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Urban Growth Boundaries: Urban Crime Reduction or Urban Myth?

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URBAN GROWTH BOUNDARIES: URBAN CRIME REDUCTION OR URBAN MYTH?

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There has been much research written on the negative aspects associated with sprawl, such as crime, the flight of people and businesses to the suburbs, and resulting inner-city decay. However, there is a dearth of information on the effects of limiting sprawl and crime. The objective of this research was to examine the impact of an urban growth boundary (UGB) that limits uncontrolled sprawl on crime rates in Portland, Oregon. UCR data from 1975-1997 was utilized to measure the impact. Crime impacts were analyzed with time-series analysis for property crime, violent crime, and overall crime indexes. Vancouver, Washington crime data was used as a comparison group. Other smaller cities within the UGB in the Portland area also were analyzed. The results show significant increases in violent, property, and the overall crime rates in Portland. There also were significant increases in crime rates in the comparison city of Vancouver. The smaller cities showed a significant decrease in violent crimes after the implementation of the urban growth boundary, with property crimes increasing slightly. This legal impact study does provide results that can be interpreted through both ecological theories and routine activities theory. It would appear that the benefits of the urban growth boundary may be felt in the Oregon cities surrounding Portland.

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As the late Steve Jobs once said, **"**Here's to the crazy ones. The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently. They're not fond of rules. And they have no respect for the status quo. You can quote them, disagree with them, glorify or vilify them. About the only thing you can't do is ignore them. Because they change things. They push the human race forward. And while some may see them as the crazy ones, we see genius. Because the people who are crazy enough to think they can change the world are the ones who do.**"**

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CHAPTER I

INTRODUCTION

Park, Burgess, and McKenzie (1925/1984) observed:

> With the growth of great cities, with the vast division of labor which has come in with machine industry, and with movement and change that have come about with the multiplication of the means of transportation and communication, the old forms of social control represented by the family, the neighborhood, and the social community have been undermined and their influence greatly diminished…from the point of view of society and community, it is social disorganization (p. 106).

When discussing crime and place, ecological theory often is the starting point. This means that there is something about the area that is related to crime. There are aggregate-level predictors of crime in an area, such as poverty, heterogeneity, and mobility (see Park et al., 1925/1984; Shaw & McKay, 1942, Land, McCall, & Cohen, 1990; Ogburn, 1938; Sampson & Groves, 1989; Sampson, Raudenbush, & Earls, 1997; Warner & Pierce, 1993). Further, certain areas can have a stigma of a "bad reputation" with clear signs of disorder and decline such as gang activity, public drinking, empty lots, and garbage in the streets (Skogan, 1990, p. 65). Many people flee the central city areas to escape these types of environments. Fleeing to the suburbs and newer developments is defined as sprawl. Sprawl is the term used to describe the often unplanned and uncontrolled movement of people and businesses away from the central city area. There is no single definition of sprawl, but put simply, sprawl is suburbanization or the outward expansion of people and community resources to less densely populated areas.

There are benefits of sprawl for those who leave for the suburbs, such as a lower cost of living, a better quality of living, lower-density living, lower crime rates, cheaper land, and choice of where to live (Burchell, Lowenstein, Dolphin, Galley, Downs, Seskin, Still, & Moore 2002; Burchell, Downs, McCann, & Mukherji, 2005; Cullen & Levitt, 1999; Downs, 1999). For many, these qualities of an area embody the idea of the American Dream that many desire to obtain

(Messner & Rosenfeld, 1994). Sprawl benefits those residents who leave the central city areas, but for those who must remain in the inner city there are negative aspects of sprawl.

Sprawl is the spreading out of resources and this is not a simple process. The causes and consequence are entangled. Development can come at a financial cost, such as greater costs for water lines, sewer lines, roads, revenue leaving, as well as the destruction of undeveloped rural lands surrounding a city (Burchell et al., 1998, 2005; Orfield, 1998, 1999). Police services, fire services, and hospitals have to cover a larger area as the city's boundaries expand (Burchell et al., 2005; Carruthers & Ulfarsson, 2003; Downs, 1999) and it is argued that sprawl undermines the tax revenue of an area, at necessity to maintain vital human services (Orfield, 1998, 1999; Squires & Kubrin, 2005).

Additionally, there are a host of problems attributed to sprawl, such as crime. Empirically, sprawl is related to crime and crime is related to further sprawl (Cullen & Levitt, 1999; Jargowsky & Park, 2009; Klovers, 2006; Oh, 2005; Orfield, 1998, 1998; Wilson, 1987, 1996). The basic argument is that with resources (both people and businesses) leaving the central city area in a state of disinvestment, crime will increase. Presumably, the increases in the concentrations of poverty, heterogeneity, and mobility within the central city as well as the lack of investment are precursors to crime (Orfield, 1998, 1999). Researchers have argued that sprawl limits the sense of community in an area and the lack of a sense of community is related to crime (Orfield, 1998, 1999; Sampson, Raudenbush, & Earls, 1997; Wilson, 1996).

For many actions in the social sciences, there are equal and opposite reactions. The relationships can be on the micro or macro-levels, with interconnections as Sampson (1988) found when researching individual-level attachment and community attachment variables. Orfield (1998) argues that, "cities and suburbs within a metropolitan area are interdependent" (p.

7), suggesting that a change in one can affect a change in the other, such as the population in an area. People can migrate to and from an area causing an area to change. Orfield (1998, 1999) has argued that when the affluent leave an area; poverty, crime and social disorganization follow in its wake. The problem is that Orfield's proposition only has been tested using cross-sectional research. There is a lack of longitudinal research about the effects of sprawl on crime and even less about limiting sprawl (smart growth) and crime (see Appendix A: Smart Growth Principles).

For every pursuit of "more" often something is lost, which is the basic argument that Orfield (1998, 1999) and Hall and Lee (2010) made. This argument is based on the idea that when cities are expanded with suburbs, the wealthy take their money and resources to build malls and newer, bigger homes, leaving less resources devoted to the preservation and upkeep of the city itself (see Orfield, 1998, 1999; Wilson, 1987). Orfield (1998, 1999) and Wilson (1987) argued that when wealth moves from a city, decay is left behind. This relationship is parasitic and viewed as a zero-sum gain. If there is a finite budget and more is spent on the suburbs that would mean less can be spent on the central-city areas (all things being equal). Those who remain in the city are longing to relocate to safer neighborhoods and their chance at the American Dream. Decay can be a lack of investment, which manifests itself in abandoned and run-down buildings, vacant sites, and a general lack of commitment to an area.

It is a fact that sprawl occurs in many locations and where sprawl exists there is a void of resources left within a city (Carruthers & Ulfarsson, 2003; Squires & Kubrin, 2005). Resources that could go toward redevelopment and services in the central-city area are moving to the suburban areas. Currently, there are legislative attempts to limit sprawl and control urban growth. Smart growth regulations address the necessity for greenbelts, urban service areas, and urban growth boundaries (Bengston, Fletcher, & Nelson, 2004). Greenbelts are relatively permanent

boundaries, such as farmlands that surround a city inhibiting outward expansion (Bengston et al., 2004), although this does not mean the farmlands remain untouchable from development. Rather, city-boundary growth seems inevitable and is only limited by local zoning laws. Urban service areas inhibit outward expansion by only allowing water and other vital systems to extend so far from the center of the city (Bengston et al., 2004). Urban growth boundaries (UGBs) are zoning tools where development is limited through zoning ordnances.

These smart growth regulations are designed to stop the mass deforestation around the city, preserving the rural lines by providing a clear demarcation between city and country. Constraining the uncontrolled suburbanization of cities (slowing sprawl) increases the city's tax base; thus, additional funding is available to invest in crime reduction initiatives [i.e., law enforcement programs and urban revitalization] (Burchell et al., 2005). City revitalization (i.e., gentrification) should lead to businesses and residents thriving within the city's boundaries.

Statement of the Problem

Sprawl is the current trend of urban development in the United States (Burchell, Downs, McCann, & Mukherhi, 2005); Carruthers & Ulfarsson, 2003). However, there has been a movement in recent years to limit sprawl in more locations around the country due to the negative outcomes of sprawl on cities and their tax base. The focus of this study was to examine the impact of Portland's UGB on crime rates.

Carruthers and Ulfarsson (2003) noted, "sprawl has come to represent the dominant mode of growth in most U.S. metropolitan areas" (p. 504). All over the U.S. suburbs are built, which could cause a concentration of crime in the sense that more money and resources are directed to the suburbs because many want their own property in more remote locations from the city (see Orfield, 1998, 1999). With the departure of the affluent from the city, both high poverty rates and

high crime rates often follow. Those who lack the financial ability to leave are trapped in a decaying city (Wilson, 1987). Since the 1950s, urban containment policies, and other forms of smart growth, have increased in their application in metropolitan areas in an attempt to curb inner city abandonment (Nelson et al., 2004). If sprawl and crime rates are related (see Jargowsky & Park, 2009) then criminological research needs to be extended to assess the impact of various smart growth initiatives, especially their potential impact on crime rates.

Relatively little is known about the relationship between sprawl and crime rates (Carruthers, 2003). It has been suggested that population density is related to urban land use (Alig et al. 2004). That is, as more people live in an area, the area becomes compact and thus affects both land use and property values. When applying the concept of density to an area surrounded by an UGB, population density becomes a factor. As the population increases and the land area remains constant, the population density of the area increases (population density often is measured as the number of residents per square mile). Per capita income is another factor that can affect property development. Per capita income was found to be positively related to land consumption (Alig et al., 2004), meaning wealthier residents demanded more property, which caused sprawl.

Land use varies by region, and the Pacific Northwest is unique. From 1982-1997, the Pacific Northwest was one of the lowest areas in the nation for change in developed land (Alig et al., 2004). This lower level of land development is attributed, in part, to legislators' concerns over saving the rural lands and preserving the urban lands through UGBs. UGBs are physical demarcations placed around a city denoting a no-construction zone. In many locations, the boundaries have been in place for 20 years, such as is the case with Portland in that developers can ask to develop land outside the zone and the permit will most likely be denied (Harvey &

Works, 2002; Nelson & Moore, 1993). The developers cannot build without the appropriate governmental permits. In Portland, the Metro is this governing body overseeing the use of land. If indeed there was a "dominance, invasion, succession" (Williams & McShane, 2009) occurring in an area, an UGB might affect crime rates.

Portland, OR is a city with a relatively uncommon approach to revitalizing their neighborhoods: the UGB. Portland was chosen for this study because of its robust approach to protecting land and promoting revitalization of the central city. Portland has been called "a national model" (Orfield, 1998, p. 1), "a shining example of regional land use policy" (Wiewal & Schaffer, 2001, p. 600), and a "pioneer" (Wickersham, 2006, p. 49). Portland, OR stands alone, for a city its size, in its pursuit of protecting both the inhabited and uninhabited areas within its borders.

Orfield (1998) succinctly describes how Portland is different from the rest of the country in its regional planning initiative—the UGB. First, he explained that having an UGB promotes reinvestment in the central city areas. If the money is not spent on the suburbs, it can be directed to the central areas. Second, he argued there is not a separation of the rich and poor that suburbanization promotes. The physical geography restricts that separation. Third, he noted that Portland has been limiting sprawl, or the uncontrolled outward expansion. Fourth, Orfield argued that Portland is making strides to protect surrounding farmland.

Orfield (1998) suggests that by using UGBs, Portland has reduced the impact of "social and economic polarization" occurring throughout the nation where sprawl is not contained. Orfield (1998) argues that concentrated poverty "destabilizes schools and neighborhoods, [which] is associated with increases in crime [and thus] the flight of the middle-class families and businesses [from the central cities and older areas] (p. 1). This central idea of poverty

concentration is an argument also set forth by Wilson (1987) and other scholars (see Orfield, 1999 and Valdez, Kaplan, & Curtis, 2007). Second, Orfield argues that the suburbs are built without a necessary "property tax base" and will become "tomorrow's troubled suburbs" (p. 1). What this means is that the "upper-income residentially exclusive suburbs" [become] "socially and politically isolated from regional responsibilities" (p. 1). It is the first argument, involving crime that this research addressed.

This study about the plausible impact of an UGB on crime rates was necessary. There is a paucity of research in this area despite fiscal concerns from many locations around the country. Further, this study added to the literature through a more modern application of land use legislation on crime through utilizing three decades of data. This study was the natural extension of Jargowsky and Park's (2009) work, where they reported that suburbanization is related to crime; thus, the next step was to examine what happens to crime when an attempt is made to contain sprawl.

Conclusion

The focus of this research was to examine the effects of an UGB (that limits sprawl) and the plausible impact on crime rates using a legal impact study. A time series analysis of crime before and after the UGB law took effect with a comparison city that does not have an UGB was used to assess the impact of limiting sprawl. The focus of this study more specifically was one city, Portland, OR because this city is a forerunner in city planning (see Orfield, 1998). The comparison city to Portland, OR was Vancouver, WA, its smaller neighbor to the north. Other available cities within the UGB in the Portland area were analyzed with time series analysis, such as Beaverton, Cornelius, Forest Grove, Gladstone, Gresham, Hillsboro, Lake Oswego, Oregon City, Tigard, Troutdale, Tualatin, and West Linn. These represent 13 of the 24 cities with

data available from the UCR. Of the reporting cities, only six had an appreciable amount of UCR data available. They are: Beaverton, Cornelius, Gresham, Forest Grove, Hillsboro, and Tigard. Only these six cities are included because they have reported crime data both before and after the implementation of the UGB in the Portland Metro area.

This study identified the effects of UGB on cities within the Portland Metro area. By looking at the crime rates before and after implementation of the UGB, it was possible to examine the statistical impact of an UGB on crime rates for all three areas Portland, Vancouver, Portland's collar cities). It was hypothesized that crime within the collar cities and Portland would decrease as a result of strict adherence to the UGB, since more resources and revitalization would have been redirected back into these areas.

Chapter II addresses the theoretical concept surrounding the implementation of UGBs, the positive and negative aspect of implementing UGBs, and the need for legal impact studies for policy assessment. Further, theoretical links are described including social disorganization theory and routine activities theory (see Appendix B for further discussion of social disorganization Theory). Chapter II concludes with a summary and reiteration of the need for this study.

Chapter III discusses the methods used in this research. Here, the data sources are identified and discussed, namely census data and UCR data, followed by an overview of time series analysis and SPSS Forecasting, along with the independent and dependent variables for the various models. Threats to validity and limitations of official data were highlighted. This chapter concludes with the recognized strengths and limitations of the current study.

Chapter IV discusses the statistical results for the various ARIMA models and a brief discussion of each model. First the violent crime indexes for Portland, the collar cities, and Vancouver are discussed. Then, the SPSS Forecasting displays (from SPSS 17.0) are explained.

Each section concludes with an actual impact of the UGB on crime (computed by SPSS 10.0). Property crime indexes for the three areas then are discussed using the output from the ARIMA models. Finally, the overall crime rates (includes both violent and property indexes) were computed and are addressed.

Chapter V offers a discussion about the research findings. This chapter covers the summary of the findings and possible policy implications from the findings. The strengths and weaknesses of the methodology and data as related to the findings also are discussed. The chapter concludes with future research suggestions related to better clarifying the finding of this study and to validate the findings using other locations.

CHAPTER II

LITERATURE REVIEW

Overview

This research was an examination of the effect of an UGB on crime as measured with official crime statistics. For clarification, the research was designed as a legal impact study and not as a test of social disorganization theory. Any reference to social disorganization theory refers to the traditional, ecological approach and not the modern version, which focuses on social bonds/collective efficacy of an area; although, both approaches measure the investment of residents in a neighborhood, whether it is percentage of homeownership (traditional ecological variable, see Shaw & McKay, 1942) or civic club membership and involvement (modern collective efficacy concept, see Sampson & Groves, 1989). Ecological theory provides one foundation for the understanding of the changes in an area.

Environmental contexts often are called neighborhood effects because they measure variables of interest at the neighborhood or census tract (proxy for neighborhood) level. This research examined the effects of sprawl on crime rates, while examining changes in key variables (poverty, heterogeneity, and mobility) within the UGB for the city of Portland, Oregon. The empirical relationship between poverty and crime, heterogeneity and crime, and mobility and crime must be acknowledged because of the known relationship among these variables.

The literature review starts with a discussion of the UGB and events leading up to the UGB, including goals and policies listed for the city of Portland. The goals of the UGB provided the framework for which to view the intended outcomes—revitalization and restoration of the central city areas. Next, sprawl is defined and the benefits and negative aspects of sprawl are discussed. Empirical finding about the impact of sprawl and research about urban studies are

discussed, along with legislative efforts to stop sprawl, including UGBs. Research that measures the impacts of UGBs on an area are limited, but does suggest that sprawl restraint efforts do both positively and negatively impact the area under containment. Ecological theory, which is the link between the UGB law and crime, is presented. The relationship between crime and ecological theory (poverty, heterogeneity, and mobility) is discussed since understanding these variables is essential when addressing changes in crime rates in an environment. A complimentary theory, routine activities theory, is briefly discussed. This section concludes with reasons for and the focus of the current study.

Introduction

On November 8, 1979, Portland OR implemented an UGB, which encompassed the Portland metropolitan area and the collar cities. At the UGB's inception there were 23 cities within the UGB area, another city was added to the UGB at a later date, bring the total to 24. This boundary encapsulated the region and set it apart from the surrounding farms and woodlands. The UGB set into motion one of the most restricted land use policies in the nation. The UGB established geographical boundaries outside of which development cannot occur, forcing developers to remain within the identified UGB area. Portland also developed a regional land planning agency, the Metro, to ensure that property development inside the UGB was planned and conducted in an orderly fashion. The Metro controls the area covered by the UGB, and ensures that the goals set forth by the 1973 Land Conservation and Development Act are maintained.

In 1973, the Oregon Legislative Assembly reported that the "Uncoordinated use of lands within this state threaten the orderly development, the environment of this state and the health, safety, order, convenience, prosperity and welfare of the people of this state" (Senate Bill 100,

Section 1(1), 1973). The Assembly was referencing the problems associated with sprawl. To counter this threat (i.e., the problems associated with sprawl through uncontrolled development), the legislators sought to control land development. They knew that land development could not go on haphazardly. Senate Bill 100 (1973) proposed the establishment of goals and guidelines to promote the proper development of areas within the state. Senate Bill 100 (1973) charged each city and county with the responsibility of maintaining an UGB within their area.

Portland's Comprehensive Plan (1980/2004) clearly articulates the goals, policies, and objectives of their land use regulation and the logic behind the UGB implementation. For example, goal number three is to "Preserve and reinforce the stability and diversity of the City's neighborhoods while allowing for increased density in order to attract and retain long-term residents and businesses and insure the City's residential quality and economic vitality" (Comprehensive Plan, Goal 3, 1980, 2004). Goal three suggests that if outward migration of residents and businesses could be contained, the Portland area would be enhanced through both stability and diversity (social economic, race, etc.).

Some additional goals listed in the policy are the desire to maintain physical and social quality of neighborhoods (Policies 3.1 and 3.2). Policy 4.7 notes that it is desirable to have diverse groups of people living together, such as by SES and housing type. Where unchecked sprawl has been noted to promote economic polarization of people by income (Orfield, 1998, 1999; Wilson, 1987, 1996), containing sprawl should enhance diversity. Goal 4.14 notes the need to have stability in the neighborhoods by increasing the tenure of residents living there. Policy 5.1 highlights the need for economic revitalization of urban areas. The policy notes the need to promote investment by bringing people together.

It seems apparent that Portland's city planners intended central city revitalization and enhanced maintenance by severely restricting development outside the UGB area. Further, the UGB's goals surpassed that of just limiting development. Portland's UGB was designed to control growth, enhance economic reinvestment in the Portland area, promote desirability of the area, and prevent the economic polarization of people.

Sprawl

Sprawl is a concept known by many, even if they do not know the word itself or how to measure it (Song & Knaap, 2004). Sprawl is the opposite of compact development. Sprawl is the idea of resources spread out. Through sprawl, businesses go on for miles with no clear demarcation of were a city boundary starts and stops. Ownership of land may not be apparent. Sprawl is a spreading out of people and resources in an often haphazard manner consuming natural lands, concentrating poverty in an area, and promoting a "lack of community" (Wheeler, 2003, p. 322). Sprawl disperses limited resources across a broader geographical location, usually from the city to the suburbs.

Although city growth expansion can be planned, sprawl refers to the people and businesses leaving the cities and moving to the suburbs in mass exodus in a regionally unplanned way (Burchell et al., 2005). On the one hand, it is the natural progression as density increases and people want to leave the city due to central city issues (Mieszkowski & Mills, 1993; Orfield, 1998, 1999; Shaw & McKay, 1942; Wilson, 1987, 1996). Throughout much of the country, unsightly strip malls stretch on for miles as businesses vie for a cheaper place to build. In terms of ecological theory, sprawl is the process of the expanding zones around a city, but sprawl also denotes rapid uncontrolled expansion around a city. An UGB provides a clear demarcation for developers.

Sprawl was a term first used in 1937 by a city planner, Earle Draper, to explain the idea of resources leaving the city (Nechyba & Walsh, 2004). City planners at the time began to take note of how a city was constructed and the social effects left in the wake of development, especially with the large increases in city populations around the early 1900s. The large wave of immigrants had the potential to double the size of a city like Chicago from one million to two million residents in the span of two decades (Shaw & McKay, 1942). With the rise in the number of inhabitants, the cities naturally grew and spread out as people earned more money to do so. With the rise in population and mixing of ethnicities, a lack of social organization was said to have taken place in Chicago (Shaw & McKay, 1942). Shaw and McKay noted that people wanted to move away from the areas of disorganization (p. 19-21). This, they said created an area that remained disorganized regardless of the race of the inhabitants. It was the desirability of the land away from the city that promoted sprawl.

Sprawl is a concept that is easy to recognize but more difficult to define (Burchell et al., 2005). In fact, Rusk (2006), echoing a similar message of a former Justice Potter Stewart, argued that, "Sprawl is like pornography—hard to define but you know it when you see it" (p. 91). Regardless of the definition, sprawl has "negative connotations" (Willmer, 2006, p. 61). With the resources leaving the city, the idea of hollowing out, or emptying out of an area leaving behind decay, social disorganization, and a host of negative factors. The central city areas became less desirable as suburban areas become more desirable.

There are many ways to measure sprawl. Measurement, of course, is related to conceptual and operational definitions. Like many definitions, such as social disorganization, the causes and consequences can be tied together. Soule (2006b) defined sprawl as:

> Sprawl is low density, auto-dependent land development taking place on the edges of urban centers, often "leapfrogging" away from current denser development nodes, to transform open, undeveloped land, into single-family residential subdivisions and campus-style commercial office parks and diffuse retail uses (p. 3).

Burchell et al. (2005) defined sprawl as "1) unlimited outward extension into areas, 2) low density, and 3) leap frog development" (p. 12). Regardless of the definition, sprawl is simply the spreading out of resources, both people and businesses.

A definition is important because defining concepts in various ways leads to different measurements to capture the concept, which can lead to different results. Limitations of studies involving social disorganization or indicators of social disorganization also apply to research examining sprawl. Talen (2003) noted the difficulty that remains in measuring and conducting research with urban and suburban concepts (see p. 214). Sprawl is measured in a myriad of ways, but there are central factors, such as population density, continuity, and mixed land uses (Soule, 2006b, p. 275).

Land use and consumption is a dynamic process that changes the land and environment. Estimates of land converted to urbanized usage in the United States from 1982 to 1997 varies from 34% to 47% (Alig, Kline, & Lichtenstein, 2004; Burchell et al., 2005). Burchell et al. noted that during this time-period, the population only increased by 17%, thus indicating that land consumption is outpacing population increases. Beck, Kolankiewicz, & Camerota (2003) noted that during the same time period (1982-1997) about 39,000 square miles of rural land was converted for either suburban or urban uses. Clearly, land is being utilized for development. In 1950, 65% of the urbanized population lived in central cities, but as of the 1990s, only 35% did so (Nechyba & Walsh, 2004). Thus, it appears the traditional trend is for people and businesses

to move away from the city to the suburbs and rural areas of America, as was noted by Shaw & McKay (1942) presumably because of the desirability of the lower cost housing and property.

Currently, it is estimated that 80% of the population either lives in suburban areas or urban areas compared to 20% in rural areas (Alig et al., 2004, p. 223). Further, population density is related to urban land use (Alig et al. 2004); suggesting that as the population increases and the area in which people are located remains the same, then the density will affect how land is consumed and utilized. Income is another factor in how land is utilized. Per capita income is related to the consumption of land (Alig et al., 2004). Put another way, higher per capita income is positively related to land consumption; basically, those who can afford to move out of inner city areas do so, those who cannot remain behind. Crime and sprawl were topics that both concerned Americans in the late 1990s (Alig et al., 2004), yet there is little research available that has evaluated the relationship of these two variables.

Benefits of Sprawl

Sprawl has been noted to have positive effects and people benefit from sprawl in a variety of ways (Burchell et al., 2002; Downs, 1999). Sprawl is a phenomenon that has public support (Burchell et al., 2005; Carruthers & Ulfarsson, 2003). Burchell et al. (2002). Those who believe in sprawl's positive effects say it is the "apple pie" residents always have wanted and are now getting (p.1). On a basic level, the American Dream and freedom of choice as to where to live and where to place a business are hallmarks of our society. Many people prefer choices and the choice of housing and business locations seems unlimited except by ordinances from local and state governments by means of permits issued (Brueckner, 2000). This section discusses the alleged benefits and empirical findings of the positive aspects of sprawl, namely housing-related, transportation, land-planning, and quality of life benefits.

A key benefit of sprawl is that it provides choices to individuals who can afford to relocate and decide where they choose to live and build up their businesses (Burchell et al., 2005), but there also are other benefits. Burchell et al. (2002, 2005) and Downs (1999) argue that two reasons people support sprawl are related to cost of living issues and quality of life issues. As one transitions away from the city, property values decrease as development of the area has yet to occur, making these areas prime targets for developers and those who cannot afford to live in the city.

Utilizing data from the California Association of Realtors for the year 2000 for the Los Angeles area, Burchell et al. (2002) found that as the distance inland away from the central business district increased, then the value of a house decreased. Burchell et al. (2005, p. 128) describe this phenomena as "Drive until you qualify!" [for the bank loans]. The land and housing costs are lower allowing residents to buy larger lots. In addition to larger lots, people can buy larger homes with larger room sizes. Burchell et al. (2005) noted that "Not everyone in our diverse society aspires to this lifestyle [having their own house], but most Americans do" (p. 127). It is a fact that home values generally decrease as distance from the business districts increases (Burchell et al., 2005). Yet, there is an increase in value of homes when far enough away from the central city.

Permitting sprawl also offers psychological benefits. These benefits include low-density preference that many have with regard to where they live. Some people prefer living in lower density areas. For example, people want to have a home with more open, private land and these lots of land are located away from the central city areas. It is not difficult to understand that some people may want more, private land away from the potential ills, whether perceived or real, of a city. Using Department of Education data for the year 2000, Burchell et al. (2002) also argued

that there are, for the most part, better schools in the suburban areas, as evidenced by higher achievement scores than their central city counterparts.

