partial g_{it}|$ be size of tax incentive.
  - Relative giving price is $1 - s_{it}$
  - As we explain later, there is *within* variation of s_{it} due to tax reform.

Define $g_i(1 - s_{it}, y_{it})$ and $g_i(1, y_{it})$ to be the optimal levels of donations (potential outcomes) for choices $R_{it} = 1, 0$ respectively.

Self-Selection of Tax Relief

We can write indirect utility as

$$v_i(1 - s_{it}, y_{it}, G_{-it}) - K(Z_{it}), \tag{6}$$
$$v_i(1, y_{it}, G_{-it}). \tag{7}$$

Thus, individual i applies for tax relief in year t, that is, $R_{it} = 1$ iff

$$\Delta v_{it} \equiv v_i(1 - s_{it}, y_{it}, G_{-it}) - v_i(1, y_{it}, G_{-it}) \geq K(Z_{it}). \tag{8}$$

Identification Strategy

Outcome Equation

We assume the demand function $g_i(1 - s_{it}, y_{it})$ and $g_i(1, y_{it})$ can be written as the following log-log demand function with two-way FEs:

$$\ln g_i(1 - s_{it}, y_{it}) = \theta_i + \gamma \ln(1 - s_{it}) + \beta X'_{it} + \iota_t + u_{it}, \tag{9}$$

$$\ln g_i(1, y_{it}) = \theta_i + \beta X'_{it} + \iota_t + u_{it}. \tag{10}$$

Thus, observed outcome equation is

$$\ln g_{it} = \theta_i + \gamma R_{it} \times \ln(1 - s_{it}) + \beta X'_{it} + \iota_t + u_{it}. \tag{11}$$

- θ_i and ι_t are individual and time FE, respectively.
- X_{it} includes pre-tax income (y_{it}) and others.
- If $R_{it} = 0$, the relative price is one (its logged value is $\ln 1 = 0$).
- Our parameter of interest is γ, which represents the price elasticity of charitable giving.

Source of Price Variation

1. Within variation of tax incentive (s_{it})
   - Major variation comes from the 2014 tax reform
   - Before 2014, tax deduction (所得控除) was used for tax relief on charitable giving.
   - After 2014, tax credit (税額控除) started to be used for tax relief on charitable giving.
2. Within variation of application for tax relief (R_{it})
   - This variation is endogenous.
   - We use **wage earner dummy** and **number of tax accountant** as instrumental variables (IV).

Background: 2014 Tax Reform in South Korea

Tax deduction system (until 2013)

$$T_{it}(y_{it}, g_{it}) = T_{it}(y_{it} - g_{it}) \tag{12}$$

- In 2012 and 2013, the marginal tax rate was the same, though it was different from ones before 2011.
- Tax incentive is $s_{it} = T'(y_{it} - g_{it})$
- The giving price depended on income level and giving level

Tax credit system (from 2014)

$$T_{it}(y_{it}, g_{it}) = T_{it}(y_{it}) - mg_{it} \tag{13}$$

- m is tax credit rate and is $m = 0.15$
- Tax incentive is $s_{it} = m$

Background: Application System for Wage Earners

Background: Application System for Non Wage Earners

Data

Data

We use the Korean annual financial panel survey, called the National Survey of Tax and Benefit (hereafter, NaSTaB).

- 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.
- Data is constructed as the subjects represent the population of Korean society.
- We exclude the subject of the sample, whose age is under 23, since they are not likely to have income or assets.
- We use data from 2013 to 2017.

Descriptive Statistics

Table 1: Descriptive Statistics

	N	Mean	Std.Dev.	Min	Median	Max
Charitable Donations						
Annual chariatable giving (unit: 10,000KRW)	40064	36.64	153.72	0.00	0.00	10000.00
Dummary of donation > 0	40064	0.24	0.43	0.00	0.00	1.00
Income, giving price, and tax report						
Annual taxable labor income (unit: 10,000KRW)	40054	1674.04	2733.18	0.00	0.00	91772.00
First giving relative price	40063	0.86	0.04	0.62	0.85	0.94
Dummy of declaration of a tax relief	40064	0.11	0.31	0.00	0.00	1.00
Individual Characteristics						
Age	40064	54.20	16.31	24.00	52.00	104.00
Female dummy	40064	0.43	0.50	0.00	0.00	1.00
University graduate	40063	0.41	0.49	0.00	0.00	1.00
High school graduate dummy	40063	0.31	0.46	0.00	0.00	1.00
Junior high school graduate dummy	40063	0.28	0.45	0.00	0.00	1.00
Wage earner dummy	29753	0.54	0.50	0.00	1.00	1.00
#.Tax accountant / population	36259	1.04	0.51	0.32	0.92	2.24

