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URBAN REVITALIZATION AND SEATTLE CRIME, 1982–2000

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Abstract

This study examines the relationship between crime and processes of urban revitalization, or gentrification. Drawing on recent urban demography research, we hypothesize that gentrification progressed rapidly in many American cities over the last decade of the 20th century, and that these changes had implications for area crime rates. Criminological theories hold competing hypotheses for the connections between gentrification and crime, and quantitative studies of this link remain infrequent and limited. Using two measures of gentrification and longitudinal tract-level demographic and crime data for the city of Seattle, we find that many of Seattle's downtown tracts underwent rapid revitalization during the 1990's, and that these areas 1) saw reductions in crime relative to similar tracts that did not gentrify, and 2) were areas with higher-than-average crime at the beginning of the decade. Moreover, using a within-tract longitudinal design, we find that yearly housing investments in the 1980's showed a modest positive association with crime change, while yearly investments in the 1990's showed the opposite pattern. Our findings suggest a curvilinear gentrification-crime relationship, whereby gentrification in its earlier stages is associated with small increases in crime, but gentrification in its more consolidated form is associated with modest crime declines. Implications of these results for criminological theory, urban development, and broader crime patterns are discussed.

Keywords

Gentrification; Revitalization; Crime; Communities; Neighborhoods

For over a century, macro-level explanations of urban crime have been central criminological concerns. Beginning with Clifford Shaw and Henry McKay's (1931) seminal Chicago studies and spurred by William Julius Wilson's (1987) conceptualization of "the urban underclass," researchers documented the deleterious effects of poverty and structural isolation on inner-city communities (Bellair 1997; Lauritsen 2001; Krivo and Peterson 1996). More recently, Robert Sampson, Stephen Raudenbush, and Felton Earls' (1997) concept of "collective efficacy" galvanized the field, generating a spate of studies linking

informal social control processes to aggregate rates of crime and delinquency (Browning, Feinberg, and Dietz 2004; Morenoff et al. 2001; Sampson et al. 1999; Sampson and Raudenbush 1999). Studies in this vein widen our understanding of neighborhood heterogeneity and point to the often-strong correlations between community characteristics and area crime rates.

Although productive, urban studies continue to offer little help in understanding changes in crime and shifts in the city landscape (Bursik 1988; Bursik and Webb 1982; Hipp 2010; Kubrin and Herting 2003; Sampson, Morenoff, and Gannon-Rowley 2002). This is surprising, given the centrality of structural change for Shaw and McKay's (1931) social disorganization theory and the urban ecology models originating from the University of Chicago (Park and Burgess 1921). For the pioneers of urban research, rapid city growth accompanying industrialization disrupted inner-city social institutions and promoted criminogenic conditions (Bursik and Webb 1982; Taylor 1988). For example, Robert Bursik and colleagues (Bursik 1984, 1986; Bursik and Webb 1982; Heitgerd and Bursik 1987) found that unexpected shifts in community structure—such as increasing unemployment and minority concentration—corresponded with shifts in Chicago-area crime rates from the 1930's through the 1960's. Community dynamics also lay at the core of Wilson's (1987) theory of urban black isolation, with the loss of industrial jobs at mid-century encouraging white flight and the concentration of black residents in areas of disadvantage. Despite the amenability of social disorganization models to ecological change over time, few quantitative criminologists have approached community research with longitudinal data or dynamic models. The changing city may be particularly important for explaining metropolitan crime declines of the late 1990's (Bureau of Justice Statistics 2011). Instead of focusing on demographic shifts in the country's urban centers, criminologists have pointed to shifting drug markets or local police practices to explain crime drops, concepts that are difficult to measure at the neighborhood level and have been met with limited success (Blumstein and Wallman 2000; Zimring 2007).

In this article, we explore the link between changes in local crime rates and the dynamics of urban revitalization. Urban demographers document substantial downtown revitalization during the 1990's in cities across the country (Hackworth 2002; Hackworth and Smith 2001; Wyly and Hammel 1999). In that decade, capital investments accompanying the housing bubble and increased consumer demand dramatically altered the character of many inner-city neighborhoods. Although the gentrification-crime link garnered modest attention in the past, the more aggressive form of revitalization that occurred in the late 1990's has gone virtually unnoticed. We argue that the surge in urban capital over the last two decades has important implications for criminological theory and our understanding of crime trends. Whereas social disorganization and human ecology perspectives view gentrification as potentially disruptive to informal social control processes, the more recent "consolidated" revitalization of the 1990's may actually undermine criminogenic conditions (e.g., displace poverty and motivated offenders) and increase *formal* controls (e.g., police protection and building surveillance), thereby decreasing crime in gentrifying areas. Moreover, the relationship between gentrification and crime may vary according to the stage of gentrification. When gentrification is "spotty" and emergent, crime may increase in a

manner consistent with social disorganization theory (Covington and Taylor 1989; Taylor and Covington 1988). When gentrification passes a tipping point, however, population and control may shift in favor of the new gentry and crime may subsequently decline. In this paper, we test these hypotheses with two measures of gentrification and two longitudinal analytical designs. First, we use a mixed-methods indicator of gentrification and two-panel change score analyses to examine crime changes in Seattle's gentrified tracts between 1990 and 2000, relative to poor tracts that did not gentrify. Second, we use two decades of yearly mortgage data and fixed-effects models of within-tract change to examine curvilinear trends in gentrification and crime in the 1980's and 1990's. These designs complement one another and provide a comprehensive analysis of urban revitalization and dynamic crime patterns in an American metropolitan context.

The Resurgence in Gentrification

Urban scholars commonly define gentrification as “the class transformation of those parts of the city that suffered from systematic outmigration, disinvestment, or neglect in the midst of rapid economic growth and suburbanization” (Wyly and Hammel 1999:716). This definition equates gentrification with reversals in the concentration of urban poverty and structural decay described by authors such as Wilson (1987) and Douglas Massey (1990). Gentrification is distinguished from other forms of economic growth because it applies only to urban neighborhoods that underwent a period of substantial economic decline. Additionally, gentrification is associated with changes in both population and property characteristics, as increased middle- and upper-class residents accompany visible improvements to an area's real estate and local infrastructure.

Although clearly not eliminating neighborhood disadvantage, many urban geographers argue that the 1990's surge in gentrification significantly transformed the downtown cores of cities across the nation. Areas once written-off as too risky for financial investment (i.e., “redlined”) now house high-rise condominiums, high-end retail establishments, and commercial entertainment centers catering to newly arrived and economically advantaged downtown residents. A nationwide study by the Brookings Institute (Birch 2005) captures the extent of the 1990's gentrification surge. Using census data covering 45 downtown areas in cities with populations greater than 100,000, Birch (2005) found that downtown households grew by 13% in the 1990's, reversing negative trends in the 70's and 80's and surpassing growth in the rest of the city and suburbs. Moreover, the composition of these households changed substantially, with downtown residents becoming increasingly single, young adult, educated, high-income, and homeowners (many of the latter purchasing condominiums). Although considerable variation existed in the sampled downtowns (e.g., many Midwestern and Southern cities lost populations and high-income residents), the study's overall conclusion was that significant inner-city development occurred in the last decade of the 20th century and that this development changed the face of America's urban core.

A growing body of research corroborates the Brookings report and points to the 1990's as a pivotal period for urban redevelopment (Hackworth and Smith 2001; Smith and Defilippis 1999; Wyly and Hammel 1999). Prior to that decade, gentrification was typically sporadic

and localized, exemplified by small-scale investors or artists moving into poor communities to take advantage of cheap rents and home prices (Ley 2003; Lloyd 2002; Simpson 1981; Zukin 1982). However, in the mid-1990's, following a three-year recession period, corporate investors and urban renewal programs joined individual gentrifiers to rapidly transform large swaths of cities' downtowns. Much of this change can be attributed to the increased demand for inner-city dwellings from rising numbers of childless young professionals, who often postpone larger suburban homes and good school districts for the convenience and cultural stimulation of urban living (Ley 1980; Spain 1992). In addition, many suburban residents increasingly desire to return to the city once their children had left home (i.e., "empty-nesters") or to engage with communities where they shared historical racial or ethnic ties (Pattillo 2007). In the 1990's, city planners played to this demand by investing taxpayer dollars in public works programs – such as transportation upgrades and municipal parks – that encouraged developers to accommodate upscale residents (Hackworth 2002; Hackworth and Smith 2001). Security and surveillance (e.g., closed-circuit television cameras and gated enclosures) often accompanied the latter, protecting corporate and government investments and simultaneously excluding, displacing, or monitoring "high-risk" disadvantaged populations in the emerging middle-class corridors (Beckett and Herbert 2008).

Federal housing policies also contributed to the changed urban environment. During the Clinton presidency, the Department of Housing and Urban Development (HUD) found new strength to dismantle decaying low-income housing projects and replace them with mixed-income tenements and private commercial developments (e.g., the HOPE VI program) (Wyly and Hammel 1999). Although addressing decrepit high-rise projects was clearly warranted, the outcomes of HUD's policies remain controversial. Advocates argue that such policies reduce concentrated poverty and visibly improve city landscapes, while critics cite increased displacement and segregation of the extreme poor and the centralization of resources in the hands of a small number of powerful land developers (Newman and Ashton 2004; Newman and Wyly 2006; Wyly and Hammel 2004).

The above discussion highlights the complexity and contested nature of modern gentrification. Many factors aligned to cause the 1990's gentrification resurgence, and the consequences of this trend for race and class stratification (DeSena 2009) have yet to be fully realized. In this paper, we recognize and discuss the controversies and potential negative costs surrounding gentrification, but focus on the impacts of revitalization for area crime rates. Do gentrified and gentrifying areas have increased or decreased levels of crime relative to other city communities, particularly areas that remained relatively disadvantaged? Macro-level criminological theories hold competing expectations for the gentrification-crime link, and results from prior research have been equivocal. We argue that prior research has not addressed the entire process of gentrification, nor perceived of gentrification as a potentially non-linear process. We quantitatively test these ideas using longitudinal data collected in the Seattle metropolitan area.

Gentrification-Crime Research

In an early article on the topic, Scott McDonald (1986) summarized opposing views of the gentrification-crime relationship. On the one hand, gentrification may reduce crime by (1)

displacing a community's "criminal elements" with more affluent, and less crime prone, residents, (2) increasing neighborhood controls whereby newcomers become better organized to fight crime, and (3) increasing building renovations that instill greater neighborhood pride and reduce criminal opportunities. On the other hand, gentrification might also increase crime by (1) increasing the number of attractive theft targets, (2) raising economic inequality that results in greater intra-community conflict, and (3) disrupting longstanding ties held by previous residents and therefore reducing informal crime controls. Although not explicitly drawing on criminological theory, McDonald's (1986) expectations implicated concepts central to social disorganization (Shaw and McKay 1942), routine activities (Cohen and Felson 1979), collective efficacy (Sampson et al. 1997), social learning (Akers 1998), and relative deprivation theories (Blau and Blau 1982). In his own descriptive analyses, McDonald (1986) found that cities undergoing significant gentrification had decreasing crime rates, particularly in violent crimes. He therefore tentatively concluded that gentrification has a negative relationship with crime.

