Relationship Between Social Support Factors and Major Crimes in Korean Capital Area

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국문요약 : 한국의 범죄 발생 건수가 지속적으로 증가함에 따라 이에 대한 위험성이 증가하고 있다. 현재 범죄의 원인을 분석하는 접근 방법의 한계를 극복하기 위하여 범죄 발생에 영향을 미치는 요소들을 기존의 관점뿐만 아니라 새로운 관점에서 파악할 필요성이 있다. 사회적 지원 이론은 범죄 발생과 연관이 있을 뿐만 아니라 범죄 발생을 억제 할 수 있는 역할을 수행 할 수 있다는 점에서 최근 주목을 받고 있는 요소이다. 본 연구는 공간 계량 모형과 최소자승모형을 통해 사회적 해체이론, 도시계획 등의 기존 관점의 요소와 사회적지원 요소가 세 가지 범죄(흉악, 절도, 폭력) 에 미치는 영향을 분석해보았다. 그 결과 거의 모든 기존 관점의 요소들이 유의한 가운데 가족으로부터의 사회적지원 요소의 대리 변수 중 하나인 1인 가구는 모든 범죄에서 유효한 영향을 미치고 있었으며, 폭력에서는 다른 대리 변수인 이혼율 또한 유의하게 나타났다. 지방 정부로부터의 사회지원 요소는 재산 범죄인 절도에서만 유의미하였고 공간계량 모형은 흉악 범죄에서만 유의하게 나타났다. 이렇게 각 요소의 효과가 다르게 나타나는 것은 각 범죄의 다른 특성에서 비롯된 것으로 보인다. 본 연구는 가족으로부터의 사회적지원 요소의 부족이 범죄의 증가로 이어질 수 있다는 결과를 이끌어내고 사회복지 예산의 긍정적 외부 효과를 밝혀내었다는 점에서 정책적 시사점을 제공한다. 이는 방범 서비스, CCTV 등의 요소뿐만이 아니라 가족으로부터의 사회적 지원 요소와 사회복지 예산 또한 범죄 방지 방안의 하나로 고려될 수 있는 이론적 근거를 제공할 것이다.

주제어 : 사회적 지원 요소, 범죄, 공간 계량, 사회해체이론

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1. Introduction

Crimes must be reduced not only because of the financial, physical, and emotional damages they bring to the victims but also because crimes increase social costs by elevating distrust in the society and instilling fear among citizens. Although the total number of crimes in Korea has not increased significantly (from 1,894,762 in 2003 to 1,857,276 in 2013), the occurrence of major crimes has risen steadily. For example, the number of heinous crimes, including murder, rape, robbery, and arson, increased from 16,519 in 2003 to 26,962 in 2013. Theft cases also increased from 187,352 in 2003 to 288,343 in 2013. Meanwhile, cases of violence have not increased since 2003. The increasing number of major crimes implies that the existing approaches to addressing the factors that cause these crimes are no longer effective. To cope with the rising number of crimes, the factors that affect their occurrence should be identified beyond the current approach.

The application of social support theory in criminology was initially suggested by Cullen (1994). Social support, as defined by Lin (1986), has indeed been used in the mental health area, but Cullen (1994) expanded this definition in criminology. He suggested the core propositions of social support theory. According to one of his propositions, "the less social support there is in a community, the higher the crime rate will be." This proposition implies two important views. The first view is the reduction effect of social support factors on crime occurrence. The second view focuses on community structure instead of individual features. Social support theory claims that the research aimed at identifying the causes of crimes should focus not only individual elements but also on social structure.

A number of studies on crime occurrences have been conducted in a variety of fields, including sociology and urban planning. However, with the recent introduction of social support theory in criminology, few studies have considered this theory and social support factors (Kwon, 2012). Two representative studies in Korea examined the effect of social support factors on crimes (Kim, 2010; Kwon, 2012), but these studies only considered macro social support factors such as welfare budget and did not demonstrate the effect of micro social support factors such as family support.

The causes of crimes at a regional level have also not been studied sufficiently because of the difficulties involved in the collection of data related to crimes at the regional level (Kim, 2011). These difficulties arise from the wide variety of data sources that challenge the integrity of available data. The few studies (Kim, 2010; Kwon, 2012) that attempted to investigate the causes of crimes at a regional level did not adopt

the spatial econometrics method. However, as Lee and Cho (2006) mentioned in their study, spatial factors can have a strong effect on crimes. Therefore, to precisely determine the effects of social support factors on crime occurrences, spatial econometrics may be a necessary method to implement in the analysis.

The present study investigates the effects of social support theory on crime occurrences and the deterrents of using spatial econometrics, which has not been considered previously. This study contributes to the criminology field by emphasizing the importance of social support factors in reducing crimes, especially in Korea.

