Report Title: The Impact of Foreclosures on Neighborhood Crime
Award Number: 2010-IJ-CX-0028
Author(s): Dr. Ingrid Gould Ellen; Johanna Lacoe

Abstract

In the last few years, mortgage foreclosures have uprooted millions of households, and many have expressed concern that the foreclosed homes they leave behind are increasing crime. The three papers that emerged from our project study this question by examining whether and how elevated foreclosures affect different types of crime in the immediately surrounding area, in five cities around the country.

In our first paper, we use point-specific, longitudinal crime and foreclosure data from New York City to examine how foreclosures affect crime on the same blockface– an individual street segment including properties on both sides of the street. We compare changes in crime on blockfaces after homes on the blockface enter foreclosure to changes on other blockfaces in the same neighborhood that did not experience foreclosures during the same time period. To bolster our confidence in a causal relationship, we also estimate regressions that control for *future* foreclosure notices. These future foreclosures cannot affect crime today, but they help to capture unobserved differences in trends between those blockfaces where foreclosures occur and those where they do not. In brief, while much of the association between foreclosures and crime is explained by both occurring on similar blockfaces, we find that marginal foreclosures on a blockface lead to a small number of additional violent and public order crimes. Our results are robust to both OLS and negative binomial estimation. As expected, effects are largest for foreclosed properties that go all the way through the foreclosure process to an auction. The effects of foreclosure extend to crime on neighboring blockfaces, but these effects are attenuated. When estimating threshold-level models, we find that foreclosures have a larger effect on crime after there are three foreclosures on the block.

In our second two papers we focus more on identifying mechanisms and also extend our analysis to four other cities to test for generalizability. Our second paper, focused on Chicago, finds similar results as we did in New York City: an increase in the number of properties that receive foreclosure notices appears to increase total, violent, and public order crime on blockfaces in Chicago. In addition, our estimates suggest that foreclosures change the location of crime. They increase crime that occurs inside residences, but if anything reduce crime outside on the street. Foreclosures are also associated with substantively large (but weakly estimated) effects on crime within vacant buildings. Finally, increases in foreclosures are associated with increases in the number of 311 calls made to the City of Chicago about problems such as vacant buildings, rodents, graffiti, and other types of physical disorder increase in the following quarter. This suggests that the crime increase may come from an increase in physical disorder.

In our third paper, we explore the relationship between foreclosures and crime in five cities, Atlanta, Chicago, Miami, New York, and Philadelphia. Overall, we find that properties banks take over through foreclosure (real estate owned or REO) are associated with higher crime both in the census tract and on the blockface. However, once we control for the number of properties in the foreclosure process (which we can do in three cities), we find no evidence that the presence of REO properties increases crime. Rather, it is the properties *on the way* to foreclosure auctions that appear to elevate crime. In other words, the crime increases caused by foreclosures appear to be driven by the reduced maintenance and investment of 'limbo' properties that are in transition to bank ownership.

Collectively, these results suggest that local law enforcement and housing agencies should track foreclosure notices and monitor properties as they go through the foreclosure process, as their owners have little incentive to maintain them.

Table of Contents

Executive Summary

Between 2007 and the middle of 2013, approximately 5.5 million households in the United States lost their homes to foreclosure. Many have expressed concern that these foreclosed homes are holding back the economic recovery of the communities surrounding them, by depressing property values and inviting crime. But we have little hard evidence that foreclosures actually lead to increased criminal activity. Our project aimed to fill this gap by examining in several cities around the country whether and how elevated rates of foreclosure affect different types of crime in the immediately surrounding area. We completed three related papers through the project.

In our first paper, we use a unique dataset of point-specific, longitudinal crime and foreclosure data from New York City to examine how foreclosures affect crime on the same blockface– an individual street segment that is bounded by the two closest cross-streets, and which incorporates buildings on both sides of the street. Most of the analyses we completed through this project use blockface units. We believe they are preferable to the more commonly-used census blocks (encompassing all buildings on the interior of a square city block bordered by four street segments) because foreclosures are more likely to affect behavior and crime just across the street than around the corner (or two corners). We employed city street shapefiles and GIS analysis to create blockfaces, which are not captured in standard mapping shapefiles. These geographic units are very small – in New York City, there are over 96,000 blockfaces. We also map foreclosures and crimes to police precincts and census tracts.

Under an agreement with the New York City Police Department, we use point-specific data on all crimes initiated by victim or bystander complaints and reported in New York City between 2004 and 2008. This detailed dataset includes the spatial coordinates of each reported crime, along with its date, time, and offense category. We used GIS procedures to assign each crime to various levels of geography, including police precincts, census tracts, and blockfaces. We focus on three key categories of crime: Uniform Crime Reporting (UCR) property crimes; UCR violent crimes; and public order crimes, which include less serious offenses such as loitering, prostitution, drug crimes, graffiti, and weapons offenses. We complement these crime data with foreclosure data from 2002-2010. We compare changes in crime levels on blockfaces before and after homes on the blockface enter foreclosure to changes on other blockfaces in the same neighborhood that did not experience a change in foreclosure activity during the same time period.

We take several steps to address concerns about causality. First, we lag our foreclosure measures, which means that any association demonstrates a link between crime today and prior foreclosures. Plus any confounding, localized distress that affected both crime and foreclosure activity would have to have led to elevated crime in the current quarter but elevated foreclosures in the prior six quarters. Second, we include blockface fixed effects in our regressions of crime on foreclosures to take into account pre-existing, time invariant, blockface-specific contributions to crime, such as geographic features, proximity to commercial areas and transit, and the distribution of building and occupancy types. Third, we control for the characteristics of the neighborhood that change over time (such as household structure, age, income, and other local socioeconomic drivers of mobility) by also including neighborhood-specific time trends (either police precinct-by-quarter, or census tract-by-quarter, depending on the specification) as fixed effects. Through including these neighborhood-by-quarter fixed effects, we capture most of the localized social and economic trends that might lead to both elevated foreclosures and crime. As discussed below, census tracts are quite small in New York City given the city's high population density. The average census tract in the city covers just 0.14 square miles and includes only 14 blocks and 29 blockfaces. Finally, to bolster our confidence in a causal relationship, we also estimate models that control for *future* foreclosure notices on a blockface. These future foreclosure notices cannot yet affect crime, but they help to capture differences in unobserved trends between those blockfaces where foreclosures tend to occur and those where they do not.

In brief, while much of the association between foreclosures and crime is explained by both occurring on similar blockfaces, we find that marginal foreclosures on a blockface lead to a small number of additional crimes. An additional foreclosure leads to around a one percent increase in crime on average. But the number of foreclosures was relatively small in New York City, so only a few blockfaces around the city experienced meaningful increases in crime as a result of foreclosures. Our results are robust to both OLS and negative binomial estimation. We find strongest effects for violent crime and public order crime and little impact on property crime, despite the fact that media attention has focused on property crime. It may simply be that properties in foreclosure contain fewer valuable goods to steal.

As expected, effects are largest for foreclosed properties that go all the way through the foreclosure process to an auction and either sell at auction or revert to bank ownership, compared to properties for which owners appear to have been able to resolve the foreclosure. The effects of foreclosure extend to crime on neighboring blockfaces, but these effects are attenuated. When estimating threshold-level models, we find that foreclosures typically have a significant effect on crime only after there are at least three foreclosures on the block. There were only 723 blockface-quarters with at least this many foreclosure starts during our timespan.

While this paper offers robust evidence that foreclosures lead to a modest increase in violent and public order crimes, our data and identification strategy do not allow us to determine the mechanism through which foreclosures affect crime. Our second and third papers use additional data to do more to explore the mechanisms through which foreclosures shape crime. Further, while we expect that these New York City results are generalizable to other cities, it is possible that results are unique to New York. Thus, our second and third papers directly explore the relationship between foreclosure activity and crime in four additional cities.

In our second paper, we focus on Chicago. This paper considers whether foreclosures lead to increased crime on a block in Chicago, and also sheds light on the mechanisms through which foreclosures affect neighborhood crime. Specifically, we investigate whether and how foreclosures shift the location and type of criminal activity by changing the relative attractiveness to potential offenders of one location versus another. For instance, the presence of a vacant, foreclosed building may make it more likely that a drug dealer will sell drugs in a building rather than on the street. As a result, crime occurring inside residences (and in vacant buildings in particular) and on the street may increase by different magnitudes. Using detailed foreclosure and crime data geo-coded to the blockface, we estimate the impact of foreclosures on the location of crime within blockfaces. We use point-specific data on foreclosures from 2006 through 2011 and data on reported crimes from 2007 through 2011. We also use data on 311 calls made to the City of Chicago about problems such as vacant buildings, rodents, graffiti, and other types of physical disorder, to test whether foreclosures increase perceived physical disorder on the blockface, which may precede increases in crime. Unfortunately, we were only able to obtain these data starting in 2011.

In terms of overall impacts on crime, we find similar results as we did in New York City: an increase in the number of properties that receive foreclosure notices appears to increase total, violent, and public order crime on blockfaces in Chicago. In addition, we find evidence that foreclosures change the location of crime. Specifically, estimates suggest that foreclosures increase crime that occurs inside residences, with null or negative effects on crime outside on the street or in other locations. Second, although there is a null overall effect of foreclosures on property crime, we find that foreclosures shift the location of property crimes from the street to inside residences. Finally, foreclosures are also associated with substantively large (but weakly estimated) effects on crime within vacant buildings. Taken together, these results indicate that overall impact estimates mask the changing dynamics of crime on blockfaces in Chicago that experience foreclosure activity. Finally, in an OLS model with blockface fixed effects and tract*year*quarter fixed effects, we find that when the number of foreclosures on the blockface increases, the total number of 311 calls made to the City of Chicago about problems such as vacant buildings, rodents, graffiti, and other types of physical disorder increase in the following quarter. This may be evidence of a decline in social control within the neighborhood, which may then lead to increased crime.

