ABSTRACT

RICE, KENNON JOHN. An Ecological Analysis of Burglary, Auto Theft, and Robbery Using Hierarchical Linear Methodology: An Investigation of a Strategy for Theoretical Integration. (Under the direction of Dr. William R. Smith).

Social disorganization theory posits that spatial patterns of crime emerge because neighborhood characteristics contribute to differences in propensity for criminality. Routine activity theory, on the other hand, asserts that spatial patterns emerge due to contextual differences in opportunity for criminal acts. Given that a criminal event requires both a motivated offender and an opportunity, scholars have recently recognized that these two independent traditions are complementary in nature. Spatial characteristics associated with the production of criminality and the creation of opportunity may both be independently associated with the patterns of distribution of criminal events, but when they occur simultaneously in the same location an interaction may occur whereby there is a multiplicative, rather than an additive, effect. This dissertation contributes to the growing body of literature that seeks to integrate these two lines of research on the basis of empirical interaction effects.

However, a contentious dilemma has emerged around the choice of an appropriate unit of analysis for the measurement of the concepts involved in these interactions. On the theoretical front, there is general debate as to the role of "awareness space" versus the role of an emergent milieu of a larger social context. On the methodological front, large units are suspected of introducing error through within unit heterogeneity, while small units are suspected of heightening autocorrelational errors.

Through the use of Hierarchical Linear Analysis, this dissertation improves the understanding of these issues by developing multi-level models of robbery, burglary, and auto theft using data from a mid-sized south-eastern city. That is, distinct models for each of these

crimes are built which simultaneously measure the associates of crime at relatively micro- and macro-levels of analysis. Both micro- and macro-level social contexts are found to be important to understanding the ecology of street crime, and the influence of micro-level characteristics are found to be contingent on the macro-level environments in which they are nested. The empirical findings in conjunction with the theoretical interpretation of these findings aid the development of an integrated ecological theory of crime and contribute to knowledge about the unique factors that are associated with the specific crimes of burglary, auto theft, and robbery.

AN ECOLOGICAL ANALYSIS OF BURGLARY, AUTO THEFT, AND ROBBERY USING HIERARCHICAL LINEAR METHODOLOGY: AN INVESTIGATION OF A STRATEGY FOR THEORETICAL INTEGRATION

by

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BIOGRAPHY

Kennon Rice was born on March 19, 1974 in Ravenna, Ohio. He received his primary and secondary education in Chardon, Ohio. Upon graduation from high school in 1992 he attended Grove City College in Grove City, Pennsylvania for one year before transferring to Westminster College in New Wilmington, Pennsylvania. At Westminster Kennon majored in sociology and completed his BA in 1996. In the summer following his graduation from Westminster, he married Tracy Ann Monegan and the two of them moved to Raleigh North Carolina where, in the fall of that year, he entered graduate school at North Carolina State University and she entered graduate school in the geology department at Duke University. Kennon completed his master's degree in the fall of 1998 and his doctorate in the spring of 2003. In the fall of 2003 he will begin employment at Albright College in Reading, Pennsylvania as an Assistant Professor in the Sociology and Anthropology Department.

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THEORETICAL FOUNDATIONS

The Roots of Ecological Theory

Most theories about the causes of crime focus on the individual person as the subject of study. Some popular theories claim that whether an individual acts criminally depends on whether their relationships with other people act to control them and constrain such behavior (e.g., Hirschi, 1969). Other theories claim that individual offending is learned from those closely associated with a person and that if one spends time with those that lack law abiding values, one will similarly learn to be criminal (e.g., Sutherland, 1947). Still other popular theories focus on individual experiences of hardship, and how the strain and isolation of such experiences can drive one to criminal behavior out of a sense of anger, frustration, or the belief that, "the rules just don't seem to apply anymore," (e.g., Agnew 1992; and Merton, 1938). Indeed, these are the three predominant theories (control, learning, and strain) that ask one to look at the experiences of the individual person to understand the big picture of crime.

An ecological approach to studying crime stands in contrast to these individual level approaches. Much of the contemporary ecological approach can be attributed to contributions made at the University of Chicago. The individuals who worked in this school examined maps of their city and recognized that street crime is not randomly distributed in space, but occurs in a regular and somewhat predictable pattern, regardless of the racial/ethnic background of the people living in the criminal environments. Thus, the premise of their work in attempting to understand crime was that human behavior is

primarily developed and changed by the social and physical environments in which they live.

They believed that the individual paths to crime discussed by other scholars may have some validity, but the communities and neighborhoods in which people live are major determinants of the individual experience and may, therefore, be prior in the causal chain that eventually results in crime. Such notable figures as Robert Park, Louis Wirth, Ernest Burgess, Clifford Shaw, and Henry McKay developed this community or "ecological" approach to studying crime throughout the 1920s. They believed that to have a full understanding of crime, it is necessary to study the characteristics of neighborhoods, not just people. Thus, they attempted to examine how a context affects the attitudes and beliefs of individuals, and how contexts differ in the control they exert on the people present there. Their approach to studying how criminal impetus is shaped has become known as "social disorganization theory" and has a strong tradition that has continued through the present.

Social Disorganization Theory

Social disorganization theory proposes that communities are socially organized to the extent to which their members are able to reach culturally influenced common goals (Merton, 1968) and to the extent that a common system of values and norms are able to effectively regulate behavior (Kornhauser, 1978). Subsequently, social disorganization is said to occur in the absence of these things.

Social disorganization theory is most fully developed in Clifford Shaw and Henry McKay's 1942 book *Juvenile Delinquency and Urban Areas*. The authors note that high

crime rates persist in some communities even as the social and cultural characteristics of the populations within them change dramatically. To Shaw and McKay it appears that poverty, relatively frequent residential mobility, and racial heterogeneity of the local populations are more closely associated with high crime neighborhoods than any particular characteristic of the individuals living in them. Shaw and McKay hypothesized that "natural areas" seemed to be formed due to the functional needs of cities so that particular areas served particular roles. Once these natural areas were formed they were presumed to be stable even if the populations living in them changed. Subsequently, differences in the amount of poverty, racial heterogeneity, and mobility that neighborhoods experienced tended to remain constant over time (Shaw and McKay 1942).

Having established these macro-level spatial correlates of crime, the authors sought to explain the link between these characteristics and individual offending. They borrowed from a variety of other popular criminological theories of the crime, positing that the mechanisms of social control, cultural transmission/social learning, and strain all contributed to individual offending (Kornhauser, 1978).

Social control theory in general assumes that crime is its own reward because of the profit, and gratification it typically brings and, hence, the probability of crime hinges on the extent to which these natural and universal urges can be controlled. These controls are similarly said to depend on the extent of personal investments in relationships with conventional people and institutions. These relationships are in turn disrupted by frequent relocations, the distrust that often accompanies racial/ethnic diversity, and the fear, and lack of resources associated with poverty (Kornhauser, 1978). Social

learning/cultural transmission theory proposes that deviant or conventional values as well as the skills to accomplish the accompanying lifestyles must be learned through interaction with others with whom they associate. Thus, youths in areas that already have deviant subcultures continue to learn the values associated with those cultures generation after generation (Shaw and McKay, 1942). Strain theory proposes that criminal tendencies are acquired due to hardship. These theories propose that individuals living in areas characterized by poverty are more likely to experience frustration, anger, and or alienation from conventional society and its values. These experiences, in turn, are said to be associated with crime (Cullen and Agnew, 2003).

To the extent that there are variety of possible causal mechanisms that could be attributable to Shaw and McKay (see, for example Kobrin 1971), many criminologists believe that Shaw and McKay's original ideas were too eclectic, and in need of revision. Shaw and McKay are charged with being contradictory and theoretically inconsistent in their explanations of how mobility, poverty, and heterogeneity affect crime rates (Kornhauser, 1978). Their borrowing from several different theoretical traditions is seen as problematic in that they failed to closely adhere to an underlying theoretical orientation. Indeed, while strain theories, cultural transmission/social learning theories, and social control theories may each have individual merit, the assumptions behind each of these processes may have the potential to contradict one another (Liska et.al. 1989; Akers 1989; Kornhauser 1978). For example, if everyone has a natural motivation to offend that must be controlled, as social control theory assumes, one would not need to learn criminal tastes (e.g., social learning theory) or require relative hardship (e.g., strain

theory). Furthermore, Shaw and McKay establish no grounds for their integration or the partitioning of the theories' influences to specific circumstances.

Several social control theory loyalists have noted this contradiction and have sought to rectify it by revising social disorganization theory so as to be strictly a theory of social control (e.g., Kornhauser 1978; Bursik and Grasmick 1993). (See Figures 0.0 and 0.0 for diagrams of these models). The original theory assumes networks of friends and family ties to be one of many aspects related to crime rates, but the revised social control version views the systemic network ties essential to the process of regulation and socialization as eclipsing all other theoretical mechanisms (Sampson, 1991). The revised version of the theory proposes that economic despair, land-use transition, residential mobility, cultural conflict, low local ownership, family instability, institutional instability, and the like are all correlates of network ties (Miethe and Meier, 1994; Sampson and Wilson, 1995). However, network ties are the mediating variable between these elements and crime. Thus, these elements are only important so far as they promote such occurrences as a lack of primary relationships, high levels of anonymity, low organizational participation, weak bonds, low supervision, low social cohesion, and a lack of consensus.

Figure 1.1 Shaw and McKay's Original Conceptualization of Social Disorganization Theory

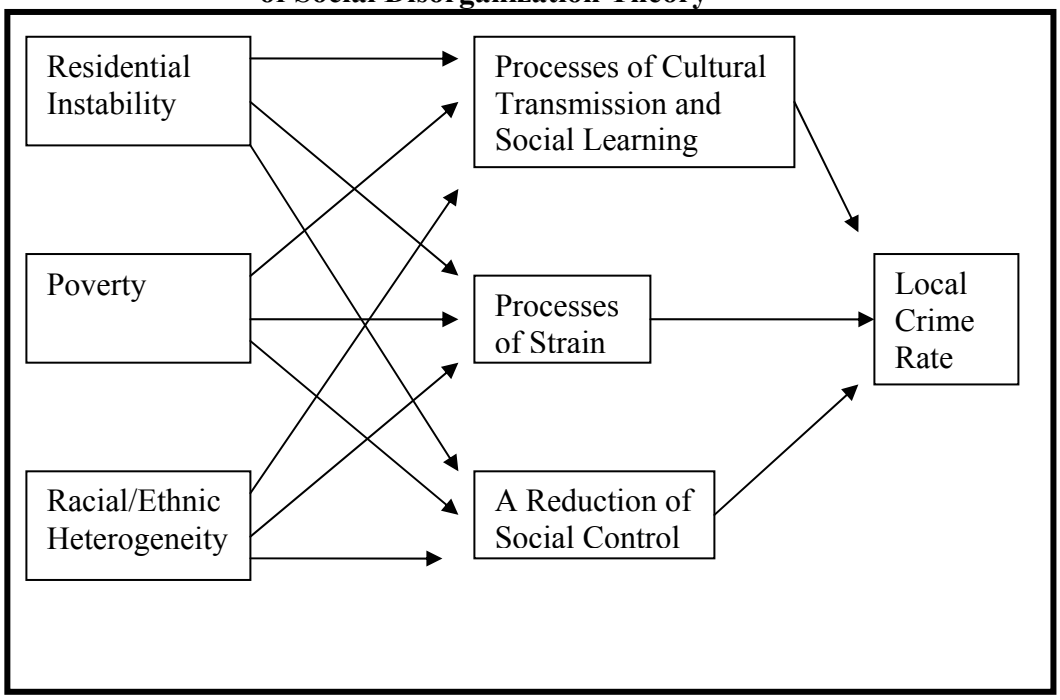
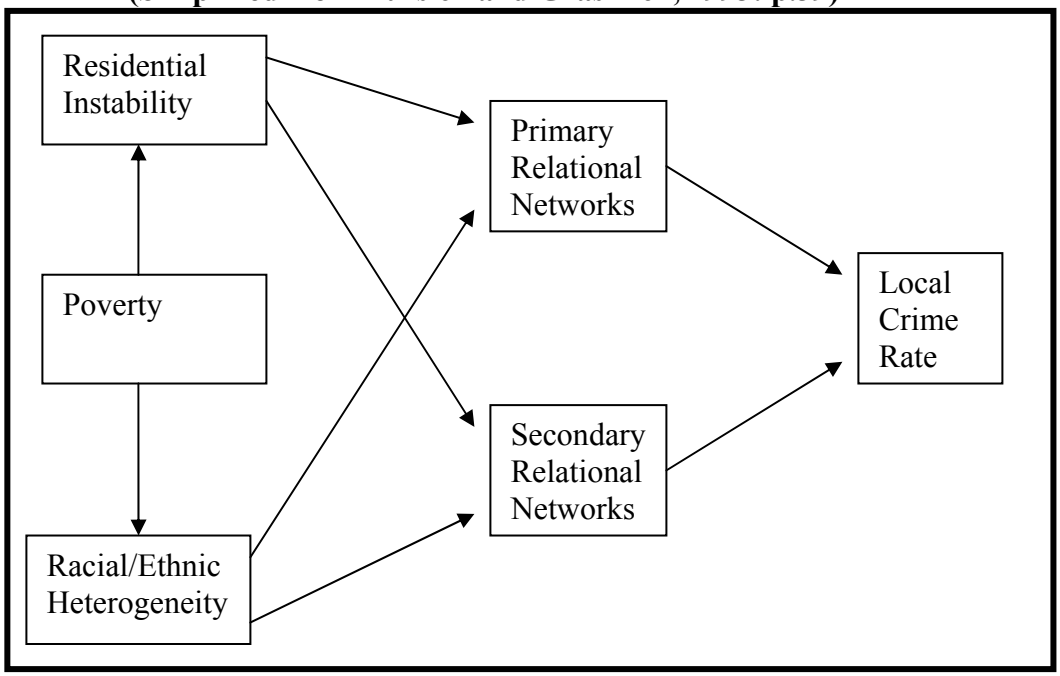


Figure 1.2 The Social Control Model of Social Disorganization Theory (Simplified from Bursick and Grasmick, 1993: p.39)



The present study does not have direct measures available for social control, anomie, or subculture. Therefore, the variables involved in this particular operationalization of social disorganization fail to make a methodological distinction between the two versions of the theory. Nonetheless, the theoretical interpretation of results within this study has the potential to differ by theory. Implications of these differences will be discussed wherever they may occur.

Routine Activity Theory

A second intellectual tradition that focuses on the spatial distribution of crime also began with the Chicago School, but the origins are in the works of Roderick McKenzie and his more well-known student Amos Hawley (Cohen and Felson, 1979; Felson, 1998). This line of research notes that contexts differ not only in their contributions to changing people, but also in the levels of opportunity they provide for criminal acts. Hence, two locations with the same kinds of people might have different amounts of crime simply because they differ in the prospects for crime (e.g., shopping malls offer many more opportunities for property crime than hay fields). Research in this tradition recognizes the importance of how space itself is used and experienced not only by those who reside in a space, but also for those who may arrive there as a destination, and even for those who may be merely passing through. After all, it is not necessary for a person to live in a neighborhood to commit a crime there. This later tradition has come to be known as "Lifestyle Theory," or more commonly "Routine Activities Theory."

The theory defines "routine activity" as, "any recurrent and prevalent activities which provides for basic population and individual needs," (Cohen and Felson, 1979:593). Therefore, in proposing that crime is a result of routine activity, the theory sees crime as a function of everyday behavior. Routine activity theory also assumes that crime is engaged in as a rational choice in which offenders attempt to maximize their gains and minimize their losses (Massey et al., 1989). Therefore, in geolocational terms, it proposes that crime will occur where daily activities create the most numerous opportunities for the most profitable crime and the least chances of social and/or physical retaliation.

More specifically, the theory posits that there are three basic elements of routine activity which influences crime rates: accessibility, guardianship, and target suitability (Brantingham and Brantingham, 1984). "Accessibility" is simply the degree to which a target is conveniently available to potential offenders. On an aggregate level it is often indicated by land use as some land uses require more accessibility to the public than others. For instance, retail establishments require that many individuals pass through an area, while exclusively residential areas made up of single family homes require very little accessibility to anyone other than the residents themselves. Thus, many more potential criminals pass through retail areas than residential ones and, in doing so, become familiar with the area and observe opportunity for crime. Furthermore, the anonymity that comes with high traffic further increases the attractiveness of criminal opportunity (Brantingham and Brantingham, 1984). Fleming et al. (1994), Martin (1995), Weigman and Hu, (1992) and Brantingham et al. (1991) posit that auto theft in particular occurs in areas of high traffic.

Targets are generally thought of as "suitable" if they are visible, valuable, transportable, and saleable (Cohen, 1981). Amount of target suitability is, therefore, a function of awareness of the target, whether its form facilitates the crime (is it vulnerable), and whether or not it is desirability in terms of the profits it will yield. In terms of a vehicle, for instance, it is more "suitable" if it is a vulnerable vehicle model, has a particularly high value, is advantageous for the purpose of stripping for parts, is capable of removal (i.e., it runs properly), or is particularly desirable for "joy riding." These traits and their ilk are probably best indicated in spatial terms by conditions of land use and socioeconomic status variables indicative of the value of property in an area.

"Guardianship" is the degree to which a target is protected from crime due to the presence of inhibiting structures such as alarms or locks, or the presence of people who are likely to interfere with the crime being carried out successfully (security guards, helpful neighbors, or, in the case of property crime, the owners of the property themselves). Hence, property located indoors, or under the immediate supervision of its owner is presumably less likely to be stolen; and areas of high traffic, or with security guards, or security cameras are similarly theorized to be less vulnerable.

Theoretical Weaknesses

Routine activity theory proposes that crime occurs when there is a convergence in time and space of a motivated offender, a suitable target, and an absence of a capable guardian. However, by excluding variables pertaining to the motivational factors, common applications of routine activity theory tend to assume, by default, that the presence of motivated offenders is a constant. In other words, the likelihood of a

motivated offender encountering the opportunity is always presumed to be equal (Cohen and Felson, 1979). This results in the implicit assumption that opportunity in one location is as likely to result in crime as opportunity in any another (Miethe and Meier, 1994). Hence, routine activity theory is a theory of crime rather than a theory of criminality in that it assumes that crime occurs independent of the structural and cultural conditions that may motivate individuals to commit crimes, but, nevertheless, attempts to predict its distribution (Sampson and Lauritsen, 1990).

Several theorists and empirical studies have criticized the theory as being incomplete for having failed to consider the spatial distribution of motivation. Clarke (1984) notes that the conversion of opportunity to criminal incidents depends on the potential offender's subjective evaluation of the ease and attractiveness of the opportunity, and this evaluation occurs in the context of criminal motivation, experience, and knowledge. Maguire (1980) similarly observes that opportunities can be created by those with sufficient motivation. While, several other authors (e.g., Lynch, 1987; Miethe, Stafford, and Long, 1987; Sampson and Wooldredge, 1987) have suggested that opportunity may only result in crime if it occurs in proximity to a population of motivated offenders and in some cases, motivation may be so prevalent that issues of opportunity and routine activity become moot (i.e., a crime is committed regardless to even the overwhelming probability of formal and/or informal sanction). Furthermore, studies demonstrating that new protective measures can displace crime from protected targets to unprotected targets cannot be explained if crime is simply a product of opportunity (e.g., Mayhew et al., 1976). Much less, can the theory explain why some attractive and poorly guarded targets are not chosen for crime (Roncek and Meier, 1991).

In contrast, social disorganization theory proposes that crime occurs not necessarily where the opportunity for crime is greatest, but rather where social structural factors produce an environment conducive to the impetus to offend. As discussed previously, various versions of social disorganization theory differ in the degree to which the theory is one of "social control" or "motivation." However, past literature that has discussed the integration of routine activities and social disorganization theories have spoken of social disorganization theory as a theory of motivation. The term "motivation" will, hence, be used here in order to be consistent with the related research and to emphasize its amenability to integration with the traditional elements of Routine Activities Theory, but the word choice is not meant to exclude the possibility of a social control interpretation. Regardless of the distinction between motivation and control, social disorganization theory does not make the implicit assumption that there is a constant presence of motivated offenders, as routine activity theory does. However, social disorganization theory implicitly makes the alternate assumption that there is a constant level of opportunity to commit crime for those who are motivated to do so, and/or that opportunity has no bearing on the decision to commit criminal acts.