2. Literature Review

1) Social Support Theory

Lin (1986) defined social support theory as "the perceived or actual instrumental and/or expressive provisions supplied by the community, social networks, and confiding partners." In this definition, three components are presented: recognition of perceived or actual social support, expressive or instrumental delivery of social support, and provision of social support by an institution or an individual, including the family. However, Lin (1986) and other researchers used this theory to explain how social support can solve problems related to

mental health and did not consider the relationship between social support factors and crime occurrences.

Cullen (1994) adopted social support theory in the criminology field by slightly modifying the definition of Lin (1986). Cullen (1994) offered 14 propositions related to social support theory in criminology.

The present study focuses on the second and third propositions of Cullen (1994). These propositions support the basic hypothesis of this study, that is, a strong social support equates to a low number of crimes, and weak social support equates to a high number of crimes. The second and third propositions of Cullen (1994) focus on the effects of social support on offenders while the thirteenth proposition focuses on the effect of social support on victims. These descriptions indicate that social support can reduce crimes, which mainly occur through two main participants: offenders and victims.

The works of Kim (2010) and Kwon (2012) are two representative case studies that investigated the relationship between social support factors and crime occurrence in Korea.

Kim (2010) studied the relationship between macro social support factors and property crimes in police districts. He found that social support factors increase public expenses for social community reconstruction, improvement of the

city environment, and alleviation of poverty and inequality. The author chose a social support index as an independent variable. This index is a sum of the standardized scores of the health and life improvement budget and social security expenditures. By adding poverty variables as an independent variable, the author also attempted to show that social support could weaken the effect of poverty on crime occurrences. However, he failed to prove the hypothesis that an increase in the social support of a local government can statistically reduce or weaken property crime occurrence.

Similarly, Kwon (2012) suggested that social support variables deter crimes in metropolitan areas in Korea. His social support variables consist of housing and regional social development policies, health and life environment policies, education and cultural policies, and the social welfare policy. He also identified dependent variables related to theft and specified target crimes to investigate the relationship between crimes and the said policies. However, his study failed to establish the statistical relationship between the independent and dependent variables.

Previous studies performed empirical studies for verifying the effect of social support factors, especially for Korea. However, as previous studies did not considered the social support from families, it might be the reason that they failed

to show the effect of the social support factors. Therefore, to overcome the limitation of previous studies, social support from families is also considered in this study.

2) Other Theories Under the Social Structure Category

There are several theories that examined the cause of crime occurrence under the social structure category. Social disorganization theory, social learning theory, anomie theory, and routine activity theory are representative theories in this category.

Shaw and McKay (1942) introduced Social disorganization theory. They found that certain social structure factors cause social disorganization and that a socially disorganized region is likely to have higher crime occurrences than other regions. Social control factors emerged when Shaw and McKay (1942) identified weak social control as the link between crime occurrences and social disorganization theory. The authors proposed that the social control of a traditional social order is weakened by the transition caused by industrialization, urbanization, and modernization.

Social learning theory by Burgess and Akers (1966) suggests that crime is learned and repeated and can change, similar to the learning process

of conformity based on differential association theory by Sutherland (1947). If a person has a differential association with people who are exposed to deviation and if the deviation of such person is reinforced, this individual is highly likely to either deviate from or associate with crime.

Anomie is defined by Durkheim (1897) as "a normlessness condition where the individual desire is not regulated by social rule even when it needs to be" to explain the abnormal suicide ratio. In the case of the economic bankruptcy of households, the frequently used social rule is no longer available (Ki, 1997) because of rapid changes in the external environment. This situation is an example of an anomie. To analyze crime occurrences, Merton (1939) adopted the theory but slightly modified it by defining an anomie as the gap between a social structure, which is the method or tool, and a culture, which is the goal.

Cohen and Felson (1979) developed routine activities theory, which points out time, space, object, and people as elementary components of crimes. The authors claimed that the number of crimes increases in settings in which motivated offenders and a suitable object or victim are present at the same time and location with little supervision (Cohen and Felson, 1979).

Social support theory can explain part of the

reason of crime occurrence, but it can not explain all of the reason of crime occurrence. To build more exact model, these theories are also important to analyze the cause of crimes. Therefore, these theories are used for choosing other variables.

3) Spatial Econometrics

Lesage and Pace (2009) explained that spatial regression methods are useful in analyzing the spatial dependence between observations, especially for observations gathered at a regional level. If a spatial correlation exists between observations, the ordinary least squares model cannot be used because this model violates the independent characteristic of error terms and of dependent variables. Therefore, spatial econometrics is required to analyze regional level data.

