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Foreclosures and crime: A city-level analysis in Southern California of a dynamic process



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ABSTRACT

Although a growing body of research has examined and found a positive relationship between neighborhood crime and home foreclosures, some research suggests this relationship may not hold in all cities. This study uses city-level data to assess the relationship between foreclosures and crime by estimating longitudinal models with lags for monthly foreclosure and crime data in 128 cities from 1996 to 2011 in Southern California. We test whether these effects are stronger in cities with a combination of high economic inequality and high economic segregation; and whether they are stronger in cities with high racial/ethnic heterogeneity and high racial segregation. One month, and cumulative three month, six month, and 12-month lags of foreclosures are found to increase city level crime for all crimes except motor vehicle theft. The effect of foreclosures on these crime types is stronger in cities with simultaneously high levels of inequality but *low* levels of economic segregation. The effect of foreclosures on aggravated assault, robbery, and burglary is stronger in cities with simultaneously high levels of racial heterogeneity and *low* levels of racial segregation. On the other hand, foreclosures had a stronger effect on larceny and motor vehicle theft when they occurred in a city with simultaneously high levels of racial heterogeneity and *high* levels of racial segregation. There is evidence that the foreclosure crisis had large scale impacts on cities, leading to higher crime rates in cities hit harder by foreclosures. Nonetheless, the economic and racial characteristics of the city altered this effect.

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1. Introduction

Although the foreclosure crisis that began in 2006 has impacted numerous households directly through the loss of their homes, additional indirect effects likely occur for other residents in neighborhoods impacted by high numbers of foreclosures. Among the possible consequences for such neighborhoods is that a high number of foreclosures might lead to high levels of social disorder and crime. Foreclosed housing units might have a micro-spatial effect in which they increase the amount of crime nearby. However, beyond the effect that foreclosures may have on the local block on which they occur, there are various theoretical reasons to expect that their impact may bleed into the broader spatial area of the neighborhood or even the broader community of the city. Indeed, a growing body of literature focuses on the relationship between the

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number of foreclosures in a neighborhood and crime rates (Immergluck and Smith, 2006; Katz et al., 2013; Kirk and Hyra, 2012; Teasdale et al., 2011; Williams et al., 2013).

Whereas recent studies have focused on the relationship between foreclosures and crime at the geographic level of neighborhoods, there are various reasons why the impact of foreclosures may be felt at even larger geographic units such as cities. For one thing, the large magnitude of the foreclosure crisis implies that entire cities may experience very high rates of foreclosures. If this is indeed the case, do these cities suffer a rise in the level of crime as a consequence? Furthermore, the larger city context within which neighborhoods are situated likely plays a critical role in determining how the community may respond to various economic and financial hardships (Logan and Molotch, 1987), such as the housing crisis. This implies that certain cities may be better equipped to redress various social problems that may arise.

For example, although foreclosures can set in motion a process of abandonment and decay leading to higher crime rates, it is also possible for cities to engage in activity to ameliorate the impact of foreclosures. Cities have the ability to provide upkeep to vacant units to prevent them from falling into disarray, to provide extra police patrol to neighborhoods suffering from more vacancies, or to send more oversight into such neighborhoods to keep units from falling into blight (Perlman, 2013). This suggests that whereas foreclosures will increase crime rates in some city contexts, they may not in other contexts; indeed previous research suggests that this is the case (Arnio et al., 2012; Baumer et al., 2012).

If cities can help neighborhoods address the problems of foreclosures before they result in more crime, it is natural to ask whether cities with certain social structural characteristics are better able to moderate the foreclosure and crime relationship. Specifically, we ask whether cities with less social distance (Poole, 1927), and hence more potential cohesion, are able to moderate the impact of foreclosures. Indeed, some scholars have posited that social distance can reduce the city's ability to address various problems, one of which may be the impact of foreclosures (Putnam, 1995). Two key measures of social distance that scholars have focused on in recent decades are economic inequality and racial/ethnic heterogeneity. Furthermore, the extent to which racial and economic groups are spatially segregated within cities may reduce the general cohesion in a community and impact its ability to address such problems. A core argument of the ecological model asserts that the characteristics of the city, such as economic inequality and racial segregation independently affect crime (Byrne and Sampson, 1986). We address these questions here by assessing whether cities with higher economic inequality or racial/ethnic heterogeneity, or cities with higher levels of economic or racial segregation, experience higher crime rates as a result of foreclosures.

We explore these questions using monthly data on foreclosures and crime rates in 128 cities in the Southern California region over the 1996–2011 period. Foreclosures are in fact a *process*, and not an event, that may take several months to complete; the lengthy process associated with foreclosure underscores the importance of examining the impact of foreclosure on crime over time. By using monthly data, we can achieve a more precise temporal test of these relationships, allowing us to determine the rapidity with which increasing foreclosure rates might subsequently result in an increase in crime. This is also necessary because simply observing a relationship between foreclosures and crime at a point in time does not address whether rising foreclosure rates translate to higher rates of crime. More precise temporal data is needed for exploring this question. The Southern California region is a particularly useful area to study these relationships given how hard it was impacted by the foreclosure crisis. California ranked 4th in the nation in the number of mortgages seriously delinquent or in foreclosure in 2010, with foreclosure and delinquency rates sharply increasing as early as 2005 (Bocain et al., 2010). Furthermore, Southern California is ideal to study given the relatively large amount of racial/ethnic diversity in the region. We therefore examine whether racial and economic inequality in the city compounds the effects of foreclosures on crime.

2. Literature review

2.1. Foreclosures and crime

Scholars have articulated numerous reasons why we should expect crime rates to rise in areas with increasing foreclosure rates. Whereas a foreclosure takes place within one particular neighborhood, when concentrated across several neighborhoods throughout a community the consequences of foreclosure such as crime, residential mobility, and informal social control, might result in changes in the broader composition of the residents within the city, impacting crime at a much larger level. We next discuss the micro-processes that might lead to these broader community changes.

Disorder theories are frequently used to explain the relationship between foreclosures and crime. During the initial phase after being served a notice of possible foreclosure, the owners may change their behavior by reducing upkeep, which can impact the quality of the unit. This can increase the level of physical disorder in the neighborhood as the unit falls into increasing disrepair. This builds on broken windows theory (Wilson and Kelling, 1982), in which physical disorder in the neighborhood, typically characterized as incivilities or violations of norms regarding public behavior or physical space, serves as a cue for potential offenders that the neighborhood lacks the requisite ability to monitor the environment and provide informal social control (Skogan, 1990). It is theorized that such neighborhoods are more attractive targets to offenders, and hence have more crime. It is also possible in this perspective that fellow residents will perceive such disorder as a similar such cue: the sense that others are not willing to take care of the neighborhood may then reduce a household's willingness to engage in informal social control behavior, further catalyzing neighborhood decline.

