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### Authors
Hipp, John R
Luo, Xiaoshuang Iris



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# Improving or Declining: What are the Consequences for Changes in Local Crime?

John R. Hipp*

Xiaoshuang (Iris) Luo

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* Department of Criminology, Law and Society and Department of Sociology, University of California, Irvine. Address correspondence to John R. Hipp, Department of Criminology, Law and Society, University of California, Irvine, 3311 Social Ecology II, Irvine, CA 92697; email: john.hipp@UCI.edu. This research is supported in part by NIJ grant 2012-R2-CX-0010

**Improving or Declining: What are the Consequences for Changes in Local Crime?**

Abstract

Whereas existing ecology of crime research frequently uses a cross-sectional design, an open question is whether theories underlying such studies will operate similarly in longitudinal research. Using latent trajectory models and longitudinal data in ½ mile egohoods from the Southern California region over a 10-year period (2000-2010), we explore this question and assess whether the changes in key measures of social disorganization theory are related to changes in violent or property crime through three possible relationships: 1) a monotonic relationship; 2) an asymmetric relationship; 3) a perturbation relationship in which any change increases crime. We find evidence that measures can exhibit any of these three possible relationships, highlighting the importance of not assuming monotonic relationships. Most frequently observed are asymmetric relationships, which we posit are simultaneously capturing more than one theoretical process of neighborhoods and crime. Specific findings include asymmetric relationships between change in concentrated disadvantage, racial/ethnic minority composition, or population and violent crime, as well as relationships between change in Asian composition or population and property crime. We consider how this strategy opens a needed area of future research assessing how measures for other theories operate as environments change.

***Keywords***: social disorganization; longitudinal; declining neighborhoods.

***Bio***

**John R. Hipp** is a Professor in the departments of Criminology, Law and Society, and Sociology, at the University of California Irvine. His research focuses on how neighborhoods change over time, how that change both affects and is affected by neighborhood crime, and the role networks and institutions play in that change.

**Xiaoshuang Iris Luo** is a Ph.D. student in the department of Criminology, Law and Society, at the University of California, Irvine. Her primary research interests include the community context of crime, criminal justice, mass incarceration and prisoner reentry, and social networks.

# Improving or Declining: What are the Consequences for Changes in Local Crime?

A long-standing question of interest to criminologists is why some locations in cities have more crime than others. A feature of the vast majority of studies focusing on this question is that they employ a cross-sectional design, and therefore ask whether certain features of the environment are associated with higher levels of crime, either in micro locations such as street blocks (Boessen & Hipp, 2015; Ratcliffe, 2012; Weisburd et al., 2012), or meso locations such as neighborhoods (Krivo & Peterson, 1996; Sampson & Groves, 1989). A question that has received less attention is whether the theories used to explain the location of crime operate similarly in explaining the *change* in crime in locations. The most common presumption is that change in environmental features impacts changes in crime in a fashion similar to how the level of environmental features at a point in time is related to levels of crime: that is, in a monotonic fashion.[1] Nonetheless, there are reasons to question whether this is necessarily the case, as neighborhood processes might not be captured simply by viewing how short-term changes in one measure are related to short-term changes in crime (Bursik, 1986). For example, the early social disorganization research was premised on the assumption of a system in a state of equilibrium, or stationarity, in which such stationarity would imply *monotonic* changes. However, this assumption deserves more careful scrutiny than typically afforded in criminological theories or empirical work.

How crime responds to neighborhood demographic change may depend on the *direction* of that change. This idea has been given limited consideration in criminology, and has only been occasionally considered in the social sciences more generally (Allison, 2019; Lieberson, 1985:

[1] By monotonic, we mean that a one-unit increase in a measure would have the same effect on crime as would a one-unit decrease (but opposite sign).

Chapter 4; York & Light, 2017). Here, we propose that there are at least two alternative possibilities (beyond monotonic change) for how environmental change is related to changes in crime. One possibility is that *any change* in certain environmental features will increase levels of crime, regardless of the direction of that change—what we refer to as *perturbation*. This idea in part comes out of social disorganization theory, which posits that environmental change in general can have a destabilizing effect on neighborhoods (Shaw & McKay, 1942). The implication is that it is not enough to simply focus on whether the direction of change in a measure is related to the direction of change in crime, but rather that increases *or* decreases in some measures might result in increases in crime. In short, any change in certain characteristics is expected to disrupt neighborhood social relationships, which could reduce neighborhood cohesion and informal social control, and therefore increase crime.

A second possibility is that the relationship between the change in an environmental feature and crime is *asymmetric*. That is, in some instances an increase in a measure might cause a much stronger change in crime, whereas a decrease in the measure has a smaller or no effect, or vice versa (Lieberson, 1985). This can occur due to a nonlinear relationship, or if there are two countervailing processes at work. LaFree (1999) pointed out that, in general, few studies have tested for the asymmetry of relationships with crime. There are only a few exceptions, although these are generally measured at the macro scale using time series for the entire U.S. For example, Cohen and Land (1987) studied effects of changing age structure, while two other macro studies using time series data for the entire U.S. tested whether nonlinear effects resulted in longitudinal asymmetric effects for homicide (McDowall, 2002) or other crime types (McDowall & Loftin, 2005), though no such effects were detected.

The present study assesses how environmental change might impact changes in crime and in what manner by employing longitudinal crime data over a decade (2000-2010) from cities in the Southern California region. We explore how change in neighborhood characteristics over 10 years—based on three types of change—is related to changes in crime over the decade. Specifically, in the next section, we describe what we propose as three possible patterns of a relationship between changes in measures and changes in violent and property crime—monotonicity, asymmetry, and perturbation—based on the theoretical lens we employ utilizing social disorganization theory. We then describe four theoretical dimensions—changing neighborhood disadvantage, social distance, residential instability, and the business environment—important to neighborhood scholars that we focus on here, and how these might manifest as monotonicity, asymmetry, or perturbation. We then describe our data and methods. After presenting the results, we conclude with a discussion of the implications of our findings.

**Literature Review**

A large body of research in the social disorganization tradition has tested cross-sectional models in which positive relationships are often detected between residential instability, racial/ethnic heterogeneity, or the level of economic disadvantage with levels of crime in neighborhoods (for an overview of such studies, see Pratt & Cullen, 2005). The presumption when moving to longitudinal models is that we should observe a similar lockstep relationship in which increases in any of these measures in a neighborhood will be accompanied by increasing rates of crime. Whether this is in fact the case is an open empirical question.

The ecology of crime studies that have employed a longitudinal design most often ask whether a change in some measure is related to change in neighborhood crime, based on the

presumption of monotonic changes. For example, one study explored the relationship between drug markets and crime on blocks and in the surrounding blocks using monthly data (Contreras & Hipp, 2020 (2018)), and studies focused on the impact of housing vacancies or demolitions on crime have used quarterly data (Kim & Wo, 2020; Spader et al., 2016; Wheeler et al., 2018). There is also a body of research focusing on the foreclosures and crime relationship using longitudinal data (Cui & Walsh, 2015; Hipp & Chamberlain, 2015; Katz et al., 2012; Williams et al., 2013). Despite this growing body of literature focusing on relatively short-term changes in various characteristics and changes in crime rates, studies rarely consider the timing of such effects, or whether they should indeed be expected to operate in such a monotonic manner. Furthermore, the results detected in many longitudinal studies are generally weak. Notably, in a study with weak results predicting change in St. Louis neighborhoods over 15 years, the authors concluded that "this underscores our general lack of understanding concerning what drives variation in individual neighborhood trajectories of change and what accounts for the variation" (Kubrin & Herting, 2003: 345).

Moving beyond a monotonic relationship is the theoretical possibility that *perturbations* might result in increasing levels of crime. In this view, any change in certain neighborhood characteristics can have a destabilizing effect on a neighborhood, which can reduce the potential provision of informal social control as posited by social disorganization theory. This may operate through residents' perceptions, in which visible changes in the neighborhood's socio-demographic composition bring about a visceral sense that the neighborhood is changing in ways that may or may not be desirable. Or it may operate by impacting the social ties among residents: if difference along key social dimensions reduces the likelihood of the formation of social ties due to homophily preferences (McPherson et al., 2001), then such neighborhood transition has

the ability to sharply change the overall structure of the neighborhood social network, which would then be expected to impact the capability of neighborhood informal social control and levels of crime.