Numerous studies in Korea have demonstrated the importance of considering spatial characteristics, especially in the analysis of regional unit data in criminology (Cheong, 2014; Kim and Lee, 2011; Lee and Cho, 2006). In using regional level data, which allow the macroscopic analysis of the causes of crimes, the spatial characteristics of crimes must be strongly considered (Kim and Lee 2011) because regional data generally involve spatial correlations that can affect results.

Lee and Cho (2006) analyzed the effects of spatial and environmental factors on crime occurrences using three spatial econometrics models. The independent variables they used are divided into two categories: socioeconomic factors and urban planning factors. The socioeconomic factors include the property tax per person, living population, population density, floating population, youth population ratio, higher education population ratio, number of businesses affecting public morals, and number of police officers. The urban planning factors include the green belt area ratio, residence area ratio, and commercial area ratio. In conclusion, Lee and Cho (2006) found that the crime data on Seoul have spatial heterogeneity and spatial dependence and that the floating population and the number of businesses affecting public morals have significant effects on crime occurrences. Lee and Cho (2006) also indicated that urban planning factors have a significant relationship with crime occurrences.

Cheong (2014) also analyzed the occurrences of murder in Seoul. Three spatial econometrics models, namely, SAR, SEM, and SAC models, were used to investigate the relationship between social structure characteristics and the occurrences of murder. The study showed that a spatial econometrics model is not significantly better than a non-spatial econometrics model regardless of the spatial dependence of the

independent variables. This result is inconsistent with that of Lee and Cho (2006).

From previous studies, there are different claims about the effect of spatial econometrics model on spatial influence of crime occurrence. Lee and Cho (2006) stated that spatial econometrics model can well control the spatial influence. However, the result of Choi et al (2010) and Cheong (2014) showed that the spatial econometrics model is ineffective to handle the spatial influence. Therefore, in this study, we use spatial econometrics and the results are compared with the results of ordinary least square to investigate the effectiveness of spatial econometrics model.

3. Model

1) Methodology

If there is a spatial autocorrelation or a spatial dependence, it means that they violate assumptions of Ordinary Least Square (OLS) model. Because OLS model usually does not consider the spatial factors, there would be spatial heterogeneity or dependence in error term which violates the third and the fourth assumptions. This implies for better analysis, other econometrics models considering spatial factor are needed instead of OLS model. If the spatial autocorrelation is investigated by Moran's I, it is better to use the spatial econometrics.

The spatial econometrics model is commonly used to solve the spatial heterogeneity and to control the spatial effect in the data to improve the validity of the results. There are three representative spatial econometrics models: Spatial Autoregressive Model (SAR) for solving spatial dependence, and Spatial Errors Model (SEM) for solving spatial autocorrelation in error term, and General Spatial Model (SAC) for solving the spatial autoregressive in the dependent variable and the spatial autocorrelation in error term.

The concepts and the definitions of the spatial econometrics models are mostly from Lesage and Pace (2009) 'An Introduction to Spatial Econometrics' and 'Application for Spatial Econometrics (Lee et al., 2006)'.

$$y = \rho W_1 y + X\beta + \mu \qquad (1)$$

$$\mu = \lambda W_2 \mu + \epsilon$$

$$\epsilon \sim N(0, \sigma^2 I_n)$$

The Equation (1) shows the General Spatial model which has assumptions for both spatial dependence and spatial autocorrelation. If ρ is 0, and λ is not, it means that there is no spatial dependence while there is spatial autocorrelation. Therefore that equation would present the Spatial Error Model. If λ is 0, and ρ is not, it means that there is no spatial autocorrelation while there is spatial dependence. Therefore that equation

would show the Spatial Autoregressive Model. Finally, it both ρ and λ is zero, that equation would be the OLS model

2) Variables

(1) Dependent Variables

The dependent variables in this study are heinous crimes (i.e., murder, robbery, arson, and rape), theft, and violence in the capital region comprising Seoul, Incheon, and Gyeonggi in 2013. In Korea, five major crimes, namely, murder, rape, robbery, theft, and violence, are generally used in analyses (Kim and Lee, 2011; Oh, 2010). However, the data on the five major crimes in the several regions in Gyeonggi are unavailable at the city and county levels. Only aggregated data, including those on murder, rape, robbery, and arson, are available for all regions. Hence, these aggregated data are used and categorized as heinous crimes in this work. Heinous crimes, theft, and violence are used in this study instead of the five major crimes.

Given that Seoul is the capital city, we can reasonably consider all areas in this city as urban areas. The districts of Incheon and the cities in Gyeonggi Province are also regarded as urban areas while the counties of Incheon and Gyeonggi are rural areas. The crime data of each region are available in the 2014 Crime Statistics of the Supreme Prosecutor's Office. However, this

reference does not include the crime data of all the target regions, especially those of the rural areas. Hence, we address the missing data by using the statistics from the Gyeonggi Police Office.