Time Series of Charitable Giving

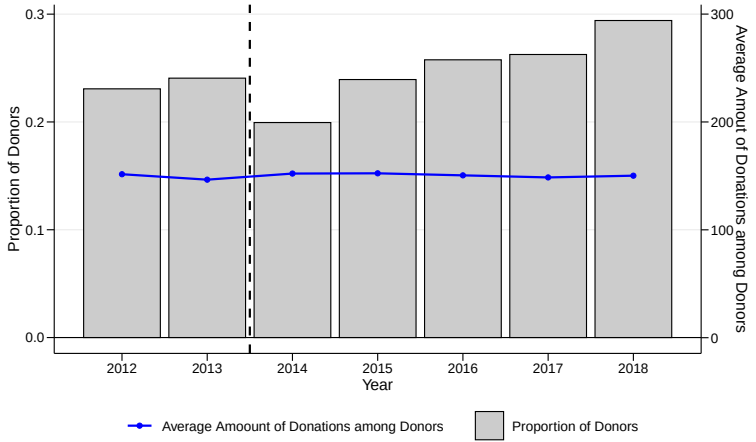

Figure 1: Proportion of Donors and Average Donations among Donors. Notes: The left and right axises measure prooortion of donors and the average amount of donations among donors, respectively. Authors made this graph based on NaSTaB data.