A third possibility we consider here is that there may be an asymmetric relationship between the variable of interest and crime levels. There are at least two reasons why this might occur. One reason would be due to a nonlinear relationship between the measure and crime. For example, a logarithmic relationship will appear to have larger gains and smaller decreases if it is inadvertently modeled as a linear relationship in a longitudinal setting. Whereas this could be addressed by properly modeling this nonlinear relationship in a longitudinal setting, this is not always done. Furthermore, more complicated nonlinear relationships may not be so easily modeled (e.g., a polynomial relationship). A second reason we might observe an asymmetric relationship between changes in structural characteristics and changes in neighborhood crime is due to competing processes. Thus, if the change in a measure is capturing both a monotonic theoretical relationship along with a perturbation relationship, the combination of the two can result in an observed asymmetric relationship.

The possibility of asymmetry in relationships has only occasionally been considered in criminological studies, and there arguably is a need for more consideration of this possibility. As mentioned earlier, some of the earliest examples come from the macro literature, with Cohen and Land (1987) assessing the asymmetric impact of changing age structure, while other research asked whether a nonlinear relationship could give rise to asymmetry in longitudinal effects for homicide (McDowall, 2002) or other crime types (McDowall & Loftin, 2005). Yet other macro research tested and found that a decrease in oil prices has a much stronger negative effect on commercial burglaries compared to an increase in oil prices (Chamlin & Cochran, 1998). Rotolo

and Tittle (2006) proposed that population changes will have an asymmetric impact on changes in crime rates at the macro scale. Such asymmetric effects can also exist at the individual level. For example, we might expect that decreasing self-esteem has a much stronger impact on antisocial behavior than does an increase in self-esteem (Allison, 2019). Skogan (2006) explicitly proposed that negative police encounters will much more strongly impact residents' perceptions of the legitimacy of the police than will positive encounters, and recent scholarship using a longitudinal survey of adolescents found empirical evidence consistent with this hypothesis (Thompson & Pickett, 2021). Nonetheless, scholarship assessing the ecology of crime has rarely assessed possible asymmetry.

The question then is how change in the neighborhood environment impacts changes in crime. We consider these three possible patterns of neighborhood change in the context of four key social structural changes: 1) neighborhood disadvantage; 2) social distance; 3) residential instability; and 4) the business environment. We turn to this discussion next.

*Changing Neighborhood Disadvantage*

A prime tenet of social disorganization theory is that more disadvantaged neighborhoods have less access to resources, have less capability of informal social control, and therefore will have more crime. Indeed, a large body of empirical research finds that disadvantaged neighborhoods have higher levels of crime (Krivo & Peterson, 1996; Sampson et al., 1997). Thus, more disadvantaged neighborhoods—those with higher levels of socioeconomic disadvantage, or a greater presence of more disadvantaged minority groups such as African Americans or Latinos—are less able to obtain resources from the community in addressing the crime and disorder problems they face (Bursik & Grasmick, 1993). The expected consequence is a monotonic relationship in which increases in disadvantage will correspond to higher levels of

crime, whereas decreasing disadvantage results in reduced crime. A study of Los Angeles census tracts found that increasing disadvantage over a decade was associated with increases in aggravated assault and larceny, but was unrelated to other crime types (Hipp & Branic, 2017), and a study of Brisbane neighborhoods found a positive relationship between disadvantage and changing violent crime (Hipp & Wickes, 2017). Also, decreasing average income was associated with rising aggravated assaults, robberies, and burglaries in another study of Los Angeles egohoods (Hipp & Kubrin, 2017). However, research in St. Louis neighborhoods found a nonlinear relationship between changing disadvantage and homicide, an issue to which we will return shortly (Kubrin & Herting, 2003). Nonetheless, studies typically only test for a monotonic relationship.

Likewise, there is a considerable body of literature demonstrating that racial/ethnic minorities—particularly Black and Latino residents—are especially disadvantaged and often pushed into segregated, less desirable neighborhoods (Deng et al., 2003; Rosenbaum, 1994). For example, studies have shown evidence that these segregated neighborhoods have lower quality schools, as well as other institutions (Massey et al., 1987), and there is evidence that this racial segregation results in residents of majority Black neighborhoods reporting a greater fear of crime (Quillian, 2002). As a consequence, one study found that neighborhoods in cities with more racial segregation had higher violent crime rates (Krivo et al., 2009), whereas another found that increasing Black population was associated with increasing neighborhood violent crime (Morenoff & Sampson, 1997). Thus, these are disadvantaged neighborhoods with fewer resources and greater structural challenges that limit the ability to address problems of crime and disorder (Sampson & Wilson, 1995). Consistent with this reasoning, a large number of cross-sectional studies have tested, and found, that racial/ethnic minorities often tend to reside in

neighborhoods with more violent crime (Hipp, 2007; Krivo & Peterson, 1996; Roncek, 1981). This implies an expected positive relationship between the change in these groups and changes in neighborhood violent crime. For example, a study of Los Angeles found that increases in percent Black over a decade were associated with increasing violent crime (but falling property crime), and increases in percent Latino were associated with increasing robberies and property crime (Hipp & Kubrin, 2017).

*Changing Social Distance*

Another perspective is that certain types of demographic change in a neighborhood can accentuate social distance between residents (Merton, 1968; Simmel, 1955), be destabilizing, and therefore reduce the capability of informal social control in two ways: 1) it can impact residents' perceptions of the neighborhood, and 2) it can reduce social ties between residents. Although perceptions drive residents' behavior, they are relatively undertheorized in neighborhood change. Robert Sampson has provided key insights into the importance of perceptions by coining the phrase *the looking-glass neighborhood* to characterize how residents perceive their own neighborhood, and the consequences that can occur due to these perceptions (Sampson, 2012). In research in Chicago neighborhoods, he found that residents' perceptions of the level of disorder were impacted by the presence of racial minorities in the local environment (Sampson & Raudenbush, 2004). Similarly, a study of residents in Brisbane, Australia found that residents who perceived more minorities in the neighborhood *than actually existed*—what they termed *minority status distortion*—perceived more disorder, which further emphasized the importance of perceptions (Wickes et al., 2013). A study of Los Angeles residents found that in neighborhoods with more social distance there was less agreement about the perceived level of collective efficacy (Hipp et al., 2018). Research in Seattle found that residents living in

neighborhoods with more disorder and more African Americans perceived a greater fear of crime (Rountree & Land, 1996). These perceptions appear important for explaining neighborhood change, and neighborhood demographic transition may accentuate these effects.

While there are many possible dimensions of social distance based on different socio-demographic characteristics of residents (Hipp, 2010; Simmel, 1955), a primary dimension of importance in U.S. society is race/ethnicity. Therefore, any racial/ethnic change in which households are replaced by new households of a different race/ethnicity will increase social distance in the neighborhood and can reduce social ties in the neighborhood. Thus, a changing racial/ethnic composition might be expected to impact residents' perceptions that the neighborhood is undergoing change, which may be of concern. Furthermore, given the presumptions of homophily in the social network literature (McPherson et al., 2001), new residents of a different race/ethnicity from current residents in the neighborhood increase the amount of social distance, which could impact social networks quite quickly. The consequence is that any racial/ethnic transformation would reduce neighborhood capability of informal social control and neighborhood cohesion, what one study referred to as *ethnic churning* (Pastor et al., 2001), regardless of which group is entering or leaving the neighborhood. A study of Los Angeles egohoods found some evidence for this, as greater levels of racial/ethnic churning during the decade led to larger increases in violent crime (Hipp & Kubrin, 2017).

A second important dimension of social distance in neighborhoods is the socio-economic status (SES) of residents, and this may also increase crime any time the new residents are of a different socio-economic class from the existing residents. Again, one way this can occur is if any change in the neighborhood economic composition reduces social network ties between residents and therefore results in less cohesion and informal social control (Morenoff et al., 2001)

and an increase in crime. For example, a study of a single community found that households with greater SES difference between them were less likely to form a social tie, even accounting for the physical distance between the households (Hipp & Perrin, 2009). Furthermore, a study using annual data over a five year period in 2,500 Dutch neighborhoods found evidence that *any* economic change in neighborhoods—whether it is increases or decreases in various measures—resulted in more victimization, and it operated through the mechanism of increased instability (Van Wilsem et al., 2006). Change in SES occurs through the gentrification process in some neighborhoods in which average home values increase. For example, a study in Los Angeles between 1990 and 2000 found that neighborhoods undergoing economic improvement experienced increasing crime, and this pattern was even stronger in higher income neighborhoods when nearby neighborhoods were not also gentrifying (Boggess & Hipp, 2016). Likewise, a study of St Louis tracts over 15 years found a U-shaped relationship between changes in economic disadvantage and changes in homicide, where the largest increases in homicide occurred in tracts in which disadvantage was either increasing *or* decreasing, and that falling homicide rates occurred when there was little change (the bottom of the U), implying that change more generally in disadvantage was important for explaining changes in homicides (Kubrin & Herting, 2003).

