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Social Capital, Mutual Aids in Disasters, and Evaluation on Neighborhood's Disaster-Preparation: Comparison between the States of Volunteer-Firefighter and the States of Career-Firefighter in the United States^{a)}

社会資本, 災害における共助, 地域の災害準備評価:
アメリカ合衆国における消防士がボランティア中心の州と職業消防士が多い州との比較

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SUMMARY

Putnam defined concept of social capital as social network and also focused on its psychological aspects of trust, good will, fellowship, and sympathy. Influence of subjective connectedness in neighborhood, a psychological feature of social capital, on evaluation on neighborhood's disaster-preparation was compared between 14 States in the U.S where more than 80% of fire departments were served by all volunteer-firefighters (SVF) [Nebraska, South Dakota, Pennsylvania, New York, etc.] and 6 States where more than 20% of fire department were with all Career-firefighters (SCF) [Florida, Massachusetts, California, Arizona, etc.]. It was assumed that culture or social norm of neighbors' mutual aids in disasters is kept in SVF while it is at a low ebb in SCF. Respondents of a nationwide online questionnaire survey in SVF [N=180] and in SCF [N=170] were put into causality analyses of SEM. The results showed that perception of social capital determined evaluation on neighborhood's disaster-preparation in SVF but it directly determined personal disaster-preparing behaviors in SCF. It might be considered that it was spurious relationship and true cause of it was small size of communities, as almost all the areas with small population are protected by volunteer-firefighters in the U.S. However, the spurious relationship was not supported by the analysis with respondents in urban life style areas [N=379] and in country life style areas [N=235]. It was inter-

puted that culture or social norm of neighbors' mutual aids in disasters was a factor whether perception of social capital facilitate evaluation on neighborhood's disaster-preparation.

Key Words

social capital; connectedness in neighborhood; mutual aids in disasters; disaster-preparation; efficacy against disasters

要約

Putnam は、社会資本を社会ネットワークの概念であると定義し、さらにその心理学的側面すなわち信頼、善意、仲間意識、共感などに着目した。本論文では、社会資本の一側面である近隣社会における人々の主観的結びつき感が、近隣社会による災害共助、災害準備への評価に及ぼす影響について検討した。アメリカ合衆国の消防制度は歴史的にボランティアによって担われてきた。ネブラスカ、サウスダコタ、ペンシルベニア、ニューヨークなど14州は、すべての消防士がボランティアである消防署が80%以上である(SVF)。これに対して、フロリダ、マサチューセッツ、カリフォルニア、アリゾナなど6州は、すべて職業消防士である消防署が20%以上ある(SCF)。ボランティア消防士によるSVFでは、災害における近隣の共助の文化・規範が保たれて社会資本が近隣の共助・災害準備評価と連動するのに対して、職業消防士が多いSCFではその文化・規範が弱まっていてその連動は小さいであろうと考えられた。アメリカ全土におけるweb調査から、SVFに住む回答者(N=108)とSCFに住む回答者(N=170)を抽出して、構造方程式モデルによる多母集団同時分析を行った。結果は、SVFでは主観的結びつき感が近隣の災害準備評価を規定していたのに対して、SCFでは主観的結びつき感は個人的災害準備行動を直接規定していた。これは仮説を支持していた。ここで、このSVFとSCFの違いは、都市と田舎の効果が疑似的に表れている可能性も考えられた。アメリカ合衆国では小さな地域ではボランティア消防士、大都市では職業消防士である傾向がある。しかしながら、上記調査から都市居住者(N=379)と田舎居住者(N=235)を抽出して同様の分析を行ったが、データはモデルに適合しなかった。SVFとSCFの違いが、都市と田舎の疑似的關係であるとは認められなかった。

1. INTRODUCTION

When people face to disasters they will expect three kinds of aids given to them, self-aid by family and themselves, public-aid by governments, and civic-aid by neighbors and communities. We focused on the expectation of mutual aids in neighborhood, one of civic-aids, in disasters, as a parameter of effects of social capital. That is, it would be a factor that conditions the effects of social capital, especially in its psychological aspect, in disasters. In case

of Hanshin-Awaji earthquake in Japan in 1995, neighbors rescued more than three times as many people as firefighters, policemen, and self-defense force did.⁽¹⁵⁾ Shiotani⁽²⁴⁾ found out that social capital facilitated efficacy of neighbors' mutual aids through analysis using Japanese nationwide questionnaire survey data of JGSS-2012.

The concept of social capital is not new. Putnam⁽²²⁾ pointed out that social capital in its contemporary guise was first identified as such by Hanifan⁽¹²⁾, Jacob⁽¹⁴⁾, Loury⁽¹⁷⁾, and Bourdieu⁽²⁾.

Putnam⁽²¹⁾ merged a variety of meaning as he defined social capital as features of social life, networks, norms, and trust, that facilitated coordination and cooperation for mutual benefit, though most of social capital researches in recent years have focused on social networks and general trust as two main dimensions of the concept.^{(4) (8) (11) (18) (19) (20) (21) (22)} Therefore, the concept of social capital in its psychological aspect is defined as a belief or expectation that people of area/community will coordinate or cooperate for mutual benefit.