These results suggest that foreclosures not only increase crime but can change its composition and location. Specifically, they suggest that vacant and unmonitored buildings may attract criminal activity away from the street to the inside of buildings where it can be more concealed.

In our third and final paper, we explore the relationship between foreclosure activity in five diverse cities, Atlanta, Chicago, Miami, New York, and Philadelphia. We start by following the norm in the literature and studying the relationship between the presence of lender-owned properties and reported crime. We then test how properties at different stages of the foreclosure process affect crime, with an eye towards shedding light on the mechanisms and the timing through which properties in foreclosure generate crime. To what extent is the impact of foreclosure driven by homes caught "in limbo" – between homeowners who have received foreclosure notices and bank ownership – rather than the turnover in owners and changes in communities? Might the community impacts of foreclosure be mitigated by policies that reduce the time during which foreclosed properties are "*nobody*'s home" or that step up code enforcement and accelerate tax foreclosures during this period? Through looking at variation across states and across different stages of the foreclosure process, we shed light on the answers to these important questions.

This paper draws on detailed, point-specific crime data and property-level foreclosure data for five of America's largest cities – Atlanta, GA, Chicago, IL, Miami, FL, New York City, NY, and Philadelphia, PA. The key measure available in all cities is the number of properties that become real estate owned (REO) following a foreclosure auction. New York, Chicago, and Philadelphia also provide information about the timing of the foreclosure notice allowing us to construct two additional measures – the number of properties receiving foreclosure notices, and the number of properties that are in the midst of the foreclosure process – that is, between notice and public auction. These are the properties that are essentially in limbo between ownership by their original owners and lender ownership.

The centerpiece of our empirical work is a regression model linking the level of crime in the census tract (or the blockface) to the presence of REO properties (and, in some cases properties in foreclosure). We allow for city-specific coefficients so effects can vary across cities. In New York, Chicago, and Philadelphia, we observe foreclosure starts as well as the outcomes of the foreclosure process, which allows us to disentangle their separate effects. To do so, we separately count and test for the effects of properties that are currently in between the notice of foreclosure and the public auction, and properties that have completed the process and become REO.

Overall, we find that properties that become REO are associated with higher average total crime both in the census tract and on the blockface. However, once we control for neighborhood fixed effects, we find mixed evidence about whether the presence of REO properties increases crime. Consistent with Baumer et al (2012), in some cities, crime appears to increase with the number of bank-owned properties, while in others it appears to decline as properties move from being in the foreclosure process to becoming bank-owned. And once we control for the number of properties in the foreclosure process (which we can do in New York, Chicago, and Philadelphia), we find no evidence that the presence of REO properties increases crime. Rather, it is the properties on the way to foreclosure auctions that appear to increase crime. In other words, the spillover costs imposed by foreclosures appears to be driven more by the presence of properties that are in the foreclosure process than by the presence of bank-owned properties. While the precise mechanism is unclear, our results suggest that the positive relationship between foreclosure and crime is less the result of changes in ownership (say, breaking social ties/reducing social capital) but rather the result of reduced maintenance and investment of properties in transition to bank ownership. The ownership of these properties is essentially in limbo, as those who technically hold title have little stake in the long-term value of the property (that is to say, "nobody's home"). While we do not have direct evidence on property conditions, it seems likely that owners in foreclosure invest less in maintenance and upkeep given that they know they may not keep their properties.

The limitations of these studies warrant discussion. The primary limitation is potential bias in reported crime. But we expect that these biases lead our results to be understated. Specifically, such under-reporting should lead us to understate the impact of foreclosures on crime. Residential turnover caused by foreclosure may result in vacant buildings and fewer residents to report local crime. If crimes go unreported, the increases in crime found here are likely underestimates of the true impact of foreclosure. Further, crimes in vacant/abandoned buildings may be the least likely to be reported in the period leading up to bank-ownership because no one is looking after the building. Finally, our identification strategy does not allow us to determine whether foreclosures have led to net increases in overall crime in a city or metropolitan area. Our results may not suggest a net increase in new crimes – the increases in crime on blockfaces that we find to be associated with foreclosure activity on that blockface and neighboring blockfaces may be roughly matched by corresponding decreases in crime on surrounding blockfaces. Thus, our results do not necessarily imply that cities reeling from the foreclosure crisis are at risk of increases in overall crime.

Our work offers important implications for policy. First, our results contribute to the growing evidence of neighborhood spillover effects of mortgage foreclosures. In addition to detrimental effects on property values, housing formation, and educational outcomes for children, we show that heightened foreclosure activity increases crime (especially violent and public order crime) in the micro-neighborhoods immediately surrounding the property in foreclosure. Admittedly the magnitude of the impacts is relatively small, but effects are robust and significant. Importantly, our results suggest that bank-owned properties are not the key problem, although they have been the focus of most policy attention. Rather, it is properties that are on the way to foreclosure auctions but are still technically controlled by original owners. The effects of these properties on crime aren't large but they are consistent and suggest that police and residents should closely monitor the blocks and neighborhoods that are disproportionately affected. Local law enforcement should work with local courts and other relevant agencies to track the issuance of foreclosure notices to residential properties and incorporate them into their neighborhood targeting strategies.

Second, our results suggest that foreclosures may change the location of crime, pushing more crime indoors into unmonitored homes, especially vacant homes. Thus, the results suggest that local law enforcement agencies may want to coordinate with local housing agencies to identify properties that are vacant and those that are in the foreclosure process. Local law enforcement officials should work with neighbors and community groups to closely monitor activities in those buildings.

Third, our results suggest reforms to the laws governing foreclosure. They suggest that changes in policies, regulations or resources that reduce the time that properties spend in limbo may effectively reduce the impact of foreclosure on neighborhood crime. Of course, extended foreclosure timelines may bring greater protections to borrowers. Although some recent work suggests that reforms that extend already lengthy foreclosure timelines make little difference in the probability that borrowers will keep their properties, policy makers should surely consider both benefits to homeowners and costs to the surrounding neighborhood in deciding on reforms to the foreclosure process.

Finally, this research also suggests important lessons for local code enforcement. It suggests that lengths should be taken to secure buildings that are currently in the foreclosure process that might already be vacant, to make them less attractive targets for crime. This might mean introducing vacant property ordinances that require owners to register their properties when vacant, physically securing entrances, windows, and yards, or stepping up efforts to require maintenance of the property so it becomes a less visible target. Reaching out to residents in surrounding buildings and encouraging them to report any and all criminal activity in the area of the foreclosure may help stimulate the neighborhood's social control networks, and also improve reporting in areas that have experienced residential turnover and vacancy. Of course the results do not suggest that local housing officials should only focus on buildings in foreclosure; rather they should step up code enforcement efforts more generally and work to secure buildings with absent and unengaged owners.

Technical Report

I. Introduction

A. Statement of the Problem

Between 2007 and the middle of 2013, approximately 5.5 million households in the United States lost their homes to foreclosure. In most cases, these foreclosed properties have reverted to bank ownership, as few bidders at auction have been willing to pay the full value of the outstanding mortgage (which is typically the bank's reservation price). Many have expressed concern that these foreclosed homes are holding back the recovery of the communities surrounding them, by depressing property values and inviting crime. But we have little hard evidence that foreclosed properties or properties in the midst of foreclosure actually lead to increased criminal activity. Our project aimed to fill this gap by examining whether and how elevated rates of foreclosure affect different types of crime in the immediately surrounding area, in five cities around the country. Further, we aimed to shed light on the mechanisms through which foreclosures affect crime, with an eye towards informing policy and practice.

B. Literature Citations and Review

Urban scholars and criminal justice experts have long posited a relationship between the built environment and crime. Jane Jacobs, in *The Death and Life of Great American Cities*, introduced the notion of "eyes on the street," suggesting that mixed use communities with low-rise buildings would allow people to better monitor activity and therefore make streets safer from crime. In 1972, Oscar Newman wrote *Defensible Space*, which argued that publicly-owned spaces, with unclear ownership and management, were more vulnerable to crime. James Q. Wilson and George L. Kelling (1982) argued that signs of neighborhood decline signaled to potential offenders that a neighborhood was not well-monitored or protected by residents.

The first papers directly exploring the relationship between foreclosures and crime use cross-sectional data. Using data from Chicago, Immergluck and Smith (2006) find that higher foreclosure rates are associated with higher levels of violent crime in a given census tract, but not higher levels of property crime. Because their analysis is limited to a single cross-section of census tract-level data on crime and foreclosures, however, the authors cannot tell whether foreclosures actually lead to higher crime or if they simply tend to occur in areas with higher crime.

Similarly, Clark and Teasdale (2005) find that subprime mortgage foreclosures have a significant, positive association with public order crime, which they define as the sum of all larceny, burglary, drug, and disorderly conduct crimes. But the authors are again unable to infer causality given that they examine foreclosures in census tracts in Akron, Ohio during 2001-2003 and a single cross section of crimes in 2003.

Several recent papers have begun to use longitudinal data sets to study the relationship between foreclosures and crime. These papers are able to more persuasively identify the direction of causality. They focus primarily on the association between the presence of real estate owned (REO) properties and crime. The findings are mixed. In a national study of counties, for example, Goodstein and Lee (2009) find one percentage point increase in the REO rate (lagged one-year) is associated with a three percent increase in burglaries per capita at the county level, controlling for demographic characteristics, macroeconomic conditions, law enforcement, and subprime lending.