Distribution of Charitable Giving

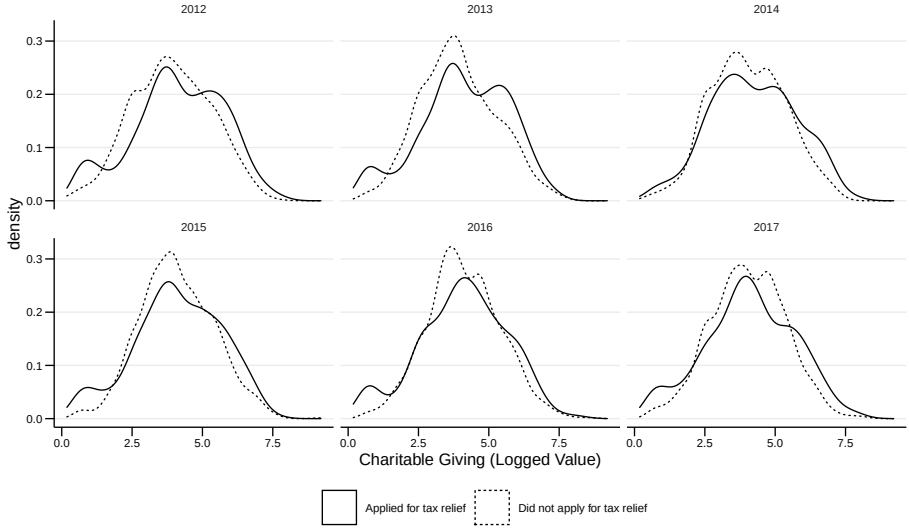

Figure 2: Distribution of Charitable Giving among Those Who Donated

Proportion of Donors By Having Applied for Tax Relief

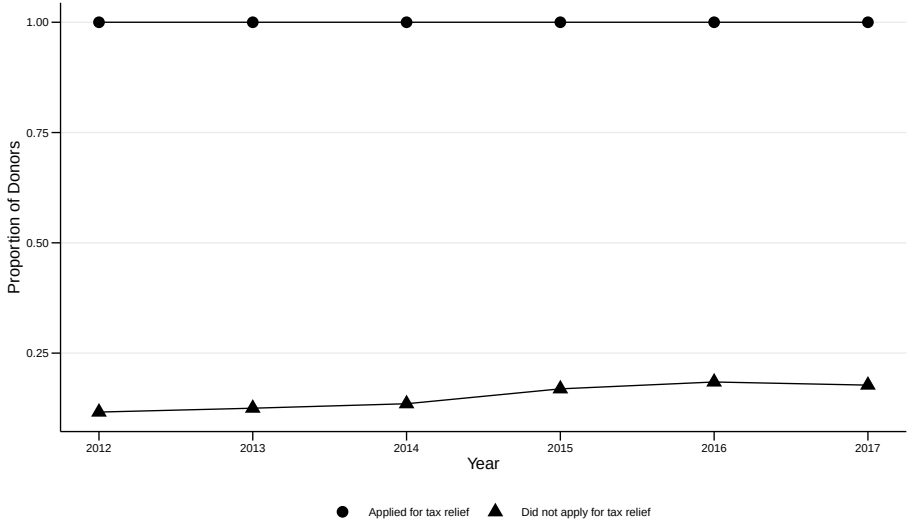

Figure 3: Proportion of Donors By Having Applied for Tax Relief

Income Distribution and Giving Price

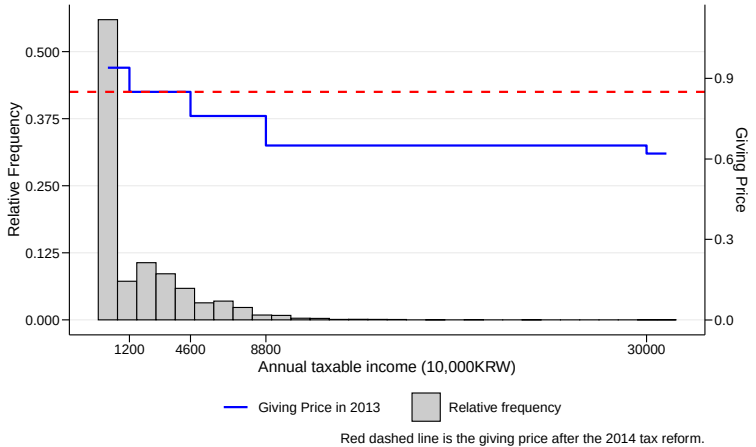

Figure 4: Income Distribution and Relative Giving Price in 2013. Notes: The left and right axis measure the relative frequency of respondents and the relative giving price, respectively. A blue step line and a red dashed horizontal line represents the giving price in 2013 and 2014, respectively. The grey bar shows income distribution in 2013.

Charitable Giving by Income Group (Overall)

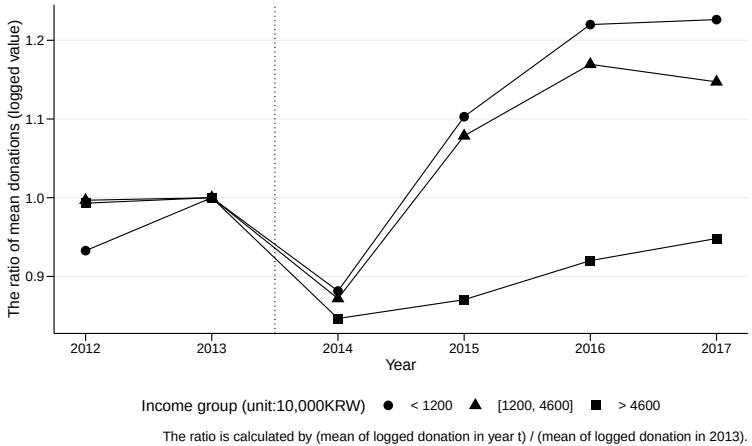

Figure 5: Average Logged Giving in Three Income Groups. Notes: We created three income groups, with the relative price of giving rising (circle), unchanged (triangle), and falling (square) between 2013 and 2014.