Similarly, by assuming that crime will occur within those neighborhoods that produce motivation, the theory, by extension, assumes that offenders tend to find their targets near their own residences. Therefore, the assumption of "constant/irrelevant opportunity" does not only imply that all motivated offenders will find a suitable target at some location, but also that they will commit their criminal acts within the vicinities of the environments that are shaping their behavior rather than traveling to other areas with

the specific intention of maximizing gain or minimizing risk (see Reiss, 1986; and Brantingham and Brantingham, 1984, for discussion).

These assumptions have similarly exposed social disorganization theory to regular critique. The theory often fails to account for areas with low crime despite possessing many criminogenic factors, and it tends to counter-intuitively assume that criminally motivated individuals will always find an outlet for their desires through adequate suitable opportunities when, in fact facilitating opportunities may be required (Lofland, 1969). In an empirical example, Cohen, Felson, and Land (1980) conducted an examination of crime trends between 1957 and 1989 and found that while motivational factors alone failed to account for the relatively small amount of crime that occurred between 1973 and 1977, the trend was accounted for when issues of opportunity were added to their model. In addition, contemporary efforts to design crime free environments and situational crime prevention measures (see Clarke 1983) virtually ignore motivation upon the assumption that criminal motivation can be controlled merely by eliminating opportunity, and some of these efforts have seemed to be quite effective (Clarke, 1989; Barr and Pease, 1990; Poyner, 1991; Barclay et al., 1996; HLDI, 1990; Mayhew et al., 1976; Webb, 1994).

The Structure of a Theoretical Integration

Theorists loyal to both theories undoubtedly accept the criminological truism that a criminal event requires both a suitable victim and a motivated offender.[1] However, they have traditionally failed to address either one or the other of these two factors

[1] Again, whether one thinks of "motivation" as an attitudinal will to commit crime or simply a lack of social control to prevent one from doing so may be irrelevant to whether "motivation" will interact with opportunity.

(Miethe and Meier, 1994). Recently, however, numerous theorists have proposed that the differing assumptions of the two theories could complement each other if used in conjunction, and an integration of the two could improve the overall state of knowledge about the ecology of crime (Bursik and Webb 1982; Kennedy and Forde, 1990; Miethe and McDowall 1993; Miethe and Meier 1990, 1994; Miethe et al., 1987; Rountree et al., 1994; Sampson and Lauetsen 1990; Sampson and Wooldredge 1987; Simcha-Fagan and Schwartz 1986; Smith and Jarjoura 1989; Smith, Frazee, and Davison 2000; Rice and Smith 2002).

These proposed integrations are founded on the premise that the only way to assess the degree of influence of either of these models of crime, or to discover any potential interactions between their respective elements is to include operationalizations of both theories in the same empirical model. Their simultaneous inclusion in a single model has great potential for both accounting for greater amounts of spatial variance in rates of offending, and for correctly specifying the amount of predictive power attributed to each inclusive aspect. However, just as importantly, it has great promise for revealing new contextual stories of the process by which criminal events occur. Such contextual "stories" about how crime occurs are what allows a truly measured and considerate response to crime (Thornberry 1989).

Yet another reason to explore the issue of integration of these two theories, is that the traditional variables used to operationalize the concepts within each of these respective theories have often had the potential to simultaneously represent multiple concepts peculiar to each of the distinct theories. For example, whether or not a residence is owner occupied is often used as an indicator of how likely its occupants are

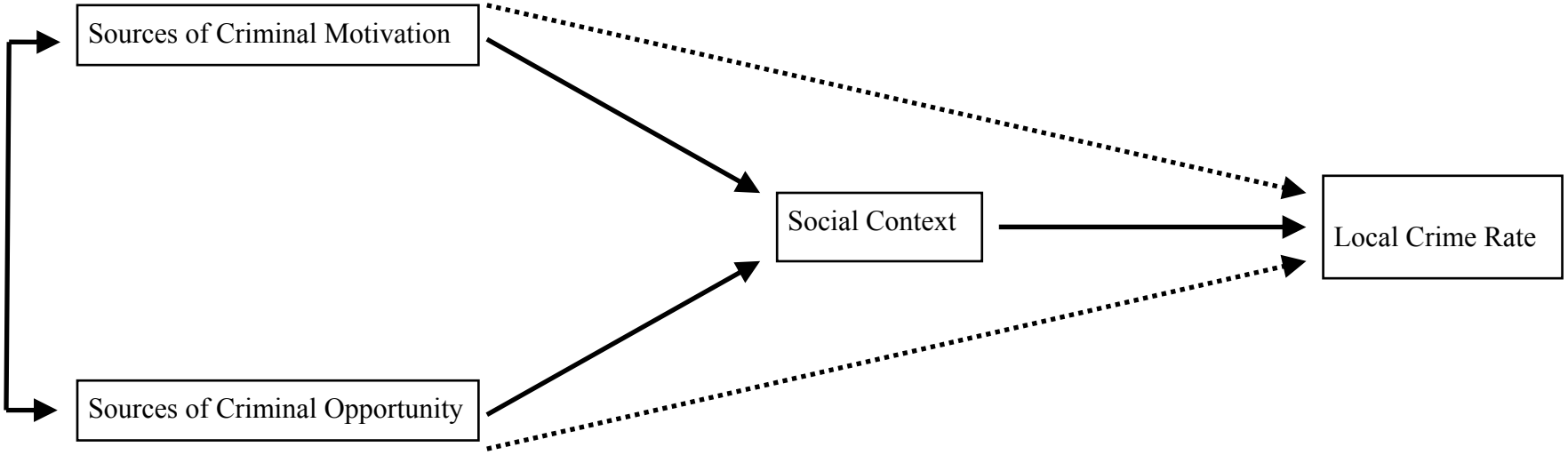
to be integrated into the local community, thus reflecting social organization. However, owner occupied structures are similarly likely to be associated with increased guardianship of property, and relatively small amounts of traffic by unfamiliar individuals. A comparison of operationalizations across studies reveals that it is common for researchers to operationalize concepts in such ways that the results can be interpreted as vindication of either of these two theories (see Miethe, Hughes, and McDowall, 1991). If elements of both theories are inadvertently being considered, then it is impossible to isolate the effects of each of the theories individually, and a simultaneous operationalization is therefore practiced whether or not this is the actual intention. Hence, at least until a more theoretically pure method of operationalizing the respective principles is developed, an accurate depiction of the sources of crime may only come from considering both theories in combination.

The only apparent obstacle to their conceptual integration lies in the fact that routine activity theory tends to assume a rational decision making process by offenders whereas social disorganization theory does not. That is, routine activities theory assumes that offending is determined by a logical comparison of risk to rewards. Meanwhile, social disorganization considers the tastes and emotions acquired through social learning or strain and these may or may not be consistent with means/ends calculations. However, if one views a criminal event as a two-step process in which an individual first becomes motivated to commit a criminal act and only second selects a target for that act then the apparent contradiction looses its saliency. That is, motivation may have its roots in either rational or irrational origins, while the target selection processes discussed by routine activity theory may retain a predominantly rational basis (Cornish and Clarke, 1986;

Miethe and Meier, 1994). Hence, while the assumptions about rationality may initially appear to be contradictory in these theories there is no reason for concern with integration.

In previous literature, integration has predominantly been built upon empirical interaction effects (i.e., cross product terms - see Horney, Osgood, and Marshall, 1995; Miethe and McDowall, 1993; Rountree et al., 1994; Smith, Frazee and Davison, 2000; Rice and Smith, 2002). By use of interaction effects, the variance explained by one theory is shown to be contingent upon values of the variables of the other theory. Thus, it is assumed that both theories contribute to a general context which mediates their relationships to criminal events. That is, motivation and opportunity may have their own direct contributions to a location's crime rates (as opportunity may occasionally be great enough to generate motive, and motive may occasionally be great enough to make opportunity irrelevant), but some (and possibly even the majority) of their contributions to variance in crime rates may be attributable to their interaction in a contextual environment (i.e., the variance explained by the presence of suitable targets is dependent upon the context of social organization or vice versa - see Figure 1.0). Thereby, not only are the theories rendered compatible in their assumptions, but grounds are established for the operation of their mutual influence.

Figure 1.3
Heuristic Model of Criminal Events



(Modification of a figure appearing in Miethe and Meier, 1994, p.

Results of Previous Integration Studies

Initial attempts at demonstrating the feasibility of integration through interaction have shown mixed results. Miethe and McDowall (1993) and Rountree and her colleagues (1994) use the same Seattle data set (though Rountree et al. employ hierarchical linear models), to test such a proposition. In regard to burglary, Miethe and McDowell test 27 interaction terms and find three interactions indicating that the favorable effects of burglary precautions and the detrimental effects of living alone are negatively related to the number of "busy places" (number of public places nearby). In regard to violent crime, they report that that none of the twenty seven interaction effects tested in their model of violent crime are statistically significant. Rountree and her colleagues test six interactions pertaining to burglary and likewise find the effect of busy places on security precautions to be significant. Meanwhile, their model for violence reveals only one out of six interactions to be significant (that blacks are more likely to be victimized in homogenous neighborhoods). Thus, neither of the studies find prevalent statistically significant interaction effects between the elements of the respective theories. Miethe and McDowall's research discover only three out of a potential 54 interactions to be significant, while Rountree's research finds only two out of twelve potential interaction effects to be significant.

The results of Smith et al. (2000) and Rice and Smith (2002) using data based on a mid-sized south-eastern city are far more encouraging, however. Smith et al. examine street robbery using a forward selection regression model to find five out of twelve interaction effects to be statistically significant. Similarly, Rice and Smith find thirteen out of twenty two interactions to be significant in their model of automotive theft.

Moreover, the land use variables employed to indicate concepts of routine activities in both these studies interact with the variables presumed to indicate social disorganization so that together they are associated more sharply with crime than either of the sets of variables independently. Furthermore, one theory cannot be said to be eclipsing the other, as variables from both theoretical approaches prove to be integral to the explanation of variance.

Furthering the integration of Routine Activities and Social Disorganization theory may be dependent on understanding why the first two studies fail to find many interactions, while the second two studies find about half of those tested to be significant. There are two primary differences between the studies.[2] The first is that the studies that find few interactions examine general categories of crime while those that find greater numbers focus on specific types of crime. Hence, it may be that heterogeneity within crime categories is responsible for differences in results. That is, different types of street crimes may exhibit different patterns of distribution and these differences may have a muting or confounding influence on results (Miethe and McDowell propose such a process may be occurring within their violent crime category).

The second, and purportedly more significant, major difference between these two sets of studies is in their units of analysis. By entertaining the idea that one can study crime by studying contexts rather than people, many questions are raised regarding what constitutes an important context. In other words, are characteristics of cities what

[2] In addition to the two differences subsequently described, it is also possible that there may be differences based on the fact that the early studies are based on self-report victimization data, while the later studies are based on official police report data. Although, there is no direct evidence that this would make a difference in terms of prevalence of interactions, it is conceivable that the number of minor offenses that tend to be disproportionately represented in self-report victimization data may obscure some spatial patterns of crime distribution.

matters, or large regions of a city (e.g., census tracts), or small local neighborhoods, or maybe even what one can see from one's front porch? Or perhaps, more than one of these units are simultaneously important to the crime at a place (e.g., maybe the characteristics of the larger city matters to crime at a specific address, but so do the characteristics of its immediate neighborhood).

Smith et al. and Rice and Smith employ face-blocks[3] as their units of analysis rather than the much larger groupings of up to eight square blocks employed by Miethe and McDowell and Rountree et al. This shift in unit of analysis may be crucial as larger units have a much greater potential for "within unit heterogeneity." "Within unit heterogeneity" refers to the phenomena whereby territories with much different characters are analyzed as a single unit. For example, a concentration of bars and vacant lots on one end of a unit of analysis may act as a strong criminogenic force, but if a stable residential neighborhood is included in the same spatial unit the influences of each on the criminological character of the unit may confound the other. Thus, empirical effects are muted, and neither land use is able to truly express its influence on the distribution of crime.

Similarly, when relatively large units of analysis are employed a unit may have an all black population at one end and an all white population at the other end. Since both the black and the white populations are within the same unit it would be classified as "racially heterogenous," even as these territories may be experienced as independently homogenous by those who reside within them. Thus, the processes associated with racially heterogeneous territories may not appear as expected and empirical results may

[3] A "face-block" is defined as opposing sides of a street located between two intersections or between one intersection and a dead end – see Figure 2.0.

not appear even in the case that racial distributions play an important criminogenic role. Hence, "within unit heterogeneity" is distinct from the conceptual heterogeneity referred to in social disorganization theory (Janson, 1993)

Spatial heterogeneity within large units of analysis, such as census tracts, has long been recognized as a methodological dilemma (Robinson, 1950; Sampson, 1987; Janson 1993). Yet, even the relatively small units of analysis used in the Seattle data may suffer from spatial heterogeneity. Survey respondents in Seattle were asked to report on neighborhood traits within three or four blocks of their own household.[4] This form of data collection establishes units inclusive of up to a 64 block area. It is highly conceivable that within-unit heterogeneity may be present within such multi-block areas. "Busy places" or incivilities within a three or four block area may be irrelevant to crime at a particular location if the awareness space of motivated offenders does not extend to the location in question (Brantingham and Brantingham, 1984). Undoubtedly, there are some situations in which a large number of highly motivated potential offenders may regularly pass through a given location with complete lack of awareness of attractive, unsupervised targets just a block away.

Face-blocks are presumably a more spatially-homogeneous unit of analysis, and thus, as a unit of analysis, their results may be more empirically sensitive to interaction effects with individual level variables. Moreover, spatial heterogeneity within a face-block may be irrelevant, as awareness space for anyone present on a face-block is likely to be inclusive of its entire expanse (Taylor, 1997). Motivated offenders present on a face-block are more likely to have an awareness of any place similarly located on that

[4] Specifically, respondents were asked to report the number of busy places within three blocks and number of neighborhood incivilities within four blocks of their household.

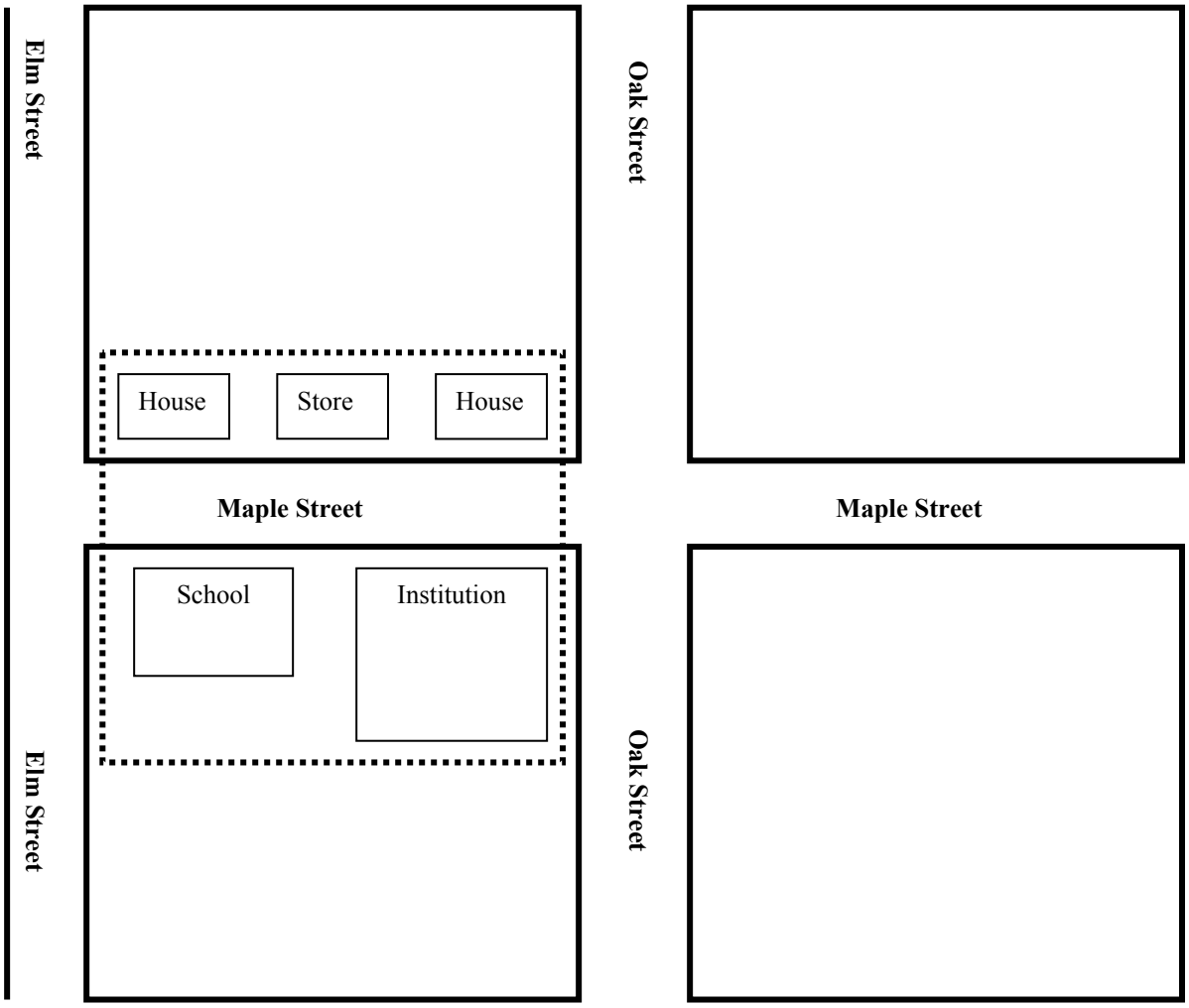
face-block than they are to have an awareness of any place located only a block away where they may rarely or never voyage (Brantingham and Brantingham, 1984; Beavon et al., 1994; Taylor 1997).

A decision of an appropriate unit of analysis is not quite as clear cut as these observations may imply, however. Some criminogenic influences presumably have their origins in relatively large spatial milieus. As has been noted, motivated offenders may not be aware of land uses just on the other side of the block from wherever they may be. Yet, some offenders will undoubtedly be aware of wider contextual surroundings. Social disorganization theory, especially, assumes that the qualities of local communities are important in inspiring conformity/deviance in their residents. Hence, social disorganization tends to assume that crime rates will originate in the characteristics of neighborhoods rather than micro-level environments. Indeed, it would be naïve to assume that the social structural characteristics in one spatial unit have no effect on the potential for crime on adjacent spatial units, especially when units are small.

In a related manner, it is logical to assume that diffusion of social influences through space is more likely to affect closely proximal spatial units than more distally proximal units. It is precisely for this reason that using geographic territories as units of analysis often violates the assumption of independent errors in Ordinary Least Squares regression as the value of the dependent variable in one geographic unit is influenced by another geographically proximal unit. As long as significant diffusion is occurring or as long as errors may be patterned due to unmeasured variables with localized effects this violation of an autocorrelational assumption will occur (Doreian 1980,1981).

Smith et al. (2000) and Rice and Smith (2002) attempt to avoid violating this regression assumption by including a control for offending which occurs on the same street and within ten blocks of the one in question. The present study proposes an alternate manner of addressing these statistical and theoretical dilemmas based on nesting one unit of analysis within another.

Figure 1.4: Diagram of a Face-Block



The area within the dotted line represents the contents of one face-block:
(One side of a city block including both sides of the street).

An Alternative Hierarchical Approach

The present study makes use of Hierarchical Linear Analysis (HLM) and a statistical model that includes both face-blocks and the census block-groups in which they are imbedded. HLM nests smaller units (or L1 units) within larger ones (L2 units) and calculates a slope, intercept, and error term for each of the larger units. Hence, the error terms for the L1 units are not assumed to be the same for the entire sample, but only for those nested within the same L2 unit. This not only minimizes concern over autocorrelation, but also allows one to control for the variance in one unit while calculating that of the other (Bryk and Raudenbush 1992). Consequently, one is able to determine the relative contributions of the characteristics of a face-block to those offered by the larger block-group. Similarly, it allows for the examination of cross-level interactions. That is, HLM allows for the examination of the potential that the criminogenic influence of face-block characteristics is contingent on the larger social context in which it is situated.

Census block-groups have been chosen as the larger unit of analysis so as to complement the face-block's merits as an approximation of awareness space. Block-groups consist of a cluster of compact and contiguous clusters of census blocks. The majority of block-groups are delineated by local participants as an element of the Census Bureau's Participant Statistical Areas Program and are only delineated by the bureau where a cooperative local participant could not be identified. They are delineated so as to follow visible features such as high tension power lines, roads, rivers, railroads, ridgelines, etc. Therefore, they constitute a unit of space which is likely to seem "natural"

to local residents and can correspond roughly to local cognitive divisions of how space is experienced.