The social capital was measured in several ways in recent researches as the concept entails several components. We measured the psychological aspects of social capital by questions about subjective connectedness in neighborhood, and general trust. In addition, psychological costs in neighborhood lives were measured as negative feature of social capital. Among the three measurement items subjective connectedness will relate most with mutual aids in disasters, since general trust is the function of relatively long term transactions in give-and-take relations⁽²⁷⁾, and mutual aids should be expected without trust in emergencies. Psychological costs in neighborhood lives will work for not keeping membership of the community and will have small relation with mutual aids in emergencies.

It is known that at the first phase of a disaster people will not panic at it because people without any special talents and/or responsibility against the disaster will fall into resignation in the situation.^{(7) (13) (23)} At that period most of social and economic status of victims will be canceled out and everyone will

seem to be equal which will facilitate people to take mutual aids in disasters. However, at the next phase of a disaster the individual differences in power of self-aids will make victims differentiate between those who have enough power of self-aids and those who have the insufficient power and count more on public-aids. As a result, mutual aids or civic-aids will decline at the second phase of a disaster in general.

Plenty of researches reported that social capitals helped to produce better aids and recovery from disasters. For example, Barrios⁽¹⁾ researched two local communities in Choluteca, Honduras after Hurricane Mitch attacked them in 1998, and gap in social capital between the communities made absolutely different results in housing recovery. Chamlee-Wright and Storr⁽⁶⁾ investigated the swift return of the residents in Vietnamese-American community surrounding the Mary Queen of Vietnam Catholic Church in New Orleans East after Hurricane Katrina. Utilizing the church provision of club goods, they could foster social cooperation and community redevelopment in the wake of a disaster.

As the concept of social capital contains several components and its measurement varies in each research so far, it is still obscure what feature of social capital would facilitate communities' preparedness against disasters. It is plausible that some unique factors in disaster determine the effect of social capital. We assume that one of the factors would be culture or social norms of mutual aids in disasters.

Shiotani, et al⁽²⁵⁾ analyzed social survey data and found that subjective connectedness, one

of social capitals, strengthened collective efficacy in neighbors. Neighbors with strong subjective connectedness would expect more mutual aids against disasters in community, therefore subjective connectedness would facilitate efficacy against disasters in community.

According to Dual Process Theories⁽⁵⁾ psychological factors such as attitudes will not correspond behaviors in condition of low involvement to the issue. In case that neighbors' mutual aids against disasters do not have personal value and people are not involved in the mutual aids, the efficacy and evaluation of community's preparedness against disasters would not correlate. And if people do not have psychological involvement in neighbors' mutual aids against disasters, they would be involved more in personal preparation against disasters.

In the U.S. traditionally firefighters have served as volunteers, and 69.4% (783,300/1,129,250) of firefighters are estimated to be volunteers in 2012.⁽¹⁶⁾ However, in some States the ratio of career firefighters are relatively high and 48.8% of U.S. population are protected by fire departments with all career firefighters. [table 1]⁽¹⁶⁾ It would be predicted that in the areas where almost all the firefighters serve as volunteer people keep stronger social norm of mutual aids in disasters and expect to take them than in the areas where the ratio of

career firefighters is high.

Variety of researches about cognitive dissonance theory⁽¹⁰⁾, a classical theory of social psychology, have proved that we have stubborn tendency to justify ourselves and make higher evaluation on what we expect to have.⁽³⁾⁽⁹⁾ So, when mutual aids of neighbors in disasters are highly expected, the efficacy and preparation against disasters in neighborhood will be estimated high.

Therefore it is hypothesized that in the States where almost all fire departments are organized with all volunteer-firefighter (States of Volunteer-Firefighter: SVF) the residents who think to have the more social capital (= subjective connectedness in neighborhood) would evaluate the neighborhood's efficacy and preparation against disasters the higher, while in the States where relatively high ratio of fire departments are organized with all career-firefighter (States of Career-Firefighter: SCF) the residents' subjective connectedness in neighborhood would not relate to their evaluation of the neighborhood's efficacy and preparation against disasters.

2. METHOD

2.1 Outline of the survey

An online survey was conducted in the U.S. The survey was nationwide but Alaska,

Table 1. Number of Fire Departments by Type and Population Protected in US (2012)

All Fire Departments	All Career	Mostly Career	Mostly Volunteer	All Volunteer
30,100 (2010-2012 average annual estimate of stations: 51,650)	2,610 (8.7%)	1,995 (6.6%)	5,445 (18.1%)	20,050 (66.6%)
Percentage of U.S. Population Protected	48.8%	16.9%	16.5%	17.8%

Career=100% career firefighters, Mostly Career=51%-99% career firefighters, Mostly Volunteer=1%-50% career firefighters, Volunteer=100% volunteer firefighters (source: US fire department profile 2012⁽¹⁵⁾)

Hawaii, and U.S. territories were excluded. The number of respondents was 830 and their ages were between 20 and 59 years old. They were assigned by gender, age, and area (North East, Midwest, South, and West) to be composed in the same ratio estimated by United States Census Bureau, Department of Commerce, the U.S.A.

2.2 Respondents in analysis

The respondents in analysis were mainly

those who lived in SVF and SCF. SVF were categorized as the States where more than 80% fire departments were consisted of all volunteer firefighters on the National Fire Department Census in 2012^(26) b), and SCF were where more than 20% fire departments were consisted of all career firefighters. 14 States were categorized into SVF, and 6 were into SCF [table 2]. The number of the respondents on the survey who lived in SVF was 180, and that in SCF was 170.

