

## ABSTRACT

RICHARDSON, NICHOLAS J. Place, Space, and Residential Burglary: A Multilevel Spatial Analysis and Theoretical Integration. (Under the direction of William R. Smith.)

It is accepted as commonplace that crime is not randomly or evenly distributed across spatial locations. A long line of research has investigated the spatial, temporal, and social processes of geographic areas where crime occurs. Ecological theories of crime such as Social Disorganization and Routine Activities have provided unique insights into the causal mechanisms of these processes. Using hierarchical linear models and testing for cross-level interaction effects, the present study investigates how the broader, community-level characteristics (community is defined as a Census block group) moderate the relationship between micro-level processes (micro level is defined as a faceblock) and residential burglary. Findings provide moderate support for an integrated, multi-level ecological theory of crime. Relevant policy implications and directions for future research are discussed.

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Place, Space, and Residential Burglary: A Multi-Level Spatial Analysis  
and Theoretical Integration

by  
Nicholas James Richardson

A thesis submitted to the Graduate Faculty of  
North Carolina State University  
in partial fulfillment of the  
requirements for the degree of  
Master of Science

Sociology

Raleigh, North Carolina

2013

APPROVED BY:

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William R. Smith (Chair)

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Patricia L. McCall

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Margaret A. Zahn

## BIOGRAPHY

Nicholas James Richardson, son of Kathleen and James Richardson, was born on June 4, 1980 in Aledo, Illinois. Several years after graduating from Sherrard High School in 1998, he began taking courses at Black Hawk community college in Moline, Illinois where he developed a passion for the social sciences. After completing his general education requirements, he transferred to St. Ambrose University in Davenport, Iowa where he received a Bachelor's degree in Forensic Psychology in 2006 and, later, a Masters of Criminal Justice in 2009 under the supervision of Dr. Christopher Barnum. He completed his Master of Arts degree in Sociology in 2013 from North Carolina State University and is currently conducting research on the relationship between neighborhood characteristics and crime under the direction of Dr. William R. Smith.

## ACKNOWLEDGEMENTS

Although it would take a tome to list all of the people who made this project possible and supported me in it, I would like to thank my mother who provided a great deal of encouragement and support, and my committee members, Dr. William Smith (chair), Dr. Patricia McCall, and Dr. Margaret Zahn. Dr. Smith was instrumental, from the beginning, in guiding me through each step of this process. His patience and support are greatly appreciated. Both Dr. McCall and Dr. Zahn gave me thought-provoking feedback and constructive criticism, which not only improved my thesis, but gave me direction for future research projects as well. I have been fortunate to be surrounded by such encouraging and supportive faculty.

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## **-INTRODUCTION**

Early 20<sup>th</sup> century socio-ecological theorists such as Shaw and McKay (1942) documented that crime clusters in certain areas of the city. This finding has opened up a long-line of research investigating the spatial, temporal, and social characteristics of geographic areas where crime occurs. If researchers are able to describe the structural characteristics of areas where crime occurs, then it is hoped they will be able to predict where crime is likely to cluster. The last several decades has seen a surge of scholarly research investigating the spatial and temporal characteristics that predict where crime is likely to occur. Ecological theories of crime such as social disorganization (Bursik and Grasmick 1993; Sampson, Raudenbush, and Earls 1997; Shaw and McKay 1942) and routine activities (Cohen and Felson 1979) have provided criminologists with unique insights into the interaction between social-structural characteristics and crime rates. Researchers have been using these ecological theoretical frameworks to investigate the clustering of violent crimes such as homicide (Land, McCall, and Cohen 1990), street robbery (Martinez, Rosenfeld, and Mares 2008; Smith et al. 2000), and sexual assault (Tewksbury, Mustaine, and Covington 2010), and also, property crimes, such as burglary (Bernasco 2006; D'Alessio, Eitle, and Stolzenberg 2011; Johnson and Bowers 2010), larceny (Allen and Cancino 2012), and motor-vehicle theft (Rice and Smith 2002). One crime type that has not been as thoroughly investigated for clustering is burglary (in part because relative to most crime times, burglary (residential) is rather scattered across geographic space (Johnson and Bowers 2010; Rountree, Land and Miethe 1994).

The purpose of this project is to add to the extant literature by examining how the broader, contextual-level community characteristics (measured at the census block group level) condition the micro-level (faceblocks) routine activity neighborhood processes to affect residential burglaries at the faceblock level. Faceblock is defined as both sides of a street between two intersections, and is chosen here to allow the use of available data sources at the aggregate level (census), yet be small enough to avoid some of the pitfalls of large unit aggregate analysis (Smith, et al., 2000). Data were gathered from a mid-size southeastern U.S. city. Hierarchical linear models are used to integrate two prominent spatial theories of crime – social disorganization and routine activities – by testing for cross-level interaction effects (this is elaborated on below).

The outline of this paper is as follows. First, social disorganization theory and routine activities theory are reviewed. Second, an overview of previous attempts to integrate these theories and the compatibility of the theories are discussed. Next, the relevant literature between multi-level spatial analysis and residential burglary is reviewed. Third, the data and methods for the current study are discussed. Lastly, relevant findings, policy implications, and directions for future research are detailed.

## **-THEORETICAL BACKGROUND**

### ***-Social Disorganization Theory***

Since the early half of the 20<sup>th</sup> century, researchers have been documenting the numerous structural characteristics of a community associated with crime. Shaw and McKay (1942), attempting to explain why some Chicago neighborhoods experience higher

delinquency and crime rates than others, observed that certain social structural components were indicative of high crime neighborhoods. They posited that high rates of residential mobility, racial/ethnic heterogeneity, and poverty weakened control mechanisms that formed a protective barrier against crime (Shaw and McKay 1942). First, neighborhoods characterized by high rates of residential mobility where individuals are constantly moving in and out of neighborhoods, makes it difficult for attachments to form. Thus, community members may spend little time “getting to know one another” in the community since they may be changing residences soon. Interacting and forming friendships with neighbors and others in the community is essential for attachments to form, resulting in the individuals being invested socially in the community.

Next, those individuals in neighborhoods characterized by racial/ethnic heterogeneity may lack a norm or value consensus, which may limit interaction among and exposure to other residents since they may feel they have little in common with others in the neighborhood. As was mentioned previously this interaction among residents is essential for the formation of bonds, which can form a protective barrier against crime. Lastly, poverty also seems to be indicative of high crime neighborhoods. Poverty weakens already existing institutions such as schools or other facilities that can strengthen communal ties.

