Very preliminary

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Determinants of Charitable Giving to Unexpected Natural Disasters: Evidences from Two Big Earthquakes in Japan

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1. Outline of This Presentation

* Motivation of This Research
* Literature Review
* Data Description
* Analysis Method
* An Analysis of Tohoku Earthquake in 2011
* An Analysis of Hanshin Earthquake in 1995
* Result
* Conclusion

Motivation of This Research (1)

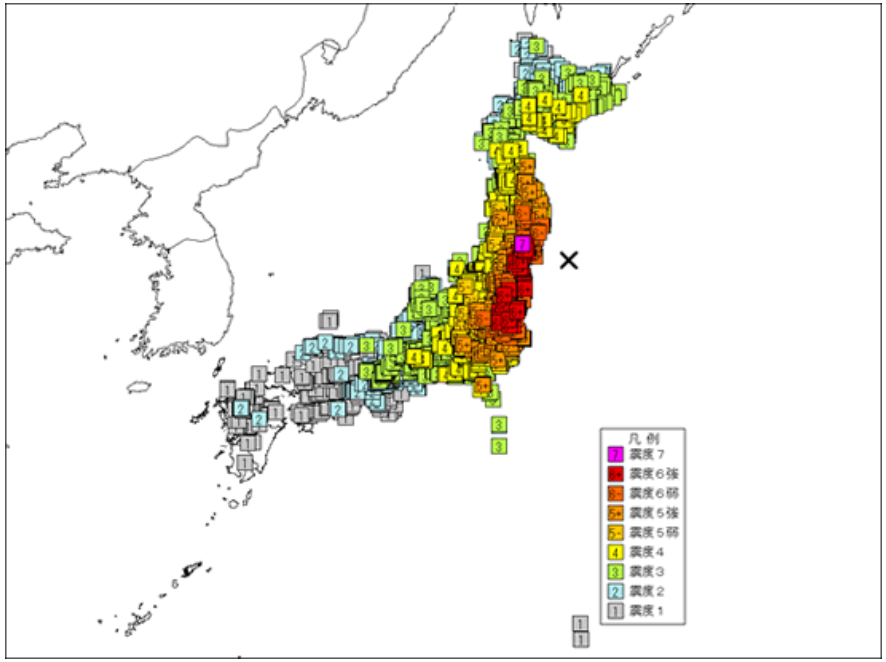
* **Japan is a land of earthquakes**
  * Almost 10% of earthquakes on earth occur in Japan or close to Japan*1
* Among these earthquakes, **Tohoku Earthquake in 2011** (the death toll 13,135, loss of ~$20.7 billion*2) and **Hanshin Earthquake in 1995** (the death toll 6,402, loss of ~$9.62 billion*2) are the most disastrous ones in recent years.
  * Note that ¥100≈$1 in 2013.
* After the earthquakes, many charity events and volunteer activities were made, and a great amount of donation was collected.

*1 The Headquarters for Earthquake Research Promotion (http://www.jishin.go.jp/main/pamphlet/kodomopanf/jishin02.pdf)

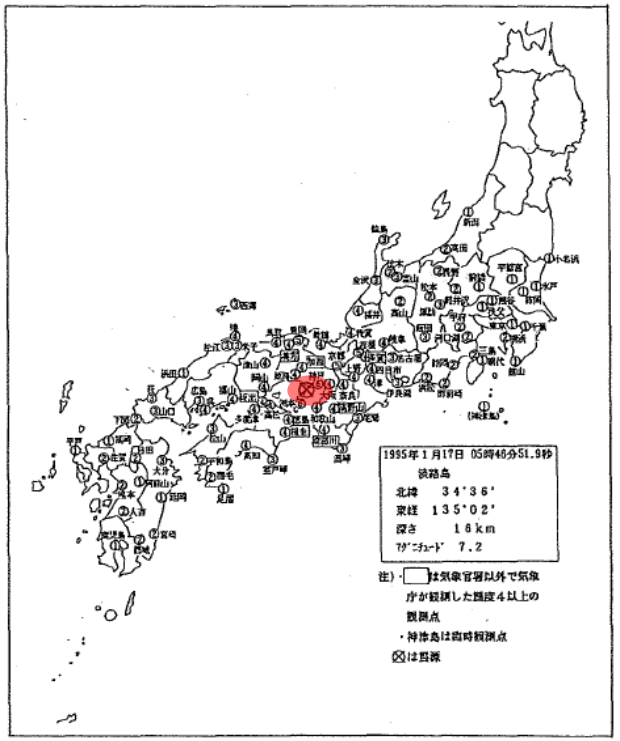
*2 Cabinet Office, Japanese Government (http://www.bousai.go.jp/kaigirep/hakusho/h23/bousai2011/html/honbun/2b_sanko_siryo_06.htm , http://www5.cao.go.jp/j-j/cr/cr11/pdf/chr11_zu2-2.pdf)

Motivation of This Research (2)

Tohoku Earthquake, Mar 11, 2011



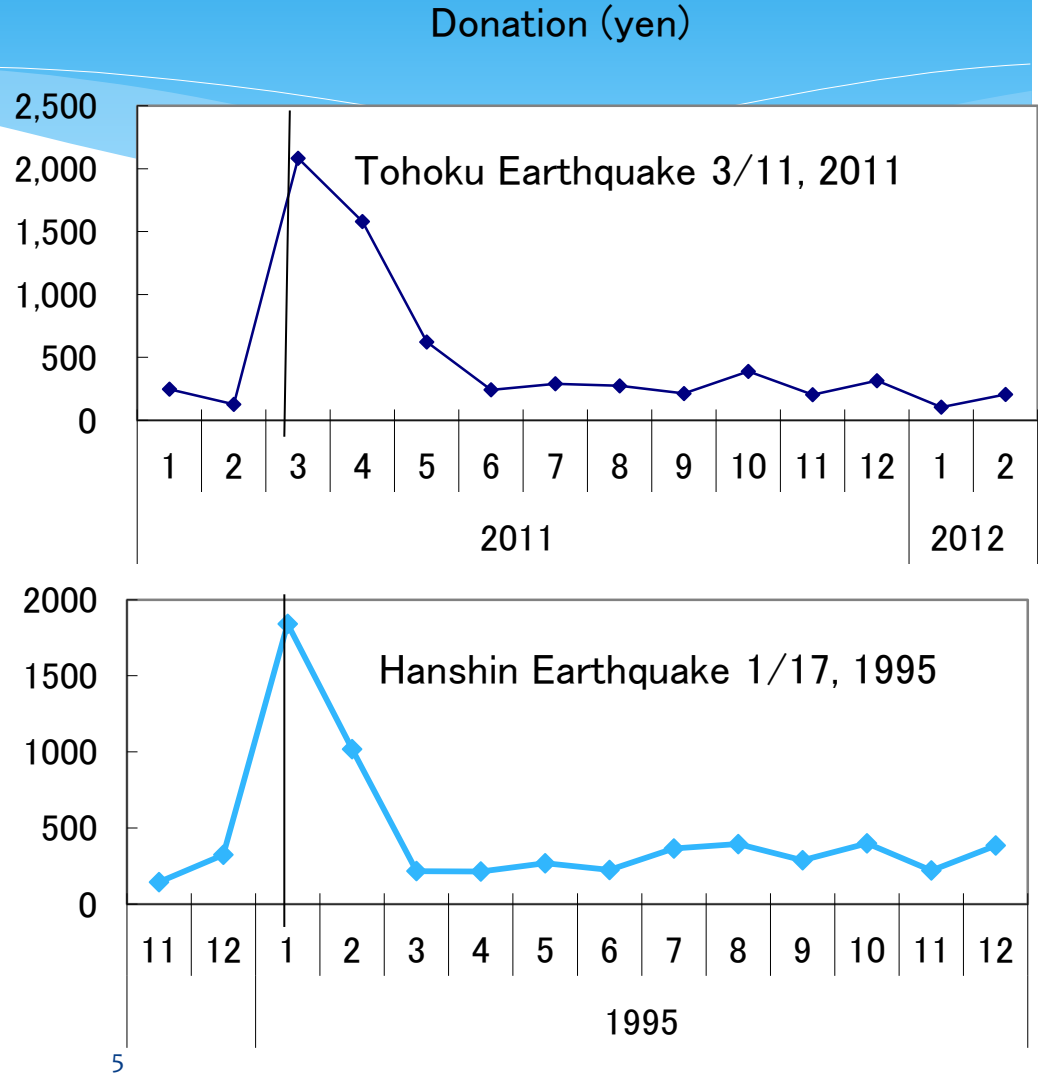
Hanshin Earthquake, Jan 17, 1995



Cited: Ministry of Education, Culture, Sports, Science and Technology, Japanese Government (http://www.mext.go.jp/b_menu/hakusho/html/hpaa201101/detail/1311096.htm) and Cabinet Office, Japanese Government (http://www.bousai.go.jp/kyoiku/kyokun/pdf/101.pdf)

Motivation of This Research (3)

- Surge of donations were observed in Japan just after the earthquakes
- Almost half of the private donation (2011) in Japan was for the Tohoku Earthquake *3.
- Few studies have been done on the donation related to these two big earthquakes.