Focusing on Glendale, Arizona, Katz, Wallace, and Hedberg (2011) conduct a census block level analysis of the impact of bank-owned properties on crime between 2003 and 2008. They find that bank-owned properties have a short-term association with crime (approximately three months). Stucky, Ottensman, and Payton (2012) study the link between listed sales of bank-owned properties and crime in Indianapolis, IN and they too find that the number of listings of REO properties in a small area is consistently associated with crime counts.

But some studies find little evidence of REO property effects on crime. For example, Baumer et al (2012) use cross-sectional data from 50 cities to study the relationship between REO property rates in census tracts and crime, and they find little in the way of effects overall. Similarly, Kirk and Hyra (2012) draw on data from Chicago to study the connection between crime and lagged foreclosure starts in order to focus on the impacts of "outcomes" of the foreclosure process, like "bank repossession." Although they find a positive association between foreclosure and crime, the association goes away after controlling for an index of neighborhood disadvantage.

C. Hypothesis or Rationale for the Research

While these recent papers have helped to further our understanding of the effects of foreclosure on crime, most of the work relies on census tracts of blocks as their unit of analysis, which may not be the right level theoretically. We believe instead that a more appropriate unit of geography is the blockface, which is a street segment that is bounded by the two closest cross-streets, and which incorporates buildings on both sides of the street. More significantly, the papers have done little work to understand how properties at different stages of the foreclosure process affect crime, as they focus only on the effects of lender-owned properties. Finally, the existing papers have not studied how foreclosures affect the location and mix of crimes.

We have aimed to fill these gaps with three related papers. In the first paper, "Do Foreclosures Cause Crime," which was published in the *Journal of Urban Economics*, we studied whether foreclosure activity led to increased crime in New York City between 2004 and 2008 at the level of the blockface. Our hypotheses for this paper were that foreclosures would lead to increases in violent and public order crimes on the same blockface. We did not expect that foreclosures would lead to increases in property crimes because properties in foreclosure likely contain fewer valuable goods to steal. We also expected that properties that go all the way through the foreclosure process to an auction, and either sell at auction or revert to bank ownership, would have a larger impact on crime compared to properties for which owners appear to have been able to resolve the foreclosure. Finally, we also expected that an additional foreclosed property would have a greater effect on crime when there was already a concentration of foreclosed properties in the area.

In the second paper, "Mortgage Foreclosures and the Shifting Context of Crime in Micro-Neighborhoods," we shifted our sights to Chicago between 2007-2011. In addition to testing whether foreclosures led to crime in Chicago, we also explored potential mechanisms by studying how the location of crime changes in the presence of foreclosures. Our hypotheses were that foreclosures would not only increase crime but would also shift the location of crime, as more crimes were drawn inside of unmonitored properties.

In the third paper, "Nobody's Home: The Impact of Foreclosures on Neighborhood Crime," we broadened our focus to five diverse cities: Atlanta, Miami and Philadelphia, as well as New York and Chicago. We hypothesize that while bank-owned properties are surely problematic, the larger threat may be the homes *on the way* to lender ownership that are not yet lender owned. These properties, which are owned and controlled by people who have little incentive to care for them – including, but not limited to, properties that may be vacant or abandoned for some period of time – may generate more substantial externalities.

II. Methods

Our key interest is in learning whether and how foreclosures affect neighborhood crime in five cities: Atlanta, Chicago, Miami, New York, and Philadelphia. Table 1 provides some critical information about each of our cities and highlights their diversity.

Most of the literature uses census tracts to explore this relationship. For consistency with the literature, we use GIS methods to map foreclosures and crime to census tracts and estimate many of our models at the level of the census tract. But our primary unit of analysis is the blockface, a street segment that is bounded by the two closest cross-streets, and which incorporates buildings on both sides of the street (see Figure 1). We believe blockfaces are preferable to the more commonly-used census blocks (encompassing all buildings on the interior of a square city block bordered by four street segments) because foreclosures are more likely to affect behavior and crime just across the street than around the corner (or two corners). In a study of crime on street segments in Seattle, Groff, Weisburd, and Yang (2010) found that crime patterns varied widely between street segments, reinforcing the importance of using small-scale geographies in research on crime. We employed city street shapefiles and GIS analysis to create blockfaces, which are not captured in standard mapping shapefiles.

Blockfaces are quite small. New York City, for example, contains over 96,000 blockfaces. But as shown in Table 1, there is considerable diversity across our five cities. The average blockface length is longest in Atlanta (492 feet) and shortest in Chicago (314 feet), and Chicago has the largest number of blockfaces (118,276), while Miami has the smallest number (14,008). Atlanta has the lowest population density and the smallest number of census tracts, despite the fact that Miami is much smaller in square mileage. New York is the largest city in terms of both population and square mileage, and has the highest population density and the smallest number of blockfaces per census tract.

Empirically identifying the causal effect of foreclosures on crime is a challenge, as elevated crime on a block might reduce demand and prices, and potentially trigger defaults and foreclosures, as some borrowers find themselves in negative equity. But since borrowers might need time to adjust their perceptions of blockface-level house prices and then to make the decision to stop making mortgage payments, and lenders generally must wait for the loan to enter formal default status (90 days past due) before issuing a foreclosure notice, this reverse-causal mechanism would likely take some time to unfold – so crime would not immediately lead to foreclosures. Perhaps more worrisome is the possibility that very localized distress (economic, social, or otherwise) might lead to both elevated crime and foreclosure activity.

In our three papers, we take several steps to address concerns about causality. First, we lag our foreclosure measures, which means that any confounding, localized distress would have to have led to elevated crime in the current quarter but elevated foreclosures in the prior six quarters. Second, we include neighborhood (either blockface or census tract) fixed effects to take into account pre-existing, time invariant, neighborhood-specific contributions to the payoffs and costs of committing crime, such as geographic features, proximity to commercial areas and transit, and the distribution of building and occupancy types.[1] Further, we control for the characteristics of the neighborhood that change over time (such as household structure, age, income, and other local socioeconomic drivers of mobility) by also including time trends in the larger area (city-by-quarter, police precinct-by-quarter, or census tract-by-quarter, depending on the specification) as fixed effects. Through including these area-by-quarter fixed effects, we capture most of the localized social and economic trends that might lead to both elevated foreclosures and crime. This is particularly true in our specifications that use blockfaces as the geographic unit of analysis and include census tract-by-quarter fixed effects. Consider that the average census tract in New York City covers just 0.14 square miles and includes only 14 blocks and 29 blockfaces.

[1] We also estimate models without blockface fixed effects that include these measures directly.

As for trends that are specific to the blockface or census tract, we include some attributes of blockfaces or tracts that change over time, which may reflect population and economic shifts, including changes in the total number of units, building demolitions and new construction, and new liquor licenses. Finally, in some of the blockface models in New York City, we also include future foreclosure starts to control for unobserved trends on a blockface that might be correlated with both crime and foreclosures. If unobserved trends in blockface-level economic distress or social cohesion are causing both foreclosures and crimes, then future foreclosure activity also should be correlated with current crime (through the effects of the unobserved, persistent trends).

The rest of this section describes our regression models in more detail, and we focus on the blockface level models in the interest of simplicity. (The tract-level models are highly similar; they are simply estimated at higher levels of geography.)

Intuitively, our baseline empirical strategy in answering this question is to compare changes in crime levels on blockfaces experiencing an increase in foreclosure activity to changes in crime levels on nearby blockfaces that are not experiencing an increase in foreclosures, but are located within the same small neighborhood (defined as a police precinct or census tract). Specifically, we estimate the following model:

$$y_{bnt} = \alpha + \beta X_{bnt-1} + \gamma Z_{bnt} + T_{nt} + B_b + \varepsilon_{bnt},$$

where y_{bnt} is the level of criminal activity on blockface *b* in neighborhood *n* and quarter *t.* We focus primarily on simple counts of crimes per quarter, rather than rates, in part because we do not have quarterly population estimates for blockfaces, but we control for the number of units on a blockface in a given quarter to capture changes in density.

Note that our use of crime counts instead of crimes per capita will bias our estimated coefficients towards zero if foreclosures lead to reductions in the population, since our estimates will understate the true impact of foreclosures on victimization risk by not accounting for the reduction in population. Similarly, to the extent that a smaller population means fewer people available to report crime, any reporting bias will also be in the direction of not finding an effect. It is possible that policing strategies have changed in response to the foreclosure crisis, and that areas with high foreclosure activity are more heavily monitored by the police. However, our dataset of crime reports are those initiated by complaints made by crime victims and observers, and excludes to the extent possible crime reports that were initiated solely by police officers.[2] Thus, our data are less affected by any monitoring bias.

On the right hand side of the equation, X_{bnt-1} is a measure of foreclosure activity in the previous quarter on blockface *b*; Z_{bnt} represents our set of time-varying blockface characteristics (including total units) to control for other observable changes in the blockface over time that might affect the payoffs and costs to committing crime; T_{nt} is a vector of fixed effects indicating the quarter for each neighborhood *n*, which controls for crime, policing, and other trends in the neighborhood; B_b are blockface fixed effects, which control for time-invariant differences between blockfaces with more and less foreclosure activity; and ε_{bnt} is the random error term.

As noted, we proxy for neighborhoods with both police precincts and census tracts. While the census tract-by-quarter variables allow us to control for trends in a smaller geographic area, there are also good arguments for using police precincts. First, policing is managed in New York at the precinct level, and thus controlling for precinct time trends will capture any differences in trends in policing practices or crime reporting across precincts. In addition, census tracts are quite small in New York City given the city's high density, and thus the comparison group of blockfaces with a census tract is limited and potentially affected by a given

[2] False or prank calls are not filed as official crime complaints, and are not included in our data. It is possible that some of the drug crime reports were initiated by police officers but they are likely a minority.

foreclosure (which may bias our estimated coefficients towards zero). Thus, we generally show both sets of results.