Furthermore, the individuals in these communities are more focused on “survival” (e.g., earning a living) rather than coming together to help the community effectively deal with problems. Furthermore, individuals in these socially disorganized neighborhoods find it difficult to mobilize themselves to effectively deal with common problems (Sampson et al.

1997). Thus, all three structural characteristics seem to weaken informal control mechanisms found in the community.

Classic social disorganization fell out of flavor in the years following Shaw and McKay's work. However, the last three decades researchers have shown a renewed interest in the theory. This renewed interest began with the influential work of theorists such as Kasarda and Janowitz (1974), Kornhauser (1978), Bursik (1988), Bursik and Grasmick (1993), and Sampson et al. (1997). Because of this revival, social disorganization theory has undergone changes that have made the causal processes more precise (Bursik and Grasmick 1993:39). Focusing on the control aspects of social disorganization theory, Bursik and Grasmick (1993) developed a systemic model where they identified three types of neighborhood level social control (based on Kasarda and Janowitz, 1974; Hunter, 1985). The first is private control which consists of the strength of attachments among friends and family within a neighborhood. The second, parochial control refers to the relationship between individuals in the neighborhood and organizations such as schools or churches. Finally, public control refers to the relationships individuals in the neighborhood have with institutions outside of the neighborhood such as the government (e.g., police).

Social disorganization theory and other modifications and expansions to this theory purport to explain ecological variation in crime rates across particular areas of a city. The importance of social disorganization theory is that it posits that disorganized communities lack the ability to maintain effective social control mechanisms or to act collectively. Structural barriers impede the development of both formal and informal ties that band the community together in order to solve common problems that affect the community as a

whole. Thus, in more “disorganized” communities social structural impediments decrease social control mechanisms, which, in turn, increase the probability of crime in these areas. Overall, empirical evidence has provided support for social disorganization theory (Parker & McCall 1999; Sampson 1991; Sampson & Groves 1989; Smith & Jarjoura 1988).

### ***-Routine Activities theory***

Grounded in the classical school of criminology, routine activities theory (Cohen and Felson 1979) purports to explain ecological variation in crime rates. According to these theorists, crime is not a result of strains or stressors, weakened control, or subcultures, but rather crime is the result of a convergence of three variables in both time and space: motivated offenders, suitable targets and an absence of capable guardians (guardianship).

Routine activities theory assumes that an ample supply of motivated offenders exists in a given population and that they are rational beings who calculate the costs and benefits of certain actions. Routine activities theory predicts that crime will occur when it is considered most advantageous in a particular situation. Thus, there is not, necessarily, a sketch of a “motivated offender.” Almost anyone in a situation where the benefits of crime outweigh the costs is more likely to commit crime than if that person were in a situation where the benefit to cost ratio is not so obvious.

A motivated offender is a necessary but not a sufficient condition for crime to occur. There must be something that “attracts” a motivated offender, and since the theory is about predatory crime, that attraction is a “suitable target.” Felson (1998) argued that value, inertia, visibility, and accessibility are four characteristics that help to determine the suitability of

targets. The value of a target differs from person to person and does not necessarily depend only on objective monetary value. For example, teens and young adults tend to use peer to peer (P2P) file sharing program to share music illegally while older adults tend not to frequent P2P file sharing websites. It would probably be safe to assume that the music of certain bands will be pirated more often than certain other musical groups since teens and young adults typically have different tastes in music.

Inertia refers to the size of an object. Although a digital camera and a television may cost roughly the same amount of money and may both be available in an electronics store, the digital camera will probably be shoplifted more often since its size is smaller and can be concealed more easily.

The motivated offender must also be aware of a target. In other words, it must be visible to the offender. The visibility of houses might be increased for those near attractor land uses (e.g., bars or restaurants). Motivated offenders who frequent, for example, bars, might become aware of potential houses to burglar while going there. Houses near bars may enter into an offender's "awareness space" (Brantingham & Brantingham 1993).

Lastly, the suitable target must also be accessible to a motivated offender. This is an important aspect of routine activities that is essential to this research. While routine activities theory acknowledges the importance of the accessibility of suitable targets, it does not go into detail in describing the mechanisms through which this occurs. Environmental criminologists have argued that design can not only influence crime rates, but also where crime occurs. Researchers investigating the link between space syntax and crime have noted that street integration and street connectivity are related to crime (Hillier and Shu, 2000; Shu,

2000). Essentially, street integration and connectivity are measures of the level of accessibility of street segments to all other street segments in a given geographical area (Hillier and Hanson, 1984; Nubani and Wineman, 2005).

Street integration is the number of connections that one must make if one was to move from every street to every other street in particular geographical area. The fewer the connections one must make, the more integrated the street. For example, one would expect to find places of business such as grocery stores, restaurants, bars, and gas stations on highly integrated streets since they are easier to get to and most likely to be seen. It would probably not be very business savvy to open up a restaurant in a cul-de-sac since cul-de-sacs are poorly integrated and least likely to be traversed. Street integration and connectivity can be mechanisms through which motivated offenders come into contact with suitable targets.

There are two competing hypotheses concerning the association between street integration and crime. The first concerns “eyes on the street” (Hillier and Hanson, 1984). These researchers argue that on highly integrated streets there is more traffic from cars and people walking around. Motivated offenders will be less likely to commit crimes on highly integrated street out of a fear of being detected. The second hypothesis argues that highly integrated streets is where motivated offenders are most likely to come into contact with suitable targets, thus, increasing the likelihood of a crime occurring (Shu and Huang 2003). Offenders may choose to target, for burglary, houses that tend to be highly accessible or just off of main roads. Also, houses on streets that are more integrated with other streets provide better accessibility and also more escape routes. Also, what Beavon, Brantingham and

Brantingham (1994) refer to as “spatial awareness” plays a role as offenders tend to victimize in areas they are familiar with (aware of).

Another form of street accessibility is connectivity (Nubani and Wineman 2005) Street connectivity can be defined as the number of times a street segment is intersected or crossed by another street segment. Highly connected streets encourage more traffic, which increases the likelihood that motivated offenders will come into contact with suitable targets. Taken together, these two concepts will measure the accessibility of targets to motivated offenders.

