RESEARCH ARTICLE

Bonding and bridging social capital and their associations with self-evaluated community resilience: A comparative study of East Asia

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Abstract

The purpose of this study is to test key social capital indicators in a disaster context by considering the bonding and bridging types of social capital. Using the East Asian Social Survey, this study chooses three behavioural/cognitive elements of social capital—social trust, voluntary association membership, and personal networks—and divides them into bonding and bridging social capital, in-group and out-group trust, homogeneous and heterogeneous membership, and strong and weak ties to test their effects on self-evaluated community resilience to natural hazards. The results showed that social trust and personal networks had strong positive effects, but the effect of voluntary association membership was positive in societies with high rates of membership (Japan and South Korea) and negative in a society with a low rate of membership (Taiwan). Furthermore, while bonding social capital generally showed a stronger effect than bridging social capital in East Asia, a society with more frequent and intense disasters (Japan) showed a strong effect of heterogenous membership on self-evaluated community resilience. This study connects two aspects of social capital studies—the elements and the types of social capital—and the findings imply that the relationship between social capital and community resilience may have some mediator variables.

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1 | INTRODUCTION

Every year, climate change and rapid urbanization place hundreds of millions of people around the world at risk of suffering from natural hazards (World Bank, 2013), but human beings have a limited ability to predict where and when extreme natural events will occur. Despite these pervasive uncertainties, residents in some communities believe that their community members are able to collaborate and cope with extreme natural events, whereas residents in other communities are skeptical of this. It is natural to assume that members of the former communities are more likely to collaborate in preparing for and resisting such events than the members in the latter communities.

It is widely accepted among social scientists that social capital plays a positive role in making community life more sustainable and resilient to disaster (e.g., Aldrich, 2012; Cox & Perry, 2011; Kawachi, Kim, Coutts, & Subramanian, 2004; Lee, 2019; Nakagawa & Shaw, 2004). Such studies have shown that social capital is a critical resource for post-disaster recovery as well as for transforming communities and enabling greater resilience Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008). More recent studies have searched deeply into different types of social capital that play various roles in the face of community emergencies. These studies define *bonding* social capital as a person's network of close ties (such as family, friends, and neighbours), *bridging* social capital as a person's outward-looking networks across socially heterogeneous groups, and *linking* social capital as a person's vertical networks with more powerful and authoritative entities (see Aldrich, 2012).

However, although the positive role of each type of social capital has been widely examined, questions still remain: To what degree do ordinary citizens rely on each type of social capital in the face of disaster, and how does the phenomenon vary across societies? To answer these questions, studies must assess the effect of each type of social capital with appropriate and comparable measures. This study focuses on two types of social capital—bonding and bridging—embedded in the three widely used elements of social capital—social trust, voluntary association membership, and personal networks. The study tests and compares the effects of in-group and out-group trust, homogeneous and heterogeneous membership in voluntary associations, and strong and weak personal ties on East Asian citizens' self-evaluated community resilience.

The study contributes to the literature of social capital and disaster resilience in three ways. First, East Asia has been exposed to frequent natural hazards that caused disasters. According to the Emergency Events Database (EM-DAT), Asia has experienced 40% of the world's disasters and comprised 90% of the total affected people since 1980. Of these, East Asia comprises 30% of occurrences and 52% of the total affected people. Although not all East Asian societies are included in this study (e.g., Mainland China, Mongolia, or North Korea), this comparative study provides insights into East Asian peoples' behaviour and cognition in relation to disaster events. For example, of the three societies examined in this study, Japan has been significantly more prone to disaster than South Korea and Taiwan in terms of the occurrence and intensity of disasters (see Table 1), which can exemplify how frequent disasters affect the role of social capital. Second, the study connects two streams of social capital studies—the behavioural/cognitive elements of social capital and the types of social capital. Comparing how people perceive and rely on different types of social capital in the face of disaster deepens our understanding of social capital and can help us to develop more resilient communities. Third, this study uses three recognized proxies of social capital in the national or international surveys. Therefore, the findings can readily be compared with each other and potentially applied to other geographical areas.