Finally, to further test the direction of causality, following Schuetz et al (2008) and Campbell, Giglio, and Pathak (2011), we estimate the relationship between past foreclosure starts on the blockface and crime while also controlling for future foreclosures on the blockface (a count of the number of foreclosure starts in the 18 months *following* the quarter for which we measure crime). Specifically, we estimate:

$$y_{bnt} = \alpha + \beta X_{bnt-1} + \delta X_{bnt+1} + \gamma Z_{bnt} + T_{nt} + B_b + \varepsilon_{bnt}$$

Foreclosure notices issued 18 months in the future (X_{bnt+1}) should pick up unobserved trends in the blockface that might be correlated with both foreclosures and crime, but not have any direct effect on criminal activity today (y_{bnt}).

For our Chicago analysis, we separately consider crimes that are reported to occur inside residences, and those that are reported to occur on the street and in other locations. For the five-city paper, we estimate regressions that allow for separate effects for properties that are currently in between the notice of foreclosure and public auction and for properties that have completed the process and become REO.

Our analyses rely critically on both geocoded foreclosure data and geocoded crime data. In most of the five cities, we were able to get point-specific crime data for a number of years from local enforcement agencies. We obtained point-specific foreclosure data from a variety of local vendors.

Crime Data

Under an agreement with the New York City Police Department, we have obtained point-specific data on all crimes initiated by victim or bystander complaints and reported in New York City between 2004 and 2008. This detailed dataset includes the spatial coordinates of each reported crime, along with its date, time, and offense category. We used GIS procedures to assign each crime to various levels of geography, including police precincts, census tracts, and blockfaces. Many of the X/Y coordinates of crimes are geo-coded to the middle of the street, or literally on the border of two census blocks (and often two census tracts). These crimes do not pose a problem for our analysis, because they clearly occur on a single blockface. We assign the 20 percent of crimes that take place at intersections to multiple blockfaces, as they could be affected by conditions on all adjoining blockfaces. We randomly assign the 19 percent of crimes that take place on a blockface on the border of two census tracts to one tract or the other. Although we have the exact date of both crimes and foreclosure notices, we aggregate crimes to quarters, as sample sizes do not permit shorter time periods for blockfaces.

The Chicago crime data come from the Chicago Police Department and include geographic coordinates, date and time, crime descriptions, and information about the location in which the offense occurred. We have records from 2007 through 2011, which we use to construct quarterly counts of total, violent, property, and public order crime at the level of the blockface and the census tract. The Chicago crime data also include a description of the location of each crime, e.g., on a sidewalk or in a store. The specific location of a crime – whether it is indoors or outdoors – may have different implications for the neighborhood and for policing strategy. We estimate the impact of foreclosures on crimes that occur in four mutually exclusive locations: in the street or on a sidewalk, inside residences, inside vacant or abandoned buildings, and in all other locations.[3]

[3] Street crimes include those occurring in the following locations: street, sidewalk, parking lot/garage (non-residential), alley, park property, CHA parking lot/ground, residential yard, residential driveway, vacant lot/land, cemetery, porch, yard, parking lot, vacant lot, CHA parking lot, driveway, school yard. Crimes inside residences include those occurring in the following locations: apartment, basement, residence, residence porch/hallway, or residence garage. "Other locations" where crimes take place include "other" (3.6% of total crimes), parking lot/garage (non-residential) (2.8% of total crimes), school public building (2.2% of total crimes). The following places represent less than 2% of the total each, including: vehicle non-commercial, small retail store, restaurant, department

Point-specific crime data was also provided by the police departments in the three remaining cities. In addition to a measure of total crime, we create separate measures of violent and property crimes based on the Uniform Crime Report (UCR) categories.[4]

In New York[5], Chicago[6], and Miami[7], we also create a measure of public order crime, which includes less serious offenses including loitering, prostitution, drug crimes, graffiti, and weapons offenses. In Philadelphia, we have measures of UCR violent and property crimes, and a few types of public order crimes, but not the complete universe of crimes committed.[8] In Atlanta, we only have measures of the UCR violent and property crimes, and therefore the total crime measure is the sum of these serious crime categories.[9] Figure 2 presents the total crime rate per 1000 population in each of the cities. Crime rates are consistently highest in Miami over the time period of the study. The violent crime rate is highest in Philadelphia and Chicago, followed by Atlanta and Miami, and lowest in New York City (see Table 2). Property crime rates are highest in Miami and Atlanta over this period. Overall, Miami's high total crime rate appears to be driven by public order crimes.

Mortgage Foreclosure Data

The foreclosure process varies widely across states. In some states, like New York, Florida, Pennsylvania, and Illinois, foreclosure is governed by the courts. In these 'judicial' foreclosure states, foreclosures are conducted through the courts, and the time between the initial foreclosure filing and the auction can last for several months or even years. In states with a 'non-judicial' process (including Georgia), foreclosures are conducted outside of the court system, and the time from foreclosure notice to auction is generally much shorter. In Georgia, once a lender sends a notice of foreclosure to the borrower, they must wait only 30 days to sell the property at a public auction. At the end of 2011, RealtyTrac estimated that the average time between the initiation of a foreclosure and its completion was 1,068 days in New York, 806 days in Florida, 567 days in Illinois, and only 142 days in Georgia (National Public Radio, 2012). Thus, properties may sit in a state of limbo for far longer in judicial states like Florida, Illinois, Pennsylvania, and New York than non-judicial states like Georgia.

In New York State, a mortgage foreclosure is initiated when the foreclosing party files a legal document, called a *lis pendens*, in the county court.[10] We use foreclosure filing data from 2003-2010 obtained from a private vendor, the Public Data Corporation.[11] Note that many properties that receive foreclosure notices do not go to auction; owners are able to cure those foreclosures through paying back arrears, receiving a modification, or selling quickly to a new owner. Despite this, most researchers simply use data on counts of REO properties or foreclosure notices, failing to distinguish between foreclosures that are quickly resolved and those that are completed. In New York, the foreclosure process is lengthy, and some properties that go to auction linger in the

---

store, grocery food store, gas station, CTA platform/ train, commercial/business office, CHA parking lot/apartment/property, bar /tavern, public school grounds, bank, drug store, hospital, construction site, place of worship, hotel/motel, government building, convenience store, private school, nursing home, etc.

[4] UCR part I violent crimes include homicide, robbery, felony assault/battery, and rape. UCR part I property crimes include burglary, larceny, motor vehicle theft, and arson.

[5] Crime data from the New York Police Department for 2004-2010.

[6] Crime data from the Chicago Police Department via the City of Chicago Data Portal for 2001-2011.

[7] Crime data from the Miami Police Department for 2005-2011.

[8] Crime data from the Philadelphia Police Department for 2005-2010.

[9] Crime data from the Atlanta Police Department for 2005-2011.

[10] Beginning in September 2008, mortgage servicers were required by New York State law to issue pre-foreclosure notifications to borrowers with high-cost loans 90 days in advance of issuing a foreclosure notice. However, this law was not in effect for the majority of borrowers during our time period of analysis.

[11] A *lis pendens* may be filed for many reasons, unrelated to a mortgage foreclosure. The Furman Center uses a variety of screening mechanisms to identify *lis pendens* related specifically to mortgage default.

foreclosure pipeline for months and even years. Thus, we expect that properties that go all the way to auction are more likely to experience disinvestment and periods of vacancy than the properties whose owners are able to quickly resolve their foreclosures.

We use data from the New York City Department of Finance's Automated City Register Information System (ACRIS) to try to distinguish between foreclosures that are completed and those that appear not to be, by tracking property transactions that occur following the foreclosure filing, including deed transfers such as arms-length sales, auction sales, and reversion to lender ownership, or Real Estate Owned (REO) status. Figure 3 shows the overall trend in *lis pendens* over the years in our study period, while Figure 4 shows the distribution of outcomes of those foreclosure notices three years after issuance. As the total number of *lis pendens* increases over time, so does the share that make it all the way through the foreclosure process and go to auction.

Variation in the foreclosure and data collection processes across states translates into differences in the foreclosure measures available in each state. In judicial states, courts collect data on foreclosure fillings. But in non-judicial states like Georgia, courts do not gather data on foreclosure notices. The only available data in Atlanta are foreclosure auctions and sales out of REO, which come from the Fulton County Tax Assessors Office. We have these data for the years 2002-2011. We have data on the number of properties that become real estate owned (REO) following a foreclosure auction in our other four cities as well, which we obtain from mortgage deeds or assessor's offices. New York, Chicago, and Philadelphia also provide information about the timing of the foreclosure notice, which we can link (through unique property identifiers) to foreclosure auctions and property sales, which allows us to construct a wider variety of foreclosure measures.

In our separate New York City analysis, we are able to construct and test three different measures of foreclosure activity. First, and most simply, because the foreclosure process in New York City typically lasted about 18 months during our study period, we count the total number of properties on a blockface that entered foreclosure in the prior 18 months, or six quarters. We call this measure "cumulative foreclosure starts."

Second, we construct a measure of "active foreclosures," which captures the number of properties that we believe remain in the foreclosure process. We assume a property is in the foreclosure process if it meets one of three criteria: a) it has received a foreclosure notice within the last 18 months and has *not* resold to a new owner;[12] b) it received a foreclosure notice more than 18 months ago but we know that it is still in the foreclosure process, as we observe that it will be put up for auction in the future; or c) it is in lender ownership (REO status) after going through a foreclosure auction. Note that we use property sales data through 2011 to identify auction sales for properties receiving foreclosure notices between 2003 and 2008. While this allows for a three-year lag between the notice and an auction, given the lengthy foreclosure process in New York, we could potentially be undercounting active foreclosures at the end of our time period (by wrongly assuming that some properties may have cured the foreclosure and will never go to auction). This undercounting would likely bias us against finding an effect.