## **-THEORETICAL COMPATIBILITY**

### ***-Routine Activities and Social Disorganization***

The integration of routine activities and social disorganization is not a novel idea. Many previous researchers have called for their synthesis in the past (Bursik and Webb 1982; Horney, Osgood, and Marshall 1995). Aside from being two prominent spatial theories of crime the emphasis that each places on motivation and opportunity makes theoretical integration much more beneficial and increases explanatory power. One significant weakness of social disorganization theory is that it assumes the omnipresence of opportunity. To classic social disorganization theorists, motivated offenders will always be able to find opportunity. In reality, however, this does not seem to be the case. Decisions to commit crime are governed by the opportunity for crime. Some situations, circumstances, and even neighborhoods have more opportunity than others. Routine activities theory addresses this shortcoming by placing a much greater emphasis on opportunity. Similarly, a weakness of

routine activities theory is that it assumes that an ample supply of motivated offenders exists. Cohen and Felson (1979) do little to discuss criminal motivation and assume it is essentially a constant in that there is usually criminal motivation present in most situations. Social disorganization theorists posit that there is more criminal motivation present when there is ethnic heterogeneity, population mobility, and concentrated poverty in a neighborhood. This leads to weakened control and allows criminal motivation to manifest itself (Kornhauser 1978). While both theories acknowledge criminal motivation and to some extent, opportunity, it is argued here that social disorganization theories better articulate the structural characteristics of a neighborhood that allow the manifestation of the motivation, and routine activities better addresses the concept of opportunity.

Another aspect that makes both theories suitable for integration is that both recognize that crime is not evenly or randomly distributed across ecological units of a city. In other words, neighborhoods are not independent of one another. Adjoining neighborhoods or even streets tend to have similar crime rates (Smith et al. 2000). For social disorganization theory, crime can be prevalent in any neighborhood as long as it is in a socially disorganized area of a city. Similarly, in routine activities, nearby neighborhoods may be a part of offenders' awareness space, and they may choose to commit crimes since it is where their routine activities take them (Felson et al. 1994).

Empirically, simply entering in variables from both social disorganization and routine activities into a regression model is not sufficient for theoretical integration. Previous research has shown that both routine activities and social disorganization variables do predict crime. Prior research has integrated routine activities and social disorganization by

examining interaction effects between the variables from each theory (Miethe and McDowall 1993; Rountree et al. 1994; Smith et al. 2000). These theorists predicted that the level of the variables measuring routine activities varies according to the levels of the variables measuring social disorganization, and they found minimal support depending on the size of the units of analysis.

## **-LITERATURE REVIEW**

### ***-Place, Space, and Residential Burglary***

The purpose of this section is to review the current literature on residential burglary. First, though, it is important to ask why residential burglary is worthy of scholarly attention in the first place. Although the rate of most forms of property crime<sup>1</sup> (including residential burglary) have been decreasing significantly since the early 1990s – from about 1,252 per 100,000 inhabitants in 1990 to about 700 per 100,000 inhabitants in 2010 – it still poses significant economic and socio-psychological problems for victims (UCR, 2010). A burglary occurs about every 15 seconds in the US. The majority of burglaries – roughly 75% – in the U.S. are of residences. In 2010, there were over 2.1 million burglaries in the U.S. Not only does a burglary affect the homeowner, but everyone who lives at the residence as well. Victims of burglary are also more at risk of being burglarized again as victimization increases the odds of re-victimization (Robinson 1998). Moreover, a burglary occurring in one particular neighborhood can increase the likelihood of subsequent burglaries occurring in

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<sup>1</sup> Property crime, per the FBI, includes the following offenses: burglary, larceny, motor -vehicle theft, and arson. The focus of this paper, though, is on residential burglary which is a more specific type of burglary.

that neighborhood, which affects others living nearby. Thus it is important to examine the economic and social-psychological problems associated with residential burglary.

Residential burglary is responsible for a variety of economic and social-psychological problems for victims. In 2010 victims of burglary lost about \$4.6 billion in property, which averages to about \$2,137 per burglary offense (UCR 2010). While some may be able to file insurance claims to get property replaced, many without homeowner's insurance must replace the stolen property themselves. Also, the hassle of having to replace stolen credit cards, driver's licenses and IDs can be a very frustrating experience. Furthermore, some property stolen as a result of burglary may have great sentimental value, but little monetary value, which makes replacement of this property impossible. Although the scholarly research examining the psychological problems of burglary victims is lacking, it is reasonable to assume that victims can face a range of psychological symptoms including Post Traumatic Stress Disorder, anxiety, and depression. Individuals need a safe haven and expect to feel safe in their homes. A constant feeling of vulnerability and lack of security can most likely exacerbate psychological symptoms associated with burglary victimization. Thus, even though burglary rates have decreased in recent years, it still affects a large number of victims both economically and social-psychologically which warrants scholarly attention.

Since the purpose of this project is to examine how macro-level social processes condition the effect of micro-level neighborhood processes to increase (or decrease) the likelihood of burglary, this section will examine prior research that focuses on multi-level, spatial analyses of residential burglary in the U.S. Although residential burglary has been a subject of academic discourse for several decades, multi-level studies in this area are lacking.

There has only been a handful of scholarly work in this area directly analyzing burglary victimization (Capowich 2003; Rountree and Land 1996; Rountree, Land, and Miethe 1994; Wilcox, Madensen, and Tillyer 2007).

Using neighborhood-level data from several Chicago neighborhoods, Capowich (2003) investigated how neighborhood ecology conditions the effect of household characteristics on burglary victimization. The author divided neighborhoods among varying degrees of social order and posited that the level of social order of a neighborhood will interact with household characteristics to influence the likelihood of burglary victimization. There were two general findings in their research. First, the interaction between household routine activities and neighborhood social order rather than household income contributed to household victimization. This finding ran counter-intuitively to other research that found a positive association between household income and burglary victimization as it was posited that more affluent households made for more attractive targets. The second general finding is that neighborhoods condition the effects of household routines on victimization. For example, the size of the household was positively related to burglary victimization, but was mediated by the size of the youth population in the overall community.

Although this research provided insight into the inner mechanisms of Bursik and Grasmick's (1993) systemic theory of social disorganization, it is not without its limitations. Households at the smallest level of analysis, minimize the importance of other micro-level neighborhood processes that might be present, which are influencing the likelihood of burglary victimization. For example, households nearby on the same street segment may be affecting the odds of burglary victimization. Also, if streets nearby have "attractor land uses"

such as bars, restaurants or gas stations, they may be at a heightened risk of burglary victimization since these types of land uses “attract” motivated offenders. Streets with many of these types of land uses may cause crime to “spill-over” to nearby streets which could increase the number of household burglaries. This research fails to take into account how the characteristics of nearby land uses and street segments can influence victimization at an address or on a specific street segments. This is important to take into consideration as we know that neighborhood boundaries in ecological research are arbitrarily drawn and are, thus, not independent of one another.