Table 2. States of Volunteer-Firefighter [SVF] and States of Career-Firefighter [SCF] (exclusive of Alaska, Hawaii, and U.S. Territories)

SVF	total N of departments	Percentage of fire-departments			
		Volunteer	Mostly Volunteer	Mostly Career	Career
1 Nebraska	372	92.7	3.8	1.4	2.2
2 South Dakota	282	92.5	4.3	0.4	2.9
3 North Dakota	302	92.4	4.7	0.0	3.0
4 West Virginia	396	91.3	4.1	1.5	3.1
5 Iowa	731	90.7	5.5	0.6	3.3
6 Pennsylvania	1,800	90.1	6.9	0.5	2.5
7 New York	1,610	89.9	4.7	1.1	4.3
8 Vermont	194	89.1	7.8	2.1	1.0
9 Minnesota	714	87.7	9.6	0.9	1.8
10 Arkansas	672	85.0	8.6	3.0	3.4
11 Montana	263	84.8	9.5	1.1	4.6
12 Oklahoma	709	81.5	9.8	2.3	6.4
13 Alabama	796	80.8	8.6	3.2	7.5
14 Wisconsin	764	80.4	12.7	1.6	5.4
15 New Mexico	242	78.8	10.4	3.7	7.1
SCF					
1 District of Columbia	3	0.0	0.0	33.3	66.7
2 Florida	477	35.1	14.5	17.4	33.0
3 Rhode Island	72	35.2	23.9	11.3	29.6
4 Massachusetts	359	26.8	29.1	17.3	26.8
5 California	835	28.7	29.9	16.3	25.1
6 Arizona	249	32.5	26.8	17.5	23.2
7 Georgia	461	52.0	25.1	8.1	14.8

Career=100% career firefighters, Mostly Career=51%-99% career firefighters, Mostly Volunteer=1%-50% career firefighters, Volunteer=100% volunteer firefighters (source: National Fire Department Census Quick Facts⁽²⁶⁾)

2.3 Questionnaire

The questionnaire consisted questions about 'social capital', 'activities and preparedness in neighborhood against disasters', 'personal disaster-preparing behaviors', 'values to risks', 'cognitions to Fukushima-Daiichi Nuclear Power Plant accident', respondents' demographics, and so on.^{c)}

On the process of the online survey respondents were forced to reply all the questions and the data contained no missing values.

3. RESULTS

3.1 Subjective connectedness, efficacy, and preparing behaviors against disasters in SVF and SCF

It is predicted that subjective connectedness, neighbors' efficacy against disasters, and

neighbors' preparedness against disasters would higher in SVF than in SCF. However, there were no significant differences among them between SVF and SCF. [see tables in Appendix]

3.2 Causal structures of subjective connectedness, efficacy, and preparing behaviors against disasters

As indexes of social capital we measured 'activities of communities in neighbor area', 'subjective connectedness in neighborhood', 'psychological cost of neighborhood lives', 'general trust'. Among them we focused on Subjective connectedness in neighborhood, since the results of correlation analysis showed that it was the most representative.^{d) e)}

Subjective connectedness in neighborhood, efficacy of neighborhood against disasters,

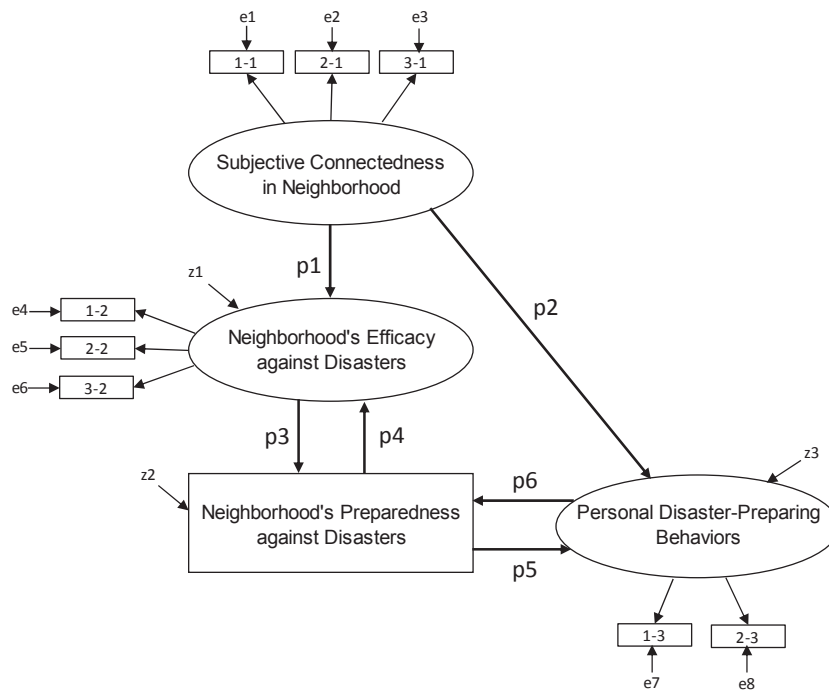


Figure 1. Structural Equation Model of Social Capital, Efficacy, and Preparing Behaviors against Disasters