TABLE 1 Disaster caused by natural hazards in East Asia (1993-2012)

	Occurrence	Deaths
Japan	117	27,087
Storm	58	874
Earthquake	23	25,474
Flood	18	235
Landslide	7	162
Extreme temperature	6	341
Volcanic activity	3	1
Epidemic	1	
Wildfire	1	
South Korea	55	1,618
Storm	27	694
Flood	18	827
Epidemic	3	6
Landslide	3	89
Wildfire	3	2
Drought	1	
Taiwan	55	3,725
Storm	43	1,325
Flood	5	38
Earthquake	5	2,271
Epidemic	2	91
Grand Total	227	32,430

Source: EM-DAT

2 | SOCIAL CAPITAL AND COMMUNITY RESILIENCE

Community resilience has been defined in various ways, but the key feature that distinguishes it from other similar concepts (i.e., community capacity or community sustainability) is its role in the face of change (Magis, 2010). Specifically, community resilience is the ability of a community to absorb change (Holling, 1973), to recover from stress (Brown & Perkins, 1992), to find unknown inner strengths (Ganor & Ben-Lavy, 2003), and to take collective action to remedy the impact of disasters (Pfefferbaum, Reissman, Pfefferbaum, Klomp, & Gurwitch, 2005). More recent studies take the view that community resilience should go beyond short-term survival or coping strategies and pursue adaptation and sustainable transformation following disasters (Adger, Hughes, Folke, Carpenter, & Rockström, 2005; Norris et al., 2008). Community resilience is strongly influenced by predisaster social contexts and processes that are endogenous to local communities (Cutter, Burton, & Emrich, 2010; Wickes, Zahnow, Taylor, & Piquero, 2015). As Norris et al. (2008) pointed out, community resilience links predisaster adaptive capacities to "a positive trajectory of functioning and adaptation after a disturbance" (p. 130).

At the individual level, community residents' socio-economic and demographic characteristics relate to critical predisaster social factors; for example, income (Fothergill & Peek, 2004), education (Yates & Anderson-Berry, 2004), age (King, 2001), sex (Enarson & Morrow, 1998), and ethnic background (Dooley, Catalano, Mishra, & Serxner, 1992) are critical factors in disaster preparedness. These studies suggest that people who are more highly educated, wealthy, mature, female, and/or members of majority groups are more likely to take preventive action than those

who are less well educated, poor, young, male, and/or members of minority groups. Moreover, individual residents' knowledge of disasters and direct or indirect exposure to such disasters increase their levels of preparedness and resilience (Mileti & O'Brien, 1992).

In addition to individual-level social indicators, social capital has been identified as a main source of community resilience (Cutter et al., 2010). Without active community members leading their own recovery and rebound, government-led disaster policies often go awry (Chamlee-Wright & Rothschild, 2007; Cigler, 2007). One of the key questions regarding social capital has been how to measure its key elements. Scholars have adopted two main approaches: cognitive and behavioural (see Aldrich & Meyer, 2015). A cognitive approach focuses on people's level of trust in others. Social trust is widely considered to be the core of social capital (Delhey, Newton, & Welzel, 2011; Putnam, 2001). It is a person's belief that other people in society are generally trustworthy and are an integral part of that society (Uslaner & Conley, 2003). The other popular approach is to look at the behavioural manifestations of social capital in daily life. Studies that use this approach include data on participation in voluntary, nonprofit, religious, and civic or political organizations, as well as the number of registered voters and voter participation in general (see Curtis, Baer, & Grabb, 2001; Putnam, 2001; Stolle & Rochon, 1999). Social networks are also important indicators of behavioural social capital. Studies have used survey questions to ask respondents about the depth of their social connections, such as "With how many friends and contacts do you discuss your problems?" (Aldrich & Meyer, 2015). The behavioural and cognitive approaches are often combined to properly investigate the various aspects of social capital. For example, Klein and Hador (2018) tested corporate employees' personal networks and goal sharing with others and found that both aspects of social capital increased intrapreneurial activities in the firms they worked for.

Besides measuring the key elements of social capital, some studies have distinguished three different types of social capital based on the strength and the direction of relationships: bonding, bridging, and linking social capital (see Woolcock & Narayan, 2000). Bonding capital represents the close ties that build cohesion within homogeneous groups (McPherson, Smith-Lovin, & Cook, 2001). It reflects the tendency of people to bond with similar people. Bridging capital represents the loose ties between groups that bring people together across diverse social divisions. It connects people from different backgrounds, exposing them to diversity and enhancing their ability to work with each other. Bonding and bridging social capital can be seen as strong ties and weak ties, respectively (see Granovetter, 1973). Weak ties are just as essential for a person's integration into wider society as strong ties (Mitchell & LaGory, 2002). Finally, linking capital focuses on the vertical relationships between groups and those with power or authority (Szreter & Woolcock, 2004). Vertical relationships are particularly important for communities that lack resources (Ahmed, Seedat, van Niekerk, & Bulbulia, 2004).

