

The impact of crime rate, experience of crime, and fear of crime on residents' participation in association: studying 25 districts in the City of Seoul, South Korea

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Abstract While the majority of studies on community crime have focused on socio-economic characteristics that lead to high or low rates of crime, the impact of crime on community residents' social ties has received less attention. This study examines the impact of district-level crime rate, experience of crime, and fear of crime on individual community residents' participation in association—which has been widely seen as an indicator of social capital—in the city of Seoul, South Korea. Moreover, as recent social capital studies look deeper into the different types of neighborhood crime connected to different types of associations, this study separately examines the impact of total crime, violent crime, and property crime on the respondents' social, civic engagement, reward-based, and online associations. We find that district-level crime rates negatively correlated with all types of associations, but the difference between violent crime and property crime was minimal. Additionally, individual-level experience of crime significantly decreased residents' participation in social and online associations. However, fear of crime did not show a significant effect on any type of association.

Keywords Crime rates · Fear of crime · Voluntary association · Social capital · Civic participation

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Introduction

How crime affects community residents' social ties has been an important research question since Durkheim's suggestion that crime is an inevitable part of a society that may reinforce common consciousness within communities (Durkheim 2014). While Durkheim's functional approach is still tested in various contexts (Liska and Warner 1991; Cohen and Machalek 1994; Hawdon et al. 2010), a greater percentage of crime studies focused on the causes of crime rather than its impact on community residents. This study examines how individual community residents' participation in associations is affected by three different aspects of crime—district-level crime rates, individual experience of crime, and individual fear of crime—in the city of Seoul, South Korea. Studying community residents' participation in associations is particularly important as numerous studies have found it an indicator of social capital and important source of trust (Brehm and Rahn 1997; Stolle and Rochon 1999; Putnam 2000; Curtis et al. 2001; Delhey and Newton 2003; Kim 2005; Liu and Stolle 2017).

This study contributes to the literature of crime and social capital in three ways. First, empirical findings on the social impact of crime in previous studies have presented mixed perspectives; in some studies, crime as an external threat increases social solidarity and promotes civic participation (Collins 2004; Hawdon et al. 2010; Oh and Kim 2009) while, in other studies, crime yields a decrease in social interactions and informal social control (Skogan and Maxfield 1981; Skogan 1990; Ross and Jang 2000; Saegert and Winkel 2004). Moreover, previous studies have used different aspects of crime, such as crime rates, experience of crime, and fear of crime (or perceived risk of crime victimization), which complicates the relationship between crime and community residents. Therefore, the findings of this study contribute to the literature by including all three aspects of crime and concisely determine the relationship.

Second, a growing number of studies emphasize that crime and voluntary associations are not monolithic. Different types of crime have different characteristics (Kennedy et al. 1998; Rosenfeld 1994; Deller and Deller 2010), and different types of associations have different relationships with social capital (Knack and Keefer 1997; Rupasingha et al. 2006). One type of crime is more closely intertwined with residents' social capital than another type of crime (Moore and Recker 2016, 2017). This study, therefore, bifurcates district-level crime into violent crime and property crime and examines their impacts on the respondents' social, civic engagement, reward-based, and online associations.

Third, previous studies have predominantly focused on the experiences of major cities in the USA and Western Europe, which should be tested elsewhere to increase the generalizability. Luckily, recently published crime data, made available by the South Korean Supreme Prosecutor's Office and the Seoul Survey conducted by the Seoul Metropolitan Government, enabled Seoul to be the focal point of this study. The data provided crime rates in 25 districts of Seoul and information on the residents' associational lives, crime experiences, and fear



of crime. With these sets of public data, this study connects to and builds on the broader literature of social capital and crimes.

This article is organized into four sections. The first part discusses the literature on crime and community responses and shows how research, heretofore, has offered inconsistent findings on the impact of crime. The second part discusses the literature on types of crime and types of associations. The third part presents the research design, including data, method, and variables. The fourth part reports on the empirical analysis of the impact of crime. Finally, the article analyzes the implications that can be drawn from the empirical evidence.