A second possible mechanism is that changing SES of residents can not only reduce cohesion in the neighborhood but lead to outright conflict and hostility. There is some qualitative evidence in studies of gentrification processes of resentment on the part of some existing residents as higher SES residents move in and the neighborhood undergoes change in amenities as well as rent levels (Brown-Saracino, 2017; Doucet, 2009; Nyden et al., 2006). Indeed, studies have found evidence that crime increases during the initial stages of

gentrification, which is an instance of improvement in economic resources in a neighborhood, although in the long term crime begins to fall (Kreager et al., 2011). The long-term change results in lower levels of inequality as the neighborhood becomes more fully gentrified, which potentially enhances neighborhood social networks and reduces enmity, resulting in less crime. For example, longitudinal models revealed that gentrification associated with increased amenities such as coffee shops was strongly related to declines in homicide and robbery (Papachristos et al., 2011).

*Changing Residential Mobility and Instability*

Up to now we have discussed residential mobility where the exiting household is replaced by one with different demographic characteristics, but residential mobility itself can be consequential for neighborhoods. Residential mobility by households occurs for many reasons and is a normal part of the neighborhood ecology. The concern of neighborhood scholars is when the rate of mobility in a neighborhood becomes more extreme, and is referred to as residential instability.

Although social disorganization theory pointed to the importance of residential instability based on the turnover of residents, systemic theory made explicit the expectation that in more stable neighborhoods residents are better able to create social ties, cohesion, and informal social control (Kasarda & Janowitz, 1974; Sampson & Groves, 1989). Whereas studies typically consider residential instability at a point in time, we argue that this measure may operate in an asymmetric manner in a longitudinal framework. In our view, increasing levels of residential instability would impact the neighborhood more than would falling levels. In part, increasing turnover would arguably impact social ties more substantially. Thus, social ties are severed as soon as residents leave the neighborhood, but it then takes some time for new ties to form with

the new residents. In this case, the overall density of ties in a neighborhood drops more sharply with an increase in instability than it increases with rising stability. Another reason is that increasing residential turnover may more strongly impact residents' perceptions that the neighborhood is undergoing turmoil and change, and therefore reduce confidence in the efficacy of the neighborhood. Seeing multiple residents move out within a short period of time can create a sense of neighborhood abandonment (Ross et al., 2000; Skogan, 1990; Steenbeek et al., 2012). In contrast, increasing residential stability would presumably not have such a strong visceral impact on residents, and would therefore more modestly impact changes in crime.

An important consequence of residential mobility is that the household wishing to exit may or may not be able to do so, and if they do leave, they may or may not be replaced by another household. These considerations have important consequences. Thus, if a household exits the neighborhood and then is replaced by a new household, this will result in increased residential instability, as described in the prior paragraph. However, if the household is not replaced, this will have other consequences. One consequence is that the residential unit will become vacant, which can impact crime levels (Boessen & Chamberlain, 2017; Cui & Walsh, 2015). A second consequence is that the population in the area will decline. This exodus of households without replacement will result in reduced population density, dissolved social ties, and more vacant units. This would all quite likely impact residents' perceptions of the efficacy of the neighborhood to address problems, and this along with the lost social ties may bring about reduced potential informal social control.

In contrast, increasing population in a neighborhood can occur through at least two different processes. One is when larger households move into the same number of housing units, which would increase the density of persons within units and in the neighborhood. Another

process occurs when new housing units are constructed—either on vacant lots or when higher density housing is built to replace lower density units. In this case, the crowding within units will not necessarily change, but we again will see an increase in population density. The presence of newer units may result in less physical disorder given their newness, which might reduce crime (Hipp et al., 2019). However, this increasing population arguably implies more crime opportunities through increased density, and the increasing population density may negatively impact social ties and create more tension among residents. Thus, there are mixed processes regarding increasing population and crime.

*Changing Business Environment*

Although social disorganization scholars tend to focus less on the business environment of a neighborhood, this also has consequences for a neighborhood's economic vibrancy or levels of disorder. We can distinguish businesses based on the extent to which they serve consumers. At one extreme are businesses that exist to serve consumers—such as retail establishments, restaurants, grocery stores, etc. These are often the focus of crime opportunity theories as the presence of customers provides attractive targets. At the other extreme are businesses that do not directly serve consumers, such as factories, warehouses, or white-collar offices. Although these can provide some crime opportunities as workers come and go, they are not nearly as attractive to offenders; instead, from the perspective of a neighborhood these locations arguably are more important as potential employment sources for residents. Although businesses exist all along this spectrum—including some consumer-facing businesses that are particularly attractive to offenders, such as bars or liquor stores—we will focus here on these two ends of the spectrum. Regarding what have been referred to as consumer-facing businesses (Kane et al., 2017; Porter, 2000), crime opportunity theories imply a monotonic relationship in which increases in the

number of these businesses will result in crime increases, whereas decreases will lead to falling crime rates (Brantingham & Brantingham, 1984; Felson & Boba, 2010). Indeed, numerous cross-sectional studies have found a positive association between commercial land use areas and various types of crime, especially violent crime (Boessen & Hipp, 2015; Kinney et al., 2008), or how this land use can impact crime differently depending on the neighborhood context (Smith et al., 2000; Stucky & Ottensmann, 2009; Wilcox et al., 2004). One study did find evidence of a cross-sectional curvilinear relationship between commercial land use and violence (Browning et al., 2010), implying that there could be asymmetry in this relationship.

Regarding non-consumer businesses, we would expect these to have an asymmetric relationship with crime. Whereas they do provide some crime opportunities, they are typically less attractive to offenders. Instead, their role as job generators may be particularly important for a neighborhood. But here we might expect an asymmetric relationship, as declines in job opportunities would more strongly impact the neighborhood. This is because when a business is initially placed, the workers arguably come from a broader area than the local neighborhood. Over time, there is evidence that some workers will relocate closer to their workplace to reduce their commute distance (Boarnet & Crane, 2001). This relocation over time implies that if an employer leaves a location or goes out of business, there may be a stronger negative impact on the neighborhood than from the initial business placement. There is a large literature on the loss of employment in areas and the negative consequences for neighborhood residents (Sampson & Wilson, 1995; Wilson, 1996). If these lost jobs are particularly disruptive to the neighborhood, they might result in an increase in crime.

There is a second mechanism through which lost businesses might impact the neighborhood and that is through increased physical and social disorder. Whereas there is

evidence that business districts have more physical disorder (Steenbeek et al., 2012; Wilcox et al., 2004) and social disorder (Steenbeek et al., 2012) than do residential areas, this may be accentuated if businesses leave and are not replaced. Specifically, the loss of businesses, at least in the short-term, typically does not result in the disappearance of the building containing the business. Instead, the reduction in businesses in an area usually yields empty storefronts and buildings, which are themselves a measure of disorder (Ross & Jang, 2000; Sampson & Raudenbush, 2004). The presence of numerous empty buildings may be taken as an indication that the neighborhood is struggling economically, and there is evidence that residents' sense of territoriality is strongly reduced by such abandoned buildings (Kurtz et al., 1998). To the extent that these empty buildings become targets of physical disorder through graffiti and vandalism, this could further increase disorder and therefore yield more crime. The reduction in the ambient population in such commercial areas due to the loss of businesses will also reduce the presence of potential guardians through "eyes on the street" (Jacobs, 1961), providing increased crime opportunities. This all implies a countervailing process in which the loss of consumer-facing businesses does not reduce crime much, if at all, and the loss of non-consumer businesses actually increases crime levels.

