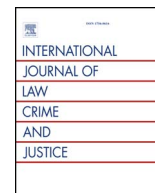




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Conditional effects of open-street closed-circuit television (CCTV) on crime: A case from Korea

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ABSTRACT

Prior studies reported mixed findings concerning the effects of Closed-Circuit Television (CCTV) on crime reduction. By utilizing the multi-contextual criminal opportunity theory, this study aims to determine the conditional effects of open-street CCTV surveillance system on crime across socioeconomic and physical environmental factors. Using the data from one district in Seoul, Korea, we ran a series of Poisson regression models with interaction terms allowed for articulating the conditional effects of CCTVs on crime. In line with studies in Western countries, CCTVs in Korea were significantly associated with levels of property crime and the areas with larger surveillance zones had lower property crime levels. Also, there was a conditional crime reduction effect of CCTVs on assaults, depending on the areal density of alcohol outlets. The conditional effect of CCTVs suggests some neighborhood characteristics optimize the deployment of CCTVs, which guide more effective implementation of CCTV systems for crime control and prevention.

1. Introduction

Individuals have free will to choose whether, when, where, and how to commit crimes. These choices are made through a utilitarian analysis of the costs and benefits associated with any action (Cornish and Clarke, 2014). Additionally, surrounding environments inevitably influence individuals' choices, as potential offenders seek to avoid or minimize the potential harm they may encounter as an outcome of their decisions (Wortley and Mazerolle, 2013). Empirical studies have argued that environmental factors play as important a role as individual traits in shaping crime patterns, indicating that criminal behavior is significantly influenced by the immediate environment in which it occurs (Paul Brantingham and Brantingham, 1981; Wortley and Mazerolle, 2013). Thus, crime is not randomly distributed over time and space, but is correlated with, or possibly affected by, environmental factors (Patricia Brantingham and Brantingham, 1995; Eck and Weisburd, 2015).

Many ecological factors have been associated with crime. Those factors can be social, economic, or physical. From the perspective of social disorganization theory, some studies have examined associations of social and economic neighborhood status with crime. Neighborhood socioeconomic status, family disruption, racial or ethnic heterogeneity and residential instability were well-established social and economic environmental predictors of crime (e.g., Bursik, 1988; Bursik and Grasmick, 1993; Cantillon et al., 2003; Kingston et al., 2009; Kubrin, 2003; Kubrin and Herting, 2003; Kubrin and Weitzer, 2003b; Sampson and Groves, 1989; Sampson et al., 1997). In the theoretical field of routine activities, empirical studies have focused on predicting the presence of criminal

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opportunities by investigating how physical environments naturally place offenders and victims/targets in proximity to one another (e.g., LaGrange and Silverman, 1999; Roncek and Maier, 1991; Sampson and Raudenbush, 1999). Furthermore, recent empirical studies have illustrated differential or conditional effects of neighborhood characteristics and physical environmental factors on crime. By studying their interactions with one another, these studies integrate both theoretical perspectives of social disorganization and routine activities into *multi-contextual criminal opportunity theory* (Cahill, 2005; Wilcox et al., 2003). The theory follows that the effects of physical environments on crime are conditional or differential, depending on social or economic factors existent nearby (e.g., Lockwood, 2007; Rice and Smith, 2002; Rountree et al., 1994; W. R. Smith et al., 2000; Stucky and Ottensmann, 2009; Wilcox et al., 2003).

Multi-contextual criminal opportunity theory suggests that the surrounding factors condition the effects of some ecological factors on crime. By accounting for this multi-contextual, integrated theoretical approach, the current study aims to find direct and conditional effects of open-street closed-circuit television (CCTV) on crime. CCTV is a newly developed common tool for public surveillance. It has gained popularity across nations and has been implemented worldwide with the purpose of reducing crime in public places (Cameron et al., 2008; Caplan et al., 2011; La Vigne et al., 2011; Ratcliffe et al., 2009). Through the routine activities theoretical perspective, open-street CCTV surveillance systems act as capable guardians. By artificially modifying an environmental setting and increasing a perceived risk of detection among potential offenders, these systems reduce criminal opportunities (Clarke, 1997; La Vigne et al., 2011). Several evaluation studies have vouched for open-street CCTV surveillance systems as effective anti-criminogenic mechanisms in public settings in Western countries (See Welsh and Farrington, 2009a). A few recent studies have explored the contextual effects of open-street CCTV surveillance system on crime by examining surrounding characteristics of the CCTV surveillance area and CCTV technical features (See Lim and Wilcox, 2016; Piza et al., 2014).