Social impacts of crime on community residents

Criminologists have long studied the relationship between crime and community characteristics. One stream has focused on neighborhood structures and characteristics that caused high or low rates of crime; the other stream, relatively understudied, has investigated the social impact of crime on community residents. In the former stream, for example, social disorganization theory has focused on the extent of the social control that depends on the extent of pre-existing neighborhood social disorganization (Shaw and McKay 1942; Kornhauser 1978; Wilson and Kelling 1982; Bursik 1988; Sampson and Raudenbush (1999); Bursik and Grasmick 1999; Rose and Clear 1998; Sampson and Groves 1989; Sampson et al. 1997; Sampson 2001). Moreover, criminal opportunity theory has investigated the neighborhood structure that allows offenders to choose targets that offer a high reward with little effort and risk (Liska and Warner 1991; Hindelang et al. 1978; Cohen and Felson 1979; Felson and Cohen 1980; Miethe et al. 1987; Messner and Blau 1987). Since the mid-1990s, as the concept of social capital became popular, scholars have studied the impact of social capital—measured by civic participation, networks, and trust—on crime rate or the fear of crime. (Sampson 2001; Lindström et al. 2002; Buonanno et al. 2009; Deller and Deller 2010; Takagi et al. 2012; Moore and Recker 2016, 2017). These studies have found social structures (or the breakdown of the structures) that results in the change of crimes in communities.

In the latter stream, on which this study builds, scholars have examined the impact of crime on the level of community social ties and participation. However, the empirical findings have been mixed (Takagi et al. 2016). Specifically, some studies have shown that crime as an external threat increases social solidarity and promotes civic participation, while other studies have found that crime results in a decrease in social interaction and informal social control. Moreover, other studies have demonstrated that the relationship is weak or none.

A century ago, Mead (1918) discussed two types of social organizations, hostile and friendly, and argued that social organizations created as a reaction to crime are hostile, often uniting members of the community in a distrusting and competitive way. In a similar vein, Conklin (1975) pointed out that crime causes people to avoid dangerous situations or defend potential criminals, which often results in a decrease in social interaction and informal social control of deviant behavior. Additionally, Skogan (1990) posited that neighborhood disorder brings anger, demoralization, and



fear to the community, which leads to the residents' "withdrawal from the community" (p. 13). Such withdrawal diminishes attachment and reduces satisfaction, leading to further disorder.

Fear of crime, or perceived risk of victimization, has often been distinguished from crime rates or the actual experience of crime. Skogan and Maxfield (1981) discussed that fear of crime is closely related to crime but are not wholly similar in that fear spreads to people who have not experienced crime, and the people who are least likely to be victimized are often more likely to be fearful. Palmer et al. (2005) argued that media coverage also increases residents' fear of crime among people who have not experienced crime and creates the stigmatization of the community. Despite the differences, evidence has shown that crime event and the fear of crime have similar effects. Markowitz et al. (2001) measured fear of crime by the percent of people who felt unsafe walking alone after dark or worried about being burglarized or robbed. They found that neighborhood disorder events increase fear among residents, and the fear reduces cohesion among community members. Palmer et al. (2005) also showed that crime and fear of crime both negatively affect social interactions among residents; however, fear of crime, the perceived risk of becoming a victim of crime, plays a more direct role in weakening social interactions. In other studies, fear erodes the ability of the community to organize and weakens residents' motivation for community-based activities (Saegert and Winkel 2004), leading to shrinking ties among neighbors (Wilson and Kelling 1982; Taylor 1996) and lowered community satisfaction (Robinson et al. 2003). Ross and Jang's (2000) study on neighborhoods in Illinois showed that neighborhood disorder increases fear and mistrust among the residents; however, the increase in fear and mistrust is reduced by the residents' degree of informal social integration.

The response of community residents to crime has not always been negatively reported. Building on Durkheim's functional perspective of crime, Lauderdale (1976) found that an external threat to a group re-established solidarity among members, which lead to a severe rejection and prevention of deviant behavior. Liska and Warner's (1991) model exhibited that robbery constrains social interactions, but the constrained social interaction leads to a decrease in other crime and robbery. Other studies have shown that crime as a collective threat increases social solidarity and promote civic participation (Berkowitz 2000; Wandersman and Florin 2000). Collins (2004) studied a terrorist attack and found that the rise of ritual after a crime event intensified social interaction while Hawdon et al. (2010) found that solidarity significantly increased after the crime and stayed elevated around six months. Likewise, Takagi et al. (2016) studied two cities in the Tokyo Metropolitan area and found that neighborhood crime is related to frequent civic participation by positively associating with more intimate friendship ties.

Fear of crime has also been found to increase social interaction. Skogan and Maxfield (1981) analyzed how citizens cope with the fear of crime and noted that people who have indirectly been in contact with crime are more likely to be fearful and take active crime-reduction efforts in the community. Oh and Kim (2009) examined the interaction effects of fear of crime and age on social integration, cohesion, and trust in a Chicago neighborhood in 1995 and found that the urban elderly population's



fear of crime had positive effects on neighborhood attachment, heightening social interaction, cohesion, and trust.

