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SOCIOECOLOGICAL MODELS OF AUTOMOTIVE THEFT: INTEGRATING ROUTINE ACTIVITY AND SOCIAL DISORGANIZATION APPROACHES

**KENNON J. RICE
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This study explores causes of variation in auto theft rates using spatial data with face blocks as a unit of analysis. An integration of routine activity theory and social disorganization theory is proposed, premised on an empirical basis of interaction effects and a pattern of automobile theft diffusion. The results show that the integration of social disorganization theory and routine activity theory significantly increases the predictive power of the analyses and reveals several new socioecological implications for how and why auto theft occurs.

It is widely recognized that auto theft represents a major crime problem in the United States. In 1999, an estimated \$7 billion was lost to auto theft, with an estimated 1.1 million vehicles stolen, representing 1 out of every 188 registered vehicles (U.S. Department of Justice 1999; U.S. Department of Transportation, Federal Highway Administration 1999). Besides direct monetary loss, automobile theft results in inconvenience and loss of work time among its victims,¹ injuries incurred while joyriding or attempting to evade police, the facilitation of other crimes committed with the use of stolen vehicles, and expenses incurred in attempting to prevent theft in the first place (e.g., insurance and antitheft devices).

Auto theft is also important for academic reasons. Geographically speaking, rates of auto theft have been found to have very little relationship to the rates of offense of other crimes (Mayhew 1990), suggesting distinct etiology (Clarke and Harris 1992) and a potential need for distinctive crime-fighting initiatives (Cornish and Clarke 1986). Also, the relative ease with which auto theft can be isolated and counted results in auto theft being particularly well suited to the development of new causal theories and policy programs.² For all of the above reasons, one might expect the research on auto theft to be abundant, but it is surprisingly sparse.

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The present research demonstrates the relative importance of various aggregate characteristics by using a small unit of analysis, the face block, defined as both sides of a street between two intersections (Smith, Frazee, and Davison 2000; Taylor et al. 1995). Routine activity theory and social disorganization theory, the two leading theories of the geographic distribution of crime, are depicted as partially overlapping explanations of auto theft. A theoretically integrated approach to the two theories based on interaction effects is proposed to explain auto theft.

APPLICABLE THEORIES

Historically, the predominant theory of the spatial location of crime has been social disorganization theory. Three exogenous factors—poverty, racial and ethnic heterogeneity, and residential mobility—are hypothesized to result in a withdrawal in community social control activities and an increase in delinquent and criminal activities, including automobile theft. Routine activity theory, the other major theory of the spatial location of crime, claims that crime occurs where there are attractive targets (opportunities), motivated offenders, and an absence of capable guardianship. Previous work from a routine activity–rational choice approach has shown the importance of weak guardianship and ample opportunity (Barclay et al. 1996; Clarke 1989).

Social Disorganization Theory

The application of social disorganization theory to auto theft is especially interesting because contrary to other street crimes, auto theft offending has long been believed to be concentrated among the socially advantaged and thus seems to negate the hypothesis of social disorganization theory. Sanders (1976) typified what has commonly been believed when he wrote, “Automobile theft is generally committed by white middle-class youths in groups of two or more, largely for ‘kicks’ ” (p. 94; see also Chilton 1967 and Schepses 1961). The high recovery rate of stolen vehicles also suggests that most theft occurs for recreational and short-term use rather than for profit³ (Clarke and Harris 1992; McCaghy, Giordano, and Henson 1977; Ogrodnik and Palement 1992; *U.S. News and World Report* 1996). Furthermore, Harris and Clarke (1991) found strong evidence that “car chopping” and “parts marketing” of stolen vehicles are relatively rare events because patterns of auto theft are not dependent on the interchangeability of parts, the demand for specific parts, or the market price of parts.

Felson and Cohen (1981) similarly posited that areas with weaker economies will have lower rates of auto theft (i.e., auto theft is positively correlated

with the economic well-being of a location). They cited evidence to support the hypothesis that high unemployment and reduced hours of overtime work will reduce one's exposure to criminal victimization outside the household, and decreased money for leisure will localize activities (see also Britt 1994).

Other researchers, however, have refuted the claim that auto theft is likely to be positively related to income levels. Some researchers suggest that although favored groups may make up a large percentage of auto theft offenders, African Americans disproportionately commit the offense, and the majority of auto thefts are committed by individuals with incomes below the median (McCaghy et al. 1977). Messner and Blau (1987) found evidence that the level of poverty in an area is positively related to the area's motor vehicle theft rate, and several other authors have claimed that auto theft increases as the legitimate availability of cars decreases (Biles 1977; Gould 1969; Mansfield, Gould, and Namenworth 1974; Mayhew 1990; Tremblay, Clermont, and Cusson 1994).⁴

Routine Activity Theory

In contrast with social disorganization theory, research on routine activity theory assumes that crime is engaged in as a rational choice in which offenders attempt to maximize their gains and minimize their losses (Massey, Krohn, and Bonati 1989). The theory posits that there are three basic elements of routine activity that influence crime rates: accessibility (e.g., the proximity of motivated offenders to crime targets), guardianship, and target suitability (Cohen and Felson 1979). Routine activity theory also proposes that crime will occur where daily activities create the most numerous opportunities for the most profitable crime and the least chances of detection or arrest.

Several researchers have also found that where there are more automobiles to steal, as measured indirectly by heavy traffic and higher rates of activity, there are higher rates of auto theft (Brantingham, Brantingham, and Wong 1991; Flemming et al. 1994; Martin 1995; Weigman and Hu 1992). The risk of detection is presumably lower at night, as evidenced by the fact that 62.7 percent of motor vehicle thefts occur then (with 12.3 percent at unknown times and 25 percent in the daytime hours; U.S. Department of Justice, Bureau of Justice Statistics, 1994).⁵

Auto theft offers an intriguing application of routine activity theory in that unlike most personal property, cars move from place to place rather than being preserved behind walls. For this reason, potential victims are particularly responsible for their vehicles' theft risk because they choose where to park their cars. Auto theft is especially victim facilitated in that some estimates place the number of vehicles stolen by the use of keys to be even higher

than 70 percent (McCaghy et al. 1977), and repeat victimization is not uncommon (nearly 25 percent; Fleming et al. 1994).

THEORY INTEGRATION

Several theorists have proposed that social disorganization theory and routine activity theory are complementary (Miethe and Meier 1994). Bursik and Webb (1982) argued for an integration of the theories, and Horney, Osgood, and Marshall (1995) proposed that opportunity and criminality may be usefully studied as interacting concepts (see also Kennedy and Forde 1990; Miethe and McDowall 1993; Miethe and Meier 1990; Miethe, Stafford, and Long 1987; Rountree, Land, and Miethe 1994; Sampson and Laubetsen 1990; Sampson and Woolredge 1987; Simcha-Fagan and Schwartz 1986; Smith and Jarjoura 1989; Smith et al. 2000). Therefore, it seems reasonable that a combined model consisting of the two previous models may better explain auto theft than either of them individually.⁶

The integration of social disorganization theory and routine activity theory must take into consideration the fact that the theories partially overlap in at least two respects: their treatment of social control in the community and their assumptions about delinquent and criminal motivation. Although both theories seem to stress control concepts—the concept of capable guardianship in routine activity theory and the concepts of primary (familial), secondary (neighbors), and tertiary (police) controls in social disorganization theory—the focus in routine activity theory is at the micro level (defined as the immediate visible environment surrounding a potential crime event), whereas social disorganization theory has historically had a more macro orientation, focusing on the idea of “nested neighborhoods” (Slovak 1986) in which the social control mechanisms of small units of “neighborhood” are embedded within larger ones. Furthermore, social disorganization theory focuses on the causes of low community control (e.g., heterogeneity) whereas routine activity theory does not.