**Hypotheses**

Given the above discussion, we here formulate several hypotheses. First, we described a posited monotonic relationship between economic disadvantage and crime, along with a posited perturbation relationship in which increases or decreases in disadvantage should result in more crime. Combining these two perspectives, we therefore hypothesize an asymmetric relationship for concentrated disadvantage and crime with a strong positive relationship for increasing disadvantage, but a smaller, or null, negative relationship for decreasing disadvantage. Thus,

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*Hypothesis 1: The impact of changing concentrated disadvantage on crime will be asymmetric.*

Similarly, we posited a monotonic relationship between the presence of the disadvantaged groups of Black and Latino residents, along with a *perturbation* process in which crime would increase with any change in these groups. This also implies an asymmetric relationship in which crime increases with increases in these groups but decreases less or not at all with a falling composition of these groups. Thus,

*Hypothesis 2: The impact of changing Black and Latino composition on crime will be asymmetric.*

For Asian residents, we posited a perturbation relationship based on social distance theory, as this group is not as economically disadvantaged as Black and Latino residents. Thus, an increase or a decrease in this group would be posited to increase crime. Thus,

*Hypothesis 3: Any change in Asian composition will result in greater increases in crime.*

We described competing processes for residential instability, based on the differential impact on residents' perceptions of the neighborhood or their social networks. Thus, we hypothesize an asymmetric relationship in which increases in residential instability have a stronger positive relationship with crime than do decreases in instability. Thus,

*Hypothesis 4: The impact of changing residential instability on crime will be asymmetric.*

Similarly, we posited competing processes for the change in population, which implies an asymmetric relationship. Although increasing population should have an unambiguous positive relationship with crime, decreasing population in part implies fewer opportunities for offenders and therefore less crime but also a countervailing effect from reduced informal social control and therefore a net result of little impact on how crime changes. Indeed, a study of cities commented that systemic theory implies an even stronger pattern in which "population growth and

population decline should both lead to greater crime because they both produce social and community disorganization" (Rotolo & Tittle, 2006: 348). We nonetheless posit here that these countervailing processes will lead to an asymmetric relationship:

*Hypothesis 5: The impact of changing population on crime will be asymmetric.*

Finally, we posited that consumer-facing businesses would have a positive asymmetric relationship with crime as increases in these businesses would have a stronger positive relationship with crime than the negative relationship with decreases in these businesses (given the countervailing possibility of increased disorder from empty buildings). We also posited that non-consumer businesses would have a negative asymmetric relationship. Thus, we expect that decreasing numbers of businesses—particularly non-consumer businesses—might actually result in *increases* in crime rates, given the lost employment and increased disorder. Thus:

*Hypothesis 6a: The impact of changing consumer businesses on crime will be positive and asymmetric.*

*Hypothesis 6b: The impact of changing non-consumer businesses on crime will be negative and asymmetric.*

*Summary*

We distinguish between three competing types of relationships in this study: monotonic, asymmetric, and perturbation, and test the effects of these types of change for violent crime versus property crime. Rather than using traditional non-overlapping unit meso-units such as block groups or tracts, we test our neighborhood-level hypotheses with egohoods given that they better capture the spatial patterns of residents (Hipp & Boessen, 2013). Egohoods are measured as a census block at their center and then all block centroids within some radius of this block (½ mile in this study). Thus, they create overlapping units that better capture activity patterns of

residents and offenders (Moudon et al., 2006; Rossmo, 2000; Sastry et al., 2002). Given that housing turnover may disproportionately occur at the smaller geographic scale of blocks—rather than larger neighborhood units—we believe that egohoods will better capture this change. Furthermore, prior evidence from Hipp and Boessen (2013) found that egohoods better captured mixing in the environment, especially for racial heterogeneity and economic inequality, compared to traditional neighborhood units. It is also the case that egohoods' explicit spatial nature accounts for spatial autocorrelation in the data as well, and therefore we employ them here.

We use data from a large number of cities in the Southern California region over a decade to capture enough change in these processes. The Southern California region is an interesting one to study given that it has experienced a fair amount of neighborhood change over this time period, including the gentrification of parts of downtown Los Angeles, as well as other racial/ethnic churning that occurs in this large immigrant destination. We next turn to a description of our data and methods.

## Data and methods

### *Data*

The study site is cities in the Southern California region, defined as the five counties of Los Angeles, Orange, Riverside, San Bernardino, and San Diego. We used crime data obtained from the Southern California Crime Study (SCCS), in which researchers collected crime data from a number of agencies in the region with data covering the years 2000-2010.[2] The data cover 23 cities with at least 50,000 population, and 41 cities with at least 20,000 population, for a total of 83,192 egohoods when including smaller cities and unincorporated county areas with

[2] See more information about the SCCS here: https://ilssc.soceco.uci.edu/category/southern-california-crime-study/

crime data at both time points. Crime incidents were geocoded to latitude–longitude point locations using a geographic information system (ArcGIS 10.2) and placed in the appropriate block, and then later aggregated to egohoods. The geocoding match rate was over 96%. We also constructed several socio-demographic variables based on the 2000 and 2010 U.S. Censuses and the American Community Survey 5-year estimates for 2008-2012. Business data were obtained from the Reference USA Historical Business Data **(Infogroup, 2015)** that provides the precise address of businesses. For blocks near the boundary of a city in which there is no crime data for the adjacent city, we only compute the population of blocks in the egohood with crime data, and thus the population appropriately matches blocks with crime data.[3] In ancillary analyses, we aggregated all the data to block groups (a more traditional geographic unit) and compared the results.

*Dependent Variables*

We computed the number of crime incidents in each egohood for each year from 2000 to 2010. Violent crime incidents were computed by summing up homicide, robbery, and aggravated assault incidents.[4] Property crime incidents summed burglary, larceny, and motor vehicle theft incidents. All crime incident counts were log transformed (after adding 1) to account for how the skewed distribution impacts the residuals (the logged distributions were approximately normal for all time points).

*Independent Variables*

We created measures that capture four dimensions of neighborhoods—economic conditions, racial/ethnic composition, residential instability, and the business environment. For

[3] This addresses boundary issues between cities. This also relates to the fact that we do not have crime data for all cities in the region. Indeed, nearly all existing micro- and meso-level studies use data from a single city, and thus such boundary issues, as well as concern about generalizing to the entire region, are not unique to this study.
[4] Although it would be informative to estimate models with homicides alone as the outcome measure, they are too rare in the study area to estimate such models.

each Census measure, we computed the variable in 2000, in 2010, and the difference of the two. Because the smallest geographic unit at which the Census reports some variables is block groups or tracts, our strategy requires us to impute these variables to blocks before aggregating to egohoods. We used synthetic estimation for ecological inference (M. L. Cohen & Zhang, 1988; Steinberg, 1979) to assign these values to the blocks within the block group rather than using a naïve uniform imputation strategy, as is commonly employed (Boessen & Hipp, 2015). In the synthetic estimation for ecological inference approach, an estimated model predicts the presence of a variable of interest at a larger geographic unit of analysis, and then uses the parameter estimated from this model and multiplies them by the values of these variables in a smaller geographic unit to impute values of the missing variable in the smaller units. This strategy assumes that the relationship between variables at one unit of analysis is similar at a different level, rather than assuming that there is no relationship at all as is done in the more typical strategy of uniform imputation. Boessen and Hipp (2015) in an online appendix showed that this approach yields estimates much closer to the true values compared to a uniform imputation approach.[5] By using multiple imputations, the standard errors appropriately account for the uncertainty.

To capture the economic environment, we constructed measures of concentrated disadvantage and income inequality. We measured *concentrated disadvantage* with a factor score after a factor analysis of four variables: 1) percent at or below 125% of the poverty level;[6]

[5] The online appendix is here: https://onlinelibrary.wiley.com/action/downloadSupplement?doi=10.1111%2F1745-9125.12074&attachmentId=117311654. The variables we included in these imputation models were percent owners, racial/ethnic composition, percent divorced households, percent households with children, percent vacant units, population density, and age structure (percent aged: 0-4, 5-14, 20-24, 25-29, 30-44, 45-64, 65 and up, with percent aged 15-19 as the reference category).

[6] We use 125% of the poverty rate as the cutoff, rather than the official poverty cut-off value, given that the relatively high cost of living in Southern California makes this higher cutoff value more appropriate for capturing disadvantage.

2) percent single parent households; 3) real average household income (in 1982 dollars); and 4) percent with at least a bachelor's degree. *Income inequality* was measured by first assigning household incomes to the midpoint of their reported range (the Census reports household incomes in ranges of values), log transforming these values, multiplying them by the number of observations in each bin, computing the mean logged household income, and then computing the standard deviation of logged income based on these values.[7] We followed the approach of Hipp and Kubrin (2017), and used the information on the racial/ethnic composition of each block, and then imputed the binned income values based on the particular race/ethnicity to match this block racial composition to improve the precision of the imputed values to blocks before constructing the egohood values.

For racial/ethnic composition, we constructed measures of the *percent Black, percent Latino, percent Asian, percent other race* (with percent white as the remainder). We accounted for racial/ethnic mixing by computing *racial/ethnic heterogeneity* as a Herfindahl index based on five categories of Black, Latino, Asian, White and other race: this was computed as 1 minus a sum of squares of the proportion of each group. Larger values indicate more heterogeneous areas. We measured *residential instability* by creating standardized versions of the percent homeowners and the average length of residence (z-scores) and summing them (and then multiplying by -1 to make this a measure of instability).[8] We accounted for changes in the local population by constructing a measure of *population (logged)*. Vacant units can create disorder and more crime opportunities, so we created a measure of *percent vacant units*.

