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

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お詫び

私の準備不足のために、本スライドと他のスライド（12/5 に行われた公共選択学会で共著者の後藤さんが使用された日本語スライド）を併用してご報告させていただきます。

皆さまにご不便をおかけして申し訳ありません <(_ _)>

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 Frameworks

Optimization Problem

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

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

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

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

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.

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_{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.

Let $g_i(1 - R_{it}s_{it}, y_{it})$ be a demand function of charitable giving.

- 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 (without application cost) as

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

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

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

Identification Strategy

Outcome Equation

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

$$\ln g_{it} = \theta_i + \gamma \ln(1 - R_{it}s_{it}) + \beta X'_{it} + \iota_t + u_{it}. \tag{9}$$

- θ_i and ι_t are individual and time FE, respectively.
- X_{it} includes pre-tax income (y_{it}) and others.
- If $R_{it} = 1$, then the logged price of giving is $\ln(1 - s_{it})$; otherwise, $\ln 1 = 0$.

Our parameter of interest is γ, which represents the price elasticity of charitable giving.

2014 Tax Reform in South Korea

Our major *within* variation of tax incentive (s_{it}) comes from the 2014 tax reform.

- Before 2014, tax deduction (所得控除) was used for tax relief on charitable giving.
  - the giving price depended on income level.
- After 2014, tax credit (税額控除) started to be used for tax relief on charitable giving.
  - The tax credit rate was determined as 15%.
  - Giving price is 0.85, irrespective of income level.

2014 Tax Reform in South Korea

Tax deduction system (until 2013)

$$T_{it}(y_{it}, g_{it}) = T_{it}(y_{it} - g_{it}) \tag{10}$$

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

Tax credit system (from 2014)

$$T_{it}(y_{it}, g_{it}) = T_{it}(y_{it}) - mg_{it} \tag{11}$$

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

Source of Endogeneity

- Giving price is endogenous to the amount of giving before 2014
  - $s_t(y_{it}, g_{it}) = T'(y_{it} - g_{it})$ if $t < 2014$. $s_t(y_{it}, g_{it}) = 0.15$ if $t \geq 2014$.
  - $1 - R_{it}s_t(y_{it}, g_{it})$ is called as the last-price $s_t^f(y_{it}) = s_t(y_{it}, 0)$
  - Instead, we use the first-price $1 - R_{it}s_t^f(y_{it})$ where
- If the declaration cost is ignored, the estimation should be biased.
  - The giving price depends not only on marginal tax rate and tax credit rate, but also on the declaration behavior.
  - As far as we know, only Almunia et al. (2020) deal with this problem, though they used tax return data.
  - We use the first-price of giving if taxpayers had applied for tax relief $1 - s_t^f(y_{it})$.

First-Stage Equation

$$\ln(1 - R_{it}s_{it}^{f}) = \theta_{1i} + \delta_1 \ln(1 - s_{it}^{f}) + \delta_2 X_{it}' + \iota_{1i} + v_{it} \tag{12}$$

Validity of instrument

- Since $\ln(1 - R_{it}s_{it}^{f}) = R_{it} \times \ln(1 - s_{it}^{f})$, we include the effect of first price on charitable giving in outcome equation.
- Thus, instument does not affect outcomes conditional on covariates (Exclusion restriction)
- Increasing the first-price decreases the benefit of tax relief (Δv_{it}). There is no taxpayers who apply for tax relief by an increase of price (Monotonicity).

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
Covariates						
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

Summary Statistics: Charitable Giving

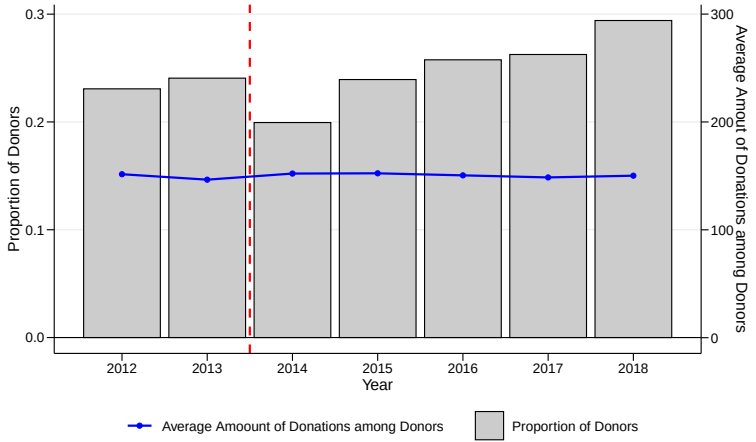

Figure 1: Proportion of Donors and Average Donations among Donors. Notes: The left and right axises measure prooortion of donors and the average amount of donations among donors, respectively. Authors made this graph based on NaSTaB data.