Contrastly, some authors concluded that crime and fear of crime were not associated with residents' civic participation. Perkins et al. (1996) examined crimes in New York City, Baltimore, and Salt Lake City and found that crime and fear of crime were not associated with residents' civic participation. In Japan, Richey (2005) reported that residents' fear of crime and past experience of victimization were not associated with their participation in neighborhood watch groups (a form of civic participation), using data from the International Crime Victims Survey. Finally, Perkins et al. (2002) argued that crime itself may not be a sufficient stimulus to enhance the level of community organization.

As discussed, findings of previous studies have offered various results and arguments. These different findings, including the relationship being reported both negative and positive, may be a result of the examination of different aspects of crime. Therefore, the goal of this study is to define the relationship between crime and community residents' social ties by testing three different aspects of crime: crime rate, experience of crime, and fear of crime results.

Type of crime and type of associations

While the primary goal of this study is to determine the impact of crime on residents' associational ties, we also consider a growing concern that both crime and associations are not monolithic. Different types of crime have different impacts on social interaction (Kennedy et al. 1998; Rosenfeld 1994). Deller and Deller (2010, 2012) divided crime into violent crimes and property crimes, according to the Uniform Crime Reports from the United States Federal Bureau of Investigation. They found that social capital is more closely associated with property crime than violent crime, such as burglary and larceny. As property crime and violent crime take place in different settings, they may have different characteristics (Moore and Recker 2016). Just like crime, different social organizations differently serve as a source of social capital. Knack and Keefer (1997) and Rupasingha et al. (2006) measured different forms of social organizations by dividing them into Putnam-type and Olson-type social organizations. According to them, Putnam-type organizations are based on social interactions that promote trust and cooperation, such as civic organization, bowling centers, and religious organizations while Olson-type organizations are "rent-seeking" groups where there is a financial incentive to form and join associations. They concluded that Putnam-type organizations are a better indicator of social capital than Olson-type organizations. Building on this, Moore and Recker (2016, 2017) distinguished Recreation-type social organizations from Putnam-type social organizations in the assumption that sport clubs would have a different effect on crime than religious and civic organizations. Recreation-type organizations are informal and private, while Putnam-type organizations are relatively formal organizations that have civic and public goals. They tested the role of "parochial social controls" in decreasing community crime, as Hunter (1985) suggested, and found



that Putnam-type organizations were more significant indicators of crime than Recreation- and Olson-type organizations (Moore and Recker 2017).

Methods

The individual-level data were collected from the Seoul Survey carried out by the Seoul Metropolitan Government in 2015. For the survey, a stratified, cluster sampling method was employed to select 20,000 households across Seoul's 25 districts. Face-to-face interviews of 46,837 household members aged 15 and older were conducted between September 18 and October 31, 2015. Clusters were formed based on three strata: district, neighborhood, and house types. Households that were unable to reach were replaced within the stratified cluster until the sample reached 20,000 households. District-level data were available through Statistics Korea, a governmental organization for public statistics (www.kostat.go.kr). A multilevel logistic regression method was used because the dependent variable, participation in association, is a binary variable (1 = "participate"; 0 = "do not participate"), and the independent variables are both individual- and district-level data. Variables are described in detail below.

Participation in associations

As the dependent variable, we chose the respondents' participation in various voluntary associations. Respondents' participation in associations is included in many social surveys, but the categories are different depending on the survey; for example, Curtis et al. (2001) used the World Value Survey that has 16 types of social associations; Delhey and Newton (2003) used the Euromodule that has 9 types of associations; Kim (2005) used a South Korean national survey that has 10 types of associations. In the Seoul Survey, eleven types of associations were suggested: social clubs, alumni groups, regional community groups, online community, leisure societies, volunteer groups, citizens movement groups, professional organizations/labor unions, political associations, religious organizations, and others. As Table 1 shows, social clubs and alumni groups are the most popular associations in South Korea. Here, social clubs in South Korea generally refers to informal "social gatherings among people who share common backgrounds or interests, or social experience at one point in life" (Kim 2005, p. 201). Alumni groups are similar social gathering groups, but they differ in that membership is based on the school from which they graduated, or graduates of nearby schools located in their hometown. Since it is uncommon in South Korea that one respondent has membership in multiple social clubs and alumni groups, simply counting the types of associations each respondent answered to participate, as in Curtis et al. (2001)'s study can be misleading. Therefore, the respondents' participation was coded in the binary system (0 = "do not participate"/1 = "participate"), which is suitable for the logistic regression method.