Charitable Giving by Income Group (Intensive Margin)

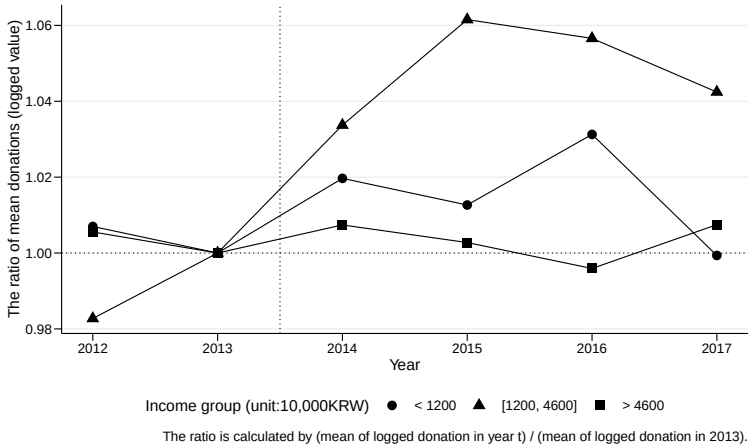

Figure 6: Average Logged Giving in Three Income Groups. Notes: We created three income groups, with the relative price of giving rising (circle), unchanged (triangle), and falling (square) between 2013 and 2014.

Charitable Giving by Income Group (Extensive Margin)

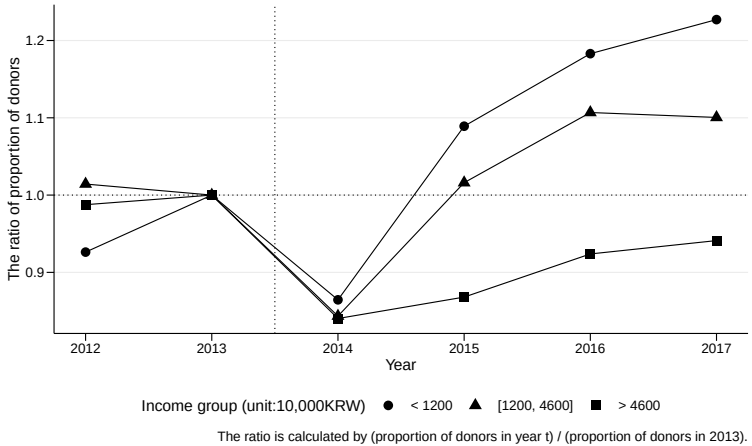

Figure 7: Proportion of Donors in Three Income Groups. Notes: We created three income groups, with the relative price of giving rising (circle), unchanged (triangle), and falling (square) between 2013 and 2014.

Share of Tax Relief Grouped by Wage Earner or not

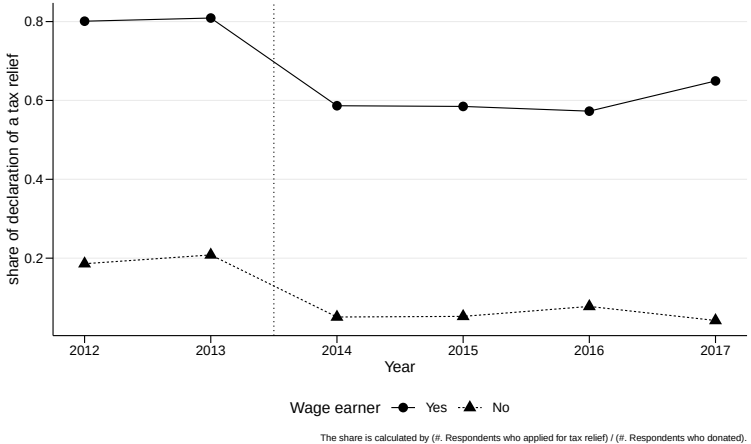

Figure 8: Share of Tax Relief. Notes: A solid line is the share of applying for tax relief among wage eaners. A dashed line is the share of applying for tax relief other than wage earners.