In a similar study, Wilcox et al., (2007) used survey data collected from over 4,000 individuals nested within 100 Seattle neighborhoods (defined as census tracts) to examine how the four dimensions of guardianship at both the individual and contextual level interact to condition the likelihood of burglary victimization. The four dimensions of guardianship are the social (informal social control), personal (occupancy of the home), natural (environmental design), and physical (target hardening). Using opportunity-based theories of crime, the authors argued that an increase in the four dimensions of guardianship at the individual level should be related more negatively to burglary victimization as the four levels of guardianship increase at the neighborhood level. In general, the authors found support for their hypotheses in that 6 out of 16 possible interaction effects were statistically significant. Overall, the neighborhood-level social, physical, and natural dimensions of guardianship moderated the effects of the individual-level personal and physical dimensions of guardianship.

It is contended here that Wilcox et al.'s (2007) research suffers from not only the same limitation as Capowich's (2003), but additionally the use of census tracts as proxies for neighborhoods is problematic as well. One of the issues surrounding defining census tracts as neighborhoods is their sheer size. Tracts typically consist of populations ranging from 2,500 to 8,000 people with an average of around 4,000 individuals (Census 2010). The optimal number of households in a census tract is around 1,500. Using these very large areas as neighborhoods can be problematic in analyses because of large amounts of spatial heterogeneity that most likely exists within tracts (Smith et al., 2000). Because these areas are so large it is quite probable that one end of the tract is much different, both demographically and structurally, than the opposite end. For example, in a census tract, if half the population is white (.5) and the other half of the population is black (.5), it may appear that this particular tract is ethnically heterogeneous. However, if all the blacks live at one end of the tract and all the whites at the other, then a different "neighborhood" dynamic emerges, which cannot be captured with census tract-level data and may bias the results of a study especially if residential segregation is a focal point of the study.

In another multi-level analysis of burglary victimization, Rountree et al. (1994) investigate how neighborhood level factors (defined as 4 or 5 blocks in every direction from a respondent) condition the effects of individual level factors to increase or decrease the likelihood of burglary victimization. The authors found support for an opportunity theory of burglary victimization. They found that target attractiveness (measured as high family income and expensive goods present in the home) was positively associated with burglary victimization. Furthermore, there was a negative association between home guardianship and

likelihood of residential burglary. The contextual level effects of ethnic heterogeneity and neighborhood incivilities had a positive effect with burglary victimization. These relationships at the contextual level also moderated the effects at the individual level.

While this research uses smaller units of analysis in defining a “neighborhood” (i.e. using city blocks instead of census tracts), the problem with individual households has been discussed in the preceding paragraphs. Rountree et al. (1994) did recognize that crime tends to displace and “spill-over” from one street to another. To account for spill-over, they included in the analysis every adjoining street segment to an address that reported a burglary. Research suggests that once a residence has been burglarized, it is at increased odds of being burglarized again (Johnson et al. 2007). Not only is a particular house at increased odds of re-victimization, but residences within four city blocks are at an increased risk of victimization (Bowers and Johnson 2005). Given previous research, simply including an adjacent street segment may not accurately take into account burglary “spill-over.” Thus it may be beneficial to extend the number and direction (north, south, east, and west) of adjacent street segments. In other words, if a house is burglarized on a particular street segment, taking into consideration up to 4 or 5 streets north, south, east, and west of the original street segment may, more accurately, take into account the potential “spill-over” of residential burglary.

The current study attempts to address these limitations by using census block groups as the unit of analysis for contextual level variables and faceblocks as a micro-level unit assessing routine activities processes while creating a “burglary potential” variable to account for spill-over onto adjacent faceblocks. In the following sections, the data and methods are discussed.

## **-DATA AND METHODOLOGY**

In this section the methodology is described to test the theoretical integration by conducting a multi-level analysis of residential burglary in a mid-sized southeastern city. Empirically, I will integrate these theories by testing for cross-level interaction effects. I will examine how the broader, macro context of a neighborhood (defined as a census block group) affects micro level (defined as a faceblock) routine activities processes. More specifically, the goal of this research is to see how classic social disorganization variables at the macro-level exert a direct effect and also conditions the effect of micro-level processes in routine activities theory at the faceblock level.

### **-Levels of Analysis**

As mentioned previously, there are two primary levels of analysis in this study. The larger level of analysis is the census block group. Census block groups contain a cluster of census blocks. The total population in a block group can range from about 600 to about 3,000 people. The optimal population is around 1,500 individuals per block group. I chose the block group as the macro, contextual level because this is the smallest unit of analysis available that provides information on poverty and education levels. The smaller level of analysis is the faceblock. A faceblock can be defined as both sides of the street facing each other, between two intersections.

Although faceblocks are rarely used,<sup>2</sup> a primary reason for choosing faceblocks as a level of analysis is to decrease problems associated with spatial heterogeneity in socio-ecological research (Janson 1993; Sampson 1987; Smith et al., 2000). In large units of analyses such as census tracts within-unit spatial heterogeneity exists. In census tracts, “attractor land uses” such as bars, restaurants, and gas stations may only be located in one corner of the tract. It is reasonable to assume that these land uses that “attract” potential offenders and would be victims, going about their daily routine activities, will not enter into their awareness space (Brantingham and Brantingham 1984). Thus, in order to achieve a more spatially homogenous level of analysis, faceblocks will be used.

#### **-Data**

Data for this analysis are gathered from three sources. The first source is the 2000 Census Bureau data containing information on population characteristics. The city’s police department supplied the 2003-2004 data for residential burglaries. Finally, 2003 tax assessor data contained information on land use variables and the number of residences being rented. The tax assessor and the crime data were aggregated to the faceblock level using Atlas GIS software.

The city chosen for this study is a mid-size southeastern city in the U.S. According to the 2000 Census, the total population for this city was between 250,000 and 300,000. African Americans represented about 30% of the total population. The city has a relatively educated population with about 90% having a high school diploma and almost half of the total

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<sup>2</sup> For notable exceptions see Smith et al. 2000; Rice and Smith 2003; Taylor 1997; Taylor et al. 1995.

population having a bachelor's degree. In 2000, the median household income was about \$52,000. And about 14.6% of all persons were at or below the poverty level.