The total number of regions is 66. However, with the crime data of Osan being part of the Hwasung data from the Gyeonggi Police Office, these two regions were considered as one region. Therefore, the total number of regions is 65.

Each crime has its own characteristics. Oh (2010) categorized five major crimes according to violence level and contingency (randomness) level (Table 4). This study suggested that heinous crimes such as murder, rape, and robbery (arson was not considered in the study) are extremely violent, whereas theft has less violent features. Violent crimes are less violent than heinous crimes but more violent than theft. By contrast, the study proposed that violence has a strong contingency level among crimes. Heinous crimes show various contingency levels (rape has strong contingency, murder has medium contingency, and robbery has low contingency). Theft is in the medium level of contingency. The cause of each crime can expectedly be different because the characteristics of crimes are different.

(2) Independent Variables

<Table 1> shows the overview of independent variables. Independent variables consist of three

〈Table 1〉 Independent Variables

Category	acronym	Variable	Explanation
Social Support from Family	SPHH	Single-Person Household	The number of single-person household per 1000 people in 2013
	DIVR	Divorce Ratio	The number of Divorce per 1000 people in 2013
Social Support from Local Government	WELPER	Welfare budget per person	Welfare budget per a person in 2013
	WFAM	Welfare budget for family	The proportion of Welfare budget in total budget of local government in 2013
Control Variables	FRGN	Foreigner Ratio	The number of foreigner per 1000 people in 2013
	FSST	Ratio of Recipient of basic livelihood	The number of Recipient of basic livelihood per 1000 people in 2013
	LVNG	Ratio of Residence Area	The proportion of Residence Area in total district/county or city area
	DSTY	Population Density	The population in one km2 area

categories such as social support from family, social support from local government, and control variables.

① Social Support From Family

According to Hunter (1985), intimacy and fellowship from families and friends provide strong social support that can prevent individuals from breaking away from society and becoming involved in crimes. This category of social support is provided by spouses, families, and friends, and important support factors need full consideration to prevent crimes. In the present study, two variables are used to represent the social support from families: single-person household (without living family) and divorce ratio (without companion).

In supporting the assumption that a person who does not live with a family has little social support, the relationship between living alone and the amount of social support should be identified. Although people do not live with their families, receiving social support from their families is possible. Therefore, the amount of social support received by persons in a single-person household and a non-single-person household should be compared. A few studies have compared the social support of a single-person household and that of a non-single-person household. Broadheand et al. (1988) found through a survey that people who live with others have better

social support than people who live alone. Therefore, the high ratio of single-person households in a certain region equates to little social support in the region; such phenomenon is expected to have a positive effect on crime. In this study, the variables are measured as the total number of single-person households in the region (KOSIS, 2014) divided by the total population of the region (SPO, 2014).

Considering the relationship between divorce and social support requires knowing whether divorce results from little social support or not. Several studies have shown that divorce involves not only the dissolution of the marital relationship, which may have ceased when spouses lost their support for each other, but also the disruption of the couple's entire social network (Bohannan, 1970; Sprenkle and Cyrus, 1983). Therefore, a high divorce ratio equates to the lack of social support from families, similar to that in single-person households, and is expected to have a positive effect on the increase in crime occurrences. This variable is calculated as the total number of divorce cases in a region (KOSIS, 2014) divided by the total population of the region (SPO, 2014).

As mentioned earlier, higher the single-person household and the divorce rate associate with lower social support level in a community. Cullent (1994) mentioned in his 14 propositions that lower the social support in a community can

lead to the high crime rates. Therefore, the lack of social support from the family can also lead to the higher crime rates in a community.

② Social Support From local Government

Previous studies (Kwon, 2012; Kim, 2010) have regarded welfare budget as a social support factor. Kwon (2012) used housing and regional societal development policies, health and life environment policies, educational and cultural policies, and a social welfare policy as social support variables. The author also used the increase in public expense for social community reconstruction, improvement of the city environment, and the effort to alleviate poverty and inequality as social support factors. Similarly, the current study employs two variables: the social welfare budget per person and the ratio of budget for daycare, woman, and family.

Many techniques can be used to measure the amount of welfare budget. For example, the proportion of welfare budget in the total budget, welfare budget per person, or absolute amount of welfare budget can be candidates for the measurement of welfare budget. However, the absolute amount of the total welfare budget at a regional level might depend on the population of a region. For example, if the region has a large population, then it might have a large total welfare budget because it would receive greater tax revenue from more people. The proportion

of welfare budget can be a good representative because it is not related to the population. However, this factor ignores the actual amount of social support that one person can receive. Although a region has a high welfare budget, the actual amount that a person receives can be small if the population is high or if the absolute amount of the total budget is small. Therefore, the amount of welfare budget per person is an appropriate consideration in the measurement of social support from a local government because it represents the absolute amount of welfare budget that one person can receive. As Lin's definition explains, not only the perceived support but also the actual support is important. Therefore, a large amount of welfare budget per person is expected to have a negative effect on crime occurrence. The variable is calculated in this study as the welfare budget of a region (Local Finance Open System, 2014) divided by the population of the region (SPO, 2014).