If a foreclosure is indeed completed, several consequences are possible. First, even if the unit is immediately re-occupied by new owners, the transition in residents can impact the amount of crime in the neighborhood given that this will increase the general level of residential instability, and social disorganization theory posits that higher levels of residential instability

can lead to higher rates of crime (Bellair, 2000; Heitgerd and Bursik, 1987; Kubrin and Herting, 2003; Peterson et al., 2000; Sampson and Byron Groves, 1989; Warner and Pierce, 1993; Warner and Rountree, 1997). Or, if the residents move out and are not replaced, the unit will become vacant. This can reduce social control by reducing the “eyes on the street” and hence increase crime. This can also increase crime because such units provide opportunities for delinquent behavior, which can increase social disorder. This social disorder can include engaging in sales or use of illicit drugs, gambling, or just hanging out and drinking by persons who might be perceived by residents as being potential offenders. Or these vacant units can fall into disrepair, which will increase physical disorder, leading to the mechanisms posited by broken windows theory. Researchers observe that disorder and crime rates move together (Sampson and Raudenbush, 1999; Sampson et al., 1997).

Although the preceding discussion may give the impression of a mechanical process in which a foreclosure will lead to a downward spiral of decay leading to more crime, this need not be the case (Wallace et al., 2012). There are several points in the process at which actors within cities could intervene, if they so choose. For example, the Philadelphia Housing Court brings homeowners and lenders together to renegotiate loan terms in an effort to prevent foreclosure and ultimately, vacancy (Perlman, 2013). Cities have initiated various programs to minimize the deterioration of vacant properties: for example, in Chula Vista, CA lien holders must register vacant properties, which enhances accountability should the property fall into disrepair (Perlman, 2013). Land Banks, a public entity, are another strategy used by some cities, such as Columbus, Ohio, to secure, maintain, and rehabilitate properties and then sell them to entities that will use the property for the benefit of the community (Perlman, 2013).

These possible actions imply that the impact of foreclosures on crime may not be uniform, and may vary across the neighborhoods *within* a city, or across *different cities*. As one example of the former issue, a study using geographically weighted regression found that the relationship between foreclosures and crime at the neighborhood level was not even constant *within* the city of Chicago (Arnio and Baumer, 2012). Instead, this study found that the relationship differed across neighborhoods located in different spatial areas within a city, with strong positive effects in some neighborhoods, but null or even negative effects in other neighborhoods.

Even more salient for the present study was research of neighborhoods nested within 50 large U.S. cities that found considerable variation in the relationship between foreclosures and crime *across* the cities in the study (Baumer et al., 2012). Thus, whereas Baumer and colleagues found that the foreclosure and crime relationship was indeed positive in some cities, it weakened in others and went to zero in yet other cities. As a consequence of this variability, Baumer et al. concluded that “One significant implication of our findings is that it would be potentially misleading to draw strong conclusions about the relationship between foreclosure and crime from a single city. Our results imply that this relationship is highly variable across cities” (Baumer et al., 2012: 594).

Further evidence of the variability noted by Baumer and colleagues can be detected in the literature focusing on foreclosures and crime within the neighborhoods of a single city. Whereas some cross-sectional studies have found a positive relationship between foreclosures and violent crime (Cui, 2010; Ellen et al., 2013; Immergluck and Smith, 2006; Stucky et al., 2012) or foreclosures and property crime (Cui, 2010; Stucky et al., 2012; Teasdale et al., 2011), one study found no effect on property crime (Immergluck and Smith, 2006) and another study suggested that the foreclosure and crime relationship is spurious once taking into account other neighborhood characteristics (Kirk and Hyra, 2012). Studies using longitudinal data have found that more foreclosures lead to higher property crime rates (Katz et al., 2013; Williams et al., 2013), but the evidence is mixed for violent crime (Katz et al., 2013; Williams et al., 2013). Given that Baumer and colleagues note that “...conclusions about the role of foreclosures in generating higher neighborhood crime rates are sensitive to the broader city context in which they occur” (Baumer et al., 2012: 597), the present study focuses on how the larger city context might impact the overall level of crime depending on the level of foreclosures.

2.2. Social distance and the consequences for the foreclosure and crime relationship

For understanding why certain cities might be better able to ameliorate the deleterious impact of foreclosures on crime rates, we utilize the notion of social distance (Poole, 1927), along with social capital theory (Putnam, 1995). Broadly, this perspective focuses on how social distance can lead to differences among residents (Hipp, 2010), which then impacts the cohesion of a community and its subsequent ability to effect political action. To the extent that foreclosures require a concerted response by either the local neighborhood or the larger community to ameliorate their impact, the social distance among residents may be an inhibitor to this capacity. This follows the work of Putnam (2000), who has suggested that cities with more social distance due to economic inequality or racial/ethnic heterogeneity may lack solidarity and community social capital. Such cities may be less willing to provide resources to ameliorate the consequences of foreclosures in various neighborhoods within the city.

The importance of social distance for the formation of social capital also relates to the distinction between bridging and bonding social capital. As Putnam (2000) noted, bonding social capital builds strong ties among the members *within* a group, whereas bridging social capital captures social ties that bridge *between* groups. One study posited that this distinction has consequences for the network structure of the larger community, and found evidence that this was related to county crime rates (Beyerlein and Hipp, 2005). When considering how a larger community reacts to a foreclosure crisis, the degree of bridging or bonding social capital may be important. Thus, cities in which there is strong bonding social capital within the neighborhoods of the city, but a lack of bridging social capital across the various neighborhoods, may respond differently to a foreclosure crisis than one with more bridging social capital across the neighborhoods of a city. This suggests the need to

make a distinction between measuring social distance within neighborhoods of a city and measuring social distance *across* the neighborhoods of a city, when assessing the impact of foreclosures on crime. If bonding social capital is more important, then measuring social distance within neighborhoods of a city would be sufficient.

We follow the strategy of Hipp (2011) who tested and found that how inequality and racial/ethnic heterogeneity are clustered within the neighborhoods of a city has consequences for city-level crime rates. This strategy uses city-level data and accounts for the level of inequality or racial/ethnic heterogeneity in a city, but then also accounts for the spatial distribution of race and socio-economic status by including measures of racial or economic segregation. For example, consider the three dimensions of economic resources: (1) the overall income level in the city (median income); (2) the distribution of income in the city (inequality); (3) the spatial distribution within the city (economic segregation). Note that this third dimension also has consequences for the neighborhoods *within* a city: cities with higher levels of economic segregation will have *lower* levels of inequality in their neighborhoods (neighborhoods will contain residents of relatively homogeneous income levels). On the other hand, a city with low economic segregation will, in general, have high levels of inequality in its neighborhoods (this greater economic mixing leads to lower segregation). Thus, the distinction is whether variability in income occurs *within* or *across* neighborhoods. The implications are the same when considering the composition of racial minorities, the level of racial heterogeneity, and the level of racial segregation in a city.

In our city-level analysis, we are able to capture such neighborhood and city contexts by including a measure of economic (or racial) segregation along with the city-level measure of economic inequality (or racial heterogeneity). Here we test whether the impact of foreclosures on crime rates differs based on these structural characteristics. Given that Baumer et al. (2012) found that the foreclosure and crime relationship for neighborhoods varies *across* cities it is worth exploring this more carefully. Indeed, there are theoretical reasons to expect that these characteristics—at the neighborhood-, or the city-level—will moderate the foreclosure and crime relationship, and we explore these next.