Table 3. Estimates of causal paths on the Model in the figure 1 with groups of States of Volunteer-Firefighter [SVF] and States of Career-Firefighter [SCF]

	causal path	standardized estimate		z score of estimates path difference
		SVF [N=180]	SCF [N=170]	
p1	Neighborhood's Efficacy against Disasters ← Subjective Connectedness in neighborhood	.532***	.211*	2.69*
p2	Personal Disaster-Preparing Behaviors ← Subjective Connectedness in neighborhood	-.125	.632+	2.03**
p3	Neighborhood's Preparedness against Disasters ← Neighborhood's Efficacy against Disasters	.426*	-.048	2.16*
p4	Neighborhood's Efficacy against Disasters ← Neighborhood's Preparedness against Disasters	-.154	.323*	1.90+
p5	Personal Disaster-Preparing Behaviors ← Neighborhood's Preparedness against Disasters	.705*	-1.096	1.54
p6	Neighborhood's Preparedness against Disasters ← Personal Disaster-Preparing Behaviors	-.238	1.045***	1.95+

+:p<.10, *:p<.05, **:p<.01, ***:p<.001

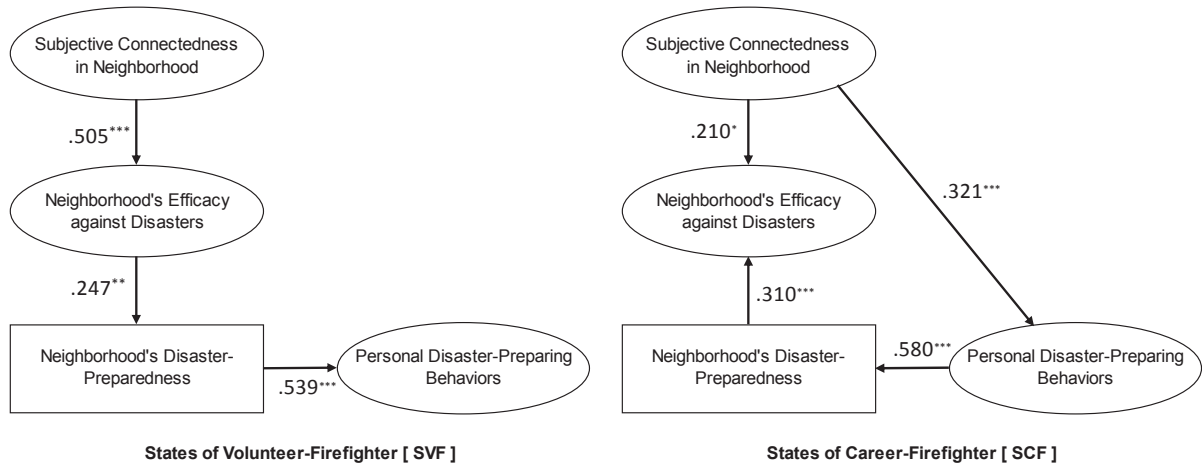
neighborhood's disaster-preparedness, and personal disaster preparing behaviors in SVF and SCF were put into Causal structural models and tested fitness by Simultaneous Multi-Group analysis of Structural Equation Model.^{f)}

Causal paths (p1 to p6) were assumed as presented in figure 1. In Simultaneous Multi-Group analysis two groups of SVF and SCF were set and variances, covariance, intercepts, means, and residuals were not constrained to be equal. The model fitted well [$\chi^2(44)=47.2$, $p=.342$; GFI=.971; AGFI=.941; RMSEA=.015].

The estimates of causal paths and their difference tests were on table 3. In SVF the estimates of the paths, p1 ('subjective connectedness in neighborhood' to 'neighborhood's efficacy against disasters'), p3 ('neighborhood's efficacy against disasters' to 'neighborhood's preparedness against disasters'), p5 ('neighborhood's preparedness against disasters' to 'personal disaster-preparing behaviors') were significant, while in SCF p1,

p4 ('neighborhood's preparedness against disasters' to 'neighborhood's efficacy against disasters'), and p6 ('personal disaster-preparing behaviors' to 'neighborhood's preparedness against disasters') were significant. The estimates of the paths p1, p2 ('subjective connectedness in neighborhood' to 'personal disaster-preparing behaviors'), and p3 were significantly different between SVF and SCF, that is p1 and p3 were stronger and p2 was weaker in SVF than in SCF. All the significant paths had the directions that supported the hypothesis.

By eliminating causal paths that did not reach significant level of .10 from the model in figure 1, the models in figure 2 were assumed and tested their fitness by Simultaneous Multi-Group analysis of Structural Equation Model. The models of SVF and SCF were different and variances, covariance, intercepts, means, and residual variances were not constrained to be equal. The model fitted well and all the causal paths were significant,



$\chi^2(49)=54.1, p=.287; GFI=.967; AGFI=.940; RMSEA=.017$ (***: $p<.001$, **: $p<.01$, *: $p<.05$)

figure 2. Causal Models and Standardized Estimates of Paths in States of Volunteer-Firefighter [SVF] and States of Career-Firefighter [SCF]

(Simultaneous Multi-Group Analysis of Structural Equation Model)
(Measurement items and residuals in analysis were omitted to present)

which did not contradict the hypothesis.

3.3 Causal structures with groups divided by locality

In SVF and SCF distribution of the respondents' locality was different [see table ap-1 in appendix]. More respondents in SVF resided in country life style area than those in SCF. And more respondents in SVF resided in the area where they spent their childhood than those in SCF.

It is widely said in everywhere in the world that personal relations between neighbors are tighter and closer in rural areas than in urban areas, that is, rural people have more social capital than urban people. So, it would be predicted that social capital would facilitate efficacy and expectation of behaviors of neighbors' mutual aids more in rural areas than in urban areas.