We argue below that the more micro level of guardianship and control is measured by the variable proportion of housing that is owner occupied. Owners of dwellings typically are more committed to their neighborhoods than renters (Rohe and Stegman 1994) and have more at stake economically such that they are more likely to take action to control threats to their housing investments. Although homeowners are probably concerned about the neighborhoods around their face blocks, they are probably most concerned about their face blocks. Because both theories assume that this level of control is important, we allocate equal credit to each theory to the extent that the proportion of housing that is owner occupied is related to automobile thefts.

As for the assumptions made by social disorganization theory and routine activity theory about motivation, routine activity theory researchers usually assumes its presence, whereas for social disorganization theorists, motivation is either assumed or seen as a product of neighborhood characteristics (poverty, ethnic heterogeneity, population turnover). That is, in practice, routine activity researchers usually assume that there is a sufficient supply of motivated offenders such that their crucial variables are opportunity and guardianship (the latter discussed above). As for social disorganization theory, the concept of delinquent and criminal motivation in the interpretations of the theory since Kornhauser's (1978) important work is also "assumed" in the sense that a lack of community controls allows motivations to manifest themselves in behavior. Before Kornhauser's (1978) work, the presence of a subculture of delinquency would have been assumed by social disorganization theorists as crucial to the origin of delinquent and criminal motivation. Thus, in neither routine activity theory nor the modern, control interpretation of social disorganization theory is it necessary to explain the origin of delinquent and criminal motivations, other than to say that a lack of control helps trigger the behavioral manifestation.⁷

We think it is fair to conclude that social disorganization theory is more attentive to the origins of motivation than routine activity theory in that the former proposes that crime occurs where social structural factors produce an environment conducive to the behavioral manifestation of motivations to commit crime, including low levels of social control and normative environments conducive to crime and delinquency. Social disorganization theory neglects, however, to consider the actual opportunity for motivated individuals to successfully turn their desires into action. On the issue of opportunity, social disorganization theory and routine activity theory are most different. Thus, social disorganization theory implicitly makes the assumptions that there is a constant level of opportunity to commit crime for those who are motivated to do so and/or that opportunity is incidental to the decision to commit criminal acts. It tends to counterintuitively assume that criminally motivated individuals will always find an outlet for their desires because suitable opportunities are plentiful when in fact facilitating opportunities may be required (Cohen, Felson, and Land 1980; Lofland 1969).

Routine activity theory has precisely the opposite weaknesses in accounting for levels of criminal activity. By excluding variables pertaining to the motivational factors, common applications of routine activity theory tend to assume by default that the supply of motivated offenders is always adequate for crimes to occur.⁸

Sources of criminal motivation tend to be ignored in common operationalizations (Miethe and Meier 1994). From a routine activity perspective, it would seem that abundant opportunity may be all that is necessary

to produce motivation in some cases. Contemporary efforts to design crime-free environments and situational crime prevention measures (see Clarke 1983) virtually ignore motivation on the assumption that criminal motivation can be controlled merely by eliminating opportunity (Barclay et al. 1996; Barr and Pease 1990; Clarke 1984, 1989; HLDI 1990; Maguire 1980; Mayhew et al. 1976; Poyner 1991; Webb 1994).⁹

Several other authors (e.g., Lynch 1987; Miethe et al. 1987; Sampson and Wooldredge 1987), however, have laid the groundwork for integrating routine activity theory and social disorganization theory by pointing out that the crime-enhancing aspects of many variables associated with routine activity theory may be dependent on the social contexts in which they occur. That is, opportunity may result in crime only if it occurs in proximity to a population of motivated offenders. Opportunity and motivation (or at least the social origins of motivation) interact to produce crime (or at least enhance the likelihood of crime).

The present study follows this insight and proceeds with the model of integration originally used by Miethe and Meier (1994) in which social disorganization theory and routine activity theory are used in conjunction. This model assumes that both theories contribute to a general context that mediates their relationship to criminal events. That is, motivation (or at least the conditions conducive to the manifestation of motivation) and opportunity may have their own direct contributions to the location of a crime, but the majority of their contributions to explaining variance in crime rates are mediated by their interaction in a contextual environment. We should expect to find that the measures of social disorganization theory have interaction effects with measures of opportunity, as derived from routine activity theory.

Thus, in the work of Miethe and McDowall (1993) and Rountree et al. (1994), both of their models combine indicators of elements of each theory into a single model and introduce interaction terms between the concepts. Yet neither Miethe and McDowall (1993) nor Rountree et al. (1994) found prevalent, statistically significant interaction effects between the elements of the respective theories. Miethe and McDowall's (1993) research discovered only 3 out of a potential 54 interactions to be significant, and Rountree et al.'s (1994) research using the same Seattle data found only 2 out of 12 potential interaction effects to be significant. Smith et al. (2000) argued that an integrative model is more likely to demonstrate the presence of interaction effects if it uses much smaller units of analysis than the Seattle data allow and focuses on a specific type of criminal act.

The unit of analysis in the present study is the face block, as in Smith et al. (2000). As discussed above, a face block is defined as both sides of a street located between two intersections (i.e., one side of a city block, but including the locations on both sides of the street). Most ecological studies tend to use

standard metropolitan statistical areas (SMSAs), cities, counties, census blocks, or city blocks as their units of analysis (Bursik and Grasmick 1993), but these units are quite large and consequently include a variety of different physical and demographic structures that may confound the interpretation of effects (Blalock 1989; Janson 1993; Robinson 1950; Sampson 1987). Census blocks, for example, may contain neighborhoods of vastly different socioeconomic character, and even a single block may contain drastically varying micro environments. This phenomenon is called “spatial heterogeneity” or “geographic heterogeneity” in the literature (Janson 1993; Smith et al. 2000). For instance, one side of a block may easily be of an intensive commercial nature, whereas the opposite side of the block may be of a residential or industrial character. Of all the units discussed, the use of face blocks is most likely to minimize the degree to which dissimilar ecological environments are lumped together within a single unit and therefore better enables us to analyze neighborhoods as they are experienced by a city’s residents. Presumably, offenders familiar with one side of a face block are familiar with the other such that both sides are part of the “awareness space” of offenders (Brantingham and Brantingham 1984).

Even within the Seattle data that Miethe and McDowall (1993) and Rountree et al. (1994) used, heterogeneity within the unit of analysis may be a substantive issue, because survey respondents were asked to report on neighborhood traits within three or four blocks of their own household.¹⁰ This form of data collection establishes units inclusive of up to a 64-block area. “Busy places” or incivilities within a three- or four-block radius 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).