Finally, we also separately identify one particular subset of active foreclosures: those properties that either will go to auction or have already gone to auction and have reverted to lender ownership, or REO status.[13] This type of property is most likely to be vacant and neglected, and thus theoretically should have the largest impact on crime on the blockface.

[12] Note that some of these foreclosures could 'cure' in less than 18 months through means other than arms-length sales, but we unfortunately have no data on loan modifications or payment of arrears. We assume here that a foreclosure is 'cured' after 18 months if we see no auction of the property during our time period (which will range from three to eight years depending on when notice is first issued).

[13] This group essentially omits from the active foreclosure group properties that received a notice in the last 18 months but that never go to a foreclosure auction (at least during the timeframe of our data). The owners of these properties likely find some way to cure the foreclosure.

For our Chicago paper, we rely simply on a count of properties receiving foreclosure notices in the past year. (We shorten the window from 18 months to 12 months in Chicago as compared to New York City, because the foreclosure timeline is shorter in Illinois than in New York State.)

For the five-city paper, we rely on two key measures: the number of properties that are REO at the end of the previous quarter and the number of properties that are in the midst of the foreclosure process – that is, between notice and public auction. These are the properties that may be in limbo.

Figure 3 presents the foreclosure start rate per 1000 population in New York and Chicago during the time period of this study. Chicago has a much higher foreclosure start rate relative to Philadelphia and New York City. REO rates also vary significantly by city. Figure 2 presents the REO rate per 1000 population, and shows that Miami has a much higher REO rate than the other cities, followed by Atlanta.

Other Data

In the New York City analysis, we also control for several, time-varying characteristics of blockfaces that may affect the likelihood of both foreclosures and crime occurring in that place. These include the total number of residential units on a blockface, measures of new construction or demolitions (created from permit data from the New York City Department of Buildings), and the number of active liquor licenses for bar or alcohol purveyors on the blockface in a given quarter from the New York State Liquor Authority.[14]

To describe the structural characteristics of blockfaces, we draw on time-invariant blockface level variables from the New York City Department of Finance's Real Property Assessment Database (RPAD): the number of religious buildings, store buildings, and the number of vacant lots. We also report measures of the composition of the residential housing stock from RPAD: the number of single family, two-to-four family, and multi-family buildings with five or more units, the number of condos and co-ops, and the share of building square footage on the blockface that is of commercial use.

In Chicago, we also draw on 311 complaints made to the City of Chicago about graffiti, street light outages, pot holes, tree debris, garbage maintenance, rodents, vacant buildings, and abandoned vehicles. The 311 data are available beginning in January 1, 2011. We construct a measure of resident reported disorder by aggregating the total number of calls by blockface and quarter.

.

[14] Our measure excludes liquor licenses granted to grocery stores and drug stores. Note that our results are unchanged when we estimate models without liquor licenses, new construction, or demolitions.

III. Results

A. Statement of Results

New York City:

The results of our baseline regression analyses are found in the three panels of Table 3. Panel A presents estimates from models using the cumulative count of foreclosure starts in the past 18 months, Panel B shows the results from our models using our measure of active foreclosures, and Panel C presents results from our models using a count of all active foreclosures, and a count of the active foreclosure properties that are on the way to auction or in REO. The first column in every group shows results controlling for precinct-by-quarter fixed effects while the second shows results from regressions that include census tract-by-quarter fixed effects.

The estimates of the impact of cumulative foreclosure starts on total crime, violent crime, and public order crime are statistically significant in the models that include precinct-by-quarter fixed effects. When we include census tract time dummies instead, the coefficients on total crime and violent crime retain statistical significance, while the coefficient on public order crimes falls just below the standard of statistical significance (t-statistic = 1.94). Our models predicting total and public order crime explain about 75 and 87 percent of the variation in blockface level crime, as compared to only between 41 and 47 percent of violent crimes.[15] As noted, these results use standard errors clustered at the police precinct level (when we include precinct-by-quarter fixed effects) and at the census tract level (when we include census tract-by-quarter fixed effects). Note also that this weaker result for property crime is consistent with our theoretical predictions, as foreclosed properties – especially when they sit vacant as they change ownership or go to auction – may be less attractive targets for theft.[16]

When we turn to active foreclosures, the results are very similar in both significance and magnitude. This lack of difference in results may be driven by the fact that few of the foreclosure starts are resolved through sales or other means. Alternatively, foreclosure starts themselves may generate residential turnover that destabilize communities.

As expected, Panel C suggests that the properties headed to auction are the properties that most affect crime and particularly public order crimes. Because there are not many of these properties, it is difficult to estimate a precise impact, but the results are instructive. When we include the count of properties on route to auction or in REO, the coefficients on the active foreclosure measure fall in magnitude and lose significance, and the coefficients on the auction/REO measure are about two to four times larger than the estimated coefficients on active foreclosures in panel B and are significantly different from zero in all of the precinct-by-quarter models (except for property crimes). When we include census tract-by-quarter fixed effects, they remain statistically significant in the regression of public order crimes. In other words, foreclosure filings that go all the way through the process and result in an auction appear to have larger effects on neighborhood crime than foreclosure filings that are resolved in other ways.

As for effect sizes, they are small. The OLS results suggest that an additional active foreclosure in the prior quarter is associated with a 0.7 percent increase in total crime, a 1.4 percent increase in violent crime, and a 0.7 percent increase in public order crimes.[17] The auction results indicate larger effects: an additional property headed to a foreclosure auction on a blockface leads to a 1.4 percent increase in total crime, a 2.6 percent increase in violent crimes, and a 2.6 percent increase in public order crimes. To give a sense of magnitudes, there were only 723 blockface-quarters in our data with at least three cumulative foreclosure starts and only 247

[15] Past research finds that patterns of more serious crimes are more difficult to explain.
[16] Models estimated on a sample excluding properties in Manhattan yields almost identical results to the full five-borough sample.
[17] Effect sizes are calculated as the estimated coefficient divided by the mean number of crimes (by type) per blockface-quarter.

with more than three. Of course in many other cities, especially in California, Nevada, Arizona and Florida, there were considerably more foreclosures. So if these same point estimates were to hold in those cities, we would have seen a more meaningful aggregate increase in crime.

Future Foreclosures

To bolster confidence that our results capture a causal relationship between foreclosures and crimes, we run a set of regressions that estimate the relationship between past foreclosure starts on the blockface and crime while also controlling for a count of the number of foreclosure starts in the 18 months *following* the quarter for which we measure crime. As presented in Table 4, the coefficient on the number of future foreclosure starts is statistically insignificant in all but one model.[18] These results provide suggestive evidence that the census tract-by-quarter fixed effects are controlling for most of the unobserved trends that affect both foreclosure activity and crime (for total, violent, and property crimes) over time on the blockface. More importantly, the coefficients on past foreclosure starts retain their magnitude and statistical significance in all models when future foreclosure starts are included (the coefficients in property crime models remain insignificant). That said, in the public order crime model (the one model in which the coefficient on future foreclosure starts is statistically significant), the difference between the coefficients on lagged and future foreclosure counts is not statistically significant.

Negative Binomial Results

Modeling crime at the micro-neighborhood level raises the concern that the dependent variable may not be normally distributed across geographic units or time. In New York City, the distribution of crime across blockfaces follows a non-normal distribution. Therefore, we also estimate a negative binomial model to account for the concentration of observations on the left tail of the crime distribution. Table 5 presents the results of our negative binomial models of the impact of cumulative foreclosure starts on total crime. All of the models have likelihood ratios well above the critical chi-square values, allowing us to reject the null hypothesis that the model is not explaining the variance in crime. The coefficient on cumulative foreclosures remains statistically significant. Our results are also robust when we estimate negative binomial versions of regressions with alternative foreclosure measures.[19]

Spillover Effects on Neighboring Blockfaces

As noted, we also explore the diffusion of the effect of foreclosure on crime by examining the degree to which foreclosures from neighboring blockfaces affect crime on a given blockface. We find that a foreclosure start issued on an adjacent blockface is positively and significantly associated with crime on a blockface, but the effect is smaller than that for a foreclosure start that is issued to a property on the same blockface. Thus, the impacts of foreclosures on crime do not appear to simply reflect a displacement of crime from neighboring blockfaces to the blockface with foreclosure activity. Of course, it is still possible that foreclosure activity is attracting crime from blockfaces that are further away, and that there is no net impact of foreclosure on crime in larger geographic areas. Fully addressing the question of whether foreclosures generate or displace crime will require further investigation.

Threshold Effects

Our analyses thus far assume that foreclosures have a linear effect on crime. As noted, however, there may be threshold effects such that one foreclosure occurs with little notice but several may signal that the

[18] For simplicity, the remaining tables only show results with census tract-by-quarter fixed effects, but results are the same when we include precinct-by-quarter fixed effects instead.
[19] For all remaining tables, results for alternative foreclosure measures and all crime types are available from authors upon request.

block's social networks are unraveling. In Table 6, we estimate models with categorical variables for blockfaces with 1, 2, or 3 or more foreclosures in a given quarter by crime type. The reference category is zero foreclosures in a given quarter. We see some evidence of non-linearity for cumulative foreclosure starts. Foreclosure activity only appears to be linked to subsequent crime when there have been three or more foreclosure notices issued on a blockface. (As noted above, less than 0.1 percent of all blockface-quarters in our data saw this many foreclosure notices.) However, we see little evidence of threshold effects when looking at active foreclosures and auctions.