Further, Burchell et al. (2005) argued that since some of the jobs have relocated to suburb areas, people will want to live there to have shorter commute times, which would translate into less traffic congestion. Shorter commute times could be possible if both the jobs and the people are in the suburbs. Weber and Sultana (2008) found empirically that sprawl meant a shorter driving time to work for residents working in Alabama. However, the opposite could be true if most of the residents would drive to jobs located in the city, while living further away from the city. Living in the outskirts of a city allows those who desire it easier access to nature. It would seem that with all these benefits, few would give concern about sprawl or want to stop it.

Sprawl also helps people get away from the things they do not want to be around, while offering access to the things they enjoy. Statistically, crime rates significantly are lower in the suburbs than they are in urban areas. Families with children may want to leave these higher crime areas for areas of lower crime (Burchell et al., 2005); this assertion was found to be true empirically (Cullen & Levitt, 1999). People seek to move to the suburbs to avoid the drug use and gang activities that are associated with inner-city neighborhoods and schools (Burchell et al., 2005; Downs, 1999; Orfield, 1998). People who move to the suburbs may want to flee from areas of high unemployment and broken families, in addition to seeking areas that are more homogeneous (Downs, 1999). Homogeneity refers to people who are like you, such as by race and income. Le Goix (2005) found empirically that in southern California sprawl was related to gated communities and thus social segregation.

The last points regarding the benefit of sprawl include that fact that leapfrog development can be efficient, sprawl offers more lifestyle choices, and there is the possibility of more local

government participation with fragmented local governments (Burchell et al., 2005). In fragmented governments, the governing bodies could be smaller, thus garnering more participation from those in the area. Burchell et al. (2005, p. 137) noted "It is almost self-evident that the average citizen of a town containing five hundred residents has a much better chance of persuading the local city council to adopt his or her views than the average resident of a city containing 5 million residents." People may be more willing to come to town meetings with fewer attending than larger city hall meetings where their voice may not be heard. Additionally, sprawl offers local suburban and rural residents, through supply and demand, the ability to dictate what products and services they want, along with affording businesses more opportunities for development.

In summary, permitting sprawl offers a variety of positive aspects, often restricted to the more affluent. The positive impact of permitting sprawl include: lower housing prices, lower land prices, larger lot sizes, larger homes, lower density preference, better-quality schools, shorter drive times, less traffic congestion, lower transportation costs, homogeneity of residents, efficient leap frog development, lower crimes in neighborhoods, more lifestyle choices, and stronger citizen participation (Burchell et al., 2005). These positive factors promote and push further development of areas outside the central areas. The positive aspects of sprawl are just one side of the debate; there also are negative aspects.

Negative Aspects of Sprawl

Hylton (1995) noticed a difference between American and European cities on a vacation trip. He was surprised to find that touring an area in Europe did not take all day in traveling. Rather, European cities have a central location with all tourist-spots and amenities located on a walking scale. There were many shops and places to visit that were centrally located. It would

not take all day to tour the area because the tourist attractions are within walking distance. In America, Hylton noted that the current, sprawling approach to commerce is to drive from one store to another, which could be miles and/or hours apart. There is no clear demarcation or boundary of where cities start or stop; it is just one big suburb stretching for miles. As a person leaves the central city area, it would seem that demarcations of boundaries may decrease. This section discusses the negative aspects of sprawl.

In *Sprawl Costs*, Burchell et al. (2005) categorized the negative consequences of sprawl by chapters: 1) land consequences (to farmland and fragile areas), 2) infrastructure consequences (costs for water, sewer, and roads), 3) real estate development costs (costs of compact versus sprawl growth), 4) fiscal impacts (revenue for an area), 5) travel issues (costs of driving, transit, congestion), and 6) quality of life issues (physical activity, stress, sense of community, social capital). The following review follows Burchell et al.'s (2005) categories, although not necessarily in order.

Again, sprawl is the idea of spreading out of resources. With resources spread out, some people may be driving longer to get to the services they want. Distance and problems associated with driving have been key variables researchers have argued that both researchers and politicians need to consider when discussing sprawl (Burchell et al., 2005; Downs, 1999; Ewing et al., 2002; Nechyba & Walsh, 2004). With people and businesses moving to the suburbs, there will be longer driving distances for those who do not move with the employment opportunities. Those who do move to the suburbs and have jobs that remain in the city will face longer commute times. When jobs move to the suburbs, poor people without means of transportation will be left behind (Wilson, 1987, 1996). Sprawl also may be related to increases in traffic jams and congestion along the nation's highways if people do not move with their jobs (Burchell et

al., 2005; Ewing et al., 2002). Further, increases in driving times increase pollution associated with longer driving and traffic congestion. Longer driving times also can alienate people from one another. For example, driving to and from work alone would leave less interacting with people on a personal level (Burchell et al., 2005). Less interaction could be good for some, but there are benefits from people interacting with each, such as people knowing each other's names, and this could affect the social control in an area. If there was less control in an area from people not knowing one another, then criminals could potentially come and go without being observed (Jacobs, 1961).

There are financial costs associated with sprawl that can be perceived by many as being negative. Businesses may leave an area to become established in a city's periphery because of lower taxes. If the revenue of the businesses is leaving the central city area, then a wake of business decline can be left. The loss of revenue could create a situation of further decline, and decline could cause a further loss of revenue (Orfield, 1998, 1999). This cycle can be argued as 'sprawl causes further sprawl'. As Downs (1999) argued, revenue can affect the number and location of police departments, fire departments, and hospitals. The lack of police services, in turn, could lead to disorder, decline, and the flight of people from an area. Sampson and Wilson (1995) suggested that when communities are isolated by poverty there would be a corresponding decrease in resources such as police presence. Disorder, decline, and less police presence could lead to crime and fear of crime, which could lead to people wanting to flee an area even more (Skogan, 1990; Orfield, 1998, 1999; Wilson, 1987).

Other costs associated with sprawl include the costs of establishing and maintaining the infrastructure (Orfield, 1998). For example, as developments are built around a city and further from the city, there is an increase in costs associated with building the sewer systems, roads, and

even the schools. Redirecting these monies and resources on a continuous line of suburbs could create a monetary hole in the central city (Orfield, 1998, 1999), all things being equal. Less money could mean less police officers or police officers covering a larger area, thus only responding to major crimes. A loss of investment could drive urban flight from blight. A loss of investment could mean disorder and decline. Disorder, decline and a loss of investment and renewal could lead to crime.

Not only can emergency service be limited due to sprawl (Orfield, 1998), but parks and civic gathering places will be spread thin due to sprawl. With money being diverted to the suburbs that would mean the central areas would get only a fraction of the money, if any. Gies (2006) argued that parks and other facilities can bring people together and increase their sense of community. Less public gathering could mean a lowering of the sense of community, which can affect residents' willingness to intervene and come together to solve a common problem affecting the community such as crime.

Another negative aspect of sprawl is the aesthetic aspect or the visual pleasantness of an area. Sprawl has been related to the vast loss of rural land and forests surrounding a city (Nechyba & Walsh, 2004). This process leads to patchwork development of housing and unsightly strip malls continuously spreading out from some cities. A lack of preservation of open spaces can be a concern because the uncontrolled sprawling development could lead to a lack of real understanding by residents as to where a city starts and stops. Again, a lack of investment could lead to decline, disorder, and ultimately crime in an area.

Another problem of sprawl is the exodus of residents or urban flight from an area. Orfield (2006) argued that there is a negative effect of sprawl and the result is a separation of the races, leaving the minorities in clusters in the city while the whites head to the suburbs. Race has been

found empirically to be related to spatial differentiation of a metropolitan area (Lee & Leigh, 2007). In past research, Orfield has argued that sprawl causes a separation by race, decline, crime and therefore further separation due to the decline or disinvestment in the central city areas (Orfield, 1999). Similarly, Farley et al. (1978) analyzed census data and found that when white residents leave the city, there is an influx of black residents who move into the area just vacated by white occupants. One can clearly see how this relates to Shaw and McKay's (1942) work. Further, others have found that as the poor come to live in the central cities, those who can afford to do so move out (Margo, 1992; Mills & Lubuele, 1997).

Wilson (1987) stated that this transition "removes an important 'social buffer' that could deflect the full impact of…prolonged and increasing joblessness" (p. 56). By social buffer, Wilson means that having middle and working-class families removes the strength of decline and negative effects that concentrating poverty causes. Orfield (1998) suggested that areas in disorder do not have the human resources necessary to hold the community together. It is possible that when people see the resources dwindle and decay, their sense of community also vanishes (Wheeler, 2003). Again, a loss of the sense of community could lead to residents' lack of concern and thus crime could run rampant in an area (Sampson & Groves, 1989).

Cooper (2006) argued that the way residents interact with each other can be examined through spatial analysis. He noted that areas, such as community centers, could bring people together in a beneficial way for the community. This idea goes back to the early programs, such as the Chicago Area Project, which intended to bring people from the community together in pro-social ways for the betterment of the community (Bernard, Snipes, & Gerould, 2009). Communities coming together relates to the concept of social efficacy (Sampson & Groves, 1989), which goes as far back as Jacobs (1961) noting that neighborhoods that are more tightly

knit and have lower crimes have residents with "eyes on the streets". If more residents care about an area then potentially there are more people watching for trouble, thus they become capable guardians (Cohen & Felson, 1979).

In a small town, where everyone knows one another, arguably it is easy to maintain surveillance of the area. As a place becomes more spread out, this surveillance becomes more difficult. As Cooper (2006) argued, the "sense of place" is affected by sprawl (p. 111). The growth of neighborhood spreads neighbors out, thus a lack of monitoring and caring about the place can occur. If those who can afford to move do so, a concentration of poverty can be left behind (Orfield, 1998, 1998; Wilson, 1987, 1996). Poverty and crime, in turn, can lead to further problems associated with social disorganization, and in turn more flight (Rusk, 2006). In sum, sprawl can lead to a "loss of sense of community" within an area (Nechyba & Walsh, 2004, p. 186). If sprawl leads to less community cohesiveness then this could contribute to the prevalence of crime.

The underlying them of the research just reviewed is that permitting sprawl enhances the opportunity for crime to occur. The negative factors of sprawl, especially the spreading of limited financial resources could promote crime in the central-city areas. One can witness the "broken windows" proposition that by permitting disorder and decline to occur only permits further disorder and decline (Brantingham & Brantingham, 1981; Wilson & Kelling, 1982). Ignoring little negative occurrences in a community eventually leads to tolerance for minor infractions that extends into more serious criminal offenses. Disorder and crime may push people into the suburbs.

Empirical Findings for Sprawl and Crime

As a whole, what is known about sprawl is limited. Much like tests of ecological theory, sprawl research is varied in its approach. What follows are key empirical finding of research about sprawl. This section consolidates the empirical research about the relationship between sprawl and crime.

Oh (2005) examined the relationship between crime and population change for 142 U.S. central cities and their suburban rings. Suggesting that crime could be a factor in urban flight, Oh combined census data and UCR data. The dependent variable was the percent change of black and white populations from 1980 to 1990 in both the central city area and suburban areas. This number was calculated by taking the differences between the populations from the one time-period to the next. Neighborhood effect variables (IVs) included violent crime, employment, population, percent below the poverty line, and percent of single mothers. The research findings suggested that central-city crime was related to white flight in 1990. It was possible for Oh to make this conclusion by examining one timeframe and comparing it to another while holding neighborhood effects constant. Further, he found that when suburban crime increased, there was a movement of whites to central locations. It would appear that whites are fleeing certain areas, but the plausible reasons for the urban flight were beyond his data. However, based upon the finding that crime preceded urban flight, Oh made the argument, "It is reasonable to state that the central-city population moves out of central cities to avoid crime or to maintain more stable conditions of life" (Oh, 2005, p. 672). Thus, Oh (2005) argued that crime drives sprawl.

Bayoh, Irwin, and Haab (2006) researched the reasons why people leave an area. The researchers looked at deed transfers of 824 households that moved in 1995 in the Columbus, OH area. Of those who moved, 80% were white, 54% had children, the average income was between

$60,000 and $80,000, average increase of 10% for lot size, housing values increased by 25.6%, and 75% moved away from the city. The pattern is evident, people wanted to move away from the city, for the most part. Factors related to respondents' choices in relocation varied. Crime rates, property taxes, school quality, and job accessibility all were factors identified as relevant to selecting an area to live, whether urban, suburban, or rural. Per capita income, shorter commuting times, and the number of retail establishments (access to goods and services) also were factors in area selection. Those moving from urban to either suburban or rural generally had higher incomes and children, noting that school quality was a significant factor in moving.

A closer examination of resident opinions in the Portland area is warranted to see if it follows the pattern of movement that research has shown—it does. In the 1970s, Lycan, Pendleton, and Weiss (1978) examined reasons why residents move. This study was reported about a year before the implementation of the UGB so it provides a glimpse into the mindsets of residents in the area. Of 3,824 households that completed the telephone survey and 876 that completed the longer, 40-minute interviews. Many factors were highlighted as to why they moved. Housing factors were a large part in deciding to move. Housing included residents wanting to own their own homes and also more privacy. A second factor identified was related to neighborhood environment. Neighborhood environment included the condition of the houses in the neighborhood, street noise, and lack of open space. A third factor reported were the perceptions of urban services available. Lycan et al. found "Perceptions of crime rates and quality of police protection were important both in deciding to move and in finding a new residence" (p. 9). Other factors were store availability, school quality, and the flight of families with children to the suburbs. Of those who agreed to a longer interview (n=876) the question *What was the main reason that (you/ your family) moved from your previous residence?* was

posed. Again, the reasons they gave correspond to national research. Reasons included wanting to own home, size of house, number of rooms in the house, privacy, and size of yard. Neighborhood reasons included crime rates, street noise, and condition of neighborhood. Teacher quality and curriculum quality also were important factor in the decision to move.

Neal (2001) continued this line of research by examining the factors related to people's decisions to move away from the public school districts in Portland. Telephone interviews were conducted with 111 people who had children enrolled in Portland's public schools but then moved away from the school district. Neal found that 76% of respondents noted that housing was a large factor. Safety and security reasons were noted by 35% of the respondents, while 32% reported neighborhood concerns. Twenty eight percent of the respondents were concerned with the quality of the teachers/schools. Clearly, there are many reasons people move to or from an area, but crime rates do appear to be a genuine concern and a factor in the decision to move from urban to suburban environments.

Later, Glaeser, Kahn, and Rappaport (2008) wanted to understand why poor residents remained in the central city locations. They found that as public density increased so too did the public transportation systems. They argued that transportation was the key to understanding why lower income individuals remained in the city. Specifically, they noted, "the census tracts that gained access to public transportation became poorer" (p. 2). If a person is from a lower SES and cannot afford a car, it would seem logical that they would rely on the public transportation system to get to work. However, public transportation limits where people can work and live.

Brueckner and Largey (2008) sought to understand Putnam's central thesis of his seminal book *Bowling Alone* that stated that low density living caused less social interaction. Low density living is, of course, sprawling developments and suburbanization. Brueckner and Largey

surveyed 14,823 individuals in 40 communities in 29 states. They examined friendships among contacts and group involvement. They found that higher incomes predicted leaving the city. Further, being in a family predicted leaving the city for the suburbs. Minorities remained in the city. There was less interactions in the city, which does seem counterintuitive. Those who live in the city have less confidants. Lastly, as the density decreased (think suburbs), then people reported talking and socializing with neighbors more.

More recently, Jargowsky and Park (2009) conducted one of the most comprehensive examinations of city-level factors and crime. Suburbanization was identified through four factors: 1) density gradient (i.e., how density decreases with distance from the central business area), 2) average population density, 3) percentage of the metropolitan's population residing in the central city, and 4) average commuting time. Utilizing ordinary least squares regression, they found that suburbanization did have a *direct effect* on an increase in the amount of crime in the central city (emphasis added). They analyzed the relationship between these factors and crime measured with UCR data for the year 2000 (focusing only on Part I offenses). Population and heterogeneity were found to be positively related to both violent crime and property crime. Income was negatively related to violent and property crime. They found that suburbanization was related to crime with the stronger relationship being with property crime more than violent crime. They also found that "suburbanization has a positive effect on overall crime rates in metropolitan areas" (p. 46). Put more simply, as the boundaries around a city increase from the center of the city, there is a predictive notion that crime will increase in the metropolitan areas. Basically, sprawl is predictive of crime.

Carruthers and Ulfarsson (2003) examined measures of public expenditure of 283 metropolitan areas in 24 states from 1982-1992. These areas of public expenditure included: total

direct, capital facilities (new construction), roadways, transportation, sewerage, trash collection, housing and community development, police protection, fire protection, parks, education, and libraries. Through a combination of cross-sectional and time-series analyses, the authors found that sprawl (measured by taking into account the density of people per area and urbanized areas) was related to more roads and expenditures, with police and fire departments being spread thin. As density decreased (i.e., sprawl), Carruthers and Ulfarsson (2003) found that money spent for educational purposes, police protection, public spending (salaries and wages), capital facilities, and roadways all decreased. The money spent on public services is related to the nature of community and the regional planning.

Another aspect of sprawl is investment in an area and crime. Lee and Leigh (2007) examined the growth patterns for Atlanta, Cleveland, Philadelphia, and Portland. They utilized census data from 1970 to 2000 from GeoLytics (company that aggregates census data over time in a manageable package ready for SPSS analysis). Factor analysis produced three categories. The first loading was the distress factor, which was the proportion minority, unemployment rate, public assisted households, poverty rate, housing ownership, and vacant housing proportion. Prosperity loaded heavily on the following variables, the proportion of college degrees, relative per capita income, relative average housing value, and the proportion of overcrowded housing. The third factor was age with the proportion of young and the proportion of elderly loading together. In these cities, the authors found that inner-rings showed decline while the outer-rings of the suburbs prospered. What set Portland apart from the other cities used in the study was that Portland was the only city with a UGB. Lee and Leigh argued that the "UGB can be an effective tool for both central city and inner-ring suburban revitalization" (p. 149). Lee and Leigh did find

that differentiation of distress was lowest in Portland. The authors concluded that it appears that the vitalized outer-rings attract new populations.

The research on the relationship between sprawl and crime is limited. There is a paucity of research covering the two concepts, and even less on smart growth and crime, specifically UGBs and crime. Carruthers and Ulfarsson (2003) noted that sprawl is the dominant form of development in the U.S. and numerous authors (Burchell et al., 2002; Orfield, 1998, 1999, 2006; Wilson, 1987, 1996) have either argued or shown support that sprawl is related to crime. The processes could be cumulative over time, such as poverty being concentrated in an area (Wilson, 1987), meaning that poverty in an area can increase over time having a stronger relationship with crime over time. In a powerful analogy, Orfield (1998) conveyed the notion that the relationship between poverty and decline as continual:

> A growing core of concentrated poverty is like a collapsing star, which as it grows denser, grows more powerful in its gravitational pull. A core of concentrated poverty holds individuals in with an enormous and growing gravity, making escape from poverty impossible. A core of concentrated poverty draws in increasingly greater levels of governmental and philanthropic resources that rapidly disappear—with little sign of improvement. As poverty concentrates and social disorganization increases, crime grows, and waves of middle-class flight, business disinvestment, and declining property values surrounding the core intensify (p. 7).

In summary, there is a host of problems that researchers have argued are related to sprawl, such as the expense of building suburbs, unsightly development, public health concerns, traffic problems, and separation by class (Soule, 2006a) and these can be categorized as push and pull factors (Rusk, 2006). Put simply, sprawl has been argued to cause inner city decline, decay,

and poverty as those who can afford to move do so (Orfield, 1998, 1999; Wilson, 1987, 1996). The next logical step is to research the effects of controlling sprawl. An UGB is one such approach. UGBs contain a city by limiting the expansion of the city through permits.

Land Use and the Urban Growth Boundary

Although Oregon may be the leader in smart growth, many states have taken some measures toward sprawl reduction. For example, in the 1980s, Minnesota established the Metropolitan Urban Services Area; in the 1980s, Florida enacted the Growth Management Act; and in the 1990s Washington, DC enacted the Growth Management Act (Orfield, 1999). It would seem that more locations are implementing smart growth strategies in recent years (Edwards & Haines, 2007). Smart growth is on the rise in America because of the host of problems associated with sprawl. Recently, Howell-Moroney (2008) showed that many states—Oregon, Florida, New Jersey, Maine, Rhode Island, Vermont, Georgia, Washington, Maryland, Arizona, and Tennessee have some form of state growth management policy (p. 342). In fact, a survey conducted of the 25 largest metropolitan areas in the early 1990s showed that 15% of cities had an urban containment policy in effect (Pendall, Martin, & Fulton, 2002).

Smart growth requires permits to build in certain areas; without the permits, residents cannot legally live in certain areas, as is the situation with the UGB (Bhatta, 2009; Brueckner, 2000). A person cannot build a house outside the UGB in Portland, without obtaining a land permit (Brueckner). There are multiple approaches that could be utilized to prevent uncontrolled outward expansion into the countryside. Brueckner argued that sprawl is caused by three main factors of 1) increasing population, 2) increasing income, and 3) decreasing commuting costs. Brueckner also said sprawl could be controlled by various means. Brueckner went on to argue that expansion could be minimized by imposing the following: taxes could be utilized, commute

times could be changed, administer a “congestion toll”, implement “impact fees”, or use an UGB. The UGB is the method utilized by Portland.

An UGB is a limit on urban development placed around a city that demarcates where the city stops and the rural surrounding area starts. These boundaries are designed to prevent uncontrolled development of lands outside the city; in short, the UGB slows or stops sprawl in certain areas and are implemented in a few ways. This boundary can be in closed-region containment, open-region containment, or isolated containment for a designated area (Nelson, 2004; Wassmer, 2002). Within the boundary of the designated area, such as with the isolated containment boundary, space can be preserved for specific purposes, such as a wildlife refuges. This is a boundary for a relatively isolated area. The partial boundary or open-region containment is more restrictive than the isolated containment boundary in regards to area development. This is an improvement on limiting development. The most restrictive is the closed-region containment, which Portland has implemented (Wassmer, 2002). The closed-region containment UGB requires municipal permits for all development activities. Boundaries are established and maintained through legislative acts. In the case of Portland, developers cannot build outside the boundaries freely because permits are withheld. The UGB is one method of controlling growth through mandated permits (see Appendix C for details specific to Portland’s UGB and the impact of Smart Growth Boundaries).

Theoretical Perspective: Ecology and the Environment

Although this research is not designed as a test of social disorganization theory, a basic understanding of the ecological perspective is deemed necessary to assist in interpreting the research findings in the discussion section. The earlier concentric zone model of Park et al. (1925, 1984) and Shaw and McKay (1942) suggested that rings, based primarily on social

economic status, emanated outward from a city's center. Remaining unchecked, these rings would expand as the city developed (sprawl), pushing the more affluent further from the city's center. By placing an UGB around those zones, the outward migration of residents could be controlled, but to what end?

Crime is not spatially random nor is it temporally random (Chainey & Ratcliffe, 2005). This means that where a crime occurs and when it occurs often is not a random event. Crimes occur at certain locations, for the most part. Crimes have been shown to be concentrated in the central city areas from as far back as Guerry (1833) and Quetelet (1842) in Europe as well as Shaw and McKay (1942) in America. Modern research has shown the importance of considering time and place as a factor in crime causation.

The literature indicates that the environment can be a critical factor in explaining crime. What began with a map of economical indicators and crime in France (Guerry, 1833; Quetelet, 1842) turned into a theoretical approach (Park et al., 1925) to an empirical examination of crime in Chicago (Shaw & McKay, 1942). There are locations that are desirable and undesirable, with less desirable areas being primarily inhabited by those categorized as having lower economic status (Paternoster & Bachman, 2001; Sampson, 2002). This competition over land usage and development is a constant process as the city expands. How to best measure these processes also has changed over time, but is it essential to note that numerous researchers continually come back to the traditional indicators of social disorganization (poverty, heterogeneity, and mobility).

Changes in a city occur regardless of theoretical application, but location is still a constant. Tita, Petras, and Greenbaum (2006) argued, "The characteristics of place play an undeniably important role in determining the levels and patterns of crime within communities" (p. 300). It would be a truism that the only constant is change--cities change and grow, and in

doing so, set up an environment in which the residents must contend. For example, urban blight may create an environment were respondents do not care and do not get invested with stopping crime. It may be that residents in an area are fearful and distrusting of police (Brunson, 2007). It is possible that residents vary by area as to the level of bonding networks in an area (Bursik & Grasmick, 1993a, 1993b). There may be changes in legislation that affect an area and thus crime, such as crime prevention through environmental design—including such approaches as lighting, surveillance, street access control, supporting activities, target hardening, and the image management of an area (Cozens, Saville, & Hillier, 2005). What follows is a review of the propositions and key empirical findings regarding urban studies of crime.

In a concise manner, Stark (1987) presented a set of 30 propositions for how the environment can relate to the people who live there. One key argument was that there are "kinds of places" that cause social problems and not the people who live there (p. 906); suggesting that it was normal people who were responding to abnormal situations, and thus, crime occurred. He further proposed that, as density of an area increases, then the environment is such that criminals and non-criminals will be able to interact more, and this interaction provides opportunities for crime. There is also a higher level of moral cynicism and overcrowding of homes in more densely populated neighborhoods. The overcrowding of the home, in turn, causes the children to gather outside, with less supervision from adults. Stark suggested that areas that are prone to higher mobility have less attachment or care of the area and children are less supervised. Stark argued the police do not watch neighborhoods equally. The benefit of police interaction on behalf of the residents is given to higher socio-economic neighborhoods. One last point made by Stark is that as people can afford to move out of a neighborhood with a bad reputation, they will do so, leaving behind a place with many wanting to leave it. Sprawl is promoted by at least some

people leaving the urban blight areas, which in turn causes additional decrepitude and disrepair in the blighted area.

Skogan (1990) provided insight into factors that induce people to want to leave an area. Skogan (1990) examined six cities (i.e., Atlanta, Chicago, Houston, Newark, Philadelphia, and San Francisco) and the associated factors that gave neighborhoods within these cities a "bad reputation" (p. 65). Skogan's index of disorder covered two broad areas: social and physical disorder. Variables such as loitering, drug use or sales, vandalism, gang activity, public drinking, and street harassment were combined to cover the social aspect of disorder (p. 4). The physical component covered abandoned buildings, garbage on the streets, and junk in empty lots (p. 4). Of interest are the analytical models that show the path analysis of key variables. For example, percent minority can have a direct effect on disorder or an indirect effect on disorder through poverty and instability (p. 60). Disorder in turn affects robbery victimization (p. 75). Disorder and decline are intervening variables promoting further sprawl and thus crime (Orfield, 1998, 1999) [see Appendix D for a detailed discussion about additional factors (Poverty, Heterogeneity, and Mobility) related to sprawl].