### **-Variables of Interest**

The dependent variable for this analysis is the logged count of all residential burglaries (N=832) occurring in the city from 2003-2004. Since the dependent variable is a count rather than a rate it is necessary to control for population size since it is reasonable to assume that faceblocks with more people will have more residential burglaries than faceblocks with fewer people. Thus, the total population of a faceblock was entered into the model as a control variable.<sup>3</sup>

Variables measuring routine activities will be at the L1 or faceblock level. Routine activities variables will include a measure of street integration and street connectivity. On highly accessible streets, motivated offenders are most likely to come into contact with suitable targets. As operationalized here, integration<sup>4</sup> is an algebraic function of the number of connections (depth) that must be traversed if one were to move from every line (street) to every other line (street) in the axial map (a network of intersecting axial lines). The higher the integration value of a line, the lower the number of connections needed to reach that line. For a given line, integration can be computed in terms of access from all other lines (referred to as global integration). In other words, integration is the relative ease of movement from one street segment to all other street segments (Hillier and Hanson 1984). The higher the

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<sup>3</sup> The total number of households was also entered into the original model, along with population size, as a control variable, but problems with multicollinearity prevented use of both population size and the total number of households in the same model.

<sup>4</sup> See Hillier and Hanson 1984 for the formula used to calculate "global integration."

value for integration and for connectivity, the more accessible a street segment is and the more likely motivated offenders are to come into contact with suitable targets.

Attractor land use variables or “busy places” is another important measure of routine activities. Land use variables will consist of a count of the number of bars, restaurants, and gas stations that are on a faceblock. The more land uses on a faceblock, the greater the likelihood of residential burglaries occurring in nearby faceblocks. Finally, a variable is included on the number of single-parent households on a faceblock to assess the level of guardianship.<sup>5</sup> It is likely that the number of single-parent households will be positively associated with the number of residential burglaries since single-parents may have a greater difficulty supervising youths and also maintaining guardianship over their residence.

This analysis will include two contextual measures of social disorganization: racial heterogeneity and income.<sup>6</sup> The social disorganization variables will be measured at the L2 or Census block group level. Racial heterogeneity is operationalized as the proportion of black to white individuals residing in a census block group. Income refers to the median household income in a Census block group. Population mobility was not included in this analysis since, in the city under study, much of the residential mobility is due to white, middle-class “northerners” moving in and out of the suburban sectors of the city where burglaries are relatively uncommon.

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<sup>5</sup> It is arguable that the number of single-parent households could be included as a “family structure” variable to capture one aspect of social disorganization. However, for the purposes of this paper, I am using the number of single-parent households to reflect routine activities concept of guardianship or “capable guardians.”

<sup>6</sup> Income was chosen instead of the classic social disorganization measure of poverty since income can be used to assess not only poverty, but “target attractiveness” as well.

Finally, the last variable included is a measure of “residential burglary potential.” As mentioned previously, neighborhoods are not independent of one another. In fact, adjacent neighborhoods tend to have similar crime rates. This has a tendency to result in spatial autocorrelation. For this reason, it is necessary to create a “potential” variable that takes this lack of neighborhood independence into consideration. Residential burglary potential is defined as the weighted average of a sample of five proximate faceblocks in the direction of the street. The nearest faceblock gets a greater weight compared to faceblocks that are further away. After this variable is computed, it is entered into the regression equation as a dependent variable along with the independent variables described above. Then the predicted values from that equation will be entered as an independent variable in the next model with residential burglary as the outcome variable.

The residential burglary potential variable is important to understanding burglary “spillover” from one faceblock to another nearby faceblock (Roncek and Montgomery 1984). As I mentioned previously, both routine activities theory and social disorganization theory argue that neighborhoods are not independent of each other. Crime can occur on any faceblock in a socially disorganized area where there is weak informal control. Motivated offenders are able to move throughout a socially disorganized neighborhood to commit crimes. According to routine activities theory, motivated offenders commit crimes in their “awareness space” as they go about their routine activities. Land uses such as bars, restaurants, and gas stations may attract motivated offenders, and nearby houses (suitable targets) may enter into their awareness space. Research has consistently shown that offenders

tend to commit burglaries near where their routine activities take them (Beavon et al. 1994; Brantingham and Brantingham 1984, 1993).

Attaching Census population measures to the faceblock level presents a unique problem. The smallest unit of analysis in which the Census reports population information is at the block level. Since a faceblock is much smaller than a Census block, population estimates must be disaggregated and attached to the faceblock. This disaggregation is accomplished by multiplying the sum of the population counts by the ratio of the faceblock length and dividing by the census block perimeter length. Since the contextual level variables at the L2 level are at the block group, no disaggregation is necessary. The only disaggregated variables used in these analyses include the total number of multi-family dwellings and the number of single-parent households.

Lastly, since residential burglaries are a relatively rare event in most face blocks, the dependent variable is highly skewed which can cause problems of heteroscedasticity (Cohen and Cohen 1983). To correct for this, the natural log of residential burglary is used. Thus a one unit change in the independent variable is associated with a proportional change in the dependent variable, holding all other variables constant.

### **-Hypotheses**

The purpose of this section is to create testable hypotheses based on prior research and theory. In general, this project examines how the broader, neighborhood-level characteristics condition the effects of micro-level processes. More specifically, measures of routine activity at the faceblock level should vary according to the level of social

disorganization at the block group level in predicting the number of residential burglaries on a faceblock. Areas of a city characterized by a high degree of social disorganization should produce higher crime rates than areas with lower degrees of social disorganization. For example, face blocks within block groups that have low levels of income and high levels of racial heterogeneity should experience a higher number of residential burglaries than face blocks in block groups that have higher levels of income and lower levels of racial heterogeneity.

As discussed earlier, research on the relationship between street accessibility and crime is somewhat unclear. On the one hand, the “eyes on the street” hypothesis predicts that highly accessible streets will reduce crime because fear of detection will increase. On the other hand, the “opportunity” hypothesis predicts that highly accessible streets will actually increase crime since there will be a greater likelihood of motivated offenders coming into contact with suitable targets. In other words, I would expect to find that highly accessible streets in high income areas will experience a different number of residential burglaries than highly accessible streets in low income areas. Thus, I will be testing competing hypotheses in regards to street integration and street connectivity.

This discussion leads to two general hypotheses:

- I. Net of other factors, racial heterogeneity of the Census block group will moderate the relationship between residential burglary and the variables measuring routine activities at the faceblock level.

- II. Net of other factors, the median household income of the Census block group will moderate the relationship between residential burglary and the variables measuring routine activities at the faceblock level.