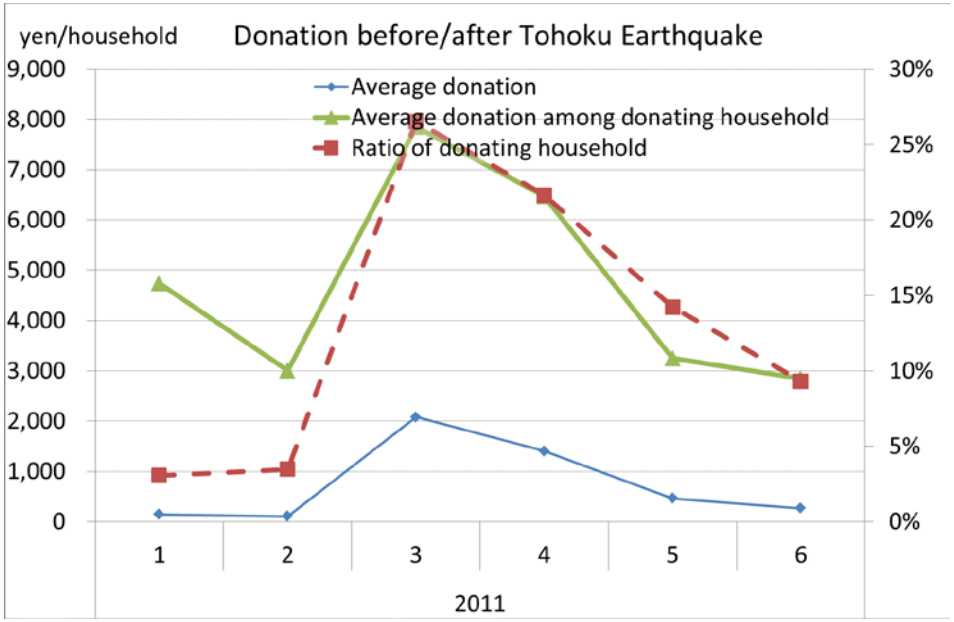


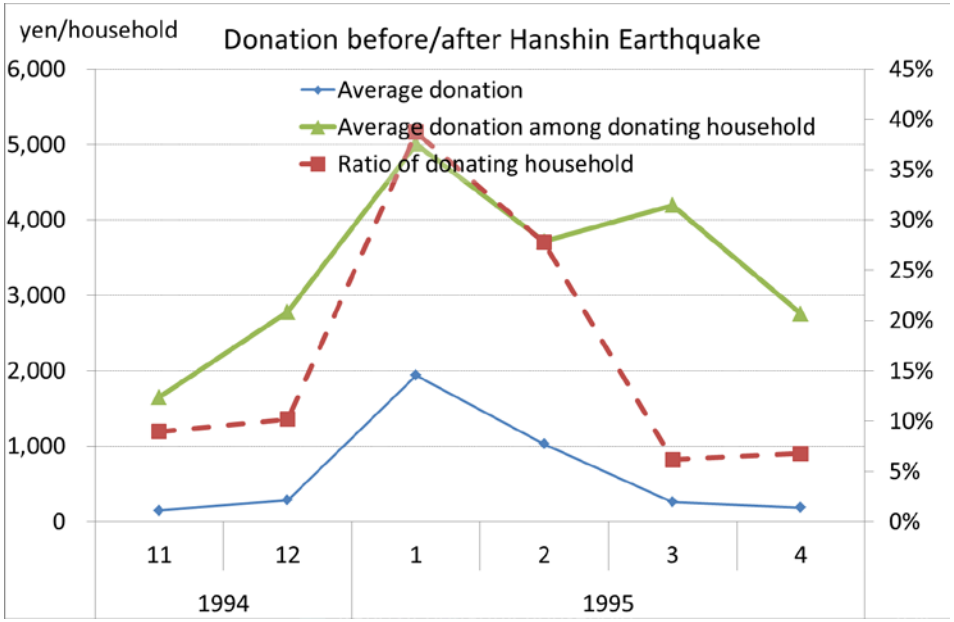
Data: Family Income and Expenditure Survey

*3 Giving Japan 2012

Motivation of This Research (4)

* Scrutinizing the data, both internal margin and external margin contributed the surge of donation.
  * External margin is the dominant reason for the surge.





Data: Family Income and Expenditure Survey

Motivation of This Research (5)

* The following points to be analyzed
  * **Who donated for the earthquake victims?**
  * **What factors are associated with donors making donation?**
* FIES (Family Income and Expenditure Survey) contains proprietary*4 **monthly panel consumption data of households**, including **data of private donation**, as well as **demographic feature of households**.
  * Statistics peculiar to Japan
* Micro-level household data is available.

→We can study the determinants of donations after earthquake

*4 The access is restricted to one single place in Tokyo.

Literature Review (1)

* Plenty of studies about private charitable donations
  * Both theoretically and empirically
  * Reason 1: Huge amount of donations (e.g. in USA, the amount of donation is $316.23 billion in 2012*5, 2% of the GDP.)
  * Reason 2: In USA, 72% of the donation is contributed by individuals
* Some studies focus on the determinants that enhance charitable donations.
  * Income: Hood et al. (1977), Kitchen (1992), Tiehen (2001), Auten et al. (2002), Bakija and Heim (2008)
  * Wealth: Kitchen (1992)
  * Age: Glenday et al. (1986), Kitchen (1992), Gittell and Tebaldi (2006)
  * Education: Tiehen (2001),Gittell and Tabaldi (2006), Schokkaert (2006)
  * Tax deduction or government grant: explain later

*5 Giving USA 2012

Literature Review (2)

* The effect of tax deduction or government grant is studied extensively.
* A lot of studies focus on how much tax deductibility enhances charitable donations.
  * Survey: Andreoni (2006)
  * Feldstein and Clotfelter (1976), Feldstein (1980), Kingma (1989), Randolph (1995), Auten et al. (2002)
* Many focuses on how government grants enhance or crowd out charitable donations.
  * Warr(1982), Roberts (1984), Clotfelter (1985), Bergstrom et al. (1986), Bernheim (1986), Andreoni (1988), Andreoni (2006), Andreoni and Payne (2011)

Literature Review (3)

* Recently, experiments focusing on the relationship between deduction and the amount of charitable donation have gained popularity.
  * List and Lucking-Reiley (2002), Eckel and Grossman (2003), Eckel et al. (2007), Karlan and List (2007), Meier (2007) , Eckel and Grossman (2008)
* However, these literatures focus on time-homogeneous charitable donations and disregard sudden surge of donations following an unexpected event such as a natural disaster.
  * Exception: Brown et al. (2012), Eckel et al. (2007)…

Literature Review (4)

* One example of research on such sudden surge of donations is Brown et al. (2012), who studied the determinants of charitable donations in USA for 2004 Indian Ocean tsunami disaster.
* They studied the determinants of sudden surge of charitable donations to unexpected natural disasters.