To check if the difference of the causality

that appeared on the causal models above between SVF and SCF were spurious and true causality would be from the difference of their locality, we took the same analysis on figure 1 with the groups of nationwide respondents divided by their locality as did with groups of SVF and SCF.

Two sets of groups of nationwide respondents were made. One set had group in urban life style area [N=379] and group in country life style area [N=235]. The respondents who answered 'neither' of urban nor country life style [N=216] were eliminated from the set. The other set had group of respondents who resided in the same area where they spent their childhood [N=257] and group of those who did not [N=573].

The analysis with groups by the urban or country life styles of areas showed that the model did not fit very well [$\chi^2(44)=71.32, p=.005; GFI=.975; AGFI=.948; RMSEA=.032$].

Table 4. Estimates of causal paths on the Model in the figure 1 with groups of 'urban' and 'country'

	causal path	standardized estimate		z score of estimates difference
		area of URBAN life style [N=379]	area of COUNTRY life style [N=235]	
p1	Neighborhood's Efficacy against Disasters ← Subjective Connectedness in neighborhood	.580***	.351***	0.24
p2	Personal Disaster-Preparing Behaviors ← Subjective Connectedness in neighborhood	-.102	3.070	0.25
p3	Neighborhood's Preparedness against Disasters ← Neighborhood's Efficacy against Disasters	.705***	-.256	3.97***
p4	Neighborhood's Efficacy against Disasters ← Neighborhood's Preparedness against Disasters	-.282+	.170*	2.36*
p5	Personal Disaster-Preparing Behaviors ← Neighborhood's Preparedness against Disasters	.762***	-10.426	2.00*
p6	Neighborhood's Preparedness against Disasters ← Personal Disaster-Preparing Behaviors	-.466	1.637*	2.78**

+: p<.10, *: p<.05, **: p<.01, ***: p<.001

The casual paths are on table 4. As the model fitness was not very good, the reliability of the analysis was less, that is, the result showed that the model representing the difference between SVF and SCF (figure 1) could not explain the difference between the urban and the rural.

4. DISCUSSION

The hypothesis that social capital in its psychological feature would facilitate evaluation of civic-aids or mutual aids in neighborhood against disasters in case people keep the culture or social norm of civic-aids against disasters was investigated. Firefighters have traditionally served as volunteers in the U.S. Therefore, we assumed that the culture or social norm are kept in the States where almost all the firefighters are volunteers (SVF), but in the States where relatively high ratio of firefighters (SCF) are careers the culture or social norm are in low ebb.

Relations (simple correlations) between social capital, neighborhood's preparedness and efficacy against disasters, and personal disaster-preparing behaviors showed that participation in community activities in neighbor area, social capital in its behavioral feature, correlated with evaluation of neighborhood's preparedness, civic aids, and self-aids against disasters in both SVF and SCF.

But, subjective connectedness in neighborhood, social capital in its psychological feature, correlated with both evaluation of neighborhood's preparedness and self-aids against disasters only in SCF. The social capital in its psychological feature did not correlate with self-aids against disasters in SVF. The difference in correlations of the psychological social capital and self-aids against disasters between SCF and SVF was statistically significant. Besides, those who had higher self-efficacy against disasters evaluated neighborhood's preparedness against disasters

better in SCF, but there was no such relation in SVF. The difference between SCF and SVF had tendencies of significance. Those who felt psychological costs of neighborhood lives less estimated neighborhood's efficacy against disasters better in SCF, but there was no such relation in SVF. The difference between SCF and SVF also had tendencies of significance.

These results indicate that evaluation on civic-aids in disasters given by neighborhood has relations with social capital in both its behavioral and psychological features. However, self-aids against disasters given by family and themselves are thought to be needed more by those who have psychological social capital more in SCF, while self-aids against disasters and psychological social capital are recognized to have no relation in SVF. It means that those who believe to have much psychological social capital, intense connectedness with neighbors, would be motivated to have power of self-aids against disasters first and then they would become leaders of civic-aids against disasters in neighborhood in SCF, while people in SVF would expect that civic-aids in neighborhood will naturally be served in disasters since they

have culture or social norm of mutual aids in disasters, so there was no relations between the psychological social capital and self-aids against disasters in SVF.

To test the validity of this interpretation, we did analyses of causality by Structural Equation Model. The results of the analyses showed that different causality models were fitted well the data of SVF and SCF. The model of SVF was that the psychological social capital had indirect effects on evaluation of neighborhood's preparedness against disasters via estimation of neighborhood's efficacy against disasters in SVF and the model of SCF was that the psychological social capital had direct effects on self-aids against disasters and then it influence on evaluation of neighborhood's preparedness against disasters. It supported the interpretation above.

The volunteer firefighters are typical in rural small communities in the U.S. Most of the volunteer firefighters (94.7%) are in departments that protect fewer than 25,000 people and almost half are located in the small, rural departments that protect fewer than 2,500 people. On the other hand, career firefighters are typical in urban area. Most of

Table 5. Numbers and percentages of volunteer and career firefighters

population protected by fire departments	Career	Volunteer	Total
25,000 or more	247,900 71.7%	41,900 5.3%	289,800 25.7%
under 25,000	98,050 28.3%	741,400 94.7%	839,450 74.3%
total	345,950 100.0%	783,300 100.0%	1,129,250 100.0%

(source : US fire department profile 2012⁽¹⁶⁾)

the career firefighters (71.7%) are in communities that protect 25,000 or more people.⁽¹⁶⁾ [table 5] Therefore, it may be possible that the differences in the causality between SVF and SCF came from the difference of urban or rural, as most of fire departments with all volunteers are in rural areas and most of departments with all careers are in urban areas.