The change in the business environment can also impact the location of crime, and we

[7] For the highest, open-ended range, we assigned the midpoint value as being 25% greater than the bottom value in this range.

[8] We first "stacked up" the data such that the standardized scores are based on both time points. This is necessary for capturing the direction of change, as standardizing at each time point separately would only allow for measuring relative change, not absolute change, which was our interest.

therefore accounted for businesses with two separate measures based on Reference USA data from 2000 to 2010. This is address-level data that we directly aggregated to egohoods. We had annual data for these measures, so we constructed linear trajectories of the change in each measure in each egohood over the decade using techniques described by Bollen and Curran (2006), and included these measures in the models.[9] Given that some businesses attract customers to an area, we computed the *number of consumer-facing employees* based on the number of retail and restaurant employees (these are North American Industry Classification System codes 44, 45, and 72). We used employees rather than establishments as a better proxy of the number of customers coming to the area. We captured the general presence of workers with the *number of non-consumer employees* (subtracting the number of consumer-facing employees from total employees).[10]

We also included other measures that may be important for explaining the change in crime. We constructed a measure of *percent immigrants*, given evidence that neighborhoods with more immigrants often have lower crime rates (Ousey & Kubrin, 2018). We included a measure of the *percent aged 16 to 29* to capture those in the prime offending ages.

*Constructing Spline Measures*

To assess whether it is change itself in these measures that matters, we constructed spline versions of our change variables (York & Light, 2017). Specifically, for each of our change measures we constructed two additional measures for each variable that we included in the

[9] Including these additional trajectories as latent variables in the model introduced estimation difficulties, so we instead entered them as observed variables based on the estimated trajectories. This involved estimating the trajectory for a single egohood over the 11 years and saving this estimated slope as the observed variable. A loop estimated this value for each egohood in the sample.

[10] We also estimated additional models in which we constructed and included measures of bars and liquor stores, given that they can operate as crime attractors. However, they exhibited very weak relationships with changes in crime. Including these measures had minimal effect on variance explained and did not alter any of the other results presented.

models rather than the change measure: one that captures *increases* (and has values of zero for any observations that experienced a decrease in the variable during the decade), and another that captures *decreases* (and has values of zero for any observations that experienced an increase in the variable during the decade). Furthermore, we multiplied the *decrease* variables by -1, so that they are capturing how much crime changes for decreases in the variable.

Thus, to interpret the results, consider a variable that in fact has a monotonic positive relationship with the change in crime: we would expect the *increase* version of this variable to have a positive coefficient (say .25) and the *decrease* version of this variable to have a negative coefficient (say -.25). This would indicate that a one unit increase in the variable results in a .25 increase in crime during the decade, and a one unit decrease in the variable results in a .25 decrease in crime, on average. If, instead, changes in this variable resulted in increases in crime (regardless whether the changes are increases or decreases), then we would expect the *decrease* version of the variable to have a positive coefficient (say .25). This would indicate that a one unit decrease in the variable results in a .25 increase in crime over the decade, on average.

The summary statistics for the variables used in the analyses are displayed in Table 1. As seen there, the average increase in inequality for egohoods with increases (10.5) was about 50% greater than the average decrease of decreasing egohoods (7.4). There was somewhat more evidence of increasing residential instability as opposed to decreases as almost 55% of egohoods experienced increases and just 45% experienced decreases. There were much larger increases in percent Latino and percent Asian compared to the decreases (82% experienced increases in percent Latino and 72% experienced increases in percent Asian), emblematic of the demographic changes that occurred in the region during the decade.

<<<Table 1 about here>>>

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*Methods*

We are measuring change in these egohoods over the decade. One strategy for capturing change in crime is to construct measures at the beginning and end of the decade, and then compute the difference in them. A limitation of this approach is that it does not account for measurement error in these crime measures, as well as the fluctuation in crime across years. One strategy to address this is to compute the average of crime incidents over three years to smooth out fluctuations, however, this strategy only minimizes the measurement error to some extent but does not directly address it. We instead adopted an approach of estimating a latent trajectory model (LTM) of crime over the entire decade for these egohoods. The LTM estimates a latent variable that captures this change in crime, but parses out the measurement error (Bollen & Curran, 2006). The first equation in the latent trajectory model can be represented as:

(1) $$y_{ti} = \alpha_i + \lambda_t\beta_i + \varepsilon_{ti}$$

where y is the logged crime count at time *t* in egohood *i*, $\alpha$ is a random intercept that varies over egohoods, $\beta$ is a random slope that varies over egohoods and has a $\lambda$ effect on *y* (where lambda is structured to measure time), and $\varepsilon$ is a disturbance term for each egohood at each time point with an assumed normal distribution and mean of zero. Thus, this model is estimating a separate trajectory for each egohood. We allowed for temporal autocorrelation by allowing the errors for adjacent years to be correlated in the violent crime model (these correlations did not improve model fit for the property crime model).

The second step in the analyses after estimating the trajectories of crime is attempting to explain these differing trajectories. Our covariates are therefore included in these second-level equations:

(2) $$\alpha_i = \kappa_\alpha + \Gamma_\alpha X_i + \zeta_{1i}$$

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(3) $$\beta_i = \kappa_\beta + \Gamma_{\Delta\beta}\Delta X_i + \zeta_{2i}$$

where $\alpha$ and $\beta$ are as defined before, the $\kappa$'s represent the intercepts for these random terms, X is a matrix of the egohood-level variables at time 1 which has $\Gamma_\alpha$ effect on the random intercept in equation 2 (the amount of crime in the egohood at the beginning of the decade), which effectively is a cross-sectional relationship, $\Delta X$ is a matrix of the spline changes in the egohood-level variables of interest over the decade (both increases and decreases) which has an $\Gamma_{\Delta\beta}$ effect on the random slope (capturing the change in crime in the egohood over the decade), and the $\zeta$'s are disturbance terms with an assumed zero mean and normal distribution. Our primary interest is in how changes in our measures of interest predict the latent trajectory variable of crime.[11]

A first step in estimating LTMs is to estimate an unconditional model in which there are no covariates predicting the random intercept and slope (equations 2 and 3). We tested models with different trajectory specifications including linear, quadratic, and exponential, and found that the linear model fit the data quite well. In addition, we found that including autoregressive correlations between the errors at adjacent time points improved the fit of the model for violent crime, so we included these in the violent crime linear models. The model fit for our full models was very good, as the RMSEA values were 0.073 and 0.108 and the CFI values were 0.989 and 0.980 for violent crime and property crime, respectively, in our presented models. Given that we are explaining the trajectory of violent and property crime extremely well (the average R-square each year is .96 and .98 for violent and property crime, respectively), there is little ability to improve the model fit. Furthermore, these high R-squares inflate the overall model fit statistics through increased statistical power (Browne et al., 2002).

[11] Note that our outcome variable is therefore a latent variable capturing the amount of change in crime over the decade, and *not* the level of crime in each individual year.

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**Results**

The main results of the latent trajectory models are shown in Table 2. We first focus on the change in socioeconomic status, and find an asymmetric relationship between the change in concentrated disadvantage over the decade and the change in violent crime. Whereas an increase in disadvantage is associated with increasing violence (β = .062), there is a much weaker relationship between decreasing disadvantage and violent crime (about 1/3 the size), which is consistent with hypothesis 1.[12] There is a perturbation relationship between disadvantage and property crime: increasing disadvantage is associated with *decreasing* property crime (β = -.096), and decreasing disadvantage is also associated with decreasing property crime, although much weaker.[13] Regarding changes in income inequality, we find that any change is associated with decreasing property crime. This is an unexpected finding, and we will return to this in the discussion.

<<<Table 2 about here>>>

Turning to change in race/ethnicity, we see differences between increases and decreases in these compositions. Consistent with hypothesis 2, there are asymmetric relationships between changes in percent Black or Latino and changes in violence. An increase in percent Latino is associated with increased violent crime (β = .032), whereas a decrease in percent Latino has a much weaker relationship (β = -.007, and not significant). Likewise, the positive relationship between changes in percent Black and changing violence (β = .153) is five times stronger than the relationship between decreasing percent Black and falling violent crime. However, the

[12] Given evidence from cross-sectional studies of a nonlinear relationship between disadvantage and crime, we included polynomial variables of the change in disadvantage to test this possibility. There was no evidence of substantively important nonlinear effects in these change measures.

