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What motivates volunteer work in an emergency? Evidence from the 2011 East Japan Earthquake and Tsunami

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Abstract

This paper studies the mechanism of volunteer labor supply using panel data gathered during the period before and after the Great East Japan Earthquake and Tsunami, which occurred on March 11, 2011. The results obtained from descriptive statistics and random probit model estimates show that the lower the opportunity costs of workers were, the more inclined they were to participate in volunteer activities prior to the earthquake. However, the data also suggests that this trend had become reversed during the period following the earthquake. This shift indicates that besides opportunity costs, factors such as altruistic and philanthropic sentiment may have inspired people to volunteer, particularly when serious conditions necessitate urgent assistance.

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1. Introduction

The Great East Japan Earthquake, which occurred on March 11, 2011, caused catastrophic human and economic damage along the coastal areas of the Tohoku region in Japan. The intense tremors and accompanying tsunami had resulted in a combined total of more than 19,000 dead and missing. Coupled with the accident at the Fukushima nuclear power plant, the estimated cost from the damage exceeded 16 trillion yen, which was equivalent to 3.4% of the Japanese gross domestic product (GDP). Immediately following the earthquake, large numbers of volunteers gathered in the disaster-stricken areas to participate in various activities, such as removing debris and sludge and providing soup-runs for those in need. As of January 2012, the numbers of disaster volunteers have exceeded 900,000 within the devastated areas of Fukushima, Miyagi, and Iwate prefectures alone. How can the volunteer labor supply at the time of such disasters be explained economically? Using panel data obtained before and after the Great East Japan Earthquake, this paper examines how the decision-making mechanisms of volunteer labor supply can differ between the periods of normality and disaster.

As Menchik and Weisbrod (1987) and Freeman (1997) suggest, previous studies often consider volunteerism to be a type of leisure. Assuming that participating in volunteer activities in itself produces utility, one can show that individuals determine the optimal distribution between consumption (paid work) and leisure (unpaid volunteer work) subject to budget and time constraints. Consequently, as long as the income effect is small, volunteer labor supply has a substitution relationship with paid work or wages, which are the shadow price of leisure. In other words, the amount of time a volunteer becomes involved tends to increase for those who possess shorter working hours or lower wages.[1]

However, research from previous studies suggests that people do not necessarily determine whether to supply volunteer labor in correspondence to opportunity costs. For instance, using the Current Population Survey in the U.S., Freeman (1997) shows a weak relationship between volunteer participation and the number of hours worked. Using

[1] Menchik and Weisbrod (1987) also propose a human investment model, which view volunteering as a type of human investment. The human investment model also shows a relationship in which individuals with higher opportunity costs are less inclined to participate in volunteer activities.

Japanese data, Yamauchi (2001) shows mixed results that negative correlations between volunteer participation and hourly wages are observed in regional aggregate data but not in individual micro data. In addition to examining whether the supply of volunteer labor prior to the earthquake in Japan was in direct correspondence to workers' opportunity costs, this paper investigates how it differed during the state of emergency brought about by the disaster.

2. Data and basic fact

The data used in this paper include the Great East Japan Earthquake Special Survey (GEES) conducted in June 2011 as well as the Keio Household Panel Survey (KHPS) and the Japan Household Panel Survey (JHPS), both of which were administered in January 2011. The KHPS and JHPS are nationwide household panel surveys that begun in 2004 and 2009, respectively. For the GEES, questionnaires were mailed to 6,190 respondents of the KHPS and JHPS, and 4,210 individuals responded, which corresponds to a response rate of 68.0%.[2] Since the GEES respondents also replied to the KHPS and JHPS conducted in January 2011, it is possible to see how the same individuals were inclined to volunteer during the period before and after the earthquake in March 2011.[3]

The data from KHPS and JHPS 2011 survey shows that the percentage of those who participated in all kinds of volunteer activities prior to the earthquake was 10.2% with an average time of 0.4 hours per week.[4] On the other hand, from March to May

[2] The research targets for KHPS and JHPS were males and females throughout Japan selected by a stratified two-stage sampling method. They ranged in age from 20 to 69 years of age (20 years of age or older for JHPS).