Similarly, block-groups are a size that may correspond to what residents consider to be their extended neighborhood. They are drawn to include a population of 600-3,000 people with an optimum of 1,500 people. Nationally, they average 30.6 census blocks per group, but because of the population guidelines, an urban area like the one in question is likely to average somewhat less than this (U.S. Census Geographic Areas Reference Manual 1994).[5] Therefore, the simultaneous examination of face-blocks and block-groups allows for a "decomposition" of an ecology of street crime so that one may examine the contribution of micro-level characteristics while controlling for the composition of the more macro-level area and vice versa.

Other potential units of analysis were considered. In fact, a great deal of effort was made to include individual addresses or the "place" level within a three level analysis. However, HLM requires that individual slopes be estimated for all but the smallest level of analysis so that the influence of more macro-level characteristics on the smaller units can be estimated. Therefore, the inclusion of "places" as a unit necessitated slopes at the face-block level. Even though Bayesian estimation made this possible, face-blocks very rarely contained more than one of some particular land uses (e.g., schools, hotels, or shopping centers). Consequently, the population on which these slopes were estimated proved exceedingly small (as few as three face-blocks) and these slopes were regarded as overly unreliable and unstable. Similarly, units larger than a block-group (e.g., census tracts) could have been utilized, but within unit heterogeneity would have

[5] In the city in question there were 133 usable block-groups containing 7,186 usable face-blocks (averaging 54 face-blocks per block-group). Assuming that no face-blocks are invalid due to missing data, this would be roughly equal to about 23 blocks per block-group.

increased with the larger units. Furthermore, data limitations originating in the size of the city of study would have reduced the available population of tracts to the point that reliability would again become a major concern.

CHAPTER II:

DATA STRUCTURE AND VARIABLES

Construction of the Data Set

The level one or face-block data used for this study consists of 1994 county Tax Assessor data[6], 1990 Census Bureau data, and 1993 Police Department crime incident data for the city of reference (a southeastern U.S. city with an approximate population of 250,000). Geographical information software (GIS) is used to match the tax data (77,018 addresses), with U.S. Census information, and the locations of 1993 crime incidents (225,593 criminal incidents are aggregated up to 35,984 cases as many addresses are cited for more than one incident). Locations of certain types of commercial businesses are also matched using phone directories and Yellow Pages information. There are 10,242 addresses that are the locations of crimes which do not match with the tax assessor addresses. This represents 28.5% of the total crime in the sample. Some of these failures to match are undoubtedly due to typographical errors or incompatibilities in the way that these two data sets list addresses. However, because great efforts are made to correct these incompatibilities, a large number of these are undoubtedly excluded due to the fact that the crime occurred on non-taxable or non-reporting properties. A large percentage of these cases also occur at locations without street addresses (for instance, on the sides of highways or wooded areas). Addresses are then aggregated into one of 7,186 face-blocks using GIS. All places successfully match to face-blocks, but 5,095 face-

[6] "Tax Assessor Data" is that data which is collected by the county for the purposes of collecting property taxes. It includes such variables as property value, type of land use (e.g. single family residence, free standing commercial store, industry, etc.), size of structure, number of occupants, etc.

blocks do not contain any usable addresses and are dropped from analysis. Again, it is presumed that many of these face-blocks contain only government or university campus buildings, or no buildings at all, and hence lack taxable addresses. Subsequent to the aggregation to the face-block, GIS software is again used to "nest" the face-blocks within 144 block-groups. Eleven of these block-groups fail to contain any face-blocks with usable addresses. Hence, the 77,018 usable addresses in the city are each assigned a face-block and a block-group identifier leaving 7,186 usable face-blocks and 133 usable block-groups.

T-tests of statistical significance are then performed to see if the 10,242 addresses containing crimes that cannot be matched to tax data or the 5,095 face-blocks without usable addresses are significantly different along the dependent variables than the remaining sample. Results show that these areas have significantly less crime than those that remained in the analysis, but this is not entirely surprising considering that most of these places are non-taxable institutions or unzoned property.

Caveat About Official Data Sources

The dependent variables all consist of police department crime incident data. Thus, they are the type of official data which is routinely submitted to the FBI for the purpose of composing the Uniform Crime Reports. Much has been made of the weakness of such officially collected crime data.

Officially collected data are known to have errors associated with law enforcement policies and biases involving race, class, gender. For example, Smith (1986) finds that minority and poor neighborhoods are subjected to more rigorous policing

resulting in a higher rate of detection and recorded incidents (see also Liska and Chamlin, 1984). In addition, bias is introduced through the recording and classification of crimes. Law enforcement organizations that are more highly trained and professional may classify more incidents as criminal events than less professional organizations where officers may be tempted to neglect filing a report if the crime appears to have little chance of ever being solved, or if citizens appear indifferent to law enforcement response. Furthermore, crimes may be undercounted in certain cases so as to promote the status of specific persons or agencies (Butterfield, 1998) and victims may fail to report crime for numerous reasons (Rennison, 1999).

These sources of bias are all considered to be important to ecological crime research, not only because they distort the rates of crimes across place, but also because this distortion has implications for the testing of theory (Davison and Smith, unpublished). Nonetheless, of the widely available types of data, officially collected data may be the best suited for a geographical analysis of small units of space. Self-reports of serious offenses are so rare that it would be extremely difficult to acquire a data set of a substantial size for an entire city, and offenders are not likely to know the addresses of their offenses except in a minority of cases. Furthermore, victimization surveys typically fail to capture the victimization of businesses or institutions and victims are similarly unlikely to know the addresses of their victimization with any accuracy unless it occurred in their own home. Call-for-service data could easily be substituted for the police recorded incident based data used here. However, Davison and Smith (unpublished) find that there is no obvious advantage for doing so.

Dependent Variables

The dependent variables in this study consist of police incident data for burglary, automotive theft, and robbery. The descriptive statistics for these crimes can be seen in Table 2.1. As is detailed in the "Procedure" portion of this paper, appropriate measures are taken to adjust for their skewed distributions.

BURGLARY

The Federal Bureau of Investigation defines burglary as, "The unlawful entry into a structure with the intent to commit a felony or theft." However, in practice, the use of force to gain entry is not necessary to classify an offense as a burglary, and, as long as there is intent, it is not necessary to have completed a felony or theft. (FBI, 2003). Because the distinction between "breaking and entering" and burglary seems artificial, both crimes are combined together for the purposes of this study. In the city in question, at the face-block level, the mean number of burglaries was .37 with a maximum of 17. Furthermore, 80.5% of face-blocks experienced zero burglaries. At the block-group level, the mean number of burglaries was 21.32 with a maximum of 87.

Burglary, like auto theft, is considered to be a property crime, but it demonstrates its own set of unique properties. Burglars tend to be disproportionately young, as about 1/3 of burglaries committed by individuals under the age of eighteen (FBI 2003) and according to several studies based on interviews of habitual offenders, (e.g., Wright and Decker, 1994; Cromwell, Olson, Avery, 1991) many burglars have drug habits (60%) and pursue the crime due to a lack of conventional opportunities for success. However, they claim to approach their jobs in a rational businesslike fashion and choose their targets

carefully.[7] There is some evidence that aggregate burglary rates are sensitive to local markets for stolen goods (Baumer et al 1998), and some types of burglary require special skills which are often learned from association with other more veteran burglars (Shover, 1972; Cromwell, Olson, Avery, 1991).

Patterns of burglary exemplify this "businesslike" mode of operation. Burglars tend to target residences that show signs of long-term care and wealth (Cromwell, Olson, Avery, 1991) and most burglars avoid occupied residences considering them too risky (Wright and Decker 1994). Of all business establishments, retail stores are the favorite target because merchandise is displayed in such a way that it is easy to find and collect, new items are easier to resell, and pricing tells them the relative value of different items (Hakim and Shachmurove 1996). Furthermore, locations with multiple potential escape routes are considered the most desirable targets (Cromwell, Olson, Avery, 1991).

Advance planning is also an important element of the crime. Gaining access to an establishment previous to the crime in order to plan the theft is an important element to commercial burglary. Hence, locations are preferred where potential burglars can initially enter as legitimate customers, and factories, warehouses, service centers, etc. are relatively less attractive targets. Burglars also tend to prefer targets more distant from major roads and from pedestrian traffic so that they are less likely to be seen by passers-by and there is less of a chance that someone will quickly respond to an alarm (Hakim and Shachmurove 1996). Similarly, targets are often given preference that can relatively

[7] Much of the evidence for the "rationality" of the selection of targets for burglary comes from the accounts of burglars themselves. However, Cromwell and colleagues (1991) find that when taken to the scene of the crime, and questioned at length, many burglars begin to reveal clues that their crimes contain more elements of opportunism than they initially portrayed. Rather than targeting the most "optimal" places, they often seem to opt for targets that are "sufficient" and that they happen to come across through their legitimate employment or through recreational activities such as shopping, visiting relative/friends, or partying. Hence, the degree of rationality in target selection is somewhat in question, and, could perhaps, be best described as a "partial rationality."

easily be unobtrusively observed (Cromwell, Olson, Avery, 1991) and acquaintances are often targets (Wright and Decker 1994). Farrell, Phillips, and Pease (1995) also note that, when choosing a target, burglars often pay attention to how attentive neighbors are to each other's properties.

According to the National Crime Victimization Survey (U.S. D.O.J. 1998) relatively poor Hispanic, and African-American families are the most likely to be burglarized, and owner occupied and single family homes have less burglary than renter occupied and multiple family dwellings. In general, about two-thirds of burglaries are residential in nature, 2/3rds of all burglaries involve forcible entry, and over half (52 percent) occur during the daylight hours. (U.S. D.O.J 1996).

AUTO THEFT

The crime of auto theft includes unlawful use of a motor vehicle, but not "theft from auto," which is categorized as a larceny. In 1993, the mean number of auto thefts per face-block was .11 with a maximum of 9 in a single face-block. At the block-group level the mean number of auto thefts was 6.43 with a maximum of 34. The frequencies reveal that 92.1% of face-blocks experienced no auto theft in 1993.

Auto theft has many characteristics that make it unique among property crimes. Geographically speaking, rates of auto theft have been found to have very little relationship to the rates of offense of other crimes (Mayhew, 1990).[8] Hence, the etiological theories applying to auto theft may be distinct from the etiological theories applying to other crimes (Clarke and Harris, 1992) and the means of addressing rates of

[8] Specifically, at the micro-level, Messner and Blau (1987) find evidence that while measures of household activities are significantly related to larceny, and burglary, they are not related to auto theft.

auto theft may subsequently need to be distinct from other crime fighting initiatives (Cornish and Clarke, 1986). Furthermore, its causal uniqueness may help us to understand other causes by way of contrast and the relative ease by which auto theft can be isolated and counted results in auto theft being particularly well suited to the development of causal theory.[9]

Another reason for the distinct character of auto theft is that, unlike most personal property, cars move from place to place rather than being preserved behind walls. Potential victims are, therefore, particularly responsible for their risk of theft as they choose where to park their cars.[10] Several researchers have found that areas with heavy traffic and higher rates of activity experience greater rates of auto theft (Flemming et al., 1994; Weigman and Hu, 1992; Brantingham et al., 1991; Martin, 1995) while the department of Justice Bureau of Crime Statistics (1994) purports that 62.7% of motor vehicle thefts occur at night, 12.3% at unknown time, and 25% in daytime hours.[11]

Auto theft is further distinguished from other forms of property crime from the standpoint of who is likely to commit the offense, and the sources of their motivation. More so than other street crime offenses, auto theft offending has long been believed to be concentrated among the socially advantaged. Sanders (1976) typifies what has commonly been believed when he says, "Automobile theft is generally committed by white middle-class youths in groups of two or more, largely for 'kicks'," (94) (See also Schepses, 1961; and Chilton, 1967) and several authors have found a geographic

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[9] Auto theft is the property offense which is most frequently reported to authorities (U.S. Department of Justice, 1996), and there is evidence presented later in this study to indicate that measures of rates of auto theft are far more valid than measures of rates of other types of crime.

[10] In addition, some estimates place the number of vehicles stolen by use of keys to be even higher than 70% (McCaghy, Giordano, and Henson, 1977), and repeat victimization is not uncommon (nearly 25%) (Fleming et al., 1994).

[11] Furthermore, 41.2% of victims describe the behavior they were engaged in at the time of the theft as "sleeping."

relationship between the affluence of an area and its rate of auto theft (U.S. News and World Report, 1996; Cohen, 1981; Britt, 1994). There is also strong evidence that most theft occurs for recreational and short term use rather than for profit[12] (U.S. Department of Justice, 1996; Ogrodnik and Palement, 1992; Clarke and Harris, 1992; McCaghy et al., 1977). Finally, the issue of motivation is made interesting by the findings that a few individuals probably account for a large percentage of total thefts (Fleming et al., 1994; Clarke and Harris, 1992; Collins and Wilson, 1990).

ROBBERY

The Federal Bureau of Investigation's Uniform Crime Report (2003) defines robbery as "the taking or attempting to take anything of value from the care, custody, or control of a person or persons by force or threat of force or violence and/or putting the victim in fear." For the purposes of this study, street robberies (robbery of individuals in outdoor public spaces- about 60% of all robberies), residential robberies (robberies of individuals in a residence- about 10% of all robberies), and commercial robberies are all considered together as one type of crime (FBI, 2003). In the present study, at the face-block level, the mean number of robberies was .08 with a maximum of 9 and 95.2% of face-blocks experienced zero robberies. At the block-group level the mean number of robberies was 4.65 with a maximum of 28.

There is some evidence that robbers are especially concentrated among lower socioeconomic status groups. Wright and Decker (1997) find that most robberies are

[12] One must generalize from these results cautiously as resale of stolen motor vehicles is more active along national borders (Tomb 1985; Miller 1987; Clarke et al., 1991), but for an interior city, like the one in question, it is unlikely that resale of entire vehicles or parts is a common occurrence.

motivated by a pressing need for cash and habitual robbers often experience repetitive financial crises. Robbers also tend to be disproportionately black (about 54% black compared to 28% for burglary, 42% for motor vehicle theft - FBI 2000).

In addition, habitual robbers are said to seldom engage in long range planning, or have a strong commitment to the future, and few are able to maintain long term employment (Wright and Decker, 1997). Indeed, robberies themselves tend to involve relatively little planning and occur relatively spontaneously (Katz, 1988). About one-quarter of robberies are committed by those under eighteen (FBI 2003) and it seems to be an overwhelmingly male crime (approximately 90% of robberies committed by males - FBI, 2000).

Robbers tend to be discouraged by even modest elements of defense, such as having more than one clerk in a store, or locating stores in shopping centers (robbers prefer isolated strores). Pedestrians, gas stations, and convenience stores are more common targets than highly secure places such as banks (Calder and Bauer, 1992) and commercial places that are open late at night are particularly targeted (Wright and Decker, 1997). Individuals who are intoxicated or who otherwise appear to be physically vulnerable, less likely to struggle, and located so as to be unlikely to receive assistance from others are likewise preferred (Wright and Decker, 1997; Miller, 1998). Robberies generally occur between strangers (Hindelang 1976).

Robbery tends to be a more geographically concentrated crime than either burglary or auto theft. The fact that it tends to occur relatively frequently in some areas, while almost never occurring in others may make it particularly well suited to analyses of small units of analysis (Dunn, 1980; Frazee, 1997). Robbery is very much a crime of

urban areas with a rate of 83.2 per 100,000 people in cities of greater than 250,000 people but a rate of only 21.9 in suburban counties and 9.8 in rural counties (FBI 2000). Furthermore, there is evidence that those committing the act prefer to stay in their own neighborhoods relying on their own knowledge of it to avoid detection. Some are willing to travel in search of affluent victims, but many believe that the residents of a city's poorest areas are the most likely to carry cash (Wright and Decker, 1997).

Face-Block Level Variables

ROUTINE ACTIVITIES VARIABLES

Routine activities theory speaks to the presence of such abstract elements as amount of human traffic, day and night time use, lines of visibility, presence of portable items of value, etc. Because direct measures of these abstractions are difficult to acquire some theoretical extrapolation is needed for the case at hand. The land uses detailed in the tax assessor data are considered to be the best available proxy for these concepts. However, a large variety of land uses are available for use as potential variables. Consequently, the logic of the theory and a speculative relationship between the various land uses and elements such as those mentioned above are used to combine some of these land uses together.

The variable *Apartments* includes traditional apartments as well as townhouses and garden apartments. Apartments tend to offer less guardianship than single family homes due to their association with public space. They are frequently associated with greater anonymity, and vehicles are placed outside the immediate supervision of their owners. Furthermore, patterns of foot traffic and proximal living quarters may raise

awareness of potential targets to potential offenders. However, while it is believed that the variable *Apartments* is most appropriately categorized as a routine activities variable, it also has the potential to capture the social disorganization concepts of poverty and mobility. Apartment dwellers are likely to be less affluent than the occupants of single family homes, and their tenure is likely to be shorter. Indeed, it is probably very rare that an apartment resident resides at the same address for more than five years.

Places indicated to be *Offices* or *Industry* are likely to attract large numbers of employees, but would tend not to have as much continual traffic as other commercial areas that depend on an immediately present customer base (e.g., stores, shops, restaurants, bars, and gas stations). Nonetheless, they both generate large numbers of targets, especially, because they both tend to be vacant at night. However, there are a few key differences between the places as well. *Industry* may be more likely to have controlled access to parking areas, *Offices* may be more likely to have more portable targets for theft, and *Industry* may have more of a blue-collar population associated with it. Finally, *Industry* may tend to present more of an appearance of disorder and is generally less desirable as a neighbor, hence, neighbors may be less capable and less invested in providing guardianship to the site.

The measure of the *Number of Hotels and Motels* is an indicator of areas that offer offenders increased opportunities for crime. Both property in rooms and vehicles in parking lots present targets with little guardianship. In addition, the inherent transience of clients inhibits their effectiveness as guardians and increases vulnerability.

The *School* indicator represents areas that are significant largely because of the relatively large numbers of youth that are associated with them. Youth commit a

disproportionate amount of many types of crime (Cohen and Land 1987; Farrington 1986; Greenberg 1976; Hirschi and Gottfredson 1983; Sanders 1976) and may be both relatively vulnerable as targets and less capable guardians of the property of others. *Theaters* similarly represent areas that are likely to attract many youth. In contrast to schools, however, theaters attract large numbers of people after dark.

The *Number of Restaurants and Bars* is a measure of areas that have relatively high amounts of pedestrian traffic at all times of day, and a relatively large number of vehicles present. Roncek and Maier (1991) have found that crime occurs more frequently on blocks with bars or taverns, while Sherman et al. (1989) found that bars and convenience stores account for a large number of the addresses from which calls for assistance are made. Moreover, people are relatively likely to be in the proximity of bars and restaurants in the evening hours and after dark, which are conditions that are conducive to robbery and auto theft.

Number of Vacant Lots is simply a measure of the number of properties which lack a building or structure. Some of these may be undeveloped lots or used as undeveloped parking lots (not a parking deck), or even cemeteries. These places may offer very little guardianship and their presence may also represent disinvestment in an area. However, in areas more distant from downtown this variable is more likely to represent the presence of wooded areas and unzoned property rather than abandoned lots and buildings.

Number of Stores and Shops is a measure of the presence of all direct retail establishments that exist in independent structures except for large discount stores and supermarkets. It includes such things as clothing stores, grocery stores, pawn shops, toy

stores, novelty shops, tanning salons, etc. They provide both targets and high traffic areas. They are distinct from *Restaurants/Bars* in that they are more likely to be vacant of human traffic after dark and because of their less recreational character.

The *Gas Stations/Garage* indicator represents relatively high traffic and numbers of targets, and they offer relative ease of flight after an offense. They also offer high rates of anonymity and are generally considered undesirable neighbors for residents. They may be particularly vulnerable to robbery, because there are typically fewer people around at any one time than at *Stores* or *Restaurants* so that they may have less guardianship.

Number of Shopping Centers is a variable that also includes multi-store locations, supermarkets and large discount stores. These places are distinguished from single store locations in that they promote the traffic of more people, more anonymity, and less direct supervision by commercial personnel. Each location in a shopping center is coded as another instance of a shopping center regardless of its precise use. This multiple count allows for a control on the number of places within them.

The variable *Number of Multifamily Buildings* is a measure for the presence of buildings with more than one household. In practice, these buildings are usually condominiums or duplexes. As with *Apartments* they are likely to have an association with public space alongside personal property, and vehicles are likely to be out of the immediate supervision of their owners. However, residents of these places may be more personally invested in the location, and residential instability may be less than for apartments. Larger numbers of multifamily dwellings have been associated with lower guardianship and higher rates of criminal activity (Roncek 1981; Sampson 1983).