Wilson's Propositions and Support

Many researchers have made significant contributions in examining and postulating the relationship between the environment and crime. Wilson (1987), in his seminal work *The Truly Disadvantaged*, postulated that there are "concentration effects" of environmental factors that can negatively affect an area. This means that certain variables, such as poverty, can be concentrated in certain areas, making other factors even worse. It would not be surprising to predict that there are higher levels of poverty in government-subsidized housing developments or that there would be lower poverty in a gated-community. Wilson argued that within certain areas

of the city and especially the ghettoes, there are concentrations of social ills (e.g., joblessness, poverty, households headed by a single female, welfare dependency, and crime). These concentrations are not random. These concepts are the aspects of the urban environment that promote sprawl. In many ways, Wilson applied traditional ideas of ecological theory to modern times by reflecting on modern cities and economic forces driving changes with residents in the city. Utilizing census data, Wilson showed that decay, disorder, and crime are outcomes when affluent people leave an area. Residential flight from an area is a component of sprawl that is called the social isolation thesis. Wilson also argued that industries are moving out of the cities. Additionally, Wilson (1987, 1996) noted that negative environmental factors caused different reactions based on race, such as varying levels of disorder.

Wilson (1996) made numerous assumptions in his seminal book *When Work Disappears*. His assumptions describe the second part of sprawl—the flight of businesses. Undesirable central-city locations push businesses and jobs to the city's edges. People in turn follow the jobs to the suburbs. Further tied into this process is white flight that occurs when there are undesirable living conditions in a neighborhood. People were moving from the central locations of the city to more distant locations. Again, the argument has been made that work has moved to the suburbs leaving behind urban decline. Wilson references the ideas of "broken windows" (see Wilson and Kelling, 1982) and a lack of care for a rundown area. A quote from Wilson (1996, p. 5) that eloquently captures this phenomenon: "The once-lively streets [of the past]…now have the appearance of an empty, bombed-out war zone". This quotation means that the once positive-environments, now are reduced to areas where people would rather avoid.

Wilson (1996) asserts that people are working longer hours per week and for less income. Jobs also are diminishing in many urban areas as businesses move to the suburbs. Wilson argued

the complexity of the situation by stating that poverty and joblessness are intertwined with businesses being gone and those individuals left behind may find it difficult to secure a job while applying with an address from the government subsidized housing projects. According to Wilson, subsidized housing exacerbates social ills. Wilson (p. 6) posited that, the decline in "economic, social, and political resources" of an area can affect a community's ability to come together in a positive way. Wilson argued that in poor areas, there exists a lower level of informal social control.

Wilson (1987, 1996) posited that there is a concentration of poverty and crime due to people and businesses (collectively resources) leaving the central city area. His work addressed sprawl and the negative consequences it has on central-city residents, namely those who cannot afford to leave the area. This leaves behind a concentration of poverty and social ills. Wilson's propositions appear strongly supported. Land et al. (1990) found that economically deprived areas have high concentrations of minorities and single-parent families. Quane and Rankin (1998) found support for Wilson's social isolation thesis, which suggested that economic and social factors impact the environment. Ousey (2000) found that the homicide rates have been rising from 1970-1990, and the black homicide rate was greatly influenced by black female-headed households in an area. Finally, McCall, Land, and Parker (2010) confirmed Land et al.'s (1990) conclusions as well as Wilson's (1987) arguments about poverty and crime being concentrated in particular areas.

This urban decline is captured in the phrase "broken windows" (see Wilson and Kelling, 1982), which further exasperates the problem of urban flight and leads to more crime and thus more urban flight (Cullen & Levitt, 1999). Signs of physical decline have already been noted with the work of Skogan (1990). As the number of dilapidated buildings, drugs, and violence

increase in an area, the social efficacy of a neighborhood is lowered (Sampson et al., 1997). Although the impact of urban decline is well documented, what appears to be sparsely researched in the existing literature is potential cures for urban flight and the reduction or elimination of the corresponding urban blight. One approach to containing urban flight is the passage of UGB ordinances, which is the focus of this study.

Theoretical Link: Routine Activities Theory

Hirschi (1979) made the argument that theories in criminology are not compatible. He proposed that criminological theories would be best if kept unintegrated because at the fundamental level, they are incompatible. Further, he noted that "separate and unequal is better" (p. 34). However, criminological theory has been advanced through viewing crime from different perspectives. There are many causes and events that lead to crime. Routine activities theory is another theory that has its roots in location.

Routine activities theory is a theory about victimization more than an attempt to explain the motivation of an offender. The theory suggests that the motivated offender is taken for granted, focusing more on crime prevention through situational awareness and guardianship. The theory posits that crime is related to the availability of targets (Cohen & Felson, 1979). This is just one necessary part of the conditions they proposed for crime—there needs to be a convergence in time and space of the suitable target, a motivated offender, and the lack of a capable guardian (Cohen & Felson). Changes in lifestyles, such as both parents working, could make the vacant homes a more suitable target for burglars. The empty house could have no capable guardian watching it and the offender would be more motivated because the perceived threat of being caught could be lower. People staying at home could prevent property crimes or they could increase the probability of personal crimes occurring.

With regard to an UGB and revitalization, smart growth and more connected routes could provide more access for offenders to target. Smart growth and compact development would promote more public transit and thus more access of people to others in the compact environment. More access, of course, could mean more opportunity for crime. Cohen and Felson (1979) called this accessibility. As mentioned above, lower income people can be limited by the public transit system.

Revitalization of the city, as Nelson et al. (2004) proposed, could make for more desirable targets for property criminals. This finding is dated back to Guerry (1833) and Quetelet (1842) that found that higher SES areas had more property crimes. Conversely, an abandoned railroad station may not provide much for criminals to plunder. Revitalization of a city, as Nelson et al. found, is the exact opposite of what sprawl produces, land that is not valued or watched after (see Wilson, 1987, 1996). Again, location becomes a factor in crime.

Sherman, Gartin, and Buerger (1989) found that the location of "hot spots" were not random among the population of residents calling for police help. Rather, the vast majority of crime that was reported could be traced to only 3% of the locations. This study highlights the importance of factor location in predicting crime.

More recent approaches to hot spot analysis have allowed researchers opportunities for more sophisticated analyses. Grubesic and Mack (2008) looked for spatial-temporal patterns using Cincinnati's 2003 crime data. The researchers geocoded reported criminal incidents to specific areas. Despite geocoding crimes to specific locations, the authors noted a recurring criticism; namely, the patterns of human interaction are clear to see and are intuitive, but the process of quantifying and categorizing concepts remained elusive. They found there were spatial-temporal patterns for robbery, assault, and burglary. Specifically, the authors found that

assault hotspots could be predicted to occur within nine days and 161 meters (around 528 feet) of the last assault hotspot. This suggests that certain crime is not geographically random, but occurs in certain locations. Further, crime is not temporally random. An assault could be predicted nine days later if it occurred in a certain location.

Focus of the Research

Criminality occurs from a host of factors varying from the micro-level to the macro-level. There are both individual factors and environmental factors that promote criminality. The focus of this research was to examine the plausible impact of Portland's UGB on crime rates in Portland and Portland's collar cities from 1975-1997 using both crime data from the UCR and census data (see Appendix E for details about Portland census data). This study is both an extension of past research related to environmental factors and crime, while being unique in focusing on the impact of UGBs on crime rates through the application of time series analysis and the use of both the collar cities (controlled also by the UGB) and a comparative city (Vancouver) which should not have been impacted by the UGB effect, if any.

Research Questions

1) What is the relationship between an UGB and the violent crime index in Portland, Oregon, the collar cities, and Vancouver, WA?
2) What is the relationship between an UGB and the property crime index in Portland, Oregon, the collar cities, and Vancouver, WA?
3) What is the relationship between an UGB and the overall crime index in Portland, Oregon, the collar cities, and Vancouver, WA?

Hypotheses

Sprawl decreases city revenue and increases urban flight, both of which appear to be correlated with higher inner city crime rates. Containing sprawl should have an inverse effect on crime; thus, the following hypothesizes were tested:

H1: There will be a statistically significant difference between pre- and post treatment reported violent crime rates (UCR I offenses), property crime rates, and the overall crime rates in Portland after the implementation of the UGB law.

H2: There will be a statistically significant difference between pre- and post treatment reported violent crime rates (UCR I offenses), property crime rates, and the overall crime rates in the collar cities after the implementation of the UGB law.

H3: There will not be a statistically significant difference between pre- and post treatment reported violent crime rates (UCR I offenses), property crime rates, and overall crime rates in Vancouver, WA after the implementation of the UGB law.

Chapter III addresses how each hypothesis was tested. Following a general overview, an explanation of each regression model is provided, along with the source of the data included in the model. Threats to validity are addressed along with control measures used to reduce these threats. Finally, the strengths and limitations of the research are addressed.

CHAPTER III

METHODOLOGY

This chapter discusses the data and the methods used for this research. The primary data sources include census data and UCR data, both of which are public access information. The various time series designs used to model the data are discussed in detail, along with a general overview of assumptions when using time series analyses and ARIMA modeling. Finally, several threats to validity and the various limitations when restricted to using official data are addressed.

Overview

This legal impact study assessed the impact of Portland's UGB ordinance on three specific crime rates; violent crime rates (FBI UCR I offenses), property crime rates (FBI UCR I offenses, minus arson), and overall crime rates (FBI UCR I and FBI UCR II reported offenses). The census data provided an understanding of the changes in key variables in an area over time as reported in the 1970, 1980, 1990, and 2000 census. Census data cover many various units of area, such as city, metropolitan area, and state. For the purposes of this research, the area was assessed at the city level. The time series analyses employed were both a simple and a nonequivalent-groups quasi-experimental design. For the simple interrupted time series designs, crime rates (violent, property, and total) were modeled for Portland and Portland's collar cities, as both were under the UGB ordinance. The nonequivalent-groups design assessed Vancouver's crime rates (violent, property, and total), using Portland's UGB ass the interruption point. In short, the impact of the UGB on the collar cities and Portland was assessed by comparing the data from these two areas to that of Vancouver, which was not impacted by the UGB. For example, if after the UGB was implemented, there was a decline in property crime in Portland and the collar cities, but not in Vancouver; the UGB could cautiously be credited with this

impact. If after the implementation of the UGB, crime rates remained unchanged in all three areas (Portland, collar cities, and Vancouver), it would be suggested that the UGB had no impact on crime rates.

At the heart of this analysis is the idea of the counterfactual, or what would have happened without the intervention (the UGB). Hee, Bae, and Jun (2003) defined the notion of "counterfactual planning" as "how the world might have been different if a particular policy or plan had never existed" (p. 374). Basically, the analysis compares the forecasted trend based on pre-intervention data to what actually happened in the post-intervention trend. For the purposes of this research, the crime rates in various geographical areas both located inside the UGB area and outside the UGB area were assessed to assist in controlling for various threats to the validity of the research findings.

From a criminological perspective, examining the relationship between sprawl containment and crime is an important step in furthering the discussion of ecological theory; that is, the effect of the environment on crime. Past researchers have examined the relationship between suburbanization/sprawl and crime (Jargowsky & Park, 2009; Klovers, 2006). The next logical step is to examine the relationship between regulated sprawl and crime. UGBs are designed to minimize sprawl (see Brueckner, 2000; Burchell et al., 2005). Specifically, the UGB in Portland has changed relatively little from its implementation in November 1979 to 2000 (Metro Regional Development, 2011). After the year 2000, numerous larger areas have been added to the UGB area. This research addressed the time frame from 1970-2000 (prior to the UGB expansion) using both census data and crime data to examine the impact of the UGB legislation. Using monthly observations of reported crime rates, the time frame selected (1970-2000), using an interruption point of November 1979, provides meaningful measurement points

of data before and after the implementation of the impact (UGB) that far exceed the 50 pre treatment and post treatment observations recommended for ARIMA modeling. Additionally, this time frame maintains a relatively constant land usage area, which is a desired factor to assist in controlling for measurement issues (Shadish, Cook, & Campbell, 2002).

Descriptive Information

This research used census data from 1970, 1980, 1990, and 2000 to assess poverty, heterogeneity, and mobility (U.S. Census, 1970; U.S. Census, 1980; U.S. Census, 1990; U.S. Census, 2000; U.S. Department of Urban Development, n.d.). Since the time series models assessed monthly data, these variables cannot be incorporated into the models as control variables, but their relation to crime and urban growth suggest that they cannot be discounted. The census data provides an overview of how these variables changed overtime (see Appendix E for a discussion of the key census variables).

Independent Variable

For the time-series analysis, the independent variable or the treatment is the date of implementation (Nov. 8, 1979) for the UGB. This date becomes the interruption point (independent variable/ UGB) or the point in time that the pre- and post-data (dependent variables/ crime) is compared. Evaluating the data before and after the implementation allows for an analysis of the effect of the UGB. In particular, any changes between pre- and post-trends are analyzed visually and statistically for onset (gradual or abrupt), duration (permanent or temporary), and immediacy (immediate or delayed) (Shadish, Cook, & Campbell, 2002). A time series analysis is required to examine the pre- and post-trend periods. Specifically, a time series is a "time-oriented or chronological sequence of observations on a variable of interest" (Montgomery, Jenning, & Kulahci, 2008, p. 2). The dependent variables for this study are crime

rates (FBI UCR I violent crimes, FBI UCR I property crimes, minus arson, and FBI UCR I and II offense combined, minus arson).

Dependent Variables

There are a myriad of dependent variables in the social sciences related to crime, but frequent use of federal and state UCR data, especially UCR Part I offenses, is prevalent throughout criminological studies. UCR I offenses are considered the most serious of offenses and capture both crimes against a person and crimes against property. The severity of these offenses often leads to a greater standardization in what constitutes the offense and the reporting of such an offense. Part I UCR offenses were the primary data source for criminal violations for this study.

Of particular interest to this study were murder/non-negligent manslaughter, forcible rape, robbery, aggravated assault, larceny, burglary, and motor vehicle theft. These crime categories mirror those reported in the FBI's Uniformed Crime Report Category I offenses with the exclusion of arson. Arson is not examined in this study because it was not added to the UCR until 1980, which is after the implementation of the UGB. These crime variables were summed into two separate crime indexes. Murder, manslaughter, forcible rape, robbery, and aggravated assault were combined into a violent crime index. Larceny, burglary, and motor vehicle theft were combined into a property crime index. The overall crime index was taken directly from the UCR files. The overall crime index numbers are higher than the combined property and violent crime indexes due to the fact that it captures simple assaults and other crimes reported as UCR II offenses. The UCR data origin was ICPRS.com. For example, UCR data are available from 1975-1997 (ICPRS dataset 9028).

For the time series analysis, the monthly data are desirable over yearly aggregated data. Examining data on the monthly level allows for analysis of trends and cycles that are inherent due to seasonality (Montgomery, Jennings, & Kulahci, 2008). For example, crimes are naturally higher in the summer months (seasonality) with more people being outdoors and interacting with one another. Seasonality is a form of autocorrelation, which can cause statistical conclusion validity issues if OLS is used prior to the data being modeled. Examining monthly data allows for 50 data points before the implementation of the event (UGB) and 50 data points after the implementation point. To properly model the data it is recommended that at least 50 equally spaced data points exist on both side of the interruption [independent variable] (Shadish, Cook, & Campbell, 2002). Having more data points after the implementation strengths the analysis by permitting a longer time period to model pre intervention and post intervention trends.

Comparison City

Vancouver, WA was selected as the best comparison city for Portland based on several factors (i.e., geographical proximity, census similarities). The comparison city, Vancouver, had not passed or implemented sprawl control measures during the duration of the time-period used for the study. The concept of a control city is that any changes between pre- and post-intervention periods attributed to the UGB law should not be observed in the Vancouver data. Basically, Vancouver becomes a control for external validity threats to the research. Since Portland and the other cities within the UGB received the treatment, the UGB itself, then there should be a change in crime with those cities. Since Vancouver did not receive the treatment, then there should not be a change in crime.

The basic argument in quasi-experimental designs is that if two subjects are similar (cities) and one receives a treatment (UGB), then an analysis can be used to determine if there

was possibly an effect over time (Shadish, Cook, & Campbell, 2002). It could be argued that no two cities are identical, but they should be at least comparable and census data can provide evidence of the similarity and change over time within and between cities.

An examination of Census facts shows the similarities of the two cities, Portland, OR and Vancouver, WA. For the year 2000, Portland had 21.1% of its population under 18 years of age, while Vancouver was 26.7%. The elderly population percentages also were similar, Portland had 11.6% of its population over the age of 65 and Vancouver reported 10.7%. Heterogeneity was comparable: Portland had 77.9% of its population as white in 2000, while Vancouver had 84.8%. The cities matched up on percentages of high school graduates (85.7% and 86%) and mean travel time to work (23.1 minutes and 23.0 minutes, respectively). The cities also matched up on homeownership rates, the median value of owner-occupied housing units, median household income, per capita income, persons below poverty, and retail sales per capita (see Table 1). In many ways, Vancouver is a smaller Portland without the UGB.

Table 1

2000 Census of People and Business Facts

	Portland	Vancouver
Population	537,081	158,855
Persons under age 18, percent, 2000	21.1%	26.7%
Persons 65 years old and over, percent, 2000	11.6%	10.7%
White persons, percent	77.9%	84.8%
Black persons, percent	6.6%	2.5%
Living in same house in 1995 and 2000, percent	45.0%	38.0%
High school graduates, percent persons 25+	85.7%	86.0%
Mean travel time to work, in minutes	23.1	23.0
Homeownership rate	55.8%	52.9%
Median household value	$154,900	$142,900
Per capita money income	$22,643	$20,192
Persons below poverty	13.1%	12.2%
Retail sales per capita	$12,758	$12,102

Soule (2006b) argued researchers need to incorporate time series data within the confines of a boundary of an area. City boundaries were the focus for this study. It has been noted that if too large of area is examined, the details can be lost (Chainey & Ratcliffe, 2005; Greenberg, 2001). For example, if three murders occurred at the same location, it is possible for crime analysts to see a pattern or hotspot. If these same three murders were reported at the county level, there may not be any pattern observed. To expand the analogy, three murders aggregated at the national level would most likely not even be noticeable in an analysis. This narrowing of focus gets at the idea of the importance of selecting the proper geographical size for analysis (Chainey & Ratcliffe, 2005; Greenberg, 2001). A national boundary or state boundary could lose some of the relationships among variables, so city-level reported crime was utilized for this research. Crime rates were not coded by neighborhood until 1985 in Portland, so this level of data was not available for analysis. Marwah (2006) also recommended the approach of incorporating time series analysis as future directions for the study of communities and larger areas.

Time Series Analysis

Interrupted time series (ITS) designs can be modeled as follows:

$O_1 \quad O_2 \quad O_3\ldots \quad O_{56} \quad O_{57} \quad O_{58} \quad X \quad O_{60} \quad O_{61} \quad O_{62}\ldots \quad O_{262} \quad O_{263} \quad O_{264}$

The symbol "O" is an observation and the "X" is the intervention. The observations for this study were monthly crime rates (violent, property, and overall) and the intervention was the UGB implementation date in the Portland area. The starting point, O_1, is January of 1975 which corresponds with the starting date of the ICPSR dataset 9028 that contains UCR data from 1975-1997. From the beginning of the dataset to the implementation of the UGB encompasses 58 months; thus, the subscripts indicate the months of passage corresponding to the months of the dataset and the implementation of the law. The end point, O_{264}, corresponds to December of

1997, or the 264th month of the dataset. The comparison city, Vancouver, would have an ITS design consisting of just observations of: O_1 O_2 $O_3 \ldots O_{56}$ O_{57} O_{58} X O_{60} O_{61} $O_{62} \ldots O_{262}$ O_{263} O_{264}. Note the intervention at the five year/59 month mark. Although the data actually were not interrupted by a UGB, an assessment was conducted on the Vancouver data to determine if there was a difference between pre- and post intervention trends based on the Portland intervention date. Basically, to give the UGB support for any changes in Portland's crime rates or the collar cities' crime rates, a similar change could not have occurred in Vancouver. Similar trend changes between those areas covered by the UGB and the area not covered by the UGB would suggest a third plausible variable other than the UGB was accounting for at least part of the change in crime rates.

Time series analysis has been utilized by many researchers in the social sciences to observe trends over time and to assess the impact of legislation. Taylor (2001) argued, "one of the major extensions of social disorganization theory in the past two decades has been the application of the model to ecological changes over time" (Taylor, 2001, p. 132). Time series analysis is one way to analyze changes over time. Time series analysis involves examining a variable over time. Previous data can be used to predict future data (Taylor, 2001) or assess the impact of an intervention. That is, events, such a criminal acts, flow through cycles and trends. The impact of a law or a policy can be assessed by determining if there was an interruption in the crime cycle or trend. Box, Jensen, and Reinsel (2008) have noted that "A *time series* is a sequence of observations taken sequentially in time" (p. 1). A problem with events viewed over time is that they tend to be dependent upon the last observation (Box et al., 2008), which statistically causes autocorrelation.

SPSS Forecasting was utilized to measure for and control for autocorrelation. SPSS Forecasting (from the SPSS Forecasting Manual) assumption is simple: all that is required is that the numeric data be separated at equal time intervals (SPSS Forecasting 17.0, 2007). Ideally, there would be no missing data, but if there were, SPSS could interpolate over missing data. The crime data are numeric and are monthly reports or totals sent to the FBI and reported by the UCR, which are then placed in chronological order and treated as the dependent variable. The independent variable is the UGB inception on November of 1979.

The Expert Modeler function in SPSS Forecasting automatically generates the best-fitting models for the data (SPSS Forecasting 17.0, 2007). This modeling indicates cycles, trends, and seasonality that could be occurring at various intervals. The Expert Modeler can be likened to backward elimination with multiple regression where the best models are automatically analyzed. Analyzing for trends is important in the process of converting autocorrelation, through ARIMA modeling, to white noise and making the equations more linear. Portland, OR and Vancouver, WA, along with cities within the UGB that have reported consistently over that time period were included in the analysis.

White noise is the term used to describe the natural fluctuations of dependent variable values over time (McCleary & Hay, 1980). Crime is not constant, rather it bounces around a mean value, increasing or decreasing based on various factors (e.g., seasonality, enforcement, unemployment, etc). These various factors impact crime rates and must be controlled for so only the white noise (natural fluctuation around the mean value) remains. Failure to remove the factors impacting crime rates other than white noise causes statistical conclusion validity. Using an autoregressive integrated moving average (ARIMA) statistical program to manually build models can eliminate the disturbances in the data that are extremely difficult to model out using

Ordinary Least Squares Regression. ARIMA is an iterative process, meaning multiple manual manipulations could be needed to identify the best fit model. The models refer to how well the past data can predict the future data and through what intervals. For example, a certain month's level of crime may need the past three months data to be able to accurately predict or data from the previous year (August 78 predicting August 79).

Prior to SPSS 17 Forecasting, model building was completed manually by selecting a model based on the data ACFs and PACFs and running various models to determine the best-fit model. SPSS 17 has an Expert Modeler function, in which models are generated automatically once the data are entered. Even though the models are built automatically, the models themselves need explained as well as a basic understanding of the mathematics involved. McCleary and Hay (1980) noted that "An observed time series is a realization of some underlying stochastic process" (p. 30); meaning the results obtained are a function of the time period utilized to get the baseline. McCleary and Hay likened this to how sample is related to population—your sample will affect your results. You will need at least 50 observation time period (roughly 5 years since the intervals are monthly) to obtain a baseline (McCleary and Hay, 1980; Shadish, Cook, & Campbell, 2002).

The baseline is referred to as a model. The components are AR, I, and MA, which correspond to p, d, and q, respectively. In identifying the model, there is a filtering process. For OLS, there is a linear relationship; for time series analysis, there is a dynamic process. The dynamic process needs to be accounted for to access the impact in a time series analysis (McCleary & Hay, 1980). This can be seen in the following diagram:

$a_t \rightarrow$ Moving Average Filter $\rightarrow$ Autoregressive Filter $\rightarrow$ Integration Filter $\rightarrow$ Y_t

Here, a_t is the white noise and Y_t are the predicted values of the Y variable (crime). Each arrow shows the flow of the information as it passes through each filter that allows for accounting for nonlinear functions in the data. Noise, as mentioned above, refers to all of the variance due to factors such as trends, seasonality, and random error (McDowall, McCleary, Meidinger, & Hay, 1980). Again, these noises or impacts must be removed until only white noise remains for the model to work properly. The first component is the MA or moving average component. If the process was completely a moving average (MA) process (0,0,1), then the current shock would be a function of the preceding shock and a 0,0,2 process would be a function of the preceding two shocks in the data series (McCleary & Hay, 1980, p. 62). The completely autoregressive model (AR) would show up as p,0,0 or 1,0,0 would how that the predicted value is a function of the preceding observation and random shock (McDowell et al., 1980, p. 16). Autocorrelation cannot be allowed to be part of the final model. The last filter is the differencing component (the I in ARIMA) or the integrated portion. This is where values in the data are differenced or subtracted from preceding values to come to a number that could show the relationship or pattern in the data. For example, the 1st value is subtracted from the 2nd, the 2nd from the 3rd, and so on (McCleary & Hay, 1980; McDowell et al, 1980).

When analyzing time series models, there are different types of impacts that can be seen. If there were no impact, then there would be no change in the observed dataset. Subtracting the post observations from the pre observation would net zero (McDowall et al., 1980). The null hypothesis (H_0) would dictate that subtracting the observations after the impact from those before it would result in a net of zero; $b_{pre} - b_{post} = 0$ (McDowall et al., 1980). The alternative hypothesis would indicate change or an outcome of greater than or less than zero when comparing the pre and post data.

One must also look for changes before and after the implementation. Changes can be abrupt or gradual (Shadish et al., 2002). With an abrupt change, one can see a relatively rapid change after the implementation or impact. A gradual change would show that the slope after the impact to be a slower rate of change over time. Also, researchers must look at duration of the effect (Shadish et al., 2002). The duration of the effect of the impact could be permanent or temporary. A temporary change from an impact would show a return to normal levels over time. A permanent change would show just that, a relatively stable change after the impact. Immediacy is another factor to consider when looking for change (Shadish et al., 2002). The effect could be immediate, meaning there was an immediate change after the impact or the impact could be delayed indicating that there is some time between the impact and change.

Violent Crime Models

The first three models assessed the violent crime index for Portland, the collar cities, and Vancouver from 1975 to 1997. Violent crimes consisted of murder, manslaughter, forcible rape, robbery, and aggravated assault. These crimes were totaled and converted into a rate per 100,000 people for each area. The ARIMA model is similar for each to the three locations with the exception of the data entered by month is specific for that location.

O_1	O_2	$O_3\ldots$	O_{56}	O_{57}	O_{58}	X	O_{60}	O_{61}	$O_{62}\ldots$	O_{262}	O_{263}	O_{264}

Figure 1. Violent Crime Index Model

Property Crime Models

The property crime models assessed the FBI UCR I property crimes reported for Portland, the collar cities, and Vancouver from 1975 to 1997. Property crimes consisted of burglary, larceny, and motor vehicle thefts, with arson being omitted since it was not included in

the reporting of pre intervention observations. These crimes were totaled and converted into a rate per 100,000 people for each area. Again, the ARIMA model is similar for each to the three locations with the exception of the data entered by month is specific for that location.