[13] Strictly speaking, we defined perturbation as an instance in which any change results in crime increases, but in this case any change results in crime decreases. However, if we recoded the variable to economic *advantage*, then any change would result in crime increases, and thus it is a perturbation effect.

positive relationship between changes in percent Black and property crime is monotonic. We hypothesized a *perturbation* relationship for percent Asian in hypothesis 3, and we see mixed evidence. We do see the expected relationship for property crime, as increases or decreases in percent Asian result in increasing property crime. However, the relationship is a negative monotonic one with violent crime.

Note also that in Table 2, the last column for each crime model shows the result when testing the difference of statistical significance between the increase and decrease coefficient (when coding the decrease coefficient opposite what it is in the presented models). We see that there are statistically significant differences between the increase and decrease coefficients for percent Black and percent Latino for violent crime, and percent Asian for property crime. We also see that *any change* in racial/ethnic heterogeneity is related to *decreases* in violent crime.

Turning to population turnover, we find that population change exhibits an asymmetric relationship with crime, whereas residential instability and vacancies exhibit different relationships with violent versus property crime. Although hypothesis 4 posited an asymmetric relationship for residential instability, we instead find a monotonic positive relationship with violent crime. To interpret these results, given that our outcome variable is logged, we can interpret these as a one unit increase in instability resulting in an approximate 7.4% increase in violence per year, whereas a one unit decrease in instability results in an approximate 5.1% decrease in violence per year. We do find that any change in residential instability is associated with increases in property crime. Although we anticipated that increasing instability would be associated with increasing property crime, we did not expect that increasing *stability* would also be associated with increasing property crime. We do find strong evidence of an asymmetric relationship for changing population and crime: whereas increases in population are associated

with very sharp increases in both violent and property crime, decreases in population are associated with much weaker, or nonsignificant, decreases in crime (less than 1/15 the size). This is consistent with hypothesis 5. Furthermore, increases *or* decreases in vacancies are associated with increasing violent crime. Thus, any change in vacancies appears to have a destabilizing effect for neighborhoods regarding violent crime. However, there is a monotonic positive relationship between vacancies and changing property crime.

Regarding changes in the business environment, there are differences between consumer-facing businesses as opposed to non-consumer firms for violent crime. There is a positive asymmetric relationship for consumer-facing employees with crime; however, opposite our expectations the effect is somewhat stronger for *decreases* compared to increases. Likewise, although non-consumer businesses exhibit an asymmetric negative relationship with violent crime, the pattern is opposite to our expectations. We hypothesized that the loss of these jobs would strongly increase crime, but while their loss is indeed associated with increasing violence and a very small decrease in property crime, it is the increase in these jobs that is particularly beneficial for crime levels. This may be due to the study context, an issue to which we will return in the discussion.

Finally, we note the effects of control variables in the model. Any change in the percent aged 16 to 29 is related to increasing violent crime, and there is an asymmetric relationship in which an increase in this group is associated with more property crime but a weaker negative relationship when there is a decrease in this group. And whereas a decreasing percentage of immigrants is associated with falling violent and property crime, an increasing percentage is related to increasing property crime, which may indicate that they are more attractive targets for

property crime (Hipp et al., 2009). We do not discuss the variables predicting the latent intercept in 2000, as these simply mimic the typical cross-sectional model results in the literature.

*Sensitivity Analyses: Block Group Models*

We also estimated the same models with the data aggregated to block groups to assess the robustness of the results (see Table A1 in the Appendix). Although there was less statistical power in these models given the smaller sample size, the pattern of results was generally similar. Oftentimes, the magnitudes of the coefficients were similar. There were only a couple instances of differences in which signs of coefficients changed: in the block group models increasing inequality for violent crime and increasing racial/ethnic heterogeneity for property crime were associated with rising crime, whereas the relationships were negative in egohoods. We point out that distribution measures such as inequality and heterogeneity are arguably more appropriately measured in egohoods rather than neighborhoods whose boundaries are defined based on creating homogeneous units—as Hipp and Boessen (2013) noted in their initial formulation of the justification of using egohoods—and therefore we trust the egohood results more for those measures. Some measures had weaker relationships in the block group models, which was not surprising given that the motivation for egohoods was to capture the spatial heterogeneity that is intentionally minimized in non-overlapping units such as block groups. Thus, the effects for disadvantage, residential instability, percent aged 16 to 29, percent Asian, and employees were all weaker in block groups. Nonetheless, the general pattern of the results remained similar in these alternative models, despite the fact that we believe that the egohood results are more conceptually appropriate.

## Discussion

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This study has explored the question of how change in environmental features is related to changes in crime. We distinguished between three possible patterns: that the relationship would be characterized as a monotonic one, an asymmetric one, or perturbation in which any change in environmental features results in increasing crime. Our results indicated that simply assuming a monotonic relationship for many of these measures is not reasonable. Note that in Table 2 if monotonic change was the case, we would observe that coefficients predicting the latent slope for the *increase* and *decrease* spline variables would have opposite signs but be similar in absolute magnitude. That was rarely the case for the variables in the analysis. Instead, for several measures there was evidence of an asymmetric relationship. And for some other measures there was evidence that any change—increasing or decreasing—was associated with increasing crime. These results highlight the need for more careful theorizing about how changes in environmental features are related to changes in crime. It appears that the relationships are more complicated than might be presumed if one simply extrapolates from the cross-sectional evidence. These results also highlight that policymakers need to more carefully consider which neighborhoods are more likely to experience increases in crime, and not presume such monotonic longitudinal relationships. This will provide more insight into which neighborhoods are more at risk of crime increases, and therefore in need of resources. We show the summary of results for our hypotheses in Table 3, and here highlight some key findings from our study.

<<<Table 3 about here>>>

First, we saw evidence consistent with both hypotheses 1 and 2 of countervailing effects for disadvantaged neighborhoods and the relationship with violent crime as we posited that competing processes would bring about such asymmetry. We found for concentrated

disadvantage, percent Black, and percent Latino that increases in these measures had much stronger relationships with changes in violence than did decreases in these measures. This might occur because whereas increasing disadvantage would lead to a lack of resources and therefore a monotonic relationship with violence, there would also be a perturbation relationship in which any change in SES or racial/ethnic composition impacts perceptions and networks. This latter effect would counter-balance the monotonic effect for decreasing disadvantage and result in less change in crime. This is precisely what we found. Thus, a policy implication is that neighborhoods experiencing increasing disadvantage or inflow of disadvantaged minority groups may be particularly in need of resources from the larger community to address this rising violence. However, no such asymmetric effect was detected for property crime for these racial/ethnic groups. Furthermore, for property crime it appeared that increasing neighborhood SES resulted in increases in property crime. This may reflect that increasing SES increases property crime opportunities in neighborhoods, consistent with prior evidence of increasing crime in gentrifying neighborhoods (Kreager et al., 2011; Papachristos et al., 2011).

Second, consistent with hypothesis 3, we detected evidence of a perturbation effect for Asians regarding property crime. Any change in this group was associated with increasing property crime, which is consistent with the idea of increasing social distance among residents in these neighborhoods due to this racial/ethnic churning (Pastor et al., 2001). We posited that this might impact residents' perceptions of the neighborhood and how it is changing (Rountree & Land, 1996; Wickes et al., 2013), or it might impact social networks within the neighborhood (McPherson et al., 2001) which could impact informal social control capability. We did not measure mechanisms, so we cannot say why this relationship was observed, and suggests an area of needed research using longitudinal data.

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We found mixed evidence for our hypotheses about changing residential instability and population. On the one hand, we found strong evidence in support of hypothesis 5 that population change would have an asymmetric effect in which increasing population has a much stronger relationship with changes in crime. We hypothesized that falling population not only reflects fewer opportunities, which would decrease crime, but it also potentially represents a neighborhood that is experiencing economic troubles, which could increase crime, and these competing processes would result in minimal change in crime. Note that we also accounted for changes in concentrated disadvantage, so this effect is capturing something beyond a SES change. Consistent with theorizing from the macro literature on cities (Rotolo & Tittle, 2006), we posited that this decreasing population may reflect other forms of disadvantage such as increasing disorder, or even reduced collective efficacy for residents who perceive that the neighborhood is troubled (Rountree & Land, 1996; Wickes et al., 2013). An implication is that policy makers may wish to target neighborhoods experiencing population loss—for whatever reason—as particularly in need of resources to address community challenges. On the other hand, although we posited an asymmetric relationship for residential instability, there was instead a monotonic positive relationship with violent crime. It was only for property crime that we found a perturbation relationship, in which any increase or decrease in instability resulted in rising property crime. Further research is needed to understand the dynamic relationship between residential instability and change in violent versus property crime.