For further analysis, we categorized each type of association into social associations, civic engagement associations, reward-based associations, and online



Table 1 Respondents' participation in associations

Associations	Frequency	Percent
Social associations		
Social clubs	20,891	26.5
Alumni groups	25,285	32.1
Regional community groups	8737	11.1
Leisure societies	7481	9.5
Civic engagement associations		
Volunteer groups	5787	7.3
Citizens movement groups	387	0.5
Religious organizations	8118	10.3
Reward-based associations		
Professional organizations/labor unions	689	0.9
Political associations	231	0.3
Online associations	1248	1.6
Others	3	0.0

associations according to each association's primary purpose and characteristics. Social association is similar to Moore and Recker's Recreation-type association where individuals engage in informal interactions based on recreational social activities; civic engagement association is similar to Putnam-type association where individuals meet in public with clear goals to develop networks and trust; reward-based association is similar to Olson-type association where the primary purpose is to acquire financial and economic rewards (Rupasingha et al. 2006; Moore and Recker 2016, 2017). Finally, online communities in South Korea are primarily social associations (Choi 2006; Phua and Jin 2011), but we distinguished online association as a separate category due to its different mode of participation compared to traditional associations, which are based on face-to-face interactions.

District-level crime rate

As a key independent variable, district-level crime rates published by the Supreme Prosecutors' Office of Republic of Korea were collected. Seven types of crime were selected and categorized into two groups: violent crime (homicide, sexual assault, robbery, and aggravated assault) and property crime (burglary, larceny, and arson). Total crime was defined as the sum of all seven types of crime. This categorization was based on the Federal Bureau of Investigation's Uniform Crime Reports (UCR), which differs from the definition of *crime* denoted by the South Korean Supreme Prosecutor's Office (SPO). For example, the South Korean SPO defines *arson* as a violent crime; also, *aggravated assault* is separately defined in South Korea as assault and bodily injury. However, the crimes were categorized in a way to compare with and build on previous studies that used the FBI's UCR. In particular, we tested Moore and Recker's study (2016), which reported that citizens' joining of associations is related closer to property crimes than violent crimes.



One concern raised by Osgood (2000) about dealing with crime rate was that areas with small populations would have a significant increase in crime rates with just one event occurring while areas with a large population would see a small increase in their crime rate with one additional crime. He suggested using the negative binomial regression in case the dependent variable is counts. However, all districts of Seoul are densely populated, and the gap between districts is small (average population=400,887; average population density=17,307 persons/km²; standard deviation of population density=4812 persons/km²). Moreover, the dependent variable (participation in association) is binary data and not count data. Therefore, the issue regarding population and crime rate is not a critical concern of this study.

Crime experience

Studies have pointed out that personal crime experiences are not exactly the same as crimes reported by the media or official crime rates as reported by government organizations (Skogan and Maxfield 1981; Palmer et al. 2005). Skogan and Maxfield (1981) stated that people who indirectly experienced crime are often more fearful of crime than people who directly experienced crime. For the experience of crime, respondents were asked if their households were exposed to the suggested threats for the last 12 months. Among the nine types of suggested threats, the respondents who chose “crime victimization” were separately coded with binary numbers. However, the question does not distinguish to which types of crime the respondents were exposed; therefore, we can only measure the respondents’ overall crime experiences.

Fear of crime

For fear of crime, measurements in previous studies were inconsistent. Markowitz et al. (2001) measured fear of crime by the percentage of people who felt very unsafe walking alone after dark and who were very worried about being burglarized or robbed. Palmer et al. (2005) defined fear of crime as the perceived risk of becoming a victim of crime. Oh and Kim (2009) combined respondents answers into three statements: people take a big chance to walk alone after dark, people know areas where trouble is expected, and many people are afraid to go out at night. This study uses a question that asked respondents to evaluate their perceived severity of the violence and crime in their living areas. Each respondent chose among “not at all,” “not much,” “somewhat,” and “a great deal.”

As control variables, respondents’ education, gender, duration of residence in current location, and age were included from the Seoul Survey. As district-level control variables, the proportion of the population aged over 65 and the proportion below the poverty line were collected through Statistics Korea (see Table 2).