O_1	O_2	O_3…	O_{56}	O_{57}	O_{58}	X	O_{60}	O_{61}	O_{62}…	O_{262}	O_{263}	O_{264}

Figure 2. Property Crime Index Model

Overall Crime Index Models

The final three models, although similar in appearance to the first two models, assessed the overall crime index for Portland, the collar cities, and Vanvouver from 1975 to 1997. The overall crime index consisted of all reported crimes to police (FBI UCR I and FBI UCR II offenses minus arson). These crimes were totaled and converted into a rate per 100,000 people. The models for each area appear as follows:

O_1	O_2	O_3…	O_{56}	O_{57}	O_{58}	X	O_{60}	O_{61}	O_{62}…	O_{262}	O_{263}	O_{264}

Figure 3. Overall Crime Index Model

Although the above described models offer a statistical analysis into the impact of Portland's UGB on property crimes, violent crimes, and total reported crimes; additional visual representations of the data are offered for direct comparison of the UGB's impact on the three areas used for this study, along with models indicating the forecasted value if the UGB would not have been enacted. It is important to understand with the forecasting models that forecasts projected out after a three month window are considered extremely inaccuarate, as can be noted with stock market forecasts and weather forecasts. The models offered in the analysis section are only for a visual representation of the predicted forecast based on pre intervention data.

Validity

A randomized experiment is not possible at the city-level, thus a quasi-experimental design was used to answer the research questions. Quasi-experimental designs, like all research designs, have their own set of limitations and threats to validity. Simply put, a threat to validity is simply how the results of the research may not be truthful. In the social sciences, there are many processes occurring at the same that could confound the results. Further, there are factors that are complex with there relationships, such as indirect relationships where A is not related to B, but rather through X, Y, and Z. Legal impact studies involving time series analysis and the use of ARIMA modeling permits the ability to cautiously dismiss many of the common threats to statistical conclusion validity, internal validity, and construct validity found in research involving sampling issues and surveys. It is through the examination of relevant threats to validity and the discussion of alternative explanations that confidence in the research findings can be obtained.

Internal Validity

Internal validity "[refers] to inferences about whether observed covariation between A and B reflects a causal relationship from A to B in the form in which the variables were manipulated or measured" (Shadish et al., 2002, p. 53). Internal validity is the degree of confidence that researchers can argue there exists a significant relationship between A and B, A comes before B, and there is no other plausible explanation for the relationship between A and B. In short, A causes B, and without A the occurrence of B would be extremely limited. Threats to internal validity include the following: ambiguous temporal precedence, selection, history, maturation, regression, attrition, testing, instrumentation, and additive and interactive effects (see Shadish et al., p. 55). Of these nine threats, six can be cautiously dismissed through the use of an

ITS design (maturation, regression, attrition, testing, instrumentation, and additive and interactive effects), leaving ambiguous temporal precedence, selection, and history.

Ambiguous temporal precedence refers to the inability to clearly understand which variable came first (Shadish et al.). The independent variable is the UGB, and the dependent variables are crime index, property crime index, and violent crime index. Since the UGB date of implementation is clearly defined, the pre-treatment observations and the post-treatment observations also are clearly defined.

Selection refers to "Systematic differences over conditions in respondent characteristics that also could cause the observed effect" (Shadish et al., p. 55). Here, the respondents are the cities. It is possible that the cities vary on some factors that influence crime rates instead of UGBs. Also, it is possible that the cities are not similar enough to compare in the nonequivalent groups design. To counter this, the cities have been compared with Census variables. However, it would be unlikely that any two cities could ever be exactly identical on all variables. The cities are similar enough and located in the same geographical area of the U.S. According to Tobler (1970) "everything is related to everything else, but near things are more related than distant things" (p. 236). This has come to be known as Tobler's Law and put another way: areas that are closer together have similar properties. For example, applying Tobler's Law to ecology, it would be fair to say that New Hampshire (residents, cities, etc.) would be more similar to Vermont than California. This is not to say that things near each other are identical, but there is a trend for things that are closer to each other to be more similar on various factors.

According to Shadish et al. (2002) "the major threat to internal validity is history" (p. 179). This means that something else could have happened at the same time or about the same time of the implementation of the treatment. This would suggest that something else occurred at

the time the UGB was fully implemented in November 1979, which impacted Portland's crime rates. Additionally, whatever might have occurred would have to be restricted to the Portland area or it would be accounted for in the Vancouver comparison data. There also are national level factors that could influence localities. Greenberg (2001) has argued there are many factors that can influence society: court cases, law enforcement practices, unemployment, age composition, child labor laws, school attendance, consumerism, labor force participation, and plant closings. To control for history, it is recommended that a no-treatment control group be utilized (Vancouver).

Statistical Conclusion Validity

Threats to validity also cover statistical conclusion validity, which refers to the idea that for a statistical analysis to be performed accurately, the research must adhere to the assumptions associated with that statistical process. The key threats to statistical conclusion validity include the following: violation of statistical tests, unreliability of measures, restriction of range, and unreliability of treatment implementation. Of these four possible threats, only violation of statistical tests and unreliability of measures are plausible for an ITS design. The first threat is diminished through the use of an ITS design which contains at least 50 observations on both sides of the interruption point and through the use of ARIMA modeling.

The unreliability of measures issue is one that cannot be dismissed since the data are official police statistics. Official crime statistics, although a necessity, are problematic (e.g., underreported or not reported, reported differently by jurisdiction, etc.). Although the data are not perfect, it is the best available. Additionally, for the findings to be invalid the police would have had to start reporting crimes differently at the interruption point (inception of the UGB),

which is unlikely. It is possible for a police organization to alter crime data to make the city look less crime prone, but in terms of an UGB, this does not seem plausible.

Construct Validity

Threats to construct validity cover many ideas that are more appropriate when discussing individual-level factors. Reactivity can be dismissed because this is archival data; the data could not be different because of people reacting different as in experiments. Treatment diffusion is unlikely because Portland's UGB has not influenced the residents of Vancouver to also adopt one. The threat of a pre-treatment impact is controlled for through the use of multiple pre- and post-treatment observations.

External Validity

External validity refers to the ability of a researcher to take findings and apply them to other situation or places. The first threat to external validity is the interaction of causal relationship with units (Shadish et al., 2002). In traditional research studies, the question was one of applying the findings from one group, say males, to another, females. Here, the question becomes can the findings be applied to another neighborhood, city, or metropolitan area, or other changes in aggregation/size. This research makes no such attempt to infer the findings of the impact of Portland's UGB on other geographical locations. These findings offer insight to the impact of Portland's UGB on crime rates when compared to a neighboring city without a UGB. The external validity of this research will come only if other studies assess the impact of UGBs similar to Portland's in other areas and the findings are comparable to those found in this study.

Limitations of Official Data

What is missing is many research articles are the research limitations. When these limitations are listed, the limitations rarely go beyond the obvious such as a limited sample size

and generalizability. All research should explain the limitations of the research and the data. For this research, the data limitations include having to use UCR data for crime statistics. The UCR reporting system is known for its limitations. First, there is the hierarchy rule; only the most severe crime is reported in a case that could have had numerous crimes committed in parallel to the most serious crime (Maxfield, 1999). There also is the fact that many crimes do not come to the attention of the police, thus the dark figure of crime could greatly influence the true crime rate. There are possible mistakes in the handling of the data, aggregating the data, and even definitional problems. UCR data are limited to the extent it can be utilized because crime rates per area can only be examined at the aggregate-level. Further, police agencies do not have to report crime to the FBI. Even when agencies do report crimes, it is possible to have months or years missing from the report. Even with all the short comings identified with using UCR data, often it remains the best source available to researchers for crime statistics.

Similarly, the census data are not all-inclusive. The data do not provide for levels of collective efficacy that survey methodology allow. As noted by Lee and Thomas (2010), there is a "lack of availability of a set of more refined community-level measures of civic infrastructure and civic robustness" (p. 137). They stated further, "we do not directly measure the intervening mechanisms that link a community's civic infrastructure to levels of violence (p. 137). However, census data does provide for a relatively consistent manner of examining aggregated data in meaningful ways.

Strengths of Current Study

The current study utilizes official data, both crime and census data. Even with all its limitations, official data still provides a robust proxy measure for researchers to assess the impact of various ordinances and laws. Official data are a reliable way of capturing key variables of

poverty, heterogeneity, mobility, and crime. The current study contributes to the literature by examining temporal factors regarding the city of Portland and surrounding smaller cities in the UGB area. Past research usually has limited timeframes (one year or three-year average) and limited focus on concepts (such as divorce and effect on homicide as Beaulieau & Messner, 2010 examined). The current approach focused on aggregate crime levels over time.

Institutional Review Board

Although the data used in this study was public access information, this research proposal was forwarded to IUP's Institutional Review Board for protection of both the researcher and the University. An expedited review was requested and approved. Input and approval by the IRB provides the researcher additional protections under federal law should there be an issue later during the research or the publication of material from the research.

CHAPTER IV

ANALYSIS

Introduction

Using a legal impact study, this research assessed the impact of Portland's UGB on that city's crime rates, while using Vancouver and Portland's collar cities crime rate data for comparison. The assumption is that if UGBs are an effective means of crime reduction, crime rates (property and violent offenses) in Portland and the collar cities should not mirror those of the neighboring city of Vancouver, which did not implement UGBs over the time frame assessed. As with most studies that assess longitudinal crime rates, especially at the monthly level, autocorrelation among the observations, both from the preceding months and through seasonality were a concern.

Chainey & Ratcliffe (2005) suggest that crime in an area is not random by time or space. Basically, minus some sort of interruption (e.g., hot spot policing, increases in patrol activity, UGBs, etc.) an area's future crime rates can be predicted using previously reported crimes. The idea that the current amount of crime in a particular area is related to previous crime patterns in that area suggests that crime rates for an area are autocorrelated (McCleary & Hay, 1980).

Autocorrelation between past and present observations for variables could be based on the months leading up to the current observation, or annually, in that homicide rates in August 2010 might be a stronger predictor of homicide rates in August 2011 than homicide rates in the preceding month (July 2011). Autocorrelation causes statistical analysis issues since the current value of a variable is dependent on previous values of that same variable. A key assumption of Ordinary Least Squares (OLS) regression is that the value of each observation is independent of any other observation (lack of autocorrelation). Since there was the threat of autocorrelation in

the variables used in this study, an autocorrelation check was conducted on each variable using the Durbin-Watson coefficients.

The "Durbin-Watson test assesses the likelihood that the current value of a variable is related at least in-part to the past value of the same variable. The traditional range of acceptability for cautiously dismissing the threat of autocorrelation is 1.5 - 2.5 (Norusis, 2008). The Durbin-Watson was 0.231 for Portland's property crime index, 0.410 for the violent crime index, and 0.237 for the overall crime index. These values are outside the acceptable range identified and suggest that there is autocorrelation among the various monthly observations. The Durbin-Matson values also were problematic for the Vancouver and Collar Cities crime rate data.

Autocorrelation among the observations precludes the ability to utilize OLS regression analysis. The failure to address the autocorrelation issue prior to using a regression analysis could cause an inflated relationship to be observed among the observations (see McDowall et al., 1980); thus, an Auto Regressive Integrated Moving Average (ARIMA) statistic was employed for this study. Both ARIMA and OLS regression have the potential to measure the impact of an intervention, but ARIMA also can address the autocorrelation issue through modeling, where the autocorrelation is treated as a separate variable either through auto regression, differencing, or moving average functions. OLS regression has no such capability.

Data Limitation

Crime rates for a particular offense category were determined by dividing the amount of reported crime in an area by the population of that area and then multiplying by 100,000 to determine the amount of occurrences of an offense per 100,000 residents. If the reported crime was to increase dramatically and the population remained constant, then the crime rate would

obviously increase. Inversely, if the number of criminal offenses remained constant, but the population in an area increased one might make the erroneous assumption that crime itself had changed, when in fact population growth changed the crime rate, but the number of reported criminal offenses remained the same.

Population can increase through annexation (i.e., the central city expanding its boundary to subsume the prime real estate of suburbia) or from people moving to the city. Since the UGB by design promotes inward growth and revitalization (see Nelson et al., 2004), it would be expected that the population would increase in Portland and the collar cities since jobs and people would be migrating to that metropolitan area. There was a population explosion around 1990 in Portland as well as in Vancouver and the collar cities. The numerator (reported crime) remained constant over this period, but the increasing denominator (population) suggests a substantial drop in the overall crime rate in Portland between 1989-1990, Remember, an intended effect of the UGB was to cause urban population increases by eliminating urban sprawl.

A validity issue with the UGB assumption is that the overall crime rate in Vancouver during the same time period also dropped dramatically based on a large population influx. Since Vancouver has no UGB laws, a third, unknown variable appeared to cause a large population increase in this geographical area unrelated to Portland's UGB. Additionally, attempting to control for the 1990 population increase in the regression model is not plausible since it impacted both the experimental and the control areas. To assess the impact of Portland's UGB, the post observation data were used through December 1989, permitting more than 60 post observations for model building, while eliminating the 1990 population increase for all three areas being assessed. The embedded figures in this manuscript display data from 1975 through 1997, permitting the information consumer to view the trends and draw personal conclusions, but the

table data assessing the impact of the UGB were restricted to January 1975 through December 1989.

UGB and Reported Violent Crime

To reiterate, the UCR's Part I violent crime index is composed of four crimes: murder/non-negligent homicide, rape, robbery, and aggravated assault. The UCR's Part I property crime index also includes four crimes: larceny, burglary, arson, and motor vehicle theft. Arson was not included in the property crime variable for this research since it was not added to the UCR until 1980, which is after the implementation of the UGB. The overall crime index is the summation of all crimes reported to the police for a specific month (UCR Part I and UCR Part II offenses).

Time Series Forecasting and Analysis

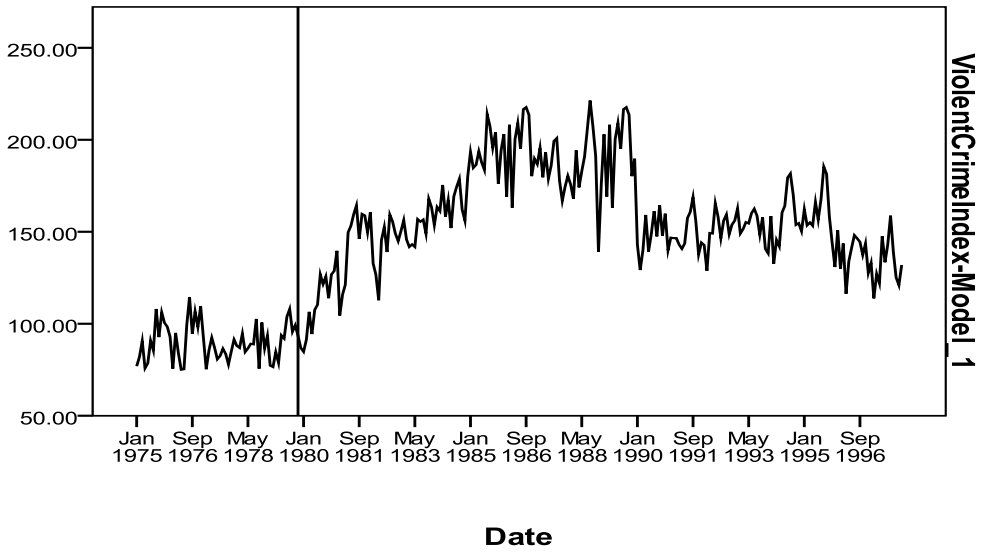

Figure 4. Violent Crime Index in Portland, OR

When analyzing time series data, it is useful to begin by looking for trends or patterns in the graphed data. The violent crime rate for Portland appears to be increasing overtime. The variance, or deviation, from the average is not constant. From 1975 to 1980, Portland's violent

crime rate appears to be a stochastic process, in that there appears to be a mean value and the monthly observations deviate slightly from the mean, but return in the following month or months. At around 1980, just after the implementation of the UGB, there is an immediate, but gradual increase in Portland's violent crime rates. This upward trend continues until about Sept 1985, when it levels off until 1990. Just before 1990, there are higher peaks and troughs, and after 1990, Portland's violent crime rates drop dramatically before establishing a new trend. This new trend is lower than the earlier post intervention UGB period, but higher than the pre intervention UGB period. Also, there appears to be seasonality, or patterns, in the data.

Traditional approaches for ARIMA analysis involve identification, estimation, diagnosis, and meta-diagnosis (McCleary & Hay, 1980). McCleary and Hay suggest that the identification portion involves looking at the graphed data and also the autocorrelation functions (ACFs) and partial autocorrelation functions (PACFs). SPSS 17.0 has moved forward with its practical applications from earlier versions such as SPSS 10.0. SPSS 17 (Forecasting) allows for automatic model identification as well as forecasting (SPSS Forecasting 17.0, 2007). Further, SPSS 17 handles data in a more user friendly manner than SPSS 10.0, but the trade-off is the loss of regression analysis in SPSS 17; thus, for this study both SPSS 17 and SPSS 10 were utilized.

The pre-intervention period (coded 0) for this data was identified as January 1975 through October 1979. Since the majority of November 1979 was after the implementation of the UGB, November 1979 through December 1989 were included in the post-intervention period (coded 1). In terms of time series analysis the "1" signifies the data are "expected to be affected by the event" (SPSS Forecasting 17.0, 2007, p. 10). For forecasting, once the pre-treatment period is identified (January 1975 to October 1979), SPSS generates an output for expected future values.

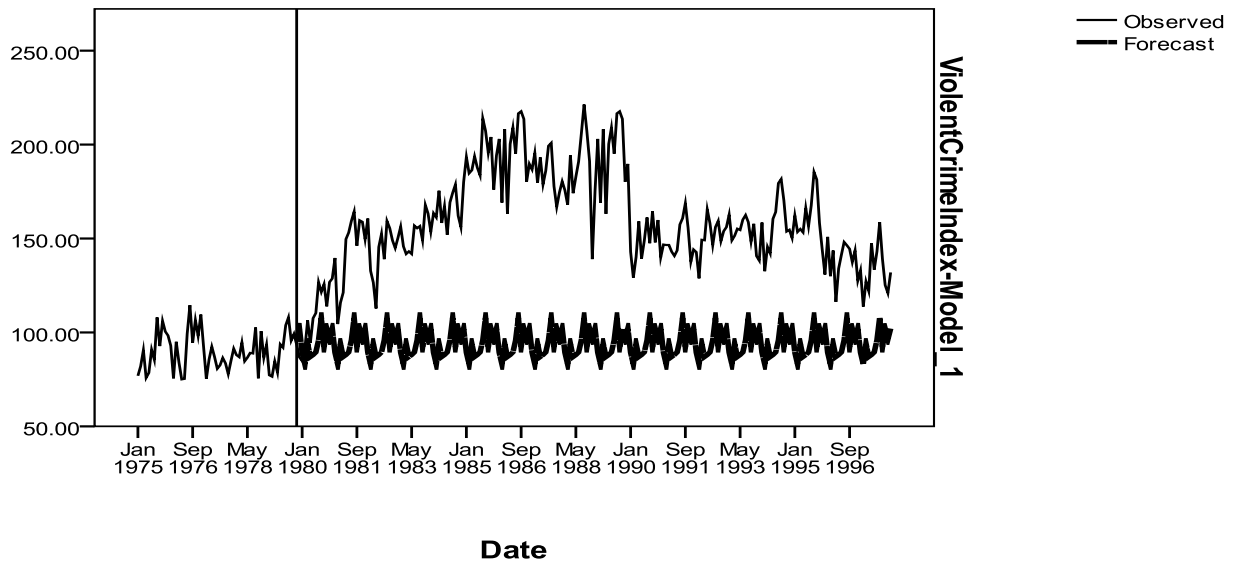

Figure 5. SPSS 17.0 Forecasting of Violent Crime Index in Portland, OR

The predicted values determined by the pre-intervention data suggest that Portland's violent crime rates increased greater than what was forecasted. The vertical line in Figures 4 and 5 indicates the intervention point, the UGB implementation date. The predicted value is the counterfactual, or what would have been forecasted to occur without the intervention. It is important to note that in both economics and business, forecasts that exceed 90 days are suspect, so the forecasts presented throughout this research should be identified for what they are; a predicted value for comparison against the actual value reported, without controlling for other variables that would impact future observations.

In the past, ARIMA model identification was a lengthy process as researchers assessed the ACF and PACF values of various models. SPSS 17 automatically generates the best-fit model for the data. The model identified by SPSS Forecasting 17.0 for Portland's violent crime index was ARIMA $(0,0,0)(1,1,0)_{12}$.

The first part of the model equation (0,0,0) addresses autocorrelation between the current observation and the observations immediately preceding the current observation. For example, a

(2,0,0) would suggest that the current observation is correlated with the preceding two observations (i.e., the value of the observation in August 1978 is related to the values observed in both June 1978 and July of 1978). The second portion of the model $(0,0,0)_{12}$ addresses seasonality, in this case set annually ($_{12}$).

The first 1 in the second part of the model $(1,1,0)_{12}$ indicates seasonal autocorrelation between observations (the value of August 1978 is related to the value of August 1977, etc.). The second "1" in the model $(1,1,0)_{12}$ refers to the fact that the observed value for a particular observation must be subtracted from previous seasonal values to account for cumulative effects that build up (SPSS Trends 10.0). This process also is known as differencing. Differencing is necessary to "smooth" the data. Figure 5 indicates violent crimes in Portland are increasing for several years before they start to decrease. Using differencing helps smooth out the data and in doing so makes a non-stochastic process into a stochastic one. For this model, to change the identified autocorrelation into "white noise" the data needed to be differenced seasonally and then auto-regressed also seasonally.

The ARIMA $(0,0,0)(1,1,0)_{12}$ model was entered in to SPSS Trends 10.0. These statistical packages (SPSS 10 and SPSS 17) are complementary; as noted, SPSS 10 allows for an impact assessment. An impact can be likened to a slope, for every one unit change in X, there is a corresponding change in Y. Where SPSS Trends (10) has a more solid mathematical foundation, SPSS Forecasting (17) can be used for forecasting by individuals with little to no understanding of modeling ARIMA data.

Another output statistic that provides insight into the modeling is the Ljung-Box statistic. This statistic indicates the degree to which there is a pattern in the residuals. Having significance above 0.05 means the residuals have been reduced to white noise. White noise is referring to a

random process or a process without patterns. In other words, the underlying processes are accounted for through modeling the data. The output also indicates that there are no outliers in the data. Although the Ljung-Box statistics was a necessity when developing and comparing ARIMA models using SPSS 10; again, the process is automated using SPSS 17. SPSS 17 accounts for the Ljung-Box statistic when selecting the best fit model for the data. Although the Ljung-Box statistic is an automated process using SPSS 17; using SPSS 10, the Ljung-Box statistics were verified for each ARIMA model used in this research.

The data in Table 2 suggest that Portland had a reported increase in violent crimes after the implementation of the UGB. Before the implementation of the UGB, the violent crime rate in Portland averaged about 90 violent crimes per month. After the implementation, Portland averaged around 166 violent crimes per month. After removing seasonality and autocorrelation present in the data, the true impact was an increase of 12.14 reported violent offenses per month per 100,000 residents after Portland implemented the UGB. The null hypothesis that there would be no difference in violent crime rates between pre-intervention observations and post-intervention observations is rejected. There was a statistically significant increase in reported violent crime rates after implementation of the UGB.

Table 2.

SPSS Time Series Regression Output for Portland's Violent Crime Index
ARIMA Model (0,0,0)(1,1,0)$_{12}$

MODEL: $(0,0,0)(1,1,0)_{12}$
Variable: Portland's ViolentCrimeIndex
Regressors: Impact

FINAL PARAMETERS:
Number of residuals 168
Standard error 18.04723
Log likelihood -723.17867
AIC 1452.3573
SBC 1461.7292

Analysis of Variance:

	DF	Adj. Sum of Squares	Residual Variance
Residuals	165	53919.602	325.70249

Variables in the Model:

	B	SEB	T-RATIO	APPROX. PROB.
SAR1	-.213096	.0725861	-2.9357723	.00380231**
Impact	12.139992	5.3803865	2.2563420	.02536222*
CONSTANT	6.736898	1.2274853	5.4883738	.00000015***

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

To add validity to the study, the collar city violent crime index was compared to Portland's violent crime index. The collar cities included were ones with pre and post UGB data. The collar cities were Beaverton, Cornelius, Gresham, Forest Grove, Hillsboro, and Tigard (all Oregon cities). It was evident from the missing ICPSR data that many cities in Oregon would report some years and not others. Truly, the UCR is a voluntary practice. The collar cities also were contained within the UGB. The reported populations and crime for each seat were combined then a crime rate was identified per 100,000 residents. As with Portland and Vancouver, the population of the collar cities increased significantly around 1990.

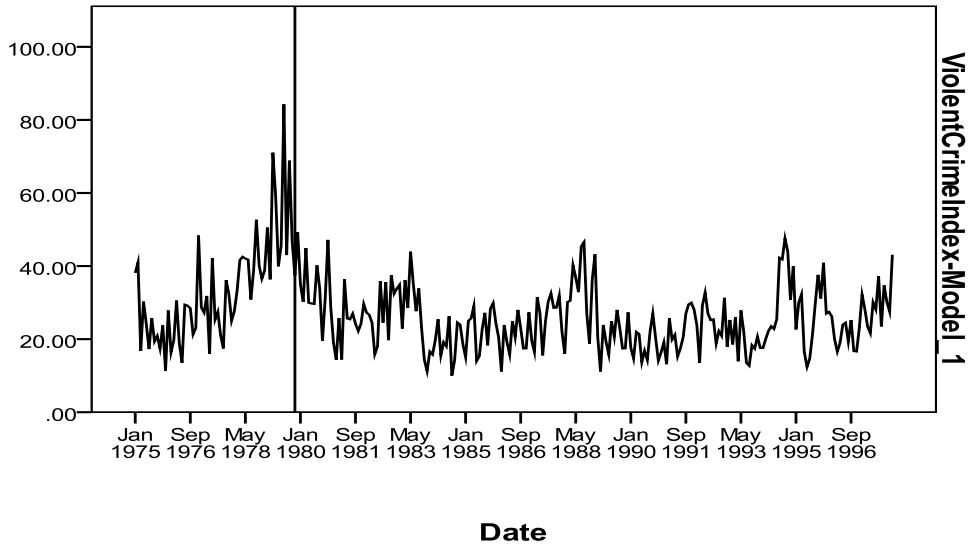

Figure 6. Violent Crime Index in the Collar Cities

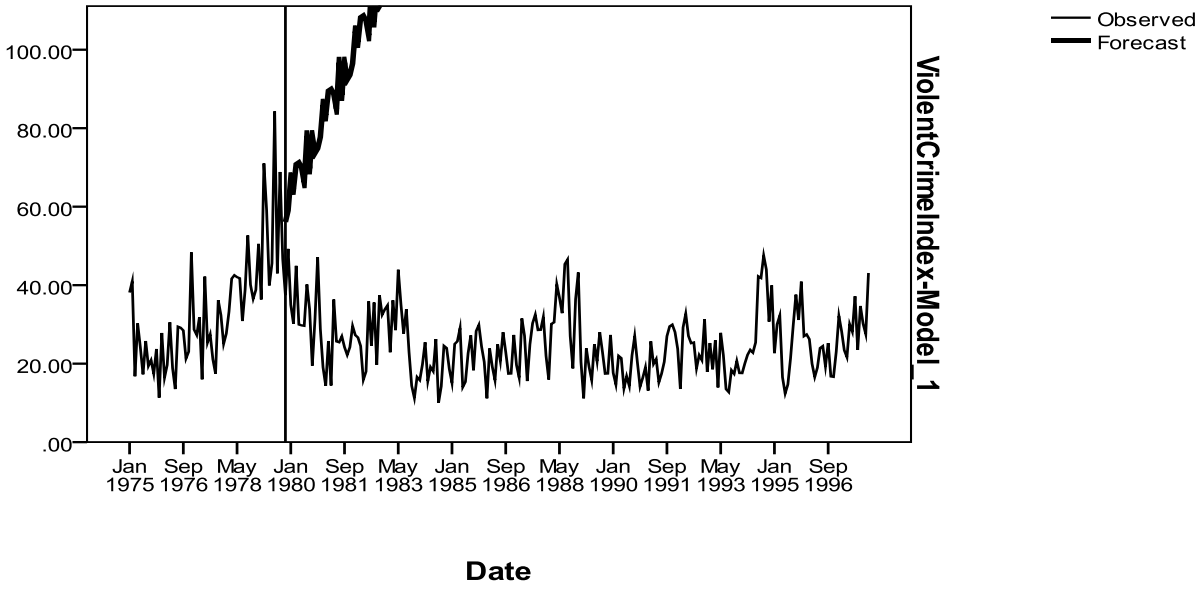

Figure 7. SPSS 17.0 Forecasting of Violent Crime Index in Collar Cities

For the collar cities, violent crime increased sharply from 1975 to just before 1980. After 1980, the reported violent crime rate declined and became constant through 1997, with unexplained spikes in reported violent crime rates in 1983, 1988, and 1995. SPSS17 Forecasting predicted that after the implementation of the UGB, violent crime should have continued to increase (Figure 7), clearly this did not happen.