2.3. Social distance as a moderator of the foreclosures and crime relationship

First, the social distance among residents engendered by *city-level* economic inequality or racial heterogeneity may have important consequences for the foreclosure and crime relationship. Thus, foreclosures may not be the problem of only the individual household, or the local neighborhood, but may imply a social cost borne by all residents in the city. This suggests the need for a broader political response to address the problems occurring within the neighborhoods of a city. Resolving the problem might entail directly addressing foreclosures (trying to help households from actually going into foreclosure), or it might entail taking care of housing units that have been abandoned to prevent them from becoming crime magnets (by maintaining the exterior of the properties), or it might involve targeting police resources to particularly vulnerable neighborhoods in a city due to high foreclosure rates. For example, the city of Lancaster, CA invested more than \$4 million to purchase and rehabilitate foreclosed homes, before reselling the properties to moderate-income families (Simmons, 2008). The city of Indio, CA took a three pronged approach of requiring banks and lenders to register and maintain all vacant foreclosed properties, having the police department ramp up local code enforcement, and developing a resource center to assist families in default to stay in their homes (Ramos, 2009). Regardless of the actual strategies taken, the failure to take *any* of these strategies might lead to higher levels of overall crime in a city. This could occur because crime increases in these neighborhoods with more foreclosures, or because of spillover effects of crime into nearby areas given the well-known spatial patterns of offenders (Rossmo, 2000).

In this perspective a city with high levels of social distance due to economic inequality or racial/ethnic heterogeneity may lack the solidarity and community social capital (Putnam, 1995) needed to provide the political and economic resources necessary to address foreclosures when they become a problem in some neighborhoods of a city. In such cities, foreclosure problems in some neighborhoods may be seen as “their” problem, with an accompanying unwillingness to provide needed resources. Therefore, the general level of economic inequality or racial/ethnic heterogeneity in the city may accentuate the impact of foreclosures on crime rates (Brown, 1999; Immergluck, 2010). This implies that we will observe a positive effect of city-level inequality or heterogeneity on the foreclosures and crime relationship, as shown in Table 1 demonstrating our theoretical expectations.

Second, it may be that the level of social distance within *neighborhoods* of a city has important consequences for the foreclosure and crime relationship. Studies have found that neighborhoods with more racial/ethnic heterogeneity (Hipp, 2007; Sampson and Byron Groves, 1989; Warner and Rountree, 1997) or inequality (Crutchfield, 1989; Hipp, 2007; Hipp and Yates, 2011), and therefore less bonding capital, have higher crime rates. Studies have found that such neighborhoods have less cohesion and neighboring as a result of this form of social distance (Connerly and Marans, 1985; Lowenkamp et al., 2003; Sampson, 1991; Warner and Rountree, 1997). To the extent that foreclosures are a stressor on a neighborhood, they may require a concerted response by residents to address possible disorder and incivilities. This implies that such neighborhoods would need to band together to address problems on their own, or to petition for resources from the larger community. In some instances, residents act on their own to maintain the exterior of foreclosed properties to prevent them from becoming blighted (Boerner, 2009). Or they might make an extra effort to provide social control to minimize the possibility of disorder, or that any disorder will translate into more crime. For example, residents in three Southern California cities (Studio City, Valley Village, and Sherman Oaks) mobilized to form watch groups to prevent graffiti and blight stemming from foreclosed, abandoned homes (Doyle, 2008). Thus, neighborhoods with lower cohesion may be more vulnerable to foreclosures. This implies that neighborhoods with more inequality or racial/ethnic heterogeneity would experience a stronger relationship

Table 1
Theoretical predictions of model.

| | Inequality | Income segregation | Inequality × income segregation | Racial heterogeneity | Racial segregation | Racial heterogeneity × racial segregation |
|--|------------|--------------------|---------------------------------|----------------------|--------------------|---|
| 1 City inequality or heterogeneity | + | ns | ns | + | ns | ns |
| 2 Neighborhood inequality or heterogeneity | ns | – | – | ns | – | – |
| 3 Neighborhood disadvantage | + | + | + | | | |
| 4 Neighborhood racial minorities | | | | + | + | + |

between foreclosures and crime; as these types of neighborhoods become more prevalent in a city, city-level crimes rates will also rise.

In our strategy using cities as units of analysis, if social distance within neighborhoods is important, then cities with *less* racial or economic *segregation* (and therefore more mixing within neighborhoods) may be more vulnerable to foreclosures and therefore crime. Cities with high inequality *and* low economic segregation may be particularly vulnerable. This prediction is noted in [Table 1](#).

Third, whereas social disorganization theory posits that low income communities have higher crime rates in general, if foreclosures are a stressor on a community then neighborhoods with fewer economic resources will be more vulnerable to foreclosures. Households at the lower end of the economic spectrum arguably are more vulnerable to economic downturns, and therefore to foreclosures.¹ The inability to find buyers for such units given that these households are often located in less desirable locations would increase the likelihood of these foreclosures turning into vacant units, which can bring about more crime in the community ([Krivo and Peterson, 1996](#); [Stucky and Ottensmann, 2009](#)). This implies that such neighborhoods may be particularly dependent on city resources to help ameliorate the consequences of foreclosures on crime rates, and neighborhoods with more bridging social capital may be more successful in doing so. In our analytic strategy the impact of foreclosures on crime rates would be more pronounced in a city with high levels of both income inequality and economic segregation (and thus more impoverished neighborhoods). This prediction is noted in [Table 1](#), in which we would expect the main effects of inequality and economic segregation, as well as their interaction, to have significant positive effects on the foreclosure and crime relationship.

Fourth, research has found that neighborhoods with high-minority populations experienced significantly higher foreclosure rates ([Bocain et al., 2011](#)). A recent study found that Latino and African-American borrowers were 2.3 and 1.9 times more likely to experience foreclosure compared to non-Hispanic white borrowers in California ([Bocain et al., 2010](#)). The higher rate of foreclosure among these types of borrowers coupled with the disproportionate rates of crime in racial minority-dominated neighborhoods within cities suggests that the impact of foreclosures on crime may be stronger in cities that have greater concentrations of minority dominated neighborhoods. Such neighborhoods may be particularly dependent on external resources to weather an economic storm, and yet may be least able to obtain these resources in a highly segregated city. In a segregated city, minority neighborhoods might be more strongly impacted by foreclosures, which might lead to a sense that it is not the responsibility of the larger community to help address such problems by providing resources. In our analytic strategy, a city with higher levels of racial heterogeneity *and* segregation will have more minority dominated neighborhoods. If such neighborhoods are indeed more vulnerable to foreclosures, this would imply that the main effects of racial/ethnic heterogeneity and racial segregation, as well as their interaction, will have positive effects, as noted in [Table 1](#). Whereas one study showed that metropolitan areas with more racial segregation experienced higher foreclosure rates ([Rugh and Massey, 2010](#)), we test whether the combination of foreclosures and segregation also translates into higher crime rates.