Although conceptually informative, McDonald's (1986) study had several important limitations, most notably the lack of uniform criteria for selecting gentrifying neighborhoods and the failure to compare gentrifying with non-gentrifying areas (Covington and Talyor 1989). Subsequent researchers fleshed out McDonald's (1986) hypotheses and provided more nuanced tests of the gentrification-crime link. Ralph Taylor and Jeanette Covington (1988) examined gentrification and violent crime in Baltimore neighborhoods between 1970 and 1980. They found that neighborhoods that rapidly increased in "status" (e.g., greater home values, less poverty, more educated residents, etc.) or "stability" (e.g., more married couples and owner-occupied homes) also saw increases in homicide and aggravated assault. They interpreted these findings within a human ecology framework, whereby rapid social change—even change in a "positive" direction—is expected to disrupt social processes that enable crime control.

Taylor and Covington's (1988) explanation echoes recent systemic models of social organization (Kasarda and Janowitz 1974). Systemic models are elaborations of social disorganization theory that conceive of communities as complex networks of social relationships, ranging from close friendship and kinship ties to more diffuse associations with extended neighbors and institutions. This conception of community networks directs attention to the constraining and enabling potential of "social relations among persons and the structural connections among positions" within a given ecological unit (Sampson 1999:255). Systemic models thus focus on social capital, or the structures of relationships among people that facilitate action (Coleman 1988), to explain spatial variation in crime (Sampson et al. 1997). Within this framework, ecological features that disrupt social relations at the neighborhood level, such as residential instability or population heterogeneity, attenuate a community's ability to organize in favor of common values, including crime reduction.

In support of a systemic model of social organization, Taylor and Covington (1988) found that changes in neighborhood "stability" were more strongly associated with violent crime than changes in neighborhood "status", leading the authors to conclude that disruptions in social control and neighborhood stability explain the problems associated with gentrification

better than structural strain caused by relative resource deprivation. The authors summarized their findings by stating that gentrification disrupts informal social networks and increases group conflict, which then creates conditions ripe for crime. Building on Taylor and Covington (1988), Johan van Wilsem et al. (2006) linked neighborhood rapid economic improvement in the Netherlands with increased risk of victimization. Consistent with the systemic model, these authors also found that residential instability brought about by economic transition provided the mechanism by which gentrification translated into increased victimization risks (see Aktinson 2000 for a similar argument of London gentrification). Overall, this work supports recent formulations of social disorganization theory and challenges McDonald's (1986) results by demonstrating a positive link between area gentrification and violent crime rates.

In a subsequent analysis, Covington and Taylor (1989) found similar positive effects of gentrification on Baltimore's property crime rates. Areas with rapidly increasing home values had higher property crime rates than other, more slowly appreciating, neighborhoods. They again attributed the link between gentrification and crime to the disruption of neighborhood systemic organization brought about by residential instability. However, they also acknowledged that the gentrification observed in Baltimore between 1970 and 1980 was sporadic and incomplete. Instead of "making over" an area, revitalization occurred in fits and starts, affecting small pockets of the city on a house-by-house basis. And because gentrifiers moving into poor neighborhoods may move out when they contact crime or have children reaching school age, gentrification could eventually "stall," resulting in a vicious cycle of in- and out-migration and high crime rates. In his ethnography of race, class, and urban change in a Philadelphia community, Elijah Anderson (1990) noted a similar stalling of gentrification as economically advantaged newcomers realized that their economic investments and sense of well-being often depended on the declining fortunes of adjacent poor and mostly black inner-city communities. According to Covington and Taylor (1989), the instability of gentrification during the 70's and 80's led to the attenuation of controls against crime, as human ecology and social disorganization theories would predict.

Despite the consistent findings of this research, we believe the verdict on the gentrification-crime relationship remains out. In particular, Covington and Taylor's (1989) observation of the often-incomplete nature of gentrification in the 80's may not adequately describe urban revitalization in the 1990's in the U.S. Rather than stalling, areas marked by in-migrating real-estate prospectors and avant-garde residents in the 70's and 80's typically underwent rapid revitalization during the housing boom of the late 90's. Later-stage gentrification often occurred on a grand scale, funded not only by individuals moving back into the city, but often by large corporations, transforming whole city blocks or housing projects into high-end residential and retail developments. This surge in gentrification appears qualitatively different from the process at earlier times, and likely pushed areas past the tipping point of economic instability. We argue that this consolidated form of gentrification differed in its relationship to area patterns of crime. In particular, we assert that the gentrification of the 1990's post-recession period brought with it a more complete population turnover and enhanced formal controls (e.g., police surveillance and security system installments) that substantially reduced area crime levels.

Gentrification and Crime in Seattle

In this paper, we extend prior research by examining gentrification and crime in Seattle, Washington, a city that exemplifies the rapid downtown revitalization common to the 1990's (Birch 2005; Wyly and Hammel 1999). We examine two hypotheses about the relationship between gentrification and crime in Seattle. First, in contrast to most prior gentrification research that reports positive effects on crime, we hypothesize that areas that gentrified in the 1990's saw crime reductions relative to non-gentrifying poor areas. Here, we view gentrification as an *outcome* and explore whether a mixed-methods indicator of gentrification relates to changes in crime during the 1990's (Hammel and Wyly 1996). We use two decades of census information linked with crime data to compare changes in total, property, and violent crimes between once-poor Seattle areas that revitalized during the 1990's and areas that remained relatively disadvantaged throughout the same time period.

Second, we focus on the *process* of gentrification within Seattle's poor tracts and hypothesize that gentrification in the 1980's was "spotty" and incomplete, and therefore positively related to crime change, but then reversed in the 1990's when gentrification became more consolidated and complete (Figure 1). Testing this non-linear hypothesis requires longitudinal measures of gentrification and crime. To this end, we use yearly mortgage investments, collected by the Federal Financial Institutions Examination Council (FFIEC) as part of the Home Mortgage Disclosure Act (HMDA) of 1975, as indicators of urban revitalization. Specifically, we examine yearly within-tract changes in crime predicted by changes in yearly housing investments. In support of our curvilinear hypothesis, we expect to find a positive slope for the relationship between housing investments and crime in the 1980's, and a negative slope for the same relationship in the 1990's. Such findings would suggest that the effects of gentrification (as measured by increased housing activity and home values) on crime varies across the two time periods and represents a tipping point in the gentrification-crime relationship.

Because examinations of gentrification as an outcome and as a process require distinct data and methods, we discuss below separate methods for each approach. For all analyses, we construct our dependent and independent variables at the tract-level based upon boundaries taken from the 2000 United States Census.¹ In several instances, increased population density resulted in tracts splitting into two geographically smaller tracts between the 1980, 1990, and/or 2000 censuses. When this occurred, the 2000 tracts were recombined back to the 1990 or 1980 tract boundaries.

Data and Methods: Gentrification as an Outcome

Operationalizing Gentrification as an Outcome

Gentrification measurement is hotly debated among urban demographers, with some scholars dismissing the concept's relevance altogether (Beauregard 1986; Berry 1985;

¹The majority of neighborhood-level studies of both gentrification and crime use census tracts as proxies for neighborhoods. Because neighborhood boundaries are difficult to empirically define, the use of census tracts has become quite common (for a discussion, see Morenoff, Sampson, and Raudenbush 2001). Although perhaps not ideal, we follow previous research and analyze tracts as if they were "neighborhoods."

Bourne 1989, 1993a, 1993b). In the past, researchers classified gentrification based solely on census data – such as changes in housing characteristics, income, race, and educational characteristics (Lipton 1977; Nelson 1988). Although useful in capturing neighborhood change, this method suffered from two important flaws. First, when exclusively used as indicators of gentrification, census measures typically misidentify appreciating middle- and upper-class neighborhoods as gentrifying (Wyly and Hammel 1999). That is, while many middle- and upper-class neighborhoods may also experience increases in housing, income, or education related characteristics, they do not meet the definition of “gentrifying” because they did not experience prolonged earlier periods of disinvestment and decline (Bourne 1993a, 1993b; Wyly and Hammel 1999). *Reinvestment* and *revitalization* are difficult to capture relying solely on cross-sectional decennial census measures.

Second, decennial census characteristics generally lack the detail required to identify gentrification processes as they occur on the ground. Neighborhood changes in average economic and population characteristics are likely to overlook local housing and business developments that are central to the gentrification process. For example, new home construction and/or renovations – such as condominium sales, repainting, putting up new signage, fixed entryways, or simply better landscaping – may indicate emerging urban renewal processes that cannot accurately be captured in census reports.

Our first measure of gentrification addresses these limitations with a mixed-methods indicator that distinguishes gentrifying, appreciating, and non-gentrifying poor census tracts. We classify census tracts based on a mixed-methods system developed by Hammel and Wyly (1996). These authors utilized qualitative field surveys to identify gentrifying areas, and then verified their classification scheme with discriminant analyses using census-based measures. Between 1994 and 1998, Hammel and Wyly (1996; Wyly and Hammel 1999) conducted block-by-block field surveys in 23 metropolitan statistical areas, including Seattle, to “ground-truth” gentrification processes. They used historical records and income indicators from the 1960 census to identify urban tracts which underwent substantial disinvestment in the post-war period, and then visited these “at-risk of gentrifying” tracts to record evidence of housing stock development (e.g., condominium and housing construction) and renovations (e.g., exterior paint, signage, and ornamentation improvements). Based on these surveys, the authors classified city tracts as gentrifying, non-gentrifying poor, and previously high-income or “appreciating” neighborhoods.

Hammel and Wyly confirmed their classifications with stepwise discriminant analyses using census variables previously linked to gentrification processes, such as changes in population size, median household income, percent college graduates, percent professional occupation, median house value, and median rent. These analyses suggested that their gentrification classification was conservative, so that Type I errors (incorrectly identifying non-gentrifying neighborhoods as gentrifying) were rare. This increases the construct validity of their method and builds confidence in the identification of areas undergoing revitalization in the 1990’s post-recession period.

Hammel and Wyly’s research identified 21 gentrifying tracts in metropolitan Seattle. Figure 2 graphically displays these areas, as well as tracts classified as mid/upper income (i.e.,

appreciating) and tracts that were non-gentrifying poor (i.e., disadvantaged). The gentrifying areas primarily fell in the neighborhoods of Belltown, Ballard, North Lake Union, and segments of Capitol Hill and the University District, while the appreciating neighborhoods were generally in north Seattle and along coast or lakeside areas. Disadvantaged tracts were the remaining tracts that were typically inland and surrounding the downtown gentrifying areas.

Table 1 lists variable descriptive statistics, by decennial census, for the gentrifying and non-gentrifying Seattle tracts. Perhaps most striking is the rapid economic growth for all of Seattle in the 1990's. In that time, Seattle's mean family income increased three fold, while mean home mortgage values grew to over four times what they were in 1990. Although Seattle was certainly a city of rising fortunes, downtown gentrifying areas saw even greater gains. Between 1990 and 2000, average yearly income in the gentrifying tracts increased at a rate 25% greater than other Seattle tracts. Home mortgage values followed a similar pattern, growing at a pace 41% greater than non-gentrifying tracts. Finally, total population in the gentrifying areas accompanied the 1990's economic expansion, helping to close the persistent population gap between downtown areas and the remainder of the city.