Despite the prominence of these bodies of social capital literature, a gap exists between the literature on the cognitive/behavioural aspects of social capital and the literature on the types of social capital. The former focuses on measuring the key components of social capital, whereas the latter focuses on the distance or direction of the relationship; however, no previous studies have examined how the two bodies of literature are linked to each other. A few studies have tested the relationships between different types of social capital (e.g. Aldrich, 2011; Kim, Subramanian, & Kawachi, 2006), but those studies used different indicators of bonding and bridging social capital. Therefore, this study distinguishes between bonding and bridging social capital for each of three social capital indicators so that the results can be compared.

3 | DATA, VARIABLES, AND METHODS

Data were collected from the East Asian Social Survey (EASS)—a jointly conducted international survey performed in 2012. The survey in Japan was carried out by the Japanese General Social Survey Research Center at Osaka University of Commerce. There were 2,335 respondents from six Japanese regions participated, and the response rate was 58.8%. The survey in South Korea was carried out by the Survey Research Center at Sungkyunkwan University; 1,396 respondents were drawn from 12 South Korean regions, and the response rate was 71.0%. The survey in

Taiwan was performed by the Institute of Sociology at Academia Sinica in Taiwan; 2,134 respondents from 6 Taiwanese regions participated, and the response rate was 52.0%. The dataset is accessible through the Inter-University Consortium for Political and Social Research (https://www.icpsr.umich.edu).

The output variable is respondents' self-evaluated community resilience to natural hazards. The EASS survey asked individuals to rate their perceived levels of community resilience as follows: "To what extent do you agree that people in your residential community are able to collaboratively cope with situations caused by a natural disaster?" Respondents could choose one of the seven possible Likert-type scaled responses: strongly disagree, disagree, somewhat disagree, nether agree nor disagree, somewhat agree, agree, and strongly agree. A similar question was used in Murphy's (2007) study that asked respondents whether they thought their neighbourhood would "pitch-in and help" during an emergency. Similarly, Adger et al. (2005) defined community resilience as "the ability of groups or communities to cope with external stresses and disturbances" (p. 347).

The first explanatory variable is social trust—a cognitive component of social capital. The EASS survey asked respondents about their trust in family, friends, neighbours, coworkers, people they met for the first time, and local or national politicians. Unlike other international social surveys, such as the World Values Survey, the EASS does not ask about respondents' trust in people of other religions or nationalities. For trust in each group, respondents were asked to choose between four suggested answers: a great deal, to some extent, not very much, or not at all. Table 2 shows the principal component analysis of trust in different groups, yielding a two-component solution: one weighted primarily towards measures of trust in politicians (α = .89), and the other weighted primarily towards trust in family, friends and neighbours, and work colleagues (α = 0.70). Trust in people met for the first time did not belong to any groups. The results are in line with some previous studies that distinguished in-group, out-group, and political trust (see Delhey & Welzel, 2012; Freitag & Traunmüller, 2009). Political trust is not the focus of this study; therefore, it is included as a control variable. For in-group and out-group trust, some scholars referred to particular trust and general trust, while other scholars referred to bonding and bridging trust (Delhey & Welzel, 2012). In this study, in-group trust is an indicator of bonding social capital and out-group trust is an indicator of bridging social capital.

The second explanatory variable is respondents' participation in voluntary associations. The EASS first asked respondents whether they participated in the following types of organizations: political associations, residential associations, volunteer groups, citizens' movement groups, religious groups, alumni associations, recreational associations, labour unions, and professional associations. Respondents who chose any of these associations were coded 1 and respondents who did not were coded 0. A further question asked how much members in the organization differed from one another in the way they thought and acted. Respondents were asked to choose one of four possible answers: (1) "Almost all members are similar to each other," (2) "there are more members who are

TABLE 2 Principal component analysis of measures of social trust with varimax rotation

	Component		
	1	2	Cronbach's α
Trust in family	0.101	0.591	.70 (ingroup trust)
Trust in friends	0.001	0.677	
Trust in neighbours	0.223	0.536	
Trust in work colleagues	0.129	0.584	
Trust in people you meet for the first time	0.263	0.263	
Trust in local government officials	0.889	0.165	.89 (political trust)
Trust in central government officials	0.887	0.119	
Explained variance in %	24.7	22.1	
Chi square	224.5(8)		
p value	p < .01		

similar than those who are different," (3) "there are more members who are different than those who are similar," and (4) "almost all members are different from each other." The first category clearly indicates people's engagement with bonding groups, but the other three categories show different degrees of individuals' connections to bridging groups. Each category was included as a dummy variable for those respondents who did not participate in any of the listed organizations. Detailed participation rates in the three societies are listed in Table 3. It is notable that the participation rate in Taiwan (31.26%) was very low compared with those in Japan (60.81%) or South Korea (75.43%).