Table 3.

SPSS Time Series Regression Output for Collar City Violent Crime Index
ARIMA Model (0,1,1)(0,0,0)$_{12}$

	B	SEB	T-RATIO	APPROX. PROB.
MA1	.747150	.0503624	14.835474	.00000000***
Impact	-17.447265	6.0212887	-2.897596	.00423835**
CONSTANT	.059532	.1741083	.341924	.73281588

***p*<.01 ***p<.001

Actual violent crime rates for the collar cities declined significantly after the UGB was implemented (Table 3). The average pre-UGB violent crime rate for the collar cities was around 33 and after it was around 26. The data suggest that violent crime rates in the collar cities declined by 17.44 incidents per month per 100,000 residents after the UGB was implemented. It would appear that the UGB had a positive effect on violent crime reduction in the collar cities.

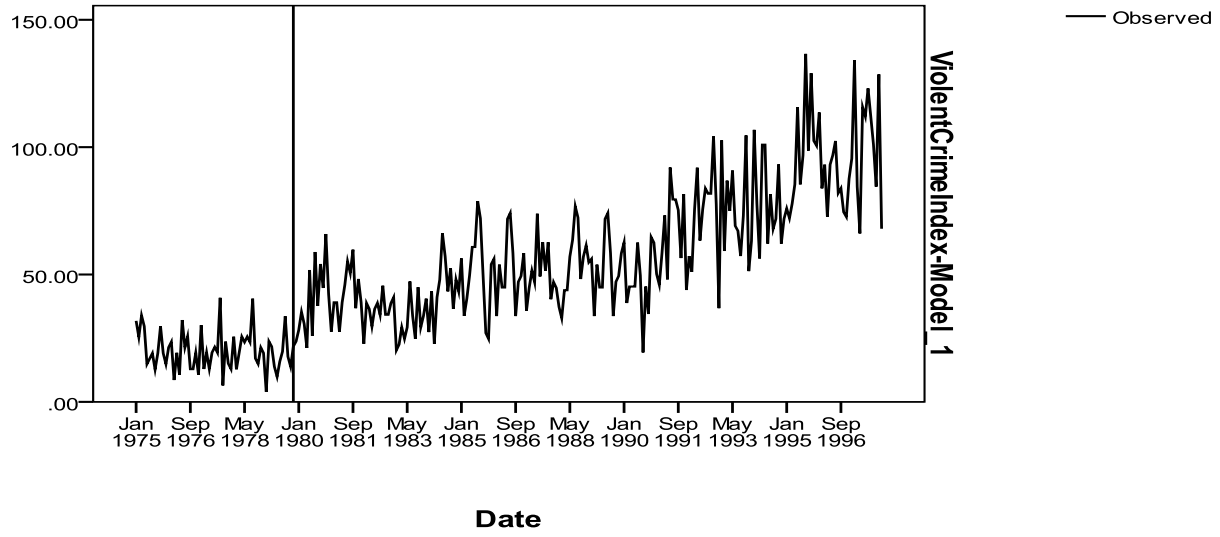

Figure 8. Violent Crime Index in Vancouver, WA

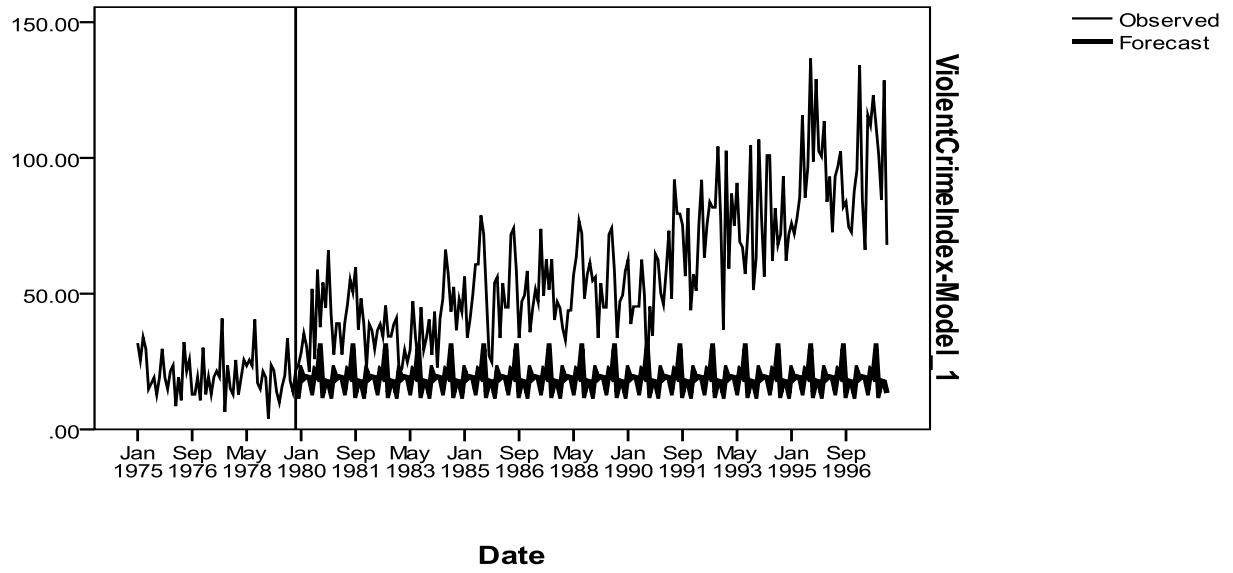

Figure 9. SPSS 17.0 Forecasting of Violent Crime Index in Vancouver, WA

As with Portland, Vancouver's population dramatically increased in the 1990s. From 1975-1980, violent crime remained constant. In Vancouver, there appears to be a constant increase in violent crimes over time. Figures 8 and 9 show Vancouver's violent crime index rate. The vertical line represents when the UGB for Portland was enacted (November, 1979). Vancouver did not receive the UGB treatment as Portland did. The forecasted values or *predicted* values of violent crime show a constant mean and variation with seasonal components. The *actual* value or observed value, however, shows a significant upward departure. In fact, it appears that Vancouver's violent crime rates have been constantly on the rise for the time period of 1980-1996.

Table 4.

SPSS Time Series Regression Output for Vancouver's Violent Crime Index
ARIMA Model $(0,1,1)(0,1,1)_{12}$

	B	SEB	T-RATIO	APPROX. PROB.
MA1	.836907	.0414036	20.213416	.00000000***
SMA1	.731024	.0667809	10.946614	.00000000***
Impact	15.495403	5.6514930	2.741825	.00679274**
CONSTANT	.021625	.0490784	.440616	.66007511

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

The model for Vancouver identified by SPSS 17.0 was $(0,1,1)(0,1,1)_{12}$, suggesting that the autocorrelation in the observations could be changed into "white noise" through the use of differencing at the previous period and seasonally, as well as accounting for a moving average value at both the previous period and seasonally. The data suggest that violent crime rates in Vancouver increased by 15.5 incidents per month per 100,000 residents after Portland's UGB was implemented. Vancouver averaged around 20 violent crimes per month before the UGB and 45 after. The increase in violent crime rates in Vancouver is slightly higher than those in Portland for the post intervention period.

Comparison of Violent Crime Indexes

Assessing the violent crime data by geographical location provides an important step in understanding the potential impact of Portland's UGB on crime rates and neighboring areas. After the implementation of the UGB, both Portland and Vancouver had comparable violent crime increases per month, where the collar cities reported a significant decline in violent crimes.

Figure 10 offers a visual representation of the reported violent crime rates per 100,000 residents in all three areas. Portland's reported violent crime rate per 100,000 residents steadily increased after the UGB was implemented, dropping slightly after the large population influx in 1990, and again around 1995, when the reported violent crime rate per 100,000 residents

matched that of the comparison city (Vancouver). Vancouver's reported violent crime rate per 100,000 residents continued to increase, with a slightly higher rate of incline after Portland's UGB was implemented (where Portland was actually starting to decline slightly). The reported violent crime rates per 100,000 residents for the collar cities appear to have been contained in that they initially declined after the UGB was implemented and since have remained relatively stable. Figure 10 suggests that for violent crime rates, the UGB plausibly had an immediate impact on the collar cities, a delayed impact on Portland, and no impact on Vancouver.

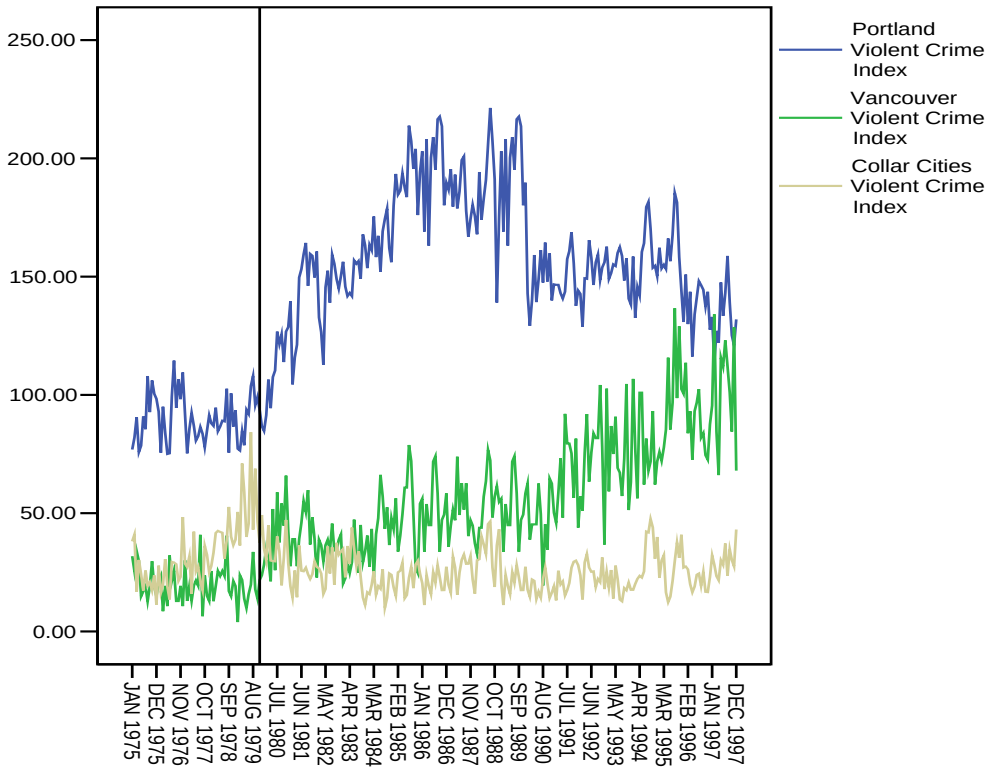

Figure 10. Comparison of Violent Crime Indexes

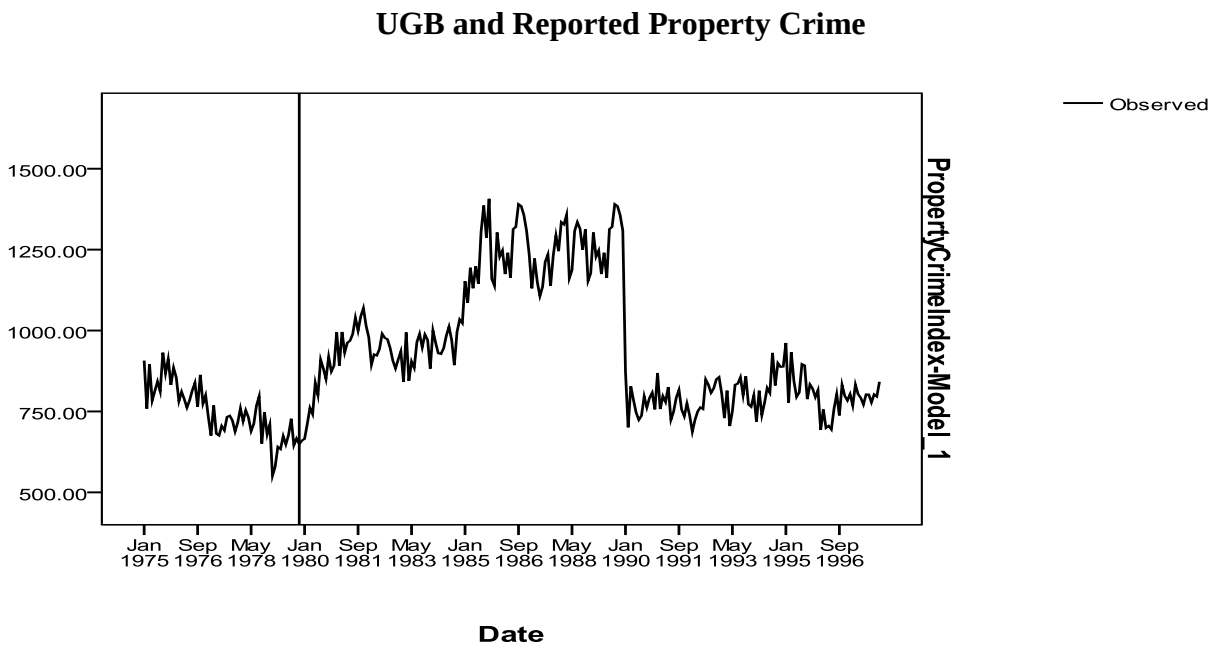

Figure 11. Property Crime Index in Portland, OR

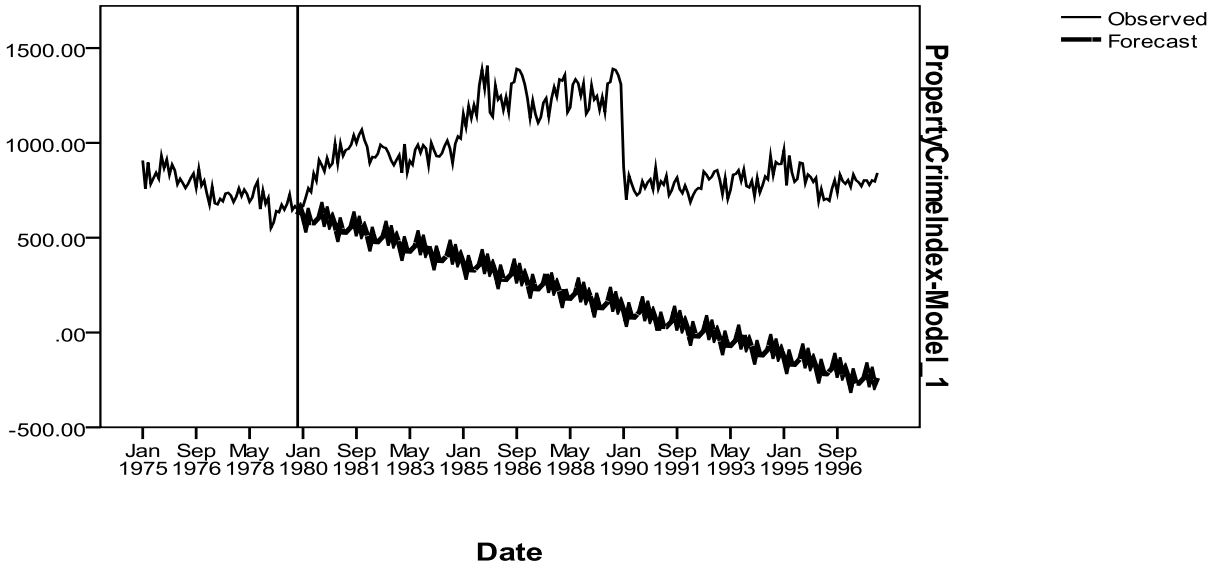

Figure 12. SPSS 17.0 Forecasting of Property Crime Index in Portland, OR

Figures 11 and 12 offer a visual representation of Portland's actual property crime rates per 100,000 residents and the forecasted property crime rates per 100,000 residents based on the implementation date of Portland's UGB. Portland's actual property crime rates appear to have

been declining from 1975-1980. After 1980, there was a sharp increase in property crime rates until 1990. After 1990, there was a sharp decline in property crime rates based more on a dramatic population increase than a decrease in the actual number of reported property crimes. Figure 12 indicates that based on pre UGB property crime rates, property crime rates were predicted to be in sharp decline after the UGB was implemented; in reality this forecast was inaccurate.

Table 5.

SPSS Time Series Regression Output for Portland's Property Crime Index
ARIMA Model $(0,0,0)(1,1,0)_{12}$

	B	SEB	T-RATIO	APPROX. PROB.
SAR1	-.12429	.076353	-1.6279016	.10545374
Impact	113.79041	36.142774	3.1483584	.00194911**
CONSTANT	23.38284	8.726966	2.6793779	.00812330**

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

The property crime index for Portland was found to have a $(0,0,0)(1,1,0)_{12}$ model. Portland averaged 751 property crimes per 100,000 residents before the UGB was implemented and 1,083 after its implementation. Using the implementation date of the UGB as the interruption between the two time periods, Portland's reported property crime rates increased on average 114 reported crimes per month per 100,000 residents. Again, the post intervention data for all the property crime locations are restricted to the time period between November 1979 and December 1989 to avoid confounding the large population increase in the 1990s (in all three areas) with any plausible impact of the UGB.

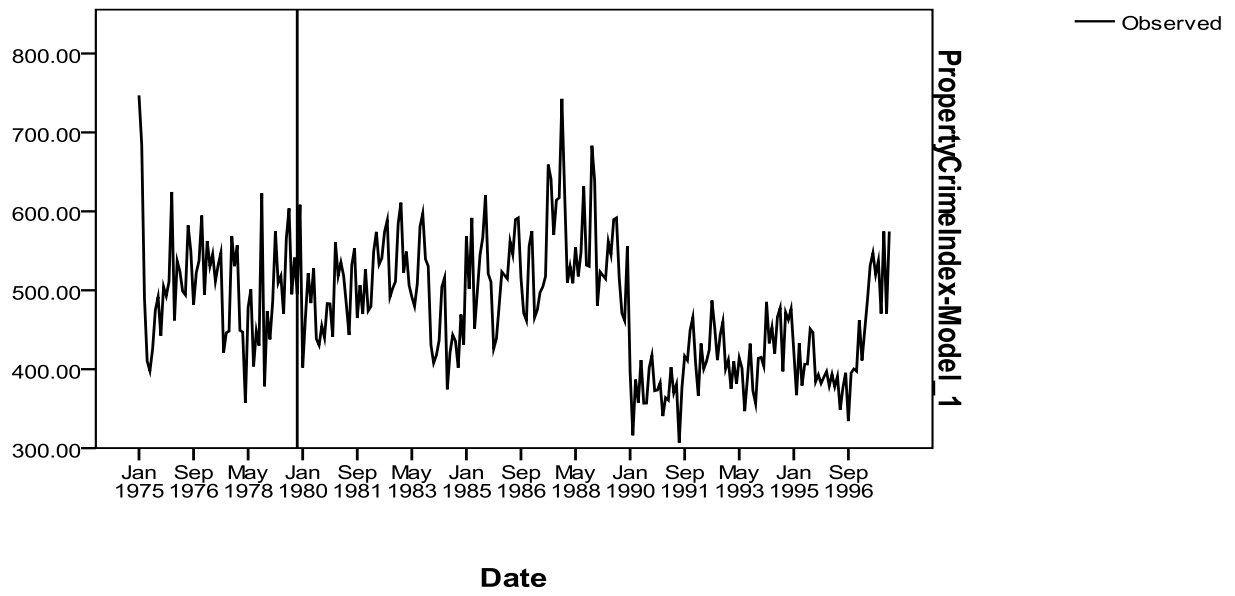

Figure 13. Property Crime Index in Collar Cities

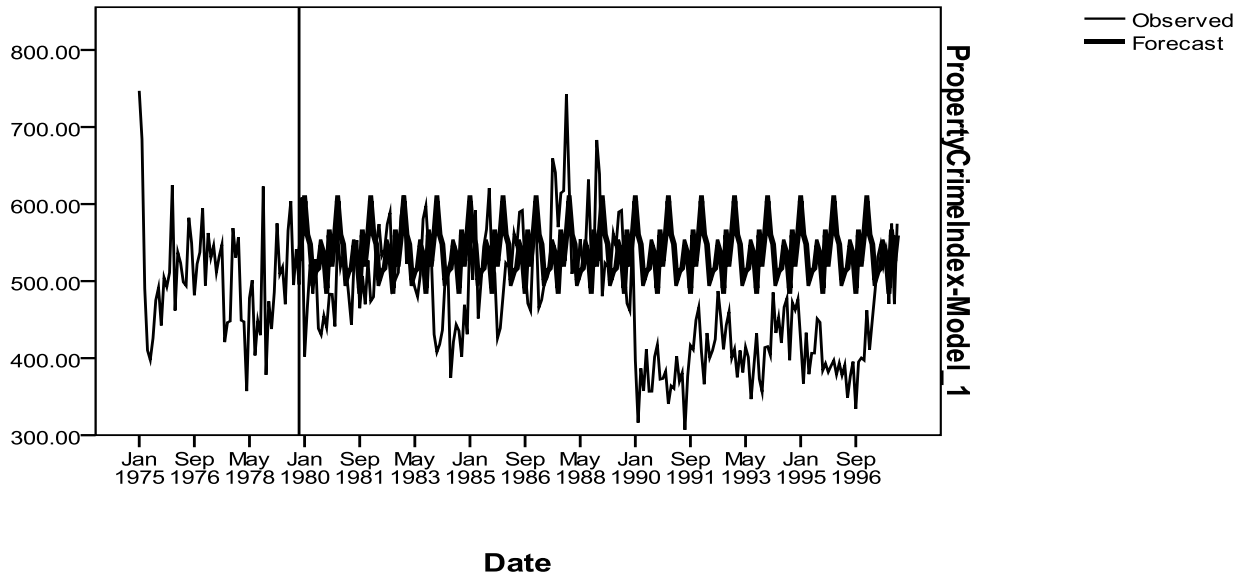

Figure 14. SPSS 17.0 Forecasting of Property Crime Index in Collar Cities

From 1975 to 1979, the collar cities' property crime rate per 100,000 residents appears to be constant. From 1980 to 1990, there appears to be a slight increase in property crime rates. Property crime rates for the collar cities appear to be stable across time with a decrease around 1990 related to the population increase (see Figure 13). After 1996, there appears to be another

increase in property crime rates. Overall, property crime rates in the collar cities appear to be a constant function. SPSS Forecasting predictions show that the actual crime starts out being equal to what was predicted (see Figure 14). At around 1990, there is a decrease in the crime rates, which makes the actual property crime rate lower than the predicted rates.

SPSS 17 indicates the appropriate ARIMA model for the property crime index for the collar cities is $(1,0,0)(0,0,0)_{12}$. This AR1 process suggests that a portion of the value of the current observation is related to the preceding observation. Using an AR1 process, the autocorrelation can be accounted for as "white noise" in the model.

Table 6.

SPSS Time Series Regression Output for Collar City Property Crime Index
ARIMA Model $(1,0,0)(0,0,0)_{12}$

	B	SEB	T-RATIO	APPROX. PROB.
AR1	.44012	.067231	6.546494	.00000000***
Impact	8.33242	6.762314	.497093	.61974064
CONSTANT	510.83585	13.862862	36.849234	.00000000***

***p<.001

Table 6 indicates that the impact of the UGB on property crime rates per 100,000 residents in the collar cities was minimal. The collar city property crime index was around 511 property crimes per 100,000 residents before the UGB and about 519 per 100,000 residents after the UGB was implemented. After accounting for the AR1 process, the true impact reportedly increased on average by approximately eight incidents per month per 100,000 residents. However, this increase was statistically insignificant (p. >.61).