Some of the independent and control variables were fairly skewed in their univariate form, but comparisons of regression models with transformed versus untransformed variables indicated very small differences. For the purposes of simplicity in translation and analysis most independent and control variables were used in their original form. The only exception to this is the *Building Values* variable which is logged. The correlations between each of the independent and control variables can be seen in Table 3. For brevity interpretations of the correlations are left to the reader.

SOCIAL DISORGANIZATION VARIABLES

Distance from the City Center is a measure of how far a face-block is located from the geographic center of downtown. Park and Burgess (1924) and Shaw and McKay (1942) both find that downtown areas tend to be surrounded by socially disorganized areas and that there is subsequently an association between proximity to downtown and higher crime rates. The city under study here seems more aptly modeled as following the concentric zone pattern than as a multi-nucleated or "metropolitan reef" pattern, such as described by Felson (1998:87-88), but seems to have some qualities of both. In addition, Byrne and Sampson (1986) find that population density is related to criminality, and the variable *Distance From the City Center* is also likely to capture this consideration to some extent. *Distance from the City Center* was calculated in miles for each face-block.

Racial Heterogeneity is a measure of differences in the ratio of racial composition of a face-block. Some authors propose that racial composition has an independent association with crime rates in that population heterogeneity is an indicator of the extent

to which the residents of an area prescribe to a common set of norms and values, and it often leads to lower levels of social cohesiveness. Lower cohesion and a greater potential for cultural conflict may interfere with the transmission of, or enforcement of, norms and values (Bursik 1986; Byrne and Sampson 1986; Kornhauser 1978; and Miethe and Meier 1994). *Racial Heterogeneity* is calculated by the proportion white times the proportion black in a face-block. ([whites / total population] * [Blacks / total population]) (following Miethe and McDowall 1993). The alternative variable, *Percent Black* was also considered, but despite being highly associated with local crime rates it was excluded from analysis. *Percent Black* was extremely collinear with several of the other demographic variables including *Single-Parent Households* and the socioeconomic indicators. Similarly, this variable is less theoretically consistent with the work of Shaw and McKay.

Single Parent Households is a measure of the estimated number of households on a face-block headed by only a single adult. Recent social disorganization theory has highlighted the importance of this variable as a measure of social control (e.g., primarily, single parents are less able to control their teenage offspring, but the presence of single parent households also may decrease social control in other general ways - Felson and Cohen 1981; Sampson and Lauritsen, 1990) and as an indicator of social class (single parent households are economically less well off then dual parent households -- Reiss 1986; Shaw and McKay 1942).

A large percentage of places considered to be *Institutions* are religious-affiliated structures. However, the category also includes other non-profits such as hospitals, park buildings, fire stations, etc. Institutions may differ from other land uses in that their

presence may be an indicator of social organization and their clientele may act as effective local guardians. The presence of religious institutions, particularly, may be a sign of strong social capital. However, while this variable is viewed primarily as a social disorganization it has some potential to represent elements of routine activity. Institutions may still represent the presence of potential targets especially since they tend to be vacant at night.

Finally, as a measure of poverty in an area, the A*verage Building Values* are measured. This variable provides an approximate measure of the socio-economic status of the residents of an area and the quality of commercial services. Consequently, it is considered to be primarily an indicator of social disorganization. However, there may also be a routine activities interpretation of this variable as higher values may be associated with more desirable and more prolific targets for crime (some prior research has provided evidence for this relationship - Gould 1969; Mansfield et al., 1974; Miethe and Meier 1994).[13] Because very large buildings tend to disproportionately skew the distribution, this variable was used in its logged form. It was also treated as an average value for the properties on a face-block rather than a sum.

STATISTICAL CONTROL VARIABLES

Some addresses are the location of several households, businesses, offices, etc. For example, an independent home would only be "one place" but an apartment building may contain hundreds of "places." Since a location with multiple "places" in it is more

[13] Social disorganization theory and routine activities theory seem to propose opposite directions of influence for this variable. Therefore, there was speculation as to whether its results may be curvilinear in effect, with very high, and very low value buildings contributing more to street crime than midrange values. Some initial tests were conducted with a categorical version of the variable to test for this possibility, but results did not prove to be substantively different from the continuous form of the variable.

likely to be the scene of a crime than a location with only one "place," the control variable *Number of Places* to standardize for variation in places. The addition of this variable adds a standardizing function so that face-blocks of varying lengths or those simply classified into differing numbers of addresses are not biased in the assessment of their relative proportion of auto thefts.

The second control variable used is the *Population* of the face-blocks. This variable is an indicator of the number of people who reside on a particular face-block as estimated from the 1990 census. When each side of a face-block is in a different census block, each block population count was divided by four, and summed for each face-block. If three census blocks were adjoining a face-block, the value was estimated to be one-sixth of the total (two of twelve "sides" of the census blocks). For those few with four adjoining census blocks, one-eighth (two of sixteen) of the total was used. Subsequently, numerous individual face-blocks were examined on the digitized street maps and the estimates were deemed reasonable. Nonetheless, some error is introduced by this estimation procedure, but the error should be random in nature. By controlling for population we control for biases similar to those created by the presence of multiple places, but the population of a place is also expected to have a guardianship effect, as more people means more "eyes on the street."

Number of Owner Occupied Places is used as an indicator of guardianship or parochial control. Thus, both social disorganization and routine activity theory lay claim to this variable and it is offered here as representing both theories. Owners have a greater vested interest in their property and the surrounding neighborhood, so it is presumed that

they are more likely to report or take action against offenders and potential offenders than non-owners (Miethe and Meier 1994).

Table 2.1 Face-block Descriptive Statistics

Variable	Mean	Standard Deviation	Maximum Value	IQR
Dependent				
Burglary	0.37	1.07	17	1
Auto Theft	0.11	0.45	9	0
Robbery	0.08	0.44	9	0
Controls				
# Places	13.89	22.74	496	19
Population	47.55	97.99	1127	40
Owner Occupied	5.86	6.77	120	12
Routine Activities				
Store/Shop	0.06	0.43	11	0
Shopping Center	0.16	2.06	109	0
Restaurant/Bar	0.06	0.41	16	0
Multifamily	0.7	2.39	50	0
Office	0.28	1.63	48	0
Theater	0.0015	0.05	3	0
School	0.01	0.11	4	0
Hotel/Motel	0.01	0.15	9	0
Gas Station/Garage	0.05	0.41	16	0
Industry	0.16	0.9	21	0
Vacant Lot	0.51	1.35	32	1
Apartments	0.97	5.53	220	0
Social Disorganization				
Distance from Capital	4.15	2.29	9.7	1.876
(ln)Building Value	2.14	1.4	15.31	1.257
Heterogeneity	0.07	0.07	0.25	0.119
Institution	0.03	0.22	5	0
Single Parent Homes	1.41	2.81	27	1.667

Block-Group Level Variables

Social disorganization is considered to be a relatively macro-level phenomenon as motivation is assumed to be the product of forces at a neighborhood level and potential offenders may disperse outward from their places of residence. Routine Activities theory similarly has a macro-level element in that attracting large numbers of people to a location may familiarize them with the larger neighborhood and its opportunities for crime (Brantingham and Brantingham, 1984).

At the block-group level, *Number of Places*, *Population, Owner Occupied*, *Institution*, and *(ln)Building Value*, are all simple aggregations up from the face-block level. Meanwhile, *Heterogeneity* is calculated in the same manner as at the face-block, but simply on a grander scale. Therefore, these variables will not be discussed in any further detail here. However, there are three variables for each theory which are unique to this level of analysis. These variables were created for two reasons. First, census data are available at the block-group level which is not available at the face-block level. Despite its lack of parallel data at the face-block level, these data's value as an indicator of social disorganization justifies its inclusion.

Second, some of the face-block level variables created multicollinearity issues when they were directly aggregated. This issue was resolved by combining several variables into indexes. A maximum likelihood (promax) factor analysis yielded five factors, the first three of which seemed to represent discrete clusters of land uses. Z-scores were taken of those variables with loadings greater than .4 and they were averaged to form the new variables to be defined below. Variables that did not load together continued to be used in the model independently.

ROUTINE ACTIVITY VARIABLES

Land Use One is an index variable consisting of the aggregated mean z-scores of *Shopping Centers*, *Offices, Restaurants,* and *Motel/Hotel*. All of these variables are also entered in the model as face-block level routine activities variables and, generally, smaller units are considered better indicators of routine activity variables since they are dependent on awareness space (i.e., that space that a person visits regularly and is generally familiar). However, these land uses may also influence a potential offender's perceptions of the larger area. The *Land Use One* variable seems to represent places frequented by more affluent clientele and, therefore, it may be an indicator of target attractiveness. A potential offender may react to a known clustering of attractive targets in a wider area as opposed to known opportunity at a specific address.

The variable *Land Use Two* is an index of mean z-scores for the aggregated variables *Industry*, *Vacant Lot*, *Gas Station/Garage*, and *Stores*. These land uses tend to be relatively less desirable neighbors than the *Land Use One* variable and possess more of a "utilitarian" character rather than a more affluent, leisure oriented character. *Land Use Two* may, therefore, be more associated with a "diffusion of target awareness" effect than a target seeking effect. That is, an offender may achieve familiarity with a broad area through visiting specific locations within it, and this may translate into higher risk for the entire broader area (Brantingham and Brantingham, 1984).

Apartment/Multifamily is an index variable consisting of the aggregated mean of the z-scores of *Apartments* and *Multifamily Homes*. This factor is clearly associated with the residential aspects of routine activity. The locations of these places may be

associated with crime both through their attractiveness as targets and through the human traffic with which they are associated. However, their clear relationship to mobility also provides a potential social disorganization interpretation for its results.

SOCIAL DISORGANIZATION VARIABLES

"Socio-Economic Status" (*SES*) is an index variable composed of the mean z-scores of eight census variables. These variables are "Percent of People Age 16-19 Who Are Not in School", "Percent of Civilian Labor Force that is Unemployed", "Percentage of Households that Receive Public Assistance", "Percent Without High School Diploma", "Percentage of Households with No Income", "Percentage of Households with Families Making Less than $12,500 Annually", "Percentage of People Below Poverty Level", and "Percentage of People without Professional or Professionally-Related Jobs." This variable is intended to capture the "poverty" aspect of social disorganization theory.

"*Same Home 5 Years*" is a census variable recording whether a resident was living at the same address for the previous five years. This variable is intended to capture the level of residential mobility in an area, another major aspect of social disorganization.

"*Family Disruption*" consists of the mean z-scores for the variables "Rate of Female Headed Households with Child" and "Divorce Rate." An extensive literature documents how levels of family disruption in a community is influential on levels of social organization (e.g., Sampson 1986; 1987; Shaw and McKay 1969).

Table 2.2 Block-Group Descriptive Statistics

Variable	Mean	Standard Deviation	Maximum Value	IQR
Controls				
Places	782.32	817.74	3885	1726
Owner Occupied	323.47	371.31	2014	837
Routine Activities				
Residential Land Use	-0.29	0.64	3.21	1.032
Land Use One	-0.33	0.61	2.29	0.641
Land Use Two	-0.19	0.71	3.34	0.666
Social Disorganization				
Institution	2.12	2.36	13	3
SES	0.16	0.78	2.84	0.465
Heterogeneity	0.09	0.08	0.25	0.1
Same Home 5 Years	0.43	0.18	0.9	0.26
Family Disruption	0.11	0.95	4.79	0.788
(ln)Building Value	0.08	0.24	2.68	0.031

Table 2.3 Bivariate Correlations

6	5	4	3	2	1	RAV
						FB Var
-.100	-.027	.329	.385	.422	1.00	1
-.071	-.012	.335	.423	1.00		2
-.104	-.034	.243	1.00			3
.229	.052	1.00				4
.070	1.00					5
1.00						6
						7
						8
						9
						10
						11
						12
						13
						14
						15
						16
						17
						18
						19
						20
						21
						22
						23
						BG Var
						24
						25
						26
						27
						28
						29
						30
						31
						32
						33
						34

Face-block Variables

Dependent

1. Auto Theft
2. Burglary
3. Robbery

Controls

4. # Places
5. Population
6. Owner Occupied

Routine Activities

7. Store/Shop
8. Shopping Center
9. Restaurant/Bar
10. Multifamily
11. Office
12. Theater
13. Institution
14. School
15. Hotel/Motel
16. Gas Station/Garage
17. Industry
18. Vacant Lot
19. Apartments
20. Distance from Capital

Social Disorganization

21. (ln)Building Value
22. Heterogeneity
23. Single Parent Homes

Block-group Variables

Controls

24. Places
25. Owner Occupied

Routine Activities

26. Apartment/Multifamily
27. Land Use One
28. Land Use Two

Social Disorganization

29. Institution
30. SES
31. Heterogeneity
32. Same Home 5 Years
33. Family Disruption
34. (ln)Building Value

21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	VAR
															FB Var
-.126	-.108	.259	.109	.233	.329	.200	.110	.112	.048	.101	.047	.265	.122	.198	1
-.169	-.171	.234	.110	.184	.243	.219	.126	.193	.086	.165	.083	.272	.170	.228	2
-.081	-.145	.129	.093	.097	.259	.245	.085	.145	.114	.097	.025	.287	.246	.183	3
-.324	.092	.469	-.018	.076	.036	.185	.026	.023	.013	.110	.116	.154	.106	.011	4
-.050	.267	.021	-.056	-.060	-.043	-.025	-.016	-.037	-.015	-.031	-.026	-.025	-.040	-.055	5
-.348	.184	-.147	.004ns	-.113	-.076	-.039	-.036	-.072	-.027	-.052	-.123	-.017	-.006ns	-.085	6
-.028	-.096	-.018	.086	.125	.244	.044	.094	.084	.087	.096	-.016	.206	.119	1.00	7
-.054	.041	-.001ns	.071	.084	.125	.073	.043	.086	.184	.063	-.014	.294	1.00		8
-.054	.017	.072	.081	.098	.343	.127	.113	.110	.199	.104	.021	1.00			9
-.134	-141	-.027	.036	-.019	-.015	-.014	-.002ns	.037	-.002ns	-.019	1.00				10
-.050	-.016	-.007ns	.039	.074	.318	.041	.262	.181	.006ns	1.00					11
-.007ns	-.009	-.009	.012	.015	.058	.065	.020	.052	1.00						12
-.014	-.087	-.006ns	.114	.049	.323	.010	.420	1.00							13
-.008	-.018	-.003ns	.021	.037	.546	.001ns	1.00								14
-.015	-.009	.040	.020	.045	.058	1.00									15
-.035	-.045	-.020	.146	.308	1.00										16
-.013	-.086	.003ns	.162	1.00											17
-.027	-.074	-.043	1.00												18
-.150	-.015	1.00													19
-.012	1.00														20
1.00															21
															22
															23
															BG Var
															24
															25
															26
															27
															28
															29
															30
															31
															32
															33
															34

34	33	32	31	30	29	28	27	26	25	24	23	22	VAR
													FB Var
.024	.135	-.036	.070	.164	.052	.097	.045	.084	-.094	-.010	.079	.080	1
.069	.196	-.051	.062	.231	.053	.062	.015	.085	-.131	-.039	.155	.074	2
.059	.203	-.040	.060	.247	.068	.070	.035	.030	-.115	-.057	.085	.047	3
-.057	.003ns	-.156	.037	-.018	.027	-.013	.044	.177	.058	.180	.103	.085	4
-.115	-.059	-.198	-.004ns	-.085	-.027	.036	.023	.129	.211	.217	.640	.107	5
-.098	-.104	.004ns	-.032	-.195	.019	-.071	.031	.034	.237	.196	.001ns	-.032	6
.027	.143	-.019	.058	.097	.069	.180	.063	-.058	-.083	-.071	-.044	-.014	7
-.010	-.006ns	-.012	-.004ns	-.021	.007ns	.022	.110	-.026	-.005ns	.009	-.034	-.001ns	8
-.014	.017	-.029	.023	-.015	.026	.084	.139	.013	-.003ns	.035	.004ns	.038	9
.027	.052	-.066	-.025	.104	.022	-.043	-.084	.119	-.100	-.043	.065	.094	10
.007	.033	-.006ns	.050	-.012	.055	.080	.121	-.049	.019	.023	.008	.006ns	11
-.001ns	.008	-.014	.007	.013	.029	.037	.053	-.008	-.009	-.005ns	-.012	-.002ns	12
.028	.064	.013	.010	.080	.127	.023	.003ns	-.023	-.062	-.052	-.020	-.007	13
.000ns	-.022	.055	-.016	-.019	.048	-.014	-.024	-.038	-.009	-.032	-.014	-.015	14
-.006ns	-.012	.013	.034	-.012	.023	.060	.129	-.025	-.002ns	.007	-.024	.005ns	15
.014	.041	.033	.043	.016	.053	.137	.062	-.051	-.040	-.043	-.034	-.012	16
.036	.065	-.006ns	.086	.040	-.003ns	.176	.058	-.045	-.090	-.059	-.043	-.023	17
.039	.103	.000ns	.050	.120	.020	.140	.018	-.026	-.096	-.070	-.030	.011	18
-.013	.079	-.075	.017	.104	-.052	-.037	-.047	.139	-.054	-.007	.166	.009	19
-.349	-.378	-.269	-.011	-.571	-.034	.076	.206	.053	.673	.554	.037	.011	20
.090	-.019	.011	-.006ns	-.009	.017	.051	.013	-.083	-.048	-.052	-.106	-.024-	21
-.036	.090	-.254	.576	-.010	.114	.198	.091	.162	-.007ns	.113	.176	1.00	22
-.062	.225	-.102	.081	.202	.034	.020	-.018	.150	.042	.088	1.00		23
													BG Var
-.296	-.197	-.434	.153	-.243	.108	.171	.344	.620	.779	1.00			24
-.297	-.282	-.135	-.036	-.365	.015	.106	.236	.240	1.00				25
-.172	.004ns	-.474	.196	.143	.145	.042	-.017	1.00					26
-.137	-.029	-.131	.239	-.171	.273	.585	1.00						27
-.093	.158	-.207	.414	.050	.298	1.00							28
-.101	.114	-.120	.215	.126	1.00								29
.131	.681	.041	.042	1.00									30
-.036	.208	-.371	1.00										31
.050	-.075	1.00											32
.075	1.00												33
1.00													34

CHAPTER III :

HYPOTHESES AND PROCEDURE

Specific Hypotheses

As previously stated, the primary hypotheses of this study are that:

1) Each routine activity variable will contribute to the explanation of variance for each of the crimes.

2) Each social disorganization variable will contribute to the explanation of variance for each of the crimes.

3) Social disorganization at level two will interact with level one land uses so that variables representing high levels of opportunity at level one will generate more crime when they are located in level two areas with high levels of social disorganization. (e.g., for robbery, the presence of a gas station on a face-block will be more criminogenic if the face-block is located in a low SES block-group).

4) Routine activities variables at level two will interact with both routine activities variables and social disorganization variables at level one. They will interact with social disorganization as they represent opportunity in proximity to social disorganization, and they will interact with routine activities as the high traffic associated with a block-group level will generate greater target awareness at the face-block level.

However, based on the specifics of the theoretical model and past tests of interactions between the relevant theories, several more specific hypotheses have also been formed. These hypotheses are categorized by variable type and are listed below:

ROUTINE ACTIVITY

5) Routine Activities theory is primarily a theory of opportunity and guardianship in micro-level environments. Therefore, all the routine activity variables are likely to be stronger at level one than level two.

6) Auto theft is particularly affected by the presence of major thorough-fares and high traffic areas (Brantingham, Brantingham, and Wong 1991; Flemming et al., 1994; Martin 1995; Weigman and Hu, 1992), so it is particularly likely to have a *Land Use Two* effect as well as a *Number of Places* effect.

7) On the other hand, burglary depends on stealth to a great degree, so burglaries may tend to occur away from areas characterized by high rates of human traffic (Hakim and Shachmurove 1996; Wright and Decker 1994; Farrell, Phillips, and Pease, 1995). This does not necessarily mean there is likely to be a negative relationship with *Land Use Two* because these land uses will still generate familiarity with an area and be associated with desirable targets, but the relationship will at least be likely to be weaker than with the other two crimes.

8) Several authors have found that large communal and public parking facilities seem to be associated with auto theft (Rice and Smith, 2002; Barclay et al., 1996; Brantingham et al., 1991; Felson 1998; Fleming et al., 1994; Geason and Wilson, 1990; Hope, 1987; Mancini and Jain, 1987; NRMA Insurance Limited, 1990; Saville and Murdie, 1988; Webb, Brown, and Bennett, 1992). Hence, variables such as *Apartment*, *Multifamily*, and *Shopping Center* should be particularly strong predictors of this crime.