For the personal networks variable, three questions were chosen. One question asked about individuals' close relationships: "How many people could you ask for a favour when needed, such as watering plants, feeding pets, and giving advice?" Another question asked about individuals' number of acquaintances: "How many neighbours are you on greeting terms with?" A further question asked about the number of individuals' daily contacts: "On an ordinary day, with how many people other than family members or relatives do you have contact?" Respondents were asked to choose from suggested categories: 0, 1–2, 3–4, 5–9, and 10 or more. The first question is assumed to refer to individuals' close ties, or bonding social capital, and the other two show two different degrees of weak ties, or bridging social capital.

As control variables, respondents' trust in politicians, disaster experiences, age, years of education, gender, household income, and urbanization of residence location were included. Table 4 summarizes all the variables.

4 | RESULTS

As a first step, self-evaluated community resilience was regressed using three social capital indicators without considering bonding versus bridging social capital, as illustrated in Table 5. Four OLS regression models were structured hierarchically to determine whether the independent variables contribute to explaining the overall variance of community resilience (Models 1–4). Three additional models were structured for individual societies to better capture the characteristics of those individual societies (Models 5–7). Fixed effects were used for three East Asian societies and their regions. To manage heteroscedasticity, standard errors were clustered by region. The variance inflation factor for all models was below 3.0, which is accepted by most social science researchers. The adjusted r^2 values of Models 1–4 showed that three independent variables contribute to the explanatory power of the models. In Model 4, the coefficient of social trust indicated that a one unit increase in social trust increases self-evaluated community

TABLE 3 Voluntary association membership

	Japan		South Korea		Taiwan	
Association type	Frequency	Percent	Frequency	Percent	Frequency	Percent
Political association	103	4.41	77	5.52	36	1.69
Residential association	1,399	59.91	369	26.43	91	4.26
Volunteer group	175	7.49	230	16.48	156	7.31
Citizens' movement group	367	15.72	93	6.66	18	0.84
Religious group	237	10.15	408	29.23	258	12.09
Alumni association	1,030	44.11	667	47.78	84	3.94
Recreational association	712	30.49	541	38.75	239	11.20
Labour union	241	10.32	97	6.95	118	5.53
Professional association	202	8.65	166	11.89	147	6.89
Any of above	1420	60.81	1053	75.43	667	31.26
Total	2,335	100.00	1,396	100.00	2,134	100.00

TABLE 4 Descriptive statistics for variables

	Value label	Japan Ave (SD)	S. Korea Ave (SD)	Taiwan Ave (SD)
Community resilience	1 Strongly disagree 2 Disagree 3 Somewhat disagree 4 Neither agree nor disagree 5 Somewhat agree 6 Agree 7 Strongly agree	4.89 (1.21)	4.90 (1.52)	4.73 (1.80)
Social trust	1 Not at all 2 Not much 3 Somewhat 4 A great deal	2.47 (0.51)	2.38 (0.49)	2.29 (0.45)
In-group		3.09 (0.55)	3.14 (0.57)	3.03 (0.50)
Out-group		1.80 (0.67)	1.63 (0.70)	1.52 (0.62)
Voluntary association membership	0 No membership 1 Having membership	0.63 (0.48)	0.75 (0.43)	0.31 (0.46)
Membership heterogeneity	0 No membership 1 Mostly homogeneous 2 More homogeneous than heterogeneous 3 More heterogeneous than homogeneous 4 Mostly heterogeneous	1.28 (1.19)	1.48 (1.26)	0.47 (0.87)
Personal network	1 0 (person) 2 1-2 3 3-4 4 5-9 5 10 or more	2.86 (0.74)	3.09 (0.93)	3.67 (0.89)
People you can ask for favours		1.52 (0.77)	2.57 (1.24)	2.81 (1.36)
Neighbours on greeting terms		3.37 (1.19)	3.64 (1.38)	4.22 (1.13)
People you come into contact with		3.64 (1.73)	3.08 (1.23)	3.91 (1.28)
Control				
Trust in politicians	1 Not at all 2 Not much 3 Somewhat 4 A great deal	2.45 (0.69)	2.54 (0.71)	2.30 (0.73)
Disaster experience	0 Never had such a problem 1 Have such experiences	0.66 (0.47)	0.79 (0.41)	0.64 (0.48)
Age	18-95	53.27 (16.88)	50.62 (18.20)	45.81 (17.12)
Education years	0-23 year(s)	12.77 (2.46)	10.84 (4.86)	11.80 (4.59)
Gender	0 Female 1 Male	0.53 (0.50)	0.56 (0.50)	0.50 (0.50)
Household income	1 Far below Average 2 Below average	2.59 (0.90)	2.47 (0.97)	3.34 (0.85)