We did the same analysis of causality with nationwide groups divided by their impression whether they reside in urban life style areas or in country life style areas as did with groups of SVF and SCF. The urban and country groups data did not fit to the model very well, and the explanation of the model on the groups were limited, and the results of the paths' estimates showed that people in urban life style areas had the same notion of causality as the people in SVF, and the people in country life style areas had the same as the people in SCF. It means that the culture or social norm of mutual aids in disasters would be kept by the people in urban life style areas more than in country life style areas. So, the possibility that the difference in causality between SVF and SCF came from the difference of urban and country cultures was not supported. Therefore, it is highly plausible that the hypothesis was supported that culture or social norm to provide mutual aids in disasters in SVF would facilitate effects of social capital on evaluation on neighborhood's preparedness against disasters.

On our analysis we divided the respondents at State level, and we did not have data which showed the community where each respondent

lived were protected by volunteer firefighters or career firefighters. Further research should be needed to make clearer the effects of the protection by volunteer firefighters.

Footnotes

- a) This paper is modified version of a visiting fellow report submitted by S. Tsuchida to Rajawali Foundation Institute for Ash, John F. Kennedy School of Government, Harvard University in 2014.
- b) The National Fire Department Census is a voluntary program and does not include all fire departments in the United States or its territories. As of January 2012, there were 26,482 fire departments registered with the census. This is about 88 percent of the departments estimated to be in the United States. The fire departments registered with the census represent approximately 48,800 fire stations across the country. Seventy percent of the departments have one station, 16 percent have two stations, and the remaining 14 percent have three or more stations. (cited from *National Fire Department Census Quick Facts*⁽²⁶⁾)
- c) The questions in analysis are on the table ap-1 to ap-9 in appendix with their means and SDs. The questions about "values to risks" and "cognition to Fukushima-Daiichi Nuclear Power Plant accident" were not used in analysis.
- d) The correlation coefficients between indexes of Social Capital, Efficacies, and Preparing Behaviors against Disasters are on the table ap-10 in appendix.
- e) The z scores of difference-tests of correlation coefficients between SVF and SCF are on the table ap-11 in appendix.
- f) The indexes of subjective connectedness in neighborhood, efficacy of neighborhood against disasters, neighborhood's disaster-preparedness, and personal disaster preparing behaviors are items on table ap-3, ap-6, ap-8, and ap-9 in appendix, respectively.

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Appendix

Table ap-1. Demographics of the Respondents in States of Volunteer-Firefighter [SVF] and States of Career-Firefighter [SCF]

		SVF [N=180]	SCF [N=170]	total [N=350]	
Gender	Male	84 46.7%	78 45.9%	162 46.3%	$\chi^2(1)=.02$ ns
	Female	96 53.3%	92 54.1%	188 53.7%	
Marital status	Single	86 47.8%	87 51.2%	173 49.4%	$\chi^2(2)=1.1$ ns
	Married	81 45.0%	75 44.1%	156 44.6%	
	Widowed / Separated	13 7.2%	8 4.7%	21 6.0%	
Life stage (the youngest child)	Infant under the age of 3	17 9.4%	15 8.8%	32 9.1%	$\chi^2(5)=8.1$ ns
	Preschooler over the age of 4	11 6.1%	4 2.4%	15 4.3%	
	Elementary School / Junior High School Student	27 15.0%	20 11.8%	47 13.4%	
	High School / University / Professional School Student	31 17.2%	20 11.8%	51 14.6%	
	Other	18 10.0%	24 14.1%	42 12.0%	
	I don't have children	76 42.2%	87 51.2%	163 46.6%	
Education	High school Graduate or lower	59 32.8%	39 22.9%	98 28.0%	$\chi^2(2)=4.3$ ns
	Junior College Graduate	50 27.8%	51 30.0%	101 28.9%	
	University Graduate or higher	71 39.4%	80 47.1%	151 43.1%	
Life stye of the area I reside	Urban	72 40.0%	105 61.8%	177 50.6%	$\chi^2(2)=34.6$ p<.001
	neither	33 18.3%	42 24.7%	75 21.4%	
	Country	75 41.7%	23 13.5%	98 28.0%	
the Locals	I currently reside in the same area where I spent my childhood	73 40.6%	44 25.9%	117 33.4%	$\chi^2(1)=8.5$ p<.01
	I currently do not reside in the same area where I spent my childhood	107 59.4%	126 74.1%	233 66.6%	

Table ap-2. Community Activates in Neighbor Area

We would like to ask you about activities in your area. Are you currently participation in the activities such as the followings?	SVF (N=180)	SCF (N=170)	<i>total</i> (N=396)
	mean (SD)	mean (SD)	<i>mean</i> (SD)
Activities and events for everyday living such as those of a neighborhood association, a residents' association, the Women's Group, and the Elders Club etc.	1.38 (0.98)	1.52 (1.11)	1.45 (1.04)
Activities for managing and improving the area such as volunteering for Fire Fighting, Area Development, Public Welfare Services etc.	1.42 (1.00)	1.51 (1.13)	1.47 (1.06)
Activities in the area for enhancing individual development such as hobbies, cultures, and sports etc.	2.09 (1.50)	2.15 (1.58)	2.12 (1.54)
Work-related area activities such as those in the commerce and industry association, the trade association and etc.	1.56 (1.14)	1.77 (1.33)	1.66 (1.24)