Dependent Variables – Decennial Crime Change

Dynamic community crime research has been hampered by the lack of longitudinal crime data linked to census boundaries (Bursik and Webb 1982). Seattle's Police Department is one of the few that has collected yearly tract-level UCR crime data since the mid-1970's. Our dependent variables draw on this data to measure changes in Seattle's total, property, and violent tract-level crime between 1982 and 2000.² Because official crime statistics are notoriously unreliable and decennial years may not accurately capture temporal trends, for our first analysis of gentrification as an outcome, we average each crime measure for the three years surrounding 1990 and 2000 (e.g., 1989, 1990, 1991 and 1999, 2000, 2001). Taking the three-year average surrounding each decennial year minimizes problems of over- or under-reporting. To capture changes in crime in the 1990's, we subtracted the crime indexes measured in 1990 (averaged across the three years spanning 1989–1991) from the crime indexes measured in 2000 (averaged across the three years spanning 1999–2001). The resulting change-score variables measure changes in total, property, and violent crime for each Seattle tract during the last decade of 20th century.

Figure 3 graphically presents tract-level change in total crime for Seattle between 1990 and 2000. The dark tracts are those that had the sharpest decreases in crime between the decennial time periods, while the lighter tracts had smaller decreases, or increases, in crime in the same periods. Visually comparing Figures 2 and 3 provides initial evidence that the greatest drops in crime occurred in the downtown areas classified as gentrifying by Wyly and Hammel (1999). Tracts in Belltown, Capitol Hill, and Lake Union saw large reductions in crime and were also sites of substantial condominium development and capital

²The property crime index includes reported incidents of larceny, burglary (residential and nonresidential), automobile theft, and arson. The violent crime index includes reported incidents of murder/non-negligent manslaughter, forcible rape, aggravated assault, and robbery.

reinvestment. In multivariate analyses, we will examine if this pattern is statistically significant for total, property, and violent crime.

Control Variables

Our first set of analyses compares changes in crime between gentrifying and non-gentrifying areas. To reduce sources of spuriousness, we create change-score measures for several time-varying demographic and economic covariates. Data for these variables come from the Summary File 3 portion of the 1990 and 2000 census reports and measure changes between the two decennial censuses.³

We create change-scores for total population (100's), percent foreign-born, percent black, percent college educated, percent residential mobility in the past five years, percent of homes built in the past five years, mean home mortgage value (measured in \$100k), and mean family income (measured in \$1k). Sampson (2006; see also Sampson et al. 2005) recently made the provocative claim that the 1990's crime drop resulted from substantial increases in first-generation immigrants residing in inner-city ethnic enclaves. We test this assertion in Seattle by examining the relationship between changes in concentrated immigration and tract-level crime. Prior research suggests that the remainder of our control variables should be positively related to changes in crime (for reviews, see Parker and McCall 1999; Morenoff et al. 2001). In particular, changes in percent-black population have been implicated in increased crime (Bursik and Webb 1982; Morenoff and Sampson 1997), presumably because blacks have been increasingly isolated into urban areas of concentrated disadvantage (Wilson 1987; Sampson and Wilson 1995). Seattle provides an interesting site for examining racial change, as the black population has traditionally been smaller than in other cities, yet nonetheless concentrated in specific areas of the city (e.g., The Central District and Rainier Valley).

Finally, we include a control for tract-level crime measured at the 1990 census. Models with this measure provide conservative estimates of our crime change predictors by controlling for initial between-tract crime differences. An advantage of such analyses is that they address regression to the mean, as areas with high 1990 crime rates statistically are more likely to experience crime declines in 2000 (Morenoff and Sampson 1997). With regard to gentrification, it may be that revitalization primarily occurred in high-crime areas (as would be expected by the curvilinear hypothesis) and that prior crime, and not gentrification, is a stronger predictor of crime change.

It is also worth noting that our control variables are likely to be related to gentrification processes. For example, areas with rapidly increasing mean income values may also be at increased risk of gentrifying (see discussion of "appreciating" neighborhoods above). Likewise, past research commonly identifies areas of declining black populations as more likely to be gentrifying. However, as stated earlier, census characteristics in isolation often miss gentrification as it occurs on the ground. We suspect that the classifications based on

³Mean home mortgage values are an exception, and were collected from the FFIEC home mortgage disclosure yearly files for 1990 and 2000 (see gentrification as a process data and methods section).

qualitative field surveys better capture the gentrification process and that these areas will have decreases in crime net of other census-based demographic changes.

Analytic Strategy

Our between-tract analysis measures changes in crime using two-panel difference models, or change-score regression analyses (Allison 1990; Firebaugh and Beck 1994; Halaby 2004). These models regress changes in a dependent variable between two time points (i.e., $Y_{2i} - Y_{1i}$) on changes in independent variables or on a treatment occurring between the two panels. A primary advantage of the difference approach over alternative models of change (e.g., lagged regressor or residual change-score models) is that it controls for unobserved heterogeneity in time-constant characteristics – such as a tract’s location within the city or its stable infrastructure of parks, schools, and roads. Allison (1990) demonstrated that the failure of lagged regressor approaches to completely adjust for prior differences can result in severely biased parameter estimates. In addition, change-scores reduce floor effects common to crime data and better approximate a normally distributed dependent variable appropriate for OLS regression. For our tract-level analyses, coefficients are interpreted as changes in the number of reported crimes per one unit change in an independent variable.

Although the timing of our gentrification measure is appropriate for estimating a “treatment” effect (i.e., it was measured mid-way between the two panels in our dependent variables), gentrification was clearly not randomly assigned to our observed tracts. Indeed, tracts that were above the mean in family income in 1960 were not at risk of gentrifying, making them inappropriate as a reference category. Our lack of experimental data limits our ability to make causal statements about the relationship between gentrification and changes in crime because endogenous unmeasured characteristics could explain any observed association between gentrification and crime change. To reduce endogenous sources of bias, we control for several time-varying covariates commonly thought to cause changes in crime (see description of control measures above), and estimate a conservative model controlling for 1990 crime. We also focus our attention on the comparison between gentrifying tracts and non-gentrifying disadvantaged tracts. These two categories are similar in their spatial locations within the city as well as their demographic characteristics. Absent random assignment, this comparison should provide an adequate test of the gentrification hypothesis.

We also consider the spatial contexts of crime for our between-tract analysis. Spatial dependence occurs when the crime rate of one neighborhood is at least partially determined by the crime rates in nearby (typically adjacent) neighborhoods (Anselin 1988; Anselin et al. 2000). Two forms of spatial dependence exist. Spatial lag occurs when observations in one neighborhood are dependent upon observations in surrounding neighborhoods. Spatial error occurs when the error terms among adjacent neighborhoods are correlated due to unobserved heterogeneity (Anselin 1988). Diagnostic tests using the spatial analysis software GeoDa revealed that our data contain significant spatial error dependence, but not spatial lag. We therefore create a first-order spatial regression weight using the queen’s contiguity matrix.⁴ This matrix utilizes data from all immediately adjacent tracts (i.e., those

⁴Additional weights using alternative contiguity matrices produced insignificant results. Although not possible using the current data, distance-based spatial weights should be considered in future research.

that share a common boundary or corner) to create a weighted average of all the values of the dependent variable (change in crime) in the surrounding tracts. We then include this spatial error weight as an endogenous variable in our analyses.

Data and Methods: Gentrification as a Process

Operationalizing Within-Tract Gentrification

Although measuring gentrification as an outcome allows us to assess the relationship between crime change and a measure of gentrification assessed at a single time point (Hammel & Wyly 1996), this strategy is less suited for examining gentrification as a process, for which a longitudinal measure of gentrification is necessary. To test our hypothesis that the relationship between gentrification and crime is curvilinear—with a positive slope in the 1980's and a negative slope in the 1990's—we use yearly home mortgage investment as a proxy for urban revitalization. The FFIEC collects yearly tract-level information for the quantities and dollar-amounts of home purchase loans originated by federally-insured lending institutions. The loan types cover both conventional loans and loans supplemented by federal agencies such as the Federal Housing Authority (FHA) and Veterans' Administration (VA).⁵ To capture yearly tract-level housing activity, we use the total dollar amount of home loans originated in each tract per year from 1981, the earliest reported year, to 2000. All dollar amounts are inflation-adjusted to 2000 dollars. The yearly values were stacked into a tract-year file, so that each tract had 19 observations covering the years 1981–2000. As we are interested in examining change only in those tracts at risk of gentrifying, we take a similar approach to Hammel and Wyly (1996) and focus our within-tract analysis on those tracts that exceeded the city's average level of poverty in 1960 (N=59 tracts, 1121 tract-years) (see “Disadvantaged” and “Gentrifying” in Figure 2).

Table 2 lists the yearly means and standard deviations for tract-level mortgage investments and crime in the 59 Seattle tracts at risk of gentrifying. Looking at mortgage investments, we can see a general upward trend that reaches its peak in the late 1990's. To help visualize investment changes over the studied years, Figure 4 graphs the yearly mean mortgage investments (\$millions) for (1) a hypothetical “low investment” tract that had one standard deviation below the yearly mean for every year, (2) a hypothetical “high investment” tract that had one standard deviation above the yearly mean for every year, and (3) the observed yearly mortgage activity for Belltown (tract 80), a core downtown neighborhood that underwent substantial gentrification both in the early '80's and late '90's.⁶ For crime, Table 2 indicates an overall curvilinear pattern that reaches a maximum around 1988 and approaches the minimum at 2000. We can also see that the majority of crime in Seattle consists of property offenses, with over 85% of crimes falling into this category at any given year.

Reporting bias by lending institutions or selection issues related to tract-level home sales may reduce our confidence in home mortgage activity as a measure of gentrification. To

⁵Home improvement and refinancing loans are also reported, but as these loans depend on previously constructed housing stock, we focused on home mortgage loans, which can also apply to new housing developments.

⁶As Belltown is an outlier for our analyses, we also ran our fixed effects and change score models without tract 80. Results were similar to those reported and are available from the authors upon request.

assess whether home loans accurately reflect neighborhood economic conditions, we compared the average tract-level mortgage value to census indicators of mean home values, mean household income, and percent college-educated at the 1990 and 2000 decennial years. The correlations ranged from $r=.63$ (1990 average mortgage and 1990 percent college-educated) to $r=.80$ (2000 average mortgage and 2000 mean household income). The strength of these correlations boosts our confidence that yearly home loan activity reflects changes in those neighborhood economic conditions associated with gentrification.

It is also useful to compare the FFIEC home mortgage measures to Wyly and Hammel's gentrification classifications. This comparison connects the two operationalization strategies and provides another means of assessing measurement validity. In 1990, the 21 tracts classified as gentrified had mean mortgage investments that were \$327,770 (.1 standard deviations for that year) *below* the average non-gentrified poor tract. By 2000, the gentrified tracts had mean mortgage investments that were \$2,413,170 (.25 standard deviations for that year) *above* the non-gentrified poor tracts. This provides further evidence that the Wyly and Hammel mixed-method classification is consistent with housing and economic characteristics commonly associated with gentrification processes.

Dependent and Control Variables

The outcomes for our within-tract analyses are yearly tract-level counts of total, property, and violent crime reported by the Seattle Police Department from 1982–2000. As the decennial census does not capture yearly changes in demographic characteristics, we are unable to include the time-variant control variables discussed in our gentrification-as-outcome analyses for our within-tract analyses. However, we do include linear, quadratic, and cubic terms for time to control for time-varying characteristics that occur above the city level – such as changes in state and national economies, incarceration rates, and city-wide ordinances. Finally, we include tract population (100's) in our fixed-effects models discussed below by linearly interpolating values for the between-census years.