9) Places with individuals around after dark such as *Restaurants/Bars* (Stark, 1987; Sherman et al., 1989; and Roncek and Maier, 1991) and *Hotels/Motels* may be particularly prone to street robberies while places without any potential night time victims such as *Offices*, *Industry*, and *Stores* may have less robbery (Wright and Decker, 1997). *Shopping Centers* may similarly have less of an influence due to their large size making them a less controllable environment (Wright and Decker, 1997; Miller, 1998). Meanwhile, *Gas Stations* will likely be a major contributor due to the fact that they are small, offer easy escape routes and are usually open 24 hours (Calder and Bauer, 1992; Wright and Decker, 1997).

SOCIAL DISORGANIZATION

10) All of the social disorganization variables are likely to be more powerful predictors at Level-Two than Level-One. The theory was originally designed to

be one of a more macro nature, speaking to the general milieu of zones of a city rather than to small groupings of addresses.

11) The *Distance from Capital* variable and its interactions played a major role in the research of Rice and Smith (2002) and Smith et al., (2000). As in these works, the variable may continue to have a negative effect on crime here, but the characteristics of the block-groups will likely capture many of the contextual effects previously relegated to this variable. That is, by controlling for the larger context's character through the introduction of block-groups as a unit of analysis, this study effectively controls for many of those factors normally associated with the concentric zones that the *Distance from Capital* variable is designed to capture. Thus, the effects of this variable are expected to be diminished compared to past studies. This hypothesis is similarly supported by the reversal of sign of the *Distance from Capital* Variable seen in both these previous studies when autocorrelational controls are added to the models.

12) Following Rice and Smith 2002, Tittle and Meier 1990, Nuehring 1976 and Albrecht 1981, *SES* is not expected to be strongly related to auto theft as it is to the other crimes.

13) The building values, single parent households, and heterogeneity face-block variables' influence may be particularly diminished from past studies in that SES

may be more precisely specified with the block-group level variables than with these face-block level measures.

14) Robberies may be particularly prone to social disorganization variables as Lenz reports that between 1965-1975, 44% to 48% of commercial robberies occurred within a relatively short distance from where the robbers live (see also Wright and Decker, 1997). However, there is little corresponding data for the crimes of auto theft or burglary.

CROSS-LEVEL INTERACTIONS

15) Results of Rice and Smith (2002) indicate that when two very strong predictors of the same crime occur together, they might not generate as much crime as when they occur separately (i.e., they have less than an additive effect). This is due to there being a "redundancy" in effect whereby the two variables overlap conceptually or empirically such that in combination one essentially can substitute for the other. The consequence of this is that some interactions between the most powerful positive predictors of a crime may have negative signs. Some potential cases of redundancy effects may occur in interactions such as those between *Shopping Center* and *Land Use Two* for the crime of auto theft; *Gas Station/Garage* and *SES* for robbery, or *Number of Places* and *Land Use One* for burglary. However, it is difficult to predict which interactions will in fact generate redundancy in effect until it is discovered which variables will be tested for interactions and what the most powerful predictors turn out to be.

Procedure

As detailed above, different crimes are likely to demonstrate different patterns of dispersion and be affected by diverse ecological factors. Therefore, each of the three crimes examined within this study are treated independently in the analysis. Hence, the procedures described below are each repeated three times, yielding findings unique to each crime in question. In all cases, all Level-One variables are group-mean centered and all Level-Two variables are grand-mean centered.

Within the HLM software package an initial model is executed with all Level-One (L1) variables having "fixed" error terms. At this point, variables with insignificant slopes are dropped from the model. It is empirically possible for variables that have insignificant main effects to be involved in significant interactions, but there is no specified theoretical reason for that to be the case in this model. Furthermore, the size of the model has detrimental effects on the reliability of the slopes and the tolerance of some particular measures, so there was some advantage to not pursuing the exploratory testing of these particular interactions.

Next, a decision needs to be made as to which L1 variables should be allowed to have "unfixed" error terms. That is, it must be decided which face-block variables are going to be tested for the possibility of a higher level contextual effects. This decision is typically made by an examination of a chi-square test of significance for the variance in the slope of each L1 variable across Level-Two (L2) units. However, the presence of inappropriately unfixed effects can suppress the significance of other effects with the model. Therefore, a single model could not be used to accurately assess which of these

variables should have fixed effects. Hence, preliminarily, one model is estimated at a time with only one variable in each model free to vary (i.e., an independent model is estimated for each of the main-effect independent variables within it). Those that have significantly different slopes in the individual models, thus demonstrating a Level-Two influence on their slopes, are then allowed to simultaneously vary in a full model.

For each of the three crimes, the results of the model with multiple freely varying error terms had several slopes that are insignificantly different despite having been significantly different when they were the only variable with an "unfixed" error term. These variables are subsequently fixed in later models. Similarly, some variables developed insignificant slopes after the error terms are adjusted for Level-Two influences. If these variables do not return to significance when the other variables in the model with insignificant slopes are fixed or when they themselves are fixed, then they are dropped from the model.

Finally, those L1 variables that have significant variance in their slopes (thus indicating the presence of a macro-contextual influence) are eligible for multilevel interactions (i.e., they may be used in the calculation of the cross-product terms entered into the model). Every significant block-group level variable is then tested for a potential interaction with these "unfixed" L1 variables. However, the simultaneous introduction of all interactions to the model containing the main effects would have constituted a massive addition of variables to the model. Since, variables with statistically insignificant effects are likely to increase issues of multicollinearity and affect the slopes and significance of other variables in the model, a systematic method is sought to determine an order for entry into the model. Statistical significance, and the magnitude of the standardized slope

is traditionally used to guide this procedure as the inclusion of the largest slope coefficients maximizes the explanatory power of the model and identifies those interactions which are substantively the most significant.

However, HLM software does not have the capability of selecting variables for inclusion on these criteria. A cumbersome manual procedure involving testing all possible orders of entry could be executed, but the differences between HLM and OLS is typically minor in regard to simple models (Bryk and Raudenbush 1992). Therefore, the task of eliminating variables is accomplished through the use of forward entry Ordinary Least Squares regression in SPSS. Forward entry regression maximizes the number of significant interactions in a model by entering the interactions in order of the size of their standardized coefficients. It proceeds down through the list of potentials to subsequently add all variables that achieve statistical significance.

The order of entry proposed by this Ordinary Least Squares procedure is then used in the entry of multilevel interactions within the HLM software. Beginning with the first variable selected in this procedure one multilevel interaction variable is entered into the model at a time. If the variable is significant it remains in the model while subsequent interactions are tested for significance, but if it fails to achieve significance it is removed in subsequent models so as not to interfere with the successful entry of later interactions.

CHAPTER IV :

FINDINGS

Burglary

FACE-BLOCK LEVEL

Table 4.1 presents the parameter estimates for the HLM burglary rate Model. The face-block level routine activities variables include *Industry*, *Multifamily Dwelling*, *Office*, and *Single Store*, while the social disorganization variables that are significant for burglary include *Heterogeneity*, and *Institution*. The control variable *Number of Places* is also significant. All seven of these variables have positive effects on rates of burglary on the face-blocks in which they are located. The model accounts for 39.8% of the explainable variance at the face-block level.[14]

[14] The variance in burglary is roughly three times its mean (.37 and 1.14 respectively). This ratio indicates that an extra-poisson or "over-dispersion" regression may be a better fit to the distribution of the data than a regular poisson model. However, a rough comparison between these two types of models reveal very few differences, the primary being that the heterogeneity variable and the interaction between Industry and Family Disruption becomes insignificant.

Table: 4.1: Final Estimation of Fixed Effects on Burglary, Poisson Regression

Fixed Effect	Coefficient	IQR Effect[15]	Degrees of Freedom	P-Value
Face-block Slopes				
Industry	0.350902	0.350902	131	.000
Multifamily	0.044791	0.044791	7170	.003
Office	0.066423	0.066423	7170	.001
Shopping Center	0.418563	0.418563	131	.000
Store	0.232608	0.232608	7170	.005
Heterogeneity	4.241492	0.504738	7170	.000
Institution	1.063415	1.063415	131	.000
# Places	0.037525	0.712975	132	.000
Block-group Effects				
Average Building Value	0.619387	0.019201	128	.014
Low SES	0.471762	0.219369	128	.000
Family Disruption	0.151885	0.119685	128	.140
Owner Occupied	-0.001065	0.891405	128	.000
Block-group Effects on Face-block Slopes				
Family Disruption * Industry	-0.051304	-0.051304	131	.046
Low SES * Institution	-0.485542	-0.485542	131	.000
Low SES * Shopping Center	-0.319820	-0.319820	131	.000

Face-Block n:	7,186	% of Overall Variance Explained:	41.14%
Block-Group n:	133	% of L1 Variance Explained:	39.80%
Deviance:	18155.61[16]	% of L2 Variance Explained:	51.52%
		% of Variance that Occurs at L1	89.54%
		% of Variance that Occurs at L2	11.46%

[15] The effects are compared using the IQR of each independent variable as they have different metrics and distributional skewing would render more traditional standardized coefficients to be misleading. If because of extreme skewness an IQR was zero (as was the case for most of the count variables), the value of one was substituted, indicative of one of the units in question (e.g., one store, restaurant, vacant lot, industry, etc.).

[16] The Deviance, Percent of Overall Variance Explained, Percent of L1 Variance Explained, and Percent of L2 Variance Explained are all based on a linear rather than a poisson model. They are, nevertheless, included here as poisson models do not provide corresponding estimates of explained variance.

These findings of positive coefficients are in harmony with predictions of routine activities theory, as each variable is an indicator of target attractiveness and low guardianship. Similarly, social disorganization theory would predict that face-block *Heterogeneity* would be associated with higher burglary as it may interfere with the establishing of the local network connections crucial to socialization and control. However, the positive effect of the presence of *Institution* is less expected. One might be tempted to interpret this result to mean that the presence of institutions is more an indicator of potential targets for burglary than it is a representative of the strength of social networks and public investment. Institutions may be particularly attractive targets in that they are usually empty at night and are unlikely to have night watch-persons.

However, interpretation of this sign must also consider that the model contains a multilevel interaction with *Low SES,* which has a negative relationship with burglary. Apparently, *Low SES* does not generate as much burglary at the block-group level in the presence of institutions. Institutions may simply represent a potential target in highly socially organized neighborhoods, but in disorganized neighborhoods, their potential as a target may be lessened as a crime-enhancing factor by the social control that they provide to the area. Therefore, institutions do seem to have the negative effect on burglary that was hypothesized, but this relationship is mediated by its relationship with the socio-economic status of the area.

BLOCK-GROUP LEVEL

In the above model, the block-group level variables *Average Building Value*, *Owner Occupied*, and *Low SES* are significant predictors of burglary. *Family Disruption*

is also included in the model because it was positive and statistically significant until the introduction of the interaction terms. Together, these variables account for 51.52% of the explainable variance at the block-group level. As expected, *Low SES*, is associated with higher levels of burglary. Similarly, the presence of *Owner Occupied* dwellings is associated with less burglary. However, the *Average Building Values* variable has a positive influence on burglary when a negative effect was expected.

Social disorganization theory might presume that higher building values would be associated with wealthier residential areas and more affluent businesses. It appears, however, that this variable may actually be a better indicator of the routine activities' element of target attractiveness. That is, potential burglars may be traveling in search of targets and may find higher value homes and businesses to be more attractive. This hypothesis leaves unanswered the question of why this variable is not significant at the face-block level, but it may be that potential burglars target neighborhoods for burglary rather than particular establishments. That is, face-blocks with high average building value may not be enough to attract potential offenders to an area in search of a target, but a whole neighborhood of relatively high value buildings may be.

CROSS-LEVEL INTERACTIONS

A model without multilevel interactions (not shown) indicates a Deviance of 18145.91. The inclusion of the interactions increased the fit of the model by approximately 10 points on this statistic. Alternatively, a model without interactions explains 41.07% of the total explainable variance, or about .07% less variance that the full model.

When testing for a significant difference in slopes for each of the L1 variables across L2 units, HLM software calculates chi-square significance based on a sample of 30 block-groups (out of 133). The reduced sample size occurs due to there being insufficient observations available for all of the L2 variables within each block-group.[17] Nonetheless, the results in Table 4.1 based on these 30 cases indicate that *Industry*, *Institution*, *Shopping Center*, and *Number of Places* are significantly affected by their block-group context.[18] These four variables are tested for interactions with the four significant block-group level variables. The resulting sixteen interactions yield nine[19] that are simultaneously statistically significant in a forward-entry OLS regression when there is a minimum tolerance criterion of .25. However, only three remain simultaneously significant in the HLM model: *Institution* * *Low SES*, *Shopping Center* * *Low SES*, *Family Disruption* * *Industry*.

It has already been pointed out that the benefits derived from the presence of an *Institution* on a face-block may be contingent on the *Low SES* of its block-group. However, it also appears that the positive influence of *Shopping Centers* may fail to be as great when in a low SES neighborhood. Rather than a multiplicative effect occurring with the presence of both motive and opportunity, what more accurately may be

[17] Note that while the significance of the variance in slopes is based on this reduced sample, the significance of the slopes themselves is based on the full sample of cases. Furthermore, alternate models which inflated the sample size by alternately fixing more of the error terms in the model did not indicate any discernable reliability issues.

[18] *Shopping Center* and *Number of Places* had significant positive relationships with burglary before the introduction of the interaction variables, so they were tested for cross-level interactions despite the main effect of the variables becoming insignificant in the final model. *Shopping Center* remained in the model because of its involvement in an interaction, but *Number of Places* was dropped from the model after it failed to appear in any interactions.

[19] These nine variables include *Low SES* * *Number of Places*, *Low SES* * *Shopping Center*, *Low SES* * *Institution*, *Family Disruption* * *Shopping Center*, *Building Value* * *Industry*, *Building Value* * *Institution*, *Family Disruption* * *Number of Places*, *and Family Disruption* * *Industry*. The interaction between *Low SES* * *Shopping Center, Family Disruption* * *Shopping Center,* and *Building Value* * *Institution* have negative slopes, while all the others have positive slopes.

occurring is a redundancy effect. That is, shopping centers may be large enough that they not only provide opportunity, but also represent an independent significant draw of potential offenders. Hence, *Shopping Centers* in a *Low SES* area may not contribute to increased levels of burglaries on a face-block as much as in other areas, as offenders are present at these locations regardless of the presence of *Shopping Centers*. This interpretation is supported by the fact that similar effects are not observed for land uses which are less likely to draw large numbers of people from as distant a space (e.g., S*ingle Stores*, R*estaurants*, O*ffices*, etc.).

The evidence that a redundancy in effect is occurring is still weak, however. Alternatively, shopping centers in low SES neighborhoods may discourage burglary in these areas in that they may have higher levels of security, or they may increase the number of people present in the area day and night (whereas other areas have fewer "eyes on the street"). These alternative processes may be consistent with what has been found in regard to a "diffusion of benefits model," whereby increased security at one location creates a general decrease in crime across a larger space. Such effects may occur by altering offender's general perceptions of risk, or general assessments of relative effort and reward (Painter and Tilley, 1999; Poyner, 1991; Hesseling, 1994).

Similarly, *Industry* does not appear to have as negative an effect when it occurs in the presence of block-group level *Family Disruption*. This is a substantively small effect, but there are no immediate logically sound explanations for this phenomenon. Before the introduction of the interaction to the model, *Family Disruption* has a statistically significant, positive effect on burglary, so the introduction of the negative interaction combined with the loss of significance of the main effect variable amounts to an effective

change of sign for the net effect of family disruption. Possible explanations that have been entertained include:

- Industrial sites often have security guards and this may be discouraging crime by uncontrolled youth in the area, and the previously mentioned "diffusion of benefits" may be taking place. However, industry would then be likely to have a negative effect everywhere, not just where there are single parent homes.
- There may be a redundancy effect whereby the combination of two criminogenic effects do not produce as much crime together as they do independently. Industry may be a sufficient attractor of target seeking burglars that may actually create motive and opportunity, but the motive may already exist in areas of family disruption. This explanation is weak, however, as the main effect for family disruption is insignificant.
- It may be that unsupervised youth in an area of family disruption are actually committing the crimes, but juveniles may be more comfortable targeting homes than large corporate sites and the presence of industry may take up space that could be filled with homes. This explanation also appears weak because the main effect for family disruption is insignificant. Apparently singe parent kids are not targeting anyone anymore than any other population.

An alternative explanation that may hold is that areas with both large amounts of industry and single parent homes are probably some of the least desirable places of residence in the city. Therefore, mobile, target seeking, potential burglars may shy away from these areas on the presumption that there are few targets there of value.

Auto Theft

FACE-BLOCK LEVEL

Table 4.2 presents the parameter estimates for the HLM auto theft rate model. The face-block variables in the model account for 36.5% of the explainable variance at Level One. Before multi-level interactions are introduced, the significant face-block level routine activities variables include *Apartments*, *Gas Station/Garage*, *Industry*, *Multifamily Dwelling*, *Restaurant* and *Shopping Center*, while the significant social disorganization variables for auto theft include *Heterogeneity* and *Institution. Number of Places* was the sole significant control variable. The *Shopping Center* main effect variable, however, becomes insignificant when its interaction with *Low SES* is introduced. All of these nine variables are associated with greater amounts of auto theft. These results are theoretically consistent in all cases except that for *Institution*. As with the case of burglary, it seems that the presence of institutions may be more of an indicator of increased opportunity rather than social organization.

Table: 4.2: Final Estimation of Fixed Effects on Auto Theft, Poisson Regression

Fixed Effect	Coefficient	IQR Effect[20]	Degrees of Freedom	P-Value
Face-Block Slopes				
Apartment	0.019442	0.019442	131	.001
Gas Station/Garage	0.843869	0.843869	132	.000
Industry	0.332164	0.332164	130	.000
Multifamily	0.034155	0.034155	7168	.001
Restaurant	0.304037	0.304037	7168	.000
Shopping Center	0.028171	0.028171	131	.455
Heterogeneity	2.327156	0.276932	132	.003
Institution	0.525757	0.525757	7168	.000
# Places	0.020925	0.397575	132	.000
Block-group Effects				
Apartment/Multifamily	0.331573	0.342183	128	.000
Land Use 2	0.416713	0.277531	128	.000
Low SES	0.495117	0.230229	128	.000
Owner Occupied	-0.000934	0.781758	128	.000
Block-group Effects on Face-block Slopes				
Low SES * Industry	0.107697	0.107697	130	.032
Apart/Multifamily * Industry	0.193926	0.193926	130	.000
Land Use 2 * Apartment	0.022549	0.022549	131	.005
Low SES * Shopping Center	-0.252143	-0.252143	131	.000

Face-Block n:	7,186	% of Overall Variance Explained:	37.86%
Block-Group n:	133	% of L1 Variance Explained:	36.50%
Deviance:	6314.74[21]	% of L2 Variance Explained:	62.77%
		% of Variance that Occurs at L1	94.84%
		% of Variance that Occurs at L2	5.16%

[20] The effects are compared using the IQR of each independent variable as they have different metrics and distributional skewing would render more traditional standardized coefficients to be misleading. If because of extreme skewness an IQR was zero (as was the case for most of the count variables), the value of one was substituted, indicative of one of the units in question (e.g., one store, restaurant, vacant lot, industry, etc.).

[21] The Deviance, Percent of Overall Variance Explained, Percent of L1 Variance Explained, and Percent of L2 Variance Explained are all based on a linear rather than a poisson model. They are, nevertheless, included here as poisson models do not provide corresponding estimates of explained variance.

BLOCK-GROUP LEVEL

At the block-group level *Owner Occupied*, *Low SES*, and *Apartment/Multifamily* and *Land Use 2* were significant predictors of auto theft. These variables account for 62.77% of the variance in auto theft at level two. Consistent with both theories, *Owner Occupied* has a negative effect on auto theft. Similarly consistent with expectations, *Low SES*, *Apartment/Multifamily* and *Land Use 2* have positive effects.

CROSS-LEVEL INTERACTIONS

A model without multilevel interactions (not shown) indicates a Deviance of 6303.97. Thus, the inclusion of the interactions increased the fit of the model by approximately 11 points on this statistic. Alternatively, a model without interactions explains 37.75% of the total explainable variance, or about .11% less variance that the full model.