Table 2 Descriptive statistics for variables

Variables	Categories	Mean	SD	Min	Max
Individual-level					
Participating voluntary associations	0 Do not participate	0.783	0.412	0	1
	1 Participate				
Social associations	0 Do not participate	0.761	0.426	0	1
	1 Participate				
Civic association	0 Do not participate	0.196	0.397	0	1
	1 Participate				
Reward-based associations	0 Do not participate	0.019	0.137	0	1
	1 Participate				
Online associations	0 Do not participate	0.124	0.329	0	1
	1 Participate				
Household Income (Monthly)	1. Less than \$1000	5.179	1.195	1	6
	2. \$1000-less than \$2000				
	3. \$2000-less than \$3000				
	4. \$3000-less than \$4000				
	5. \$4000-less than \$5000				
	6. \$5000 and above				
Gender	0 Female	0.484	0.500	0	1
	1 Male				
Education	1. Elementary school	3.699	1.113	1	6
	2. Middle school				
	3. High school				
	4. 2-year college				
	5. 4-year college				
	6. Graduate school				
Duration of residence	1. Less than 10 years	1.363	0.656	1	6
	2. 10–19 years				
	3. 20–29 years				
	4. 30–39 years				
	5. 40–49 years				
	6. 50 years and above				
Age	1. 15–19	3.821	1.516	1	6
	2. 20–29				
	3. 30–39				
	4. 40–49				
	5. 50–59				
	6. 60 and above				
Fear of Crime (Perceived severity of community crime)	1. Not at all	2.234	0.725	1	4
	2. Not much				
	3. Somewhat				
	4. A great deal				



Table 2 (continued)

Variables	Categories	Mean	SD	Min	Max
Crime experience	0 No 1 Yes	0.028	0.164	0	1
District-level					
Total crime (log)		4.072	0.133	3.91	4.58
Violent crime (log)		3.762	0.135	3.61	4.25
Property crime (log)		3.776	0.139	3.59	4.31
Percentage of Population aged over 65		1.104	0.056	1.01	1.20
Population below the poverty line (%)		2.481	0.822	1.01	4.17

Results

We began by structuring three multilevel logistic regression models to analyze the impact of district-level crime rate, crime experience, and fear of crime on residents' participation in association. The multilevel models put individuals at the first level and districts at the second with a random intercept for 25 districts of Seoul. The VIF for the full model was less than 1.7, which is more than acceptable in terms of multicollinearity, and Table 3 illustrates the results of the regression models. Firstly, district-level crime rates significantly decrease residents' participation in association. Model 1 illustrates that total crime rate ($b = -0.503$, $\text{Exp}[b] = 0.604$, $p < 0.05$) reduces the odds of residents' participation in association by 39.6% ($= 100 * [1 - 0.604]$). Model 2 shows that violent crime reduces the likelihoods of participation in association by 39.7% ($= 100 * [1 - 0.603]$), and Model 3 depicts that property crime decreases the probabilities of participation in association by 37.5% ($= 100 * [1 - 0.625]$). Although the coefficient of property crime is smaller than violent crime, the gap is small, demonstrating that the impact of crime does not significantly differ by its type. Moore and Recker's (2016) study argues that property crime is more closely associated with people's participation in association; however, the difference turned out to be minimal in the case of Seoul.

Individual-level crime experience also decreases residents' participation in association ($b = -0.175$, $\text{Exp}[b] = 0.840$, $p < 0.01$). Residents who have experience with crime are 16% ($= 100 - [1 - 0.840]$) less likely to participate in association than residents who do not have this experience. These two crime-related variables showed a negative effect on participation in association; however, the effect of fear of crime was not significant. The coefficient of fear of crime is positive, indicating that people who are fearful are more likely to participate in association, but the coefficient is neither statistically nor practically significant.

Individual-level control variables showed significant effects on participation in association. Household income increases the probability of participation in association ($b = 0.047$, $\text{Exp}[b] = 1.047$, $p < 0.01$). Education also has a positive effect on participation in association ($b = 0.120$, $\text{Exp}[b] = 1.127$, $p < 0.01$). Highly educated populations showed 1.127 times (or 12.7%) higher probability of participating in any of the associations. Male populations showed higher probability than female



Table 3 Impact of district-level crime rate, experience of crime, and fear of crime on individual-level participation in associations

Participation in association	(1)		(2)		(3)	
	<i>b</i>	Exp[<i>b</i>]	<i>b</i>	Exp[<i>b</i>]	<i>b</i>	Exp[<i>b</i>]
<i>Individual-level</i>						
Household income	0.047*** (0.010)	1.047	0.047*** (0.010)	1.047	0.047*** (0.010)	1.047
Education	0.120*** (0.010)	1.127	0.120*** (0.010)	1.127	0.120*** (0.010)	1.127
Gender (<i>M</i> = 1)	0.232*** (0.023)	1.261	0.233*** (0.023)	1.261	0.232*** (0.023)	1.261
Duration of residence	- 0.080*** (0.018)	0.922	- 0.080*** (0.018)	0.922	- 0.081*** (0.018)	0.921
Age	0.208*** (0.008)	1.231	0.208*** (0.008)	1.231	0.209*** (0.008)	1.231
Crime experience	- 0.175*** (0.067)	0.840	- 0.175*** (0.067)	0.840	- 0.175*** (0.067)	0.840
Fear of crime	0.014 (0.016)	1.013	0.014 (0.016)	1.013	0.014 (0.016)	1.013
<i>District-level</i>						
Total crime rate (log, <i>t</i> - 1)	- 0.503** (0.199)	0.604				
Violent crime rate (log, <i>t</i> - 1)			- 0.506** (0.219)	0.603		
Property crime rate (log, <i>t</i> - 1)					- 0.469*** (0.180)	0.625
Population over 65 (%)	0.004 (0.020)	1.003	0.007 (0.022)	1.008	- 0.002 (0.019)	0.998
Population below the poverty line (%)	- 0.061 (0.037)	0.940	- 0.054 (0.038)	0.948	- 0.064* (0.038)	0.937
Constant	1.964*** (0.736)	7.131	1.749** (0.717)	5.749	1.764*** (0.643)	5.835
<i>Random effects</i>						
Variance of intercept (district)	0.01308		0.01341		0.01289	
Observation	46,837		46,837		46,837	
Number of district	25		25		25	
Log likelihood	- 23,902.1		- 23,902.4		- 23,902.0	
AIC	47,828.2		47,828.7		47,827.9	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