(Continues)

TABLE 4 (Continued)

	Value label	Japan Ave (*SD*)	S. Korea Ave (*SD*)	Taiwan Ave (*SD*)
	3 Average 4 Above average 5 Far above Average			
Urbanization	1 A farm in the country 2 A country village 3 A town or a small city 4 The outskirt of a big city 5 A big city	2.82 (0.88)	3.41 (1.14)	3.55 (1.12)

resilience by 0.324 in East Asia ($p < .01$). The positive effect of social trust was consistent in Japan ($b = .401$, $p < .01$), South Korea ($b = .155$, $p < .05$), and Taiwan ($b = .420$, $p < .01$), as shown in Models 5–7.

The results of voluntary association membership were contradictory. In Model 4, the effect of voluntary association membership was not significant in East Asia. However, Models 5–7 showed that membership in a voluntary association significantly increased self-evaluated community resilience in Japan ($b = .227$, $p < .01$) and South Korea ($b = .216$, $p < .01$) but decreased it in Taiwan ($b = -.223$, $p < .01$). The strong negative effect in Taiwan contradicts the core assumption of social capital studies. Personal networks showed a positive effect on self-evaluated community resilience in East Asia ($b = .235$, $p < .01$), and the strong positive effects were consistent in Japan ($b = .314$, $p < .01$), South Korea ($b = .168$, $p < .01$), and Taiwan ($b = .226$, $p < .01$).

Among the control variables, people's trust in politicians showed a positive effect on self-evaluated community resilience in East Asia ($b = .212$, $p < .01$); however, the effect was weaker in Japan ($b = .081$, $p < .10$) and stronger in South Korea ($b = .242$, $p < .01$) and Taiwan ($b = .295$, $p < .01$). People's prior experience of disaster did not show a significant effect. Age also showed conflicting results: age weakly increased self-evaluated community resilience in Japan ($b = .007$, $p < .01$) and South Korea ($b = .007$, $p < .10$) but strongly decreased it in Taiwan ($b = -.015$, $p < .01$). Education showed weak negative effects on self-evaluated community resilience in South Korea ($b = -.027$, $p < .10$) and in Taiwan ($b = -.047$, $p < .05$), but the effect was not significant in Japan. The male population tended to evaluate their community resilience highly in East Asia ($b = .89$, $p < .10$), although the effect was not strong. Household income showed a negative effect on self-evaluated community resilience in Taiwan ($b = -.109$, $p < .05$), but the effect was insignificant in other societies. Finally, urbanization showed negative effects in East Asia ($b = -.083$, $p < .01$). The effect was only significant in Japan ($b = -.176$, $p < .01$) and South Korea ($b = -.086$, $p < .05$).

Next, three social capital indicators were divided into bonding and bridging groups. The results are illustrated in Table 6. Again, the first four models were structured hierarchically to determine whether independent variables contribute to explaining the overall variance of community resilience, and three additional models were structured for individual societies. The variance inflation factor for all models was below 3.0. Increasing the r^2 values in Models 1–4 indicated that independent variables contribute to the explanatory power of the structured models. The overall results showed that the effect of bonding social capital was stronger than bridging social capital. In Model 4, the effect of in-group trust was strong and positive ($b = .315$, $p < .01$). Similarly, the effect of in-group trust was positive in Japan ($b = .395$, $p < .01$), South Korea ($b = .198$, $p < .05$), and Taiwan ($b = .319$, $p < .01$). Compared with in-group trust, the effect of out-group trust was weak in East Asia ($b = .048$, $p < .10$). The effect was similar in Japan ($b = .053$, $p < .10$) and Taiwan ($b = .127$, $p < .10$) but statistically insignificant in South Korea.