Analytic Strategy

We employ fixed-effects panel estimators to examine within-tract changes in crime as functions of changes in home mortgage investments (Allison 1994). Fixed-effects analyses complement our gentrification-as-outcome models in three important ways. First, the fixed-effects analyses operationalize gentrification as a longitudinal process, thereby better specifying the temporal ordering of concepts and reducing the threat of reverse-causality. Second, estimates from a two-panel change score model are subject to regression to the mean, as observed group differences between two time points may result from prior differences at the first time point, such that one group's higher prior mean makes it more likely that its later mean will regress toward the grand mean. The additional time points of our fixed-effects analyses allow us to disentangle true change from regression to the mean. Third, the two-panel model is unable to examine time-varying effects of gentrification, such as those proposed by our curvilinear hypothesis. In our fixed-effects analyses, we include both independent and dependent measures for the 1980's and 1990's, with interaction terms for gentrification and time to test gentrification curvilinearity.

Similar to the two-panel change model described in the previous section, the fixed-effects estimator controls for time-stable unobserved heterogeneity.⁷ As yearly crime counts tend to be overdispersed (i.e., the variance is substantially larger than the mean, as shown in Table 2), we estimate conditional fixed-effects negative binomial models in the Stata statistical package. We account for tract-level population differences by including interpolated tract-year population as a covariate.⁸ Coefficient estimates and predicted values are thus interpretable in terms of counts per tract (Osgood 2000).

The covariates in our model include polynomial terms for time, main effects for mortgage investment, interpolated total population, and interactions between mortgage investment and the linear and quadratic time terms. The latter interactions test for non-linear relationships between housing activity over time. Finally, to specify the correct temporal ordering between our dependent and independent variables, we lag our measures of yearly mortgage investments and time trends to $t-1$. Our model thus estimates the effects of past mortgage investments on future tract-level crime, adjusting for time trends and exploring interactions between mortgage investments and time.

Results

Gentrification as an Outcome

Table 3 presents five models of between-tract differences in total crime between the 1990 and 2000 periods. Looking first at Model 1, we see that tracts classified as gentrified had significantly fewer reported crimes at the end of the decade than at the beginning of the decade, compared to other tracts in the city. Gentrified tracts are predicted to have approximately 147 fewer crimes than other Seattle tracts in that decade. Moreover, the gentrified tracts accounted for approximately 10% of the total Seattle crime drop between the decennial years. These findings provide preliminary statistical support for the argument that 1990's post-recession gentrification played a part in Seattle's crime decline. Model 2 adds a dummy variable for "appreciating" tracts that were not at risk of gentrification, thus making the reference category tracts that were "non-gentrified poor." Again, we find that the gentrified areas had significantly larger crime reductions between the two time periods than those areas that were poor but did not gentrify. Compared to disadvantaged tracts, the gentrified tracts had 105 fewer crimes at the end of 1990's than at the beginning of the decade.

Model 3 adds several time-varying covariates that potentially confound the relationship between gentrification and crime change.⁹ Net of gentrification status and other variables in the model, areas that saw increases in their total populations saw drops in crime. Every one hundred new residents to a tract corresponded with approximately nine fewer crimes at the end of the decade. Changes in residential mobility also affected changes in crime, such that a

⁷In situations where unobserved heterogeneity is orthogonal to included covariates, a model with random effects provides greater efficiency. We performed a Hausman test for this condition, and found no systematic differences in the fixed and random effects estimates (Wooldridge 2002). We chose to present the fixed effects estimates as these provide more conservative tests of our stated hypotheses.

⁸In unlisted analyses, we also estimated population-adjusted models where yearly interpolated tract-level population was the exposure variable. Results from these models were virtually identical to those reported, but the presented models had the advantage of direct interpretation in terms of predicted tract-level crime.

1% increase in the percentage of movers within the last five years is expected to increase total crime by almost seven crimes. Change in a tract's percentage of black residents is the strongest predictor of crime change in our model (standardized parameter = .32). A 1% increase in the proportion black is expected to increase total crime by 11 crimes. Home development is also expected to reduce area crime totals. A 1% increase in the percentage of homes built in the last five years results in 6 fewer crimes per tract. Interestingly, we do not find support for Sampson's (2006) hypothesis regarding immigration and crime decline, although our results are consistent with an emerging body of research suggesting null effects of immigration on crime (Martinez 2006). Tract-level changes in Seattle's immigrant population did not appear to affect changes in crime between the decennial periods.¹⁰ Although in the expected negative direction, we also do not find a significant relationship between changes in home mortgage values and crime. It should be remembered, however, that the sample for these analyses includes appreciating tracts and a strong gentrification measure. In a reduced-form model without the appreciating tracts in the sample, changes in home mortgage values is a significant negative predictor of crime change (not shown).

More importantly for the current paper, we also find that the introduced covariates fail to attenuate the relationship between gentrification and crime change. In fact, the gentrification coefficient increases in magnitude. These results continue to suggest a negative relationship between gentrified areas and Seattle crime in the 1990's.

Model four introduces a spatial error term. The significant spatial error estimate indicates that the error terms amongst adjacent tracts are indeed correlated (i.e., unobserved covariates in one tract are related to crime in neighboring tracts), net of covariates included in the model. By including the spatial error term, we ultimately improve our model fit as evidenced by the increase in the log likelihood (not shown here) and r-square estimates of our final model. Introduction of the spatial error term does not attenuate the gentrification coefficient, with gentrified neighborhoods continuing to have over 100 fewer crimes than non-gentrified poor tracts.

The final, and most conservative, model adds a measure of tract-level total crime in the beginning of the decade (i.e., the average of 1989, 1990, and 1991). As expected, this variable strongly and negatively predicts crime change, with a standardized coefficient over three times larger than any other variable. Prior crime in 1990 explains an additional 40 percent of the variance in crime change. This suggests that the tracts experiencing the greatest crime declines in the 1990's were those with the highest crime at the beginning of the decade, which is consistent with regression to the mean. Moreover, the 1990 crime measure attenuates over 75% of the gentrification estimate, rendering the coefficient non-significant. This attenuation suggests that gentrified areas in the 1990's had higher crime at the decade's outset, and that this high level of crime better predicts crime change.

⁹As in many prior spatial studies, our census measures of race, income, education, and mobility are significantly correlated with one another. However, these correlations were of moderate magnitudes (highest $r = .34$, mean income and percent college graduates) and examinations of Variance Inflation Factors (VIF) and standard errors did not produce significant evidence of multi-collinearity. Moreover, our central concern is to introduce time-varying covariates to reduce potential bias in the gentrification estimate, with the main effects for the demographic changes of secondary interest.

¹⁰Disentangling foreign-born Hispanic from Asian populations also failed to produce significant results.

Alternatively, however, it may also indicate that gentrification processes in the 1980's resulted in both high 1990 crime and subsequent revitalization and crime decline. We examine this curvilinear hypothesis more directly in our gentrification-as-process analyses.

Property vs. Violent Crime

Table 4 presents models predicting changes in Seattle tract-level crime disaggregated into property and violent offenses. Comparing the first model across the two outcomes, we see that gentrification predicts significant reductions in property, but not violent crime, net of other covariates and spatial error.¹¹ These findings provide initial support for the hypothesis that changes in the built structure accompanying gentrification helped to harden targets and reduce property offending. However, as with total crime, the introduction of 1990 property and violent crime reduces the gentrification coefficients to statistical non-significance (Model 2). Again, this suggests that gentrified areas had higher crime at the beginning of the period, but also that the temporal ordering of pre-1990 processes remains in doubt. In either case, we find no evidence that Seattle's urban revitalization in the 1990's was accompanied by *increased* crime, thereby contradicting Taylor and Covington's (1988) assertion that gentrification undermines social organization and increases crime.

Gentrification as a Process

Table 5 lists results from three population-adjusted negative binomial models of within-tract change in total crime, property crime, and violent crime between the years 1982–2000 in previously poor Seattle tracts. Looking first at the main effects for time, we see that, for all three outcomes, the linear time trend is positive and significant while the quadratic time trend is significant and in the opposite direction (net of mortgage investments). This pattern is consistent with the observed rise in crime in the 1980's and the subsequent crime drop in the 1990's. We also see that the cubic term is positive and significant, suggesting that the drop in crime in the late 1990's was not as precipitous as the rise in crime in the prior decade. Additionally, the positive coefficient for tract-level population (interpolated between 1980 and 2000) suggests that increased population in this period is associated with increased crime (net of other variable estimates).

Looking at the main effect for mortgage investment, we see that, for total and property crime, tracts that had large amounts of mortgage investment were expected to have less crime in the following year. However, the significant interactions with time and time-squared suggest that the mortgage effects varied over the two decades. The interactions suggest a curvilinear trend, where tracts receiving constant investments would have increases in crime in the earlier years, but decreases crime in the later years, relative to tracts with no mortgage investments at all time points. This pattern is consistent with our curvilinear hypothesis regarding the relationship between early and consolidated forms of gentrification. For violence, no such interactions were found. Indeed, the main effect for mortgage investments is not significant with or without the interaction terms with time (not shown), suggesting that, net of the time trend and population, periods of home investments

¹¹ Similar patterns are observed in a reduced form of the model, with only the variables for gentrifying and appreciated tracts entered into the equation.

and improvements had little relationship with changes in violent crime in previously poor tracts.

Even though the general pattern of findings is consistent with the curvilinear hypothesis, the magnitude of these effects is modest at best. To put this in perspective, a standard deviation increase in tract-level mortgage investment between 1998 and 2000 (approximately \$10 million) is associated with a drop in just 2 property crimes. Even in Belltown, a tract that saw mortgage investment growth that was over two times greater than average in this period, we would expect to see just 5 fewer crimes than the average tract. Additionally, the (positive) change associated with mortgage investment in the 1980's is smaller than the (negative) change in the 1990's. A standard deviation increase in mortgage investment between 1985 and 1987 (approximately \$2 million) is associated with an increase of less than one property crime in that period. Housing investments thus appear to play a minor role in crime change in previously poor neighborhoods, even at the height of the gentrification boom.

Discussion

Previous research on gentrification and crime has yet to consider the consolidated forms of gentrification in the 1990's and the potentially time-varying effects of gentrification. Drawing on two decades of census and crime data from the city of Seattle, this study examined the relationship between recent gentrification patterns and neighborhood crime trends. We operationalized gentrification as both a neighborhood outcome and a neighborhood process, and used between-tract change scores and within-tract fixed effects models, respectively, to test the association between gentrification and crime. Evidence from the gentrification-as-outcome analyses suggested that gentrified Seattle tracts saw decreases in total and property crime in the 1990's, compared to tracts that remained poor. However, additional analyses revealed that the crime declines associated with gentrification are potentially explained by regression to the mean, as gentrified areas were more likely to have higher crime at the beginning of the decade, and declines toward the sample average could explain why these tracts saw crime declines in the observed time period. It also remains possible, however, that gentrification occurring earlier (i.e., in the 1980's) resulted in higher 1990 crime as well as the subsequent crime declines as areas reached tipping points in gentrification. This explanation would be consistent with the curvilinear analyses. In either case, results from the between-tract analysis contradict the standard hypothesis in the field, drawn from social disorganization theory, that gentrification during the 1990's undermines social cohesion and thereby increases crime. Furthermore, crime declines were concentrated primarily in the city's central neighborhoods—the same neighborhoods that saw large-scale disinvestment and outmigration in the 1970's period of deindustrialization. This pattern of core reinvestment and dropping crime appears to contradict Shaw and McKay's (1942) concentric zone model of urban crime and reverses trends of concentrated urban poverty (Wilson 1987). Our findings suggest that, at least in the last decade of the 20th century, the areas of Seattle that saw the greatest increases in economic investment were the same core neighborhoods with the highest prior crime and largest crime declines.