Similarly, it may be that heterogeneity within crime categories is responsible for the 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 McDowall (1993) proposed that such a process might have been occurring within their violent crime category.

Heterogeneity both within the unit of analysis and between crimes is addressed within the current study. Heterogeneity within crime categories is circumvented by simply focusing on a single type of street crime. Meanwhile, heterogeneity within analytic units is minimized by the use of face blocks, which are presumably a more spatially homogeneous unit of analysis than typically used. Moreover, spatial heterogeneity within a face block may be irrelevant, because awareness space on a face block is likely to include the entire expanse (Brantingham and Brantingham 1984). Motivated offenders present on a face block are more likely to have an awareness of any place on a face block than they are of a place located only a block away, where they may

rarely or never travel (Beavon, Brantingham, and Brantingham 1994; Brantingham and Brantingham 1984). These methodological adaptations are expected to yield much more supportive results for this style of integration than have previously been found.

Although we have argued for the merits of face blocks as an appropriate unit of analysis and that they are especially useful for testing hypotheses of routine activity theory, it is not obvious that they are ideal for social disorganization theory. Recall the discussion above regarding the community control interpretation versus the subcultural interpretation of social disorganization theory. Control on a face block is arguably relevant to whether or not a delinquent or criminal act will occur there. Under a subcultural interpretation, however, larger areas than face blocks are also relevant (multiple-block definitions of neighborhood). By opting for face blocks as our unit of analysis, are we less likely to find support for social disorganization theory? We think not, in part because we control for the characteristics of the surrounding neighborhood with the concept of "auto theft potential": the propensity for surrounding face blocks to be the scene of automobile theft. This is discussed further below.

DATA SET AND METHODS

Officially collected crime data have some well-known deficiencies. However, auto theft is extremely unusual, if not unique, among criminal offenses in terms of the extent of the validity of its official crime statistics (Cohen and Lichbach 1982; Myers 1980; O'Brien 1985; Skogan 1974). Wesley Skogan (1974), for example, noted that the Pearson product moment correlation between victimization survey results and official rates of auto theft was .94, a strong value for a validity coefficient (see also Cohen and Lichbach 1982; Myers 1980).

The data used for this study consist of 1993 police department crime incident data for the city of reference (a southeastern U.S. city with an approximate population of 250,000), county tax assessor data, and 1990 U.S. Census Bureau data. Geographical information software was used to match the tax data, census information, and locations of 1993 crime incidents with specific face blocks. Locations of certain types of commercial businesses were also matched using phone directories and business telephone directory information.

When data were missing for a face block for any of the variables examined, they were entirely excluded from analysis. Therefore, of the original data set of just over 12,000 face blocks, only 7,931 were available for analysis. A comparison of the descriptive statistics for cases included compared to

the entire data set for which information is available revealed minimal differences between the two samples for all of the variables.

The technique of "centering" was also applied to all the independent variables. Centering variables in an equation brings the intercept of the regression line equal to zero (with the exception of rounding error). Hence, interpretation is facilitated because the so-called main effect of a variable (the regression coefficient) is actually the effect of that variable when other variables are at their means (zero). In addition, centering all the independent variables at their means minimizes multicollinearity between the independent variables and the intercept (Belsley 1984; Belsley, Kuh, and Welsch 1980; Cohen 1978; Cohen and Cohen 1983; Marquardt 1980).

DEPENDENT VARIABLES

The dependent variable in this study was automotive theft (including all forms of motor vehicle theft, as well as the crime of "use of vehicle without owner's consent," but not including "theft from motor vehicles."). The descriptive statistics for auto theft and other variables can be seen in Table 1. In 1993, the mean number of auto thefts per face block was 0.22, with a maximum of 21 in a single face block. There were a total of 1,049 incidents of auto theft on all sampled face blocks. The frequencies reveal that 10,802 (88.4 percent) of face blocks experienced no auto theft in 1993, and 844 (7 percent) experienced only 1 auto theft. To lessen the skew, the number of auto thefts was used in its logged form.

INDEPENDENT VARIABLES

Statistical Control Variables

Some street addresses were the locations of several households, businesses, offices, and so on. For example, an independent home would be only one "place," but an apartment building may contain hundreds of places. Because a location with multiple places is more likely to be the scene of a crime than a location with only one place, the number of places was introduced as a control variable to account for any bias that may occur as a result of this phenomenon. The addition of this variable added a standardizing function so that face blocks of varying lengths or those simply classified into more or fewer addresses were not biased in the assessment of their relative proportions of auto theft.

TABLE 1: Descriptive Statistics

<i>Variable</i>	<i>M</i>	<i>SD</i>	<i>Skewness</i>	<i>Maximum Value</i>	<i>IQR</i>
(Natural log) auto theft	.12	.33	3.68	3.09	—
Number of places	11.94	20.18	7.19	385	8
Street segment population	50.76	100.36	7.24	1,127	36
Percentage below median property value	25.60	36.21	1.11	100	50
Number of Blacks	10.21	20.38	4.52	238.5	11.5
Racial heterogeneity	.07	.07	.89	.25	.118
Number of single-parent households	1.48	2.87	4.41	27	1.333
Distance from the city center	4.16	2.29	.14	9.70	3.737
Number of owner-occupied homes	5.23	6.57	3.64	120	6
Apartment/office value	5.53	19.22	18.63	608.76	2.52
Number of vacant/parking lots	.43	1.20	6.70	32	1
Number of hotels or motels	.00	.10	37.34	4	1
Number of commercial establishments	.35	1.69	8.89	48	1
Number of stores, shops, etc.	.07	1.20	35.85	60	1
Number of multifamily buildings	1.45	5.63	12.82	220	1
Number of restaurants and gas stations	.06	.54	15.98	20	1
Number of youth places	.04	.29	14.71	7	1

NOTE: IQR = interquartile range.

The second control variable used was the population of the face blocks (1990 census), under the assumption that the more people, the more cars to steal. When each side of a face block was 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 (2 of 12 "sides" of the census blocks). For those few with four adjoining census blocks, one eighth (2 of 16) of the total was used. Subsequently, numerous individual face blocks were examined on digitized street maps, and the estimates were deemed reasonable. Nonetheless, some error is obviously introduced by this estimation procedure. By controlling for population, we controlled for biases similar to those created by the presence of multiple places.

Some of the independent and control variables were fairly skewed in their univariate forms, but comparisons of regression models with transformed (logged) versus untransformed variables indicated very small differences. For the purposes of simplicity in translation and analysis, all independent and control variables were used in their original forms. The correlations between

each of the independent and control variables can be seen in Table 2. For brevity, interpretations of the correlations are left to the reader.

Community Control Variable

As discussed above, the number of owner-occupied places was used as an indicator of guardianship or parochial control. Thus, both social disorganization theory and routine activity theory lay claim to this variable, and it is offered here as representing both theories. Owners have vested interests in their properties and the surrounding neighborhoods, so it is presumed that they are more likely to report or take action against offenders and potential offenders than nonowners (Miethe and Meier 1994). Areas with high numbers of owner-occupied buildings are likely to have higher levels of guardianship.