Despite the importance of studying foreclosures and crime among larger units such as cities, few studies have done so. Furthermore, most of this research is cross-sectional in design. For example, one study assessed the relationship between the Housing-Mortgage Stress Index (HMSI) and crime rates in standard metropolitan statistical areas (SMSAs) and found no relationship ([Jones and Pridemore, 2012](#)). Another study used data aggregated to counties and found a positive relationship between foreclosures and robbery or burglary ([Arnio et al., 2012](#)). This latter study is one of the few to test some interaction effects: the only significant relationships they found were that foreclosures had a stronger effect on robbery in a high deprivation county, or in a county with less new housing. However, Arnio and colleagues did not assess the role of city-level inequality and heterogeneity, or their spatial distribution across neighborhoods *within* a city, for the foreclosure and crime relationship.

Our study site of Southern California is particularly appropriate for addressing these questions given that it is a large, economically and racially heterogeneous region that was strongly impacted by the foreclosure crisis. Although the region experienced a large run-up in home values during the first half of the 2000s, it was hit particularly hard by the foreclosure

¹ It is interesting to note that the most disadvantaged neighborhoods might be buffered, in a sense, from this effect simply because they have lower ownership rates. Thus, a neighborhood must have a substantial number of homeowners to be vulnerable to the foreclosure crisis. Therefore, very poor neighborhoods with very low ownership rates would not in fact be impacted.

crisis that began in 2006. Prior to 2004 California had 23,577 foreclosures, in 2006—the peak of the housing crisis—the number of foreclosures was 364,330 (Bocain et al., 2010). In Southern California, while the large increase in foreclosures began in 2006, the peak occurred in 2008. In our data, Riverside and San Bernardino counties were particularly hard hit, with foreclosure rates nearly 6 and 3.5 times larger than Los Angeles County, respectively, in 2008. When looking at the total number of foreclosures, major Southern California metropolitan areas such as Los Angeles, Riverside-San Bernardino and San Diego Counties ranked in the top 10 MSAs for total foreclosures between 2006 and 2009 in California. Nonetheless, whereas the number of foreclosures hit a nadir in the early 2000s, in 1997 the number of foreclosures was near 2007 levels as the region was recovering from an earlier housing crisis in the early 1990s. Thus, we are able to assess the impact of these foreclosures on the crime rates of the cities across the region.

3. Data and methods

3.1. Data

This study uses data aggregated to cities for the Southern California region between 1996 and 2011. Given that our data extends to several years prior to the most recent housing crisis, significant findings provide more robust evidence of this phenomenon, since it is not driven by the foreclosure crisis itself. We define the Southern California region to constitute six counties: Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties. This area covers over 38,000 square miles and had a population of just over 19 million persons in 2000. The foreclosure data were obtained from the RAND Corporation, and a foreclosure is defined as when the property is actually taken back by the bank. For the years from 2002 to 2011, the foreclosure numbers are strictly recorded Trustee's Deeds. For the years from 1996 to 2001, the source is the California Association of Realtors. To assess whether this change in the middle of the series affected the results of the models, we estimated ancillary models for the two time periods separately. The results were robust over the two time periods. We also had data from both sources in 2002, and we found they were correlated .965 across zip codes, and had similar mean values. The foreclosure data were in zip codes: we apportioned the data from these zip codes to the cities in which they were located. For zipcodes that crossed the boundary of cities, we apportioned the foreclosures to the constituent cities in proportion to the population of the zip code contained within each city.² This resulted in a total of 128 cities with a population of at least 30,000.

3.2. Dependent variables

The dependent variables for these analyses are city-level crime counts for five Part I crimes: aggravated assault, robbery, burglary, motor vehicle theft, and larceny. These data come from the Uniform Crime Reporting (UCR) program for police agencies, and are measured monthly from 1996 to 2011 such that a total of 19,205 city months were included in the analyses. UCR data are limited in that they capture only those crimes that are reported to the police and therefore likely underestimate the actual number of crimes. Furthermore, there are specific limitations to the reliability of UCR reported larceny-theft. When multiple offenses occur simultaneously within one incident, the hierarchy rule is applied in which only the most serious offense is recorded. Therefore, larceny has a higher likelihood of not being reported because it is ranked lower on the hierarchy of Part I crimes. Despite the fact that crimes are typically underreported, research has shown that police data crime trends and levels are generally similar to those based on victim reports (Blumstein et al., 1991; Lauritsen et al., 2008) and are not influenced by neighborhood characteristics such as disadvantage (Baumer, 2002). Finally, monthly crime counts are subject to greater fluctuation between time points relative to quarterly or yearly counts which are "smoothed" out due to the averaging of crime events over longer periods of time. Factors contributing to these fluctuations are controlled for in our modeling strategy (discussed below).

3.3. Independent variables

The primary independent variable in these analyses is the monthly *foreclosure rate* in cities. In California, mortgages are referred to as deed of trust loans and are distinct from a mortgage foreclosure in that they are a non-judicial action and contain a power of sale clause.³ For a trust deed foreclosure, the trustee will first issue and record a Notice of Default (NOD) to the delinquent borrower, who has 90 days to respond. After the 90 day period is up, if the property owner has not satisfied the terms of the loan, then the property is listed for sale and is typically slated for auction between three weeks and 90 days after being advertised. As discussed above, increased vacancy rates can give rise to crime by increasing disorder cues, providing increased criminal opportunities, and increasing resident instability. Our measure of foreclosure captures properties at the end of the foreclosure process, when the property has been repossessed by the bank and listed for sale.

² We assessed whether apportioning based on housing units, rather than population, would change the results. It does not. The correlation at the zip code level of the two apportioning techniques was .998, and the results were unchanged when apportioning based on housing units.

³ In California, a deed of trust secures a California home loan. Furthermore, a California home loan is associated with three entities: the borrower or trustor, the lender or beneficiary, and the trustee (usually a title company) assigned to the loan's deed of trust by the lender.

The numerator is the number of units in foreclosure in a month, and the denominator is the total number of single family housing units (attached and detached) in the city. Since foreclosure is indeed a process, the timing of this effect is uncertain. Proper estimation of lag length is critical when examining dynamic processes, as any lag length that is estimated should coincide with the temporality of the causal process being examined. Indeed, although some studies have found evidence of a one-year lag (Baumer et al., 2012), others have determined this process to be more fine-grained (Katz et al., 2013; Wallace et al., 2012). To assess the proper lag length, we computed the monthly foreclosure rate as a one month lag, a two month lag, and a three month lag. It is also possible that it is not the level of foreclosures in the previous month that matters, but rather the cumulative level of foreclosures over some aggregated time period (e.g., the previous 3 months, previous 6 months, etc.). We therefore computed a measure of the foreclosure rate over the previous three months combined, the previous six months combined, and the previous twelve months combined.