The results of voluntary association membership were different in the various societies. "Mostly homogenous" membership did not show a significant effect in East Asia due to the conflicting results across the societies: the effect was weak and positive in Japan ($b = .246$, $p < .10$), relatively strong and positive in South Korea ($b = .260$, $p < .05$), and negative in Taiwan ($b = -.235$, $p < .05$). "More homogeneous than heterogeneous" membership significantly increased the evaluation of community resilience in East Asia ($b = .123$, $p < .05$) and its effect was positive in Japan

TABLE 5 Regression of self-evaluated community resilience on social trust, voluntary association membership, and personal network

	East Asia				Japan	S. Korea	Taiwan
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Social trust		0.397***	0.392***	0.324***	0.401***	0.155**	0.420***
		(0.041)	(0.041)	(0.041)	(0.036)	(0.067)	(0.095)
Voluntary association membership			0.143**	0.084	0.227***	0.216***	-0.233***
			(0.058)	(0.056)	(0.054)	(0.083)	(0.076)
Personal network				0.235***	0.314***	0.168***	0.226***
				(0.026)	(0.042)	(0.027)	(0.053)
Political trust	0.311***	0.226***	0.219***	0.212***	0.081*	0.242***	0.295***
	(0.035)	(0.039)	(0.041)	(0.041)	(0.045)	(0.081)	(0.056)
Disaster experience	0.072	0.054	0.048	0.032	0.030	-0.057	0.095
	(0.051)	(0.053)	(0.053)	(0.049)	(0.075)	(0.127)	(0.084)
Age	0.004	0.004	0.003	0.002	0.007***	0.007*	-0.015***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.005)
Education years	-0.010	-0.015	-0.019*	-0.017	-0.004	-0.027*	-0.047**
	(0.012)	(0.011)	(0.011)	(0.011)	(0.016)	(0.014)	(0.023)
Gender (M = 1)	0.066	0.083*	0.083*	0.089*	0.085	-0.001	0.154
	(0.048)	(0.050)	(0.049)	(0.051)	(0.069)	(0.089)	(0.101)
Household income	-0.016	-0.018	-0.018	-0.026	0.027	-0.010	-0.109**
	(0.039)	(0.036)	(0.035)	(0.033)	(0.052)	(0.056)	(0.043)
Urbanization	-0.100***	-0.100***	-0.102***	-0.083***	-0.176***	-0.086***	0.042
	(0.026)	(0.025)	(0.026)	(0.023)	(0.038)	(0.029)	(0.051)
Society (Reference: Japan)							
S. Korea	-0.635***	-0.562***	-0.584***	-0.633***			
	(0.090)	(0.084)	(0.083)	(0.078)			
Taiwan	0.0004	0.031	0.066	-0.180**			
	(0.068)	(0.065)	(0.073)	(0.073)			
Constant	4.355***	3.672***	3.703***	3.273***	2.791***	3.574***	3.324***
	(0.243)	(0.259)	(0.255)	(0.271)	(0.165)	(0.479)	(0.810)
Observations	4,441	4,441	4,441	4.441	1,741	1,365	1,335
Adjusted r^2	0.052	0.066	0.067	0.082	0.135	0.104	0.066
Residual std. error	1.461	1.451	1.450	1.438	1.117	1.440	1.738
(d.f.)	(4,397)	(4,396)	(4,395)	(4,392)	(1,725)	(1,342)	(1,307)
F statistic	6.676***	8.089***	8.118***	9,620***	19.110***	8.212***	4.517***

Note. Standard errors are clustered by region; regional dummies as fixed-effects were included but not reported in the table.

*p < .10; **p < .05; ***p < .01.

(b = .201, p < .01) and South Korea (b = .291, p < .01) but negative in Taiwan (b = −.226, p < .05). "More heterogeneous than homogeneous" membership was only positive in Japan (b = .148, p < .01), meaning that Japanese citizens rely more heavily on bonding social capital than the other two societies. "Mostly heterogeneous" showed a negative effect in East Asia (b = −.203, p < .01), but the effects in an individual society were not statistically significant.