  <<Their conclusions>>
  * A dummy variable whether the household donated for other purposes has a positive association with tsunami donations.
  * Age is not a significant explanatory variable for tsunami donations where it has a positive association with all other charitable donations.
  * The following determinants are positively associated with tsunami donations and all other donations.
    * Households with a female head
    * Education
    * Religious households

Literature Review (5)

* In the study of Brown et al. (2012),
  * they used biennial panel data (too long time interval),
  * they studied only one natural disaster, and
  * their study was on a natural disaster which happened outside the country.
* In our study,
  * we observe donations just before and after the natural disaster,
  * we study data of several natural disasters, and
  * We study the charitable donation for a natural disaster which happened within the country.

    → We can include "distance" as a determinant in the analysis; the distance between the residence of donors and the epicenter.

→FIES data is best suited for the analysis of charitable donation for natural disaster.

Literature Review (6)

* Kimball et al. (2006) found geographical distance affected the unhappiness after the Hurricane Katrina.
* Ishino et al. (2011) pointed out the relationship between donation and happiness after Tohoku Earthquake.
* We study whether geographical distance from the epicenter affected earthquake donations.

  →If distance matters, it is an evidence that geographical distance affects not only happiness but also *behavioral* response of the donors.

Data Description (1)

* FIES monthly panel data
  * Two-or-more-person households: 8,076 samples
  * The sample households are selected based on the three-stage stratified sampling method.
  * Six months panel data
    * "Two-or-more-person households are surveyed for six months ... and are replaced by a new one. The ratio of replacement is kept constant every month, and thus one sixth of the sample is monthly renewed."*6
    * Make panel data following the method in Unayama (2011)+
  * Contain all kinds of consumption data including donation

*6 Statistics Bureau, Japanese Government (http://www.stat.go.jp/english/data/kakei/1560.htm)

+: To make panel data, we use Stata code provided by Prof. Unayama.

Data Description (2)

* Monthly data
  * Donation
* Demographic features of household
  * Age of a head of household
  * Income
  * Gender of a head of household
  * # of household member
  * Workrate; i.e. # of workers in household / # of household member
  * Geographical distance from the epicenter
  * Saving (only from 2002)
  * Loan (only from 2002)

Data Description (3)

* A dummy variable “pre-donation” is added to identify households who donated before the earthquake month.

* Due to low quality of data in FIES, following variables are not included in our analysis.
  * Religion or ethnicity
    * FIES does not have such data. Also, Japan is relatively homogeneous in terms of religion or ethnicity.
  * Education (year of schooling)
    * FIES does not have such data except for people who are currently studying in school.

Data Description (4)

* A variable of “price” (= 1 - tax rate) is not included in our analysis due to the following reasons.
  * "price" is less important in Japan as fewer people itemize deduction.
    * 10-20% of donation enjoys tax deduction in Japan where more than 32%*7 in USA (Cordes et al., 2000; Friedman and Greenstein, 2002; Kato, 2010).
  * FIES does not have price data.
    * Only household income statistics: marginal tax rate unknown
  * Price depends on the type of deduction that we cannot know from FIES
    * Some types of donation enjoy higher deduction.

*7: 32% of taxpayers used itemized deduction in USA. Since higher income taxpayers tend to itemize deduction more and higher income people tend to donate more, it is probable that much more than 32% of donation enjoys tax deduction.

With this background, price elasticity has attracted a lot of attention in the studies in US and some studies (e.g. Brown et al., 2012) use "price" as an explanatory variable.

Data Description (5)

* We define terms as follows:
  * Pre-earthquake period: months before the earthquake month
  * Post-earthquake period: earthquake month and after
  * Pre-earthquake donation: donation in pre-earthquake period
    * The purpose of this donation is irrelevant to earthquake.
  * Earthquake donation: donation in post-earthquake period
    * It must be a mixture of donation for earthquake victims and other purpose donations. However, we look upon this donation as a donation for earthquake related.
* Used 6 months panel data from 2 months before the earthquake month to 3 months after the earthquake month
  * Earthquake month is either Mar 2011 or Jan 1995.
  * This panel contains two pre-earthquake months and four post-earthquake months.

Data Description (6) summary statistics

Tohoku Earthquake					Hanshin Earthquake				
obs. 1156	mean	std. dev.	min	max	obs. 1165	mean	std. dev.	min	max
donation Jan 2011	203	3,211	0	100,000	donation Nov 1994	118	764	0	20,000
donation Feb 2011	189	3,115	0	100,000	donation Dec 1994	262	2,210	0	50,000
donation Mar 2011	1,993	8,275	0	100,000	donation Jan 1995	1,941	6,753	0	116,600
donation Apr 2011	1,589	16,264	0	400,000	donation Feb 1995	782	3,506	0	66,000
donation May 2011	258	1,249	0	20,500	donation Mar 1995	250	2,203	0	50,000
donation Jun 2011	214	1,258	0	21,000	donation Apr 1995	208	1,383	0	20,020
age	57.0	15.1	22	95	age	50.0	13.6	22	90
income	595	368	96	3,696	income	731	466	60	8,270
gender (male:1 female:2)	1.09	0.29	1	2	gender (male:1 female:2)	1.05	0.21	1	2
# of household member	3.00	1.09	2	8	# of household member	3.34	1.16	2	7
workrate	0.42	0.32	0	1	workrate	0.46	0.29	0	1
distance [km]	546	380	45	1,756	distance [km]	404	271	29	1,184
saving	1,247	1,877	0	23,683					
loan	395	1,002	0	14,350					

note: We dropped the data around the epicenter. Thus, minimum of the distance is larger than zero.

unit: [yen] for donation and [10 thousand yen] for income, saving and loan

Data Description (7) summary statistics 2

Tohoku Earthquake						
	All households			Households which donated before the earthquake month (6.7% of all households)		
	Average donation [yen] (A)	Ratio of donating household (B)	A/B[yen]	Average donation [yen] (C)	Ratio of donating household (D)	C/D[yen]
donation Jan 2011	203	3.7%	5,544			
donation Feb 2011	189	4.3%	4,388			
donation Mar 2011	1,993	26.7%	7,465	7,206	56.2%	12,831
donation Apr 2011	1,589	22.2%	7,159	8,750	56.2%	15,579
donation May 2011	258	15.2%	1,697	1,060	47.9%	2,211
donation Jun 2011	214	9.8%	2,177	828	32.9%	2,517

Hanshin Earthquake						
	All households			Households which donated before the earthquake month (21.6% of all households)		
	Average donation [yen] (A)	Ratio of donating household (B)	A/B[yen]	Average donation [yen] (C)	Ratio of donating household (D)	C/D[yen]
donation Nov 1994	118	12.0%	985			
donation Dec 1994	262	11.5%	2,288			
donation Jan 1995	1,941	38.2%	5,076	3,433	59.8%	5,738
donation Feb 1995	782	26.1%	2,992	1,231	39.3%	3,129
donation Mar 1995	250	5.4%	4,629	682	11.3%	6,040
donation Apr 1995	208	7.1%	2,917	354	12.6%	2,823

Data Description (8)

* Natural logarithm*8 is taken hereafter to donation, income, saving, loan and distance data*9.
* Tobit regression*8 is used to investigate the relationship between
  * (1) pre-earthquake donation vs demographic feature of households
  * (2) earthquake donation vs 'demographic feature of households and "pre-donation" *10'
  * (3) earthquake donation (restricted to households who donated in pre-earthquake period) vs demographic feature of households, and
  * (4) earthquake donation (restricted to households who did not donate in pre-earthquake period) and demographic feature of households.

*8 Brown et al. 2012

*9 Natural logarithm of zero is recorded to zero. Since there is no value between zero and one among these nor is there any negative values, any natural logarithm takes zero or positive value.

*10 The dummy variable "pre-donation" takes a unity if the household donated in 2 months or 1 month before the earthquake month. Otherwise, it takes zero.

Data Description (9)

* Our hypothesis
  * Following the previous studies such as Brown et al. (2012), our hypothesis is as follows.