However, no study has examined the differential influence of open-street CCTV surveillance system on outdoor crime, across socially-constructed, socioeconomic, and physical environmental factors, while controlling for the interactions of open-street CCTV surveillance system with other factors. In other words, optimal circumstances have not been clearly identified for the effective use of CCTV schemes (Welsh and Farrington, 2009b). Additionally, more cross-national studies are needed to explore relationships between environmental factors and crime in different cultural settings and address the external validity of the theoretical relationship between CCTV surveillance systems and crime. In fact, studies testing social disorganization or assessing the effects of open-street CCTV surveillance system on crime have exclusively focused on Western Countries (see Sampson, 2006; Welsh and Farrington, 2009b). Evaluating CCTV effects on crime in different cultural settings could provide globally-accepted evidence to support the use of open-street CCTV surveillance system as a situational crime prevention strategy.

In the current study, we use official statistics data from one of the districts in Seoul, South Korea where more than one thousand CCTV cameras were installed in public settings. We include socially-constructed, socioeconomic, and physical environmental factors in our analysis. Also, interactions of the open-street CCTV surveillance system with other environmental factors are taken into account, as suggested by the multi-contextual criminal opportunity theory. The employment of interaction terms controls interaction effects and identifies optimal circumstances that can maximize the crime reduction effect of open-street CCTV surveillance system. We argue that this study not only to enriches empirical support for the multi-contextual criminal opportunity theory but also provides a better understanding of CCTV's effect on crime. Findings also provide guidance on how to efficiently deploy open-street CCTV for crime control and prevention.

2. Literature review

2.1. Evaluations of CCTV surveillance system

Open-street CCTV has been commonly utilized for crime control and prevention. Evaluation studies of the use of open-street CCTV surveillance system have reported mixed findings (Farrington et al., 2007; Gill and Spriggs, 2005; Phillips, 1999; Welsh and Farrington, 2003, 2004). The recent study, a meta-analysis, showed that open-street CCTV surveillance system had a “modest but significant desirable effect on crime” (Welsh and Farrington, 2009b). A few studies have shown that certain circumstances influence the crime reduction effect of open-street CCTV surveillance system. For example, street lights were more effective in reducing crime in inner areas of the cities than open-street CCTV surveillance system, and both street lights and open-street CCTV surveillance system together significantly lowered property crimes (e.g., auto thefts), but not violent crimes (Welsh and Farrington, 2004). Studies conducted in Britain found that the effectiveness of open-street CCTV surveillance system was significantly correlated with the coverage of the CCTV surveillance zone (Gill, 2006; Gill and Spriggs, 2005). Overall, results showed a statistically significant reduction of auto thefts in car parks, but not in city centers, public housing, or residential areas (Farrington et al., 2007; Gill and Spriggs, 2005; Welsh and Farrington, 2003, 2004). These results indicate that the open-street CCTV surveillance system work most effectively for reducing property crime, especially auto theft, and that their crime reduction effect is greatest in parking lots (Welsh and Farrington, 2009b).

Furthermore, some studies have evaluated the effects of open-street CCTV surveillance system on crime more rigorously, utilizing time-series components and advanced analytical strategies with geographical information system (GIS) software. Their findings have been mixed. Some studies show that CCTV systems are associated with a reduction in auto theft (Caplan et al., 2011), disorder crime (UCR Part 2 street offenses) (McLean et al., 2013; Ratcliffe et al., 2009) and overall crime (UCR Part1 and Part 2 street offenses) (Ratcliffe et al., 2009). Also, recent studies in South Korea found weak significant crime reduction effects of CCTV surveillance system within their surveillance zones (Lim et al., 2016; Park et al., 2012) and outside of the surveillance zone (Park et al., 2012). Another study found more CCTV cameras reduced nearby citizens' fear of crime (Cho and Park, 2017).

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