Chicago:

The first set of results in Table 7 present coefficients from the baseline model in Chicago. The coefficients on the foreclosure starts measure are positive and significant, and robust to the addition of blockface fixed effects and controls for precinct and neighborhood time trends. The first specification presents the raw relationship between foreclosure starts and total crime. The model is strengthened by the addition of quarter fixed effects to control for citywide time changes in the housing market and in crime patterns (column 2), blockface fixed effects to control for time-invariant characteristics of the blockface (column 3), and precinct-level quarterly time effects to capture changes in policing policy or issues with data reporting at the precinct level (column 4). The preferred specification in column 5 includes both blockface fixed effects and neighborhood*quarter fixed effects which control for quarterly crime variation within census tracts. In this model, an additional foreclosure start on a blockface in the past year is associated with 0.028 additional crimes in that quarter. This represents a 3.2 percent increase from the mean number of crimes per blockface-quarter of 0.86.[20]

Consistent with results in New York City, foreclosures in Chicago appear to increase violent and public order crime on the blockface, but to have little effect on property crime. Table 8 shows results by crime type using the blockface fixed effects specification that controls for neighborhood time trends. An additional foreclosure start increases violent crime by 0.01 crimes, representing a 14.1 percent increase in blockface violent crime (column 2), and increases public order crime by 0.019 crimes, a 4.6 percent increase in public order crime (column 4). The effects of foreclosures on total, violent, and public order crime appear to be concentrated on blockfaces with multiple foreclosures (Table 9). Blockfaces with three or more foreclosure starts in the past year experience average increases in violent and public order crime of greater than 6 percent from the blockface mean.

Foreclosures may not only affect overall levels of crime, but may also influence where crimes occur. Table 10 provides estimates of the relative impact of foreclosures on crime taking place on the street, inside a residence, in vacant buildings, or in another location, controlling for total crime as an independent variable.[21] On average, there is a small significant increase in crime inside residences following a foreclosure, and a small decrease in crime in "other locations." Crime in vacant buildings increases most in percentage terms (15.6%) following a foreclosure filing, although the coefficient falls just below significance (perhaps not surprising given that crimes in vacant buildings are much rarer than crimes in the other locations). In sum, foreclosure activity appears to have a positive impact on crime inside residences that is not entirely offset by decreases in crimes in other locations on the blockface. Foreclosure activity on a blockface alters the opportunities to commit crime inside versus outside, changing the potential risk-benefit calculation associated with criminal behavior. These results are robust to estimation with a negative binomial estimator. The negative binomial

[20] Effect sizes are calculated as the share of the population mean of the dependent variable represented by the coefficient. For example, the estimate of 0.028 is 3.2% of the mean number of crimes per blockface-quarter of 0.86.

[21] Measures of crimes on the street, residence, vacant and "other" locations are mutually exclusive; therefore the estimates present the relative increase in crime in the given location.

results are highly significant and larger in magnitude, in part because they include blockface and quarter fixed effects (not tract-level quarter effects, which are difficult to estimate with a negative binomial specification).[22]

Analysis of the impact of foreclosures by both crime type *and* crime location uncovers additional variation. Three main findings emerge from the models presented in Table 11, which include controls for total blockface crime. First, the primary increases in crime occur inside residences. The coefficient on foreclosure starts is positive in the regression of violent crime indoors, suggesting an 8.4 percent increase from the blockface mean, although the estimate does not quite reach statistical significance (t-statistic of 1.88). The coefficients on foreclosure starts are also positive and significant in the regressions of property crime and public order crime indoors. This may reflect a change in opportunity presented by the foreclosure for the commission of property and public order crime, shifting these crimes inside residences and away from the street or other locations.

Second, although we find no overall impact of foreclosure on property crime, there is significant variation in the effect by crime location. On average, an additional foreclosure start appears to decrease property crime on the street (2.8 percent decrease from the blockface mean), and increase property crime indoors (2.9 percent increase from the blockface mean). In other words, foreclosures appear to increase property crime that occurs indoors (such as theft of copper piping or other goods from inside the home), while they reduce property crimes on the street (i.e. motor vehicle theft). Even though the overall effect on property crime is null, a shift in the location of criminal activity occurs as a result of the foreclosure.

Third, the estimated relationships change when we look specifically at crime that occurs within vacant or abandoned buildings. Foreclosures are positively correlated with violent, property, and public order crime occurring in vacant buildings, although the coefficients lose significance in the models that control for total crime. Although we cannot detect a relative increase in crime in vacant buildings compared to crime in other locations on the blockface, perhaps due to the low frequency of these offenses, the effect sizes of the correlations are large and substantively interesting. While we cannot say definitely that foreclosures increase the number of crimes occurring in vacant buildings, theory would suggest that vacant buildings may both be a target for crime (vandalism, theft) and a haven for crime (prostitution, drug use and sales).

Finally, we also find an association between foreclosure starts and resident reports of neighborhood disorder (Table 12). In an OLS model with blockface fixed effects and tract*year*quarter fixed effects, we find that when the number of foreclosures on the blockface increases, the total number of 311 calls made to the City of Chicago about problems such as vacant buildings, rodents, graffiti, and other types of physical disorder increase in the following quarter. This may be evidence of a decline in social control within the neighborhood, which may then lead to increased crime.

Five-City Paper Results

Table 13 presents the results from the pooled census tract level model. Overall, an additional property becoming REO in a census tract is associated with an increase of 0.063 crimes. In the specification that includes census tract fixed effects and year*quarter fixed effects (column 2), it appears that average total crime on the blockface increases by 0.0192 crimes on average with an additional REO property. To test for variation in impacts across cities, the specifications in columns 3 and 4 include interactions between the REO measure and city dummy variables. The specification in column 3 also controls for city*quarter fixed effects, controlling for

[22] As discussed in Guimarães and Portugal (2009), there is no simple solution to estimating nonlinear models with two high-dimensional fixed effects (such as both blockface and tract*quarter fixed effects). While the authors develop a procedure for estimating linear models with one high-dimensional set of fixed effects, they only make suggestions as to how the method might be applied to non-linear models.

varying time trends in each city, while that in column 4 includes both city*quarter fixed effects and tract fixed effects.

In the third column, we see positive and significant coefficients on the REO count variable in all five cities, though the coefficient is substantially smaller for Atlanta than it is for the other four cities. Given that the foreclosure process in Atlanta is considerably shorter than that in the other four cities, this difference in magnitude suggests that foreclosed properties may have smaller effects on crime in cities with more rapid foreclosure processes.[23] In the final specification, which includes census tract fixed effects, and thus controls for unobserved, fixed differences between the tracts where foreclosures occur and other tracts, we see that the count of REO properties is not associated with any change in crime in Atlanta.[24] But we see no association in Miami or Philadelphia either.[25] In New York, the association is positive (a 0.291 increase in crime), while in Chicago, it is actually negative (a 0.591 decrease in crime, on average). It is possible that the strong negative association between REO properties and crime in Chicago results from the city's more vigilant monitoring of vacant, lender-owned properties. Unlike most of the other cities in our sample, Chicago has a fairly strong vacant building ordinance, which requires owners to secure the property, register it with the city, maintain both the grounds and the property, and post a sign with contact information for owner. But whatever the cause, it appears that the presence of REO properties in census tracts has vastly different effects on crime by city, which may help to explain the mixed results found in earlier studies.

The next set of models is estimated at the blockface level, which allows for tighter controls of potential time-varying confounders at the neighborhood level that may affect both foreclosures and crime. The pooled models in Table 14 show an overall negative impact of properties that become REO on blockface level crime, a decrease of 0.0097 crimes (column 2). As for city-specific effects, in the most controlled models with blockface fixed effects and tract*quarter fixed effects (column 4), REOs appear to have a negative impact on crime in Miami and Chicago, and no significant impacts in the other three cities.[26] Thus, if anything, our results seem to suggest that as properties enter REO, crime falls on their blockface. While at first blush, this seems counter-intuitive, it is important to remember that these models include blockface (or census tract) fixed effects. Thus, the coefficients simply suggest that crime is lower on blockfaces with REO properties than it is on those very same blockfaces shortly before properties enter REO, when they are already distressed but controlled by owners who expect to lose them and thus have little incentive to secure or maintain them.

The results in Table 15 shed further light on this puzzle, by controlling for both the count of REO properties and the count of properties in the midst of the foreclosure process. In the most controlled model (column 3) that includes blockface fixed effects and tract-specific quarterly time trends, we find that properties in foreclosure increase total crime by 0.0222 crimes, on average, while REOs decrease total crime by 0.154 crimes. (We obtain similar results when estimating these models at the level of the census tract.) It appears that properties in the midst of foreclosure increase crime, but once those properties are actually taken over by lenders, any effects they have had on crime seem to dissipate, perhaps because lenders do more to care for them. Unfortunately however, we have no direct evidence on maintenance and investment.

---

[23] The coefficient on the interaction between Atlanta and REO is significantly different than the estimated coefficients for Chicago and New York, but not from the coefficients for Philadelphia and Miami. F tests for difference in estimated coefficientsare as follows: atlXreo -chiXreo=0: F(1,3664) = 60.95, Prob > F =0.00; atlXreo - nycXreo = 0: F(1,3664) = 18.22, Prob > F = 0.00; atlXreo - miaXreo = 0: F(1,3664) = 1.52, Prob > F = 0.22; atlXreo - phiXreo = 0; F(1, 3664) = 1.34, Prob > F = 0.25

[24] Since we only have violent and property crime data in Atlanta, we also estimate the most controlled model for violent and property crimes separately. We find that REOs have a slight positive effect on violent crime, and no significant effect on property crime at the census tract level.