To test for possible moderating effects of inequality and heterogeneity on the foreclosures and crime relationship, we constructed several city-level measures. We used Census measures for 1990 and 2000, and data from the American Community Survey 5-year estimates in 2007–11 for the most recent years. We used linear interpolation between these three decadal points. We constructed a measure of *economic inequality*—the Gini coefficient—based on home values in the city.⁴ We accounted for the spatial distribution of economic resources in a city with a measure of *economic segregation*: the variance of logged median income across the block groups of the city (Wilkinson, 1996). *Median household income* captures the general level of economic resources in the city.

We included measures of the racial/ethnic composition of the city. We measure *racial/ethnic heterogeneity* in the city with the Herfindahl index (Gibbs and Martin, 1962: 670) of five racial/ethnic groups (white, African-American, Latino, Asian, and other races):

$$H = 1 - \sum_{j=1}^J G_j^2 \quad (1)$$

where G represents the proportion of the population of racial/ethnic group j out of J groups. We measure *spatial segregation of racial/ethnic groups* in a city with the Theil index based on the racial composition of block groups in the city (Theil, 1967). We also included measures of the *percent black* and *percent Latino* to capture any effects of these minority groups beyond the effect of general racial/ethnic heterogeneity.⁵

We accounted for the possibility that the effect of foreclosures might differ in cities with a higher percentage of renters by constructing a measure of the *percent owners* in the city. The summary statistics for the variables used in the analyses are presented in Table 2.

4. Methods

Given that the outcome measures are counts of crime events, we estimated negative binomial regression models (a Poisson model, with an additional parameter to account for the overdispersion in the data). By including the city population as an offset measure, we are effectively modeling crime *rates* as the outcome. We estimated fixed effects models on these monthly data aggregated to cities. We accomplished this by including indicator variables for each city in the region (excluding one as the reference city). In addition, we controlled for time effects over the period of the study by including indicator variables for each year in the study (omitting the first year of the study). We accounted for seasonal effects by including indicator variables for each month of the year (excluding January). The fixed effects specification controls for all unchanging, unobserved characteristics of these cities, and greatly reduces the possibility of omitted variable bias. The models are estimated as:

$$y_{kt} = \beta_1 x_{1kt-1} + B_2 \text{CITY} + B_3 \text{YEAR} + B_4 \text{MONTH} \quad (2)$$

where y_{kt} is the crime count in city k at time point t , x_1 is the foreclosure rate in city k in the previous month which has a β_1 effect on the crime rate in the current month, CITY is a matrix capturing the city of the observation (with one city as the reference city) with their effects captured in the B_2 vector, YEAR is a matrix capturing the year of the observation (with the first year as the reference year) with their effects captured in the B_3 vector, MONTH is a matrix capturing the month of the observation (with January as the reference month) with their effects contained in the B_4 vector. The fixed effects specification implies that we are only looking at change *within* a city: that is, we are not comparing across cities, but only looking at how change for a particular city in these measures affects crime the following month.

In additional models, we account for how socio-demographic characteristics of the context of these cities might moderate these relationships.

$$y_{kt} = \beta_1 x_{1kt-1} + B_2 \text{CITY} + B_3 \text{YEAR} + B_4 \text{MONTH} + B_5 (Z_t) + B_6 (x_{1kt-1}(Z_t)) \quad (3)$$

⁴ Given that the home value data from the Census are binned, we used the prln program (available at <http://www.unc.edu/~nielsen/data/data.htm>) from Francois Nielsen to construct this measure for each city.

⁵ We assessed whether our measures of segregation were impacted by cities with smaller numbers of block groups by estimating ancillary models on the subset of cities with at least 50,000 population. The results were very similar, with the only modest difference being that the interaction for racial heterogeneity and segregation was not present for larceny on the sample of larger cities.

Table 2
Summary statistics for variables used in the analyses.

| Outcome variables | Mean | Std Dev |
|--|-------|---------|
| Aggravated assaults | 26.8 | 154.4 |
| Robberies | 16.6 | 93.5 |
| Burglaries | 47.1 | 148.8 |
| Motor vehicle thefts | 45.5 | 181.8 |
| Larcenies | 132.6 | 451.3 |
| Foreclosure rate in the previous month | 0.061 | 0.120 |
| Foreclosure rate two months previous | 0.061 | 0.120 |
| Foreclosure rate three months previous | 0.061 | 0.120 |
| Total foreclosure rate in the previous three months | 0.184 | 0.346 |
| Total foreclosure rate in the previous six months | 0.366 | 0.680 |
| Total foreclosure rate in the previous twelve months | 0.727 | 1.322 |
| Inequality (Gini coefficient of home values) | 24.9 | 9.3 |
| Median household income | 50.5 | 21.3 |
| Economic segregation (household income variance) | 0.525 | 0.168 |
| Racial/ethnic heterogeneity | 48.4 | 16.2 |
| Racial/ethnic segregation (Theil index) | 0.594 | 0.067 |
| Percent African American | 4.5 | 6.6 |
| Percent Latino | 33.3 | 24.6 |
| Percent owners | 60.1 | 16.5 |

Note: N is 23,684 city months in 128 cities.

where all terms remain as defined earlier. In addition, the $x_{1kt-1}(Z_t)$ variable is an interaction between the foreclosure rate (x_1) at the previous time point and the various Z variables (which have yearly interpolated values), which have a vector B_5 of main effects and a vector B_6 of the interaction effects the outcome variable. We tested for, and found no evidence of any spatial patterning in the residuals. Whereas there is a fair amount of spatial patterning in crime for cities across the spatial landscape (the Moran's I values with a 3 mile distance band were .24 for aggravated assault, .54 for robbery, .36 for motor vehicle theft, .07 for larceny, and .25 for burglary at a 10 mile distance band), there was virtually no evidence of spatial patterning of the residuals of the models (all were essentially zero, and nonsignificant); this suggests that any spatial patterning for these crime types is accounted for by our model specification (for a similar finding from a fixed effects specification, see [Deane et al., 2008](#)).

5. Results

5.1. Lag length

In this study, we examine whether foreclosures affect overall city-level crime trends. We investigate this relationship first by testing various lag lengths to determine the temporality of this effect. The initial models all demonstrate that an increase in foreclosures in one month leads to an increase in all crime types in the subsequent month. In model 1 of [Table 3](#), we see that an increase of 0.1 percentage point in the foreclosure rate the previous month (approximately one standard deviation) increases the aggravated assault rate 1.1% ($\exp(.112 * .1) = 1.011$). We see similar evidence in the other models in [Table 3](#) that an increase in the foreclosure rate one month leads to an increase in all of these crime types the following month except motor vehicle theft. A 0.1 percentage point increase in the foreclosure rate increases the robbery rate 3.7%, the burglary rate 5.2%, and the larceny rate 1.5%.