The social welfare budget of Korea consists of eight parts: support for basic life guarantee, vulnerable class, daycare, family and women, elderly and youth, labor, war veterans, and housing and general welfare. The support for basic life guarantee and vulnerable class could be correlated with the beneficiary of basic life support, which is the control variable. Therefore, these categories are not considered as variables. The sum of the support for labor, war veterans,

and housing and general welfare is less than 10% of the welfare budget. When the total budget of a region is considered, this value would be less than 3%. These categories are not considered because of their small amounts. The support for the elderly and youth could also be correlated because generally, the ratio of the elderly population is considered as a reducing factor for crime, whereas the ratio of the youth is considered as an increasing factor for crime (Kim and Lee, 2011). These two contrasting factors are combined into one category and are thus regarded as unimportant variables. However, the support for daycare and family and women do not have any correlation with the other factors. Such support increases or decreases crime occurrences, similar to the support for basic life guarantee, and does not have contrasting factors in one category, such as the support for the elderly and the youth. In addition, such support has enough budget, which is around 10% of the total budget. They can be an important social support variable for both parents in working families. Given these considerations, this study regards this category as the second proxy variable to represent social support from the local government. The hypothesis regarding this variable states that a high ratio of support for daycare, family, and women would reduce crime occurrences. The related data are available in the Local Finance Open System (2014).

③ Control Variable

Trawick and Howsen (2006) considered a heterogeneous cultural background as a factor of social disorganization. In their study, they used foreign ratio as a social disorganization factor. Therefore, this study also adopted foreign ratio as a control variable. We assume that a high foreign ratio could have a positive effect on crime occurrence. As Shaw and McKay (1942) claimed, a high foreign ratio does not mean that foreigners are more likely to be criminals. The increase in the number of foreigners represents a degree of social disorganization in a region because this situation is not traditional. The data are available in KOSIS (2014).

Low economic levels have been generally considered as a social disorganization factor or as another control factor in several previous studies (Cheong, 2014). This variable is used in the current study as a control variable. In relation to this variable, we hypothesize that a high ratio of recipients of basic livelihood increases crime occurrence. The data are available in KOSIS (2014) and in other local government statistics publications.

Kim and Lee (2011) suggested the ratio of residential area to the total land area as an urban planning factor that increases crime occurrences because a highly populated residential area means increased exposure to crime according to routine

activities theory. The current study also uses this variable as a control factor for representing the urban planning factor. This variable is expected to increase crime occurrences. The data are available in KOSIS (2014).

In social disorganization theory, high population density plays a role in implementing informal social control. A high population means that a large number of people can easily report a crime, in which case offenders hesitate to commit crimes because they are afraid of being reported (Cullen, 1994). Therefore, population density is expected to have a negative effect on crime. This variable is measured as the total population of the region (SPO, 2014) divided by area of the region (KOSIS, 2014).

④ Spatial Weight Matrix

Weight matrix can be calculated in many ways. Typical methods include inverse distance matrix and neighborhood (sharing corners and edges).

In this study, although both weight matrix showed the significant Moran's I, neighborhood matrix is used because of its more significant Moran's I. The calculation is conducted on the Geographic Information System ArcMap 10.3. The map data are accessible through the Korea Statistical Geographic Information Service. The weight matrix used in this study is a row standardized spatial weight matrix.

4. Result

1) Descriptive Statistics

The overall descriptive statistics is shown in <Table 2>. The mean, standard deviation, minimum value, and maximum value of each variable are shown. In the dependent variables, theft and violence show similar means and standard deviations. The standard deviation of theft is slightly higher than that of violence. This result indicates the high fluctuation in theft. The

〈Table 2〉 Descriptive Statistics

		Mean	SV	Min	Max
Dependent Variable	HGNS	6.996	4.874	2.82	34.65
	THFT	5.252	2.937	1.29	19.91
	VLNC	5.293	2.145	2.28	16.05
Social Support from Family	SPHH	7.382	2.248	3.740	16.300
	DIVR	2.303	0.457	1.360	3.800
Social Support from Local Government	WLPR	477.176	160.594	226.690	994.110
	WFAM	16.285	6.808	1.836	27.879
Control Variables	FRGN	25.216	19.704	4.210	90.840
	FSST	21.048	9.396	5.910	55.300
	LVNG	32.780	22.810	0.000	93.920
	DSTY	9.894	7.597	0.745	28.290

high maximum value and low minimum value of theft support its high fluctuation intuitively. On average, a region experiences seven heinous crimes per 10,000 people a year, around five thefts per 1,000 people a year, and five violent occurrences per 1,000 people a year.