Our gentrification-as-process analyses helped to clarify the gentrification-crime link by examining within-tract changes over a period of 18 years. We used tract-level mortgage investment data to predict crime changes in tracts that suffered from high poverty in the 1960's and thus were at risk of subsequent gentrification. After accounting for time trends in crime and changes in population, our within-tract analyses found a curvilinear pattern between mortgage investment and crime: whereas increased investments in the 1980's were associated with increased crime, the opposite pattern was found in the late 1990's. These results suggest a tipping-point in gentrification, where the positive association between early gentrification and crime reverses once neighborhoods fully turn over and the gentrification process completes. We argue that these findings are consistent with urban demography descriptions of different types of gentrification in the 1980's and 1990's. During the 1980's, gentrification commonly occurred on a house-by-house basis that potentially increased criminal opportunities and undermined systemic social organization (Taylor and Covington 1988; Covington and Taylor 1989). In the 1990's, however, corporatized gentrification occurred on a grand scale combining with individual gentrifiers to create a consolidated gentrification that ultimately reversed the class compositions of neighborhoods in a very short time, subsequently resulting in lowered crime. Our study thus points to the importance of viewing gentrification as a temporal process with varying consequences for urban crime rates: early stages of incomplete gentrification likely facilitated greater crime and disorganization whereas later stages, characterized by the "consolidated" urban renewal of the 1990's, fully transformed neighborhoods and reduced crime.

Although our pattern of findings is consistent with the curvilinear gentrification hypothesis and contributes to criminological theories of urban change, the magnitude of our results suggest that gentrification explained little of the 1990's crime decline. Findings from our decennial change-score analyses showed that gentrification alone explained less than ten percent of the change in total crime between 1990 and 2000. Moreover, more conservative analyses suggested that gentrification had no association net of prior crime levels. Our within-tract analyses of 18 years of crime and mortgage investments gained leverage on non-linear gentrification trends, but again reductions in crime associated with 1990's investments were modest. Together, our analyses suggest that our measures of urban revitalization contributed to crime declines during the boom years of mortgage investment, but that these reductions were small compared to unobserved factors. Indeed, the results of our within-tract analyses suggest that crime increases accompanying mortgage investments of the 1980's outweighed reductions observed in the 1990's. What remains unknown is whether the negative investment-crime relationship continues into the millennial years, or whether the collapse of housing market also affected Seattle's neighborhood turnover and crime. Such an examination would be a worthwhile future project.

Although we are unable to identify the exact mechanism by which gentrification affects crime, we suggest that the consolidated gentrification in the 1990's may have enhanced formal controls aimed at protecting the property of new residents. Increased police surveillance, advanced security systems, and/or guards typical of new condominium communities may discourage burglary and theft (Beckett and Herbert 2008). To a lesser extent, these enhanced controls may also decrease opportunities for violent victimization. However, reductions in violence due to increased formal controls may be offset by

breakdowns in informal social control, resulting in smaller violent crime declines relative to property crime declines. We leave testing the mechanisms that might explain the differential effects of gentrification on violent versus property crimes for future analyses. Of particular interest is the relationship between informal social control (i.e., collective efficacy) and gentrification. We speculate that downtown gentrifying areas are unlikely to have strong and cohesive resident networks, reducing these communities' efforts to control neighborhood criminal behaviors informally and necessitating increases in formal crime control measures.

An alternative mechanism for the curvilinear gentrification-crime relationship may be that population turnover results in "high-risk" residents being displaced by "low-risk" residents. Although certainly plausible, we are somewhat reluctant to embrace this explanation due to the findings of our gentrification-as-outcome analyses. Here, we found that changes in resident characteristics (e.g., race, SES, education, immigration, etc.) failed to mediate any of the association between downtown gentrification and reductions in crime. As we include most of the primary demographic predictors commonly associated with crime, we conclude that population turnover is unlikely to explain the connection between gentrification and crime in Seattle.

The mechanisms linking crime and gentrification are likely complex and difficult to uncover empirically given existing aggregate data. In particular, dynamic models of crime and neighborhood characteristics traditionally have been hampered by the lack of available time-varying data. Future research utilizing more detailed longitudinal and micro-level data (for example, see Weisburd et al. 2004) may shed light on the formal and informal processes at work in gentrifying areas. Our analyses of gentrification as an outcome and as a process account for stable unobserved heterogeneity in census tracts, and we are able to control for some key aspects of neighborhood change with multiple decades of census data. However, our data do not permit us to account for other potentially relevant sources of time-varying heterogeneity, such as shifting drug markets and changes in policing policies and practices. These and other time-varying covariates may explain some of the patterns we observe between gentrification and crime.

The lack of data on neighborhood dynamics also presents challenges to researchers interested in studying gentrification over time. We argue that yearly mortgage data represent a reasonable proxy for gentrification that permit us to examine within-tract change over an 18-year period, and thus move beyond previous longitudinal analyses that focus on a limited number of time points (e.g., census periods). Despite the advantages of our approach for understanding the dynamic relationship between gentrification and crime, we acknowledge that our measure may not capture the multi-dimensionality of local gentrification processes. Scholars interested in dynamic models of crime should endeavor to explore additional time-varying indicators of gentrification that incorporate a variety of economic, infrastructure, and population measures.

Seattle exemplifies the pattern of rapid center-city growth of many U.S. cities in the last decade of the 20th Century (Birch 2005; Wyly and Hammel 1999) and therefore provides an appropriate context for examining the relationship between more recent gentrification and crime. However, we also acknowledge that our focus on a single city may limit the

generalizability of our findings. Seattle differs from other cities in its relative affluence, cultural and economic desirability, and racial/ethnic composition. Whether 1990's-style gentrification relates similarly to crime in other cities, including Midwestern cities that experienced population declines in the 1990's, remains to be seen.

Despite these unanswered questions, this study draws renewed attention to the importance of neighborhood dynamics for understanding crime rates. To date, the field has largely sidestepped issues related to neighborhood change that are at the heart of ecological perspectives of urban life and crime (e.g., Shaw and McKay 1931; 1942; Bursik and Webb 1982). We find that neighborhoods do change in ways associated with their crime rates. Previously disadvantaged and disorganized neighborhoods in Seattle's center underwent rapid and wide-scale transformation in the 1990's and saw simultaneous reductions in total, property, and violent crime.

Although our research implicates 1990's revitalization in at least a small part of Seattle's crime decline, we also acknowledge the contested nature of gentrification, and caution that large-scale gentrification processes may have less positive implications for displaced residents. Critics (e.g., DeSena 2009) have argued that gentrification processes may "improve" local metropolitan areas at the cost of greater racial and class inequality. An important and related follow-on question from our study concerns the potential displacement of crime from downtown to outlying areas of the city. Looking at Figure 3, we see that Seattle areas with rising crime in the 1990's are generally located in the North and South ends of the city, also reflecting patterns of racial and poverty dispersion from core downtown districts to the city's fringes (Cat Le and Parvaz 2002). A potential problem with this trend is that increasingly disorganized suburban or fringe neighborhoods may be overlooked by city managers responsible for resource allocations. As these neighborhoods are unlikely to impact the booming tourist and cultural industries fueling downtown growth, suburban disorganization and crime may become "out-of-sight, out-of-mind" phenomena overlooked by policy-makers and the general public. Instead of being highly visible and disturbing symbols of American stratification, shifting ghettoization from urban to suburban and rural settings could remove poverty's presence from the national consciousness, potentially leaving disadvantaged residents to fend for themselves. Being sensitive to these issues and documenting related processes should be a central concern for future criminological and demographic research, particularly as housing markets continue to falter and foreclosure rates climb.

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References

- Akers, Ronald L. *Social Learning and Social Structure: A General Theory of Crime and Deviance*. Boston, MA: Northeastern University Press; 1998.
- Allison, Paul D. Change Scores as Dependent Variables in Regression Analysis. *Sociological Methodology*. 1990; 20:93–114.

- Allison, Paul D. Using Panel Data to Estimate the Effects of Events. *Sociological Methods and Research*. 1994; 23:174–199.
- Anderson, Elijah. *Streetwise: Race, Class, and Change in an Urban Community*. Chicago, IL: University of Chicago Press; 1990.
- Anselin, Luc. *Spatial Econometrics: Methods and Models*. Boston, MA: Kluwer Academic Publishing; 1988.
- Anselin, Luc; Cohen, Jacqueline; Cook, David; Gorr, Wilpen; Tita, George. Spatial Analyses of Crime. In: Duffee, D., editor. *Criminal Justice 2000*, vol. 4, Measurement and Analysis of Crime and Justice. Washington, D.C.: National Institute of Justice; 2000. p. 213-262.
- Atkinson, Rowland. The Hidden Costs of Gentrification: Displacement in Central London. *Journal of Housing and the Built Environment*. 2000; 15:307–326.
- Beckett, Katherine; Herbert, Steve. Dealing with Disorder: Social Control in the Post-Industrial City. *Theoretical Criminology*. 2008; 12:5–30.
- Bellair, Paul E. Social Interaction and Community Crime: Examining Importance of Neighborhood Networks. *Criminology*. 1997; 35 677-7-3.
- Beauregard, Robert A. The Chaos and Complexity of Gentrification. In: Smith, N.; Williams, P., editors. *Gentrification of the City*. London, UK: Allen and Unwin; 1986. p. 35-55.
- Berry, Brian. Islands of Renewal in Seas of Decay. In: Peterson, J., editor. *The New Urban Reality*. Washington, D.C.: Brookings Institution; 1985. p. 69-96.
- Birch, Eugenie L. Who Lives Downtown? The Brookings Institution: Metropolitan Policy Program. 2005 Retrieved June 28, 2011 (http://www.brookings.edu/~media/Files/rc/reports/2005/11_downtownredevelopment_birch/20051115_Birch.pdf).
- Blau, Judith R.; Blau, Peter M. The Cost of Inequality: Metropolitan Structure and Violent Crime. *American Sociological Review*. 1982; 47:114–129.
- Blumstein, Alfred; Wallman, Joel. *The Crime Drop in America*. Cambridge, UK: Cambridge University Press; 2000.
- Bourne, Larry S. Are New Urban Forms Emerging? Empirical Tests for Canadian Urban Areas. *Canadian Geographer*. 1989; 33:312–327.
- Bourne, Larry S. The Demise of Gentrification? A Commentary and Perspective View. *Urban Geography*. 1993a; 14:95–107.
- Bourne, Larry S. The Myth and Reality of Gentrification: A Commentary on Emerging Urban Forms. *Urban Studies*. 1993b; 30:183–189.
- Browning, Christopher R.; Feinberg, Seth L.; Dietz, Robert D. The Paradox of Social Organization: Networks, Collective Efficacy, and Violent Crime in Urban Neighborhoods. *Social Forces*. 2004; 83:503–534.
- Bureau of Justice Statistics. Homicide Trends in the United States. 2011. Retrieved June 28, 2011 (<http://bjs.ojp.usdoj.gov/content/homicide/hmrt.cfm>).
- Bursik, Robert J., Jr; Webb, Jim. Community Change and Patterns of Delinquency. *American Journal of Sociology*. 1982; 88:24–42.
- Bursik, Robert J, Jr. Urban Dynamics and Ecological Studies of Delinquency. *Social Forces*. 1984; 63:393–413.
- Bursik, Robert J, Jr. Ecological Stability and the Dynamics of Delinquency. In: Reiss, AJ.; Tonry, M., editors. *Communities and Crime*. Chicago, IL: University of Chicago Press; 1986. p. 35-66.
- Bursik, Robert J, Jr. Social Disorganization and Theories of Crime and Delinquency. *Criminology*. 1988; 26:519–551.
- Cat Le, Phuong; Parvaz, D. Seattle’s Rich Areas Get Richer. *Seattle Post Intelligencer*. 2002 Sep 17.:A1–A2.
- Cohen, Lawrence E.; Felson, Marcus. Social Change and Crime Rate Trends: A Routine Activity Approach. *American Sociological Review*. 1979; 44:588–608.
- Coleman, James S. Social Capital in the Creation of Human Capital. *American Journal of Sociology*. 1988; 94:S95–S120.