When estimating models including various cumulative temporal aggregations, we present the partially standardized coefficients in [Table 4](#) to enable comparison across various cumulative temporal aggregations. These coefficients represent the change in the outcome variable in its original units for a one standard deviation change in the predictor variable. We find that typically the cumulative three month total has the strongest effects for the various crime types. It is worth noting that the magnitude of the size of the effect across all of these aggregations is quite similar. For example, for aggravated assault specification 1 shows a 1.3% increase for a one standard deviation increase in the previous month's foreclosure rate ($\beta = .013$), whereas specification 2 shows a slightly larger 1.5% increase for a one standard deviation increase in the previous three months' foreclosure rate. The effect is somewhat weaker in specifications 3 and 4 when aggregating foreclosures over the previous six months or the previous 12 months. For the other crimes it appears that the 3-month cumulative lags have the strongest effect. We therefore included the 3-month cumulative lag of foreclosures in the subsequent modeling, although the results are very similar when substituting alternative lags in the models. Given that our measure of foreclosure captures a property approximately 1 month prior to being sold at auction, the strong effect observed for the 3-month cumulative lag likely captures the peak of vacancies in a neighborhood, as most occupants are required by law to vacate within 90 days of foreclosure. This increase in vacant units provides criminal opportunities to engage in crime, and might also increase levels

Table 3
Effect of one month lagged foreclosure rate on various types of crime.

| | Outcome variable | | | | |
|--------------------------------|--------------------|--------------------|--------------------|---------------------|-------------------|
| | Aggravated assault | Robbery | Burglary | Motor vehicle theft | Larceny |
| Foreclosure rate in last month | 0.112** (3.07) | 0.366** (11.74) | 0.507** (21.80) | 0.039 (1.50) | 0.145** (7.78) |

T-values in parentheses. All models also include intercept, indicators for all but one cities, and indicators for all but one year (but not shown). *N* is 23,684 city months in 128 cities.

† $p < .05$ (one-tail test).

* $p < .05$ (two-tail test).

** $p < .01$ (two-tail test).

of physical disorder in the neighborhood. Indeed, prior studies have found that increases in physical disorder can result in crime waves and crime hot spots in neighborhoods (Weisburd et al., 2012). Furthermore, these crime waves may have enduring effects as reflected in the larger cumulative lags for 6 and 12 months. These longer term effects might also be driven by residential turnover, as new occupants begin to move into formerly vacant homes.

5.2. City contextual effects on foreclosure and crime relationship

Based on our earlier theoretical discussion, we next explored whether the level of inequality and ethnic heterogeneity in a city moderated the foreclosures and crime relationship. The models displayed in Table 5 include interactions between foreclosures and key socio-demographic characteristics of the city. We find strong effects for the economic inequality and racial/ethnic heterogeneity measures, as well as the racial and economic segregation measures for several crime types. Foreclosures that occur in cities with higher levels of inequality have a more deleterious effect on all of these crime types. Furthermore, the impact of inequality is conditioned by the level of economic segregation in the city for all crimes except aggravated assaults. For example, the effect of foreclosures on robbery rates increases as the level of inequality increases in a city with low levels of economic segregation. To get a sense of the magnitude of this effect, we plot this relationship in Fig. 1, in which we show cities with three levels of economic inequality and three levels of economic segregation (low, medium and high).⁶ Each of these bars represents the effect of foreclosures on crime at these particular levels of inequality and economic segregation, for a given level of foreclosures. In this figure, the effect of foreclosures on the robbery rate is weakest in a city with low levels of inequality, and especially if the city also has low economic segregation (the left hand side of this figure). In a city with an average level of inequality, the effect of foreclosures on robberies is again stronger if there are higher levels of economic segregation, although this effect is weaker than in low inequality cities. And in a high inequality city, lower levels of segregation exacerbate the foreclosure and robbery relationship (the right hand set of bars), implying a high level of economic inequality within the neighborhoods of such a city. The pattern of the foreclosure/crime relationship was also similarly conditioned by the combined levels of inequality and economic segregation for burglary, motor vehicle theft and larceny (not shown).

Turning to the impact of the racial/ethnic context of the city, we find that the effect of foreclosures is moderated by the level of racial heterogeneity and segregation in a city for all crime types (Table 5). To demonstrate one observed pattern, in Fig. 2 we plot the effect of foreclosures on robberies for cities with three levels of racial/ethnic heterogeneity and three levels of racial/ethnic segregation (low, medium and high). For cities with low levels of racial/ethnic heterogeneity (the left hand side of this figure), higher levels of racial segregation increase the effect of foreclosures on the robbery rate. Thus, the strongest positive relationship between foreclosures and robbery occurs in cities with low racial heterogeneity but high segregation. These are racially homogeneous neighborhoods in cities with relatively little overall racial heterogeneity. On the other hand, in cities with high levels of racial heterogeneity (the right hand side of this figure), the foreclosure and robbery relationship is stronger in cities with low levels of segregation. In such cities, the high levels of heterogeneity and mixing (due to low segregation) imply that local areas have high levels of racial heterogeneity. The effect of foreclosures on aggravated assault and burglary is similar to the pattern shown in Fig. 2 for robbery.

The effect of foreclosures on motor vehicle theft and larceny rates is somewhat different. These two crimes have a positive interaction term, and therefore the effect of foreclosures on motor vehicle thefts is strongest in cities with low heterogeneity and low segregation, as shown in Fig. 3 on the left side of the figure. In cities with high levels of racial heterogeneity, the foreclosure and motor vehicle theft relationship is strongest in cities with high levels of racial segregation (the right side of the figure). These are high minority neighborhoods in segregated cities, and this positive interaction is consistent with the hypothesis that cities are less willing to help such neighborhoods when foreclosure problems occur. Similarly, foreclosures have the strongest effect on larcenies in cities with high heterogeneity and high segregation (not shown).

As a sidenote, the fact that foreclosures have a stronger impact on burglaries in cities with a higher percentage of homeowners is arguably less of a social process effect and more of an opportunity effect, as this may suggest that such cities simply provide a larger number of such foreclosures given that owners are a higher proportion of the overall number of

⁶ We only plot points that are present in our sample. Given that there are no instances of low inequality cities with high economic segregation, and no instances of high inequality cities with low economic segregation, we do not include these two points in the figures.

Table 4

Standardized coefficients for various lagged values of foreclosure rate. Variables show percentage change in outcome for a one standard deviation change in the predictor.

| | Outcome variable | | | | |
|--|--------------------|---------|----------|---------------------|---------|
| | Aggravated assault | Robbery | Burglary | Motor vehicle theft | Larceny |
| <i>Specification 1</i> | | | | | |
| Foreclosure rate in last month | 0.013 | 0.044 | 0.061 | 0.005 | 0.017 |
| <i>Specification 2</i> | | | | | |
| Total foreclosure rate in last 3 months | 0.015 | 0.045 | 0.066 | 0.005 | 0.018 |
| <i>Specification 3</i> | | | | | |
| Total foreclosure rate in last 6 months | 0.013 | 0.044 | 0.067 | 0.004 | 0.017 |
| <i>Specification 4</i> | | | | | |
| Total foreclosure rate in last 12 months | 0.008 | 0.043 | 0.066 | 0.002 | 0.016 |

Note: *N* is 23,684 city months in 128 cities.