HLM software calculates chi-square significance based on a sample of twenty two block-groups (out of 133) when testing for the significance of variance in the slopes for each of the level one variables.[22] The results based on these twenty two cases indicate that *Apartment*, *Gas/Garage*, *Heterogeneity*, *Industry*, *Number of Places*, and *Shopping Center* are significantly affected by their block-group context. These six variables are tested for interaction with the four significant block-group level variables. Of the

[22] Note that while the significance of the variance in slopes is based on this reduced sample, the significance of the slopes themselves is based on the full sample of cases. Furthermore, alternate models which inflated the sample size by alternately fixing more of the error terms in the model did not indicate any discernable reliability issues.

resulting 24 interactions, thirteen[23] are simultaneously statistically significant in a forward-entry OLS regression when there is a minimum tolerance criterion of .25. However, only four remain simultaneously significant in the HLM model: *Shopping Center * Low SES*, *Industry * Low SES*[24], *Industry * Apartment/Multifamily*, and *Apartment * Land Use 2*.

Because the main effect for *Shopping Center* is insignificant, the negative interaction between *Shopping Center* and *Low SES* seems to indicate that *Shopping Centers* reduce auto theft when they are located in areas characterized by *Low SES*. Thus, as is the case in burglary, it may be that *Shopping Centers* provide a guardianship function against auto theft in these areas by providing more "eyes on the street."

On the other hand, *Industry* has a positive interaction with *Low SES.* This seems to indicate that *Industries* may have less protected parking lots than *Shopping Centers*. Indeed, *Industry* parking lots are likely to be relatively devoid of guardians except during shift changes, while *Shopping Centers* are likely to have a continual flow of people at all hours. The simultaneous presence of *Industry* and *Low SES,* therefore, represents a confluence of opportunity and motive, rather than the confluence of guardianship and motive experienced with *Shopping Centers*.

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[23] These variables are *Low SES * Number of Places*, *Apart/Multifamily * Gas Station/Garage*, *Apart/Multifamily * Shopping Center*, *Apart/Multifamily * Apartment*, *Apart/Multifamily * Industry*, *Apart/Multifamily * Heterogeneity*, *Land Use 2 * Number of Places*, *Land Use 2 * Apartment*, *Low SES * Shopping Center*, *Low SES * Industry*, *Apart/Multifamily * Number of Places*, *Land Use 2 * Heterogeneity*, *and Land Use 2 * Shopping Center*. All of these have positive slopes except *Apart/Multifamily * Shopping Center*, *Apart/Multifamily * Apartment*, *Land Use 2 * Apartment*, *Low SES * Shopping Center, and Land Use 2 * Heterogeneity*.

[24] The variance in auto theft is roughly twice its mean (.2 and .11 respectively). This ratio indicates that an extra-poisson or "over-dispersion" regression may be a better fit to the distribution of the data than a regular poisson model. However, a rough comparison between these two types of models reveal very few differences, the primary being that the interaction between SES and Industry becomes insignificant.

The presence of *Industry* within block-groups characterized by the variable *Apartment/Multifamily* also results in higher rates of crime. The *Apartment/Multifamily* variable may be indicative of a high degree of mobility and low social control. Hence, this interaction may represent a confluence of opportunity and motive.

Finally, the positive effect of apartments at the face-block level seems to be heightened when it occurs in the context of *Land Use 2* (the diffusion of target awareness measure). Apparently, potential offenders may become familiar with targets at apartment complexes through their visits to these other land uses (e.g. *Gas Station/Garages*, *Stores*, and *Industry*). Alternatively stated, apartments offer better protection to vehicles if they are located away from busy areas.

Robbery

FACE-BLOCK LEVEL

Table 4.3 present the parameter estimates for the HLM robbery rate model. The significant routine activities variables that emerge in the face-block level include *Apartments*, *Gas Station/Garage, Office*, *Restaurant*, *Shopping Center,* and *Stores* while none of the face-block level social disorganization variables were significant for robbery. *Number of Places* was the only significant control variable. All of these seven variables had positive influences on robbery and were theoretically consistent except for the variable, *Stores,* which is both negative and unexpected.[25] It may be that single stores are one of the few land uses that are almost universally closed after dark and, therefore,

[25] The variance in robbery is roughly twice its mean (.08 and .19 respectively). This ratio indicates that an extra-poisson or "over-dispersion" regression may be a better fit to the distribution of the data than a regular poisson model. However, do to a non-specific math error presumably caused by a software glitch, it was impossible to complete an extra-poisson model within the HLM statistical package.

neither they, nor their clientele are available as targets. Together, these significant variables account for 35.49% of the explainable variance at level one.

Table: 4.3 Final Estimation of Fixed Effects on Robbery, Poisson Regression

Fixed Effect	Coefficient	IQR Effect[26]	Degrees of Freedom	P-Value
Face-Block Slopes				
Apartment	.009966	0.009966	7174	.05
Gas Station/Garage	2.378135	2.378135	131	.000
Office	.151987	0.151987	7174	.036
Restaurant	1.58541	1.58541	132	.000
Shopping Center	.456018	0.456018	132	.000
Stores	-0.547951	-0.547951	7174	.007
# Places	.014383	0.273277	7174	.002
Block-Group Effects				
Institution	0.19353	0.58059	129	.001
Low SES	1.027648	0.47785632	129	.000
Owner Occupied	-0.001843	-1.542591	129	.000
Block-Group Effects on Face-Block Slopes				
Low SES * Gas Station/Garage	-1.676325	-1.676325	131	.000

Face-Block n:	7,186	% of Overall Variance Explained:	37.48%
Block-Group n:	133	% of L1 Variance Explained:	35.49%
Deviance:	5881.07[27]	% of L2 Variance Explained:	57.67%
		% of Variance that Occurs at L1	91%
		% of Variance that Occurs at L2	9%

[26] The effects are compared using the IQR of each independent variable as they have different metrics and distributional skewing would render more traditional standardized coefficients to be misleading. If because of extreme skewness an IQR was zero (as was the case for most of the count variables), the value of one was substituted, indicative of one of the units in question (e.g., one store, restaurant, vacant lot, industry, etc.).

[27] The Deviance, Percent of Overall Variance Explained, Percent of L1 Variance Explained, and Percent of L2 Variance Explained are all based on a linear rather than a poisson model. They are, nevertheless, included here, as poisson models do not provide corresponding estimates of explained variance.

BLOCK-GROUP LEVEL

At the block-group level *Institution*, *Owner Occupied,* and *Low SES* were significant predictors of robbery. Together, they account for 57.67% of the total variance that occurs at level two. Consistent with social disorganization theory, *Low SES* has a positive influence, while consistent with both social disorganization and routine activities theory, *Owner Occupied* has a negative effect. *Institutions*, on the other hand, contradicted preliminary hypotheses by having a positive influence. Institutions within the city in question tend to be disproportionately represented in the center of the city due to this being an attractive location for religious institutions and the fact that there are many state, county, and municipal buildings in and around the downtown areas. Religious institutions similarly are overrepresented in impoverished African-American neighborhoods. Consequently, the positive influence of the variable *Institution* at the block-group level may be a spurious result. *Institutions* may simply be located in areas where there is little guardianship at night, and where poverty and racial alienation are highest.

CROSS-LEVEL INTERACTIONS

A model without multilevel interactions (not shown) indicates a Deviance of 5879.96. Thus, the inclusion of the interactions increased the fit of the model by approximately one point on this statistic. Alternatively, a model without interactions

explains 37.471% of the total explainable variance, or about .01% less variance that the full model.

HLM software calculates chi-square significance based on a sample of 36 block-groups (out of 133) when testing for the significance of variance in slopes for each of the level one variables.[28] The results based on these 36 cases indicate that *Gas/Garage*, *Restaurant*, and *Shopping Center* are significantly affected by their block-group context. These three variables are tested for interaction with the three significant block-group level variables. The resulting nine interactions yield four[29] that are simultaneously statistically significant in a forward-entry OLS regression when there is a minimum tolerance criterion of .25. However, the interaction between *Low SES* and *Gas Stations/Garages* is the only interaction that remains significant in the HLM model.

This interaction's negative sign contradicts the positive effect expected from a combination of motive and opportunity. However, the interaction combines the two most powerful predictors of robbery, so a redundancy of effect is not completely unexpected. That is, the two variables overlap conceptually such that in combination one essentially can substitute for the other. It appears that *Low SES* may be such a strong promoter of robberies in a block-group that the presence of *Gas Stations/Garages* does not contribute as much to robbery rates in low SES areas as their presence does in high SES areas. However, once again, the alternate explanation that *Gas Stations/Garages* may be taking extra security precautions in these areas still remains a possibility.

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[28] Note that while the significance of the variance in slopes is based on this reduced sample, the significance of the slopes themselves is based on the full sample of cases. Furthermore, alternate models which inflated the sample size by alternately fixing more of the error terms in the model did not indicate any discernable reliability issues.

[29] These include *Low SES* * *Gas Station*/*Garage*, *Low SES* * *Shopping Center*, *Institution* * *Restaurant/Bar*, and *Low SES* * *Restaurant* * *Bar*. The *Institution* * *Restaurant*/*Bar* variable is the only one with a negative slope.

Comparison Across Dependent Variables

FACE-BLOCK LEVEL

All three models account for substantial amounts of the total explainable variance. The variables in the burglary model account for 41.14% of variance in this crime, the model of auto theft account for 37.86% of variance, and the model for robbery account for 37.48% of variance. A comparison across the dependent variables reveals other relevant patterns. The *Number of Places* variable at the face-block level has a large positive effect for all three crimes. Because *Number of Places* is likely to represent an area with more vehicles, and more establishments to burglarize or people/places to rob it can be seen as a representation of the number of potential targets in an area. Thus, it appears that the number of targets in an area is a strong predictor of street crime, even while controlling for what the specific types of places in question. Nonetheless, *Population* does not appear anywhere in any of the three models, so the significance of density to street crime may be more related to building density, and patterns of pedestrian traffic than residential population density.

The variable *Owner Occupied* is not significant for any of the crimes at the face-block level, but has substantially negative effects for all three crimes at the block-group level. This finding seems to enhance the variable's status as an indicator of social disorganization processes as opposed to those of routine activity. If the variable were an indicator of vulnerability, target suitability, guardianship, or accessibility one would expect the smaller unit of analysis to be the more powerful predictor of crime as this unit is the more rigorous indicator of specific experience of the space. In contrast, the

importance of *Owner Occupied* at the block-group level hints that the variable may be more accurately referred to as an indicator of a broader social context of space, and that the variable's importance may have more to do with social climate than specific target qualities. The only caveat that must be made is that high levels of owner occupied dwellings in a block-group could still represent a routine activities effect if this is, in fact, an indication of the amount of human traffic in an area - since owner occupied dwellings tend to be single family homes, and residential neighborhoods tend to have less human traffic than mixed use, or commercial neighborhoods.

The variable *Institution*, on the other hand, appears to defy its initial classification as a social disorganization variable. Not only does it appear as significant at the face-block level for burglary and auto theft, and only at the block-group level for robbery, but even more remarkably, it has a positive effect on crime in every model. In fact, its IQR effect identifies it as one of the most powerful positive predictors of burglary on a face-block. Despite the possibility that the positive sign at the block-group level is a spurious effect, these positive signs can only be interpreted as indicators that institutions provide targets and a relative lack of guardianship. Even when the presence of institutions seems to indicate a degree of social organization, as in the case of burglary, their powerful positive influence as a target obscures its small negative influence.

The routine activities variables *Vacant Lot*, *School*, *Hotel/Motel* and *Theater* are never significant in any of the three models. This result may have been largely due to the failure of these variables to clearly measure singular types of places. Since a *Vacant Lot* is simply a place lacking a structure, the variable can possibly represent undeveloped land, parking lots, cemeteries, raw material storage areas for industry, or in a few cases

even alleys. *Schools,* similarly, may represent criminogenic large high schools with spacious grounds, small elementary schools, or even private charter schools with less than 30 students.[30] *Hotel/Motel* also ranges from low budget motels to exclusive establishments. Finally, the effects of *Theater* may have been obscured by their small n (n=11) and the fact that they almost always share their face-blocks with numerous other commercial establishments.

Neither are the social disorganization variables *Distance From Capital* or *Single Parent Household* ever significant. The distance from the center of the city may simply not be a useful concept in the presence of the other variables in the model. Furthermore, the concentric zone model may simply not apply to landscape of the city in question as well as it did to historic Chicago. The results for *Single Parent Homes* are less easily explicable considering the plethora of research demonstrating a relationship between the presence of single parent homes and local crime rates (e.g., Sampson 1987; Land et al., 1990; Messner and Sampson, 1991; and Rountree and Warner, 1999). It may be that the relationship between family structure and crime is more salient the block-group level, or that it is largely mediated by socioeconomic status so that the relationship does not hold while controlling for the latter.

BLOCK-GROUP LEVEL

Of all the social disorganization variables at the block-group level, the measure of socioeconomic status was by far the most consistently significant and most powerful predictor of crime. It was also the most likely to interact with face-block level

[30] The 2001-2002 "Charter School List" published by the North Carolina State Board of Education identifies ten charter schools in the city in question ranging from a high school with a projected enrollment of 25 to a school for grades four through eight with a projected enrollment of 330.

characteristics. In fact, concern that it may be overshadowing the potential for other variables to appear significantly in the model prompted an experimental run of the model with *SES* excluded. This alternative model, however, failed to improve the performance of the other variables.

One block-group variable that failed to be significant in any of the three crime models was *Same Home Last 5 Years*. Ultimately, the presence of *Apartments* and *Multifamily Homes* may be better indicators of residential instability than this census variable. The block-group level variable *Apartment/Multifamily* which consists of an aggregate of a count of *Apartments* and *Multifamily Homes* is, in fact, significant in the model for auto theft. Five years may simply be more than enough time to establish integration into a community and the very short term accommodations that these other land uses represent may be more effective indicators of the rapid population turnover disruptive to social organization.

*Land Use 1*also failed to be significant in any of the models. Block-groups characterized by the presence of *Shopping Centers*, *Offices*, *Restaurants*, and *Motels/Hotels* are no more likely to experience crime than any other while controlling for their presence at the face-block level. The significance of *Offices*, *Restaurants*, and *Shopping Centers* at the face-block level, indicates that these land uses do contribute to crime at the micro-level, but their presence does not seem to have a broad influence on their block-group.

Block-group level racial heterogeneity similarly fails to appear in any of the three models. This finding is especially curious as face-block level *Heterogeneity* is significantly positive for both burglary and auto theft. These findings seem to indicate

that block-groups may be too large an area to measure the influence of racial heterogeneity. Block-groups may appear as heterogeneous even if this effect is created by an aggregation of largely homogeneous face-blocks. This is especially prone to happen in a southern city like the one in question where, if historical trends continue to be true, segregation tends to occur street by street rather than the broader segregation more commonly seen in northern cities (Massey and Denton, 1993).

CHAPTER V :

CONCLUSIONS

Hypothesis Testing

Each of the hypotheses stated in Chapter III "Hypotheses and Procedure" is repeated below followed by a discussion of relevant findings.

1) *Each routine activity variable will contribute to the explanation of variance for each of the crimes.*

There are twelve tested L1 routine activities variables. For burglary, five of these are statistically significant, while for auto theft and robbery, six are statistically significant. There are three L2 routine activities variables tested. Two of these are significant for auto theft, but none are significant for burglary or robbery. All of the significant variables contribute to an explanation of variance in ways predicted by the theory. Overall, it appears that burglary is primarily driven by offenders seeking the most desirable targets, places that are empty at night, and the number of places available as targets. Auto theft seems primarily driven by amount of human traffic in an area and the prevalence of targets. Finally, robbery seems to occur primarily where there are people moving around in public space after dark. The one category of routine activity variables that seems to fail to perform as expected across all three types of crime is that associated with the presence of youth (i.e., schools, and theaters). However, as is detailed in the "Findings" section discussed earlier, this result may have been more a product of methodological operationalization than an actual lack of relationship between youth places and these crimes.

2) *Each social disorganization variable will contribute to the explanation of variance for each of the crimes.*

There are five tested L1 social disorganization variables. For auto theft, and burglary, two of these are statistically significant, while for robbery, none are statistically significant. There are six L2 social disorganization variables tested. One of these is significant for auto theft, two are significant for robbery, and three are significant for burglary. However, the *Building Values* and *Institution* variables have the opposite sign from what was expected. The *Building Values* variable seems to be more a measure of routine activities and target seeking than it is a social disorganization variable, but interpretation of the *Institution* variable is somewhat less clear. At the face-block level, it appears to have a conditionally negative effect on burglary (at least partially consistent with social disorganization theory), and a positive effect (consistent with a routine activities interpretation) for auto theft. It similarly has a positive effect at the block-group level for robbery. This crime-specific effect requires further investigation. It may be that would-be offenders are reluctant to victimize *Institutions* themselves due to respect for their virtues, but that there is less of a taboo against offenses toward their clientele. Hence, burglary of these locations may be rare, while auto theft or robbery of institutional clients may be less taboo.

Overall, of the social disorganization variables, the *Low SES* variable seems to be the most powerful predictor across all three crimes. For apparent within unit heterogeneity issues, the racial heterogeneity variable seems to be more powerful at L1 than at L2, and the *Same Household Last Five Years* variable seems a weak predictor,

possibly due to land use variables such as *Apartment*, or *Multifamily Home* capturing the phenomenon of mobility more accurately.

> 3) *Social disorganization at level two will interact with level one land uses so that variables representing high levels of opportunity at level one will generate more crime when they are located in level two areas with high levels of social disorganization.*

There are 72 possible interactions for each crime between L2 social disorganization variables and L1 routine activity variables. However, there are only twenty such combinations after accounting for insignificant main effects and those L1 variables that do not have variation in their slopes across block-groups. Two of nine interactions are statistically significant for burglary, two of five for auto theft, and one of six for robbery. Each one of these crimes has one interaction with a result other than a theoretically consistent multiplicative positive reaction between greater motive and greater opportunity.[31]

Those interactions that produce results consistent with the theory are illuminating as to the context of these crimes. However, the small percentage of those tested which yield consistent results requires further explanation. OLS versions of the present model reveal that about half of the interactions are significant in a forward entry model with a minimum tolerance of .25. This percentage of significance is consistent with the within level interactions tested by Smith et al. (2000) and Rice and Smith (2002). The primary absence of significant interactions in the present model occurs due to the use of poisson regression within hierarchical linear modeling as opposed to OLS regression with a logged dependent variable. HLM is simply more conservative in its modeling as it does

[31] These interactions are Low SES and Shopping Center for auto theft and burglary, and Low SES and Gas Station/Garage for robbery.

not violate spatial modeling assumptions as does OLS. Therefore, these results still offer some substantial support for this form of integration of the Routine Activity and Social Disorganization theories. Two of the three interactions that are not consistent with the theory may all be the result of the redundancy effects predicted in hypothesis 15. However, the negative interaction between *Low SES* and *Shopping Center* for auto theft is most likely a result of an unanticipated guardianship effect and the interaction between family disruption and *Industry* remains inexplicable within the confines of the present theory.

> 4) *Routine activities variables at level two will interact with both routine activities variables and social disorganization variables at level one. They will interact with social disorganization as they represent opportunity in proximity to social disorganization, and they will interact with routine activities as the high traffic associated with a block-group level will generate greater target awareness at the face-block level.*

There are 60 possible interactions between routine activities variables at L2 and L1 variables. However, auto theft is the only crime with significant main effects for any of the L2 routine activity variables.[32] Hence, only twelve such interactions were tested for significance, two of which were statistically significant. These two interactions are both consistent with theoretical expectations (*Apartment/Multifamily* * *Industry*, *Land Use 2* * *Apartment*). In both cases, these are interactions between two routine activity variables. Results indicate that appropriateness of routine activity indicators at the block-group level is crime specific. That is, auto theft seems to be particularly dependent on the human traffic levels of block-groups, but the other two crimes are only dependent on the human traffic levels of micro-level spaces.

[32] The lack of significance for L2 routine activity variables holds for both the HLM and the OLS models of the crimes.

5) *Routine Activities theory is primarily a theory of opportunity and guardianship in micro-level environments. Therefore, all the routine activity variables are likely to be stronger at level one than level two.*

Overall, the routine activities variables perform far better at the face-block level than at the block-group level. Block-group level routine activities variables are only significant for auto theft. This may indicate that auto theft is more driven by spontaneous opportunity than the other crimes. While commission of a burglary or robbery may be only desirable when one is familiar with the specific face-block upon which the crime will be committed, potential offenders may be more comfortable committing auto theft in areas in which they are only peripherally familiar. This conclusion seems logical as auto theft inherently provides a fast exit from the place in question, while robbery entails a less certain escape from the scene, and burglary depends on stealth. Consequently, it appears that routine activity variables are more dependent on awareness space issues, while social disorganization is more an issue of general social milieu.