When the category of social support from family is considered, on average, a region has around 7 single-person households per 100 people and around 2.3 single-person households per 1,000 people a year.

In the category of social support from the local government, an average region has 477 Won of social welfare budget per person and around 16% of the total budget for daycare, family, and women.

In the last category of control variable, an average region has around 25 foreigners per 1,000 people, around 21 people who receive basic life support per 1,000 people, around 32% residence area, and around 10 people per 1,000 m2 of residence area.

2) Result of Econometrics Analysis

〈Table 3〉 Moran' I for each crime

Variable	Moran's I	P-value
HGNS	0.302	0.000
THFT	0.353	0.000
VLNC	0.211	0.001

The Moran's I for each crime is presented in <Table 3>. This study uses the weight matrix from sharing corners and edges which has the most significance in p-value. All crimes have positive Moran's I, which indicates the existence of a positive spatial autocorrelation in crimes among regions. This finding is statistically significant. Therefore, we need to use the spatial econometrics model because of the existence of a spatial relationship in crimes among regions.

(1) Heinous Crimes

The results for heinous crimes are presented in <Table 4>. Four models are used to analyze heinous crimes. In identifying the model that is better than the others, R-square is used. R-square shows the explanatory power of the model. The highest R-square of 0.64 is found in the SAC model. This model effectively controls the spatial characteristic in the data because the variables that represent spatial dependence and spatial autocorrelation in the error term are statistically significant. Therefore, for heinous crimes, an interpretation is performed with the statistics from the SAC model. We must note that the choice of model is not important because most of the variables show similar directions and statistical significance in all models.

The result for most variables is consistent with the expectations, except for divorce ratio and

〈Table 4〉　Result of Heinous Crimes

		OLS	SAR	SEM	SAC
	Constant	1.262***	1.149**	1.193***	0.656*
		(2.716)	(2.358)	(3.108)	(1.649)
Social Support from Family	SPHH	0.077***	0.077***	0.073***	0.068***
		(3.111)	(3.372)	(3.286)	(3.225)
	DIVR	0.024	0.024	-0.044	-0.085
		(0.191)	(0.203)	(-0.414)	(-0.889)
Social Support from Local Gov	WLPR	-0.001*	-0.001*	-0.001	0.000
		(-1.795)	(-1.643)	(-1.524)	(-0.264)
	WFAM	-0.005	-0.004	-0.001	0.004
		(-0.370)	(-0.319)	(-0.113)	(0.351)
Control Variables	FRGN	0.006**	0.006**	0.006***	0.006**
		(2.207)	(2.246)	(2.643)	(2.536)
	FSST	0.014*	0.014*	0.015**	0.011*
		(1.811)	(1.916)	(2.230)	(1.846)
	LVNG	0.013***	0.013***	0.016***	0.017***
		(2.884)	(3.092)	(4.282)	(4.883)
	DSTY	-0.032*	-0.032**	-0.038***	-0.038***
		(-0.032)	(-2.118)	(-2.871)	(-3.238)
Spatial Effect	Rho		0.032		0.166**
			(0.509)		(2.348)
	Lambda			-0.433**	-0.786***
				(-2.099)	(-3.845)
R2		0.541	0.546	0.579	0.64
Log Likelihood			5.038	6.456	8.425

*p〈0.1,　**p〈0.05,　***p〈0.01

ratio of welfare budget for daycare, family, and women. Both ratios are not statistically significant and need not be considered. The variables that are consistent with the expectations are statistically significant, except for the welfare budget per person, the direction of which is consistent with the expectation but not statistically significant. Therefore, social support from families has an effect on the reduction of heinous crimes, whereas social support from the local government does not affect the reduction of heinous crimes.

(2) Theft

The process of interpreting the results for theft in <Table 5> is similar to that for heinous crimes. To choose the best model among the four models, we compare the R-square values. The SAC model has the highest R-square value but has no significant difference from the other models. In addition, no spatial-related variable is found to be statistically significant, which implies that the spatial econometrics models cannot control the spatial characteristics. Therefore, the spatial econometrics model is no longer used in the analysis of theft. However, considering the