Sign Condition	pre-earthquake donation	earthquake donation
gender	+	+
age	+	insignificant
income	insignificant or +	insignificant or +
saving	insignificant or +	insignificant or +
loan	?	?
# of household member	?	?
workrate	?	?
distance	insignificant	-

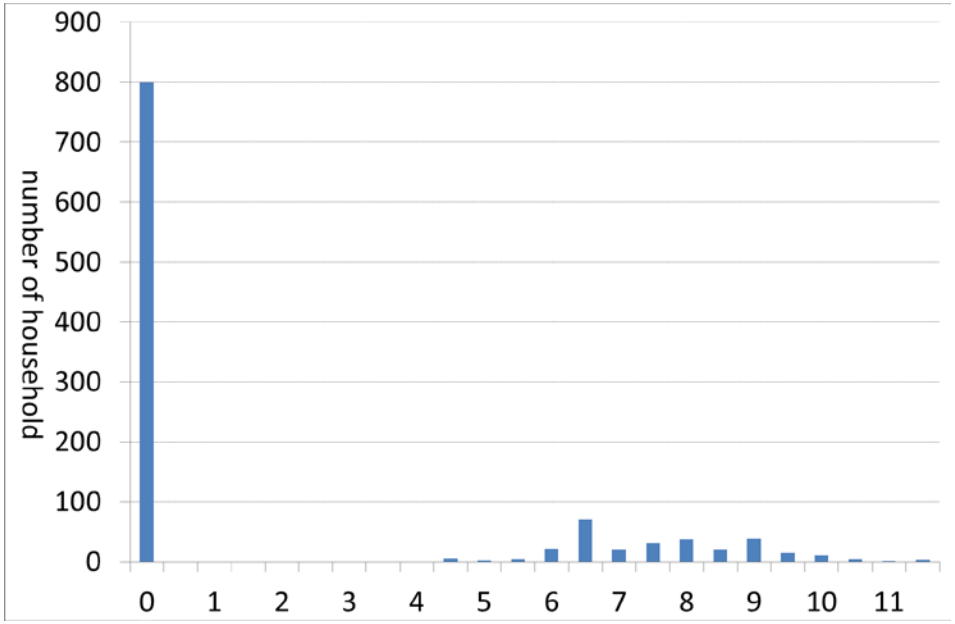
Analysis Method (1)

* Tobit regression is frequently used for the analysis of dependent variable (here, for ex. donation) which only takes non-negative value.
* OLS does not perform accurately in such data set as you can see in the figure below.

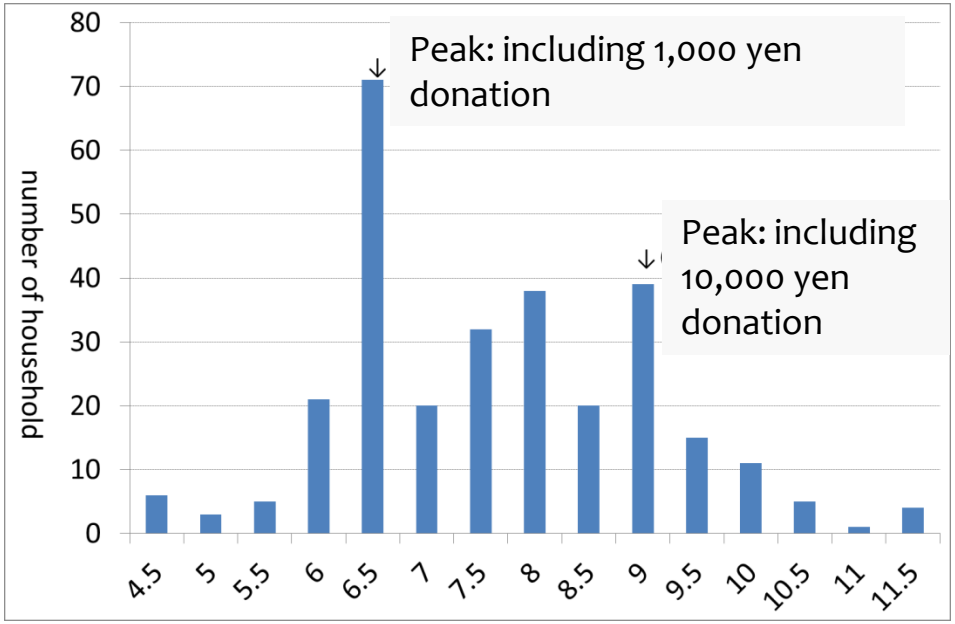
Analysis Method (2)

* Tobit regression is useful if there are a lot of zeros in the dependent variables.
* Since there are a lot of zeros in donation data, it is natural to use Tobit regression.

Histogram: Household donation on March 2011



log(donation)



log(donation), excluding donation=0

Analysis Method (3)

* Tobit model assumes that there is a latent variable y_i^* which linearly depends on the explanatory variable $\vec{x}_i$:

$$y_i^* = \vec{\alpha} \cdot \vec{x}_i + \beta + u_i \qquad (1)$$

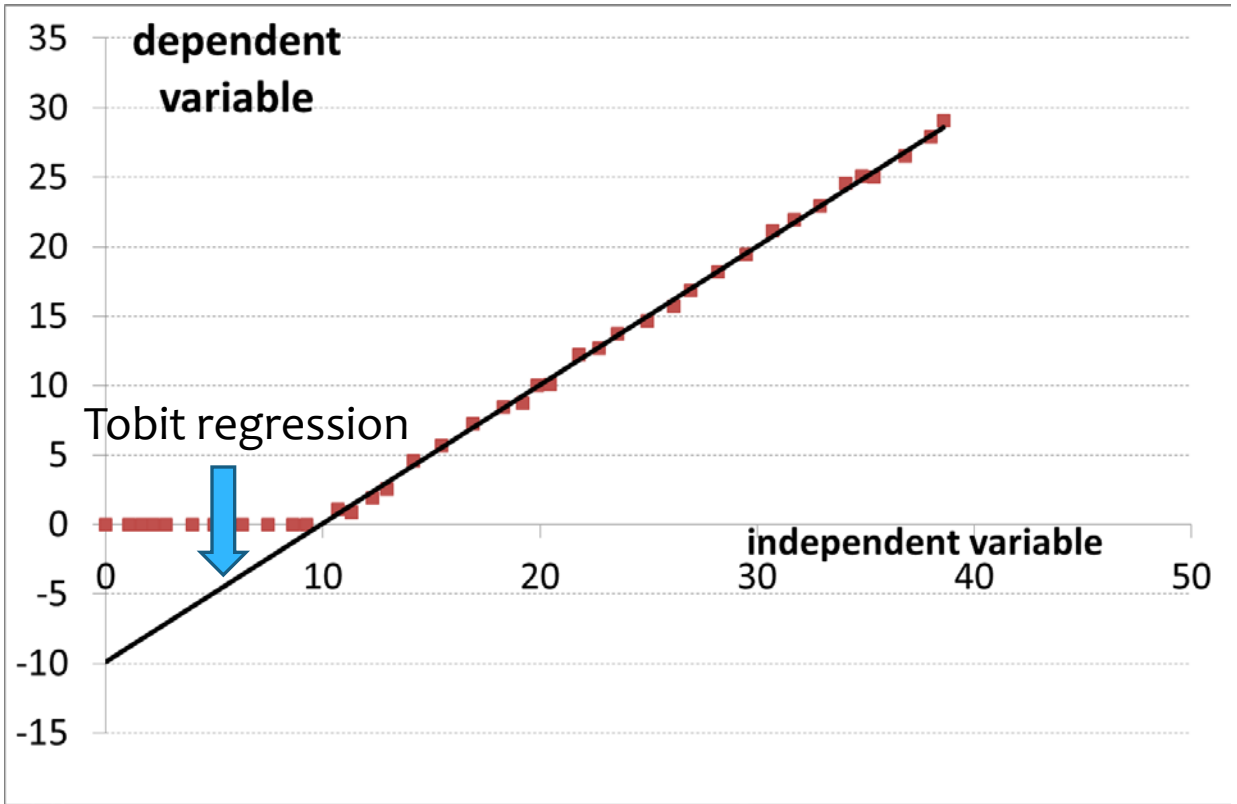
where $\vec{\alpha}$ and β are constant variables and u_i is a normally distributed independent random variable.