Table 5

Moderating effect of various city characteristics for foreclosure relationship with various types of crime.

| | Outcome variable | | | | |
|---|----------------------|---------------------|---------------------|----------------------|----------------------|
| | Aggravated Assault | Robbery | Burglary | Motor vehicle theft | Larceny |
| Foreclosure rate in last month | -2.343** (-5.23) | -1.173** (-2.78) | -2.167** (-7.27) | -3.555** (-10.89) | -2.771** (-11.86) |
| <i>Interactions with foreclosures:</i> | | | | | |
| Inequality (home value Gini) | 0.035* (2.22) | 0.084** (6.67) | 0.050** (5.19) | 0.139** (12.20) | 0.101** (13.30) |
| Economic segregation | 0.211 (0.38) | 3.182** (7.48) | 2.413** (7.17) | 5.059** (12.69) | 3.521** (13.34) |
| Inequality × economic segregation | -0.012 (-0.58) | -0.101** (-6.45) | -0.068** (-5.60) | -0.173** (-11.92) | -0.132** (-13.79) |
| Racial/ethnic heterogeneity | 0.027** (11.87) | 0.003 (1.38) | 0.008** (5.33) | -0.009** (-5.38) | -0.002† (-1.89) |
| Racial/ethnic segregation | 10.491** (11.09) | 1.960** (2.61) | 4.648** (7.26) | -3.078** (-4.59) | -0.603 (-1.18) |
| Racial/ethnic heterogeneity × segregation | -0.190** (-11.34) | -0.042** (-3.15) | -0.081** (-7.14) | 0.055** (4.54) | 0.019* (2.13) |
| Percent owners | | | 0.002† (1.85) | | 0.003** (3.70) |
| <i>Main effects</i> | | | | | |
| Racial/ethnic heterogeneity | 0.015** (8.71) | 0.019** (11.93) | 0.002† (1.72) | 0.013** (10.72) | 0.013** (15.57) |
| Racial/ethnic segregation | -0.478 (-0.83) | 0.253 (0.52) | -1.211** (-3.05) | 5.224** (12.99) | 3.134** (10.47) |
| Racial/ethnic heterogeneity × segregation | -0.019† (-1.76) | 0.017† (1.92) | 0.033** (4.34) | -0.071** (-9.26) | -0.030** (-5.29) |
| Inequality (home value Gini) | 0.013* (2.07) | 0.025** (4.41) | 0.011** (3.15) | 0.019** (3.91) | -0.005† (-1.82) |
| Economic segregation | -0.485* (-2.24) | 0.011 (0.06) | -0.193 (-1.52) | -1.071** (-6.34) | -0.822** (-8.56) |
| Inequality × economic segregation | -0.006 (-0.82) | -0.008 (-1.32) | -0.007† (-1.81) | -0.001 (-0.10) | 0.011** (4.16) |
| Percent owners | | | 0.004† (1.67) | | -0.007** (-4.12) |

T-values in parentheses. All models also include intercept, indicators for all but one city, indicators for all but one year, and indicators for all but one month (but not shown). *N* is 23,684 city months in 128 cities.

† *p* < .05 (one-tail test).

* *p* < .05 (two-tail test).

** *p* < .01 (two-tail test).

households. Finally, the presence of more homeowners strongly accentuates the positive effect of foreclosures on larceny rates (Table 5).

6. Conclusion

The foreclosure crisis that began in 2006 raised the specter that rising crime rates would be among the deleterious consequences of these foreclosures for communities. Recent scholarship has focused on this question, and studies often use data

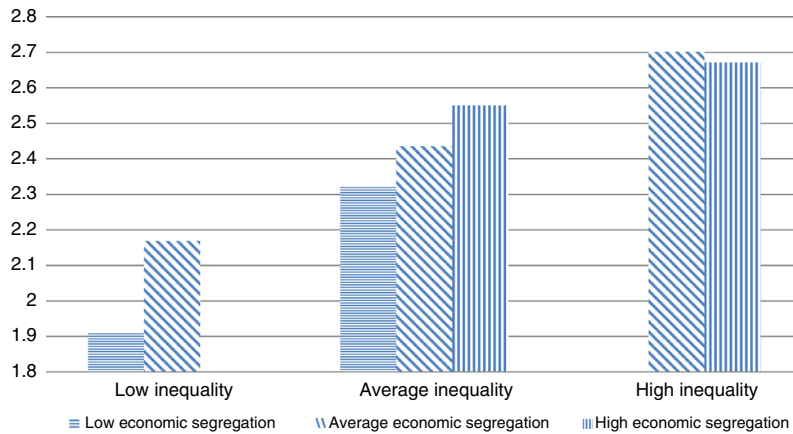


Fig. 1. Effect of city level economic inequality and economic segregation on the foreclosure and robbery relationship.

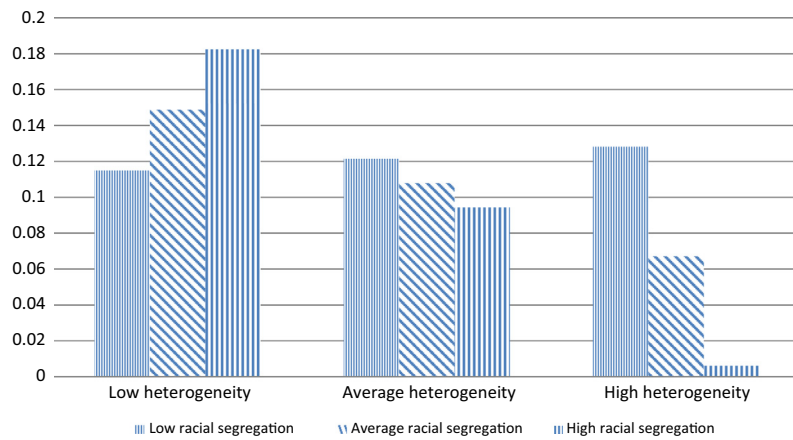


Fig. 2. Effect of city level racial/ethnic heterogeneity and racial segregation on the foreclosure and robbery relationship.