⟨Table 5⟩ Result of Theft

		OLS	SAR	SEM	SAC
	Constant	0.834**	0.840**	0.800***	0.758**
		(2.640)	(2.542)	(2.873)	(2.373)
Social Support from Family	SPHH	0.039**	0.039**	0.038**	0.039**
		(2.327)	(2.488)	(2.462)	(2.464)
	DIVR	0.172*	0.172**	0.164**	0.161**
		(1.994)	(2.138)	(2.118)	(2.068)
Social Support from Local Gov	WLPR	0.000	0.000	0.000	0.000
		(-0.885)	(-0.907)	(-0.778)	(-0.615)
	WFAM	-0.010	-0.011	-0.010	-0.010
		(1.119)	(-1.193)	(-1.222)	(-1.169)
Control Variables	FRGN	0.005***	0.005***	0.005***	0.005***
		(2.953)	(3.142)	(3.046)	(2.948)
	FSST	0.009*	0.009*	0.009*	0.009*
		(1.695)	(1.826)	(1.862)	(1.818)
	LVNG	0.008**	0.008***	0.009***	0.009***
		(2.448)	(2.637)	(3.061)	(3.111)
	DSTY	-0.013	-0.013	-0.013	-0.013
		(-1.175)	(-1.265)	(-1.312)	(-1.313)
Spatial Effect	Rho		-0.002		0.013
			(-0.038)		(0.250)
	Lambda			-0.195	-0.223
				(-0.955)	(-1.052)
R2		0.563	0.563	0.570	0.572
Log Likelihood			30.002	30.260	30.285

*p⟨0.1, **p⟨0.05, ***p⟨0.01

highest R-square value, we explain the analysis of theft by using the statistics of SAC model.

For the variable of social support from families, its coefficient and statistical significance are similar to those for heinous crimes. Whereas divorce ratio is not statistically significant, single-person household shows great significance and expected direction. For the variable of social support from the local government, the result is different from that for heinous crimes. Both proxy variables for local government support are consistent with their expected directions and statistical significance levels. The difference

might be caused by the different characteristics of the crimes.

All control variables also show expected directions and statistical significance, similar to those of heinous crimes. However, population density is not statically significant.

(3) Violence

The results for violence are shown in ⟨Table 6⟩. Among the four models, the SAC model shows the highest R-square (0.572), similar to the results for heinous crimes and theft. Although any spatial coefficient is not statistically significant, the explanation is performed with the SAC model

⟨Table 6⟩ Result of Violence

		OLS	SAR	SEM	SAC
	Constant	1.928***	1.957***	1.946***	2.040***
		(4.873)	(4.585)	(5.221)	(4.657)
Social Support from Family	SPHH	0.046**	0.046**	0.045**	0.045**
		(2.200)	(2.377)	(2.306)	(2.296)
	DIVR	-0.064	-0.065	-0.061	-0.060
		(-0.596)	(-0.645)	(-0.603)	(-0.591)
Social Support from Local Gov	WLPR	-0.002***	-0.002***	-0.002***	-0.002***
		(-3.205)	(-3.247)	(-3.547)	(-3.455)
	WFAM	-0.023*	-0.023**	-0.023**	-0.024**
		(-1.939)	(-2.079)	(-2.120)	(-2.170)
Control Variables	FRGN	0.008***	0.008***	0.008***	0.008***
		(3.442)	(3.653)	(3.839)	(3.873)
	FSST	0.011	0.011*	0.011*	0.011*
		(1.623)	(1.749)	(1.819)	(1.843)
	LVNG	0.009	0.009**	0.009**	0.009**
		(2.378)	(2.553)	(2.422)	(2.328)
	DSTY	-0.009	-0.009	-0.009	-0.008
		(-0.653)	(-0.698)	(-0.663)	(-0.617)
Spatial Effect	Rho		-0.009		-0.026
			(-0.138)		(-0.389)
	Lambda			0.097	0.140
				(0.513)	(0.716)
R2		0.635	0.635	0.637	0.638
Log Likelihood			15.402	15.487	15.535

*p〈0.1, **p〈0.05, ***p〈0.01

because all the results show similar directions and significance levels.

The results show a difference in the social support from families. Whereas only a single-person household is the valid variable in heinous crimes and theft, both single-person household and divorce ratio variables are statistically valid in violence.

The statistics on the social support from the local government is different from the results for theft. Whereas the social support from the local government is statically valid in theft, both variables are not significant in violence even though the result is consistent with the expected direction.

The result of the control variables is consistent with the expected direction. However, the significance is not valid for population density; all the other variables are valid statistically.

5. Conclusion

1) Discussion and Policy Implication

This study analyzed the effect of social support factors on heinous crimes, theft, and violence by

using ordinary least squares and spatial econometrics models. The results showed the existence of the effect of social support factors and spatial factors on crime occurrence as well as the difference of the effects of these factors. The analysis of this study was based on the result of the SAC model, which achieved the highest R-square among the four models considered.