Social Disorganization Variables

The number of Blacks was a variable that estimated the number of African Americans who lived on a face block. This variable was used because several social disorganization theorists, including Shaw and McKay (1942), have noted that the percentage of Blacks in an area is correlated with local delinquency rates. The diversity associated with a greater number of Blacks was hypothesized by Shaw and McKay (1942) to decrease social participation and social control in a neighborhood (for Whites and African Americans). The 1999 statistics from the U.S. Department of Justice also indicate that 42 percent of auto thefts cleared by arrest were thought to have been committed by African Americans. The U.S. Department of Justice, Bureau of Justice Statistics (1994), also indicated that Blacks are the victims of auto theft at a rate approximately 244 percent higher than the rate for Whites.¹¹

At the most elementary level, a higher number of African Americans in an area is associated with a higher crime rate simply because Blacks are more likely to lack economic, political, and social resources. Communities of African Americans have historically been and continue to be subject to disproportionate detrimental forces of a political economy of space. These effects are too numerous and varied to describe here but include such factors as a disproportionate experience of residential mobility (due to "White flight," "urban renewal," forced relocation, and the disruption of local economies), a denial of monetary lending and insurance, a lack of political power, a lack of city services, poor educational opportunity, and the subsequent occurrence of an oppositional subculture.

The percentage of the population that is Black is also likely to be associated with crime and delinquency through its association with areas of

TABLE 2: Correlation Coefficients

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1.00															
2	.08***	1.00														
3	-.10***	-.14***	1.00													
4	.10***	.40***	.12***	1.00												
5	.11***	.08***	.06***	.20***	1.00											
6	.12***	.69***	-.04***	.74***	.16***	1.00										
7	.04***	.30***	-.47***	-.07***	-.01	.09***	1.00									
8	.21***	.06***	-.11***	-.03**	-.07***	-.01	.16***	1.00								
9	.04***	-.02	-.11***	-.04***	-.03*	-.03**	.01	-.07***	1.00							
10	.01	-.06***	.30***	.01	.01	-.02	-.10***	-.00	-.02	1.00						
11	.01	-.02	-.01	-.02	.00	-.02	-.02	-.03**	.07***	.01	1.00					
12	.13***	-.05***	.01	-.01	.02	-.00	-.10***	-.13***	.12***	.12***	.07***	1.00				
13	.09***	-.02	-.03**	-.01	.00	-.01	.01	-.02	.12***	.05***	.06***	.13***	1.00			
14	.50***	.02*	-.05***	.14***	.08***	.19***	-.09***	-.13***	-.02	.01	-.01	.01	.02	1.00		
15	.05***	-.03**	.00	-.02	.03*	-.02	-.04**	-.07***	.08***	.11***	.15***	.29***	.23***	-.01	1.00	
16	.17***	.01	-.03*	.02	.01	.03**	-.00	-.04***	.11***	.02	.03*	.06***	.07***	.07***	.11***	1.00
17	.36***	-.03***	.08***	.13***	.09***	.11***	-.18***	-.10***	.06***	.13***	.14***	.22***	.13***	.28***	.26***	.13***

NOTE: 1 = number of places; 2 = street segment population; 3 = percentage below median building value; 4 = number of African Americans; 5 = racial heterogeneity; 6 = number of single-parent households; 7 = distance from the city center; 8 = number of owner-occupied places; 9 = average assessed apartment/office value; 10 = number of vacant/parking lots; 11 = number of hotels and motels; 12 = number of commercial places; 13 = number of stores, shops, etc.; 14 = number of multifamily buildings; 15 = number of restaurants, bars, and gas stations; 16 = number of youth places; 17 = natural log of number of auto thefts.

* $p < .05$. ** $p < .01$. *** $p < .001$.

relatively low socioeconomic status (SES) (Kornhauser 1978). Shaw and McKay (1942) concluded that poverty is the most important aspect of social disorganization in terms of determinacy of crime rates. Bursik (1986), Kornhauser (1978), and Tittle (1983) also found the SES of an area to be associated with higher levels of crime and delinquency through its association with residential mobility and other factors related to social disinvestment and community organization. Moreover, the SES of an area seems to be related to the crucial intervening variable of social network formation. Sampson (1991) found that social class is inversely related to community friendship networks, and Bellair (1997) similarly found that SES is related to network formation and that the majority of the relationship between auto theft and SES is through this medium. Meanwhile, Copes (1998), Hope (1987), and Liddy (1987) found low-SES areas to be related to auto theft.

Relatedly, racial heterogeneity was a measure of differences in the ratio of racial composition of a face block. It was similar to percentage Black in some respects but more directly tapped the diversity component. The social disorganization interpretation of population heterogeneity is that it is an indicator of the extent to which the residents of an area subscribe 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 or enforcement of norms and values (Bursik 1986; Byrne and Sampson 1986; Kornhauser 1978; Miethe and Meier 1994). Clarke and Harris (1992) and Bellair (1997) specifically found that auto theft is higher in multiracial settings. Following Miethe and McDowall (1993), racial heterogeneity was calculated by the proportion White times the proportion Black in a face block: $(\text{Whites} / \text{Total Population}) \times (\text{Blacks} / \text{Total Population})$.

The next variable, single-parent households, was 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—single parents are less able to control their teenage offspring (Felson and Cohen 1981; Sampson and Lauritsen 1990)—and an indicator of social class—single-parent households are economically less well off than dual-parent households (Reiss 1986; Shaw and McKay 1942). McKean (1983) specifically found that the number of divorces in an SMSA is related to the number of auto thefts in that SMSA.

Distance from the city center was a measure of how far a face block was located from the geographic center of downtown. Park and Burgess (1924) and Shaw and McKay (1942) both found 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 is more aptly modeled as following the concentric zone

pattern than as a multinucleated or "metropolitan reef" pattern, such as described by Felson (1994:87-88). In addition, Byrne and Sampson (1986) found that population density is related to criminality, and the distance from the city center variable (measured here in miles) was also likely to capture this consideration to some extent.

Finally, as a measure of poverty in an area, the average percentage below median property value was measured. This variable provided an approximate measure of the SES of the residents of an area. However, many of the limitations and controversies that apply to the number of Blacks variable also apply to this variable.

Routine Activity Variables

The number of commercial places variable was created on the basis of a factor analysis that was used to identify common underlying constructs. Several of the variables seemed to indicate a common construct, and these variables were subsequently combined into a single index variable. Thus, the number of commercial places variable contained a count of business offices, industries, manufacturing facilities, and warehouse and storage facilities. These places would all be 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).

The number of hotels and motels, the next variable, will most likely result in increased opportunity because typically, there are large parking lots associated with hotels and motels. Also, these lots are usually removed from the room units where the vehicles' owners are staying, resulting in relatively less guardianship compared to the situation of a car parked in its owner's private garage.