[3] Most of the individual characteristics of the responders to the GEES are similar to that of its population (the KHPS and JHPS). But, the responders of GEES tend to be older, have fewer family members, reside more urban areas than those of the KHPS and JHPS.

[4] The Japanese government's Survey on Time Use and Leisure Activities statistics (compiled by the Ministry of Internal Affairs and Communications) also shows that the amount of time volunteered per week was 0.6 hours in 2006, suggesting that there is no major difference with the data presented in this paper. On the other hand, according to the American Time Use Survey (Bureau of Labor Statistics) of the U.S., the number of volunteer hours is 1.05 hours per week, which indicates that the level of volunteer participation by the Japanese is lower than that of the Americans.

2011, the total number of disaster volunteers was 118, which was approximately 2.8% of the 4,210 respondents. Although the volunteer participation rate significantly declined after the earthquake, it is important to note that the types of volunteer activities in our data differ during the period before and after the earthquake. Since the volunteer activities before the earthquake include not only disaster volunteer but also all types of activities such as care and cleaning, it is natural to expect a lower participation rate after the earthquake. On the other hand, we could also interpret that disaster volunteering immediate after the earthquake would have been constrained by the breakdown of infrastructure, concerns about further dangers in the affected areas, and a very different pattern of opportunities by geography.

To confirm the relationship between opportunity costs and volunteer labor, Figure 1 shows the volunteer participation rates for workers plotted across hourly wage rates by quintiles. The figure indicates that the volunteer participation rate was higher for low-wage workers prior to the earthquake, which is consistent with the standard economic theory. However, they tended to recede from the disaster volunteer during the period following the earthquake, and consequently, more high-wage earners began volunteering. This shows an inverse phenomenon for volunteer behaviors. Then, what factors other than opportunity costs had an effect on the disaster volunteer labor supply?

Figure 1 Volunteer Participation Rates across Hourly Wages

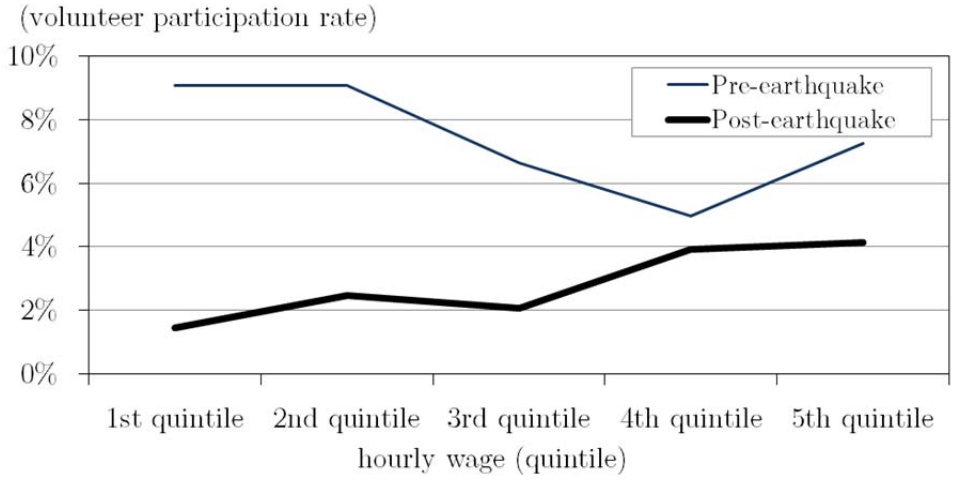

Table 1 compares the individual characteristics of volunteer and non-volunteer participants. It shows that the participation rate of post-earthquake volunteers are generally higher in the following groups: 1) residents in the Tohoku and Kanto regions close to the primary disaster areas; 2) victims of the disaster themselves, family members, friends, or acquaintances; and 3) workers experiencing operation cutbacks in their own workplace. These factors were confirmed along with the opportunity costs by estimating a probit model for the volunteer labor supply.