6) *Auto theft is particularly affected by the presence of major thorough-fares and high traffic areas, so it is particularly likely to have a Land Use Two effect as well as a Number of Places effect.*

Auto theft is, in fact, the only one of the three crimes to have a *Land Use Two* effect and auto theft also has *Land Use Two* involved in an interaction with *Apartment*. This seems to indicate that auto theft is, in fact, more associated with regions of the city containing more busy places. Similarly, when the slopes of each the crimes' relationships with *Number of Places* is standardized by dividing each slope by the

standard deviation of its dependent variable, auto theft's slope for *Number of Places* is .047, which is greater than that of robbery (.033), or burglary (.035). Thus, a change in the *Number of Places* variable seems to have a greater effect on auto theft than either of the other two crimes and density of building structure appears to be a major predictor of auto theft independent of type of land use.

> 7) *On the other hand, burglary depends on stealth to a great degree, so burglaries may tend to occur away from areas characterized by high rates of human traffic. This does not necessarily mean there is likely to be a negative relationship with Land Use Two because these land uses will still generate familiarity with an area and be associated with desirable targets, but the relationship will at least be likely to be weaker than with the other two crimes.*

Land Use Two is completely insignificant in the model for burglary, however, as discussed in hypothesis 11, *Number of Places* had a relatively strong positive effect.

> 8) *Several authors have found that large communal and public parking facilities seem to be associated with auto theft. Hence, variables such as Apartment, Multifamily, and Shopping Center should be particularly strong predictors of this crime.*

Apartment and *Multifamily* are statistically significant for auto theft and standardized slopes indicate that both these variables have a greater effect for auto theft than for either of the other two crimes.[33] However, the *Shopping Center* variable is insignificant for auto theft. Apparently, the characteristics of parking lots associated with *Shopping Centers* are not as conducive to auto theft as large parking lots associated with other types of institutions. It may be that the large public parking lots associated with

[33] The relationship between each of the dependent variables and these two independent variables are standardized by dividing the slope by the standard deviation of the dependent variable. For *Apartment*, auto theft has a standardized slope of .043 while burglary's slope is insignificant and robbery's slope is .023. For *Multifamily Home* auto theft has a standardized slope of .076, burglary has a standardized slope of .042, and robbery's standardized slope is insignificant.

Shopping Centers are off-set by the relatively high level of activity/guardianship at these places, or perhaps *Shopping Centers* are not associated with high numbers of targets at night when most auto theft occurs.

> 9) *Places with individuals around after dark such as Restaurants/Bars and Hotels/Motels may be particular prone to street robberies while places without any potential night time victims such as Offices, Industry, and Stores may have less robbery. Shopping Centers may similarly have less of an influence due to their large size making them a less controllable environment. Meanwhile, Gas Stations will likely be a major contributor due to the fact that they are small, offer easy escape routes and are usually open 24 hours.*

Restaurant/Bar and *Gas Station/Garage* do, in fact, have the two strongest positive effects on robbery of any of the tested variables. Industry lacks a significant effect, and the presence of one or more *Stores* even has a negative influence on rates of robbery on a face-block. However, Hotel/Motel fails to have the expected positive effect and *Offices* has a more substantial positive effect than was expected. As discussed previously, the Hotel/Motel variable is quite substantively important in the previous works of Smith et al (2000) and Rice and Smith (2002), but hotels and motels tend to occur in clusters in the city in question and do not actually occur in many different block-groups. Hence, the introduction of block-groups to this study may reduce their influence, and when this is combined with the diversity of character within the variable, this might account for a lack of significance. Meanwhile, it may have been an incorrect assumption that *Offices* tend to be empty after dark. Indeed, individuals working alone, or nearly alone in office buildings may be ideal targets.

10) *All of the social disorganization variables are likely to be more powerful predictors at L2 than L1. The theory was originally designed to be one of a more macro nature, speaking to the general milieu of zones of a city rather than to small groupings of addresses.*

This hypothesis initially seems to be confirmed. With the exception of racial heterogeneity, the social disorganization variables fair better at the block-group level than at the face-block level. As explained previously, heterogeneity may be more accurately measured at a smaller level of analysis, but *Institution* is the only other social disorganization variable that ever appears significant at the face-block level, and its unexpectedly positive sign indicates that it may be a more accurate reflection of processes of routine activity than social disorganization. Consequently, it appears that social disorganization may be more dependent on general social milieu than specific micro-level characteristics.

However, the measures available for use at L2 may have been more accurate reflections of social disorganization concepts than those at L1. This is particularly true of the *SES* variable, which is only available at L2. Therefore, that social disorganization variables are more powerful at the block-group level than at the face-block level, may simply be an artifact of the measures used at each level. Additional evidence is therefore necessary before a clear conclusion can be drawn about the appropriate size unit at which to measure social disorganization.

11) *The Distance from Capital variable and its interactions played a major role in Rice and Smith (2002) and Smith et al. (2000), and they may continue to be negative here, but the characteristics of the block-groups will likely capture many of the contextual effects previously relegated to this variable.*

Hence, the effects of this variable are expected to be diminished compared to past studies.

The *Distance from Capital* variable would not have been included at all if it were believed that the city in question bore no resemblance to the concentric zone model. However, as it fails to be significant in any of the models, it appears that its influence has in fact been quite diminished by the inclusion of the block-group level of analysis. In other words, the proxy for Shaw and McKay's concentric zones seems to have been completely superceded by controlling for the characteristics of block-groups.

12) *Following Rice and Smith 2002,* Tremblay et al., 1994, *Tittle and Meier 1990, Nuehring 1976 and Albrecht 1981 SES is not expected to be strongly related to auto theft as it is to burglary and robbery.*

Judging by a comparison of standardized slopes, *Low SES* appears to be most strongly associated with robbery, but its effects on auto theft are actually more powerful than for burglary[34]. Auto theft may indeed be committed relatively frequently by relatively privileged youth as past studies have shown, but target selection by offenders may similarly steer burglars to more affluent areas. Hence, it appears that, at least in terms of spatial territories, neither of these crimes is likely to be as powerfully related to SES as some other types of street crime.

13) *The building values, single parent households, and heterogeneity variables' influence may be particularly diminished from past studies in that SES may be more precisely specified with the block-group level variables than with these face-block level measures.*

[34] Slopes are standardized by dividing them by the standard deviation of each crime. For burglary the standardized slope is .44, for auto theft it is 1.1, and for robbery it is 2.34.

While the *Heterogeneity* variable still seems to play a substantial role in the models for auto theft and burglary, the roles of the *Single Parent* variable and *Average Building Values* variable do appear to be reduced. Both of these variables are tested at both L1 and L2. However, the *Average Building Values* variable appears significant only once (at L2 for burglary) and has a relatively small IQR effect. Meanwhile, the *Single Parent* variable has no significant main effects, but is significant in one interaction (where it has a minimal IQR effect in the opposite direction to what was hypothesized). The suppression of these variables implies that poverty may yield its effects primarily at larger units of analysis, but this conclusion is quite tentative, as these variables are rather indirect measures of poverty. Meanwhile, *Heterogeneity* either appears to exert more of a micro-level influence, or at least is more conceptually independent from socioeconomic status than the other two variables.

> 14) *Robberies may be particularly prone to social disorganization variables as Lenz reports that between 1965-1975 44% to 48% of commercial robberies occurred within a relatively short distance from where the robbers live. However, there is little corresponding data for the crimes of auto theft or burglary.*

By a simple count of statistically significant variables, robbery seems to be more associated with social disorganization than auto theft, but no more so than burglary. Similarly, an OLS decomposition of effects indicates that the unique R^2 attributed to the subset of social disorganization variables is similar for robbery and burglary, while they both exceed that of auto theft. However, robbery does seem to have the greatest *SES* effect. The standardized *Low SES* coefficient for robbery is 2.34, while for auto theft it is only 1.1, and for burglary it is only .44. All three variables have interactions involving

SES, but, even when these are considered, *SES* is still overwhelmingly more influential for robbery.

CROSS-LEVEL INTERACTIONS

> 15) *When two very strong predictors of a crime type occur together, they might not generate as much crime as when they occur separately (i.e., they have less than an additive effect). This is due to there being a "redundancy" in effect whereby the two variables overlap conceptually such that in combination one essentially can substitute for the other. The consequence of this is that some interactions between the most powerful positive predictors of a crime may have negative signs. Some potential cases of redundancy effects may occur in interactions such as those between Shopping Center and Land Use Two for the crime of auto theft; Gas Station/Garage and SES for robbery, or Number of Places and Land Use One for burglary. However, it is difficult to predict which interactions will, in fact, generate redundancy in effect until it is discovered which variables will be tested for interactions and what the most powerful predictors turn out to be.*

There were two separate incidents of potential redundancy effects. The strongest case may be that between *Low SES* and *Gas Station/Garage* for the crime of robbery. Both these variables were very strong predictors of robbery, but their interaction is negative. Redundancy is, in fact, predicted as a strong potential for this particular interaction. A similar effect is observed for *Shopping Center* and *Low SES* for burglary. Again, both these variables are positively associated with burglary individually, but their interaction is negative. However, in both cases, these interpretations of results must be done cautiously as either of these interactions could have been the result of increased security precautions in *Low SES* areas rather than redundancy. Furthermore, post hoc interpretations, as in the later case, must be approached with especial concern.

Overview

The use of HLM is inherently more conservative than OLS in ecological analysis, in that it avoids some of the statistical assumption violations that OLS commits. Furthermore, tests of cross-level interactions are more ambitious than same level interactions because within unit heterogeneity of relatively larger units creates the potential for micro-level units to exist in areas unrepresentative of the larger unit as a whole (e.g. a high SES street segment might exist in a block-group with overall low SES). Therefore, this study did not produce as many statistically significant interactions as previous face-block level only studies using OLS. Nonetheless, in general, the current study's results are generally supportive of social disorganization theory, routine activities theory, and an integration of the two on the basis of interaction effects. It appears that it is appropriate to simultaneous consider issues of opportunity and motivation, as the influence of these factors are often contingent on each other.

There are only a few results which seem to defy this general theoretical pattern. First, are the two "redundancy effects." The potential for redundancy effects to occur is an important addition to the theoretical model. They essentially mark a "tipping point" whereby target attractiveness or motivation are at such high levels that there are diminishing returns for additional increases in either of these factors. One of these two redundancy effects is successfully predicted in this study (Gas Station/Garage*Low SES for robbery) based on the expected strength of the relationships between the two main effects involved in the interaction and the dependent variable in question. However, the ability to predict such effects in future tests is crucial to validating the theory because identifying them post hoc is a serious challenge to its validity.

A second inconsistency with the general theoretical model is the significant negative interaction between *Single Parent Households* and *Industry* for the crime of burglary. Within the confines of the present theory, there is simply no explanation for the positive influence of *Industry* on burglary being reduced when in the presence of *Single Parent Families*. Indeed, the result may be an anomaly.

Third, the positive sign of the building values variable and the inconsistent results of the *Institution* variable bring into question the appropriate operationalization of social disorganization. Adding to this dilemma is the fact that *Low SES* is a very powerful variable across the models, but it is difficult to know what property of *Low SES* is relevant to generating a criminal impetus. Similarly, in contrast to its traditional treatment of racial heterogeneity, the results of this study imply that its effects are most validly expressed at a relatively micro-level. Future theoretical development would, therefore, benefit from further exploration of variables more appropriate for the operationalization of social disorganization theory. Direct measures of social capital and the quality of public services in an area might better substitute for the *Institutions* variable. Micro-level measures of poverty might be obtained through special permission from the census bureau to substitute for the *Building Values* variable. Or, alternatively, measures of social capital, anomie, alienation, or the strength of oppositional subcultures may substitute for the SES/poverty measures entirely.

Overall, the models for burglary, auto theft, and robbery explain substantial portions of the overall variance in these crimes (41.14%, 37.86%, and 37.48% respectively). These numbers compare favorably to other attempts to make spatial predictions about these crimes. Furthermore, linear models of these crimes indicate that

while the majority of variance in these crimes occurs at the face-block (89.54%, 94.84%, and 91% respectively), substantial variance still occurs at both levels. These findings, again, support the use of small levels of analysis or, most preferably, the use of multilevel models.

In addition to these broad theoretical issues, this study also makes contributions to the understanding of more specific criminological phenomena. First, and foremost, the three crimes did, in fact, demonstrate distinctive patterns of distribution and react differently to the independent variables. Hence, support is found for the importance of crime-specific models. Robbery is found to be most closely associated with places that have human traffic at night. Auto theft is most closely associated with busy locations, but does not seem to require the same level of familiarity with the location as burglary or robbery. Furthermore, the lack of association of auto theft with *Shopping Centers* indicates that perhaps the crime is not associated with large public parking lots unless these lots contain vehicles after dark. Finally, burglary is most closely associated with higher value buildings and places that are empty at night.

In regard to the role of the control variables across all three types of crime, it is found that local residential population may be irrelevant to these crimes at both the face-block and block-group levels. However, the presence of *Owner-Occupied* dwellings is a substantial suppressor of these crimes and the *Number of Places* may promote crime through increased traffic and available targets.

Future Research

Theoretical integration is one strategy for promoting theoretical growth through developing more inclusive, powerful, and logically convincing explanations (Liska et. al, 1989; Wagner and Berger, 1985). The value of theoretical integration, therefore, lies in its relative success at these goals as compared to other strategies. Its primary competition, in this regard, comes from the strategy of theoretical competition.

As a prominent critic of a competitive approach, Elliot (1985) describes how theory competition and "crucial tests" fail as an efficient means of advancing theory. First, he notes that theories generally tend to predict the same outcomes, so any finding can be claimed as support for any theory. Second, he posits that crucial tests are rarely definitive due to perennial methodological problems such as the means of measuring concepts, proper samples, or multicollinearity between similar variables. Third, he notes that the acceptance of one theory does not usually necessitate the disposal of another. Finally, he concludes that the explanatory powers of individual theories that emerge from the crucial tests appear extraordinarily weak and fall well short of offering a complete understanding of social phenomenon. To the extent that the causes of crime and delinquency are of multiple origins, it may be necessary to account for them in diverse fashion, but the practice of theory competition discourages the use of diverse explanation by forcing unproductive choices between theories (Chilton, 1989).

In contrast, Hirschi (1989) argues that attempts at theoretical integration in criminology usually ignore essential differences between the theories undergoing integration. He posits that some "integrated theories are merely oppositional theories in disguise, theories that pretend to open-mindedness while in fact taking sides in theoretical

disputes" (pp.41-42). Akers (1989) agrees that the practice of ignoring incompatibilities between theories often results in useless "theoretical mush." Nonetheless, these critiques do not rule out the possibility of a successful integration if the task is approached carefully. Moreover, the integration of social disorganization theory and routine activities theory may be too laudable a goal to ignore given the two theories' ability to complement each other's weaknesses and provide a more inclusive explanation of the distribution of street crime across space. However, their integration is admittedly a delicate task which will require additional analyses.

Based on the findings in this study, there are several directions that future research might take. First, one might pursue the operationalization of the concepts so that they might be more comparable measures at the multiple levels. If the measures across levels are more directly comparable then more definitive statements could be made about whether there are unique effects at each level.

Along these same lines, the operationalization of social disorganization seems particularly weak in this study. As has been noted, the influence of the racial *Heterogeneity* variable seems contingent on the size of the unit of analysis, the variable *Same Home Last 5 Years* does not seem to capture the commonly found effects related to mobility, the causal mechanism associated with the broad concept of low SES is unclear, and the crime suppressing effect commonly associated with the presence of *Institutions* fails to materialize. The exploration of alternate operationalizations of these variables may shed light on these phenomena. Alternatively, the field may benefit from the investigation of a more strict social control version of social disorganization theory which assumes that the strength of networks and social capital intervene between these concepts

and criminal outcomes. The social disorganization variables used here would, thus, be replaced by direct measures of social networks.

While the specification of social disorganization theory evolves, attention need also be paid to the continuous exploration of the "shape" of social disorganization itself. Block-groups and face-blocks are used here as a matters of convenience, and far more attention needs to be paid, not only to the degree of diffusion of the concept across space, but also to the boundaries that tend to demarcate it. Does it tend to follow major arteries of traffic, coexist with official/legal divisions of space, or are there more affective means of demarcation available only through interviewing residents themselves?

Finally, because the crimes examined here demonstrate markedly different associations with some variables, future models may benefit from continuing a tradition of crime specific analysis. While elucidating the nature of the crimes themselves, crime-specific analysis is also likely to provide more specific information pertinent to theoretical development. Indeed, crime categories may benefit from even more strict definitions than those applied here.

References

Agnew, Robert. 1992. "Foundation for a General Strain Theory of Crime and Delinquency." *Criminology*. V.30 (1): 47-87.

Akers, Ronald L. 1989. "A Social Behaviorist's Perspective on Integration of Theories of Crime and Deviance." In S.F. Messner, M.D. Krohn, and A.E. Liska, eds., *Theoretical Integration in the Study of Deviance and Crime: Problems and Prospects*, 23-36. Albany: State University of New York Press.

Barclay, Paul; Buckley, Jennifer; Brantingham, Paul J.; Brantingham, Patricia L.; and Whinn-Yates, Terry. 1996. "Preventing Auto Theft In Suburban Vancouver Commuter Lots: Effects of a Bike Patrol." In *Crime Prevention Studies* V.6. Monsey, NY: Criminal Justice Press.

Barr, Robert; and Pease, Ken. 1990. "Crime Placement, Displacement, and Deflection." In *Crime and Justice: A Review of Research.* V.12, (eds.) Tonry, Michael and Morris, Norville. Chicago: University of Chicago Press.

Baumer, Eric; Janet Lauritsen; Richard Rosenfeld; and Richard Wright. 1998. "The Influence of Crack Cocaine on Robbery, Burglary, and homicide Rates: A Cross City Longitudinal Analysis." *Journal of Research in Crime and Delinquency*. 35:316-340.

Beavon, Daniel, Paul Brantingham, Patricia Brantingham. 1994. "The Influences of Street Networks on the patterning of property Offenses." In Ronald V. Clarke (ed.), *Crime Prevention Studies*, Vol.2. Monsey, NY: Criminal Justice Press.

Brantingham, Paul J. and Patricia L. Brantingham. 1984. *Patterns in Crime.* New York: MacMillan.

Brantingham, Patricia L.; Brantingham, Paul J.; and Wong, P.S. 1991. "How Public Transit Fedds Private Crime: Notes on the Vancouver 'SkyTrain' Experience." *Security Journal.* V.2, pp.91-95.

Britt, Chester L. 1994. "Crime and Unemployment Among Youths in the United States, 1958-1990." *American Journal of Economics and Sociology*. V.53, N.1, pp. 99-109.

Bryk, Anthony S. and Stephen W. Raudenbush. 1992. *Hierarchical Linear Models: Applications and Data Analysis Methods*. Newbury Park: Sage Publications.

Bursik, Robert J. 1986. "Ecological Stability and the Dynamics of Delinquency." Pp.35-66 in *Communities and Crime*, edited by Albert J. Reiss, and Micheal Tonry, Chicago, IL: University of Chicago Press.

Bursik, Robert J. and Webb, Jim. 1982. "Community Change and patterns of Delinquency." *American Journal of Sociology.* V.88, pp. 24-42.

Butterfield, F. 1998. "Reliability of Crime Numbers Questioned." *New York Times*, Aug.3, 1998.

Byrne, James M. 1986. "Cities, Citizens, and Crime: The Ecological/Nonecological Debate Reconsidered." In *The Social Ecology of Crime,* edited by James Byrne, and Robert Sampson, New York: Springer-Verlag.

Byrne, James M. and Robert J. Sampson. 1986. "Key Issues in the Social Ecology of Crime." Pp.1-22 in *The Social Ecology of Crime,* edited by James M. Byrne, and Robert J. Sampson. New York: Springer-Verlag.

Calder, James; and John Bauer. 1992. "Convenience Store Robberies: Security Measures and Store Robbery Incidents." *Journal of Criminal Justice*. 20:553-566.

Chilton, Ronald J. 1989. "The Challenge and promise of Theoretical Integration in Criminology." In Messner, Steven F.; Krohn, Marvin D.; and Liska, Allen E. (eds.) *Theoretical Integration in the Study of Deviance and Crime: Problems and Prospects.* State University of New York Press: Albany, N.Y.