populations in participating in voluntary associations ($b = 0.232$, $\text{Exp}[b] = 1.261$, $p < 0.01$). However, duration of residence is negatively related to participation in association ($b = - 0.080$, $\text{Exp}[b] = 0.922$, $p < 0.01$). The duration of residence was included based on the assumption that people who live in a community for a longer time tend to have long-term relationships with neighbors, increasing the possibility of involvement in any associations (Lochner et al. 1999). However, the duration of



residence decreases the probability of residents' participation in association. This may be a reflection of South Korea's social context in which rapid development and urbanization encourage people to relocate to newly developed areas while older areas are left undeveloped and impoverished.

Individual-level age increases the odds of participation by 23.1% ($b=0.208$, $\text{Exp}[b]=1.231$, $p<0.01$); however, district-level population aged over 65 did not show any significant effect. This means that older populations tend to be involved in associations, but a population with a higher percentage of those over 65 in a district does not necessarily lead to an increase in participation. The district-level poverty rate showed a negative effect on participation in Model 3 ($b=-0.064$, $\text{Exp}[b]=0.937$, $p<0.10$), which supports the result of individual-level household income.

Next, four sets of multilevel logistic regression models were structured to test the impact of both violent and property crimes on participating four different types of associations (see Table 4). Firstly, district-level crime rates showed negative effects on all four types of associations, which aligns with the results in Table 3. Again, difference between the impact of violent crime and the impact of property crime is minimal although the coefficients of property crime are slightly lower than the coefficients of violent crime except online associations. The impact of district-level crime is the greatest on reward-based associations followed by online associations, civic engagement associations, and social associations. Models 1 and 2 illustrate that violent crime decreases the odds of participation in social association by 35.6% ($b=-0.440$, $\text{Exp}[b]=0.644$, $p<0.05$), and property crime reduces the odds by 34.8% ($b=-0.427$, $\text{Exp}[b]=0.652$, $p<0.05$). For civic engagement associations, violent crime decreases the likelihood of participating in association by 65.6% ($b=-0.812$, $\text{Exp}[b]=0.444$, $p<0.01$), and property crime decrease the likelihood by 63.5% ($b=-0.766$, $\text{Exp}[b]=0.465$, $p<0.01$). For reward-based associations, violent crime decreases the probabilities of participation in association by 86.7% ($b=-2.019$, $\text{Exp}[b]=0.133$, $p<0.01$), and property crime decreases the probabilities by 85.9% ($b=-1.961$, $\text{Exp}[b]=0.141$, $p<0.01$). District-level crime rate also decreases online associations, but only property crime significantly decreased the probability of participation in association by 60.4% ($b=-0.926$, $\text{Exp}[b]=0.396$, $p<0.05$).

Residents' experience of crime only had a significant effect on social associations and online associations. Experience of crime decreases the probabilities of participation in social associations by 12.6% ($b=-0.135$, $\text{Exp}[b]=0.874$, $p<0.05$) and decreases the probabilities of participation in online association by 24.3% ($b=-0.278$, $\text{Exp}[b]=0.757$, $p<0.01$). Its impact on civic engagement and reward-based association were not statistically significant. Online association was separated because it has a different mode of participation compared to other types of association; however, most online group activities are based on informal communications and non-public membership, which is closer to social associations than civic engagement and reward-based associations. Therefore, we can see that crime experience is negatively associated with informal associations rather than formal associations. Similar to the result in Table 3, fear of crime did not show a significant effect on any type of association.