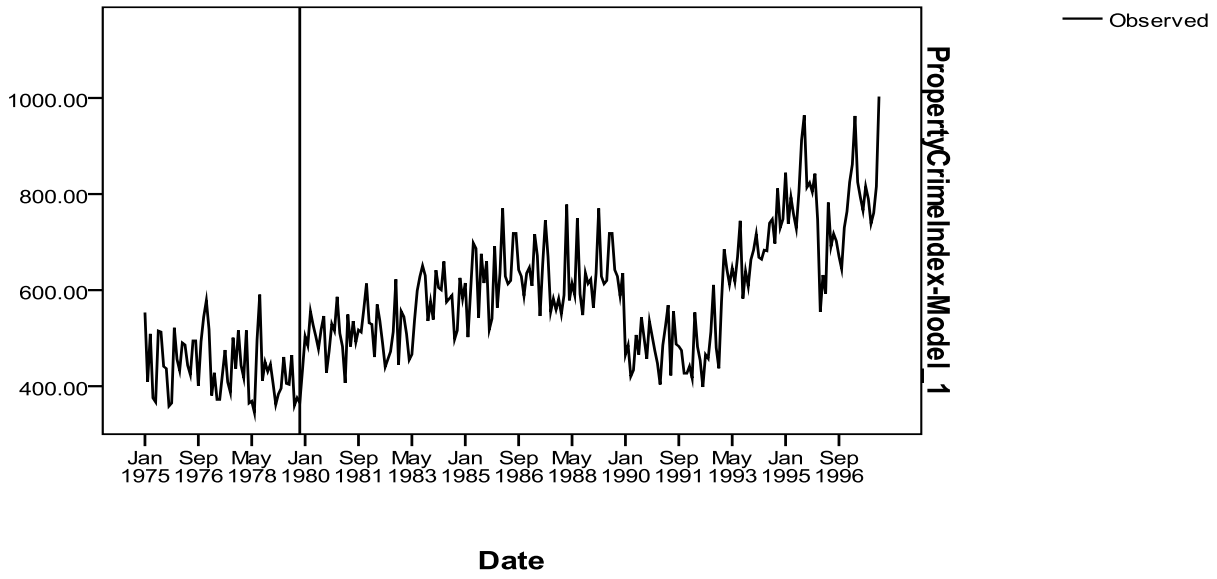

Figure 15. Property Crime Index in Vancouver, WA

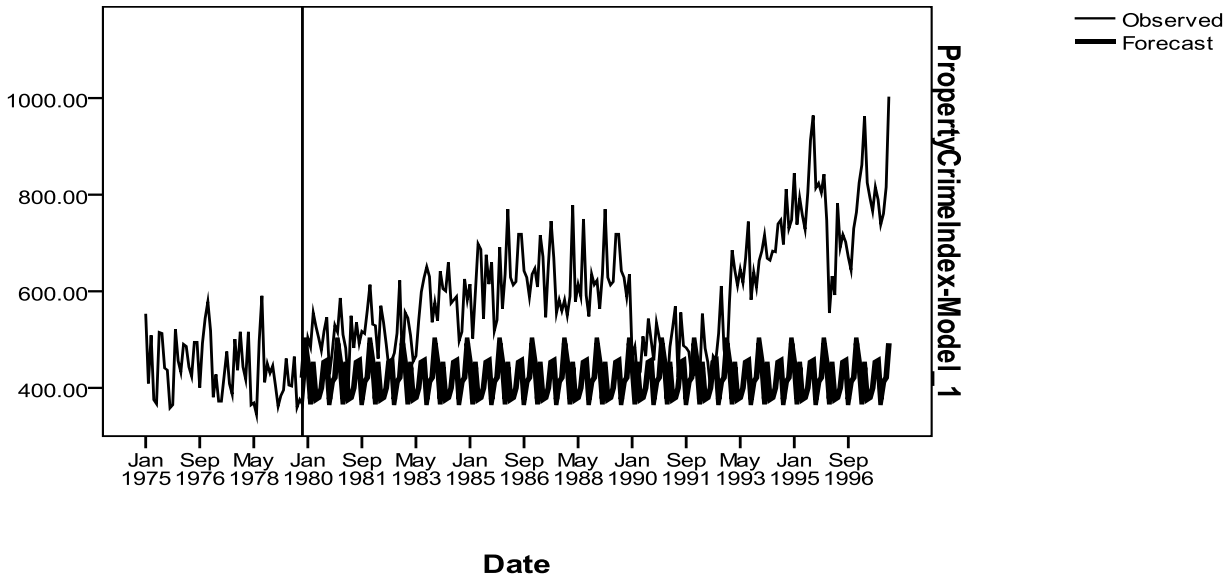

Figure 16. SPSS 17.0 Forecasting of Property Crime Index in Vancouver, WA

Vancouver's reported property crime index shows that the data are not stationary with respect to mean or variance. There is an overall increase in the data with a slight decrease in property crimes from around 1990 to 1991. After 1991, there is a sharp increase in property crimes. The overall trend is an increase in property crime rates from 1975 through 1997. Over this time frame, Vancouver's reported property crime rate per 100,000 residents has doubled.

SPSS Forecasting based on pre UGB data points predicted Vancouver's property crime rates should have remained constant and relatively low at about 400 reported incidents per 100,000 residents per month. Again, using the pre intervention data to project long-term crime rates for Vancouver was extremely inaccurate when compared to the actual crime rates.

Table 7.

SPSS Time Series Regression Output for Vancouver's Property Crime Index
ARIMA Model $(0,1,1)(0,1,1)_{12}$

	B	SEB	T-RATIO	APPROX. PROB.
MA1	.878395	.038784	22.648126	.00000000***
SMA1	.776378	.070667	10.986432	.00000000***
Impact	60.375069	29.764428	2.028430	.04414421*
CONSTANT	.138303	.198358	.697238	.48664711

*p<.05. ***p<.001

SPSS identified the ARIMA model for Vancouver's property crime rates per 100,000 residents to be $(0,1,1)(0,1,1)_{12}$. The pre-UGB averages for Vancouver were 442 crimes per 100,000 residents and were around 580 per 100,000 residents after Portland implemented the UGB. The data suggest that after controlling for autocorrelation, reported property crimes in Vancouver increased on average 60 incidents per month per 100,000 residents after Portland enacted the UGB. Although this is a statistically significant increase in reported property crime rates per 100,000 residents, it is only about half of the monthly increase reported by Portland (113 incidents per month per 100,000 residents after Portland enacted the UGB; see Figure 17 below).

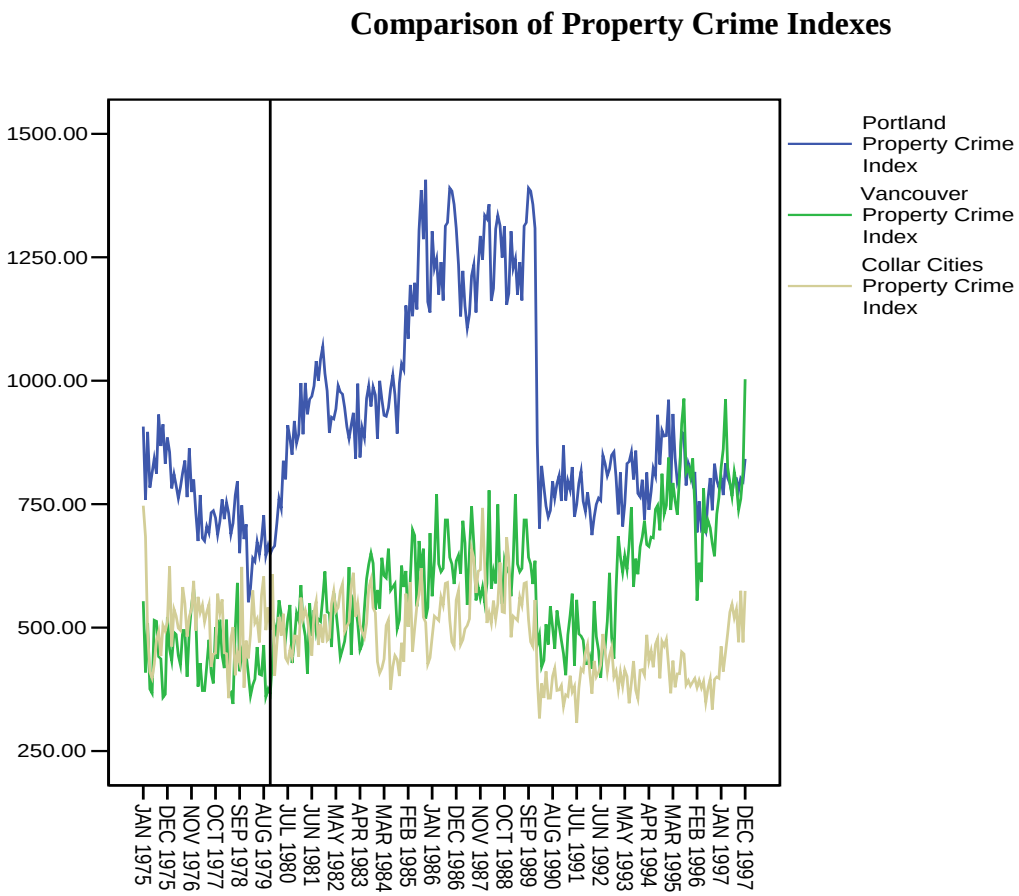

Figure 17. Comparison of Property Crime Indexes

Figure 17 offers a visual representation of the reported property crime rates per 100,000 residents in all three areas. Portland's reported property crime rate steadily increased after the UGB was implemented, dropping almost 40% after the large population influx in 1990. The collar cities and Vancouver's reported property crime rates per 100,000 residents basically mirrored each other through 1992, at which time Vancouver's reported property crime rates started to increase to match Portland's reported property crime rates by 1995. The collar cities reported property crime rates remained relatively constant after 1992 until a sharp increase in 1997.

Although it could be argued that the UGB had a delayed impact on Portland's property crime rates, for the ten years immediately preceding Portland UGB implementation, Portland's

property crime rate increased at a substantially higher rate than those of Vancouver. Similar to the violent crime data, the property crime data suggest that the immediate impact of the UGB on crime reduction was not observed in Portland, but did impact the collar cities as witnessed by declining violent crime rates and stable property crime rates.

UGB and Reported Crime Index

The crime index for each of the three geographical areas was analyzed to account for all crime reported to the police. The crime index and the property crime indices look similar, since property crimes dominate the types of crime reported to the police.

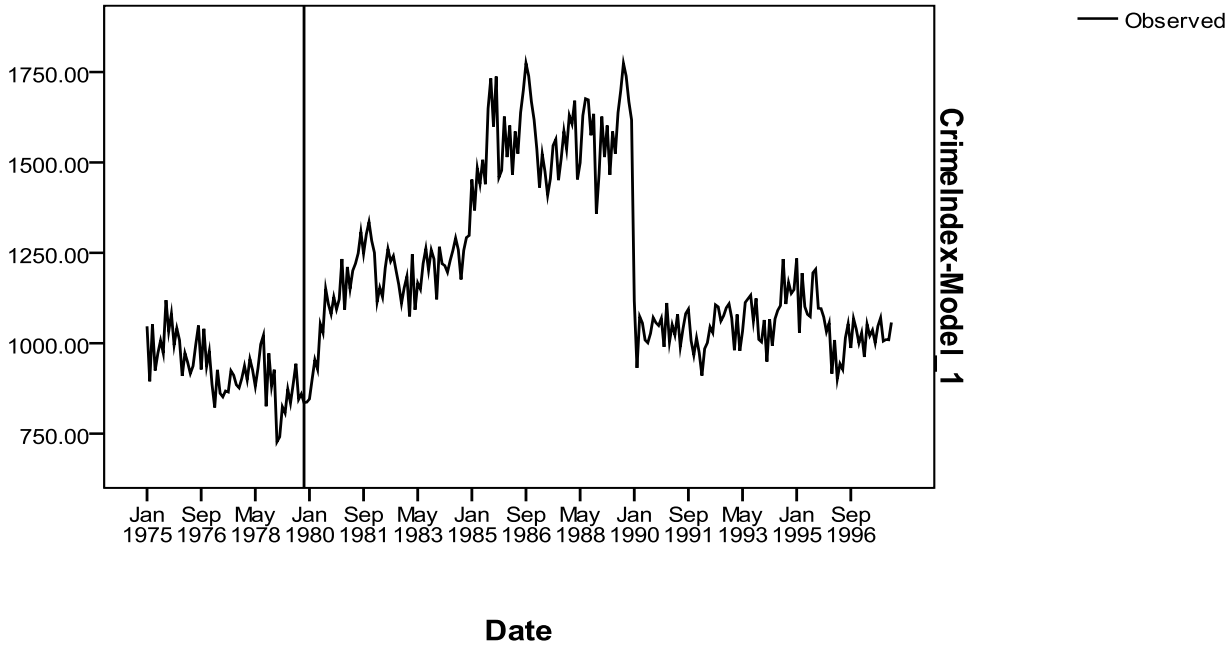

Figure 18. Crime Index in Portland, OR

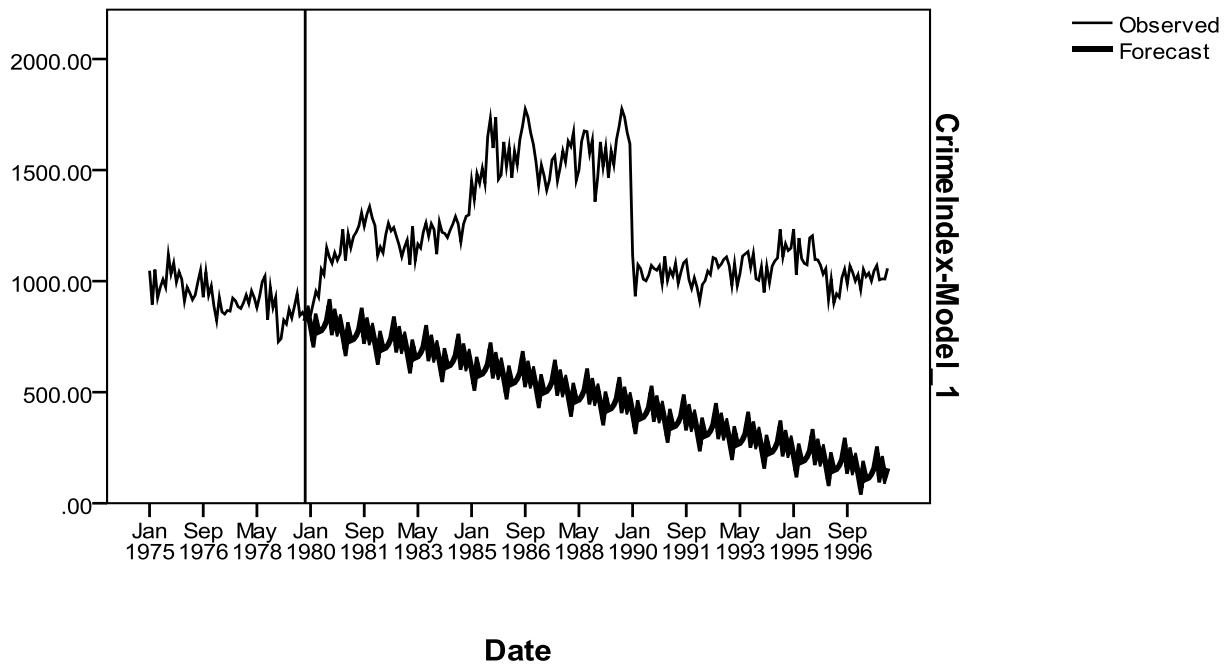

Figure 19. SPSS 17.0 Forecasting of Crime Index in Portland, OR

Figures 18 offers a visual representation of Portland's actual crime index rates and Figure 19 depicts the forecasted crime index rates based on the implementation date of Portland's UGB (November 1979). Portland's actual reported crime rates per 100,000 residents appear to have been declining from 1975-1980; thus, the forecast of lower overall reported crime. After 1980, there was a sharp increase in Portland's crime rates through 1990, driven primarily by property crime offenses. After 1990, there was a sharp decline in overall crime rates per 100,000 residents based more on a dramatic population increase than a decrease in the actual number of reported crimes. Figure 19 indicates that based on pre-UGB property crime rates, overall crime rates were predicted to be in sharp decline after the UGB was implemented; in reality this forecast was inaccurate.

Table 8.

SPSS Time Series Regression Output for Portland's Crime Index
ARIMA Model (0,0,0)(1,1,0)$_{12}$

	B	SEB	T-RATIO	APPROX. PROB.
SAR1	-.13880	.076609	-1.8118231	.07183187
Impact	114.14855	41.430393	2.7551886	.00652510**
CONSTANT	35.97091	9.902953	3.6323411	.00037461***

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

Portland averaged 928 reported UCR I and UCR II offenses per month per 100,000 residents before the implementation of the UGB and 1,364 reported UCR I and UCR II offenses per month per 100,000 residents after the implementation of the UGB. SPSS 17 indicates that the best ARIMA model for Portland's index crime rate is ARIMA Model $(0,0,0)(1,1,0)_{12}$, suggesting the data are impacted by a seasonal effect. The ARIMA model indicates that after the implementation of the UGB, there was an average increase of approximately 114.15 crimes per month per 100,000 residents. Portland's reported property crime rate increase was 113.79, suggesting again that the bulk of Portland's post UGB crime rate was composed of an increase in reported property crimes.

Figure 20 suggests that from 1975 to 1979 (pre UGB implementation), the collar cities' reported UCR I and UCR II offenses per month per 100,000 residents appears to be a stochastic process, primarily as a function of stable property crime rates. From 1980 to 1990, there appears to be a slight increase in overall reported crime rates, again as a function of increased property crime rates. Overall, reported UCR I and UCR II crime rates in the collar cities appear to be a constant function, with several high peaks, even when accounting for the reported crime rate increase after 1996.

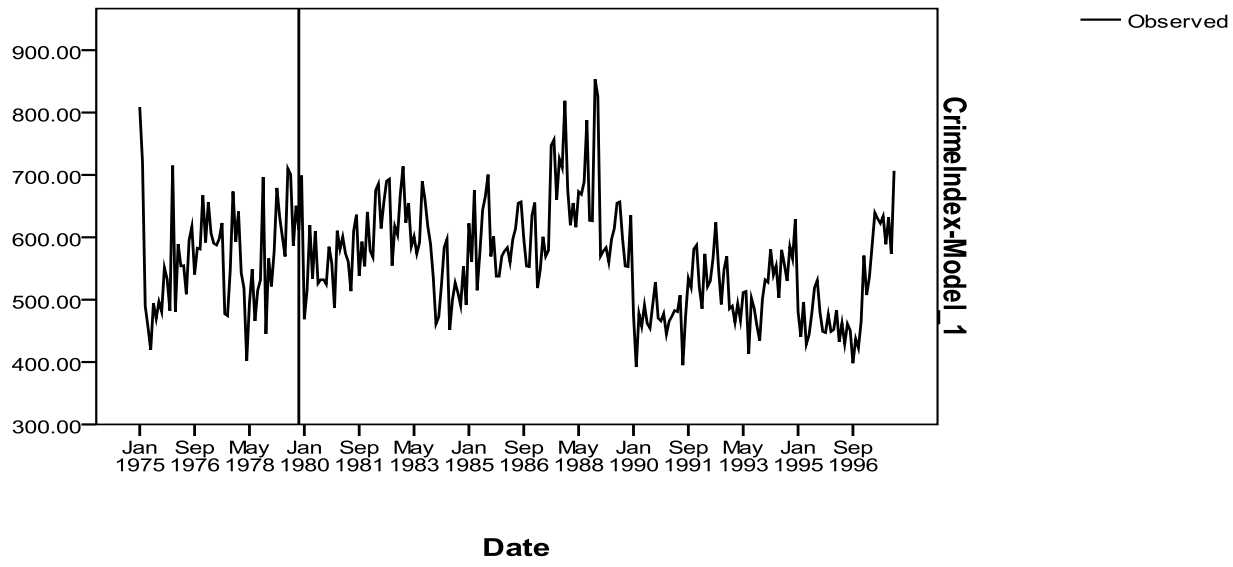

Figure 20. Crime Index in Collar Cities

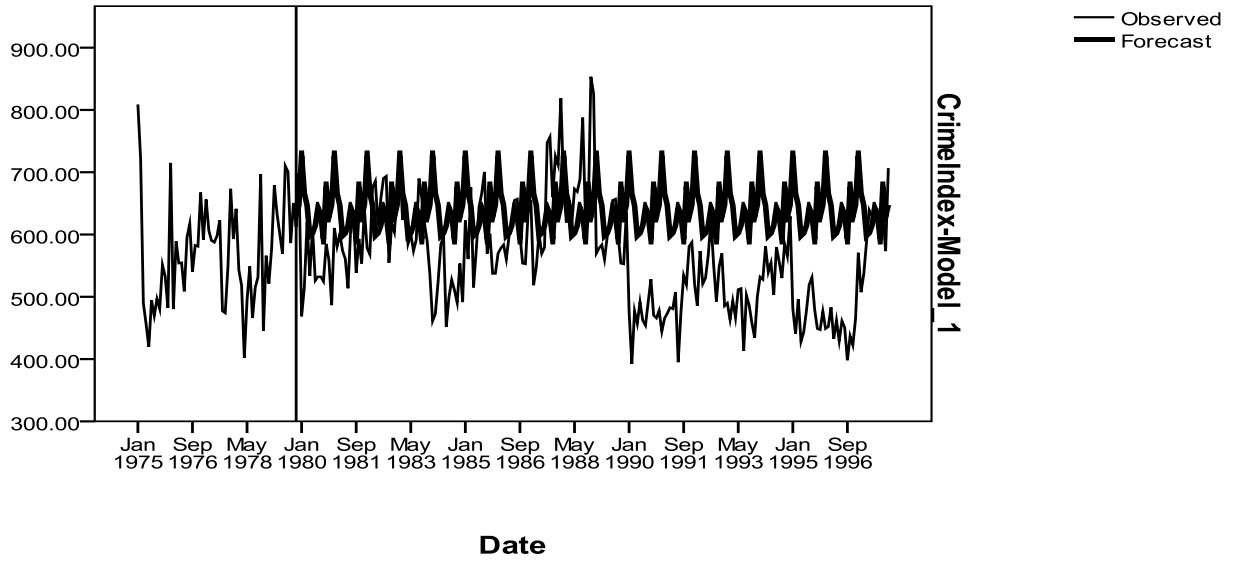

Figure 21. SPSS 17.0 Forecasting of Crime Index in Collar Cities

SPSS Forecasting predictions suggest that the reported UCR I and UCR II offenses per month per 100,000 residents starts out being equal to what is predicted, but around 1990 there is a decrease in overall crime rates, which makes the actual crime rate lower than the predicted rates through 1996. The collar cities averaged 569 reported UCR I and UCR II offenses per

month per 100,000 residents prior to the UGB implementation and 605 reported UCR I and UCR II offenses per month per 100,000 residents after the UGB implementation.

Table 9.

SPSS Time Series Regression Output for Collar City Crime Index
ARIMA Model (1,0,1)(0,0,0)$_{12}$

	B	SEB	T-RATIO	APPROX. PROB.
AR1	.67026	.115832	5.786480	.00000003***
MA1	.28203	.151136	1.866045	.06369893
Impact	26.48238	23.064607	1.148183	.25245136
CONSTANT	576.92842	19.183338	30.074455	.00000000***

***p<.001

SPSS 17 indicates the appropriate ARIMA model for the reported crime index for the collar cities is $(1,0,1)(0,0,0)_{12}$. This AR1 and MA1 processes suggest that a portion of the value of the current observation is related to the preceding observation. Using an AR1 and a MA1 process, the autocorrelation was accounted for as "white noise" in the model. The UGB impact on the overall reported crime rates in the collar cities was insignificant. Although there was a statistically significant decline in reported violent offenses, these are offset when combined with the more prevalent increase in property offenses.

Figures 22 indicates that the reported UCR I and UCR II offenses per month per 100,000 residents for Vancouver is similar to the collar cities and Portland in that it is driven by reported property crimes. Additionally, Figure 23 shows that since Vancouver had a significant increase in reported property crimes after Portland's UGB was enacted, the forecasting model generated by SPSS 17 proved to be invalid. The prediction model forecasted a continuation of offending similar to the pre intervention rates, when in reality the reported UCR I and UCR II offenses per month per 100,000 residents increased significantly, both as a result of increased property crime rates and violent crime rates.

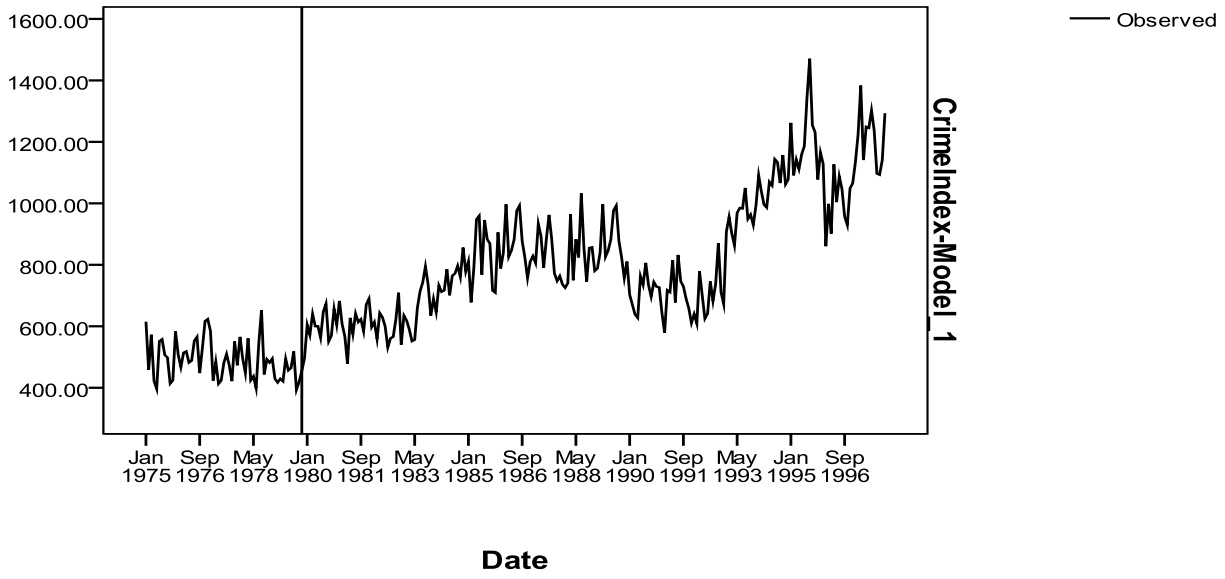

Figure 22. Crime Index in Vancouver, WA

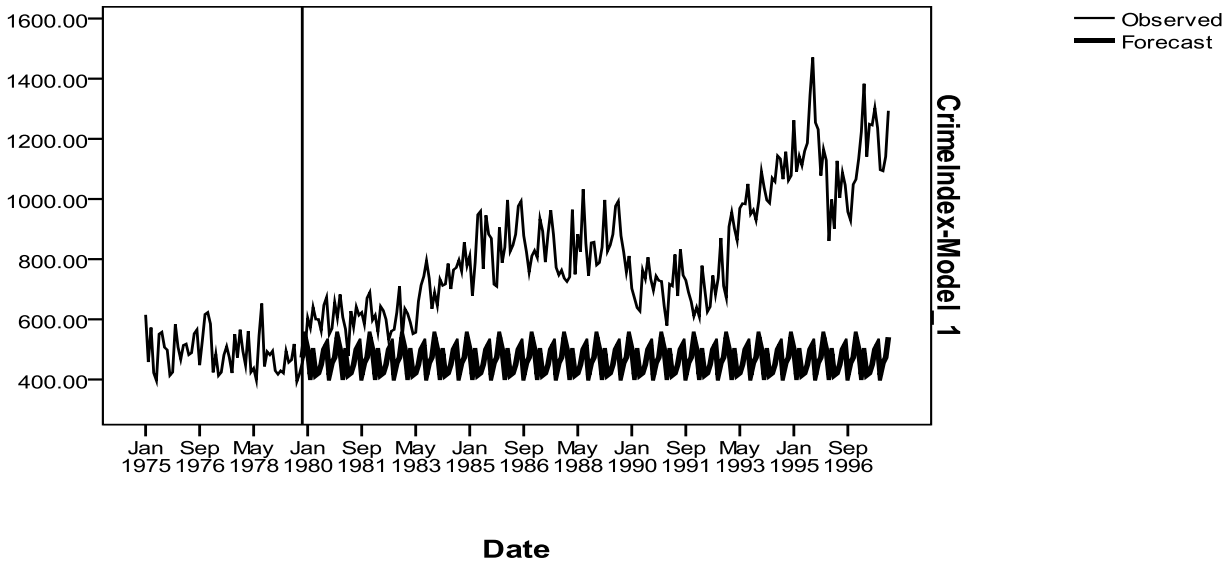

Figure 23. SPSS 17.0 Forecasting of Crime Index in Vancouver, WA

Table 10.