Share of Tax Relief Grouped By Three Income Group

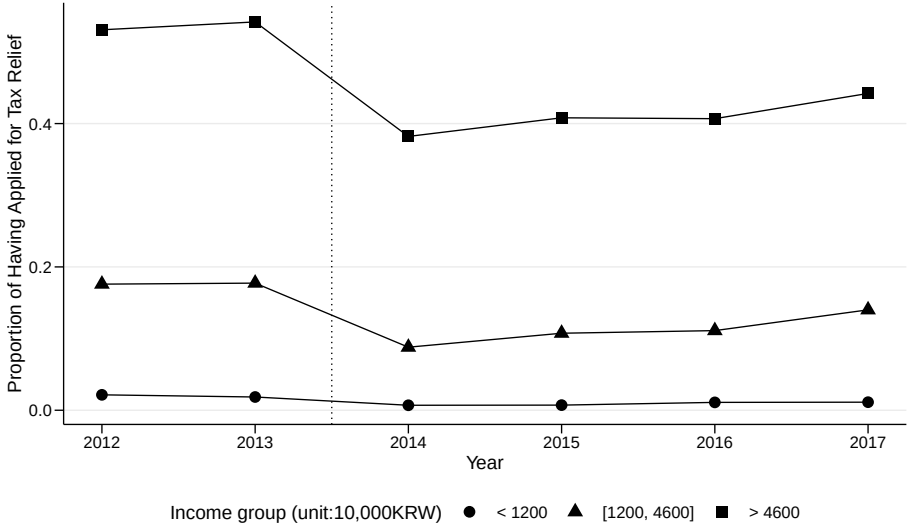

Figure 9: Proportion of Having Applied for Tax Relief in Three Income Groups. Notes: We created three income groups, with the relative price of giving rising (circle), unchanged

First-Stage Result: Who Applied for Tax Relief?

Probit Estimation of Selection of Applying for Tax Relief

		Separated Probit Model					
	Pooled	2012	2013	2014	2015	2016	2017
Wage earner	0.478***	0.457***	0.228**	0.611***	0.538***	0.440***	0.809***
	(0.069)	(0.097)	(0.095)	(0.133)	(0.122)	(0.107)	(0.130)
# Tax accountant	0.852**	0.110	-0.464	-0.204	-0.178	-0.293	-0.130
	(0.363)	(0.584)	(0.442)	(0.373)	(0.241)	(0.221)	(0.244)
log(first price)	-0.150	-1.132	-1.979**				
	(0.271)	(0.884)	(0.873)				
log(income)	18.959***	15.896***	16.033***	18.768***	19.124***	17.022***	21.084***
	(1.025)	(3.049)	(2.993)	(1.514)	(1.399)	(1.334)	(1.354)
Age	0.041***	0.057***	0.036*	0.044	0.023	0.027	0.058***
	(0.006)	(0.021)	(0.020)	(0.027)	(0.024)	(0.022)	(0.022)
Square of age	-0.044***	-0.062***	-0.036*	-0.049	-0.031	-0.027	-0.060**
	(0.006)	(0.024)	(0.022)	(0.031)	(0.027)	(0.025)	(0.024)
female	0.111***	0.012	0.216***	0.153*	0.068	0.029	0.181***
	(0.037)	(0.068)	(0.066)	(0.080)	(0.075)	(0.072)	(0.069)
University graduate	0.183***	0.294**	0.262*	0.150	0.194	0.268	-0.098
	(0.056)	(0.149)	(0.139)	(0.192)	(0.191)	(0.180)	(0.166)
Highschool graduate	0.138***	0.265*	0.224*	0.044	0.171	0.172	-0.092
	(0.051)	(0.144)	(0.133)	(0.188)	(0.187)	(0.176)	(0.162)
Num.Obs.	26922	4261	4391	4383	4550	4611	4726
Log.Lik.	-7489.763	-1383.811	-1432.453	-977.129	-1116.751	-1181.082	-1267.813
Std. Errors	Clustered (year)	Standard	Standard	Standard	Standard	Standard	Standard
FE: year	X						

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Estimating Conventional Price Elasticities

Intensive-Margin Price Elasticity

	FE			FE-2SLS	
	(1)	(2)	(3)	(4)	(5)
Application x log(first price)	-0.851***			-0.813	-1.716*
	(0.219)			(0.854)	(0.907)
PS of application x log(first price)		-1.527***	-1.561***		
		(0.371)	(0.354)		
Num.Obs.	7109	7080	7080	7080	7080
R2	0.820	0.820	0.820	0.820	0.820
First-stage: Instrument				-0.360	-0.250
				[162.5]	[181.0]
R2 Adj.	0.693	0.693	0.694	0.694	0.692
FE: area	X	X	X	X	X
FE: industry	X	X	X	X	X
FE: panelid	X	X	X	X	X
FE: year	X	X	X	X	X
Square of age	X	X	X	X	X
Method of Propensity Score		Pooled	Separated	Pooled	Separated

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level. A square bracket is wald statistics of instrument.