- Covington, Jeanette; Taylor, Ralph B. Gentrification and Crime: Robbery and Larceny Changes in Appreciating Baltimore Neighborhoods During the 1970s. *Urban Affairs Quarterly*. 1989; 25:142–172.
- DeSena, Judith N. Gentrification and Inequality in Brooklyn: New Kids on the Block. Lanham, MD: Lexington Books; 2009.
- Firebaugh, Glenn; Beck, Frank D. Does Economic Growth Benefit the Masses? Growth, Dependence, and Welfare in the Third World. *American Sociological Review*. 1994; 59:631–653.
- Hackworth, Jason. Postrecession Gentrification in New York City. *Urban Affairs Review*. 2002; 37:815–843.
- Hackworth, Jason; Smith, Neil. The Changing State of Gentrification. *Journal of Social and Economic Geography*. 2001; 92:464–477.
- Halaby, Charles N. Panel Models in Sociological Research: Theory into Practice. *Annual Review of Sociology*. 2004; 30:507–544.
- Hammel, Daniel; Wyly, Elvin. A Model for Identifying Gentrified Areas with Census Data. *Urban Geography*. 1996; 17:248–268.
- Heitgard, Janet; Bursik, Robert J, Jr. Extracommunity Dynamics and the Ecology of Delinquency. *American Journal of Sociology*. 1987; 92:775–787.
- Hipp, John R. A Dynamic View of Neighborhoods: The Reciprocal Relationship between Crime and Neighborhood Structural Characteristics. *Social Problems*. 2010; 57:205–230.
- Kasarda, John; Janowitz, Morris. Community Attachments in Mass Society. *American Sociological Review*. 1974; 39:328–339.
- Krivo, Lauren; Peterson, Ruth D. Extremely Disadvantaged Neighborhoods and Urban Crime. *Social Forces*. 1996; 75:619–650.
- Kubrin, Charis E.; Herting, Jerald R. Neighborhood Correlates of Homicide Trends: An Analysis using Growth Curve Modeling. *The Sociological Quarterly*. 2003; 44:329–350.
- Lauritsen, Janet. The Social Ecology of Violent Victimization: Individual and Contextual Effects in the NCVS. *Journal of Quantitative Criminology*. 2001; 17:3–32.
- Ley, David. Artists, Aestheticisation and the Field of Gentrification. *Urban Studies*. 2003; 40:2527–2544.
- Ley, David. Liberal Ideology and the Post-Industrial City. *Annals of the Association of American Geographers*. 1980; 70:238–258.
- Lipton, S Gregory. Evidence of Central City Revival. *Journal of the American Planning Association*. 1977; 43:136–147.
- Lloyd, Richard. Neo-Bohemia: Art and Neighborhood Redevelopment in Chicago. *Journal of Urban Affairs*. 2002; 24:517–532.
- Martinez, Ramiro, Jr. Coming to America: The Impact of the New Immigration on Crime. In: Martinez, R., Jr; Valenzuela, A., Jr, editors. *Immigration and Crime: Race, Ethnicity, and Violence*. New York: NYU Press; 2006. p. 1-19.
- Massey, Douglas. American Apartheid: Segregation and the Making of the Underclass. *American Journal of Sociology*. 1990; 96:329–357.
- McDonald, Scott C. Does Gentrification Affect Crime Rates? *Crime and Justice: A Review of Research*. 1986; 8:163–201.
- Morenoff, Jeffrey D.; Sampson, Robert J.; Raudenbush, Stephen. Neighborhood Inequality, Collective Efficacy, and the Spatial Dynamics of Urban Violence. *Criminology*. 2001; 39:517–560.
- Morenoff, Jeffrey D.; Sampson, Robert J. Violent Crime and the Spatial Dynamics of Neighborhood Transition: Chicago, 1970–1990. *Social Forces*. 1997; 76:31–63.
- Nelson, Kathryn P. Gentrification and Distressed Cities: An Assessment of Trends in Intrametropolitan Migration. Madison, WI: University of Wisconsin Press; 1988.
- Newman, Kathe; Ashton, Philip. Neoliberal Urban Policy and New Paths of Neighborhood Change in the American Inner City. *Environment and Planning A*. 2004; 36:1151–1172.
- Newman, Kathe; Wyly, Elvin K. The Right to Stay Put, Revisited: Gentrification and Resistance to Displacement in New York City. *Urban Studies*. 2006; 43:23–57.

- Osgood, D Wayne. Poisson-Based Regression for Aggregate Crime Rates. *Journal of Quantitative Criminology*. 2000; 16:21–43.
- Park, Robert E.; Burgess, Ernest W. *Introduction to the Science of Society*. Oxford, UK: University of Chicago Press; 1921.
- Parker, Karen F.; McCall, Patricia L. Structural Conditions and Racial Homicide Patterns: A Look at the Multiple Disadvantages in Urban Areas. *Criminology*. 1999; 37:447–477.
- Pattillo, Mary. *Black on the Block: The Politics of Race and Class in the City*. Chicago, IL: University of Chicago Press; 2007.
- Sampson, Robert J. What ‘Community’ Supplies. In: Ferguson, Ronald F.; Dickens, William T., editors. *Urban Problems and Community Development*. Washington DC: Brookings Institution Press; 1999. p. 241-292.
- Sampson, Robert J. Open Doors Don’t Invite Criminals. *New York Times*, March 11, Editorials/Op-Ed. 2006 Retrieved June 28, 2011 (<http://www.nytimes.com/2006/03/11/opinion/11sampson.html>).
- Sampson, Robert J.; Raudenbush, Stephen. Systematic Social Observation of Public Spaces: A New Look at Disorder in Urban Neighborhoods. *American Journal of Sociology*. 1999; 105:603–651.
- Sampson, Robert J.; Morenoff, Jeffrey D.; Gannon-Rowley, Thomas. Assessing Neighborhood Effects: Social Processes and New Directions in Research. *Annual Review of Sociology*. 2002; 28:443–478.
- Sampson, Robert J.; Morenoff, Jeffrey D.; Raudenbush, Stephen. Social Anatomy of Racial and Ethnic Disparities in Violence. *American Journal of Public Health*. 2005; 95:224–232. [PubMed: 15671454]
- Sampson, Robert J.; Wilson, William Julius. Toward a Theory of Race, Crime, and Urban Inequality. In: Hagan, John; Peterson, Ruth, editors. *Crime and Inequality*. Stanford, CA: Stanford University Press; 1995.
- Sampson, Robert J.; Morenoff, Jeffrey D.; Earls, Felton. Beyond Social Capital: Spatial Dynamics of Collective Efficacy for Children. *American Sociological Review*. 1999; 64:633–660.
- Sampson, Robert J.; Raudenbush, Stephen; Earls, Felton. Neighborhoods and Violent Crime: A Multilevel Study of Collective Efficacy. *Science*. 1997; 277:918–924. [PubMed: 9252316]
- Shaw, Clifford R.; McKay, Henry D. Report on the Causes of crime, Vol II, National Commission on Law Observance and Enforcement. Washington, D.C.: US Government Printing Office; 1931. *Social Factors in Juvenile Delinquency*.
- Shaw, Clifford R.; McKay, Henry D. *Juvenile Delinquency in Urban Areas*. Chicago, IL: University of Chicago Press; 1942.
- Simpson, Charles R. *SoHo: The Artist in the City*. Chicago, IL: University of Chicago Press; 1981.
- Smith, Neil; Defilippis, James. The Reassertion of Economics, 1990s Gentrification in the Lower East Side. *International Journal of Urban and Regional Research*. 1999; 23:638–653.
- Spain, Daphne. A Gentrification Research Agenda for the 1990’s. *Journal of Urban Affairs*. 1992; 14:125–134.
- Taylor, Ralph B. *Human Territorial Functioning*. Cambridge, UK: Cambridge University Press; 1988.
- Taylor, Ralph B.; Covington, Jeanette. Neighborhood Changes in Ecology and Violence. *Criminology*. 1988; 26:553–589.
- Van Wilsem, Johan; Wittebrood, Karin; De Graaf, Nan Dirk. Socioeconomic Dynamics of Neighborhoods and the Risk of Crime Victimization: A Multilevel Study of Improving, Declining, and Stable Areas in the Netherlands. *Social Problems*. 2006; 53:226–247.
- Wilson, William Julius. *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy*. Chicago, IL: University of Chicago Press; 1987.
- Weisburd, David; Bushway, Shawn; Lum, Cynthia; Yang, Sue-Ming. Trajectories of Crime at Places: A Longitudinal Study of Street Segments in the City of Seattle. *Criminology*. 2004; 42:283–321.
- Wooldridge, Jeffrey. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press; 2002.
- Wyly, Elvin; Hammel, Daniel. Islands of Decay in Seas of Renewal: Urban Housing Policy and the Resurgence of Gentrification. *Housing Policy Debate*. 1999; 10:711–771.

- Wyly, Elvin; Daniel, Hammel. Gentrification, Segregation, and Discrimination in the American Urban System. *Environment and Planning A*. 2004; 36:1215–1241.
- Zimring, Franklin E. *The Great American Crime Decline*. Oxford, UK: Oxford University Press; 2007.
- Zukin, Sharon. *Loft Living: Culture and Capital in Urban Change*. Baltimore, MD: Johns Hopkins University Press; 1982.