Table 1 Individual Characteristics for Volunteers and Non-Volunteers

	Pre-earthquake		Post-earthquake	
	Volunteers	Non-volunteers	Volunteers	Non-volunteers
Hourly wage (thousand yen)	1.567	1.685	2.096	1.664
	(1.266)	(1.195)	(1.486)	(1.189)
Family income other than the respondent's (thousand yen)	3993.619	3530.863	3156.171	3577.361
	(3901.039)	(4027.872)	(3446.333)	(4035.595)
Flextime dummy	0.571	0.407	0.446	0.419
	(0.496)	(0.491)	(0.500)	(0.493)
Self-employed dummy	0.393	0.235	0.289	0.245
	(0.490)	(0.424)	(0.456)	(0.430)
Age	54.350	49.000	48.289	49.430
	(12.081)	(12.795)	(12.380)	(12.832)
Male dummy	0.512	0.548	0.615	0.543
	(0.501)	(0.498)	(0.490)	(0.498)
Married dummy	0.833	0.767	0.831	0.770
	(0.374)	(0.423)	(0.377)	(0.421)
University graduate dummy	0.310	0.294	0.301	0.295
	(0.464)	(0.456)	(0.462)	(0.456)
Residential area dummy (Kanto area)	0.340	0.337	0.458	0.334
	(0.475)	(0.473)	(0.501)	(0.472)
Residential area dummy (Tohoku area)	0.059	0.047	0.133	0.045
	(0.236)	(0.212)	(0.341)	(0.208)
A dummy for the victims themselves, family members, friends, or acquaintances			0.602	0.357
			(0.492)	(0.479)
A dummy for opertiaon cutbacks			0.096	0.042
			(0.297)	(0.201)
Observations	203	2548	83	2668

Note: Numbers in parentheses are standard errors.

3. Estimation Results

By pooling the data before and after the earthquake, we estimate random-effect probit models where probability of volunteer labor supply is affected by opportunity costs and other individual characteristics. In the estimation model, the opportunity costs correspond to hourly wages, family income other than the respondent's, and dummy variables for flextime and self-employed, while the individual characteristics includes age and dummy variables for post-earthquake, sex, marital status, university graduate, residential area, the victims themselves, family members, friends, or acquaintances, operation cutbacks, industry, and occupation.

The estimation results are summarized in Table 2. As seen in Table 2, we included cross-terms of post-earthquake dummy and a series of variables to examine the difference in the marginal effects before and after the earthquake.[5] Looking at the table, we find that the hourly wage has a significantly negative effect on the participation rate of volunteer activity before the earthquake. It also shows that those who are relatively flexible in their work schedules such as self-employed or workers with flextime have a significantly higher probability of volunteering before the earthquake. These findings confirm that individuals with higher opportunity costs from wages and time are less inclined to participate in volunteer activities during period before the earthquake. Second, focusing on the cross-terms, we find the coefficients of hourly wages significantly increased after the earthquake, and those of flextime and self-employed dummies declined (although insignificant). Furthermore, conducting F-test for the coefficient of hourly wage after the earthquake (i.e. –0.007+0.019), we can confirm a significantly positive effect of hourly wage on the disaster volunteering. These results suggest that workers with higher opportunity costs were more inclined to volunteer after the March 2011 earthquake, which is difficult to explain with opportunity costs or standard economic theory.[6]

[5] In Table 2, cross-terms that were not significant are not included such as male and married dummies.

[6] Using hours worked, instead of hourly wage rates, as an independent variable still shows that volunteer participation rates tend to be higher for workers with shorter working hours before the earthquake, and lower for workers with longer working hours. However, this trend reversed after the

There would be several interpretations for the switch in the sign of the hourly wage coefficients after the earthquake. One is an increase in the cost of volunteer activity due to the breakdown of transportation and utilities and concerns about further aftershocks in immediate aftermath of the earthquake. It may be the case that only higher wage workers could afford to the higher cost of disaster volunteer. Another is a change in the allocation between time and money donation for high wage workers. Prior to the earthquake, workers with higher wages might have donated more money than time. After the earthquake, however, they might shift to donating more time possibly duet to