SPSS Time Series Regression Output for Vancouver's Crime Index
ARIMA Model (0,1,1)(1,0,1)$_{12}$

	B	SEB	T-RATIO	APPROX. PROB.
MA1	.794619	.045646	17.408202	.00000000***
SAR1	.810859	.131682	6.157685	.00000000***
SMA1	.569625	.174579	3.262851	.00132763**
Impact	98.260364	41.410620	2.372830	.01874350*
CONSTANT	1.060065	2.107688	.502952	.61563423

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

Vancouver's pre UGB UCR I and UCR II offenses averaged 490 crimes per month per 100,000 residents, the post UGB average was 742. Table 10 displays the results of the crime index model for Vancouver [ARIMA (0,1,1)(1,0,1)$_{12}$]. After the time period marking the implementation of the UGB, on average the crime rate increased by 98 more UCR I and UCR II offenses reported per month per 100,000 residents.

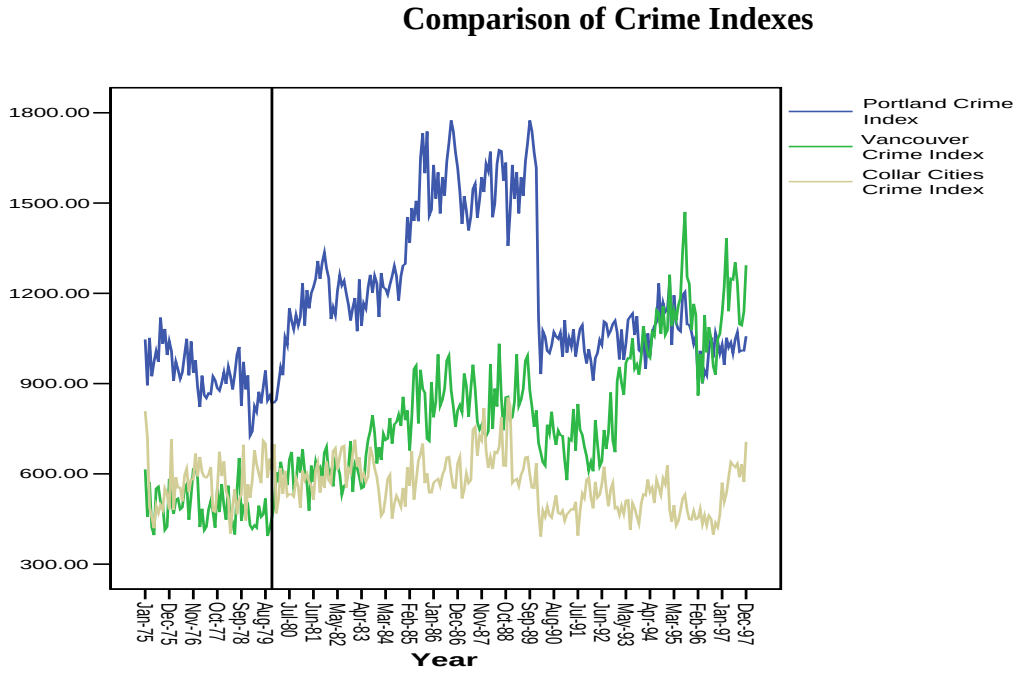

Figure 24. Comparison of Crime Indexes

A comparison of the overall reported crime rates for these three areas (Portland, Portland's collar cities, and Vancouver) suggests that overall crime rates were driven and mirror property crime rates. The significance of any increase or decrease in reported UCR I Offenses Against a Person are masked when UCR Type I and UCR Type II offenses are aggregated. When assessing the overall reported crime rates for these three areas, based on the enactment of the UGB, crime rates have remained relatively stable in the collar cities. Reported crime rates in Portland increased immediately after the UGB enactment and maintained its growth through 1989 after which it declined significantly based on a large population influx. For Vancouver, which was the only community not under the UGB laws, the city's crime rates continued to increase at a similar pace to Portland's until approximately 1992 when Vancouver witnessed a dramatic increase in property crime rates, raising its reported crime rates above those of the heavier populated Portland for the first time covering the 20 years addressed by this data. Table 11 offers a synopsis of the changes in crime rates for each geographical area by summarized type of offense.

Table 11.

Summary of All Crime Indexes Impact and Significance Level

	Violent Crime Index	Property Crime Index	Crime Index
Portland	12.1399*, *p=.0253*	113.79**, *p=.0019*	114.14**, *p=.0065*
Collar Cities	-17.447**, *p=.0042*	8.332, *p=.619*	26.482, *p=.2524*
Vancouver	15.494**, *p=.0067*	60.375*, *p=.044*	98.260*, *p=.0187*

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

Table 12.

Pre and Post UGB Crime Rate Average per 100,000 Residents (1975 – 1989)

Location	N	Minimum	Maximum	Mean
	Statistic	Statistic	Statistic	Statistic
Portland's Pre Violent Crime Index	58	75.04	114.53	89.89
Portland's Post Violent Crime Index	122	84.79	221.33	166.37
Collar Cities Pre Violent Crime Index	58	11.33	84.28	33.37
Collar Cities Violent Crime Index	122	10.02	49.25	25.85
Vancouver's Pre Violent Crime Index	58	3.95	40.86	20.05
Vancouver's Post Violent Crime Index	122	20.26	78.82	45.18
Portland's Pre Property Crime Index	58	551.50	931.59	751.15
Portland's Post Property Crime Index	122	649.16	1,407.08	1,083.08
Collar Cities Pre Property Crime Index	58	357.25	746.96	506.32
Collar Cities Post Property Crime Index	122	374.51	742.54	519.56
Vancouver's Pre Property Crime Index	58	345.45	590.67	441.74
Vancouver's Post Property Crime Index	122	365.84	778.15	579.89
Portland's Pre Crime Index	58	727.14	1,119.19	928.21
Portland's Post Crime Index	122	835.62	1,774.24	1,364.18
Collar Cities Pre Crime Index	58	402.06	808.86	569.04
Collar Cities Post Crime Index	122	451.48	853.30	604.50
Vancouver's Pre Crime Index	58	393.52	652.51	490.24
Vancouver's Post Crime Index	122	454.82	1,032.42	742.11

CHAPTER V

DISCUSSION AND CONCLUSIONS

Discussion of the Findings

The purpose of this study was to examine the impact of an UGB on crime rates (violent, property, and overall crime rates) in the Portland area. This research was a natural extension of the previous literature as well as an attempt to bridge the gap between urban containment and crime. The impact of UGBs on crime is a topic that has not been extensively researched so many questions have remained unanswered. The logic for UGBs is relatively simple: since it has been argued that sprawl is positively related to crime through the transference of tax revenues from the city to the neighboring suburbs; when sprawl is reduced, crime also should be reduced. This chapter discusses the overall findings, theory and policy implications, strengths and weaknesses of the data and design, and suggestions for future research.

Social science research often examines the relationship between variables. For time series analysis, it is the impact or change between pre and post observations of a variable based on a specific (time oriented) interruption. The time series analysis employed in this study assessed changes in crime rates based on the implementation date of Portland's UGB. Uninterrupted crime rates are cyclic, often increasing or decreasing around a mean value, but maintaining a stochastic process. Using the UGB as an interruption of this stochastic process permitted the assessment of what happened after the UGB law was implemented compared to what would have been predicted to occur based on pre-intervention trends. The null hypotheses were that no statistically significant changes would occur when comparing the pre and post UGB implementation crime rates for Portland, the collar cities, and Vancouver. The alternative hypotheses would note a significant change in crime rates. In summary, the results were mixed.

The city of Portland was selected for this study because it remains the vanguard of smart growth (land management), which was designed to limit sprawl (Orfield, 1998; Wickersham, 2006; Wiewal & Schaffer, 2001). Portland has one of the strictest land growth policies in the US; thus, the duration and strength of the UGB on crime rates should be readily identifiable, especially when contrasted to a neighboring city (Vancouver), which does not operate under a UGB policy.

The major findings from this study indicated that there were mixed results. Both violent crime rates and property crime rates significantly increased in Portland and Vancouver after Portland's UGB was enacted; thus, the null hypotheses of no difference can be rejected for the time frame addressed by this research. Additionally, the violent crime rates in the collar cities significantly declined after the enactment of the UGB; again, the null hypothesis of no difference can be rejected. Property crime rates in the collar cities showed no significant change; thus the null hypothesis cannot be rejected.

From a social disorganization perspective, the increase in Portland's property crime rates and violent crime rates is in the wrong direction. Theoretically, the UGB should have lowered the crime rates by containing urban sprawl and centralizing more funds in the inner city. Vancouver did not have an UGB in place, so the observed outcome of higher crime rates for both property and violent crimes would be anticipated under a social disorganization model.

As noted, in Portland, the crime rate changes for both property crimes and violent crimes were statistically significant, but were not in the expected direction from a social disorganization perspective. In other words, according to social disorganization perspective, an increase in Smart Growth (minimizing sprawl) should be more indicative of a decrease in crime rates rather than the increase in crime rates that was observed. However, there appears to be a delayed effect in

Portland where there was an immediate increase in violent and property crimes; which later decreased to a new and steady state, although at a higher rate than the pre-intervention crime rates.

The availability of more suitable targets, a larger concentration of plausible offenders, and the lack of capable guardians would account for Portland's increase in property crime rates and violent crime rates immediately after the UGB was enacted. During times of economic revitalization, property crimes are known to increase (see Nelson et al., 2004). Hence, Portland's initial increase in property crime rates and violent crime rates is supported by routine activities theory and the slow decline in both offenses supports assumptions found in social disorganization theory. The key census data show that Portland's demographic information did not change significantly over time (see Appendix E for the table of that information and discussion of those variables). Additionally, the continued increase over time in Vancouver's property and violent crime rates supports social disorganization theory.

With regards to the collar cities, there was a statistically significant decrease in violent crime rates, which supports the UGB hypothesis. The collar cities reported a decline of 17 violent crimes per month per 100,000 residents after the UGB was enacted. The decline in violent crime rates in the collar cities is what social disorganization theory would predict. Additionally, since the property crime rates in both Portland and Vancouver were doubling during the post intervention period, the fact that there was no significant increase in the collar cities' property offenses arguably supports social disorganization theory, especially as the property crime rates continued to decline below those of the pre intervention level through 1996.

Additional scrutiny of the data might suggest that regardless of the UGB, geographically both property and violent crime rates were increasing in these areas. The UGB appears to have

slowed the violent crime rate growth in Portland when compared to Vancouver; thus, there could be an argument made that without the UGB, Portland's violent crime rates and those of the collar cities would have mirrored or even surpassed those of Vancouver.

Finally, in addressing the dramatic increases in Portland's and Vancouver's violence crime rates and property crime rates compared to the collar cities (collar cities had a significant decline in violent crimes and no change in property crimes); if the collar cities contained more influential neighborhoods, more of the cost savings from urban sprawl could have been directed towards crime reduction in the collar cities rather than being used to fund other programs often necessary in inner city environments (i.e., job retraining, mass transit initiatives, social welfare programs, correctional facilities, etc.). As property became limited and more costly, lower income families would have been forced out of the collar cities into either Portland or Vancouver, based on one's mobility. The tax base for the collar cities and the amount of tax revenue available to law enforcement agencies in the collar cities could have increased substantially as low income families were replaced by middle class and upper middle class residents. Additional research would be necessary to validate this last observation, although it does coincide with the data for this study.

Theory Implications

Theory, policy, and research should be intimately connected. Without one, the other two lose much of their significance. This research was exploratory and the first of its kind to examine the direct relationship between an UGB and crime. An UGB is clearly a land use policy, designed to prevent the uncontrolled outward expansion away from the central business district. Stopping the uncontrolled outward expansion will impede "white flight" and other resources, to include tax revenue and employment opportunities, from leaving the central areas. Constant

transition can be associated with social problems developing in that area from a lack of stability. In both theory and practical application, the UGB should have had an effect on crime rates.

Early theories regarding crime and the environmental factors have evolved greatly over time. Much of the research about this topic has remained exploratory, attempting to understand how certain changes in an area impact the residents. Early researchers, such as Guerry (1833) and Quetelet (1842), mapped crime. Their idea that crime rates and even specific types of criminal activities were related to geographical locations was confirmed. Later, Park et al. (1925) argued that there are five concentric zones surrounding a city created out of "competition, invasion, succession, and segregation", which is a continual process (p. 145). Limiting sprawl would not stop these processes, but rather alter them because the uncontrolled outward expansion of resources would be limited. Basically, as property values increased based on supply and demand, the zone of transition identified by Park et al. would be diminished from both sides as the city expanded outward and the suburbs were forced to expand inward.

There were significant changes in Portland's violent, property, and overall crime indexes. The significant changes after the implementation the UGB could be explained by routine activities theory. Routine activities theory posits that in times of economic prosperity there are more targets and thus more crime can occur (see Farrell et al., 2010; Nelson et al., 2004). The decline in Portland's crime rates after 1990 do align with social disorganization/ecological theories, suggesting that the true impact of the UGB was delayed for as much as 11 years, as developers redesigned less desirable properties within the UGB to support higher income residents. Ecological theory provided the theoretical link between the UGB and crime by looking at environmental factors, factors of social ills that the policy makers behind the UGB sought to prevent.

The collar cities did experience an immediate and significant drop in violent crimes only, while avoiding the increase in property crimes witnessed in both Portland and Vancouver. It is possible that the UGB helped the collar cities and surrounding areas more than the central city of Portland itself. The comparison city, Vancouver, experienced a similar crime increase in all areas that mirrored those observed in Portland through 1992. After 1992, Vancouver's reported property crimes increased dramatically while Portland's achieved a stochastic process, lower than the property crime rates reported in Vancouver over the last two years of the time period covered by this data. Vancouver's and Portland's reported violent crime rates over the last two years of the time period covered by this data are similar, with the exception that the trend in violent crimes reported by Vancouver is increasing, while the trend in the data for Portland indicates a decrease in reported violent offending.

Policy Implications

Theory and research should be utilized by legislatures for informed decision making, although the degree to which this actually occurs can be argued (Marion & Oliver, 2006). Politicians are elected as representatives of the people and to make decisions for the betterment of their constituents. The UGB policy severely limits where some residents may want to live—that is outside the UGB away from the city, which could be perceived as coercive (limiting where an individual can reside).

Dunn (2004) argued that there are eight stages of the policy-making process. Articulating the need for the UGB was covered in the Agenda Setting and Policy Formulation phases. The policy was adopted (phase 3) in 1973. It was not until 1979 that the land use policy of an UGB was implemented. It would appear that the policy assessment (phase 5) is the current phase with regard to Portland's UGB.

Marion and Oliver (2006) argued there are five steps to policy analysis: problem identification, agenda setting, policy formulation, policy implementation, and policy evaluation. Examining the crime rates over time is one way to evaluate the UGB policy. Currently, from a policy analysis perspective, additional research is necessary to produce a more definitive assessment of the UGB's relation to crime and other outcomes (property usage, costs, benefits, ethical issues, etc.) before policy makers can adjust or discontinue the UGB agenda.

Limitations and Strengths

Both the limitations and strengths of this study are related to UCR data and its availability. The limitations of UCR data are addressed first. Although it is a valuable tool in longitudinal research, UCR data have long been known for their shortcomings. UCR data are reported in a hierarchical format with only the most severe crime reported where multiple crimes have occurred. Further, some agencies do not report all categories of offenses. Human transcription errors can impact data accuracy even when reported to the UCR. Many crimes are not reported to the police (dark figures of crime), that are captured in victimization data. Crime definitions may not be the same across jurisdictions (Maltz, 1999). The data are aggregated at the city-level, but not all agencies in that jurisdiction report data to the UCR. Another limitation that should be noted, outside the UCR data, is that the city of Portland was chosen because it is a considered a national model in proper land use allocation. Selecting another city with a UGB and a different matching city may have produced different outcomes than those found in this study.

With all these limitations, UCR data often are the best (and only available) for addressing research questions as those related to this study. The UCR data are well designed for legal impact studies, where continuous observations are required over time. Further, UCR data can be merged with other data such as Census data to determine crime rates. The UCR data set for this

research had more data points than were recommended as a minimum by Shadish et al. (2002). Finally, the crime data in this data set were available for Portland, the collar cities, and Vancouver. Additionally, the UCR has the data available for future studies in different locations for comparison to the results of this study.

Suggestions for Future Research

Limitations in any research are inevitable. Limitations are rarely mentioned in many research articles and when they are they do not go beyond the obvious, such as generalizability and sample size. Limitations must be rightfully acknowledged. What follows is a review of how the current research could be improved upon and possible future directions to better our understanding between an UGB and crime. Researchers must constantly ask themselves how can the limitations be overcome and what are the new directions for research to take?

It is possible that UGBs effective for one particular city in reducing sprawl and crime may not be effective in another area or city; thus, generalizability always is questionable. UGB laws developed and effective in Portland may have the same impact if implemented in Vermont. This limitation can be overcome by examining more locations and identifying the specific components of each UGB law. Additionally, researchers can narrow their focus to assess the impact of growth boundaries by design—open, closed, or limited boundaries (see Nelson et al., 2004). The narrower focus would enhance the internal validity of the findings about the plausible relationship between UGBs and crime. The trade-off for enhancing internal validity in this manner would be the loss of external validity in relating the findings to other areas especially if their UGB policies differed significantly.

New methodologies, such as geo-coding, can provide a more useful analysis. Geo-coding is the idea of being able to place a crime in a nearly exact location. This is the modern

computerized version of the old pin map used for tracking crimes. Instead of placing a pin along a road way approximately where the incident occurred, an eight digit grid coordinate using GPS can identify the location of the incident within 10 meters and can actually stack multiple occurrences of crimes within the same location. Without being able to geo-code the data, data are limited when aggregated by city level. Areas, such as neighborhoods change over time. Neighborhood boundaries change and this would affect the composition of the neighborhood and thus crime. Future research can examine crime by neighborhood. Crime by neighborhood is available from the Portland Police Bureau in an online format (see the website portlandonline.com/police/index). These data are monthly, but do not start until 1996. Future research may separate crime by precinct.

Future research also can examine crime using a GIS approach. If the data were geo-coded, more complicated analysis could be done to understand the UGB and crime locations. Spatial statistics are possible with GIS data (see Chainey & Ratcliffe, 2005, chapter 5). These approaches include the mean center where the average of the crimes that are occurring by x and y coordinates. The standard distance is similar to standard deviation, but graphically represented. The last example is Moran's I, which is statistic that shows if clusters exist. Chainey and Ratcliffe utilized FBI data for the year 2002 to show that burglary rates are not randomly dispersed—they are clustered in the southern states. Research also could examine the addresses of the crimes (violent/ property), the addresses of the victims, or even the number various establishments in an area (i.e., bars, warehouses, parking lots, abandoned buildings, schools, parks, playgrounds, etc.).

Future research could integrate date from GeoLytics. GeoLytics is a company that aggregates U.S. Census data. With this data, it is possible to map changes over time with key

census variables. Further, matching or linking variables allows for more complex analysis of crime over time.

Future research also may want to utilize real estate information, such as land values. Realtors, by the very nature of their jobs, have to know areas. This includes which areas are "good" and which are "bad". Other information about an area may come from store owners, banks, and residents themselves. For example, Bayoh et al. (2006) and Lycan et al. (1978) surveyed people as to why they moved from an area and why the chose another. Future research could be applied to those living in and near the UGB. The focus on quantitative research is but one approach. Using qualitative research, residents can be asked why they stay in undesirable locations (see Glaeser et al., 2008). Qualitative interviews can be conducted with residents, police, or even city planners. Qualitative interviews could be completed with city planners and people who work at the Metro as to why certain decisions related to the UGB were implemented or dismissed.

Conclusion

Theories will constantly evolve through testing and assimilation of other research findings. For example, Wilson's (1987) arguments about the relationship between disadvantaged areas are widely cited. However, recent research published as of December, 2011 have raised questions about research examining the relationship between poverty and crime. Hipp and Yates (2011) argue that much of the extant research in this area assumed that the relationship between disadvantaged areas and crime was linear; they argue the linear assumption is inaccurate. They concluded 24 years later that Wilson's arguments were not as robust as previously thought.

There is a paucity of research addressing the impact of UGBs and their relation, if any, to crime. The mixed findings from this research and its restrictive geographical limitations offer a

limited understanding of the impact Portland's UGB might have on crime rates. Future research needs to focus on what is significant and also what is not significant. The UGB policy makers sought to revitalize the area of Portland through smart growth. In an attempt to control the social ills of an area and thus crime, the UGB was placed around the region. There was, however, an increase in crime instead of a decrease. It is unlikely that the UGB will be removed because it is financially viable for the Portland region. Policies do not last forever; they will change over time (Palumbo, 1994). Some changes already have occurred. For example, land owners are seeking compensation through Measure 37 because the value of their land has plummeted because it lies outside the UGB, making it worthless for development (see Grout, Jaeger, & Plantinga, 2010).

Clearly there can be unintended consequences and future research should examine both the benefits and harms associated with UGBs, along with which UGB components appear effective and which are superfluous. This research offered very limited understanding about Portland's UGB as it related to crime reduction, but offered a starting point for future research designed to evaluate why violent crime was reduced in the collar cities and collar city property crime was held constant, although both violent crime and property crime in Portland increased significantly. Did the UGB increase the amount of residents entering Portland's zone of transition; thus, increasing Portland's property crimes and violent crimes, while reducing those in the collar cities? Did the UGB force those lower income residents to transition to Vancouver for lower cost housing; thus, enhancing the chances of victimization and causing Vancouver's property crimes to skyrocket? This research, although offering limited answers about the relationship between Portland's UGB and crime has identified several questions that now need to be addressed in future research. As Einstein noted, "If we knew what we were doing, we wouldn't call it research**,** would we?"

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APPENDIX A

Smart Growth Principles

Downs (2005, p. 368) Smart growth principles

1. Limiting outward extension of new developments in order to make settlements more compact and preserve open spaces. This can be done via urban growth boundaries or utility districts.
2. Raising residential densities in both new-growth areas and existing neighborhoods.
3. Providing for more mixed land uses and pedestrian layouts to minimize the use of cars on short trips.
4. Loading the public costs of new development onto its consumers via impact fees rather than having those costs paid by the community in general.
5. Emphasizing public transit to reduce the use of private vehicles.
6. Revitalizing older existing neighborhoods.
7. Creating more affordable housing.
8. Reducing obstacles to developer entitlement.
9. Adopting more diverse regulations concerning aesthetics, street layouts, and design.

APPENDIX B

Social Disorganization

Theoretical Development of Social Disorganization/Ecological Theory

The Chicago School concept in criminology developed from early researchers who worked for the University of Chicago (Bernard, Snipes, & Gerould, 2009). As the positivist tradition in criminology expanded, the Chicago School researchers focused their attention on the environment and factors that were conducive to crime; factors that fall under the general idea of social disorganization. For these researchers, the city was seen as a living entity that could be studied through both observation and official statistics. Words, such as symbiosis, were borrowed from other disciplines, such as biology. The term symbiosis was found in the natural science literature to describe various interactions in the plant and animal kingdoms. The Chicago school researchers (e.g., Park, Burgess, and McKenzie, 1925) found the term appropriate in the social sciences to describe the process of humans living together for the mutual benefit of each other.

Before the Chicago School, researchers focused on the individual, with existing theories focusing on biology and psychology. After in inception of the Chicago School, researcher began to focus on the environment and its influence on behavior. When examining the environment, researchers found that crime and social problems consistently revolve around certain locations (Sampson, Raudenbush, & Earls, 1997; Shaw & McKay, 1942). It was believed that the characteristics of an area made the area conducive to criminal activity. In many cases, the location or the unit of analysis in the research was the neighborhood and distance from the central business district.

Often, the neighborhood or census tract was examined in terms of poverty or percent unemployed among a host of other variables. It was clear that areas varied by degrees in these dimensions. Not all areas have the same rate of poverty, nor do they have the same levels of crime, nor should it be assumed that crime is stable. Further, some neighborhoods have a stigma of having a bad reputation due to the high level of poverty and crime (Sampson, 2002). Researchers have argued that people know there are "bad parts" to a city as well as "good parts", and that people intuitively know what makes an area bad, such as high unemployment, signs of disorders, and incivilities that occur in that area (Paternoster & Bachman, 2001, p. 113). The environment is the key to understanding crime in the theory of social disorganization. The environment often is framed as "neighborhood effects", that is the effect of the neighborhood on other concepts.

A good starting point to begin the discussion of the development of social disorganization theory is with early French cartographers. Early researchers, such as Guerry (1833) and Quetelet (1842), utilized cartographical approaches on an aggregate, or macroanalytic level, to examine the social factors that increase the propensity for crime. Working separately but towards the same goal of understanding the environment with relation to crime, Quetelet and Guerry utilized population statistics to examine the temporal and geographical distribution of violent and property crimes in France. Upon mapping the distributions of crime, they found that property crimes occurred more frequently in areas of wealth. In addition, they found that crime increased during the summer. Upon examining violent crimes, Quetelet and Guerry discovered that violent crimes were more likely to occur in lower socio-economic status areas. Areas with higher levels of poverty tended to also have higher levels of violent crimes, such as assault. In short, they were looking for the social factors that might have increased the propensity for crime. They

accomplished this by mapping both social characteristics of an area and the corresponding crime rates, which offered a better understanding about how environmental conditions in a geographical area related to crime.

Park et al. (1925) studied the development of a city and in doing so discussed the ecological aspects of a dynamic city, which included crime. They increased our understanding of social disorganization by building upon the knowledge of past research on plant and animal ecologies. According to ecological theory, plants and animals interact in an environment that impacts their being. Park et al. made the extension to humans by positing that the environment of the city played a key role in the presence of indicators of social disorganization. Park et al. argued that a city's level of crime can be related to a host of factors that included not only the mobility of residents and concentration of poverty left behind, but also church participation, school and family concepts, police practices, and the political environment. It is possible to see the forerunners of social efficacy in these ideas. These are ideas reflected in more current arguments noting the need of these institutions to be measured to understand how they promote positive environments and support networks.

Park et al. (1925), in studying the "growth of the city", proposed that the physical growth of a city resulted in concentric zones emanating from the center of the city. There are five zones that come from this urban expansion. Zone I is the center of the city, the central business district. Here, many of the central buildings that define a city are located, and as the name implies, many are related to business or industry making it unsuitable for residential life. Next to Zone I is Zone II. Zone II is the zone of transition and is the location of the highest indicators of social disorganization. The indicators of social disorganization taper off with transitions through Zones III (zone of working man's home), IV (residential zone), and finally Zone V (commuter's zone)

where social disorganization is lowest. The growing city is likened to an animal having a "metabolism" (p. 53). Drawing from their understanding of plant ecology, Park et al. (1925) argued that in cities there is "competition, invasion, succession, and segregation" that is a continual process (p. 145).

As cities grow, it is natural that the borders will extend outward (Park et al., 1925). The natural outward expansion has been called the "natural evolution theory" (Mieszkowski & Mills, 1993, p. 136). Just as the plant and animal kingdoms are in constant movement, growth, and interactions, so too are the neighborhoods that comprise the city. This process of movement, growth, and interaction has been described as being an "ongoing balance of nature" (Bernard, Snipes, & Gerould, 2009). In particular, the balance can be seen as competition over land within a city (Shaw & McKay, 1942). The basic premise is that there is competition over the land combined with a desire of people to leave the inner cities in search of better homes away from the central city. This process leaves lower valued land (where people do not want to live in the inner city) that attracts people who might settle for living in the undesirable locations next to businesses and factories.