Youth places was a variable used to indicate the presence of places that attract large numbers of young people, such as movie theaters, swimming pools, bowling alleys, video arcades, schools, and so on. Those areas with larger numbers of youth may experience more crime because youth commit a disproportionate amount of many types of crime, including auto theft (Cohen and Land 1987; Farrington 1986; Greenberg 1976; Hirschi and Gottfredson 1983; Sanders 1976). Vandaele (1975) and Tremblay et al. (1994) specifically found that a large number of youth in an area is a strong indicator of the number of stolen vehicles in that area. The U.S. Department of Justice (1996) indicated that people under 18 years of age accounted for 42 percent of those arrested for auto theft, and people under age 21 accounted for 59 percent of arrests.¹²

The number of restaurants, bars, and gas stations influences the amount of pedestrian traffic of potential offenders, the number of vehicles present, and the amount of guardianship. Roncek and Maier (1991) found that crime occurs more frequently on blocks with bars or taverns, and Sherman, Gartin, and Buerger (1989) found that bars and convenience stores account for a large number of the addresses from which calls for assistance are made. Moreover, cars are likely to be parked near bars and restaurants in the evening hours and after dark, which are conditions that are conducive to theft.

The number of vacant lots and parking lots was simply a measure of the number of properties that did not contain a structure of any sort. Parking lots without associated buildings were included, but parking decks were not (there are very few parking decks in the city under study). The interpretation of results based on this variable is complex. It may indicate disinvestment in an area or simply indicate a for-profit parking lot. In areas more distant from downtown, this may simply be an indicator of a wooded area.

The number of stores and shops was a measure of the presence of all direct retail establishments other than those accounted for by other variables. It included such things as clothing stores, grocery stores, pawn shops, toy stores, novelty shops, tanning salons, and so on. Interviews with offenders elsewhere have revealed that many of them spend a considerable amount of time hanging out at shopping malls (Fleming et al. 1994). Face blocks with stores and shops will typically have more cars parked on the street than purely residential streets, and those cars are probably less guarded.

The number of multifamily buildings variable was a measure of the presence of buildings with more than one household. Larger numbers of multifamily dwellings have been associated with lower guardianship and higher rates of criminal activity (Roncek 1981; Sampson 1983). National victimization data (U.S. Department of Justice, Bureau of Justice Statistics 1994) indicate that people residing in single-household structures are significantly less victimized by motor vehicle theft than people residing in structures with two or more households. In the current context, it is argued that because social control variables are controlled for statistically elsewhere in the model, the number of multifamily units is a measure of the availability of automobiles in parking lots that are usually remote from the dwellings associated with them. Multifamily dwelling units typically have parking located remote from the housing units so that vehicle owners cannot see their vehicles from their homes. Thus, these types of living arrangements typically reduce guardianship by spatially removing owners from their property.

Finally, the average assessed apartment or office value was measured in tens of thousands of U.S. dollars. Higher apartment values and more local prosperity are presumably associated with more desirable and more prolific targets for crime, and some prior research has provided evidence for this

relationship (Gould 1969; Mansfield et al. 1974; Miethe and Meier 1994). Indeed, Clarke and Harris (1992) and Fleming et al. (1994) cited evidence that car thieves prefer new and sporty cars, and Clarke and Harris (1992) proposed that a vehicle's attractiveness in terms of its cachet and profit potential is more important than its security or availability in predicting auto theft. If apartment or office value indicates the presence of attractive targets, it may be a major indicator of where auto theft occurs.

RESULTS

The results include three different models. Model 1 contains only the main effect variables from the two theories. Model 2 adds interaction effects to the equation, and model 3 introduces a control for autocorrelation.

Model 1 in Table 3 displays the ordinary least squares (OLS) regression model results of the combination of both sets of variables into a single model for the prediction of the distribution of auto thefts across face blocks. The combined model explained 28.3 percent of the variation, an improvement of 3.8 percent over the model with routine activity variables alone (not shown in the table) and 10.3 percent over the model with only social disorganization variables (also not shown). All the variables in the social disorganization model were statistically significant except for the percentage below median building value and racial heterogeneity. For all the significant variables, the direction of influence was consistent with the general literature on each theory. The fact that the percentage below median building value was insignificant may indicate that it was a weak measure of SES or poverty. Similarly, the heterogeneity measure may not have captured the character of neighborhood cohesion, possibly because of the measure's inability to identify the race of the majority population on any particular face block (i.e., 90 percent Black or 90 percent White have the same value on the racial heterogeneity variable).

All the variables in the routine activity model were statistically significant and in the expected direction. We compared the effects, which had different metrics, using the IQR of each independent variable when possible. If because of extreme skewness an IQR was zero (as was the case for most of the count variables), we used the value of one, indicative of the impact of one of the units in question (e.g., one vacant lot, parking lot, hotel, motel, store, etc.). Thus, for example, the effect of changing the distance from the center of the city 3.74 miles (from the 25th percentile to the 75th percentile) was $-.0699$ in model 1. The effect of increasing the number of hotels by one was $.320$ (over four times as large an effect as the IQR effect of distance from the center city).¹³

TABLE 3: Regression Results for the Prediction of Logged Auto Theft by a Combined Model of Routine Activity Theory Variables and Social Disorganization Theory Variables

Variable	Model 1		Model 2		Model 3 ^a	
	B	IQR Effects ^b	B	IQR Effects	B	IQR Effects
Control variables						
Autocorrelational control	—	—	—	—	.2946***	.1838
Number of places	.0051***	.0408	.0055***	.044	.0047***	.0376
Population	-.0003***	-.0108	-.0003***	-.0108	-.0002*	-.0072
Social disorganization variables						
Percentage below building value	.0001	.005	.0003*	.015	.0004*	.02
Number of African Americans	.0006*	.0069	.0007**	.0081	—	—
Racial heterogeneity	.0823	.0097	—	—	—	—
Number of single-parent families	.0110***	.0146	.0098***	.0131	.0082***	.0109
Distance from city center	-.0187***	-.0699	-.0074***	-.0277	.0188***	.0703
Social control variable						
Number of owner-occupied homes	-.0049***	-.0294	-.0052***	-.0312	-.0031***	-.0186
Routine activity variables						
Apartment/office value	.0006***	.0015	.0007***	.0017	.0005**	.0013
Number of vacant/parking lots	.0225***	.0225	.0502***	.0502	.0392**	.0392
Number of hotels/motels	.320***	.32	.564***	.564	.508***	.508
Number of commercial places	.0137***	.0137	.0234***	.0234	.0233***	.0233
Number of stores/shops	.0096***	.0096	-.0009	-.0009	-.0011	-.0011
Number of multifamily units	.0045***	.0045	.0146***	.0146	.0165***	.0165
Number of restaurants/gas stations/bars	.112***	.112	.176***	.176	.1524***	.1524
Number of youth places	.0271*	.0271	.138***	.138	.111***	.111