Extensive-Margin Price Elasticity

	FE			FE-2SLS	
	(1)	(2)	(3)	(4)	(5)
Application x log(first price)	-2.759***			-1.401***	-1.847***
	(0.074)			(0.208)	(0.193)
PS of application x log(first price)		-0.474***	-0.563***		
		(0.103)	(0.097)		
Num.Obs.	27076	26922	26922	26922	26922
R2	0.717	0.663	0.663	0.704	0.712
First-stage: Instrument				-0.275	-0.216
				[347.9]	[375.7]
Implied price elasticity	-10.509***	-1.804***	-2.141***	-5.326***	-7.024***
	(0.281)	(0.390)	(0.369)	(0.792)	(0.733)
R2 Adj.	0.620	0.547	0.547	0.603	0.613
FE: area	X	X	X	X	X
FE: industry	X	X	X	X	X
FE: panelid	X	X	X	X	X
FE: year	X	X	X	X	X
Square of age	X	X	X	X	X

Notes: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$. Standard errors are clustered at individual level. A square bracket is wald statistics of instrument.

Control Function Approach

Estimation of Outcome Equation for $R_{it} = 1$

	(1)	(2)	(3)
log(first price)	-1.325***	-1.307***	-1.279***
	(0.386)	(0.384)	(0.387)
log(income)	2.030	1.455	3.957*
	(1.515)	(1.837)	(2.229)
Selection correction term (separate)		-0.056	
		(0.133)	
Selection correction term (pool)			0.209
			(0.193)
Num.Obs.	3646	3643	3643
R2	0.839	0.839	0.839
R2 Adj.	0.726	0.725	0.726
FE: area	X	X	X
FE: industry	X	X	X
FE: panelid	X	X	X
FE: year	X	X	X
Square of Age	X	X	X

Notes: $^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

Estimation of Outcome Equation for $R_{it} = 0$

	Intensive			Extensive		
	(1)	(2)	(3)	(4)	(5)	(6)
log(income)	0.696	2.765	4.660	0.535**	0.513	0.524
	(1.613)	(3.186)	(4.188)	(0.249)	(0.352)	(0.405)
Selection correction term (separate)		-0.176			0.001	
		(0.248)			(0.031)	
Selection correction term (pool)			-0.340			0.000
			(0.305)			(0.040)
Num.Obs.	3463	3437	3437	23430	23279	23279
R2	0.865	0.866	0.866	0.580	0.580	0.580
R2 Adj.	0.685	0.687	0.687	0.419	0.420	0.420
FE: area	X	X	X	X	X	X
FE: industry	X	X	X	X	X	X
FE: panelid	X	X	X	X	X	X
FE: year	X	X	X	X	X	X
Square of Age	X	X	X	X	X	X

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Estimating Effect of Tax Incentive

Outcome	Include correction term?	ATE	ATT	ATU
extensive	No	0.834	0.624	0.852
	Pool	0.834	0.623	0.852
	Separate	0.834	0.622	0.852
intensive	No	0.112	0.151	0.086
	Pool	0.062	0.416	-0.178
	Separate	0.206	0.283	0.153

Welfare Implication

Partial Effect of Price (Subsets with $R_{it} = 0$)

	(1)	(2)	(3)
First price	46.257	77.970	56.066
	(147.244)	(156.865)	(147.440)
log(income)	-256.907	-965.220	-646.690
	(425.966)	(1025.181)	(807.601)
Correction term		69.254	42.673
		(70.117)	(56.301)
Num.Obs.	3463	3437	3437
R2 Adj.	0.622	0.622	0.622
FE: area	X	X	X
FE: industry	X	X	X
FE: panelid	X	X	X
FE: year	X	X	X
Square age	X	X	X
Method of IMR		Pooled	Separate

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at individual level.

Improve Welfare by Increasing Tax Incentive

model	Elasticity (R = 1)	Partial Effect (R = 0)	Sum of Giving (R = 1)	Partial Effect (R = 0) / Sum of Giving (R = 1)
(1)	1.325	160187.730	639992.100	0.250
(2)	1.307	267982.430	639992.100	0.419
(3)	1.279	192700.418	639992.100	0.301

Partial effect for R = 0 is multiplied by observations.

Conclusion

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