Summary: Income and Giving Price

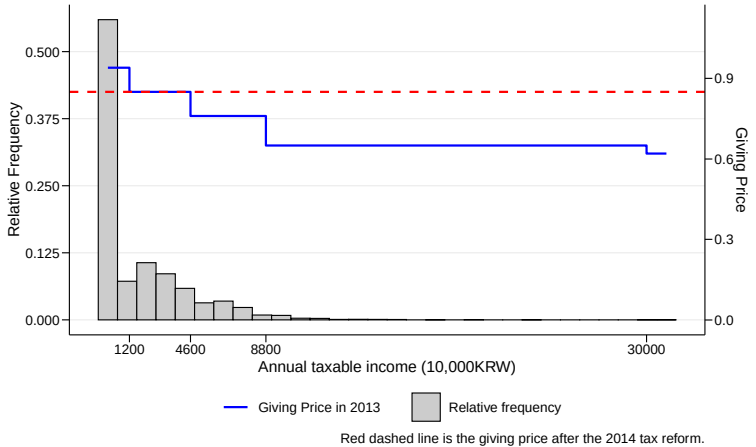

Figure 2: Income Distribution and Relative Giving Price in 2013. Notes: The left and right axis measure the relative frequency of respondents and the relative giving price, respectively. A blue step line and a red dashed horizontal line represents the giving price in 2013 and 2014, respectively. The grey bar shows income distribution in 2013.

Summary: Charitable Giving by Income Group

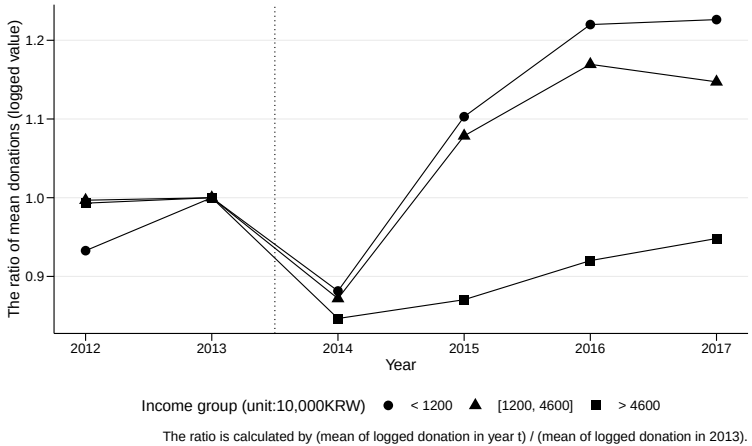

Figure 3: Average Logged Giving in Three Income Groups. Notes: We created three income groups, with the relative price of giving rising (circle), unchanged (triangle), and falling (square) between 2013 and 2014.

Summary: Share of Tax Relief

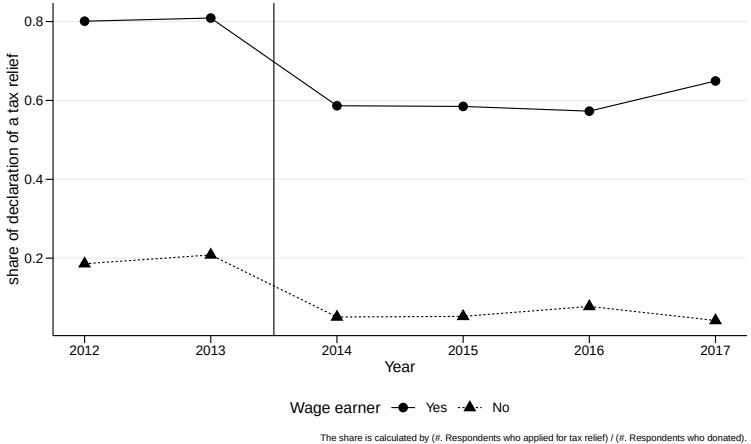

Figure 4: Share of Tax Relief. Notes: A solid line is the share of applying for tax relief among wage eaners. A dashed line is the share of applying for tax relief other than wage earners.