Interactions						
Single Parent $\times$ Rest./Gas/Bar	—	—	.0089**	.0089	.0108**	.0108
Single Parent $\times$ Commercial	—	—	-.0010***	-.0010	-.0007*	-.0007
Single Parent $\times$ Motel/Hotel	—	—	.24***	.24	.2488***	.2488
Single Parent $\times$ Stores/Shops	—	—	.0148***	.0148	.0155***	.0155
Building Values $\times$ Stores/Shops	—	—	.0026***	.0026	.0027***	.0027
Building Values $\times$ Commercial	—	—	.0005***	.0005	.0004***	.0004
Building Values $\times$ Vac./Park. Lot	—	—	.0003***	.0003	.0002	.0002
Dist. from Center $\times$ Rest./Gas/Bar	—	—	-.0203***	-.0203	-.0174***	-.0174
Dist. from Center $\times$ Commercial	—	—	-.0040***	-.0040	-.0035**	-.0035
Dist. from Center $\times$ Youth	—	—	-.0268***	-.0268	-.0233***	-.0233
Dist. from Center $\times$ Multifamily	—	—	-.0025***	-.0025	-.0029***	-.0029
Dist. from Center $\times$ Motel/Hotel	—	—	-.101***	-.101	-.0850***	-.0850
Dist. from Center $\times$ Vac./Park. Lot	—	—	-.0046**	-.0046	-.0044*	-.0044
Statistics						
Intercept	.120		.122		-.030	
Multiple R^2	.533		.569		.572	
R^2	.284		.324		.327	
Adjusted R^2	.283		.321		.324	
SE	.283		.275		.275	

NOTE: IQR = interquartile range.

a. U.S. Department of Justice, Bureau of Justice Statistics (1994), data demonstrate a strong association between the length of residency at a particular location and the rate of victimization. The rate of victimization per 1,000 individuals of those who had lived at a location for less than six months was 35.4 percent, whereas it was only 21.4 percent for those who had lived at the same location for two years and 14.1 percent for those who had lived at the same location for five or more years.

b. Strictly speaking, an IQR effect of one variable should be interpreted cautiously with a dummy variable effect of another variable. The claim made here is that the two effects can be compared to give a sense of their respective predictive power.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Judging by the IQR effects, the most powerful routine activity variable in the model was the presence of a hotel or motel. An increase of one hotel or motel on a face block was associated with an increase of 32 percent in auto thefts for that face block, holding all other variables constant (a one-unit change in the independent variable results in a $b \times 100$ percent change in the dependent variable). One of the more interesting findings was that the number of multifamily dwelling units had a significant positive association, whereas higher population was significantly associated with lower rates of auto theft. Past literature has indicated that the variable representing the number of multifamily dwelling units is expected to be associated with high rates of auto theft, not only because the units indicate probable high residential turnover¹⁴ but also because their presence tends to be associated with anonymity through an association with high-density living conditions (Newman 1973, 1980; Roncek 1981; Sampson 1983). Nonetheless, the number of multifamily dwelling units variable was positive, whereas the population of the face block was negative when controlling for each other's influences. It appears as if there is something about multifamily dwelling units that causes them to be associated with auto theft other than the anonymity that results from high-density residency. As argued previously, this seems plausible because such units often have remote, communal parking facilities, whereas other high-density living quarters do not. This explanation is consistent with the previous findings that large communal and public parking facilities seem to be associated with auto theft (Barclay et al. 1996; Biles 1974; Brantingham and Brantingham 1991; Felson 1994; 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).¹⁵

COMBINED MODEL WITH INTERACTIONS

Despite the overall affirmative findings in predicting the spatial distribution of auto theft, one may be able to specify a model that is even more powerful than the direct combined model. It is proposed here that social disorganization attributes should interact with the opportunity variables included in the routine activity theory operationalization to produce more auto theft than either would generate independently. If interaction terms are found to be significant, we should have additional information about the context in which automobile theft is committed.

Because of the prevalence of multicollinearity between product terms and their main effect variables, and because there is no theoretical rationale for giving priority to one hypothesized interaction effect over another, we relied on a "forward selection" method for the selection of variables for the final

model. All main effect variables were included in the regression model from the start, and only interaction terms found to be statistically significant when applied in a regression model independently were included in the pool of variables eligible to be added to the final regression model. This process maximized the possible number of significant interaction terms within the final model. Prior to the forward selection procedure, we calculated 32 product terms to test for interaction effects involving each of four social disorganization theory measures (percentage below median building value, number of African Americans, number of single-parent families, and distance from center city) with each of the eight routine activity variables. None of the interactions involving African Americans were entered in the next stage of the modeling because of multicollinearity. In addition, two other interactions also had high multicollinearity, so in fact, only 22 interaction effects were actually tested in the regression equation. Of the 22 tested, 13 were statistically significant and are presented in model 2 of Table 3.¹⁶

RESULTS OF MODEL WITH INTERACTION TERMS

As seen in model 2 of Table 3, the amount of explained variance was improved by adding interaction terms. The previous combined model without interaction terms explained 28.3 percent of the variance in auto theft, whereas the model with interaction terms explained 32.1 percent of the variance. There was only 1 interaction variable of the 13 that appeared contrary to the primary hypothesis. The negative sign of the interaction between the presence of single-parent families and commercial places indicates that the presence of single-parent families in conjunction with commercial places generated less auto theft than would be expected from a linear summation of their individual auto theft-generating qualities. It may be that those types of places designated as "commercial" offer a guardianship function unavailable with the other land use variables.

The remaining interactions between the number of single-parent households and the various land use variables (numbers of restaurants, bars, gas stations, motels or hotels, and stores or shops) indicate that the contexts of single-parent homes and various land uses tend to generate circumstances favorable to automobile theft. To the extent that we were adequately controlling for SES, it appears that this effect was not due to the economic disadvantage commonly associated with single-parent homes but to a lack of social control, perhaps a lack of social control of the offspring of these families.¹⁷ The social activity at places with these various land uses may generate auto theft as a result of the clientele they attract. That is, more potential offenders

are becoming increasingly familiar with a face block and spending greater time there.

The second set of interactions that appears to be both statistically and substantively important is that between the percentage below median building value of a face block and whether or not that face block included stores and shops or commercial places. This set of interactions seems particularly interesting because the main effect of the variable for building values was relatively small (an IQR effect of .015 in model 2). This combination of results indicates that low building values do result in increased auto theft, but more so if buildings are located on face blocks with these other features. The main effects of six of the eight routine activity variables were as large or larger than the main IQR effect of low building values. If building values are indeed an indicator of SES and presumably the presence of low-income people in an area, then the contingent effect implies that the presence of stores and shops or commercial places facilitates the occurrence of these motivated offenders to steal automobiles.

The effects of the distance from downtown also seem to be influenced by several routine activity variables. Areas that have high traffic of potential offenders and relatively large numbers of opportunities appear to have higher crime rates if they are located closer to the downtown area. Significant interactions occurred with the number of restaurants, bars, and gas stations; the number of commercial places; the number of youth places; the number of multifamily dwelling units; the number of hotels and motels; and the number of vacant lots and parking lots. Little explanation is required here because the results are, again, entirely consistent with what is predicted in the integration of the two theories. High traffic of potential offenders and larger numbers of suitable targets yield higher rates of auto theft in all conditions, but they especially increase auto theft when they occur in the context of socially disorganized areas (in this case represented by proximity to the center of the city).