We did find evidence of an asymmetric relationship between non-consumer jobs and crime. However, contrary to hypothesis 6b, it was the *increase* in non-consumer jobs that was particularly beneficial for neighborhoods. It may be that the Southern California area with its overall strong economy and housing market does not give rise to the sort of hollowed out

economic areas observed in declining metropolitan areas, and that we hypothesized would make employment declines particularly consequential. Indeed, in our study area only 29% of egohoods experienced decreasing non-consumer jobs over the decade. Therefore, future studies will want to test this possible asymmetry in economically declining metro areas. The negative relationship between changes in non-consumer employment and violent crime may indicate that the economic disadvantage caused by the loss of job opportunities impacts violent crime, as these abandoned buildings can help create a sense of disorder in such neighborhoods (Ross & Jang, 2000; Sampson & Raudenbush, 2004). Thus, neighborhoods experiencing falling non-consumer employment experienced increasing violence. A possible policy implication of this is that cities should provide resources to neighborhoods that are losing employment opportunities before they translate into crime increases. This again is a reminder that these change measures can have varying meanings, and therefore consequences for changing crime.

Our results highlighted that there can be different impacts depending on whether a measure is increasing or decreasing, and therefore assuming monotonic relationships is not necessarily justified. For example, even though we did not explicitly theorize them, we found that increases *and* decreases for the percent vacant units or the percent aged 16 to 29 resulted in more violent crime. However, the fact that any change in inequality resulted in decreasing property crime was unexpected. While we anticipated the finding that decreasing inequality would result in falling crime, more puzzling was why increasing inequality also led to decreasing crime. This increasing inequality may be evidence of gentrification in this region, although the impact of gentrification on crime is unclear. Nonetheless, this finding should be the focus of further research.

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We acknowledge some limitations to this study. First, we had data from a single region, so the extent to which these results will generalize to other cities and regions is always of concern for studies focusing on a single area. Nonetheless, our goal was to highlight the need for researchers to consider that longitudinal relationships may not simply be monotonic, and therefore we believe that future work using different cities will be important to conduct. Second, we had data for a single decade. The extent to which these patterns would hold across other decades will also need to be assessed in future research. Decades often have unique patterns that may make it difficult to generalize to other decades. As some recent examples in the U.S., whereas the 1960s captured civil strife, the 1970s experienced stagflation, the 1980s experienced a recession in the early part of the decade along with increasing inequality throughout, whereas the 1990s were an economic boom decade, and the 2000s experienced a catastrophic recession in the latter part after a huge boom in the early part of the decade. To what extent we can expect changing neighborhood patterns to have similar impacts on changing crime across decades with such different structural patterns is therefore an open question. Third, we tested how changing environmental characteristics were related to change in Part 1 crime aggregated to violent and property crime, but future research will want to explore how they are related to changes in other types of crime. Finally, despite the longitudinal models, we lacked fine grained temporal data to account for possible selection effects.

In conclusion, we have demonstrated that criminological theories based on cross-sectional data do not necessarily map on in a direct way to longitudinal models. We posited three possible ways to characterize the impact of changing environmental variables on crime: either as a monotonic relationship, an asymmetric relationship, or a perturbation effect in which any change in a measure results in increases in crime. While several measures exhibited an

asymmetric relationship, and others demonstrated that any change results in more crime, an important implication is that the measures are not all characterized by one of these patterns, but rather the pattern differs over these variables. The weakest evidence we found is for the idea of a monotonic relationship. In contrast, there was substantial evidence for asymmetric effects for measures capturing economic disadvantage, as well as changing population and a changing business environment, implying that changes in these measures can have more nuanced consequences for neighborhoods rather than simply presuming a monotonic relationship. One clear takeaway is that assuming a monotonic relationship always exists between changes in these measures and changes in crime is untenable. We thus highlight the need for further theorizing by criminologists about how changes in neighborhood conditions will be related to changes in crime, and drawing out more explicitly situations in which perturbations will matter, or those when an asymmetric relationship would be expected. We have done so here primarily based on social disorganization theory, but there is also a need for exploring these ideas in future work based on the insights of other criminological theories.

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**Tables**

Table 1. Summary statistics of variables used in analyses

| | 2000 variables | | Increase variables | | Decrease variables | | Percent increasing |
|---|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | S.D. | |
| Concentrated disadvantage | 0.8 | 8.7 | 2.8 | 3.7 | 3.9 | 3.0 | 15.9% |
| Income inequality | 85.3 | 13.0 | 10.5 | 9.1 | 7.4 | 7.3 | 60.6% |
| Percent Black | 6.6 | 11.9 | 1.5 | 3.0 | 2.5 | 4.4 | 47.9% |
| Percent Latino | 32.8 | 26.0 | 8.3 | 8.2 | 5.7 | 9.4 | 82.1% |
| Percent Asian | 6.7 | 8.2 | 2.4 | 3.3 | 1.5 | 4.1 | 71.8% |
| Percent other race | 3.2 | 4.2 | 0.5 | 2.0 | 0.6 | 2.4 | 42.9% |
| Racial/ethnic heterogeneity | 44.7 | 17.5 | 8.0 | 7.5 | 6.1 | 6.7 | 63.5% |
| Residential instability | 0.07 | 0.64 | 0.25 | 0.29 | 0.20 | 0.26 | 54.8% |
| Population (logged) | 7.32 | 2.37 | 0.40 | 0.89 | 0.33 | 0.80 | 67.3% |
| Percent vacant units | 9.0 | 13.9 | 3.5 | 5.7 | 4.9 | 9.4 | 77.0% |
| Percent immigrants | 25.6 | 16.8 | 5.8 | 5.3 | 4.6 | 4.9 | 62.1% |
| Percent aged 16 to 29 | 20.3 | 8.2 | 3.3 | 4.4 | 2.5 | 4.4 | 64.3% |
| Consumer-facing employees (logged) | 6.4 | 4.8 | 18.7 | 43.3 | 9.8 | 19.5 | 63.2% |
| Non-consumer employees (logged) | 5.5 | 2.8 | 68.1 | 166.1 | 56.5 | 141.3 | 70.6% |

*N = 83,192 egohoods. "Percent increasing" is the percent of egohoods that experienced an increase over the decade in that particular variable.*

# Improving/Declining and crime

Table 2. Structural equation model results - Southern California 1/2 mile egohoods