The number of people you can ask for favours strongly increased self-evaluated community resilience in East Asia (b = .092, p < .01). Its effects were also positive in Japan (b = .183, p < .01), South Korea (b = .094, p < .05), and Taiwan (b = .135, p < .01). The number of neighbours on greeting terms also significantly increased self-evaluated community

TABLE 6 Regression of self-evaluated community resilience on social trust, voluntary association membership, and personal network: Bonding and bridging social capital

	East Asia				Japan	S. Korea	Taiwan
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Trust							
In-group		0.395***	0.383***	0.315***	0.395***	0.198**	0.319***
		(0.043)	(0.043)	(0.044)	(0.015)	(0.092)	(0.094)
Out-group		0.058**	0.057**	0.048*	0.053*	-0.015	0.127*
		(0.028)	(0.028)	(0.026)	(0.029)	(0.035)	(0.075)
Membership heterogeneity (Ref.: no membership)							
Mostly homogeneous			0.135*	0.078	0.246*	0.260**	-0.235**
			(0.080)	(0.078)	(0.131)	(0.108)	(0.110)
More homogeneous than heterogeneous			0.193***	0.123**	0.201***	0.291***	-0.226**
			(0.056)	(0.050)	(0.040)	(0.102)	(0.105)
More heterogeneous than homogeneous			0.055	-0.022	0.148**	0.002	-0.186
			(0.088)	(0.085)	(0.064)	(0.168)	(0.341)
Mostly heterogeneous			-0.138**	-0.203***	-0.107	-0.107	-0.200
			(0.069)	(0.066)	(0.123)	(0.071)	(0.167)
Personal network							
People you can ask for favours				0.092***	0.183***	0.056**	0.135***
				(0.021)	(0.037)	(0.027)	(0.042)
Neighbours on greeting terms				0.126***	0.171***	0.102**	0.056**
				(0.022)	(0.028)	(0.043)	(0.029)
People you come into contact with				-0.0003	-0.009	-0.011	0.008
				(0.019)	(0.038)	(0.029)	(0.028)
Political trust	0.311***	0.225***	0.212***	0.206***	0.068*	0.235***	0.296***
	(0.035)	(0.038)	(0.039)	(0.040)	(0.041)	(0.079)	(0.055)
Disaster experience	0.072	0.045	0.042	0.025	0.017	-0.080	0.094
	(0.051)	(0.054)	(0.053)	(0.051)	(0.078)	(0.119)	(0.089)
Age	0.004	0.004*	0.003	-0.0004	0.004*	0.005	-0.016***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.004)	(0.005)
Education years	-0.010	-0.016	-0.019*	-0.016	0.002	-0.025*	-0.045**
	(0.012)	(0.011)	(0.011)	(0.011)	(0.014)	(0.014)	(0.023)
Gender (M = 1)	0.066	0.074	0.070	0.057	0.026	-0.026	0.143
	(0.048)	(0.049)	(0.051)	(0.053)	(0.074)	(0.100)	(0.097)
Household income	-0.016	-0.024	-0.025	-0.032	0.019	-0.024	-0.109**
	(0.039)	(0.036)	(0.035)	(0.033)	(0.054)	(0.063)	(0.043)
Urbanization	-0.100***	-0.103***	-0.103***	-0.076***	-0.165***	-0.078**	0.045
	(0.026)	(0.025)	(0.026)	(0.024)	(0.040)	(0.036)	(0.053)
Society (Reference: Japan)							
S. Korea	-0.635***	-0.583***	-0.608***	-0.743***			
	(0.090)	(0.083)	(0.079)	(0.076)			
Taiwan	0.0004	-0.021	0.002	-0.296***			
	(0.068)	(0.065)	(0.074)	(0.078)			
Constant	4.355***	3.345***	3.409***	3.250***	2.732***	3.546***	3.354***
	(0.243)	(0.277)	(0.275)	(0.287)	(0.215)	(0.546)	(0.789)

(Continues)

TABLE 6 (Continued)

	East Asia				Japan	S. Korea	Taiwan
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Observations	4,441	4,441	4,441	4,441	1,741	1,365	1,335
Adjusted r^2	0.052	0.072	0.075	0.093	0.163	0.114	0.067
Residual std. error	1.461	1.446	1.444	1.430	1.099	1.431	1.738
(d.f.)	(4,397)	(4,395)	(4,391)	(4,388)	(1,719)	(1,336)	(1,301)
F statistic	6.676***	8.657***	8.354***	9.709***	17.151***	7.290***	3.885***

Note. Standard errors are clustered by region; regional dummies as fixed-effects were included but not reported in the table.
*p < .10; **p < .05; ***p < .01.

resilience in East Asia (b = .126, p < .01), and the effect was also positive in Japan (b = .171, p < .01), South Korea (b = .102, p < .01), and Taiwan (b = .056, p < .05). Finally, the number of "people you come into contact with" did not show any significant effect on self-evaluation of community resilience in these three societies.