CONTROLLING FOR AUTOCORRELATION: POTENTIAL FOR AUTOMOBILE THEFT

The final procedure used to analyze the auto theft data was to add a control for autocorrelation. Doreian (1980, 1981) explained that regression analysis of social data across geographical space often violates regression's assumption of independent errors. When using spatial areas as units of analysis, errors may be patterned because of unmeasured variables with localized effects or the influence of adjacent spatial units. This latter effect is likely to have been a powerful influence in the present analysis because the units of analysis were particularly small. That is, the rate of auto theft on a particular

face block was particularly likely to have been affected by the social and structural characteristics of adjacent face blocks.

An attempt to correct for this violation of a regression assumption was achieved through the addition of a final variable to the regression model (for further explanations of this method, see Land, Deane, and Blau 1991; Roncek and Montgomery 1986; Roncek and Robinson 1984). This variable, referred to here as automobile theft potential, represented the predicted value of the weighted average of the number of auto thefts for the 10 next adjacent face blocks in either direction from the face block in question. On a street running east to west, this variable is based on a model of the weighted average number of auto thefts of the 10 face blocks located immediately to the west of the face block in question and the 10 face blocks immediately to the east of the face block in question. By calculating this average and adding it to the regression model in a two-stage least squares regression, a control was established for influences of the surrounding spatial context. That is, it controlled for the possibility that automobile theft in nearby blocks may diffuse or "spill over" to a given face block. In addition, when calculating the effects of the spatial context of a face block, it is logical that the autocorrelational effects of the 1st most adjacent face block are likely to be more powerful than the autocorrelational effects of the 10th most adjacent face block. Therefore, the auto theft potential variable was calculated using a weighted average (using the average distance between face blocks to estimate the distances, i.e., the 1st most adjacent face block's number of auto thefts is divided by .114, the second most adjacent face block's by .228, the third most adjacent face block's by .342, etc.).¹⁸

Under this procedure, the automobile theft potential variable was modeled as an instrumental variable in a two-stage least squares solution, as outlined by Land et al. (1991). The predicted value of automobile theft potential was entered in the substantive equation predicting automobile theft on a given face block. The effect of the potential variable can be interpreted as a diffusion effect of automobile theft from adjacent face blocks to a given face block.

AUTOCORRELATIONAL CONTROL RESULTS

The addition of the automobile theft potential variable to the model caused the number of Blacks variable to drop out of statistical significance, and it was consequently dropped from the model. Apparently, the association between Black occupation of residences and auto theft is due to the broader contextual environment rather than the actual presence of African American residents and the relatively low SES that the number of Blacks variable was

intended to represent. The results of the reduced model can be seen in model 3 of Table 3.

Apart from the absence of the number of African Americans variable, model 3 was only minimally different from model 2. Most variables had the same sign and similar strength in the presence of the auto theft potential variable as they did in its absence. The only major exception was the distance from city center variable, which changed from a negative to a positive sign. We speculate that the sign reversal may be because net of the automobile theft potential, distance from the center of city may represent lower guardianship.

The significance of the automobile theft potential variable in model 3 indicates that auto theft on a face block was in fact related not only to the characteristics of the face block in question but also to the characteristics of the closely adjacent face blocks. This finding and the subsequent control for its influence support the validity of the previous findings pertaining to the other independent variables. That is, the fact that the model experienced only minimal changes when controls for autocorrelation were added reinforces the claims of validity for the previous models.

The statistical insignificance of the number of African Americans and heterogeneity variables in conjunction with the small effect of the building values variable across models casts doubt on the applicability of aggregate SES to the spatial distribution of auto theft. It seems that the SES of an area does not predict auto theft for an area but that it is a crime committed across classes (or at least spatial class distributions). This conclusion seems to be supported by Tittle and Meier, (1990) and Nuehring (1976), who claimed that SES is not associated with criminality on an individual level of analysis, and by Higgins and Albrecht (1981), who specifically found no individual-level relationship between SES and auto theft. We were concerned, however, that the socioeconomic variables were predictive of automobile potential and thus indirectly contributing to the explanation of auto theft. However, in a separate analysis, we found that the SES-type variables collectively and uniquely accounted for only 0.3 percent of the variance of auto theft potential (compared to 5 percent for the remaining two social disorganization variables). Thus, the SES-type variables that we controlled for in our models were not important predictors of automobile theft.

Finally, model 3 was decomposed in terms of unique contributions to explained variance. That is, it was disaggregated by variable type to identify how much variance could be uniquely attributed to each. Routine activity (unique $R^2 = .045$), social disorganization (.022), the interaction terms (.032), and the autocorrelational control (.034) made significant and similar unique contributions to the model as groups. In addition, the fact that the interaction terms as a group contributed such a significant portion of the explained variance affirms the theory that rates of auto theft are best understood by

examining interactions of social disorganization theory variables and routine activity theory variables rather than examining either of them in isolation or even both of them in combination. Furthermore, the vital role of the autocorrelational control is revealed because its effects on the variance are similar to the effects of both the social disorganization and routine activity variables.

In addition, by examining the OLS regression of the automobile theft potential variable, it was found that it was predominately explained by the effects of the social disorganization variables (unique $R^2 = .066$), as compared to the routine activity variables (.003) and the interaction effects (.002). Hence, the contextual position of a face block influenced auto theft rates primarily through social disorganization rather than routine activity factors.

The fact that social disorganization variables were more predictive of automobile theft potential than routine activity theory measures suggests a spillover process in which motivated offenders adjacent to a face block will occasionally steal an automobile on the face block in question. What brought the offender to the area around the face block seems to be social disorganization factors, but what determines the "choice" of a face block on which to steal a car seems to be routine activity factors (opportunity). In essence, the social disorganization factors place the offender near the site of the automobile theft. Nevertheless, routine activity characteristics (here, land uses) are important for predicting car theft itself on a given face block.

As argued earlier, interaction effects between motivation (or the conditions that generate motivation) and opportunity better account for the spatial distribution of auto theft than consideration of these factors as independent phenomena. Thus, opportunity alone is not as powerful an explanation as opportunity in conjunction with social disorganization.

CONCLUSION

As a whole, these results have thus confirmed the utility of an integrated theoretical model in describing spatial patterns of auto theft in a southeastern, midsized U.S. city. The individual application of routine activity theory and social disorganization theory indicates that they each have their own distinct contribution to the understanding of the spatial distribution of auto theft. The rate of auto theft for a particular face block appears to be determined by opportunity, the flow of traffic of motivated offenders, the level of guardianship, and social disorganization factors.

Furthermore, the study confirms that these apparent relationships exist simultaneously and that controlling for the concepts in one theory does not preclude the concepts of the other theory from explaining variance. More

importantly, the results indicate that the effects of the concepts of each of the theories are conditional on the concepts of the other. That is, an interaction apparently exists in which a confluence of opportunity and motivated offenders with socially disorganized face blocks results in greater amounts of auto theft than they do independently. Hence, the variables in isolation fail to capture the full effect of their influences. In brief, the effects of the concepts of each theory must be examined within context. Any complete understanding of a spatial distribution of auto theft must begin with an integration of these two theories.