* Then, the model assumes that observed dependent variable y_i is equal to y_i^* if $y_i^* \geq 0$. Otherwise, $y_i = 0$.

$$\begin{cases} y_i = y_i^* \ \ if \ y_i^* \geq 0 \\ y_i = 0 \quad if \ \ y_i^* < 0 \end{cases} \qquad (2)$$

Analysis Method (4)

* Tobit regression performs well as you can see below.
* Since donation is restricted to non-negative value and it frequently takes zero, Tobit regression is suitable for its analysis.



An Analysis of Tohoku Earthquake in 2011 (1)

Pre-earthquake donation			
Tobit regression	coef.	std. err.	t stat.
gender	−1.51	2.91	(−0.52)
age<20	(omitted)		
20<=age<30	−4.43	5.98	(−0.74)
30<=age<40	−2.39	2.67	(−0.89)
40<=age<50	−6.59	2.83	(−2.33)
50<=age<60	−0.93	2.08	(−0.45)
log(income)	**8.56**	1.88	**(4.56)**
log(saving)	**0.57**	0.27	**(2.09)**
log(loan)	0.09	0.26	(0.36)
# of household member	−2.12	0.88	(−2.40)
workrate	−4.88	2.73	(−1.79)
log(distance)	**2.99**	1.09	**(2.76)**
dummy (Feb 2011)	1.01	1.45	(0.70)
const.	−90.42	15.76	(−5.74)

Dependent variable: log(donation) in Jan-Feb 2011

Obs.: 2180, P-value: 0.0000, Pseudo R^2: 0.0434

Post-earthquake donation			
Tobit regression	coef.	std. err.	t stat.
gender	1.16	0.78	(1.48)
age<20	(omitted)		
20<=age<30	−4.00	1.65	(−2.42)
30<=age<40	−3.98	0.87	(−4.60)
40<=age<50	−1.69	0.74	(−2.28)
50<=age<60	−1.70	0.67	(−2.54)
log(income)	**2.77**	0.51	**(5.41)**
log(saving)	**0.41**	0.08	**(4.92)**
log(loan)	−0.02	0.08	(−0.31)
# of household member	−0.99	0.25	(−3.91)
workrate	−1.70	0.80	(−2.12)
log(distance)	**−0.65**	0.30	**(−2.19)**
dummy (pre-donation)	**8.05**	0.75	**(10.79)**
dummy (Mar 2011)	**7.42**	0.68	**(10.90)**
dummy (Apr 2011)	**5.66**	0.68	**(8.27)**
dummy (May 2011)	**2.68**	0.70	**(3.81)**
_cons	−25.83	3.81	(−6.78)

Dependent variable: log(donation) in Mar-Jun 2011

Obs.: 4360, P-value: 0.0000, Pseudo R^2: 0.0493

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Dependent variable: log(donation) in Mar–Jun 2011

Obs.: 4360, P-value: 0.0000, Pseudo R^2: 0.0493

The dummy variable "pre-donation" has a positive association with earthquake donations.

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Dependent variable: log(donation) in Mar-Jun 2011

Obs.: 4360, P-value: 0.0000, Pseudo R^2: 0.0493

There is a clear evidence of sudden surge of donations.
However, it sharply declines in course of time.

An Analysis of Tohoku Earthquake in 2011 (1)

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log(loan)	0.09	0.26	(0.36)
# of household member	−2.12	0.88	(−2.40)
workrate	[illegible]	[illegible]	[illegible]
log(distance)	[illegible]	[illegible]	(2.76)
dummy (Feb 2011)	1.01	1.45	(0.70)
_cons	[illegible]	[illegible]	[illegible]

Dependent variable: log(donation) in Jan–Feb 2011

Obs.: 2180, P-value: 0.0000, Pseudo R^2: 0.0434

Post-earthquake donation			
Tobit regression	coef.	std. err.	t stat.
gender	1.16	0.78	(1.48)
age<20	(omitted)		
20<=age<30	−4.00	1.65	(−2.42)
30<=age<40	−3.98	0.87	(−4.60)
40<=age<50	−1.69	0.74	(−2.28)
50<=age<60	−1.70	0.67	(−2.54)
log(income)	**2.77**	0.51	**(5.41)**
log(saving)	**0.41**	0.08	**(4.92)**
log(loan)	−0.02	0.08	(−0.31)
# of household member	−0.99	0.25	(−3.91)
workrate	−1.70	0.80	(−2.12)
log(distance)	[illegible]	[illegible]	[illegible]
dummy (pre-donation)	8.05	0.75	(10.79)
dummy (Mar 2011)	7.42	0.68	(10.90)
dummy (Apr 2011)	5.66	0.68	(8.27)
dummy (May 2011)	**2.68**	0.70	**(3.81)**
_cons	−25.83	3.81	(−6.78)

Dependent variable: log(donation) in Mar–Jun 2011

Obs.: 4360, P-value: 0.0000, Pseudo R^2: 0.0493

Age is associated with a positive effect across both earthquake donations and pre-earthquake donations.

Income and saving are associated with a positive effect across both earthquake donations and pre-earthquake donations.

An Analysis of Tohoku Earthquake in 2011 (2)

summary

- Four findings are consistent with previous studies:
  - The dummy variable "pre-donation" has a positive association with earthquake donations.
  - There is a clear evidence of sudden surge of donations.
    - However, it sharply declines in course of time.
  - Income and saving are associated with a positive effect across both earthquake donations and pre-earthquake donations.
  - Age is positively associated with both earthquake donations and pre-earthquake donations.

An Analysis of Tohoku Earthquake in 2011 (3)

* Positive and significant relationship between distance and donation in **pre-**earthquake period is observed.
  * The reason is unknown. There might be some correlation between private donation and geographical condition.
* However, negative and significant relationship between distance and donation in post-earthquake period.

→Then, this can be an evidence that earthquake donation is likely to be a function of geographical distance with negative coefficient.

An Analysis of Tohoku Earthquake in 2011 (4)

Post-earthquake donation restricting pre-donation=0			
Tobit regression	coef.	std. err.	t stat.
gender	0.88	0.88	(1.00)
age<20	(omitted)		
20<=age<30	**−4.32**	**1.83**	**(−2.37)**
30<=age<40	**−4.29**	**0.98**	**(−4.38)**
40<=age<50	**−2.16**	**0.84**	**(−2.58)**
50<=age<60	**−1.86**	**0.77**	**(−2.43)**
log(income)	2.64	0.58	(4.57)
log(saving)	0.50	0.10	(5.20)
log(loan)	−0.05	0.09	(−0.56)
# of household member	−0.98	0.28	(−3.49)
workrate	−1.78	0.90	(−1.98)
log(distance)	−0.76	0.34	(−2.28)
dummy (Mar 2011)	8.01	0.78	(10.24)
dummy (Apr 2011)	6.01	0.78	(7.66)
dummy (May 2011)	2.73	0.81	(3.38)
_cons	−25.41	4.26	(−5.97)

Dependent variable: log(donation) in Mar–Jun 2011

Obs.: 4068, P-value: 0.0000, Pseudo R^2: 0.0366

Post-earthquake donation restricting pre-donation=1			
Tobit regression	coef.	std. err.	t stat.
gender	2.77	1.98	(1.40)
age<20	(omitted)		
20<=age<30	**−2.94**	**4.50**	**(−0.65)**
30<=age<40	**−2.13**	**1.90**	**(−1.13)**
40<=age<50	**3.51**	**2.03**	**(1.73)**
50<=age<60	**−0.02**	**1.42**	**(−0.01)**
log(income)	3.35	1.21	(2.78)
log(saving)	−0.05	0.16	(−0.33)
log(loan)	−0.03	0.17	(0.16)
# of household member	−1.33	0.65	(−2.03)
workrate	−1.40	1.95	(−0.72)
log(distance)	0.61	0.74	(0.82)
dummy (Mar 2011)	**4.81**	**1.30**	**(3.71)**
dummy (Apr 2011)	**4.39**	**1.30**	**(3.38)**
dummy (May 2011)	**2.70**	**1.31**	**(2.07)**
_cons	−25.95	10.00	(−2.60)

Dependent variable: log(donation) in Mar–Jun 2011

Obs.: 292, P-value: 0.0002, Pseudo R^2: 0.0343

An Analysis of Tohoku Earthquake in 2011 (4)

FIES data showed that the amount of the donation peaked at Mar 2011, and it declined sharply during post-earthquake period.