Ogburn (1935) examined relationships that laid a foundation for ecological theory. Ogburn conducted a correlation analysis on data collected from 16 large cities, 24 mid-sized cities and 22 smaller cities. Many variables were found to be significantly related to crime, such as percent male, age composition, percent of children of immigrants, and percent foreign-born. There also were many inverse relationships with crime. For example, when rates of church membership decreased, then there was an associated increase in crime. Lower median rent, lower percent of homeowners, and lower SES areas were correlated to increases in crime rates. This study added to the understanding of the relationships among environmental factors and crime,

but the major limitation was that correlations were the highest level of analysis for the research. Earlier researchers did not have the capability to run robust multiple regression analysis, so they worked with what they had, each improving upon past research. For example, Shaw and McKay (1942) went one step further in that they added spatial and temporal analyses to the understanding of the environmental influences on crime.

Shaw and McKay (1942) continued the tradition of examining environmental relationships with their seminal research on juvenile delinquency within the context of the city. Shaw and McKay examined many environmental qualities and mapped them to find that location did have a relationship with indicators of social disorganization. Other variables that Shaw and McKay examined were related to areas that formed a pattern around the city. Variables such as court referrals, committed youths, police contacts, infant mortality, tuberculosis, mental disorders, percentage on welfare, median monthly income, percentage of home-owners, delinquency rates, and committed youths showed a spatial ordering. These variables can be categorized in three broad areas: physical status, economic status, and population composition (heterogeneity) of an area. It was not until Shaw and McKay's work that Park, Burgess, and McKenzie's ideas were tested as an explanation of crime. The findings of Shaw and McKay show that environmental concepts do have an impact on crime in an area. What is of particular importance is the vast array of ideas Shaw and McKay examined and the multiple data sources used that include court records, probation officer records, police records, and census data. Further, multiple years were analyzed to show that these spatial relationships were consistent across distinct time-periods in the history of Chicago's development.

Some neighborhoods have a stigma of having a bad reputation due to the high level of poverty and crime (Sampson, 2002). Researchers have argued that people know there are "bad

parts" to a city as well as "good parts", and that people intuitively know what makes an area bad, such as high unemployment, signs of disorders, and incivilities that occur in that area (Paternoster & Bachman, 2001, p. 113).

Appendix C

Portland's UGB and the Impact of Smart Growth Boundaries

In 1973, Senate Bill 100 (known as the Oregon Land Use Act) was passed giving notice to 242 cities in 36 counties to establish and maintain an UGB around the city's limit (Metro Regional Development, 2011). The UGB for Portland was not established until 1979. The UGB has greatly reduced the development of land outside the city's limits (Orfield, 1998; Wheeler, 2008). The Portland Metro has 20-year limits for development projections to be made. From 1979 to around 1997, approximately 2,500 acres were added to the land inside the original boundary (Orfield, 1998), which has been described by Wheeler (2008) as "effective" in limiting the rapid growth from happening around the city (p. 400). Similarly, Jun (2004) found empirically that the leapfrog development that was going on elsewhere in the nation was not occurring in Portland. Abbott and Margheim (2008) noted, "By helping to keep the metropolitan region compact, it [UGB] centers energy on downtown Portland and the inner neighborhoods that give Portland its unusual center" (p. 197).

Portland's Metro is an elected regional planning government controlling the development of land around the Portland area. The jurisdiction of the Metro covers three counties in Oregon (Clackamas, Multnomah, and Washington counties) and oversees 1.5 million residents (Metro Regional Government, 2011). The Metro Regional Government, or Metro, is comprised of seven councilors from six districts, each elected to the position. They are tasked with long-term planning and overseeing the UGB that surrounds Portland. The Metro is unique for "it has the only directly elected regional government in the United States" (Song, 2005, p. 242). This elected body decides where and how land is developed with regard to the UGB. Having elected officials making decisions is not the same as direct democracy initiatives that are found in other

areas, such as California (Gerber, & Phillips, 2005). The elected body has more control and is able to be more flexible if needed. In 1998, 3,500 acres were added to support development of the city (Metro Regional Government, 2011).

Over time, Portland's Metro has been able to slowly add acres of land to be included within the UGB when development was legislatively deemed to be necessary. In 1999, 380 acres were added. In 2002, 18,867 acres were added. In 2004, 1,956 acres were added, and 345 acres in 2005 (Metro Regional Government, 2011). In short, these are controlled additions to the perimeter of the existing UGB and these additions were in the tradition of smart growth. Smart growth seeks to effectively utilize resources and prevent uncontrolled sprawl through higher concentration of people per area and controls on the land.

In 1995, Sampson and Wilson articulated the need to examine innovative ideas when it comes to the environment and crime, including "macrolevel public policies regarding housing, municipal services, and employment" (p. 54). Current researchers are meeting the "fruitful areas of future inquiry" of which Sampson and Wilson (1995, p. 54) wrote. To this end, researchers have merged data sets and found new ways of extending the discussion on environmental factors and crime. This research will extend this discussion to include UGBs, which places a new dynamic on city-level interactions. To do this, the city and its areas need to be examined. Orfield (1998) noted "metropolitan areas are generally divided into the following sub-regions: 1) the central city, 2) socioeconomically declining inner suburbs, 3) outer-region satellite cities and low-tax capacity developing suburbs, and 4) commercial, high-tax capacity, developing suburbs" (p. 25). Taylor (2001) noted, "desirable locations were always at the outer edge of the expanding city" (p. 127). There are many areas of a city to be studied and the impact regional planning initiatives may have on an area.

With city planning, “sometimes coercion is needed” (O’Toole, 2007). This quote is in reference to placing an UGB around a city. People are, in a way, coerced through the UGB legislation. Bolick (2000) called the smart-growth legislation a “dirty, unstated secret” that uses “coercion” to eliminate “free individual choice” (p. 860). There is no motivation required for sprawl—it is obvious that it is self-propelled, but motivation through legislation is needed for anti-sprawl efforts. In a survey measuring the approval of UGBs, Portland’s residents overwhelmingly expressed their support (Harvey & Works, 2002). It was found that 77% of those in rural areas believed the UGB to be an important factor in maintaining their quality of life. A majority of residents (62%) reported that living close to the UGB was either very positive or positive. It would appear that many people surveyed in Portland view the UGB in a favorable light.

Smart Growth Impacts

If sprawl is one end of a continuum marking waste of resources then smart growth is on the other end of that continuum marking efforts to promote thoughtful use of existing resources and promoting well-being in an area. Smart growth covers that following principles:

1. Limiting outward extension of new development in order to make settlements more compact and preserve open spaces. This can be done via UGBs or utility districts….
6. Revitalizing older existing neighborhoods. (Downs, 2005, p. 368, see Appendix for complete list of smart growth principles).

Since sprawl is related to negative outcomes, then smart growth could potentially stop some of those negative outcomes from occurring (Wassmer, 2006). The following are empirical studies on smart growth and its affects. Landis (1992) reported that growth controls do not work and have limited effects. This opinion is a minority opinion with much of the limited research on

smart growth saying there is an effect. The question one has to ask is: can a law impact an area? Simply answered, the research says urban containment policies can have both positive and negative impacts. First, the literature on the positive effects of UGBs is reviewed, then the negative effects are discussed.

Nelson et al. (2004) sought to understand the impact of urban containment on central-city revitalization. Using data from 144 central cities that had containment policies (open, closed, isolated) and 326 comparison cities, the authors found support that urban containment boundaries are related to revitalization of central-city areas. Containment policies were found to be related to a significant difference in the mean number of residential units constructed per 1,000 residents. Contained areas had a mean number of 150 ($p<.01$) while uncontained areas had 110. This means that more homes were being development in the contained areas. Further the mean value of nonresidential (i.e. business) construction per capita was significantly larger for the central-city areas with contained policies ($ 4,210 vs. $3,203, $p<.01$). This means that the areas are significantly worth more. Central-city areas with containment policies had significantly more per capita investment, higher levels of investment, more construction per capita, and more residential unit built than uncontained areas. The regression models for the dependent variables (number of units per capita and value of construction per capita) showed that the presence of containment programs was a significant factor while holding other variables (demand for housing, development opportunities, development costs, quality of life/crime, and metropolitan area controls) constant. Nelson et al. concluded that their research findings that central-city revitalization is related to containment policies is an important step in understanding this complicated and understudied area.

Cho, Chen,Yen, and Eastwood (2006) examined the impact of an UGB in Tennessee. Utilizing census data and county utility data, the authors examined the relationship between developed parcels and the UGB. They found that land parcels were more likely to be developed in the central city (Knoxville) after the implementation of the UGB, but not in the adjacent city (Farracut). Cho et al. conclude that "the UGB of Knox County seems to be successful in urban revitalization" by promoting inward growth of land parcels (p. 296).

Woo and Guldman (2011) reiterated the point made by early ecology theorists—that development emanates from the central-city areas outward. They wanted to see the effects of urban containment on population and employment distributions. Utilizing census data from the year 2000 for 135 metropolitan areas, Woo and Guldman included many variables into their models, including population, employment, socioeconomic variables (income), housing characteristics (homeownership and vacancy rate), transportation characteristics, government financing, and land use regulations. Areas with state UGBs had significantly higher house values ($137,240) than did uncontained houses ($86,053). There were also significantly fewer vacancies in the metropolitan areas with state UGBs, as well as the houses being significantly newer. This does suggest revitalization and urban renewal because of a relative lack of land to development. A higher percentage of growth occurred in areas with state UGB (25.39%) than did uncontained cities (13.02%) from 1990-2000. Further, the development was more compact as residential and economic activities occurred in the same locations in state UGB areas. The authors concluded that state UGBs were promoting revitalization over uncontained areas. This study is robust in its methodology utilizing both uncontained areas and various containment policies (local urban service area, local UGB, and state UGB; see pages 24-26). However, a limitation is that the precise implementation of the containment policy was not accounted for.

Carlson and Dierwechter (2007) examined the impact of an UGB on Pierce County, Washington. They used building permit data that could be geocoded to the exact location. This approach eliminates the modifiable areal unit problem (MAUP) that could occur when looking at data on the aggregate. Simply put, when data is aggregated, relationship could be lost or found depending on the level of aggregation (Chainey & Ratcliffe, 2005). The kernel density approach allowed for a visual representation of the density of the building permits over time. Carlson and Dierwechter noted the advantage of the approach—it has "temporal, spatial, and practical advantages" (p. 216). Of course, access to such data is not universally available. The authors found that when graphing building permits over time, there was a sharp increase in the number of building permits inside the UGBs after the implementation of the UGB in 1995, with a corresponding sharp decrease in the number of building permits outside the UGB.

Wassmer (2006) sought to examine the relationship between urban containment policies and land development in square miles. Utilizing census data for 452 urban areas and controlling for other variables, the authors found that urban containment polices reduced the square miles of land developed in the area. Factors controlled for were based on traditional theories, such as "natural evolution" (i.e., population, income, etc.), "flight from blight" (i.e. crime, age composition, race, etc.), "and fiscalization of land use (i.e. revenue, taxes, etc.) (p. 36). Even when controlling for these factors, compact growth is promoted when urban containment policies are in existence.

In summary, there are positive factors associated with urban containment polices, such as preservation of land (Pendall et al., 2002); central-city revitalization (Nelson et al., 2004); housing development directed inward (Carlson & Dierwechter, 2007); and less square mileage of

land developed (Wassmer, 2006). These studies have shown empirically that smart growth can have positive impacts in an area.

Limiting sprawl brings forth opposing arguments. In theory, containing the boundaries leaves more money for city planners and an overall revitalization of the central city area (see Nelson et al., 2004). Containing an area promotes and allows for more efficient use of police and emergency services, but could cause negative outcomes for those living in the urban containment policy areas. What follows is a review of the alleged negative impacts of land use planning.

Limiting land for development may be another concern for those who wish to have choice in where to develop land. O'Toole (2007) argued that smart growth is related to an increase in housing costs, congestion, difficulty of businesses finding new land to build upon, and an increase in crime because of connectivity. Here, one can see opportunity and relative ease in reaching a location to commit a crime (see Brantingham & Brantingham, 1981, 2008). Further, O'Toole argued that there are two entities fighting over the resources. The first is the central city officials who argue that sprawl directs money away from their areas and thus should be curtailed. The suburban areas would not be complaining if they were the recipients of money diverted from central city areas. Between the two exists a rivalry where there is competition over mass transit and where houses are built. Second, there also are people who are harmed by smart growth. O'Toole (2007) argued that people can lose freedom of choice of where they wanted to live with growth boundary restrictions in place as well as increases in the costs of homes. For example, with land area available for housing remaining relatively constant and increases in population, the price of land would increase. Others harmed are those who own land outside the boundary and cannot develop it. If land inside the UGB can be developed, it would be worth

much more to the owners than land outside the UGB that cannot be developed. In 2004, Measure 37 provided compensation for those affected by the UGB (Marin, 2007).

O'Toole (2007b) utilized housing data to conclude that there is an increase in costs of houses in urban containment areas. According to O'Toole, this cost can be upwards of $130,000 or more, with a $70,000 to $90,000 increase in Oregon alone. O'Toole argued that there is no clear way to govern an area, but urban containment policies is not the way to go. The argument made is clear: if the demand is constant, and the supply of land decreases, then the cost of housing will increase. O'Toole calculated the housing prices to income ratios for states between the years 2000-2006. Not surprising, Hawaii's was 8.7, meaning that housing was 8.7 times the average income made by a person; in other words, housing is very expensive. On the low end of the ratio was the state of Indiana with a ration of 1.8. North Dakota tied with Indiana as being the most affordable place to buy a home. Oregon came in at 4.4, while Pennsylvania was a 2.7. Further examination of the data allowed O'Toole to find "None of the 18 states with the most affordable housing have passed growth-management laws" (p. 8). In short, O'Toole found that regional planning is related to higher housing costs.

Supply and demand factors are numerous (Levine, 1999). Supply factors include the price of the land and the price to develop the land, in addition to access to community amenities (Levine). On the demand side, population growth is the key factor in land development. Further, Levine said money is needed for development. Besides supply and demand factors, policy (urban containment policies and land use policies) is a third broad area affecting the price of housing. Levine utilized survey data (from 490 California cities and counties) and census data to measure the types of growth management used by area planners and how that impacts cost of housing and other census variables. Levine lagged the variables by yearly increments because "The measures

would be assumed to take time to have an effect on housing supply" (p. 2054). Levine found that growth management measures were related to fewer rental units and fewer instances of home ownership in the area. Housing prices were increased and fewer families were living in the growth managed areas. Further, fewer black people were living in the growth managed areas and median income levels increased in the growth managed areas. Levine argued that minorities may be displaced due to the excessive rental prices and minorities are more likely to rent. It would seem that growth management policies can impact an area.

In summary, the negative effects of smart growth strategies such as UGBs have negative impacts on the surrounding communities. Currently, there is a paucity of research that addresses the intersection of UGBs and crime. Research about the relationship between UGBs and crime is essential due to the lack of research on the two concepts and the fact that there are increasing boundaries being implemented across the U.S. (Wassmer, 2002, 2006).

Appendix D

Factors Promoting Sprawl: Poverty, Heterogeneity, and Mobility

Factors Promoting Sprawl: Poverty

Poverty is one factor that continues to concentrate when sprawl occurs (Orfield, 1998, 1999). Galster (2005) argued that how well a metropolitan area is organized will be related to how the poor households are spread out. In a way, this is akin to the argument that the solution to pollution is dilution. Shaw & McKay (1942) argued that, "The relentless pressure of economic competition forces the group of lowest economic status into the areas which are least attractive" (p. 21). Filtering is the second way researchers view suburbanization, while a natural growth is the first (Mieszkowski & Mills, 1993). People want to live with others of the same income or socioeconomic status (Mieszkowski & Mills, 1993). Filtering is the outcome. Filtering means that the poor are relegated to a certain area because they cannot afford to live elsewhere.

With poverty comes crime. Short (1991) has argued that, "The linkage of poverty and crime is inexorable" (p. 501). Although poverty and crime can be measured in many ways, the relationship is consistent (Hsieh & Pugh, 1993). Empirically, much is known about poverty and crime. For example, extreme poverty and homicide show a strong relationship (Baumer, 1994). Joblessness and family disruption are related to homicide (Almgren, Guest, Immerwahr, & Spittel, 1998). Further, high school drop out rates, unemployed men, underclass (low income, poverty rate, and AFDC rate), and divorce rates all predict homicide rates (Crutchfield, Glusker, & Bridges, 1999). Rape, homicide, and aggravated assault can be predicted by the economic deprivation in an area, as well as the number of bars and recreation centers present (Peterson, Krivo, & Harris, 2000). Lee, Maume, and Ousey (2003) found that the disadvantage index was significant to homicide in both metropolitan and non-metropolitan areas. Even calls for service

for police are related to poverty and heterogeneity in an area (Roh & Choo, 2008). Disadvantaged neighborhoods predict victimization rates (Browning & Erickson, 2009). Beaulieu and Messner (2010) found that extreme deprivation and divorce in an area had great positive effects on the levels of homicide. Lastly, Mazerolle, Wickes, and McBroom (2010) found that the proportion of low-income houses predicted violent crimes.

Poverty is not a simple concept and it is more complicated than it first appears (Wilson, 1996). It has been found that in areas of extreme disadvantage, crime will increase not in a linear fashion but in an exponential way (Krivo & Peterson, 1996). Pack (1998) pointed out the fact that "poverty is far from evenly distributed within metropolitan areas and among cities" (p. 1998). That is, poverty is located in certain areas. In white communities unemployment is not related to poverty, but in minority areas it is (Sampson, 2009).

Factors Promoting Sprawl: Heterogeneity

Heterogeneity is another key component to understanding the influence of environmental factors on crime in an area. Heterogeneity measures differences among people, a difference in the ethnicities and races of those living in a particular area. The idea is that different ethnicities living together may not have the same focus or goals, thus social control is undermined and breaks down in a neighborhood, and this leads to crime (Shaw & McKay, 1942). Heterogeneity, in effect was white flight, leaving behind ethnicities and a general lack of caring for the central city area. A frequently cited, but not universal, mathematical equation of heterogeneity is $1-\sum_{pi}^{2}$, where p is the proportion of a particular racial group (i) (Blau, 1977), and values range is from 0-1. The lower the score, the closer or more homogenous the population, while the higher the score, the more heterogeneous the population. It is important to note that the Blau index is just one way to measure heterogeneity.

Sampson and Wilson (1995) made the critical observation that "blacks and whites face vastly different environments in which to live, work, and raise their children" (p. 43). They proposed a theory of urban inequality to explain the disproportionate victimization of minorities in the city. They contend that the isolation of races leads to concentrations of social ills, which leads to crime and victimization. If an area had 100% of one race, then there would be no heterogeneity, and presumably residents would more easily come together to identify and solve common problems.

Empirically, much also is known about heterogeneity. Kennedy and Silverman (1985) found that neighborhood perceptions of differences (e.g., heterogeneity, age, income, education, and housing type) were related to feelings of uncertainty that led to feelings of fear of crime that residents reported having from one another. Yang (2008) found that respondent satisfaction of the neighborhood was higher in neighborhoods comprised of a higher number of white people. Lee and Thomas (2010) found that in rural communities as heterogeneity decreases there were less rates of change in crime from 1980-2000. Browning (2009) found a relationship between immigrant concentration and property crime and disorder. Guest, Kubrin, and Cover (2008) surveyed respondents and found that heterogeneity was negatively related with each of the feelings of trusting and helping their neighbors, as well as feeling of calmness in their area.

Previous research has linked heterogeneity to other social concerns, to include: crime (Laub, 1983; Watts & Watts, 1981); social disorder (Browning, 2009); aggravated assault (Olson, Laurikkala, Huff-Corzine, & Corzine, 2008); neighborhood watch program implementation (Hirschfield & Bowers, 1997); violent crime (Cahill & Mulligan, 2007); drug markets (Martinez, Rosenfeld, & Mares, 2008); social order, physical order, and crime (Hipp, 2007); more changes in rates of crime over time (Lee & Thomas, 2010); and homicides in cities

(Weisheit & Wells, 2005). Heterogeneity was operationalized in many ways in these various studies. Heterogeneity has been defined as the percentage of immigrants (Nelson & Martinez, 2009), the percentage of the population that is non-white and Spanish surnamed (Watts & Watts, 1981), the percentage of Latino and foreign-born (Browning, 2009), and the dual approach of the percent age of non-white and the Blau (1977) heterogeneity score (Weisheit & Wells, 2005).

Heterogeneity can be an interesting variable with findings that can go against what social disorganization theory would predict. For example, Wyant (2008) found no relationship between heterogeneity levels and fear of other neighborhood residents. Further, Warner and Pierce (1993) found that heterogeneity was predictive of high crime in high SES areas, while heterogeneity was related to low crime in low SES areas. Similarly, the percentage of foreign born was found not to be related to homicide (Graif & Sampson, 2009).

It has been argued that white people live in better areas, or areas of less disorder, while minority populations tend to live in more impoverished areas (Massey, Condran, & Denton, 1987; Sampson & Wilson, 1995). Heterogeneity, along with poverty, has been shown to be a predictor of crimes in a variety of circumstances. Diversity leads to feelings of uncertainty about interacting with people in an area, which can lead to fear of others (Kennedy and Silverman, 1985). Fear in turn may lead to residents being withdrawn (Skogan, 1990). Another variable that is related to residents being withdrawn is mobility, which can result from residents fearing an area and wanting to live in what they believe to be a better area, based on lower taxes and less crime (Burchell et al., 2005; Skogan, 1990).

Factors Promoting Sprawl: Mobility

Mobility is the idea of people voluntarily moving into or out of a location, often in an attempt to better their lot in life. When thinking about mobility, on a fundamental level, there is

the idea that high turnover in an area could be related to a lack of caring and to a lack of investment. There is a lack of stability in the neighborhood. If people are renting apartments on a short-term basis they may not become attached to the community and they may not become involved in the community, and they may not care about the community as much as a person who buys a home and has made a more long term investment into a community (Kasarda & Janowitz, 1974). For example, as home ownership increased, so did collective efficacy (Mazerolle et al., 2010). This means that the homeowners were willing to get involved in their community. Skogan (1990) found that as stability increased, the level of disorder in a community decreased. Further, he found that as surveillance increased, disorder decreased. Kasarda and Janowitz (1974) found that people with higher SES had fewer friends living in their neighborhood. The following studies in this section explain the relationships between mobility and crime.

There can be many reasons for moving to the suburbs, such as wanting a better house, having lower taxes, better schools for the children (Burchell et al., 2005; Miezskowski & Mills, 1993), or perhaps there are other reasons. Skogan (1977) found that suburbanization was highest around high crime cities and made the argument that "suburbanization reflects the social stratification system", where the lower SES residents are relegated to the central city areas (p. 44). Researchers have suggested that mobility is related to social economic status stratification (Stark, 1987, Orfield, 1998, Wilson, 1996). Income, not race, is the driving force behind some suburbanization (Fischer, 2003). This finding supports Shaw & McKay's (1942) examination of social disorganization in that lower rents are located in undesirable locations.

More recently, in an attempt to understand the relationship between mobility and crime, Sampson (1988) found that one's attachment to community decreased as mobility increased.

Further, Sampson found that urbanization caused a decrease in friendship and civic engagement. Browning, Feinberg, and Dietz (2004) found that residential stability was inversely related to victimization. Lee and Thomas (2010) found that as mobility decreases, crime decreases and the level of civic engagement increases. Ellen and O'Regan (2009) examined crime in 278 U.S. cities and the suburbs surrounding the cities and found that as city crime rates declined, so did the suburban crime rates. The authors attribute the positive changes in crime to mobility of residents and the spreading out of concentrated poverty (p. 29). Ellen and O'Regan (2008) found that residents of central-city neighborhoods experienced a "reversal of fortune" from 1970 to 2000 meaning the central city area can become a better place to live (p. 856). Yang (2008) found that as mobility increased in an area neighborhood, then satisfaction decreased. Further, as density and mixed land uses increased, satisfaction increased in Portland, but not in Charlotte. Density does come at a financial cost; the higher the density, the higher the housing costs (Song & Knaap, 2004).

In summary, poverty, heterogeneity, and mobility have shown their usefulness in predicting crime through the social disorganization/ecology paradigm. It seems plausible that there is less investment in an area when there exists high levels of poverty. Aggregate minority status also seems plausible as a variable to predict a lack of investment in an area. It would seem that people who are only present in an area for a short time-period are less invested in the community. Taken together, these are key variables measuring the well being of an area as measured by census data.

APPENDIX E

Portland Census Data (1970 – 2000)

Key Census Variables for Portland, Oregon

	2000	1990	1980	1970
Population	537,081	437,319	366,383	382,619
Persons under age 18	21.1%	21.9%	21.8%	27.8%
Persons 65+ years old	11.6%	14.6%	15.3%	14.8%
White persons, percent	77.9%	88.18%	86.5%	92.2%
Minority/other	22.1%	11.82%	13.5%	7.8%
Living in same house (past 5 yrs)	45.0%	45.99%	47%	50.6%
High school graduates+	85.7%	82.9%	75.8%	60.4%
Median Family Income (in 2006 dollars*)	$60,832	$52,715	$54,152	$53,828
Persons below poverty	13.1%	14.5%	13.0%	12.5%
Unemployment rate	6.5%	6.2%	6.9%	6.6%
Homeownership rate	55.8%	52.9%	53.3%	56.5%
Land Area (square miles)	134.3	124.7	103.3	89.1
Density per square mile	3,939	3,507	3,547	4,294

Sources: 1970, 1980, 1990, and 2000 U.S. Census Data *as reported in SOCDS Census Data from the U.S. Department of Housing and Urban Development (n.d.)

Examining key census data allows for and understanding of how the city of Portland has changed from 1970-2000. Poverty variables included median family income (reported in 2006 dollars for a meaningful comparison to be made), persons below the poverty level, and the unemployment rate. These are all variables that have had a robust empirical relationship with crime. In is evident from the data that these variables are relatively constant before and after the implementation of the UGB. Heterogeneity is the percent of different races per area as measured by percent white in the Portland area. Again, this is relatively stable also. Mobility or stability of an area is the percent of the residents living in the dwelling five years ago. This too was a stable variable over time.

Poverty is a major indicator of the health of an area. Poverty of Portland, Oregon is described as the percent unemployed, the percent below the poverty line, and median family income. Heterogeneity is another key indicator of a city (as discussed *Supra*). For example, one can see that in 1970, Portland's racial composition was 81.1% white and 16.1% black (U.S. Census, 1972). The percent white will be the definition of race in an area because it was only in more recent decennial census questions that Hispanic was added. Mobility is a measure captured by the Census. It is a percentage of residents that have lived in an area for five or more years. Lower percentages would mean that people are moving into and out of the area, indicated an overall lack of commitment to the area. Mobility is a measure of the time spent at an area and also the migration patterns from state to state. Here, the percent of the residents who lived in an area in the past five years provides a proxy for commitment for an area. In a way, the longer and higher the percentage of the population that lives in an area, the more committed they could be. Conversely, if an area consisted of a large portion of renters, they may not be involved or care as much as people who have 30-year mortgages.