5 | DISCUSSION AND CONCLUDING REMARKS

This study aimed to test the impact of social capital on self-evaluated community resilience by considering the bonding and bridging types of social capital. As discussed, self-evaluated community resilience may not equate to actual community resilience; however, it has been assumed that when individual members of a community believe that they will be able to collaborate and cope with natural disasters, collaborative action is more likely in the face of a disaster. As a first step, the effects of an average level of social trust, voluntary association membership, and personal networks on self-evaluated community resilience were tested. The results showed that social trust and personal networks increased self-evaluated community resilience, supporting previous social capital studies. However, voluntary association membership did not necessarily lead to a positive evaluation of community resilience: in Japan and South Korea, where more than 60% of citizens participate in some type of association, membership tended to increase people's belief that their community members would work together in the face of natural hazards. Moreover, in Taiwan, where only 30% of people participate in some type of association, those voluntary associations did not increase people's belief that their community members would work together. Although this study does not delve into the sociocultural factors that caused the low rate of membership in Taiwanese society, the results suggest that voluntary associations work positively in societies where there are high rates of membership in associations. Further studies might address the mediation effect of membership rates and the causes of the low rate of membership in Taiwan.

Next, the three social capital variables were divided according to the degree of proximity of the respondents' relationships. Overall results showed that the effects of in-group trust, homogeneous membership, and strong ties on self-evaluated community resilience were stronger than those of out-group trust, heterogeneous membership, and weak ties across the three societies. Regarding in-group versus out-group trust, previous studies have shown that the radius of trust varies in accordance with social characteristics and that Confucian cultures tend to have strong in-group cohesion that inhibits the formation of out-group trust (see Fukuyama, 1995; Yamagishi, Cook, & Watabe, 1998). It is not certain in this study whether East Asia has a narrower boundary of trust compared with other regions because the study does not compare results from different geographical regions; however, the weak or insignificant out-group effects suggest that East Asians rely on people in a narrow range of trust for their community resilience. Further studies might compare these results with societies outside East Asia in which peoples' trust boundaries are believed to be wider, such as Western Europe.

The results of membership heterogeneity also showed that the effects of voluntary association membership on self-evaluated community resilience become weaker as membership becomes more heterogeneous, especially in Japan and South Korea. However, Japanese people are more open to heterogeneous membership than those in South Korea with regard to community resilience, as seen in the effect of the "more heterogeneous than homogeneous" membership that significantly increased self-evaluated community in Japan. South Koreans tend to perceive a weaker connection between heterogeneous membership and community resilience. Considering that Japan experiences more frequent and stronger disasters (Table 1) than South Korea and Taiwan and that the survey was conducted in the same year that Japan experienced the Tohoku earthquake, it is possible that people in Japan may have learned to engage with people from heterogeneous backgrounds. Moreover, this study did not distinguish different types of associations. As some studies have pointed out, different associations may have different social impacts (Lee & Cho, 2018; Lee & Fraser, 2019; Rupasingha, Goetz, & Freshwater, 2006). Further studies might delve into the mediation effect of the frequency or intensity of disasters on social capital and community resilience and types of associations.

It is easy to assume that broader personal networks have positive effects on community life; however, this study showed that the simple number of acquaintances or people in daily contact does not increase people's evaluation of community resilience. In the case of South Korea, however, the effect of "people on greeting terms" is greater than that of "people you can ask for favours," meaning that the radius of networks that is beneficial for community resilience may be differ according to different cultural and social contexts.

Other than social capital variables, some interesting results were found. Although East Asians' trust in politicians contributes to their perceived community resilience, the effect is weaker in Japan than in other societies. This also indicates that Japanese people rely less heavily on politicians as a source of linking social capital. Although this study has only focused on bonding versus bridging social capital, further studies might include linking social capital and look into the tripartite relationship. Another important implication of this study is that the socio-economic and demographic characteristics of residents did not show clear patterns in their effects on community resilience. This may mean that the findings of previous studies concerning socio-economic and demographic factors may not be directly applicable to the East Asian region.

The importance of the findings in this study is limited in that the community resilience variables used did not distinguish between the types or magnitudes of disasters and this requires further study. Moreover, the findings of this study only reflect East Asian cultural characteristics. However, because a widely used indicator of social capital was used in this study, future studies might compare the results with other social and cultural contexts. Finally, the roles of political institutions and their policies were not significantly considered. Scholars should investigate how the role of political institutions affects and mediates the relationship between social capital and community resilience in the face of disasters.

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