However, for the donation from those who donated in pre-earthquake period, a significant downward trend with the amount of donation was not observed.

For sympathetic guys (who donated in pre-earthquake period), sympathy for the earthquake victims might last long.

Post-earthquake donation restricting pre-donation=0			
Tobit regression	coef.	std. err.	t stat.
gender	0.88	0.88	(1.00)
age<20	(omitted)		
20<=age<30	−4.32	1.83	(−2.37)
30<=age<40	−2.16	0.84	(−2.58)
40<=age<50	−1.86	0.77	(−2.43)
50<=age<60	2.64	0.58	(4.57)
log(income)	0.50	0.10	(5.20)
log(saving)	−0.05	0.09	(−0.56)
log(loan)			
# of household member	−0.98	0.28	(−3.49)
workrate	−1.78	0.90	(−1.98)
log(distance)	−0.76	0.34	(−2.28)
dummy (Mar 2011)	8.01	0.78	(10.24)
dummy (Apr 2011)	6.01	0.78	(7.66)
dummy (May 2011)	2.73	0.81	(3.38)
_cons	−25.41	4.26	(−5.97)

Dependent variable: log(donation) in Mar–Jun 2011

Obs.: 4068, P-value: 0.0000, Pseudo R^2: 0.0366

Post-earthquake donation restricting pre-donation=1			
Tobit regression	coef.	std. err.	t stat.
gender	2.77	1.98	(1.40)
age<20	(omitted)		
20<=age<30	−2.94	4.50	(−0.65)
30<=age<40	−3.71	2.13	(−1.73)
40<=age<50	−0.02	1.42	(−0.01)
50<=age<60	3.35	1.21	(2.78)
log(income)	−0.05	0.16	(−0.33)
log(saving)	−0.03	0.17	(0.16)
log(loan)			
# of household member	−1.33	0.65	(−2.03)
workrate	−1.40	1.95	(−0.72)
log(distance)	0.61	0.74	(0.82)
dummy (Mar 2011)	4.81	1.30	(3.71)
dummy (Apr 2011)	4.39	1.30	(3.38)
dummy (May 2011)	2.70	1.31	(2.07)
_cons	−25.95	10.00	(−2.60)

Dependent variable: log(donation) in Mar–Jun 2011

Obs.: 292, P-value: 0.0002, Pseudo R^2: 0.0343

An Analysis of Tohoku Earthquake in 2011 (4)

Post-earthquake donation restricting pre-donation=0			
Tobit regression	coef.	std. err.	t stat.
gender	0.88	0.88	(1.00)
age<20	(omitted)		
20<=age<30	−4.32	1.83	(−2.37)
30<=age<40	−4.29	0.98	(−4.38)
40<=age<50	−2.16	0.84	(−2.58)
50<=age<60	−1.86	0.77	(−2.43)
log(income)	2.64	0.58	(4.57)
log(saving)	0.50	0.10	(5.20)
log(loan)	−0.05	0.09	(−0.56)
# of household member	−0.98	0.28	(−3.49)
workrate	−1.78	0.90	(−1.98)
log(distance)	−0.76	0.34	(−2.28)
dummy (Mar 2011)	8.01	0.78	(10.24)
dummy (Apr 2011)	6.01	0.78	(7.66)
dummy (May 2011)	2.73	0.81	(3.38)
_cons	−25.41	4.26	(−5.97)

Dependent variable: log(donation) in Mar–Jun 2011

Obs.: 4068, P-value: 0.0000, Pseudo R^2: 0.0366

Post-earthquake donation restricting pre-donation=1			
Tobit regression	coef.	std. err.	t stat.
gender	2.77	1.98	(1.40)
age<20	(omitted)		
20<=age<30	−2.94	4.50	(−0.65)
30<=age<40	−2.13	1.90	(−1.13)
40<=age<50	3.51	2.03	(1.73)
50<=age<60	−0.02	1.42	(−0.01)
log(income)	3.35	1.21	(2.78)
log(saving)	−0.05	0.16	(−0.33)
log(loan)	−0.03	0.17	(0.16)
# of household member	−1.33	0.65	(−2.03)
workrate	−1.40	1.95	(−0.72)
log(distance)	0.61	0.74	(0.82)
dummy (Mar 2011)	4.81	1.30	(3.71)
dummy (Apr 2011)	4.39	1.30	(3.36)
dummy (May 2011)	2.70	1.31	(2.07)
_cons	−25.95	10.00	(−2.60)

Dependent variable: log(donation) in Mar–Jun 2011

Obs.: 292, P-value: 0.0002, Pseudo R^2: 0.0343

It is interesting to see the age effect.

Age has a positive association with earthquake donations by households who did not donate in pre-earthquake period.

However, age has no significant association with earthquake donations by households who did donate in pre-earthquake period.

An Analysis of Tohoku Earthquake in 2011 (5)

summary

* FIES data showed that the amount of the donation peaked at Mar 2011, and it declined sharply during post-earthquake period.
* For the donation from those who donated in pre-earthquake period, however, a significant downward trend with the amount of donation was not observed.
  * For sympathetic guys (who donated in pre-earthquake period), sympathy for the earthquake victims might last long.
* It is interesting to see the age effect.
  * Age has a positive association with earthquake donations by households who did not donate in pre-earthquake.
  * However, age has no significant association with earthquake donations by households who did donate in pre-earthquake period.

An Analysis of Hanshin Earthquake in 1995 (1)

Pre-earthquake donation			
Tobit regression	coef.	std. err.	t stat.
gender	−0.57	1.88	(−0.30)
age<20	(omitted)		
20<=age<30	−2.57	1.99	(−1.29)
30<=age<40	−3.18	1.20	(−2.65)
40<=age<50	−1.56	1.14	(−1.37)
50<=age<60	−2.37	1.19	(−1.99)
log(income)	**2.67**	0.84	**(3.17)**
# of household member	−0.19	0.39	(−0.49)
workrate	−4.18	1.53	(−2.72)
log(distance)	**0.22**	0.45	**(0.49)**
dummy (Dec 1994)	−0.27	0.73	(−0.37)
const.	−26.24	6.44	(−4.07)

Dependent variable: log(donation) in Nov-Dec 1994

Obs.: 2218, P-value: 0.0038, Pseudo R^2: 0.0086

Post-earthquake donation			
Tobit regression	coef.	std. err.	t stat.
gender	0.76	1.03	(0.74)
age<20	(omitted)		
20<=age<30	−2.78	1.19	(−2.34)
30<=age<40	−0.66	0.67	(−0.98)
40<=age<50	−0.36	0.66	(−0.55)
50<=age<60	−0.62	0.67	(−0.92)
log(income)	**1.75**	0.44	**(3.94)**
# of household member	−0.49	0.22	(−2.21)
workrate	−2.93	0.86	(−3.42)
log(distance)	**−1.13**	0.25	**(−4.49)**
dummy (pre-donation)	**4.55**	0.48	**(9.49)**
dummy (Jan 1995)	**11.20**	0.67	**(16.65)**
dummy (Feb 1995)	**8.00**	0.67	**(12.02)**
dummy (Mar 1995)	−1.42	0.78	(−1.83)
_cons	−16.83	3.43	(−4.90)

Dependent variable: log(donation) in Jan-Apr 1995

Obs.: 4436, P-value: 0.0000, Pseudo R^2: 0.0811

An Analysis of Hanshin Earthquake in 1995 (1)

Pre-earthquake donation			
Tobit regression	coef.	std. err.	t stat.
gender	−0.57	1.88	(−0.30)
age<20	(omitted)		
20<=age<30	−2.57	1.99	(−1.29)
30<=age<40	−3.18	1.20	(−2.65)
log(income)	2.67	0.84	(3.17)
# of household member	−0.19	0.39	(−0.49)
workrate	−4.18	1.53	(−2.72)
log(distance)	0.22	0.45	(0.49)
dummy (Dec 1994)	−0.27	0.73	(−0.37)
const.	−26.24	6.44	(−4.07)

Dependent variable: log(donation) in Nov–Dec 1994

Obs.: 2218, P-value: 0.0038, Pseudo R^2: 0.0086

Post-earthquake donation			
Tobit regression	coef.	std. err.	t stat.
gender	0.76	1.03	(0.74)
age<20	(omitted)		
20<=age<30	−2.78	1.19	(−2.34)
30<=age<40	−0.66	0.67	(−0.98)
# of household member	−0.49	0.22	(−2.21)
workrate	−2.93	0.86	(−3.42)
log(distance)	−1.13	0.25	(−4.49)
dummy (pre-donation)	4.55	0.48	(9.49)
dummy (Jan 1995)	11.20	0.67	(16.65)
dummy (Feb 1995)	8.00	0.67	(12.02)
dummy (Mar 1995)	−1.42	0.78	(−1.83)
_cons	−16.83	3.43	(−4.90)

The dummy variable "pre-donation" has a positive association with earthquake donations.