### ***-Descriptive Statistics***

Table 1 presents the results of the descriptive statistics. Out of a total of 21,554 faceblocks and 157 Census block groups the final sample, due to missing data, consisted of 16,550 faceblocks and 155 block groups. The total number of residential burglaries is 3,848. The mean total population per faceblock is about 200. On average there are just over 1 single-parent households per faceblock. The average integration and connectivity values are .461 and 3.42, respectively. There are about .043 restaurant, bars, and gas stations per faceblock. The average median household income is about \$55,900 per Census block group. The average measure of racial heterogeneity for a Census block group is .163.

**Table 1 about here**

### ***-Methods***

The goal of this research could be addressed using OLS regression techniques. All L1 and L2 variables could be entered into the same regression model. However, standard regression techniques tend to ignore the hierarchical structure of certain data. The structure of the data for this project has an hierarchy in that faceblocks are nested within in Census block groups. This nested model violates one of the fundamental assumptions of traditional

regression techniques: independence of error terms. Traditional regression techniques do not inherently take into account the fact that faceblocks grouped together are going to be more similar than non-adjointing faceblocks. For example, population characteristics for one faceblock may be similar to the population characteristics on a nearby or adjoining faceblock. Similarly, crime rates on one faceblock may be similar to the crime rates on a nearby faceblock. Thus, the independence of error terms cannot be assumed as they are in traditional regression techniques. One solution to this problem is to use a hierarchical linear modeling (HLM) technique, which can account for the nested structure of certain data. The results of the analyses are presented in the following section.

### ***-HLM Results***

The level 1 (L1) model for faceblock  $i$  in Census Block Group  $j$  of residential burglary is denoted in the following regression equation:

$$\ln ResBurglary = \beta_0 + \beta_{1j}(TotalPop) + \beta_{2j}(Potential) + \beta_{3j}(Integration) + \beta_{4j}(Connectivity) + \beta_{5j}(SingleParents) + \beta_{6j}(LandUse) + \varepsilon_j$$

where all the variables are grand-mean centered. It was assumed that all level 1 faceblock coefficients would vary across the larger level 2 (L2) Census block group context resulting in the following L2 regression equation:

$$\beta_{ri} = \pi_r + \beta_{1r}(Income) + \beta_{2r}(Heterogeneity) + \varepsilon_{rj}$$

where  $r$  represents the level one independent variables 1-6.

The main effects for the L1 and L2 variables are shown below. The coefficients presented have been standardized by multiplying the original coefficient by the inter-quartile range.<sup>7</sup>

### **Table 2 about here**

Model 1 in Table 2 presents the results of the main effects for the L1 and L2 variables. All of the coefficients (recall here these are inter-quartile range effects) are statistically significant in the theoretically posited direction.<sup>8</sup> For the L1 main effects, an average increase in the total population of a faceblock increased residential burglaries by about 12%.<sup>9</sup> This finding is consistent with the expectation that, faceblocks with more people will have more households to burglarize. Burglary “potential” was the strongest predictor in the model. An average increase in burglary “potential” was associated with about a 27% increase in residential burglaries. The number of restaurants, bars and gas stations is negatively related to residential burglaries. For every one restaurant, bar or gas station increase on a faceblock, residential burglaries decreased by about 12%. This is a somewhat disappointing finding relative to the expectations associated with “spatial awareness” (Brantingham and Brantingham 1993) because the potential variable should be more strongly associated with “spill-over,” and it seems plausible that bars, restaurants and gas stations would attract motivated offenders which would bring potential, nearby targets into

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<sup>7</sup> Standardization using the inter-quartile range (IQR) is preferable to standardizing using the standard deviation since the standard deviation tends to vary more than the IQR (Cohen and Cohen 1983).

<sup>8</sup> The number of single parent households had to be excluded from the analysis because of multi-collinearity concerns between the number of single parent households and the “residential burglary potential” variable.

<sup>9</sup> Standardized coefficients were obtained by multiplying the unstandardized coefficients by the IQR.

their “awareness space.” Thus, a positive relationship between burglaries and “attractor land use” was anticipated with the addition of the potential variable in the model. It is possible that although residences nearby an attractor land use may enter into an offender’s awareness space, a motivated offender may perceive these targets as “unattractive” in that they may have less “goods” to steal.

As for street accessibility, both integration and connectivity were positively and significantly related to residential burglary. For an average increase in integration and connectivity, the number of residential burglaries occurring on a faceblock increased by about 3% and 1%, respectively. These results tended to support the “opportunity” hypothesis discussed earlier as opposed to the “eyes on the streets” hypothesis. Essentially, these main effects seem to show that the more accessible a street is, the more likely motivated offenders will come into contact with suitable targets. However, it is important to determine whether this relationship remains across different levels of neighborhood social disorganization.

Both the L2 variables capturing social disorganization are significant. Median household income was significantly and negatively related to residential burglaries. An average increase in median household income (in 1000s of dollars) in a Census block group resulted in a 16% decrease in burglaries.<sup>10</sup> From these results, it seems as though poorer households tend to be victimized more often than wealthier households, on average.

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<sup>10</sup> Some previous research has suggested that the relationship between income and residential burglary is non-linear (i.e., wealthy households and poor households tend to be targeted more often than middle class households). To test the nature of this relationship, a squared term was included in the model but was not statistically significant. To further assess this relationship, a series of dummy variables representing each quartile of income were also included in the model. The results of this suggested that the relationship between income and residential burglary is negative and linear.

Racial heterogeneity was positively related to burglaries. An average increase in heterogeneity resulted in about a 9% increase in burglaries. This finding supports the hypothesis that neighborhoods where racial heterogeneity is high experience more burglaries that may be due to weakened control mechanisms that serve to form a protective barrier against crime.

Model 2 presents the results for the cross-level interaction effects.<sup>11</sup> The inclusion of cross-product terms means that the effects of variables must be broken down into first-order and second order effects (Cohen et al., 2003:255-290). For example, in the table one can see that there is no longer an additive effect of income on burglary, but rather the effect varies across values of both integration and of connectivity. The effects of a variable involved in an interaction is broken down into first-order and higher order (here second order) effects. The first order effect can be simply defined as the effect of a variable when the variables involved in the interaction are zero (here the mean) -- for income it is -.002 and the second order effect is .038 with integration and .055 with connectivity. Since the effects of income vary with both the values of integration and connectivity, one can no longer speak of a singular effect of income. All variables in the model (including the first-order effects) remained statistically significant with the addition of two interactions terms between income and street accessibility. Total population and the potential variable remained significant and positive although the magnitude of the effect for population increased slightly while it decreased slightly for potential. For street accessibility, the addition of the interaction terms results in the first order effects of model 2 being different from the linear additive effects reported in

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<sup>11</sup> Model 2 is a trimmed model with only the statistically significant interaction effects shown. All possible combinations of interaction effects were examined.

model 1 for both integration and connectivity. For integration, with the addition of the interaction terms, the first-order effect on residential burglaries increase by an additional 1% from the linear additive effects of model 1. For connectivity, the magnitude of the first-order effect stayed about the same magnitude as the linear additive effect, but the sign changed. In model 2, an average increase in the connectivity of a street segment at the average integration and average connectivity levels, decreased burglaries by about 1% (-0.006).