[25] We also estimate models by crime separately for Philadelphia, because we do not have the universe of crimes that occur in that city. We find that REOs have a negative effect on public order crimes only. See Appendix D.

[26] We estimate separate models by crime type in Atlanta and Philadelphia, and find no significant effects. See Appendix E.

Table 16 shows the same model, stratified by city. To be fair, the positive coefficient on the count of properties in foreclosure reaches the level of statistical significance in Chicago and New York only, not in Philadelphia, but the coefficient is positive and larger than the standard error in Philadelphia too.[27] Meanwhile, we find no evidence that the presence of REO properties increases crime. In the blockface models that control for both measures of foreclosure, the coefficient on REO is insignificant in the New York and Philadelphia models and negative and statistically significant in Chicago.

[27] We estimate separate models by crime type in Philadelphia, and find no significant effects. See Appendix E.

B. Tables

Table 1. Geographic Summary

Measures	Atlanta	Chicago	Miami	New York	Philadelphia
Average blockface length (feet)	492	314	380		354
Number of blockfaces	24,952	118,276	14,008	96,933	46,808
Number of tracts	167	878	348	2246	381
Average number of blockfaces/tract	206	136	171	55	123
City Size					
Square Mileage	133	228	36	303	217
Population Density (persons/sq. mile)	3,154	11,842	11,136	27,013	3,624
Housing Stock					
Housing Units 2000	186,998	1,152,871	148,388	3,200,912	661,958
Housing Units 2010	224,573	1,194,337	183,994	3,371,062	670,171
Percent Change in Housing Units	20.1%	3.6%	24.0%	5.3%	1.2%
Population Size					
Population 2000	416,474	2,896,016	362,470	8,008,278	1,517,550
Population 2010	420,003	2,695,598	399,457	8,175,133	1,526,006
% Change in Population	0.8%	-6.9%	10.2%	2.1%	0.6%

Table 2. Crime Measures

City	Rate per 1000 Pop.	2004	2005	2006	2007	2008	2009	2010	2011
Chicago	*Total Crime*		172.39	170.21	166.92	163.02	150.09	141.63	133.16
	Violent		38.68	37.18	36.82	36.04	33.03	31.29	29.48
	Property		51.18	50.63	49.40	51.19	47.12	46.72	45.52
	Public Order		63.45	63.57	61.69	56.98	52.12	47.80	43.40
Philadelphia	*Total Crime*		134.05	141.89	135.75	139.79	126.18	133.03	
	Violent		39.88	42.95	38.99	37.14	33.67	34.43	
	Property		83.66	86.46	85.20	89.85	80.10	85.94	
	Public Order		10.51	12.49	11.56	12.80	12.40	12.65	
New York	*Total Crime*	145.59	141.41	141.94	142.36	140.21			
	Violent	12.92	12.88	12.69	12.04	12.22			
	Property	47.92	45.77	44.65	43.08	43.29			
	Public Order	69.54	68.86	70.61	73.23	71.55			
Atlanta	*Total Crime*		131.36	129.10	140.31	150.84	122.02	112.40	100.66
	Violent		23.11	23.74	26.35	24.91	19.29	17.64	15.91
	Property		108.25	105.36	113.97	125.92	102.61	94.71	84.68
Miami	*Total Crime*		336.9	710.7	764.3	797.2	784.2	722.3	692.3
	Violent		11.92	25.61	28.32	34.04	28.75	22.43	21.02
	Property		63.74	125.37	129.34	137.98	126.91	116.79	122.92
	Public Order		287.49	616.84	626.38	612.97	602.13	563.20	544.20

Table 3: OLS Regression Results, New York City

A. Regression of Crime on Cumulative Foreclosures Starts, by Crime Type

Variables	**Total Crime**		**Violent Crime**		**Property Crime**		**Public Order Crime**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cumulative Foreclosure Starts	0.0265**	0.0180**	0.00539*	0.00383*	0.00322	0.00112	0.0140**	0.0100
	(0.00811)	(0.00687)	(0.00233)	(0.00160)	(0.00246)	(0.00222)	(0.00471)	(0.00516)
Total Units	0.0000228	0.00000856	-0.00000266	-0.00000453	-0.0000235*	-0.0000291	0.0000455	0.0000427
	(0.0000136)	(0.0000219)	(0.00000692)	(0.00000826)	(0.0000117)	(0.0000191)	(0.0000239)	(0.0000252)
N	1,285,636	1,285,636	1,285,636	1,285,636	1,285,636	1,285,636	1,285,636	1,285,636
R-squared	0.852	0.866	0.412	0.470	0.834	0.849	0.750	0.775
Blockface FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Precinct*Quarter FE	Yes	No	Yes	No	Yes	No	Yes	No
Tract*Quarter FE	No	Yes	No	Yes	No	Yes	No	Yes
Clustered SE	Precinct	Tract	Precinct	Tract	Precinct	Tract	Precinct	Tract

Models include demolition permits, new building permits, and liquor licenses. Standard errors in parentheses. * p<0.05 ** p<0.01 *** p<0.001

B. Regression of Crime on Active Foreclosures, by Crime Type

Variables	**Total Crime**		**Violent Crime**		**Property Crime**		**Public Order Crime**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Active Foreclosures	0.0276**	0.0163*	0.00560*	0.00357*	0.00335	0.000923	0.0143**	0.00856
	(0.00883)	(0.00751)	(0.00260)	(0.00182)	(0.00272)	(0.00256)	(0.00537)	(0.00557)
Total Units	0.0000228	0.00000858	-0.00000266	-0.00000452	-0.0000235*	-0.0000291	0.0000455	0.0000427
	(0.0000136)	(0.0000219)	(0.00000692)	(0.00000826)	(0.0000117)	(0.0000191)	(0.0000239)	(0.0000252)
N	1,285,636	1,285,636	1,285,636	1,285,636	1,285,636	1,285,636	1,285,636	1,285,636
R-squared	0.852	0.866	0.412	0.470	0.834	0.849	0.750	0.775
Blockface FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Precinct*Quarter FE	Yes	No	Yes	No	Yes	No	Yes	No
Tract*Quarter FE	No	Yes	No	Yes	No	Yes	No	Yes
Clustered SE	Precinct	Tract	Precinct	Tract	Precinct	Tract	Precinct	Tract

Models include demolition permits, new building permits, and liquor licenses. Standard errors in parentheses. * p<0.05 ** p<0.01 *** p<0.001

C. Regression of Crime on Active Foreclosures and Auctions, by Crime Type

Variables	**Total Crime**		**Violent Crime**		**Property Crime**		**Public Order Crime**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Active Foreclosures	0.0170	0.00966	0.00348	0.00226	0.00296	0.000870	0.00487	0.00187
	(0.0105)	(0.00834)	(0.00263)	(0.00201)	(0.00319)	(0.00301)	(0.00590)	(0.00623)
Auctions	0.0527*	0.0334	0.0105**	0.00658	0.00196	0.000269	0.0468*	0.0336*
	(0.0258)	(0.0209)	(0.00388)	(0.00453)	(0.00711)	(0.00624)	(0.0211)	(0.0165)
Total Units	0.0000228	0.00000861	-0.00000266	-0.00000452	-0.0000235*	-0.0000291	0.0000455	0.0000427
	(0.0000136)	(0.0000219)	(0.00000693)	(0.00000826)	(0.0000117)	(0.0000191)	(0.0000239)	(0.0000252)
N	1285636	1285636	1,285,636	1,285,636	1,285,636	1,285,636	1,285,636	1,285,636
R-squared	0.852	0.866	0.412	0.470	0.834	0.849	0.750	0.775
Blockface FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Precinct*Quarter FE	Yes	No	Yes	No	Yes	No	Yes	No
Tract*Quarter FE	No	Yes	No	Yes	No	Yes	No	Yes
Clustered SE	Precinct	Tract	Precinct	Tract	Precinct	Tract	Precinct	Tract

Models include demolition permits, new building permits, and liquor licenses. Standard errors in parentheses. * p<0.05 ** p<0.01 *** p<0.001

Table 4: Robustness Checks: New York City

A. Impact of Future Foreclosure Starts on Total Crime

	Total Crime		Violent		Property		Public Order	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DV: Total Crime	*Reference*	*Future Foreclosures*	*Reference*	*Future Foreclosures*	*Reference*	*Future Foreclosures*	*Reference*	*Future Foreclosures*
Cumulative Foreclosure Starts	0.0175*	0.0190**	0.00382*	0.00340*	0.00111	0.000738	0.00953	0.0115*
	(0.00689)	(0.00706)	(0.00160)	(0.00163)	(0.00222)	(0.00227)	(0.00517)	(0.00529)
Future Foreclosure Starts		0.00722		-0.00201		-0.00178		0.00937*
		(0.00576)		(0.00146)		(0.00223)		(0.00435)
Total Units	0.000004	0.000004	-0.000006	-0.000006	-0.000031	-0.000031	0.000044	0.000044
	(0.0000237)	(0.0000238)	(0.00000790)	(0.00000791)	(0.0000200)	(0.0000200)	(0.0000258)	(0.0000258)
Observations	1,282,780	1,282,780	1,282,780	1,282,780	1,282,780	1,282,780	1,282,780	1,282,780
R-squared	0.866	0.866	0.470	0.470	0.849	0.849	0.775	0.775
Blockface FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tract*Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered SE	Tract	Tract	Tract	Tract	Tract	Tract	Tract	Tract

Models include demolition permits, new building permits, and liquor licenses. Standard errors in parentheses. * p<0.05 ** p<0.01 *** p<0.001