| | Violent crime model | | | | | | | Property crime model | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Intercept | | Slope - increasing | | Slope - decreasing | | (a) | Intercept | | Slope - increasing | | Slope - decreasing | | (a) |
| Concentrated disadvantage | 2.359 | ** | 0.062 | ** | -0.021 | ** | ** | -2.014 | ** | -0.096 | ** | -0.016 | * | ** |
| | (55.14) | | (5.41) | | -(3.21) | | | -(32.74) | | -(7.19) | | -(2.08) | | |
| Income inequality | 0.263 | ** | -0.009 | ** | -0.004 | | ** | 0.066 | * | -0.010 | ** | -0.044 | ** | ** |
| | (12.66) | | -(4.15) | | -(1.27) | | | (2.28) | | -(3.99) | | -(11.54) | | |
| Percent Black | 3.113 | ** | 0.153 | ** | -0.030 | ** | ** | 2.081 | ** | 0.048 | ** | -0.054 | ** | |
| | (138.93) | | (16.94) | | -(4.98) | | | (65.45) | | (4.50) | | -(7.74) | | |
| Percent Latino | 0.697 | ** | 0.032 | ** | -0.007 | | ** | 0.545 | ** | 0.008 | * | -0.014 | * | |
| | (35.45) | | (10.16) | | -(1.49) | | | (19.44) | | (2.28) | | -(2.34) | | |
| Percent Asian | -0.141 | ** | -0.020 | ** | 0.028 | ** | | 0.053 | | 0.027 | ** | 0.030 | ** | ** |
| | -(3.51) | | -(2.97) | | (3.26) | | | (0.92) | | (3.35) | | (2.94) | | |
| Percent other race | 0.562 | ** | 0.035 | ** | 0.019 | * | ** | 0.767 | ** | 0.078 | ** | -0.056 | ** | |
| | (9.86) | | (3.74) | | (2.44) | | | (9.48) | | (7.04) | | -(6.06) | | |
| Racial/ethnic heterogeneity | -0.512 | ** | -0.039 | ** | -0.054 | ** | ** | -0.074 | ** | -0.013 | ** | -0.011 | * | ** |
| | -(29.54) | | -(11.49) | | -(12.31) | | | -(3.00) | | -(3.28) | | -(2.18) | | |
| Residential instability | 14.520 | ** | 0.074 | ** | -0.051 | ** | | 20.640 | ** | 0.130 | ** | 0.099 | ** | ** |
| | (32.32) | | (8.55) | | -(5.03) | | | (32.05) | | (12.85) | | (8.36) | | |
| Population (logged) | 25.492 | ** | 0.231 | ** | 0.002 | | ** | 36.457 | ** | 0.467 | ** | -0.034 | ** | ** |
| | (155.89) | | (94.29) | | (0.60) | | | (167.62) | | (163.82) | | -(7.56) | | |
| Percent vacant units | 0.348 | ** | 0.011 | ** | 0.026 | ** | ** | 0.615 | ** | 0.026 | ** | -0.015 | ** | |
| | (17.89) | | (3.06) | | (6.85) | | | (22.32) | | (6.08) | | -(3.37) | | |
| Percent immigrants | 1.701 | ** | -0.010 | * | -0.071 | ** | ** | 0.908 | ** | 0.053 | ** | -0.109 | ** | ** |
| | (52.16) | | -(2.28) | | -(12.03) | | | (19.49) | | (10.39) | | -(15.76) | | |
| Percent aged 16 to 29 | 0.415 | ** | 0.054 | ** | 0.015 | * | ** | 0.736 | ** | 0.091 | ** | -0.039 | ** | ** |
| | (11.91) | | (9.86) | | (2.02) | | | (14.77) | | (14.21) | | -(4.61) | | |
| Consumer-facing employees (logged) | 0.103 | ** | 0.087 | ** | -0.125 | ** | * | 0.080 | ** | 0.083 | ** | -0.133 | ** | ** |
| | (99.67) | | (16.02) | | -(8.51) | | | (54.06) | | (12.84) | | -(7.68) | | |
| Non-consumer employees (logged) | -1.760 | ** | -0.121 | ** | 0.015 | ** | ** | 15.677 | ** | -0.363 | ** | -0.044 | ** | ** |
| | -(8.92) | | -(9.23) | | (6.61) | | | (56.24) | | -(23.45) | | -(16.40) | | |
| Intercept | -0.424 | ** | -0.087 | ** | | | | -0.874 | ** | -0.029 | ** | | | |
| | -(17.32) | | -(182.8) | | | | | -(26.09) | | -(53.76) | | | | |
| R squared | 0.878 | | 0.538 | | | | | 0.797 | | 0.357 | | | | |

*** p < .01(two-tail test), * p < .05 (two-tail test). T-values in parentheses. N=83,192 egohoods. The df=508 in property crime model and df=509 in violent crime model.*

*(a): tests difference between increase and decrease coefficients for model with decrease coefficients coded in the same direction.*

Improving/Declining and crime

Table 3. Summary of results

| | Violent crime | Property crime |
|---|---|---|
| Hypothesis 1: The impact of changing concentrated disadvantage on crime will be asymmetric | Support | [pert] |
| Hypothesis 2: The impact of changing Black and Latino composition on crime will be asymmetric | Support | No |
| Hypothesis 3: Any change in Asian composition will result in greater increases in crime | No | Support |
| Hypothesis 4: The impact of changing residential instability on crime will be asymmetric | No | [pert] |
| Hypothesis 5: The impact of changing population on crime will be asymmetric | Support | Support |
| Hypothesis 6a: The impact of changing consumer businesses on crime will be positive and asymmetric | Partial* | Partial* |
| Hypothesis 6b: The impact of changing non-consumer businesses on crime will be negative and asymmetric | Partial* | [pert] |

*Support: hypothesis supported; No: not supported; [pert]: perturbation relationship (any change matters); *: partial support as asymmetric but wrong direction was stronger effect.*

**Appendix**

Table A1. Structural equation model results - Southern California block groups

| | Violent crime model | | | | | | | | Property crime model | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Intercept | | Slope - increasing | | Slope - decreasing | | (a) | | Intercept | | Slope - increasing | | Slope - decreasing | | (a) | |
| Concentrated disadvantage | 0.017 | ** | 0.012 | | -0.009 | | | | -0.019 | ** | -0.031 | | 0.042 | | | |
| | (10.66) | | (0.32) | | -(0.44) | | | | -(7.95) | | -(0.71) | | (1.75) | | | |
| Income inequality | 0.001 | | 0.058 | ** | 0.024 | | ** | | 0.001 | | -0.004 | | -0.035 | | | |
| | (0.60) | | (2.89) | | (1.52) | | | | (0.44) | | -(0.19) | | -(1.91) | | | |
| Percent Black | 0.021 | ** | 0.079 | ** | -0.047 | ** | | | 0.015 | ** | 0.019 | | -0.050 | * | | |
| | (29.81) | | (3.54) | | -(2.58) | | | | (13.94) | | (0.73) | | -(2.43) | | | |
| Percent Latino | 0.007 | ** | 0.025 | * | -0.024 | | | | 0.005 | ** | 0.010 | | -0.013 | | | |
| | (9.29) | | (2.22) | | -(1.49) | | | | (4.66) | | (0.78) | | -(0.71) | | | |
| Percent Asian | -0.002 | | -0.023 | | 0.015 | | | | -0.003 | | -0.014 | | -0.025 | | | |
| | -(1.51) | | -(1.29) | | (0.60) | | | | -(1.41) | | -(0.69) | | -(0.88) | | | |
| Percent other race | -0.003 | | 0.046 | | 0.027 | | | | -0.006 | | 0.049 | | -0.004 | | | |
| | -(0.74) | | (1.39) | | (0.74) | | | | -(1.12) | | (1.27) | | -(0.10) | | | |
| Racial/ethnic heterogeneity | 0.001 | | -0.005 | | -0.013 | | | | 0.006 | ** | 0.033 | * | 0.008 | | | |
| | (1.10) | | -(0.39) | | -(1.07) | | | | (6.40) | | (2.27) | | (0.56) | | | |
| Residential instability | 0.054 | ** | 0.035 | | -0.038 | | | | 0.099 | ** | 0.010 | | 0.032 | | | |
| | (3.29) | | (0.91) | | -(1.13) | | | | (3.96) | | (0.23) | | (0.83) | | | |
| Population (logged) | 0.267 | ** | 0.239 | ** | 0.062 | | ** | | 0.373 | ** | 0.401 | ** | -0.014 | | ** | |
| | (15.90) | | (8.40) | | (1.20) | | | | (14.68) | | (12.30) | | -(0.23) | | | |
| Percent vacant units | 0.005 | ** | 0.034 | * | 0.041 | | * | | 0.006 | ** | 0.039 | * | 0.020 | | | |
| | (4.89) | | (2.34) | | (1.77) | | | | (3.74) | | (2.36) | | (0.76) | | | |
| Percent immigrants | 0.009 | ** | 0.019 | | -0.082 | ** | * | | 0.005 | ** | 0.048 | ** | -0.076 | ** | | |
| | (8.19) | | (1.19) | | -(4.28) | | | | (3.14) | | (2.66) | | -(3.46) | | | |
| Percent aged 16 to 29 | 0.004 | ** | -0.002 | | -0.026 | | | | 0.012 | ** | 0.021 | | -0.055 | * | | |
| | (3.07) | | -(0.09) | | -(1.25) | | | | (6.27) | | (1.13) | | -(2.33) | | | |
| Consumer-facing employees (logged) | 0.057 | ** | 0.025 | ** | -0.011 | | | | 0.067 | ** | 0.041 | ** | -0.005 | | ** | |
| | (16.36) | | (6.10) | | -(1.14) | | | | (12.36) | | (8.60) | | -(0.48) | | | |
| Non-consumer employees (logged) | 0.058 | ** | -0.001 | | 0.001 | | | | 0.098 | ** | -0.002 | | -0.005 | * | ** | |
| | (8.16) | | -(0.67) | | (0.52) | | | | (8.99) | | -(1.42) | | -(2.30) | | | |
| Intercept | -1.022 | ** | -0.098 | ** | | | | | -1.010 | ** | -0.039 | ** | | | | |
| | -(7.35) | | -(40.5) | | | | | | -(4.79) | | -(14.43) | | | | | |
| R squared | 0.750 | | 0.611 | | | | | | 0.371 | | 0.244 | | | | | |

*** p < .01(two-tail test), * p < .05 (two-tail test). T-values in parentheses. N= 4,682 block groups.*

*(a): tests difference between increase and decrease coefficients for model with decrease coefficients coded in the same direction.*