Lastly, the effects of median household income (comparing the first-order effects of model 2 with the linear, additive effect in model 1) and racial heterogeneity (comparing the two linear additive effects of model 1 and model 2, since racial heterogeneity is not involved in any interaction term in model 2) did not change much with the addition of the interaction terms. Both were still significant and in the same direction as model 1. None of the cross-level interactions between racial heterogeneity and the variables measuring routine activities were statistically significant (they were dropped from the analysis and model 2 was calculated with them omitted, i.e., a trimmed model). Both of the interaction terms between income and integration and income and connectivity were statistically significant and negative as theoretically predicted.

Because the relationship between street accessibility and residential burglary changed in both size and direction once the interaction terms are added, graphic representations of these interactions (figures 1 and 2) between income and integration and income and connectivity are displayed for clarity in interpretation.<sup>12</sup>

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<sup>12</sup> On the graphs, “low,” “medium,” and “high” income are defined as one standard deviation below the average income, the average income, and one standard deviation above the average income, respectively.

**Figure 1 about here**

Figure 1 plots the interaction between median household income and street integration. The findings are interesting in that the slope is much steeper for low income households than medium and high income households although all are positive. Households in poor areas in increasingly integrated streets are more likely to be burglarized than households in wealthier areas in increasingly integrated streets. There appears to be a “protective” factor that high income areas have against burglary on integrated streets. On highly integrated streets, motivated offenders are more likely to come into contact with suitable targets especially in poorer areas since these areas tend to be characterized by social disorganization. Wealthier areas, however, tend not be socially disorganized areas even though they may be on highly integrated streets.

**Figure 2 about here**

Figure 2 plots the interaction between median household income and street connectivity. Here, we can see that households in highly connected streets in low income areas are at a much greater risk of burglary than households in highly integrated streets in medium or high income areas. In fact, connectivity actually reduces the number of residential burglaries in high income areas. Connectivity does not appear to have much of an effect for medium income households as the slope of the line remains relatively flat and stable across all levels of connectivity. One might speculate that it is possible potential burglars may be

deterred from burglarizing a high income residence on a highly connected street because of a fear of detection. They may reason that they perceive that police tend to patrol wealthier areas of a city more so than poorer areas; and on highly connected streets, police can come from a variety of directions making it difficult to predict their movements. Since residences in high income areas are more likely to have security systems, this may deter would be burglars. However, if this relationship between burglary and security alarms does exist, it does not explain why security alarms have more of a protective effect on highly connected streets rather than low connected streets.

## **-DISCUSSION AND CONCLUSION**

This study has attempted to contribute to the extant literature of theoretical integration by integrating two prominent spatial theories of crime – social disorganization and routine activities – by conducting a multi-level analysis of residential burglary while testing for cross-level interaction effects. In general, it is argued that the broader contextual effects of a neighborhood will exert direct and conditional effects of faceblock-level neighborhood processes. Overall, modest support was found for integration. Two of the hypothesized interaction effects were statistically significant: income with integration and income with connectivity. It has been shown that although street accessibility is related to crime, the magnitude and direction of this effect is conditioned by the level of income in a given neighborhood. Poorer areas are most affected by street accessibility in that poor areas with high degrees of street accessibility are most likely to have higher numbers of residential burglary.

One disappointing finding, relative to the expectations associated with the concept of spatial awareness (i.e., offenders tend to target addresses on streets they are more likely to be familiar with) is that the number of restaurants, bars and gas stations on a faceblock was negatively related to the number of residential burglaries on a street. As mentioned previously, it is possible that although residences nearby these attractor land uses probably entered into a motivated offender's awareness space, the domicile targets themselves were unattractive in that these residences may not be very valuable to burglar. In other words, poor households with little potential reward for the burglar are more likely to be in the vicinity of attractor land uses. Also there were no statistically significant cross-level interactions between any of the social disorganization variables and the number of restaurants, bars and gas stations, although it had significant main effects on the dependent variable. Thus, both the social disorganization of a neighborhood and the routine activities of offenders seem to be explaining residential burglary.

There are a couple of noteworthy limitations of the present study. First, the results of this study are limited by the type of data used. Since detailed information on the movement of offenders was not available, assumptions were made about their movements using attractor land use variables. Second, since this analysis only used information from one U.S. city, it is important to test this theory integration on a more representative sample of U.S. cities to determine whether these results are supported.

Because of the implications that the design of streets can influence rates of crime, future ecological research should incorporate measures of street accessibility into models of crime. It is important to assess how measures of social disorganization condition the effects

of street accessibility for other types of crimes such as street robbery, assaults, drug sales and prostitution. Furthermore, since the findings allowed only for speculation about the conditioning effects of income on street accessibility and crime, future research should examine this relationship more closely.

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Table 1.1 – Descriptive Statistics

Variable	N	Maximum	Mean	Std. Dev.	Inter-Quartile
Residential Burglary	3,848	22	.1786	.725	.117
<b><i>Control Variable</i></b>					
Total Population	16,550	200.32	2.382	5.949	2.115
<b><i>Routine Activities</i></b>					
Integration	16,550	.70	.461	.074	.105
Connectivity	16,550	31	3.42	2.78	1.85
Single-Parent Households	16,550	114.15	1.635	4.219	1.155
N Restaurant, Bars, Gas Stations	16,550	3.0	.043	.263	0
<b><i>Social Disorganization</i></b>					
Income (in thousands of dollars)	155	146.76	55.9	22.32	27.11
Racial Heterogeneity	155	.25	.102	.085	.163