Table 4 Impacts of different types of crime on different types of associations

	Social			Civic engagement			Reward-based			Online		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)				
<i>Individual-level</i>												
Household income	0.051*** (0.010)	0.052*** (0.010)	0.085*** (0.011)	0.086*** (0.011)	0.088*** (0.032)	0.089*** (0.032)	0.058*** (0.014)	0.058*** (0.014)				
Education	0.121*** (0.010)	0.121*** (0.010)	0.070*** (0.011)	0.070*** (0.011)	0.153*** (0.033)	0.152*** (0.033)	0.132*** (0.013)	0.132*** (0.013)				
Gender ($M=1$)	0.221*** (0.022)	0.221*** (0.022)	- 0.256*** (0.024)	- 0.256*** (0.024)	0.540*** (0.070)	0.540*** (0.070)	0.115*** (0.029)	0.114*** (0.029)				
Duration of residence	- 0.078*** (0.017)	- 0.079*** (0.017)	0.045** (0.018)	0.044** (0.018)	- 0.008 (0.050)	- 0.009 (0.050)	0.004 (0.023)	0.004 (0.023)				
Age	0.261*** (0.007)	0.261*** (0.007)	0.119*** (0.008)	0.119*** (0.008)	0.117*** (0.024)	0.118*** (0.024)	- 0.338*** (0.010)	- 0.338*** (0.010)				
Crime experience	- 0.135** (0.066)	- 0.134** (0.066)	0.051 (0.071)	0.052 (0.071)	- 0.202 (0.224)	- 0.201 (0.224)	- 0.278*** (0.096)	- 0.278*** (0.096)				
Fear of crime	0.015 (0.015)	0.015 (0.015)	0.005 (0.016)	0.005 (0.016)	- 0.070 (0.048)	- 0.070 (0.048)	0.004 (0.020)	0.004 (0.020)				
<i>District-level</i>												
Violent crime ($\log, t-1$)	- 0.440** (0.224)		- 0.812*** (0.277)		- 2.019*** (0.730)		- 0.835 (0.541)					
Property crime ($\log, t-1$)		- 0.427** (0.183)		- 0.766*** (0.231)		- 1.961*** (0.626)		- 0.926** (0.516)				
Population over 65	- 0.002 (0.022)	- 0.009 (0.019)	0.021 (0.028)	0.007 (0.024)	0.029 (0.068)	- 0.008 (0.058)	0.061 (0.056)	0.053 (0.048)				
Population below the poverty line	- 0.059 (0.039)	- 0.070* (0.039)	0.047 (0.048)	0.029 (0.048)	- 0.028 (0.119)	- 0.073 (0.120)	0.068 (0.097)	0.039 (0.099)				
Intercept	1.294** (0.732)	1.371** (0.652)	0.126 (0.903)	0.191 (0.823)	1.625 (2.424)	2.020 (2.281)	0.528 (1.751)	1.062 (1.845)				



Table 4 (continued)

	Social		Civic engagement		Reward-based		Online	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Random effects</i>								
Variance of intercept (district)	0.01504	0.01433	0.02486	0.02313	0.1377	0.1278	0.1099	0.1032
Observations	46,837	46,837	46,837	46,837	46,837	46,837	46,837	46,837
Number of district	25	25	25	25	25	25	25	25
Log likelihood	-24,865.8	-24,865.3	-22,820.1	-22,819.4	-4,282.6	-4,281.8	-16,566.8	-16,566.0
AIC	49,755.6	49,754.6	45,664.2	45,662.7	8,589.1	8,587.6	33,157.5	33,156.0

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$



Control variables showed a similar picture to the results in Table 3; however, there are four noteworthy differences. First, the result of gender was not consistent across models. Male residents had higher probabilities than female population in participating in social association by 24.3% ($b=0.221$, $\text{Exp}[b]=1.243$, $p<0.01$), reward-based association by 71.6% ($b=0.540$, $\text{Exp}[b]=1.716$, $p<0.01$), and online association by 12.2% ($b=0.115$, $\text{Exp}[b]=1.122$, $p<0.01$). Female residents, however, have higher probabilities than males in participating in civic engagement associations ($b=-0.256$, $\text{Exp}[b]=0.774$, $p<0.01$), suggesting that female residents are more actively engaged than male residents in volunteer groups, citizen movement groups, and religious organizations. Second, duration of resident significantly decreases the odds of participating in social associations ($b=-0.078$, $\text{Exp}[b]=0.925$, $p<0.01$); however, it increases the odds of participation in civic associations ($b=0.045$, $\text{Exp}[b]=1.046$, $p<0.05$). People who lived longer in a community inclined to engage in civic activities. Duration of resident did not show any significant effects on the other two types. Third, age has a positive effect on social ($b=0.261$, $\text{Exp}[b]=1.298$, $p<0.01$), civic engagement ($b=0.119$, $\text{Exp}[b]=1.126$, $p<0.01$), and reward-based associations ($b=0.117$, $\text{Exp}[b]=1.124$, $p<0.01$) but has a negative effect on online associations ($b=-0.338$, $\text{Exp}[b]=0.713$, $p<0.01$). This conforms to the conventional notion that younger residents are more actively engaged in online activities. Finally, district-level poverty rate decreases participation in social associations ($b=-0.070$, $\text{Exp}[b]=0.924$, $p<0.10$).