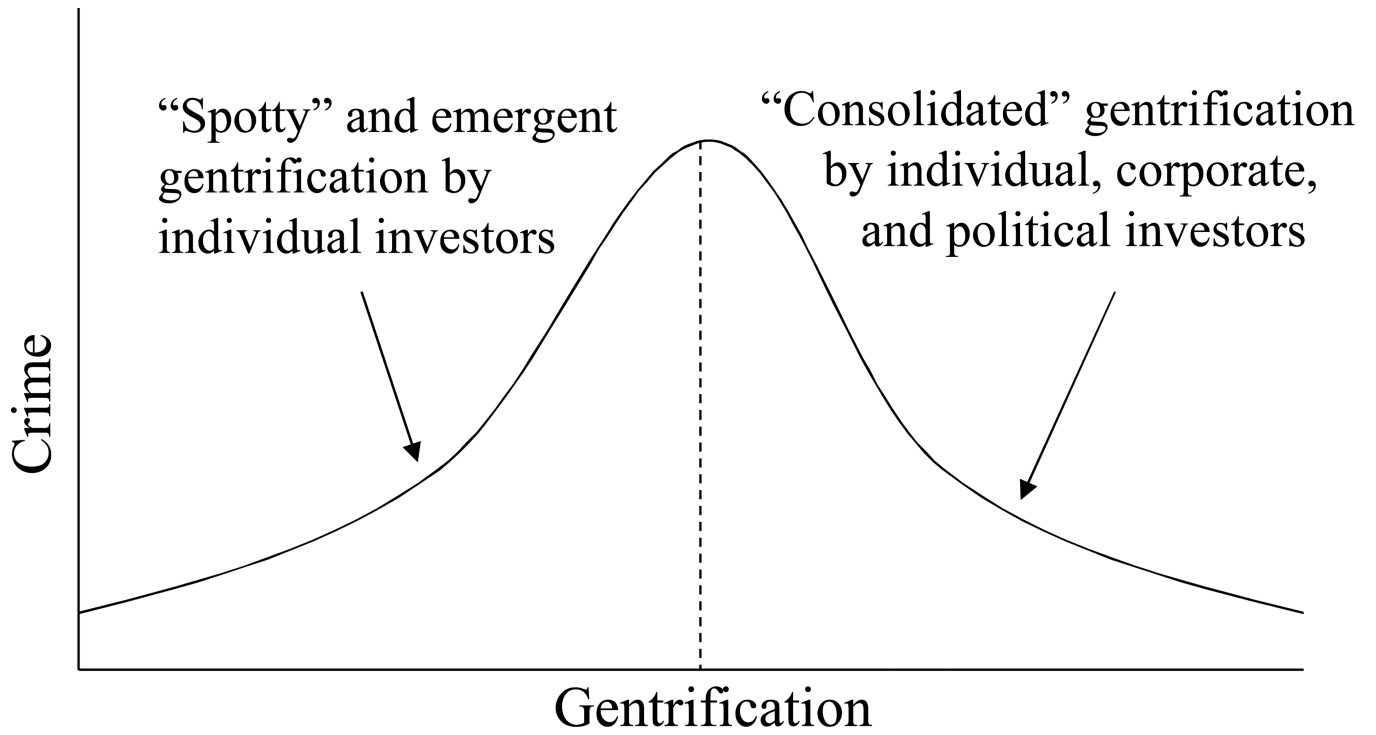


Figure 1.
Hypothesized Curvilinear Relationship between Area Gentrification and Crime