Table 1.2 – HLM Models

	Model 1*	Model 2*
<b><i>Control Variables</i></b>		
Total Population	0.056 (0.119)	0.057 (0.121)
Burglary Potential	3.370 (0.273)	3.300 (0.267)
<b><i>Routine Activities</i></b>		
Integration	0.419 (0.044)	0.234 (0.025)
Connectivity	0.012 (0.022)	-0.003 (-0.006)
N of Restaurants, Bars and Gas Stations	-0.118	-0.141
<b><i>Social Disorganization</i></b>		
Median Household Income	-0.006 (-0.164)	-0.002 (-0.054)
Heterogeneity	0.540 (0.088)	0.510 (0.083)
<b><i>Interaction Effects</i></b>		
Income*Integration	----- -----	-0.008 (0.038)
Income*Connectivity	----- -----	-.001 (0.055)
<b><i>Constant</i></b>		
Adjusted R <sup>2</sup>	-0.296 0.088	-0.301 0.093

\*All coefficients are significant at p<.01  
Standardized coefficients are in parentheses

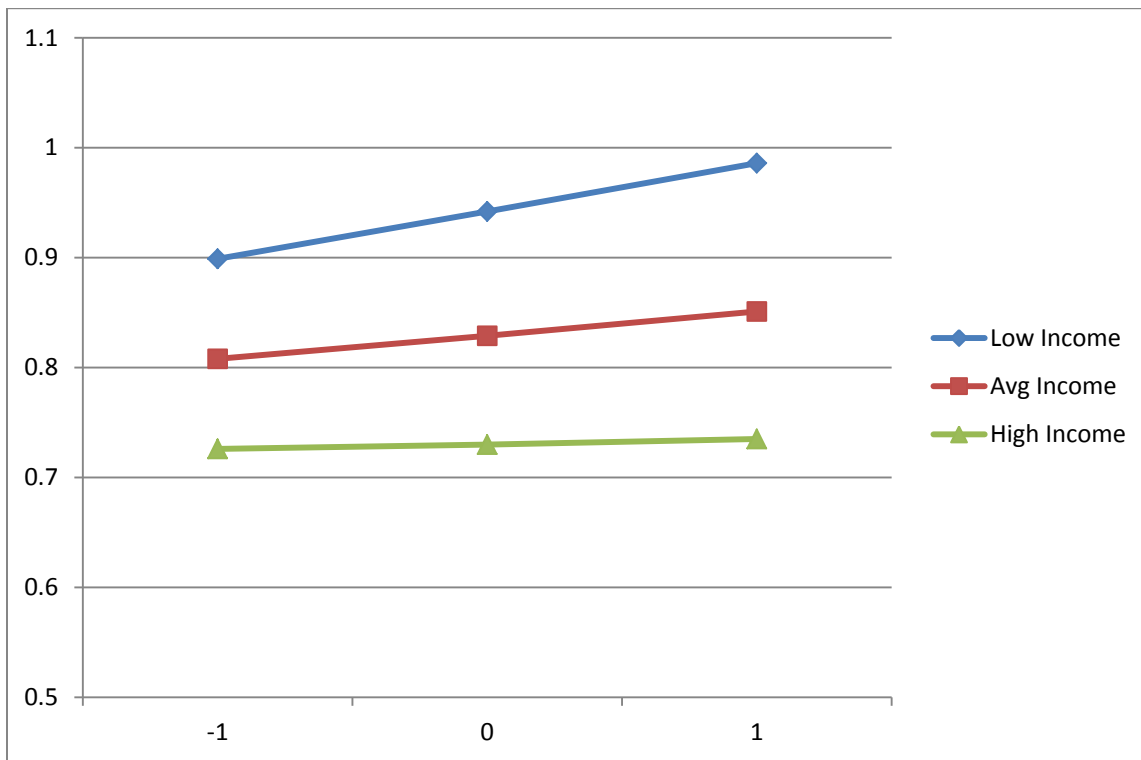


Figure 2.1 – Income and Integration Interaction in predicting Residential Burglary

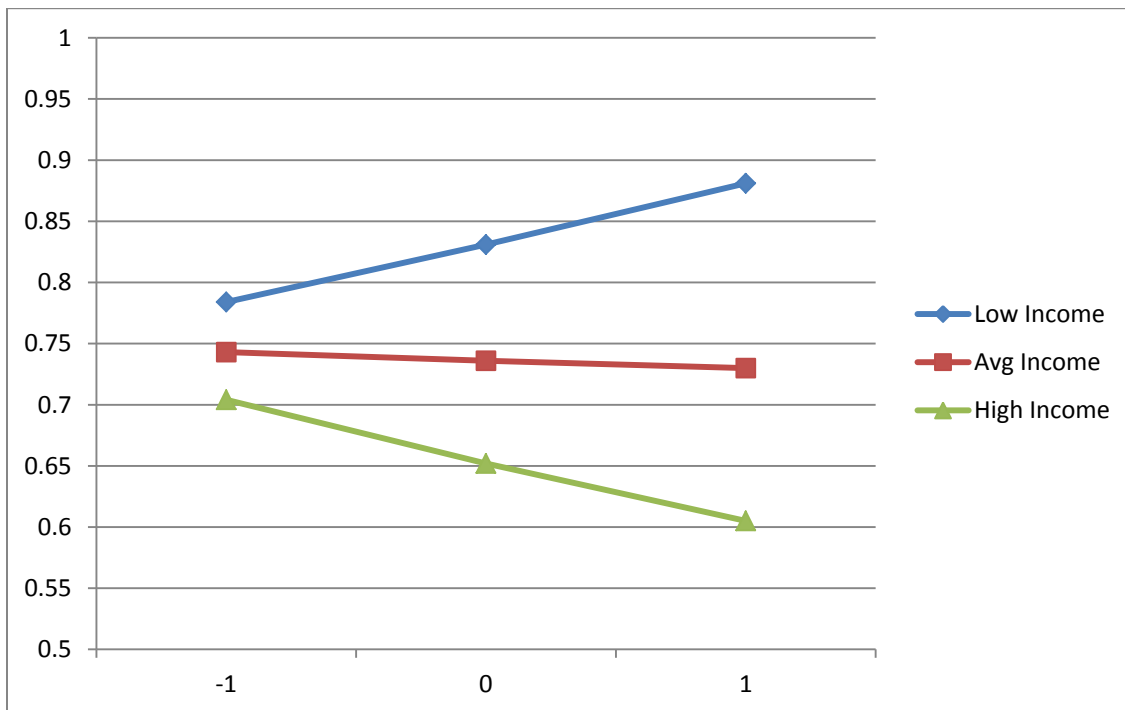


Figure 2.2 – Income and Connectivity interaction in predicting Residential Burglary