Chilton, Ronald J. 1967. "Middle Class Delinquency and Specific Offence Analysis." In E.W. Vaz (ed.) *Middle Class Juvenile Delinquency*. New York: Harper and Row, pp.91-101.

Clarke, Ronald V. 1989. "Theoretical background to Crime Prevention Through Environmental Design (CPTED) and Situational Prevention." In *Designing Out Crime: The Conference Papers.* (eds.) Geason, Susan and Wilson, Paul. Canberra: Australian Institute of Criminology,

Clarke, Ronald V. 1984. "Opportunity Base Rates." *British Journal of Criminology.* V.24, pp.74-83.

Clarke, Ronald V. 1983. "Situational Crime Prevention: Its Theoretical Basis and Practical Scope." In *Crime and Justice: An Annual Review of Research.* V.4, Michael Tonry and Norval Morris (eds.) pp.225-256, Chicago: University of Chicago Press.

Clarke, Ronald V. and Harris, Patricia M. 1992. "Auto Theft and its Prevention." In *Crime and Justice: A Review of Research.* V.16. Tonry, M (ed.), Chicago, IL: University of Chicago Press.

Cohen, Lawrence E., and Marcus Felson. 1979. "Social Change and Crime Rate Trends: A Routine Activities Approach." *American Sociological Review* 44:588-608.

Cohen, Lawrence E., Marcus Felson, and Kenneth C. Land. 1980. "Property Crime Rates in theUnited States: A Macrodynamic Analysis, 1947-1977; with Ex Ante Forecasts for the1980s." *American Journal of Sociology* 86:90-118.

Cohen. Lawerence E. and Kenneth Land. 1987. "Age Structure and Crime Symmetry versus Asymmetry and the Projection of Crime Rates through the 1990s'." *American Sociological Review* 52:170-182.

Collins, Mark F.; Wilson, Richard M. 1990. "Automobile Theft: Estimating the Size of the Criminal Population." *Journal of Quantitative Criminology.* V.6, N.4, p.395-409.

Cornish, Derek B. and Clarke, Ronald V. 1986. *The Reasoning Criminal: Rational Choice Perspectives on Offending*. New York: Springer-Verlag.

Cromwell, Paul; James Olson; and D'Aunn Wester Avary. 1991. *Breaking and Entering and Ethnographic Analysis of Burglary*. Newbury Park, CA.: Sage.

Cullen, Francis T. and Robert Agnew. 2003. *Criminological Theory Past to Present: Essential Readings.* 2nd ed. Los Angeles: Roxbury Publishing Company.

Davison, Elizabeth L. and Smith, William R. Unpublished manuscript. "The Comparative Validity of Call-for-Service and UCR Crime Incident Data." Appalachian State University.

Doreian, Patrick. 1981. "Estimating Linear Models with Spatially Distributed Data." *Sociological Methodology* 12:359-388.

Doreian, Patrick. 1980. "Linear Models with Spatially Distributed Data." *Sociological Methods and Research* 9:29-60.

Dunn, Christopher S. 1980. "The Docial Area Structure of Suburban Crime." Pp. 127-145 in *Crime: A Spatial Perspective*, ed. Daniel E. Georges-Abeyle and Keith D. Harries. New York: Columbia University Press.

Elliot, Delbert D. (1985) "The Assumption that Theories Can be Combined with Increased Explanatory Power: Theoretical Integrations." In *Theoretical Methods in Criminology.* Meier, Robert F. (ed.) Pp.123-150. Beverly Hills, Ca.: Sage.

Farrell, Graham; Coretta Phillips, and Ken Pease. 1995. "Like Taking Candy, Why Does Repeat Victimization Occur?" *British Journal of Criminology*. 35:384-399.

Farrington, David. 1986. "Age and Crime." in *Crime and Justice: An Annual Review of Research,* edited by M. Tonry and N. Morris. Chicago: University of Chicago Press.

Federal Bureau of Investigation. 2003. "Uniform Crime Reports: Crime in the United States." Washington, DC.: Criminal Justice Information Services Division.

Federal Bureau of Investigation. 2000. "Uniform Crime Reports: Crime in the United States." Washington, DC.: Criminal Justice Information Services Division.

Felson, Marcus. 1998. *Crime and Everyday Life: Insights and Implications for Society.* Thousand Oaks, CA: Pine Forge Press.

Felson, Marcus and Lawrence Cohen. 1981. "Modeling Crime Trends: A Criminal Opportunity Perspective." *Journal of Crime and Delinquency* 18:138-161.

Fleming, Zachery; Brantingham, Patricia; and Brantingham, Paul. 1994. "Exploring Auto Theft In British Columbia." In *Crime Prevention Studies* V.3. Monsey, NY: Criminal Justice Press.

Frazee, Sharon G. 1997. "Ecological Analysis of Robbery: Comparisons of Routine Activity and Social Disorganization Approaches." Masters Thesis, North Carolina State University, Raleigh, N.C.

Geason, S. and Wilson, P.R. 1990. *Preventing Car Theft & Crime in Car Parks.* Canberra, AUS: Australian Institute of Criminology.

Gould, Leroy C. 1969. "The Changing Structure of Property Crime in an Affluent Society." *Social Forces* 48:50-59.

Greenberg, David F. 1976. "Delinquency and the Age Structure of Society." *Contemporary Crisis* 1:189-223.

Hakim, Simon; and Yochanan Shachmurove. 1996. "Spatial and Temporal Patterns of Commercial Burglaries." *The American Journal of Economics and Sociology*. 55:443-457.

Hesseling, Rene B.P. "Displacement: A Review of the Literature." 1994. Pp. 197-230. In *Crime Prevention Studies*. V.3, ed. by Ronald V. Clarke. 1994.

Highway Loss Data Institute. 1990. *Insurance Theft Report: Passenger Cars, Vans, Pickups, and Utility Vehicles.* T85-I. Washington, D.C: Highway Loss Data Institute.

Hindelang, Michael J. 1976. *Criminal Victimization in Eight American Cities: A Descriptive Analysis of Common Theft and Assault*. Cambridge, MA: Ballinger.

Hirschi, Travis. 1989. "Exploring Alternatives to Theoretical Integration." In Messner, Steven F.; Krohn, Marvin D.; and Liska, Allen E. (eds.) *Theoretical Integration in the Study of Deviance and Crime: Problems and Prospects.* State University of New York Press: Albany, N.Y.

Hirschi, Travis. 1969. *Causes of Delinquency*. Berkley: University of California Press.

Hirschi, Travis and Michael R. Gottfredson. 1983. "Age and the Explanation of Crime." *American Journal of Sociology* 89:552-584.

Hope, T. 1987. "Residential Aspects of Auto Crime." *Research Bulletin.* V.23, pp.19-26. London: Home Office Research and Planning Unit.

Horney, Julie D.; Osgood, Wayne; and Marshall, Ineke Haen 1995. "Criminal Careers in the Short Term: Intra-Individual Variability in Crime and Its Relations to Local Life Circumstances." *American Sociological Review.* V.60, pp.655-673.

Janson, Carl-Gunnar. 1993. "Ecological and Individual Approaches in the Study of Crime and Delinquency." In *Integrating Individual and Ecological Aspects of Crime*, edited by David P. Farrington, Robert J. Sampson, and Per-Olof H. Wikström. Stockholm: National Council for Crime Prevention.

Kennedy, Leslie W., and David R. Forde. 1990. "Routine Activities and Crime: an Analysis of Victimization in Canada. *Criminology* 28:137-151.

Kobrin, Solomon. 1971. "The Formal Logical Properties of the Shaw-McKay Delinquency Theory." Pp. 101-131 in *Ecology, Crime, and Delinquency*, edited by Harwin L. Voss and D.M. Peterson. New York: Appleton-Century-Crofts.

Kornhauser, Ruth. 1978. *Social Sources of Delinquency.* Chicago: University of Chicago Press.

Land, Kenneth; McCall, Patricia; Cohen, L. 1990. "Structural Covariates of Homicide Rates: Are There Any Covariants Across Time and Space? *American Journal of Sociology*. 95: 922-963.

Liska, Allen; and Chamlin, M. 1984. "Social Structure and Crime Control Among Macrosociasl Units." *American Journal of Sociology*. 90:383-395.

Liska, Allen E.; Krohn, Marvin D.; Messner, Steven F. 1989. "Strategies and Requisites for Theoretical Integration in the Study of Crime and Deviance." In Messner, Steven F.; Krohn, Marvin D.; and Liska, Allen E. (eds.) *Theoretical Integration in the Study of Deviance and Crime: Problems and Prospects.* State University of New York Press: Albany, N.Y.

Lofland, John. 1969. *Deviance and Identity*. Englewood Cliffs, N.J.: Prentice-Hall.

Lynch, James P. 1987. "Routine Activity and Victimization at Work." *Journal of Quantitative Criminology.* V.3, pp. 283-300.

Maguire, M. 1980. "Burglary as Opportunity." *Research Bulletin No. 10.* London: Home Office Research and Planning Unit.

Mancini, A.N. and Jain, R. 1987. "Commuter Parking Lots - Vandalism and Deterrence" *Transportation Quarterly.* V.41, pp.539-553.

Mansfield, Roger, Leroy C.Gould, J. Zvi Namenworth. 1974. "A Socioeconomic Model for the Prediction of Societal Rates of Property Theft." *Social Forces* 52:462-472.

Martin, Douglas E. 1995. "Crime Along Rural Interstate Highways." *Free Inquiry in Creative Sociology.* V.23, N.2, pp.105-108.

Massey, Douglas S. and Nancy A. Denton. 1993. *American Apartheid : Segregation and the Making of the Underclass.* Cambridge, Mass.: Harvard University Press.

Massey, James L.; Krohn, Marvin D.; Bonati, Lisa M. 1989. "Property Crime and the Routine Activity of Individuals." *Journal of Research in Crime and Delinquency.* V.26, N.4, pp.378-400.

Mayhew, Patricia. 1990. "Opportunity and Vehicle Crime." In *Policy and Theory in Criminal Justice: Contributions in Honour of Leslie T. Wilkins*. Gottfredson, D.M. and Clarke, Ronald V. (eds.) Aldershot, UK: Grower.

Mayhew, Patricia; Clarke, Ronald V.; Sturman, Andrew; and Hough, J. Michael. 1976. *Crime as Opportunity.* Home Office Research Study Number 34. London: H.M. Stationery Office.

McCaghy, Charles H.; Giordano, Peggy C.; and Henson, Trudy Knicely. 1977. "Auto Theft: Offender and Offense Characteristics." *Criminology*. V.15, N.3., pp. 367-385.

Merton, Robert K. 1938. "Social Structure and Anomie." *American Sociological Review.* 3: 672-682.

Messner, Stephen F.; and Sampson, Robert J. 1991. "The Sex Ratio, Family Disruption, and Rates of Violent Crime: The Paradox of Demographic Structure." *Social Forces.* 69: 693-714.

Miethe, Terence D.; Hughes, Michael; and McDowall, David. 1991. "Social Change and Crime Rates: An evaluation of Alternative Theoretical Approaches." *Social Forces.* V.70, N.1, pp. 165-185.

Miethe, Terence D. and David McDowall. 1993. "Contextual Effects in Models of Criminal Victimization." *Social Forces* 71:741-759.

Miethe, Terrence D. and Robert F. Meier. 1994. *Crime and Its Social Context: Toward an Integrated Theory of Offenders, Victims, and Situations.* Albany, NY.: State University of New York Press.

Miethe, Terrence D. and Robert F. Meier. 1990. "Opportunity, Choice, and Criminal Victimizaiton: a Test of a Theoretical Model." *Journal of Research in Crime and Delinquency* 27:243-266.

Miethe, Terrence D., Mark C. Stafford, and Scott Long. 1987. "Social Differentiation in Criminal Victimization: A Test of Routine Activities/Lifestyle Theory." *American Sociological Review* 52:184-194.

Miller, Jody. 1998. "Up It Up: Gender and the Accomplishment of Street Robbery." *Criminology*. 36:37-67.

North Carolina State Board of Education. 2001. "Charter School List" Raleigh, NC.: Department of Public Instruction, Office of Charter Schools.

NRMA. 1990. *Car Theft in New South Wales.* Sydney: NRMA Insurance Limited.

Ogrodnik, L. and Paiement, R. 1992. "Motor Vehicle Theft." *Juristat Service Bulletin.* V.12, Canadian Centre for Justice Statistics. Ottawa, Canada: Minister of Industry, Science, and Technology.

Painter, Kate; and David P. Farrington. "Street Lighting and Crime: Diffusion of Benefits in the Stoke-On-Trent Project." 1999. Pp. 77-122. In *Surveillance of Public Space: Lighting and Crime Prevention.* Ed. By Kate Painter, and Nick Tilley. 1999.

Park, Robert E. and Ernest W. Burgess. 1924. *Introduction to the Science of Sociology*. 2nd edition. Chicago: University of Chicago Press.

Poyner, Barry. 1991. Situational Crime Prevention in Two Parking Facilities*." Security Journal.* V.2, pp.96-101.

Reiss, Albert J. 1986. "Why Are Communities Important in Understanding Crime?" In *Communities and Crime*, edited by Albert J. Reiss, and Micheal Tonry. Chicago: University of Chicago Press.

Rennison, Callie Marie. 1999. *Criminal Victimization 1998: Changes 1997-98 with Trends 1993-1998.* Washington, D.C.: Bureau of Justice Statistics.

Rice, Kennon, and William R. Smith. 2002. "Socio-Ecological Models of Automotive Theft: Integrating Routine Activity and Social Disorganization Theory." *Journal of Research in Crime and Delinquency.* 39(3), 304-336.

Robinson, W.S. 1950. "Ecological Correlations and the Behavior of Individuals." *American Sociological Review* 15:351-357.

Roncek, Dennis W. 1981. "Dangerous Places: Crime and Residential Environment." *Social Forces* 60:725-753.

Roncek, Dennis W. and Pamela M. Maier. 1991. "Bars, Blocks, and Crime Revisited: Linking the Theory of Routine Activities to the Empiricism of 'Hot Spots'." *Criminology* 29:725-753.

Rountree, Pamela Wilcox, Kenneth C. Land, Terrance D. Miethe. 1994. "Micro-macro-Integration in the Study of Victimization: a Hierarchical Logistic Model of Analysis Across Seattle Neighborhoods." *Criminology* 32:387-414.

Rountree, Pamela Wilcox, and Barbara D. Warner. 1999. "Social Ties and Crime: Is the Gendered?" *Criminology* 37: 789-814.

Sampson, Robert J. 1991. "Linking the Micro and Macrolevel Dimensions of Community Social Organization." *Social Forces.* V.70, pp.43-64.

Sampson, Robert J. 1987. "Communities and Crime" In Michael R. Gottfredson and Travis Hirschi (eds.) *Positive Criminology.* Newbury Park, CA: Sage.

Sampson, Robert J. 1987. "Urban Black Violence: The Effect of Male Joblessness and Family Disruption." *American Journal of Sociology*. 93:348-382.

Sampson, Robert J. 1986. "Neighborhood Family Structure and the Risk of Personal Victimization." Pp. 25-46 in *The Social Ecology of Crime*, ed. James M. Byrne and Robert J. Sampson.

Sampson, Robert J. 1983. "Structural Density and Crime Victimization." *Criminology* 21:276-293.

Sampson, Robert J. and Janet L. Lauritsen. 1990. "Deviant Lifestyles, Proximity to Crime, and the Offender-Victim Link in Personal Violence." *Journal of Research in Crime and Delinquency* 27:110-139.

Sampson, Robert J.; and William Julius Wilson. 1995. "Toward a Theory of Race, Crime, and Urban Inequality." In J. Hagan, and R.D. Peterson, eds., *Crime and Inequality.* Stanford, CA.: Stanford University Press.

Sampson, Robert J., and John D. Wooldredge. 1987. "Linking the Micro- and Macro-Level Dimensions of Lifestyle-Routine Activity and Opportunity Models of Predatory Victimization." *Journal of Quantitative Criminology* 3:371-393.

Sanders, William B. 1976. *Juvenile Delinquency.* New York: Praeger.

Saville, Gregory and Murdie, Robert 1988. "The Spatial Analysis of Motor Vehicle Theft: A Case Study of Peel Region, Ontario." *Journal of Police Science and Administration.* V.16, pp.126-135.

Schepses, E. 1961. "Boys Who Steal Cars." *Federal Probation* (March) pp.56-62.

Shaw, Clifford R. and Henry D. McKay. 1969. *Juvenile Delinquency and Urban Areas.* 2nd ed. Chicago: University of Chicago Press.

Shaw, Clifford R. and Henry D. McKay. 1942. *Juvenile Delinquency and Urban Areas*. Chicago: University of Chicago Press.

Sherman, Lawrence W., Patrick R. Gartin, Michael E. Buerger. 1989. Hot Spots of Predatory Crime: Routine Activities and the Criminology of Place." *Criminology* 27:27-55.

Shover, Neal. 1972. "Structures and Careers in Burlgary." *Journal of Criminal Law, Criminology, and Police Science*. 63: 540-549.

Simcha-Fagan, Ora and Joseph E. Schwartz. 1986. "Neighborhood and Delinquency: An Assessment of Contextual Effects." *Criminology* 24:667-699.

Smith, Douglas A. 1986. "The Neighborhood Context of Police Behavior." In *Communities and Crime*. ed. Reiss, A. and M. Tonry. Chicago: The University of Chicago Press.

Smith, Douglas A. and G. Roger Jarjoura,. 1989. "Household Characteristics, neighborhood Composition, and Victimization Risk." *Social Forces* 68:621-640.

Smith, William R., Sharon G. Frazee, and Elizabeth L. Davison. 2000. "Furthering the Integration of Routine Activity and Social Disorganization Theories: Small Units of Analysis and the Study of Street Robbery as a Diffusion Process." *Criminology* 38:489-524.

Stark, Rodney. 1987. "Deviant Places: A Theory of the Ecology of Crime." *Criminology* 4:893-909.

Sutherland, Edwin H. 1947. *Principles of Criminology*, 4th ed. Philadelphia: Lippincott.

Taylor, Ralph B. 1997. "Social Order and Disorder of Street Blocks and Neighborhoods: Ecology, Microecology, and the Systemic Model of Social Disorganization. *Journal of Research in Crime and Delinquency*. 34:113-155.

Thornberry, Terrence P. 1989. "Reflections on the Advantages and Disadvantages of Theoretical Integration." In *Theoretical Integration in the Study of Deviance and Crime: Problems and Prospects.* Ed. Steven F. Messner, Marvin D. Krohn, and Allen E Liska. (pp. 51-60). Albany, N.Y.: State University of New York Press.

U.S. Census Bureau. "Geographic Areas Reference Manual 1990." 1994. U.S. Department of Commerce, Economics and Statistics Administration.

U.S. Department of Justice. 1998. "Crime and Victims Statistics." Washington DC.: Office of Justice Programs, Bureau of Justice Statistics.

U.S. Department of Justice. October 13, 1996. "Uniform Crime Reporting Program Press Release." Washington, D.C.: Federal Bureau of Investigation National Press Office.

U.S. Department of Justice, Bureau of Justice Statistics. 1994. "Criminal Victimization in the United States, 1994." Washington, D.C. U.S. Department of Justice, Bureau of Justice Statistics.

U.S. News and World Report. January 15, 1996. V.120, N.2, p.14. Anonymous article with map by Roger Doyle.

Van Koppen, Peter; and Robert Jansen. 1999. "The Time to Rob: Variations in Time of Number of Commercial Robberies." *Journal of Research in Crime and Delinquency*. 36:7-29.

Wagner, David; and Joseph Berger. 1985. "Do Sociological Theories Grow?" *American Journal of Sociology*. 90:697-728.

Webb, Barry. 1994. "Steering Column Locks and Motor Vehicle Theft: Evaluations from Three Countries." In *Crime and Justice: A Review of Research.* V.16. Tonry, M. (ed.), Chicago, IL: University of Chicago Press.

Webb, Barry; Brown, B.; Bennett, K. 1992. *Preventing Car Crime in Car Parks.* Crime Prevention Unit Paper #34. London, U.K.: Home Office.

Weigman, F., and Hu, D. 1992. "An Analysis of Auto Theft in Vancouver Using the Network Capabilities of the Arc Info Geographic Information System." Burnaby, CAN: British Columbia Institute of Technology.

Wright, Richard; and Scott Decker. 1997. *Armed Robbers in Action, Stickups and Street Culture*. (Boston, Mass.: Northeastern University Press).

Wright, Richard; and Scott Decker. 1994. *Burglars on the Job: Streetlife and Residential Break-Ins*. Boston, Mass.: Northeastern University Press.