In addition to the theoretical findings in this article, a greater understanding of the specific contexts of auto theft itself has also been gleaned. The integrated theoretical model reveals a complex series of interactions that specify more completely the circumstances under which the offense takes place. By examining auto theft in a relatively small spatial unit, we believe that we have captured the context of the crime more so than previous spatial studies. Moreover, the relationship of nearly every independent variable to auto theft hints at potential practical application. For example, the finding that the amount of auto theft in large public parking areas is contingent on the extent of local social disorganization seems particularly important for practical application. Such a finding may be used to inform zoning and building decisions or may simply act as an impetus for the installation of protective measures in parking facilities located in these areas.

Finally, the auto theft potential variable effects represent a significant finding on the contextual presence of auto theft. Auto theft on a face block is affected not only by the structures and social traits characterizing that particular face block but also the structures and social characteristics of the face blocks surrounding it. Such a finding has implications for any policy aimed at controlling rates of auto theft in a localized area. Preventing auto theft at a specific address may involve treating social maladies of its surrounding neighborhoods. Zoning and planning boards may take steps to avoid the concentration of criminogenic influences around a concentration of targets. Beyond these board policy implications, further research validating the current study with data from another time period or place (city) is necessary before more specific implications can be drawn.

NOTES

1. Data from 1988 indicate that 13 percent of victims lost at least one day of work (Harlow 1988), while 1985 data show that victims of auto theft (49 percent) reported more inconvenience and practical problems than victims of burglary (19 percent; Hough and Mayhew 1985).

2. Auto theft is the property offense that is most frequently reported to authorities (U.S. Department of Justice 1996). Evidence presented later in this study indicates that measures of rates of auto theft are far more valid than measures of rates of other types of crime.

3. Tremblay, Clermont, and Cusson (1990) found that at most, 3 percent of stolen vehicles in Quebec were recovered because of proactive police efforts. The rest of the recoveries presumably occurred after the thieves had abandoned the vehicles, thus implying that they may have never been intended for resale. One must generalize from these results cautiously because the resale of stolen motor vehicles is more active along national borders (Clarke, Field, and Harris 1991; Miller 1987; Tomb 1985), but for an interior city such as the one in question here, it is unlikely that the resale of entire vehicles or parts is a common occurrence. (Relating the total percentage of the vehicles stolen to the total value of the vehicles recovered, there was a 67 percent recovery rate in 1999; U.S. Department of Justice 1999).

4. This finding contradicts Fleming, Brantingham, and Brantingham's (1994) findings. They found from interviews of offenders that students involved in car crime did not differ from other students in respect to the number of autos owned by their families. In fact, Fleming et al. (1994) found that young auto thieves tended to have more access to legitimate forms of transportation than other students and that of those who were over 16 years of age, auto thieves were twice as likely as other students to report personally owning vehicles. However, there are several obstacles to generalizing about the demographics of auto theft offenders or confirming either one of these schools of thought about offenders. Arrest rates are at only about 14 percent (U.S. Department of Justice 1996), and motives for the crime can vary among "having a good time" (Schepers 1961), short-term transportation, long-term use, profit, and assistance in the commission of other crimes.

5. Furthermore, 41.2 percent of victims described the behavior they were engaged in at the time of the thefts as "sleeping."

6. One apparent obstacle to their 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. 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 loses its salience. That is, motivation may have its roots in either rational or irrational origins, whereas the target selection processes discussed by routine activity theory may retain a predominantly rational basis (Cornish and Clarke 1986; Miethe and Meier 1994). Hence, although the assumptions about rationality may initially appear to be contradictory in these theories, there is in fact no obstacle here to theoretical integration.

7. We are not entirely satisfied, however, with Kornhauser's (1978) interpretation of social disorganization theory. We think it is plausible to maintain that normative subcultural components favorable to delinquent and criminal actions are among the explanatory mechanisms that are an integral part of social disorganization in a community. These subcultures come into existence and flourish under the conditions of poverty, heterogeneity, and residential mobility described by social disorganization theorists. However, it is beyond the scope of this article to discuss in full our interpretation of social disorganization theory or our dissatisfaction with the pure social control interpretation of that theory.

8. In some cases, motivation may be so prevalent that issues of opportunity and routine activity become moot (see Mayhew 1990; Mayhew et al. 1976).

9. Interestingly, minimizing opportunity seems to be quite effective. Webb (1994), for example, found that the years in which the United States, Britain, and West Germany implemented laws requiring steering column locks and safety helmets were distinct turning points in the trends of auto thefts in these nations.

10. Specifically, respondents were asked to report the number of busy places within three blocks and the number of neighborhood incivilities within four blocks of their households.

11. This statistic is based on rates of victimization after controlling for the number of vehicles owned by the racial groups.

12. However, arrest-based statistics on the ages of offenders must be interpreted cautiously; Challinger (1987) and Collins and Wilson (1990) argued that juveniles are disproportionately arrested for auto theft because they are more readily detected than adult offenders.

13. For those variables with extremely small coefficients, the difference in value between the first and third quartile was sometimes zero. In this case, the interquartile range (IQR) effect was treated as being equivalent to the slope coefficient.

14. The model summary statistics for model 3 were based on an OLS regression rather than the two-stage forward selection model that generated the slope coefficients. OLS was used in this case to be comparable to the results of models 1 and 2.

15. Furthermore, this explanation finds support in Fleming et al.'s (1994) finding that 40 percent of auto theft victims reported their vehicles stolen from lots with 100 or more parking spaces, and the finding of Clarke and Mayhew (1994) that parking in a garage at night is 20 times safer than parking in a driveway or other private place and 50 times safer than parking on the street.

16. Generally, multicollinearity can be estimated from low tolerances. Tolerances are calculated by the formula $1 - R_i^2$, where R_i^2 is equal to the multiple correlation of that variable with the other independent variables in a model. Hence, tolerances range from zero to one and are the reciprocals of the commonly used "variance inflation factor" measure. In other words, the tolerance scores can be interpreted as the percentage of independence the variable in question has from all the other variables in the model. Many of the included variables, particularly those representing interaction terms, also had tolerances that were quite low, prompting us to execute extensive procedures to confirm that the relationships demonstrated here were not simply statistical artifacts. Many different models were calculated, each time leaving out different sets of variables to artificially inflate the tolerances. With the exception of two product terms, which were dropped from the model, the results confirmed that even when the tolerances of these interaction variables were artificially elevated, the original relationships tended to remain relatively unchanged. That is, each of the procedures slightly elevated the tolerance scores of the respective variables while leaving their respective slopes relatively unchanged.

17. This assumption must be regarded as quite tentative because this study relied on weak measures of socioeconomic status. The above results may vary dramatically from those of other studies that measured socioeconomic status differently.

18. The only exception to calculating auto theft potential in the above manner occurred when it was estimated that any of the 20 adjacent face blocks were so distantly adjacent that they were not likely to influence the respective face block. Using the relative distance from the city center as an approximation of the relative distance between a face block and its most distant adjacent blocks, a procedure was used in which any of the 20 adjacent face blocks that were estimated to be more than a mile from the face block in question were eliminated from the analysis.

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