Dependent variable: log(donation) in Jan–Apr 1995

Obs.: 4436, P-value: 0.0000, Pseudo R^2: 0.0811

An Analysis of Hanshin Earthquake in 1995 (1)

Pre-earthquake donation			
Tobit regression	coef.	std. err.	t stat.
gender	−0.57	1.88	(−0.30)
age<20	(omitted)		
20<=age<30	−2.57	1.99	(−1.29)
30<=age<40	−3.18	1.20	(−2.65)
40<=age<50	−1.56	1.14	(−1.37)
log(income)	1.75	0.44	(3.17)
# of household member	−0.19	0.39	(−0.49)
workrate	−4.18	1.53	(−2.72)
log(distance)	0.22	0.45	(0.49)
dummy (Dec 1994)	−0.27	0.73	(−0.37)
const.	−26.24	6.44	(−4.07)

Dependent variable: log(donation) in Nov–Dec 1994

Obs.: 2218, P-value: 0.0038, Pseudo R^2: 0.0086

Post-earthquake donation			
Tobit regression	coef.	std. err.	t stat.
gender	0.76	1.03	(0.74)
age<20	(omitted)		
20<=age<30	−2.78	1.19	(−2.34)
30<=age<40	−0.66	0.67	(−0.98)
40<=age<50	−0.36	0.66	(−0.55)
log(income)	1.75	0.44	(3.94)
# of household member	−0.49	0.22	(−2.21)
workrate	−2.93	0.86	(−3.42)
log(distance)	−1.13	0.25	(−4.49)
dummy (pre-donation)	4.55	0.48	(9.49)
dummy (Jan 1995)	11.20	0.67	(16.65)
dummy (Feb 1995)	8.00	0.67	(12.02)
dummy (Mar 1995)	−1.42	0.78	(−1.83)
_cons	−16.83	3.43	(−4.90)

There is a clear evidence of sudden surge of donations and it sharply declines in course of time.

Dependent variable: log(donation) in Jan–Apr 1995

Obs.: 4436, P-value: 0.0000, Pseudo R^2: 0.0811

An Analysis of Hanshin Earthquake in 1995 (1)

Pre−earthquake donation			
Tobit regression	coef.	std. err.	t stat.
gender	−0.57	1.88	(−0.30)
age<20	(omitted)		
20<=age<30	−2.57	1.99	(−1.29)
30<=age<40	−3.18	1.20	(−2.65)
40<=age<50	−1.56	1.14	(−1.37)
50<=age<60	−2.37	1.19	(−1.99)
log(income)	**2.67**	0.84	**(3.17)**
# of household member	−0.19	0.39	(−0.49)
workrate	−4.18	1.53	(−2.72)
log(distance)	0.22	0.45	[illegible]
dummy (Dec 1994)	−0.27	0.73	(−0.37)
const.	−26.24	6.44	(−4.07)

Dependent variable: log(donation) in Nov−Dec 1994

Obs.: 2218, P-value: 0.0038, Pseudo R²: 0.0086

Post−earthquake donation			
Tobit regression	coef.	std. err.	t stat.
gender	0.76	1.03	(0.74)
age<20	(omitted)		
20<=age<30	−2.78	1.19	(−2.34)
30<=age<40	−0.66	0.67	(−0.98)
40<=age<50	−0.36	0.66	(−0.55)
50<=age<60	−0.62	0.67	(−0.92)
log(income)	**1.75**	0.44	**(3.94)**
# of household member	−0.49	0.22	(−2.21)
workrate	−2.93	0.86	(−3.42)
log(distance)	−1.13	0.25	(−4.49)
dummy (pre−donation)	4.55	0.48	(9.49)
dummy (Jan 1995)	11.20	0.67	(16.65)
dummy (Feb 1995)	[illegible]	[illegible]	[illegible]
dummy (Mar 1995)	−1.42	0.78	(−1.83)
_cons	−16.83	3.43	(−4.90)

Age is positively associated with earthquake donations and pre-earthquake donations.

Income is positively associated with earthquake donations and pre-earthquake donations.

Dependent variable: log(donation) in Jan−Apr 1995

Obs.: 4436, P-value: 0.0000, Pseudo R^2: 0.0811

An Analysis of Hanshin Earthquake in 1995 (2)

summary

- The findings in Hanshin Earthquake are similar to those in Tohoku Earthquake.
  - The dummy variable "pre-donation" has a positive association with earthquake donations.
  - There is a clear evidence of sudden surge of donations and it sharply declines in course of time.
  - Income is positively associated with earthquake donations and pre-earthquake donations.
  - Age is positively associated with earthquake donations and pre-earthquake donations.

An Analysis of Hanshin Earthquake in 1995 (1)

Distance is not a significant explanatory variable in pre-earthquake period.

It is consistent with our hypothesis. Note that the epicenter is different between Hanshin earthquake and Tohoku Earthquake.

Distance is a significant variable in post-earthquake period.

Therefore, earthquake donation is likely to be a function of geographical distance with negative coefficient.

It is also consistent with our hypothesis.

Pre-earthquake donation

Tobit regression	coef.	std. err.	t stat.
gender	−0.57	1.88	(−0.30)
age<20	(omitted)		
20<=age<30	−2.57	1.99	(−1.29)
30<=age<40	−3.18	1.20	(−2.65)
40<=age<50	[illegible]	[illegible]	[illegible]
50<=age<60	−2.37	1.19	(−1.99)
log(income)	**2.67**	0.84	**(3.17)**
# of household member	−0.19	0.39	(−0.49)
workrate	−4.18	1.53	(−2.72)
log(distance)	**0.22**	0.45	**(0.49)**
dummy (Dec 1994)	−0.27	0.73	(−0.37)
const.	−26.24	6.44	(−4.07)

Dependent variable: log(donation) in Nov−Dec 1994

Obs.: 2218, P-value: 0.0038, Pseudo R^2: 0.0086

Post−earthquake donation

Tobit regression	coef.	std. err.	t stat.
gender	0.76	1.03	(0.74)
age<20	(omitted)		
20<=age<30	[illegible]	[illegible]	[illegible]
30<=age<40	−0.66	0.67	(−0.98)
40<=age<50	−0.36	0.66	(−0.55)
50<=age<60	−0.62	0.67	(−0.92)
log(income)	**1.75**	0.44	**(3.94)**
# of household member	−0.49	0.22	(−2.21)
workrate	−2.93	0.86	(−3.42)
log(distance)	**−1.13**	0.25	**(−4.49)**
dummy (pre−donation)	**4.55**	0.48	**(9.49)**
dummy (Jan 1995)	**11.20**	0.67	**(16.65)**
dummy (Feb 1995)	**8.00**	0.67	**(12.02)**
dummy (Mar 1995)	−1.42	0.78	(−1.83)
_cons	−16.83	3.43	(−4.90)

Dependent variable: log(donation) in Jan−Apr 1995

Obs.: 4436, P-value: 0.0000, Pseudo R^2: 0.0811

An Analysis of Hanshin Earthquake in 1995 (3)

summary

* Distance is not a significant explanatory variable in pre-earthquake period.
  * It is consistent with our hypothesis. Note that the epicenter is different between Hanshin earthquake and Tohoku Earthquake.
* Distance is a significant variable in post-earthquake period.
* Therefore, earthquake donation is likely to be a function of geographical distance with negative coefficient.
  * It is also consistent with our hypothesis.