Table 2 Estimation Results for the Probit Model

	(1)			(2)		
	Marginal effects	Standard errors		Marginal effects	Standard errors	
Hourly wage (natural logarithm)	-0.007	(0.005)	*	-0.008	(0.005)	*
Flextime dummy	0.012	(0.006)	*	0.012	(0.007)	*
Self-employed dummy	0.021	(0.008)	***	0.021	(0.008)	***
Age	0.001	(0.000)	***	0.001	(0.000)	***
Residential area dummy (Kanto area)	0.000	(0.006)		0.000	(0.006)	
Residential area dummy (Tohoku area)	0.002	(0.014)		0.002	(0.014)	
Post-earthquake dummy						
× Constant	0.019	(0.020)		0.007	(0.021)	
× Hourly wage (natural logarithm)	0.019	(0.007)	***	0.022	(0.007)	***
× Flextime dummy	-0.012	(0.010)		-0.014	(0.010)	
× Self-employed dummy	-0.002	(0.011)		-0.001	(0.012)	
× Age	-0.001	(0.000)	***	-0.001	(0.000)	***
× Residential area dummy (Kanto area)	0.017	(0.010)	*	0.013	(0.010)	
× Residential area dummy (Tohoku area)	0.050	(0.020)	**	0.041	(0.020)	**
× A dummy for the victims themselves, family member, friends, or acquaitances				0.025	(0.009)	***
× A dummy for opertiaon cutbacks				0.028	(0.017)	*
Family income other than the respondent's (thousand yen)	0.000	(0.000)		0.000	(0.000)	
Male dummy	-0.002	(0.006)		-0.001	(0.007)	
Married dummy	0.007	(0.006)		0.006	(0.007)	
University graduate dummy	0.003	(0.006)		0.003	(0.006)	
Sigma	-0.815	(0.076)	**	-0.910	(0.076)	**
Log likelihood	−838.536			−832.916		

Notes: 1. Industry and occupation dummies are included.
2. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

earthquake as seen for hourly wage rates.

as altruistic and philanthropic sentiment in the serious and urgent circumstances following the earthquake. The other is firm's roles in disaster volunteer. It is likely that firms and/or labor unions encouraged or even ordered their workers to participate disaster volunteer activity. If so, more highly paid workers could have participated in disaster volunteer.

Table 2 also shows that the effect of age on volunteer participation reversed from positive to negative after the earthquake. In addition, it is shown that workers who resided in the Kanto and Tohoku regions (near the primary disaster areas) were more likely to participate in disaster volunteer activities. This is due to both time and distance factors, which have a strong influence for disaster volunteers, since most of the activities are centered in damaged areas. As seen in column (2), we can also confirm that a dummy variable indicating the victims of the disaster themselves (as well as family members, friends, and acquaintances) has a significantly positive coefficient. It is understood that the relationship to the victims tends to raise an overall altruistic consciousness and inspires them to disaster volunteer. Furthermore, a dummy variable indicating reduced operating hours at workplace also shows a significantly positive effect on post-earthquake volunteer labor supply. Since many Japanese firms were forced to conduct operational cutbacks due to the disaster and supply-chain disruptions, it can be understood that the extra hours brought on by the reduction of working hours were assigned toward the volunteer labor supply.[7] This may also suggest that during times of normality, the long working hours in Japan could have prevented workers from participating in any type of volunteer activity.

4. Conclusion

This paper examined the mechanism of the volunteer labor supply on the basis of panel data obtained during the periods before and after the Great East Japan Earthquake, which occurred on March 11, 2011. The results of descriptive statistics and random-effect

[7] Another interpretation is that firms with reduced operations had strong ties with the damaged areas and this may have prompted their employees to participate in volunteer activities. However, since Table 2 controls for the presence of earthquake victims, including friends and acquaintances, we can speculate that the effects from the removal of work hour constraints are more profound.

probit model estimates revealed that workers with low opportunity costs were more inclined to participate in volunteer activities before the earthquake. This trend is consistent with standard economic theory. However, this trend was also reversed after the earthquake and suggests that factors which cannot be explained by opportunity costs, such as altruistic and philanthropic sentiment, helped motivate volunteer activities during the serious and urgent circumstances following the earthquake.

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