Estimating Conventional Price Elasticities

Result: First-Price Elasticity

Table 2: First-Price Elasticities

	Overall		Intensive		Extensive	
	FE	FE-2SLS	FE	FE-2SLS	FE	FE-2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
log(first price)	-10.195***	-2.715***	-0.851***	-1.490***	-2.757***	-0.621***
	(0.303)	(0.583)	(0.219)	(0.359)	(0.073)	(0.129)
Implied price elasticity					-10.484***	-2.360***
					(0.279)	(0.489)
First-stage: Instrument		0.371		0.670		0.371
		[451.8]		[869.4]		[451.8]
Num.Obs.	26922	26922	7080	7080	26922	26922
R2	0.747	0.727	0.820	0.820	0.718	0.685
R2 Adj.	0.661	0.633	0.694	0.693	0.622	0.577
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

Result: Last-Price Elasticity

Table 3: Last-Price Elasticities

	Overall		Intensive		Extensive	
	FE	FE-2SLS	FE	FE-2SLS	FE	FE-2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
log(last price)	-10.484***	-6.479***	-0.635***	-1.852***	-2.881***	-1.600***
	(0.304)	(0.574)	(0.237)	(0.448)	(0.073)	(0.127)
Implied price elasticity					-11.687***	-6.490***
					(0.295)	(0.514)
First-stage: Instrument		0.363		0.708		0.363
		[438.3]		[432.4]		[438.3]
Num.Obs.	26334	26334	6492	6492	26334	26334
R2	0.761	0.755	0.821	0.820	0.739	0.727
R2 Adj.	0.677	0.669	0.690	0.687	0.647	0.631
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

Control Function Approach

First-Stage Result: Who Applied for Tax Relief?

Table 4: Probit Estimation of Selection of Applying for Tax Relief

		Separated Probit Model					
	Pooled	2012	2013	2014	2015	2016	2017
1 = 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)
1 = 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)
1 = 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)
1 = 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

Second-Stage Result ($R_{it} = 1$)

Table 5: Estimation of Outcome Equation for $R_{it} = 1$

	(1)	(2)	(3)
log(first price)	-1.325***	-1.306***	-1.279***
	(0.386)	(0.384)	(0.387)
log(income)	2.032	1.456	3.958*
	(1.515)	(1.839)	(2.231)
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.	0.725	0.725	0.725
FE: panelid	X	X	X
FE: year	X	X	X

Second-Stage Result ($R_{it} = 0$)

Table 6: Estimation of Outcome Equation for $R_{it} = 0$

	Overall			Intensive			Extensive		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
log(income)	2.731**	2.723*	3.311*	0.680	2.727	4.605	0.537**	0.514	0.523
	(1.114)	(1.556)	(1.753)	(1.615)	(3.188)	(4.191)	(0.249)	(0.352)	(0.405)
Selection correction term (separate)		0.000			-0.174			0.001	
		(0.130)			(0.248)			(0.031)	
Selection correction term (pool)			-0.063			-0.336			0.000
			(0.165)			(0.305)			(0.040)
Num.Obs.	23430	23279	23279	3463	3437	3437	23430	23279	23279
R2	0.635	0.636	0.636	0.865	0.866	0.866	0.580	0.580	0.580
R2 Adj.	0.496	0.497	0.497	0.685	0.687	0.687	0.419	0.420	0.420
FE: panelid	X	X	X	X	X	X	X	X	X
FE: year	X	X	X	X	X	X	X	X	X

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	0.624	0.852
intensive	No	0.112	0.151	0.086
	Pool	0.060	0.413	-0.178
	Separate	0.205	0.281	0.153
overall	No	2.405	2.353	2.442
	Pool	2.267	2.401	2.172
	Separate	2.445	2.353	2.511

Welfare Implication

Conclusion

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