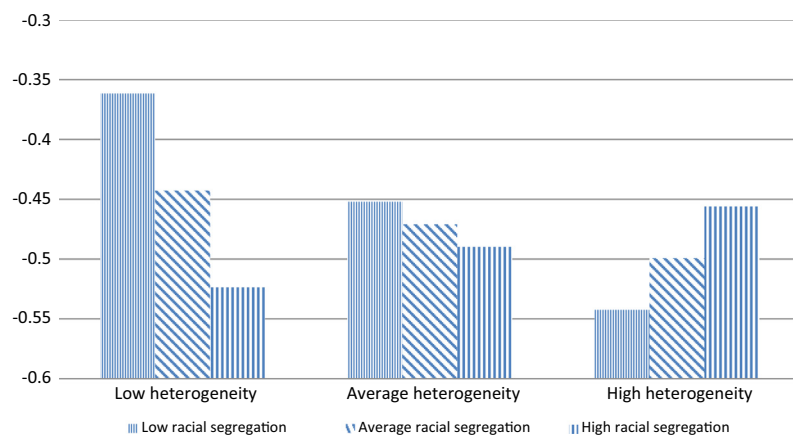


Fig. 3. Effect of city level racial/ethnic heterogeneity and racial segregation on the foreclosure and motor vehicle theft relationship.

aggregated to neighborhoods within a single city. Such research, to the extent that it is longitudinal, provides insight on whether the spatial distribution of foreclosures impacts the spatial distribution of crime within a particular city. However, given the mixed evidence of such studies, and recent work by [Baumer et al. \(2012\)](#) showing that the foreclosure and crime relationship can vary quite considerably over cities, we have argued that it is reasonable to explore whether the city context

has important consequences for the foreclosures and crime relationship. The present study addressed this question by using city level data, enabling an examination of whether higher city-level foreclosure rates give rise to higher crime rates, and finding that this was indeed the case. This approach also allowed testing and finding that the socio-demographic context of a particular city—specifically, the level of inequality and heterogeneity, and their spatial distribution within a city—exacerbated the effect of rising foreclosures on city crime rates.

A strength of the present study was the use of temporally precise data. By using monthly measures of foreclosures and crime, we were better able to assess whether the increase in foreclosures gives rise to more crime. We tested for varying lag lengths to assess how long it takes for foreclosures to impact crime rates, and generally found minimal differences across various lag lengths. We utilized cumulative measures of foreclosures over the most recent 3-months in the final models.

A key finding was that higher levels of inequality in the entire city *and* in the local areas of a city exacerbated the effect of foreclosures for city-level robberies, burglaries, motor vehicle thefts, and larcenies. We indirectly measured the amount of inequality in neighborhoods by creating an interaction between the level of economic segregation and inequality in the city. We found that in cities with less economic segregation (thus, higher levels of inequality in their neighborhoods) city-level foreclosure rates had a stronger positive effect on these four types of acquisitive crime. This suggests that foreclosures occurring within the context of inequality both in the city and at a smaller scale give rise to higher levels of these crime types in cities. Given that the journey to crime literature shows that offenders typically offend outside of their own census tract (Rossmo, 2000), this effect may have a broader spatial impact than just the neighborhood. This suggests a useful direction for future research.

An interesting pattern was that the one instance in which economic mixing was not harmful was when it occurred in a city with low levels of inequality. Thus, the weakest impact of foreclosures on these crime types occurred in cities with low inequality and low economic segregation. In such cities, although there is more economic mixing in neighborhoods, the fact that there is lower overall inequality may have important consequences for a city's ability to address foreclosure problems in neighborhoods. In such cities, there may be less of a sense of economic division among residents, as well as neighborhoods, increasing the willingness to provide services to neighborhoods suffering from foreclosures.

In addition to inequality, it also appeared that racial/ethnic heterogeneity and racial segregation exacerbated the effect of foreclosures on certain crime types. However, there were two different patterns for these crime types. In cities with high levels of racial heterogeneity, the impact of foreclosure rates on aggravated assaults, robberies, and burglaries is stronger when there are lower levels of racial/ethnic segregation (thus, higher levels of racial/ethnic heterogeneity within neighborhoods). This is suggestive that it is the racial/ethnic distribution in the smaller areas within a city that is important for understanding the context that augments the likelihood that increasing city-level foreclosure rates will give rise to increasing assaults, robberies, and burglaries. It appears that racial heterogeneity in neighborhoods similarly exacerbates the foreclosure relationship with these two crime types regardless of the level of racial heterogeneity in the city. The highest increases in robberies and assaults occur in more homogeneous cities with more segregation: this may reflect the fact that violent events more commonly occur among same-race individuals (Hipp et al., 2009), and such cities provide more such opportunities. However, there was a different pattern for the two property crimes of motor vehicle theft and larceny, as the impact of foreclosures was stronger in cities with high levels of racial heterogeneity and *high* levels of segregation. And the highest increase in these two crime types occurred when foreclosures occurred in a city with low heterogeneity and low segregation. Why such racially mixed neighborhoods in a relatively homogeneous context would exacerbate this relationship was not hypothesized, and should be an area of future inquiry.

It was also notable that the theoretical predictions of social disorganization theory that the relationship between foreclosures and crime would be stronger in neighborhoods with fewer economic resources or more racial minorities were not supported. For example, scenario 3 in Table 1 regarding the effect of low income neighborhoods hypothesized positive main effects for city inequality, economic segregation, and their interaction. This pattern was not found in any models. Likewise, scenario 4 in Table 1 hypothesized positive effects for racial heterogeneity, racial segregation, and their interaction. This pattern was also not detected in any models. Again, it appears that it is inequality and racial/ethnic heterogeneity—and how they are spatially distributed in a city—that have important consequences for the foreclosure and crime relationship.

We acknowledge some limitations to the present study. First, we were limited to data aggregated to cities. A disadvantage to an aggregation to such large units is that we cannot study how the process is unfolding within the neighborhoods of a city. We have emphasized here that there are certain advantages to city-level data; nonetheless, further questions regarding these processes can only be addressed with more spatially precise data. Second, we were limited to official crime data. The limitations to such data are well-known, as not all crime events are reported to the police, or recorded by the police (Moshier et al., 2002; Skogan, 1974). Third, measuring foreclosures is difficult, given that it is sometimes uncertain exactly when a home begins the process. Is the timepoint of theoretical interest when the home begins the foreclosure process? Or is it the very end of the process? Or is it something in between? We chose to measure it at the end of the process in this study, but future research will need to assess the implications of such a decision.

Fourth, although our longitudinal models attempted to address the possibility that crime in fact leads to more foreclosures, we cannot entirely rule out this alternative. On the one hand, it is reasonable to presume that foreclosures are more likely to occur in cities and neighborhoods with more crime (given that they are likely undesirable). However, it is less clear why a short-term spike in crime would cause a spike in foreclosures. Our study therefore attempted to address this with city-level fixed effects, which account for unchanging effects of crime levels on foreclosures. Another study attempted to address this question with longitudinal data in Chicago neighborhoods (about 10 tracts per neighborhood) from 1998 to 2009 and

found that foreclosures temporally led to more property crime, but found no evidence that higher property crime rates led to more foreclosures (Williams et al., 2013). Nonetheless, the direction of causality in our study should be treated with caution.

We conclude by noting that this study has provided important insights regarding the foreclosures and crime relationship within and across cities. By using temporally precise monthly data, we could assess the relationship between increasing city-level foreclosures and crime rates. An important contribution of this study was to show that certain city contexts augment the extent to which foreclosures translate into more crime in the city. We found that the effect of city-level foreclosures on crime rates was strongest in cities with lower levels of economic and racial/ethnic segregation (thus, higher levels of inequality and racial/ethnic heterogeneity within their neighborhoods). It therefore appears that the deleterious impact of foreclosures on crime rates is not uniform, and can vary over cities. Furthermore, the findings here suggest that understanding how economic resources and racial/ethnic groups are distributed across the landscape *within* cities is important for understanding the consequences of increasing foreclosures for crime rates.

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