(1: Not participated, 2: Several times a year or so, 3: 1-2 days a month or so, 4: 1 day a week or so, 5: 2-3 days a week or so, 6: Nearly everyday)
[MANOVA: F(4/345)=0.9, ns]

Table ap-3. Subjective Connectedness in Neighborhood

We would like to ask you about your impression of the area in which you currently reside.	SVF (N=180)	SCF (N=170)	<i>total</i> (N=396)
	mean (SD)	mean (SD)	<i>mean</i> (SD)
We, the area residents, each have a role to play.	3.51 (1.18)	3.39 (1.17)	3.45 (1.18)
We, the area residents, share knowledge and information.	3.13 (1.09)	3.15 (1.13)	3.14 (1.11)
We have a sense of common fate.	3.23 (1.08)	3.15 (1.08)	3.19 (1.08)

(1: I don't think so, 5: I think so)
[MANOVA: F(3/346)=0.8, ns]

Table ap-4. Psychological Cost of Neighborhood Lives

We would like to ask you about your impression of the area in which you currently reside.	SVF (N=180)	SCF (N=170)	<i>total</i> (N=396)
	mean (SD)	mean (SD)	<i>mean</i> (SD)
I often feel mentally fatigued and stressed with neighborhood social obligations.	2.14 (1.08)	2.21 (1.11)	2.18 (1.09)
Various events in the area have become a burden of my life.	2.01 (1.04)	1.95 (1.02)	1.98 (1.03)
Whatever I do, I am concerned about how I am perceived by people in the area.	2.61 (1.19)	2.55 (1.18)	2.58 (1.18)

(1: I don't think so, 5: I think so)
[MANOVA: F(3/346)=0.8, ns]

Table ap-5. General Trust

	SVF (N=180)	SCF (N=170)	total (N=396)
	mean (SD)	mean (SD)	mean (SD)
Most people are basically honest.	3.16 (1.04)	3.22 (1.06)	3.19 (1.05)
Most people are trustworthy.	3.17 (0.97)	3.14 (1.06)	3.15 (1.02)
Most people are basically good and kind.	3.42 (0.97)	3.51 (0.95)	3.46 (0.96)
Most people are trustful of others.	3.08 (1.00)	3.08 (1.01)	3.08 (1.00)
I am trustful.	4.02 (0.99)	4.01 (1.03)	4.02 (1.01)
Most people will respond in kind when they are trusted by others.	3.72 (0.92)	3.80 (0.90)	3.76 (0.91)

(1: I don't think so, 5: I think so)
[MANOVA: F(6/343)=0.5, ns]

Table ap-6. Neighborhood's Efficacy against Disasters

We would like to ask you about your impression of the area in which you reside, particularly regarding its readiness in responding to disasters.	SVF (N=180)	SCF (N=170)	total (N=396)
	mean (SD)	mean (SD)	mean (SD)
When disaster strikes, everyone in the area can work together to deal with the disaster.	3.93 (1.02)	3.70 (1.13)	3.82 (1.08)
There are things we, the residents, each can do to prepare for disasters.	4.16 (0.90)	4.04 (0.92)	4.10 (0.91)
It is possible to minimize the damage by us the residents working together with each other.	4.06 (0.99)	3.98 (0.98)	4.02 (0.98)

(1: I don't think so, 5: I think so)
[MANOVA: F(3/346)=1.4, ns]

Table ap-7. Self-Efficacy against Disasters

What would be your thoughts when facing disasters?	SVF (N=180)	SCF (N=170)	total (N=396)
	mean (SD)	mean (SD)	mean (SD)
I am afraid that I wouldn't know what to do when a major disaster occurs.	3.04 (1.17)	2.89 (1.31)	2.97 (1.24)
I am afraid that I wouldn't be able to give appropriate instructions to people around me when a major disaster occurs.	2.99 (1.12)	2.96 (1.25)	2.98 (1.19)
I would only be able to think of doing the same things as the people around me when a major disaster occurs.	2.93 (1.07)	2.90 (1.16)	2.91 (1.11)

(1: I don't think so, 5: I think so)
[MANOVA: F(3/346)=0.7, ns]