Discussion and conclusion

The purpose of this study is to advance our understanding of the impact of crime on community residents' social ties. In order to increase our understanding, we tested how district-level crimes, experience of crime, and fear of crime can affect district residents' participation in voluntary associations, considering types of crimes and types of associations. The results indicated that residents in Seoul tended to respond to the actual occurring of crime more than to the fear or perceived risk of victimization. District-level crime rate and individual-level experience of crime significantly weakened the residents' participation in associations while fear of crime does not show a significant effect. Two explanations are possible when considering the literature. One way to understand this discrepancy between the occurring of crime and perceived crime is Skogan and Maxfield's (1981) suggestions that people who are less likely to be victimized are often more likely to be affected by the crime. This means that residents of affluent communities with low crime rates often have higher expectations about the safety of their communities than the residents of communities with higher crime rates; thus, they tended to critically evaluate the severity of crime in their neighborhoods even at a small number of crimes. However, their critical evaluation did not significantly affect their social behavior. Another way to understand the discrepancy is stigmatization. As Palmer et al. (2005) pointed out, stigmatization influences people to perceive that a certain neighborhood is more dangerous than what it really is. Areas with concentrated public housing, low-income classes, or immigrants are often seen by people and portrayed by the media as dangerous.



It is possible that stigmatization of some areas or districts causes residents to negatively evaluate their own residents. Whether the former or the latter, the results of our study consistently told us that the actual occurring of crime, rather than residents' perceptions, is more important to the residents of Seoul.

Another important finding of this study is different impact of crime on different types of associations. While district-level crime rate significantly weakens all types of associations, the negative effect on individuals' crime experience is only significant vis-à-vis social associations and online communities. Crime experience did not show a significant effect on civic engagement and reward-based associations. It is noteworthy that online associations are similarly affected by crime as 'off-line' social associations. As some studies have pointed out, the main motive of participating in online communities in South Korea is to maintain their off-line social relations and networks rather than building completely new relationships (Choi 2006; Phua and Jin 2011). In this sense, online communities are a part of social organization in a different form. Furthermore, both social and online associations are characterized by informal membership and non-public activities, while civic engagement and reward-based associations are based on relatively clear goals, formal membership, and public activities. This means that crime experience is closely intertwined with people's participating in informal social activities.

Another goal of this study was to identify the different impact between violent crime and property crime on participation in association. The key assumption was that violent crimes, such as homicide, sexual assault, robbery, and aggravated assault may differ in nature from property crime, such as burglary, larceny, and arson. Some previous studies have shown that voluntary associations, such as parochial social control, better prevent property crime rather than violent crime because violent crime usually takes place in private or unpopulated areas (Moore and Recker 2016). However, in this study, the weakening effects of district-level crime are not substantially different between violent crime and property crime. It should be emphasized that Moore and Recker's study focused on whether participation in association decreased violent or property crime, whereas the goal of this study is to analyze the impact of crime on participation in association. Therefore, it is possible that participation in association decreases property crime, as previous studies have suggested, but, once a crime takes place, whether the crime is violent or property crime, it similarly diminishes residents' participation in association.

The findings of this study provide some implications. First, community residents' participation in voluntary associations has been seen in numerous studies as an indicator of social capital, a key source of social trust, and a foundation of a working democratic system (Brehm and Rahn 1997; Stolle and Rochon 1999; Putnam 2000; Curtis et al. 2001; Delhey and Newton 2003; Kim 2005; Liu and Stolle 2017). Larger numbers of social capital studies have proved, for the last few decades, that social capital is important for community members to overcome collective action problems, cooperate to solve their common problems, and cope with community emergencies. Therefore, the negative impact of crime on participation in association can lead to a feedback effect, decreasing the ability to cope with other community problems. Lowering crime rates, arguably, can prevent additional problems communities might face in the future. Second, focusing on the South Korean social context,



the finding that people who live in a community for a long time are less likely to participate in social associations may reflect the breakdown of old communities due to the rapid development and urbanization for the last decades. Rebuilding of communities should be seriously considered in city and district governments' planning activities.

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