First, social support from families is effective against all crimes when the focus is on single-person households only. However, the other proxy variable for social support from families, divorce ratio, is only significant in violence and not in theft and heinous crimes. Such result might imply that social support factors have a greater effect on violence than on other crimes.

Second, social support from the local government is only effective against theft and is not significant in other crimes. The result is different from those of previous studies (Kim, 2010; Kwon, 2012). Whereas such studies have failed to show the effect of social support factors on property crime statistically, the present work found the effect of social support factors on property crime theft to be statistically significant.

Third, the control variables have the same pattern in all crimes. The directions of the coefficients are all similar to their expected directions, although population density does not demonstrate statistical significance in theft and violence. This finding implies that the choice of control variables is appropriate.

Fourth, spatial factors are significant in heinous crimes and not in theft and violence. In the SAC model, no indirect effects have statistically significant coefficients in theft and violence. Although a spatial autocorrelation in all crimes is observed by considering Moran's I, spatial econometrics models could not control the spatial effect in theft and violence. This ineffectiveness of the spatial econometrics model is consistent with the results of previous studies (Cheong, 2014).

These four different interpretations of the results might be caused by the different characteristics of each crime. A high contingency level would explain the stronger effect of social support from families on violence than on other crimes. The degree of relation between property and crime could also be a reason why social support from the local government is valid only in theft and not in heinous crimes and violence. This finding is reasonable because social support from the local government is financially instrumental, and the purpose of theft is to obtain other people's property illegally. Therefore, the result of this study could be explained by the characteristics of crimes.

The results of this study have several practical

policy implications. The results indicate a positive relationship between social support from family and crime occurrence. Since the ratio of single-person household is increased from 15.5% in 2000 to 23.9% in 2010 in Korea, it is important for government to understand consistent increasing trend of the number of single-person household and the possibilities of higher number of crime occurrence. Therefore, establishment and implementation of the related policies, such as providing financial incentives for housing share by elderly to rent a room to a college student or increasing the number of social housing to accommodate financially disadvantaged households, are necessary to improve and enhance family social support. This study also suggests that the effect of externality from welfare budget should be considered as an additional effect on crime. The positive externality is part of an important factor to increase the welfare budget that can lead to the higher social benefits. Therefore, it is important to understand the related benefit and cost with the changes in welfare budget with respect to the benefit and cost of changing the number of crime occurrence.

This study has several improvements from previous studies. First, this study shows the significance of social support factors by adapting social support from families and using spatial econometrics. Second, this study uses appropriate control variables proven by social disorganization theory, which reflects crime occurrence under the social structure category. This approach minimizes model specification errors and lead to the significant results. Third, this study considered several crimes instead of total number of crimes or one category of crime. This modification makes it possible to apply the characteristics of crime for the analysis and further able to derive important implications.

2) Limitation

This study needs to be improved in several points. First, the data are limited. This study used crime data from two sources; the Supreme Prosecutor's Office and the Policy Office. These data are similar but not completely equal because their methods of gathering and categorizing are different. Crime data from one institution for all regions could enhance the accuracy of the analysis, and the target area could be expanded to all regions of Korea to allow the use of a larger sample. The aggregated crime data, such as those on heinous crimes, made the detailed analysis difficult to perform. Therefore, non-aggregated crime data could improve this study.

It is also difficult to use same regional level data due to necessity to limite the target areas within the cpital region. Limited target areas are specifies due to limited regional level crime data. The study can significantly improved if the

regional level crime data for all areas in Korea are provided with increased sample number.

This study used proxy variables to represent the social support factors. However, such factors could be different from real social support factors. If a survey is used to measure individual social support at the regional level, then this study could be more accurate with more valid variables for social support.

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<Abstract>

Relationship Between Social Support Factors and Major Crimes in Korean Capital Area

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Crimes must be reduced not only because of the financial, physical, and emotional damages they bring to the victims but also because crimes increase social costs by elevating distrust in society and instilling fear. With the increasing number of crimes in Korea, finding other factors that affect the occurrence of crimes is needed beyond the current viewpoint for crime analysis. Social support factors can be candidates for studies on the social support effect on crime occurrence in their initial stage. In this study, we identified the effect of social support factors on crime occurrence or deterrence, none of which has been considered important until now, given the emergence of spatial econometrics. The resulting Moran's I values revealed the existence of a spatial autocorrelation in all three crimes: heinous crimes, theft, and violence. As shown in the analysis using spatial econometrics and ordinary least squares, social support from families is significant in reducing all crimes especially violence. Social support from the local government is significant in preventing only theft. The spatial econometrics model is only valid in heinous crimes. These different effects of social support factors and spatial factors on crime occurrences are caused by the different characteristics of crimes. Hence, policymakers should consider the social support effect when they establish policies related to social housing or welfare.