Table ap-8. Neighborhood's Preparedness against Disasters

Are you taking the following measures in your area in order to prepare for disasters such as major earthquakes, hurricane and heavy rain falls?		SVF (N=180)	SCF (N=170)	total (N=396)	χ^2 (df=2)
Conducting emergency drills on a regular basis	Yes	14.4%	14.1%	14.3%	3.5 ns
	No	77.2%	71.2%	74.3%	
	Don't know	8.3%	14.7%	11.4%	
Occasionally having a talk with people in the neighborhood about disasters	Yes	23.9%	25.9%	24.9%	3.2 ns
	No	68.9%	61.8%	65.4%	
	Don't know	7.2%	12.4%	9.7%	
Occasionally holding a study session on the disaster prevention in the area	Yes	11.7%	9.4%	10.6%	1.4 ns
	No	78.9%	77.6%	78.3%	
	Don't know	9.4%	12.9%	11.1%	
Assigning roles among residents in the preparation for disasters	Yes	11.7%	9.4%	10.6%	3.5 ns
	No	80.0%	78.8%	79.4%	
	Don't know	8.3%	11.8%	10.0%	
Occasionally residents are making proactive suggestions on the disaster prevention to the Local Administration	Yes	16.7%	15.3%	16.0%	0.3 ns
	No	65.6%	68.2%	66.9%	
	Don't know	17.8%	16.5%	17.1%	
Fire Fighting Crews are actively working	Yes	36.1%	32.4%	34.3%	2.9 ns
	No	39.4%	48.2%	43.7%	
	Don't know	24.4%	19.4%	22.0%	
Residents are willingly making disaster prevention maps	Yes	11.1%	11.2%	11.1%	0.0 ns
	No	61.7%	62.4%	62.0%	
	Don't know	27.2%	26.5%	26.9%	
Stockpiling food and materials in Residents' association etc.	Yes	16.7%	17.1%	16.9%	0.7 ns
	No	65.6%	61.8%	63.7%	
	Don't know	17.8%	21.2%	19.4%	
Mutually aware of persons who are particularly in need of others' assistance at the time of a disaster	Yes	25.6%	28.2%	26.9%	0.4 ns
	No	52.2%	51.8%	52.0%	
	Don't know	22.2%	20.0%	21.1%	

Number of items selected 'Yes' was used as the index of disaster-preparedness of neighborhood. The averages (SD) of the index in SVF and SCF were 1.68 (2.38) and 1.63 (2.38) respectively. [t-test: $t(348)=0.2$, ns]

Table ap-9. Personal Disaster-Preparing Behaviors

Are you preparing for disasters such as major earthquakes, hurricane and heavy rain falls?	SVF (N=180)	SCF (N=170)	total (N=396)
	mean (SD)	mean (SD)	mean (SD)
Preparing goods such as food, clothing, medicines, and batteries etc. for emergency	2.42 (0.99)	2.40 (0.99)	2.41 (0.99)
Confirming the area, route, and the method by which to contact family members	2.37 (1.02)	2.39 (0.99)	2.38 (1.00)

(1: Not doing at all, 2: Hardly doing, 3: Somewhat doing, 4: Sufficiently doing)
[MANOVA: $F(2/347)=0.1$, ns]

Table ap-10. Correlation Coefficients between Indexes of Social Capital, Efficacies, and Preparing Behaviors against Disasters

States of Volunteer Firefighters [N=180]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
[A]: Community Activities in neighbor area	.154*	.285**	.003	.157*	.006	.261**	.248**
[B]: Subjective Connectedness in neighborhood	1	.255**	.229**	.431**	-.010	.183*	.006
[C]: Psychological Cost of Social Capital	.255**	1	.016	.007	.135	.259**	.154*
[D]: General Trust	.229**	.016	1	.280**	.124	.128	.047
[E]: Neighborhood's Efficacy against Disasters	.431**	.007	.280**	1	-.143	.219**	.109
[F]: Self Efficacy against Disasters	-.010	.135	.124	-.143	1	-.003	-.190*
[G]: Neighborhood's Preparedness against Disasters	.183*	.259**	.128	.219**	-.003	1	.496**
[H]: Personal Disaster-Preparing Behaviors	.006	.154*	.047	.109	-.190*	.496**	1
States of Career Firefighters [N=170]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
[A]: Community Activities in neighbor area	.260**	.278**	.062	.029	-.054	.303**	.218**
[B]: Subjective Connectedness in neighborhood	1	.204**	.281**	.281**	-.042	.291**	.269**
[C]: Psychological Cost of Social Capital	.204**	1	.023	-.199**	.100	.178*	.058
[D]: General Trust	.281**	.023	1	.423**	-.047	.247**	.158*
[E]: Neighborhood's Efficacy against Disasters	.281**	-.199**	.423**	1	-.190*	.335**	.245**
[F]: Self Efficacy against Disasters	-.042	.100	-.047	-.190*	1	-.183*	-.145
[G]: Neighborhood's Preparedness against Disasters	.291**	.178*	.247**	.335**	-.183*	1	.538**
[H]: Personal Disaster-Preparing Behaviors	.269**	.058	.158*	.245**	-0.145	.538**	1

+: p<.05, **: p<.01

Table ap-11. z scores of Difference-tests of Correlation Coefficients between States of Volunteer-Firefighter [N=180] and States of Career-Firefighter [N=170]

	[B]	[C]	[D]	[E]	[F]	[G]	[H]
[A]: Community Activities in neighbor area	1.03	0.07	0.55	1.20	0.56	0.42	0.29
[B]: Subjective Connectedness in neighborhood		0.50	0.52	1.60	0.30	1.06	2.50*
[C]: Psychological Cost of Social Capital	0.50		0.06	1.93+	0.33	0.79	0.90
[D]: General Trust	0.52	0.06		1.52	1.59	1.14	1.04
[E]: Neighborhood's Efficacy against Disasters	1.60	1.93+	1.52		0.45	1.17	1.30
[F]: Self Efficacy against Disasters	0.30	0.33	1.59	0.45		1.69+	0.43
[G]: Neighborhood's Preparedness against Disasters	1.06	0.79	1.14	1.17	1.69+		0.53
[H]: Personal Disaster-Preparing Behaviors	2.50*	0.90	1.04	1.30	0.43	0.53	

+: p<.10, *: p<.05

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