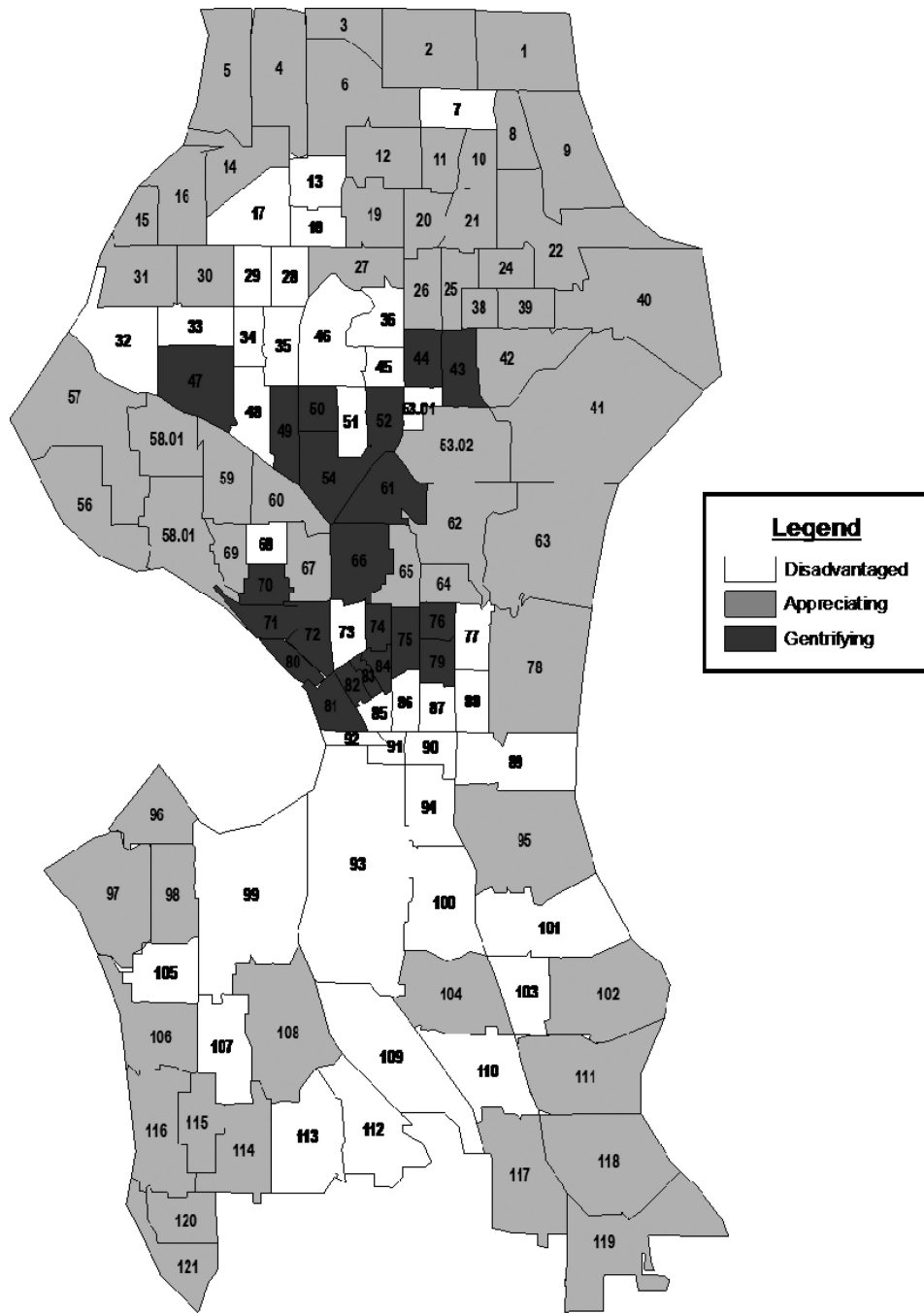


Figure 2.
Seattle Tracts and Gentrification, 1990 – 2000

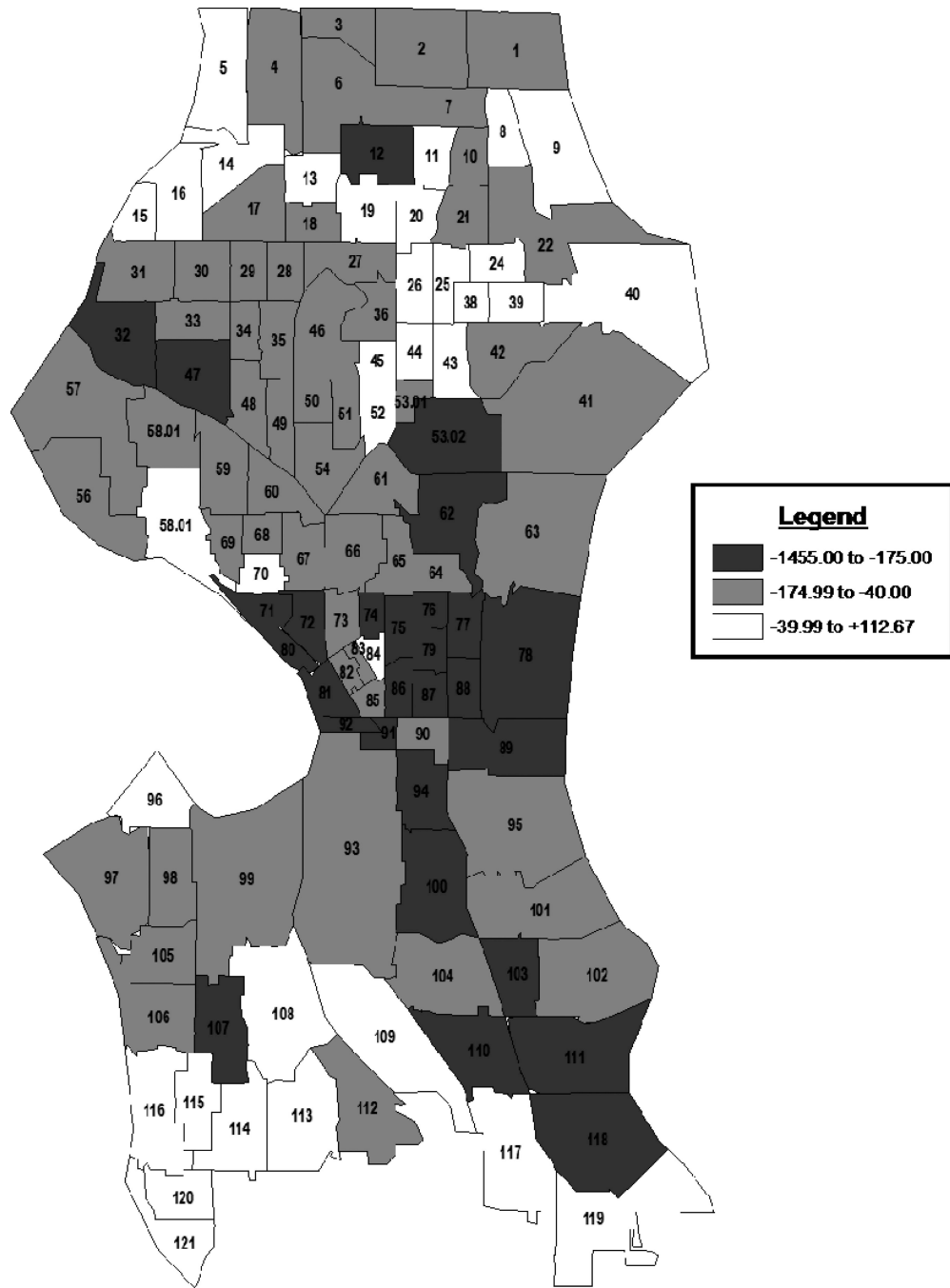


Figure 3.
Tract-Level Changes in Seattle Total Crime, 1990–2000

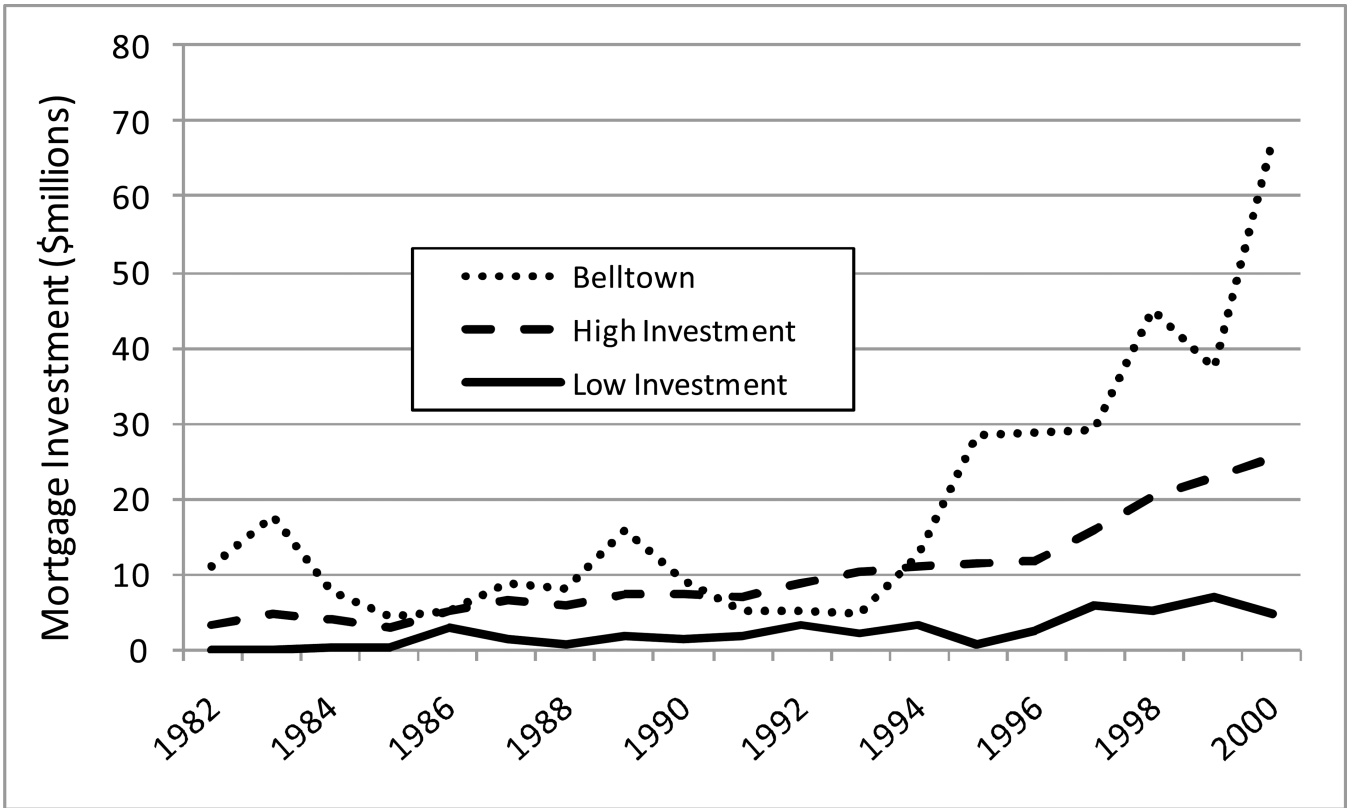


Figure 4.
Mortgage Investment Trends in Three Seattle Tracts

Table 1

Descriptive Statistics for Gentrification as an Outcome Analyses

Variables	Gentrifying Tracts (n = 21)				Non-Gentrifying Tracts (n = 99)			
	1990		2000		1990		2000	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total Crime	972.3	893.1	715.4	581.6	430.9	284.5	321.2	226.6
Property Crime	870.3	781.1	652.4	501.3	380.6	243.9	292.7	204.7
Violent Crime	101.9	116.4	63.0	83.9	50.2	53.7	28.6	29.9
Total Population (100s)	39.2	17.4	45.2	17.3	43.8	17.8	47.3	19.5
Percent Adults with College Degree	33.1	8.4	43.2	9.1	26.5	12.9	33.8	14.5
Mean Household Income (\$1k)	50.4	21.9	93.4	44.2	47.4	18.6	80.6	32.4
Mean Mortgage Investment (\$100k)	42.7	22.8	161.7	128.2	70.0	47.1	188.1	106.5
Percent Households Moved Last Five Years	72.3	5.6	74.6	4.9	53.7	11.4	52.5	11.6
Percent Foreign Born Population	10.6	3.4	12.7	3.6	13.3	8.1	17.0	11.5
Percent Black Population	7.8	9.4	6.9	6.2	10.2	15.6	9.6	11.7
Percent Housing Units Built Last Five Years	9.0	7.0	9.4	8.3	6.8	5.5	4.7	5.3

Table 2
 Descriptive Statistics for Gentrification as a Process Analyses (N=59 tracts, 1121 tract-years)

Year	Lagged Mortgage Investment (\$millions)		Total Crime		Property Crime		Violent Crime	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1982	1.62	1.77	493	561	432	481	61	83
1983	1.34	2.30	557	584	497	518	60	70
1984	2.52	1.93	603	608	534	537	69	76
1985	2.10	1.30	685	699	604	612	82	92
1986	1.76	1.16	732	730	649	643	82	94
1987	3.95	2.69	768	642	682	562	85	88
1988	4.02	2.72	779	636	696	569	84	79
1989	3.28	2.66	719	610	636	547	83	80
1990	4.56	2.93	681	598	588	512	93	96
1991	4.25	2.50	713	597	626	528	87	81
1992	4.31	2.82	717	614	628	535	89	91
1993	6.16	4.03	692	605	602	527	90	91
1994	6.34	3.84	634	568	554	505	80	73
1995	7.19	5.42	605	572	546	511	59	68
1996	6.10	4.65	611	641	556	584	55	64
1997	7.05	4.85	614	562	553	504	60	66
1998	10.84	7.56	581	503	527	450	55	61
1999	12.61	7.87	551	477	500	424	51	60
2000	14.80	10.22	499	408	448	362	51	53

Table 3

Change Score Analysis of Seattle Total Crime, 1990–2000

Variable	Model 1		Model 2		Model 3		Model 4		Model 5		
	Coef. (SE)	Coef. (SE)	Coef. (SE)	Coef. (SE)	Coef. (SE)	Coef. (SE)	Coef. (SE)	Coef. (SE)	Coef. (SE)	Std(β)	
Constant	-109.63 (17.89)	*** (28.17)	-152.12 (28.17)	*** (28.17)	-43.89 (59.91)	*	204.23 (83.41)	*	106.16 (30.79)	***	
Gentrifying Tracts	-147.26 (42.76)	*** (42.76)	-104.77 (47.62)	* (47.62)	-112.69 (45.26)	* (45.26)	-117.54 (41.91)	** (41.91)	-26.88 (23.27)		-06
Appreciating Tracts			70.11 (36.19)		38.51 (36.69)		46.25 (31.92)		-56.87 (16.34)	***	-15
Total Population (100s)					-8.74 (3.13)	** (3.13)	-9.32 (2.97)	** (2.97)	.54 (2.80)		-02
Percent Adults with College Degree					.17 (4.11)		-.63 (3.94)		-3.02 (2.00)		-07
Mean Household Income (\$1k)					-.92 (1.65)		-1.63 (1.43)		-1.00 (1.19)		-06
Mean Mortgage Investment (\$100k)					-1.76 (2.09)		-1.73 (2.13)		.33 (0.88)		.02
Percent Moved Last Five Years					6.72 (2.93)	* (2.93)	5.96 (2.90)	* (2.90)	6.41 (1.74)	***	.20
Percent Foreign Born Population					-2.79 (3.52)		-2.85 (3.46)		1.32 (1.70)		.03
Percent Black Population					11.20 (2.93)	*** (2.93)	10.83 (2.86)	*** (2.86)	9.66 (1.16)	***	.28
Percent Homes Built Last Five Years					-6.65 (2.31)	** (2.31)	-5.87 (2.23)	** (2.23)	-1.52 (1.33)		-06
1990 Total Crime									-34 (0.02)	***	-90
Spatial Error Term							.78 (0.21)	*** (0.21)	-22 (0.00)	***	

Variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coef. (SE)		Coef. (SE)		Coef. (SE)	Stzd(β)	Coef. (SE)	Stzd(β)	Coef. (SE)	Stzd(β)
R-Square	.09		.12		.29		.39		.79	

NOTE: Standard errors appear in parantheses

* p < 0.05;

** p < 0.01;

*** p < 0.001

Table 4

Change Score Analysis of Seattle Property & Violent Crime 1990–2000

Variable	Property Crime						Violent Crime					
	Model 1			Model 2			Model 1			Model 2		
	Coef. (SE)	Stztd(β)	Coef. (SE)	Stztd(β)	Coef. (SE)	Stztd(β)	Coef. (SE)	Stztd(β)	Coef. (SE)	Stztd(β)	Coef. (SE)	Stztd(β)
Constant	-107.18		109.62				-15.28	*			-3.25	
	(74.36)		(30.95)				(7.47)				(4.02)	
Gentrifying Tracts	-72.92	*	-16.33		-0.04		-10.34		.12		-4.49	
	(36.61)		(23.28)				(5.77)				(3.04)	
Appreciating Tracts	27.25		-50.95	**	-0.16		8.61		.13		-0.72	
	(33.54)		(16.76)				(4.55)				(2.19)	
Total Population (100s)	-1.73		.82		.03		-1.61	****	-0.29		.04	
	(2.88)		(2.78)				(0.39)				(0.38)	
Percent Adults with College Degree	3.71		-2.44		-0.07		.86		-0.12		-0.75	**
	(4.04)		(2.04)				(1.02)				(0.27)	
Mean Household Income (\$1k)	.40		-0.09		-0.01		.27		.10		.40	****
	(1.39)		(0.88)				(0.40)				(0.12)	
Mean Mortgage Investment (\$100k)	-4.15	*	-0.87		-0.05		-1.10		-0.03		-0.18	
	(1.98)		(1.19)				(0.53)				(0.15)	
Percent Moved Last Five Years	3.41		5.83	***	.20		1.44	*	.26		.70	**
	(2.76)		(1.74)				(0.73)				(0.23)	
Percent Foreign Born Population	.84		1.64		.05		-0.36		-0.05		-0.44	
	(2.68)		(1.70)				(0.49)				(0.23)	
Percent Black Population	8.84	***	6.97	***	.23		4.34	***	.71		2.53	****
	(2.83)		(1.13)				(0.26)				(0.19)	
Percent Homes Built Last Five Years	-5.86	*	-1.51		-0.06		-0.66	*	-0.14		-0.33	
	(2.12)		(1.31)				(0.29)				(0.02)	
1990 Property/Violent Crime			-0.35	***	-0.92						-0.33	****
			(0.03)								(0.02)	
Spatial Error Term	.73	***	-0.22	***			.92	***			-0.21	***

Variable	Property Crime				Violent Crime			
	Model 1		Model 2		Model 1		Model 2	
	Coef. (SE)	Stzd(β)	Coef. (SE)	Stzd(β)	Coef. (SE)	Stzd(β)	Coef. (SE)	Stzd(β)
R-Square	(0.02)		(0.01)		(0.10)		(0.01)	
	.36		.42		.70		.75	

NOTE: Standard errors appear in parentheses

* p < 0.05;

** p < 0.01;

*** p < 0.001

Table 5

Negative Binomial Fixed-Effects Models of Seattle Crime, 1982–2000 (N=59 tracts, 1121 tract-years)

Variable	Total Crime		Property Crime		Violent Crime	
	Coef. (SE)		Coef. (SE)		Coef. (SE)	
Time	.2323 (.0139)	***	.2331 (.0143)	***	.2110 (.0222)	***
Time ²	-.0200 (.0015)	***	-.0205 (.0016)	***	-.0152 (.0024)	***
Time ³	.0005 (.0001)	***	.0005 (.0001)	***	.0002 (.0001)	**
Total Population (100s)	.0067 (.0017)	***	.0062 (.0018)	***	.0118 (.0024)	***
Investment (\$millions)	-.0297 (.0095)	**	-.0347 (.0097)	***	.0026 (.0149)	
Investment * Time	.0044 (.0014)	**	.0051 (.0014)	***	.0001 (.0022)	
Investment * Time ²	-.0002 (.0001)	**	-.0002 (.0001)	**	.0000 (.0001)	
Constant	2.7569 (.0867)	***	2.7320 (.0881)	***	1.9529 (.1225)	***
Log-Likelihood	-6168		-6079		-4155	

NOTE: Standard errors appear in parantheses

- * p < 0.05;
- ** p < 0.01;
- *** p < 0.01