An Analysis of Hanshin Earthquake in 1995 (4)

Post-earthquake donation restricting pre-donation=0			
Tobit regression	coef.	std. err.	t stat.
gender	0.85	1.26	(0.68)
age<20	(omitted)		
20<=age<30	**−3.30**	1.48	**(−2.22)**
30<=age<40	**−0.89**	0.85	**(−1.05)**
40<=age<50	**−0.39**	0.85	**(−0.45)**
50<=age<60	**−0.72**	0.86	**(−0.84)**
log(income)	1.90	0.57	(3.35)
# of household member	−0.79	0.28	(−2.87)
workrate	−2.42	1.06	(−2.27)
log(distance)	**−1.17**	0.31	**(−3.73)**
dummy (Jan 1995)	**11.64**	0.88	**(13.18)**
dummy (Feb 1995)	**8.63**	0.87	**(9.88)**
dummy (Mar 1995)	−1.98	1.05	(−1.89)
_cons	−18.11	4.35	(−4.16)

Dependent variable: log(donation) in Jan–Apr 1995

Obs.: 3480, P-value: 0.0000, Pseudo R^2: 0.0715

Post-earthquake donation restricting pre-donation=1			
Tobit regression	coef.	std. err.	t stat.
gender	−0.06	1.95	(−0.03)
age<20	(omitted)		
20<=age<30	**−2.52**	2.09	**(−1.20)**
30<=age<40	**−0.77**	1.15	**(−0.67)**
40<=age<50	**−1.03**	1.10	**(−0.94)**
50<=age<60	**−0.61**	1.10	**(−0.55)**
log(income)	1.70	0.72	(2.37)
# of household member	0.40	0.41	(0.97)
workrate	−4.87	1.49	(−3.27)
log(distance)	**−0.98**	0.43	**(−2.25)**
dummy (Jan 1995)	**10.51**	0.99	**(10.62)**
dummy (Feb 1995)	**6.72**	0.98	**(6.84)**
dummy (Mar 1995)	−0.45	1.08	(−0.41)
_cons	−12.12	5.66	(−2.14)

Dependent variable: log(donation) in Jan–Apr 1995

Obs.:956, P-value: 0.0000, Pseudo R^2: 0.0802

An Analysis of Hanshin Earthquake in 1995 (4)

Post-earthquake donation restricting pre-donation=0			
Tobit regression	coef.	std. err.	t stat.
gender	0.85	1.26	(0.68)
age<20	(omitted)		
20<=age<30	**−3.30**	1.48	**(−2.22)**
30<=age<40	**−0.89**	0.85	**(−1.05)**
40<=age<50	**−0.39**	0.85	**(−0.45)**
50<=age<60	**−0.72**	0.86	**(−0.84)**
log(income)	1.90	0.57	(3.35)
# of household member	−0.79	0.28	(−2.87)
workrate	−2.42	1.06	(−2.27)

Post-earthquake donation restricting pre-donation=1			
Tobit regression	coef.	std. err.	t stat.
gender	−0.06	1.95	(−0.03)
age<20	(omitted)		
20<=age<30	**−2.52**	2.09	**(−1.20)**
30<=age<40	**−0.77**	1.15	**(−0.67)**
40<=age<50	**−1.03**	1.10	**(−0.94)**
50<=age<60	**−0.61**	1.10	**(−0.55)**
log(income)	1.70	0.72	(2.37)
# of household member	0.40	0.41	(0.97)
workrate	−4.87	1.49	(−3.27)

It is interesting to see the coefficient of age.

Age has a positive association with earthquake donations who did not donate in pre-earthquake period.

However, for household who did donate in pre-earthquake period, age has no significant association with earthquake donations.

Similar result with Tohoku Earthquake.

An Analysis of Hanshin Earthquake in 1995 (4)

Post-earthquake donation restricting pre-donation=0			
Tobit regression	coef.	std. err.	t stat.
gender	0.85	1.26	(0.68)
age<20	(omitted)		
20<=age<30	**−3.30**	1.48	**(−2.22)**
40<=age<50	−0.38	0.85	(−0.45)
50<=age<60	−0.72	0.86	(−0.84)
log(income)	1.90	0.57	(3.35)
# of household member	−0.79	0.28	(−2.87)
workrate	−2.42	1.06	(−2.27)
log(distance)	**−1.17**	0.31	**(−3.73)**
dummy (Jan 1995)	**11.64**	0.88	**(13.18)**
dummy (Feb 1995)	**8.63**	0.87	**(9.88)**
dummy (Mar 1995)	−1.98	1.05	(−1.89)
_cons	−18.11	4.35	(−4.16)

Dependent variable: log(donation) in Jan−Apr 1995

Obs.: 3480, P-value: 0.0000, Pseudo R^2: 0.0715

Post-earthquake donation restricting pre-donation=1			
Tobit regression	coef.	std. err.	t stat.
gender	−0.06	1.95	(−0.03)
age<20	(omitted)		
20<=age<30	**−2.52**	2.09	**(−1.20)**
40<=age<50	−1.03	1.10	(−0.94)
50<=age<60	−0.61	1.10	(−0.55)
log(income)	1.70	0.72	(2.37)
# of household member	0.40	0.41	(0.97)
workrate	−4.87	1.49	(−3.27)
log(distance)	**−0.98**	0.43	**(−2.25)**
dummy (Jan 1995)	**10.51**	0.99	**(10.62)**
dummy (Feb 1995)	**6.72**	0.98	**(6.84)**
dummy (Mar 1995)	−0.45	1.08	(−0.41)
_cons	−12.12	5.66	(−2.14)

Dependent variable: log(donation) in Jan−Apr 1995

Obs.:956, P-value: 0.0000, Pseudo R^2: 0.0802

For the donation from those who donated in pre-earthquake period, it significantly dropped after the earthquake.

Different result from Tohoku Earthquake.

An Analysis of Hanshin Earthquake in 1995 (5)

summary

* As in Tohoku Earthquake, it is interesting to see the coefficient of age.
  * Age has a positive association with earthquake donations who did not donate in pre-earthquake period.
  * However, for household who did donate in pre-earthquake period, age has no significant association with earthquake donations.
  * Similar result with Tohoku Earthquake.
* For the donation from those who donated in pre-earthquake period, it significantly dropped after the earthquake.
  * Different result with Tohoku Earthquake.

Result (1)

* We find several determinants for sudden upsurge of donations, following an unexpected event such as natural disaster.
* Some determinants are consistent with previous studies, such as Brown et al. (2012).
  * The fact that a household once donated for non-earthquake purpose has a strong positive association with the household's earthquake donations.
  * Income and saving are positively associated with earthquake donations and non-earthquake purpose donations.
  * Age has a positive association both with earthquake donations and non-earthquake purpose donations.

Result (2)

* In addition, there are several new findings.
  * Earthquake donation is likely to be a function of geographical distance from the epicenter with negative coefficient.
    * This may indicate that sympathy for earthquake victims is negatively associated with distance.
  * Age has a significant positive association with earthquake donations by households who did not donate for non-earthquake purpose. However, such positive association vanishes for earthquake donations by households who donated for non-earthquake purpose.

Conclusion (1)

* We conducted an event study on donation, before and after disastrous earthquakes and found the determinants for earthquake donations.
* Among the determinants, past experience of donation positively and significantly associated with earthquake donations.
* Income and saving as well as age have a positive association both with earthquake donations and with donations for other purposes.

Conclusion (2)

* Earthquake donations are likely to be a function of geographical distance with negative coefficient.
  * Such phenomenon, which was studied in happiness research, should be further studied in charitable donations.
* No association was observed between age and earthquake donation for households who once donated in pre-earthquake period.

Conclusion (3)

* For policy perspective, it is worthy to understand the trend of behaviors related to earthquake donation.
* From this study, we can say
  * **sympathetic** (who once donated for other purposes),
  * **rich** (high income, saving) and
  * and **close** (from the epicenter, in the case of earthquake)

people tend to donate for the victims.

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