Table 5: Negative Binomial Regression, New York City

A. Regression of Total Crime on Cumulative Foreclosure Starts	
Variables	(1)
Cumulative Foreclosure Starts	0.0108***
	(0.00124)
Total Units	0.0000735***
	(0.00000803)
Constant	2.326***
	(0.00747)
Observations	1,192,144
Log Likelihood	-1604713.8
Blockface FE	Yes
Quarter FE	Yes

B. Regression of Total Crime on Active Foreclosure	
Variables	(1)
Active Foreclosures	0.0124***
	(0.00131)
Total Units	0.0000735***
	(0.00000803)
Constant	2.327***
	(0.00746)
Observations	1,192,144
Log Likelihood	-1604707
Blockface FE	Yes
Quarter FE	Yes

C. Regression of Total Crime on Active Foreclosure and Auctions	
Variables	(1)
Active Foreclosures	0.00775***
	(0.00152)
Auctions	0.0234***
	(0.00378)
Total Units	0.0000735***
	(0.00000803)
Constant	2.327***
	(0.00746)
Observations	1,192,144
Log Likelihood	-1604688.1
Blockface FE	Yes
Quarter FE	Yes

Models include demolition permits, new building permits, and liquor licenses. Standard errors in parentheses.
* p<0.05 ** p<0.01 *** p<0.001

Table 6: Blockface Threshold Models, New York City

A. Regression of Crime on Cumulative Foreclosures Starts, by Crime Type				
Variables	**Total Crime**	**Violent Crime**	**Property Crime**	**Public Order Crime**
	(1)	(2)	(3)	(4)
1 Cumulative Foreclosure	0.00356	0.000436	-0.00568	0.00590
	(0.00978)	(0.00250)	(0.00398)	(0.00731)
2 Cumulative Foreclosures	0.0267	0.00671	0.00106	0.0121
	(0.0178)	(0.00499)	(0.00661)	(0.0135)
3+ Cumulative Foreclosures	0.0715*	0.0147*	0.00710	0.0414
	(0.0287)	(0.00730)	(0.00973)	(0.0219)
Total Units	0.00000855	-0.00000453	-0.0000291	0.0000427
	(0.0000219)	(0.00000826)	(0.0000191)	(0.0000252)
Observations	1,285,636	1,285,636	1,285,636	1,285,636
R-squared	0.866	0.470	0.849	0.775
Blockface FE	Yes	Yes	Yes	Yes
Precinct*Quarter FE	No	No	No	No
Tract*Quarter FE	Yes	Yes	Yes	Yes
Clustered SE	Tract	Tract	Tract	Tract

Models include demolition permits, new building permits, and liquor licenses.
Standard errors in parentheses. * p<0.05 ** p<0.01 *** p<0.001

CHICAGO RESULTS

Table 7. Impact of Foreclosure Starts on Total Crime, Chicago (2007-2011)

	(1)	(2)	(3)	(4)	(5)
Models	*Raw*	*Quarter FE*	*Blockface FE*	*Precinct*Quarter*	*Tract*Quarter*
Foreclosures	1.171***	1.177***	0.0364***	0.0306*	0.0291***
	(0.00575)	(0.00575)	(0.00512)	(0.0122)	(0.00632)
Observations	1755279	1755279	1755279	1754959	1755279
R-squared	0.023	0.024	0.663	0.663	0.667
Quarter FE	No	Yes	Yes	No	No
Blockface FE	No	No	Yes	Yes	Yes
Precinct*Quarter FE	No	No	No	Yes	No
Tract*Quarter FE	No	No	No	No	Yes

Clustered standard errors in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Table 8. Impact of Foreclosures Starts on Crime, by Crime Type, Chicago (2007-2011)

	(1)	(2)	(3)	(4)
Crime Type	*Total*	*Violent*	*Property*	*Public Order*
Foreclosures	0.0291***	0.00498***	0.00295	0.0194***
	(0.00632)	(0.00141)	(0.00228)	(0.00497)
	3.4%	*6.9%*	*1.1%*	*4.6%*
Observations	1755279	939879	1401579	1535239
R-squared	0.667	0.393	0.658	0.613
Blockface FE	Yes	Yes	Yes	Yes
Tract*Quarter FE	Yes	Yes	Yes	Yes

Clustered standard errors in parentheses. Effect sizes in italics.

* p<0.05 ** p<0.01 *** p<0.001

Table 9. Impact of Foreclosure Starts on Crime, by Crime Type, Chicago (2007-2011)

	(1)	(2)	(3)	(4)
Crime Type	*Crime*	*Violent*	*Property*	*Public order*
1 Foreclosure	0.00136	0.000958	0.00394	-0.00399
	(0.00859)	(0.00257)	(0.00374)	(0.00650)
	0.2%	*1.3%*	*1.4%*	*-0.9%*
2 Foreclosures	0.0156	0.0100*	-0.00258	0.00608
	(0.0160)	(0.00408)	(0.00700)	(0.0120)
	0.9%	*6.9%*	*-0.5%*	*0.7%*
3+ Foreclosures	0.119***	0.0137*	0.00936	0.0855***
	(0.0259)	(0.00541)	(0.00962)	(0.0202)
	4.6%	*6.3%*	*1.1%*	*6.8%*
Observations	1755279	939879	1401579	1535239
R-squared	0.667	0.393	0.658	0.613
Blockface FE	Yes	Yes	Yes	Yes
Tract*Quarter FE	Yes	Yes	Yes	Yes

Table 10. Impact of Foreclosure Starts on Total Crime by Location, Chicago (2007-2011)

	(1)	(2)	(3)	(4)
Crime Location	*Street*	*Residence*	*Vacant*	*Other Location*
Foreclosures	0.00180	0.00692*	0.000659	-0.00872**
	(0.00272)	(0.00287)	(0.000421)	(0.00275)
	0.5%	*2.6%*	*15.6%*	*-3.8%*
Total Crime	0.326***	0.289***	0.00534***	0.385***
	(0.0194)	(0.0372)	(0.000680)	(0.0537)
Observations	1755279	1755279	1755279	1755279
R-squared	0.848	0.857	0.198	0.891
Blockface FE	Yes	Yes	Yes	Yes
Tract*Quarter FE	Yes	Yes	Yes	Yes

Clustered standard errors in parentheses. Effect sizes in italics.

* p<0.05 ** p<0.01 *** p<0.001

Table 11. Impact of Foreclosure Starts on Type/Location of Crime, Chicago (2007-2011)

A. Violent Crime	(1)	(2)	(3)	(4)
Crime Location	*Street*	*Residence*	*Vacant*	*Other Loc.*
Foreclosures	-0.000154	0.00117	0.000102	-0.00112**
	(0.000639)	(0.000622)	(0.000102)	(0.000400)
	-0.35%	*8.43%*	*37.35%*	*-7.88%*
Total Violent	0.591***	0.194***	0.00434***	0.211***
	(0.00791)	(0.00416)	(0.000567)	(0.00670)
Observations	939879	939879	939879	939879
R-squared	0.747	0.420	0.082	0.500
Blockface FE	Yes	Yes	Yes	Yes
Tract*Quarter FE	Yes	Yes	Yes	Yes
B. Property Crime	(1)	(2)	(3)	(4)
Crime Location	*Street*	*Residence*	*Vacant*	*Other Loc.*
Foreclosures	-0.00281**	0.00226*	0.000299	0.000249
	(0.000948)	(0.00111)	(0.000252)	(0.000938)
	-2.82%	*2.90%*	*18.34%*	*0.26%*
Total Property	0.280***	0.301***	0.00594***	0.413***
	(0.0124)	(0.0433)	(0.000701)	(0.0524)
Observations	1401579	1401579	1401579	1401579
R-squared	0.673	0.762	0.123	0.899
Blockface FE	Yes	Yes	Yes	Yes
Tract*Quarter FE	Yes	Yes	Yes	Yes
C. Public Order Crime	(1)	(2)	(3)	(4)
Crime Location	*Street*	*Residence*	*Vacant*	*Other Loc.*
Foreclosures	0.00302	0.00447*	0.000266	-0.00776***
	(0.00215)	(0.00207)	(0.000317)	(0.00216)
	1.53%	*3.55%*	*12.34%*	*-8.22%*
Total Public Order	0.382***	0.217***	0.00521***	0.396***
	(0.0298)	(0.0275)	(0.000632)	(0.0553)
Observations	1535239	1535239	1535239	1535239
R-squared	0.805	0.722	0.161	0.818
Blockface FE	Yes	Yes	Yes	Yes
Tract*Quarter FE	Yes	Yes	Yes	Yes

Clustered standard errors in parentheses. Effect sizes in italics.
* p<0.05 ** p<0.01 *** p<0.001

Table 12. Impact of Foreclosure Starts on 311 Complaints, Chicago (2011)

	(1)
	Total 311 calls
Foreclosures	0.0601*
	(0.0261)
Observations	473100
R-squared	0.703
Blockface FE	Yes
Tract*Quarter FE	Yes

Standard errors in parentheses. * p<0.05 ** p<0.01

FIVE CITY RESULTS

Table 13. Census Tract Level Analysis – Pooled Models of Effect of REO on Total Crime

VARIABLES	(1) Raw	(2) Tract and YRQ FE	(3) City*YRQ FE	(4) Tract and City*YRQ FE
REO	0.0633***	0.0192***		
	(0.00524)	(0.00734)		
ATL*REO			0.0395***	0.00172
			(0.00549)	(0.00639)
CHI*REO			4.554***	-0.591***
			(0.0450)	(0.0756)
NYC*REO			1.635***	0.291***
			(0.118)	(0.0675)
MIA*REO			5.515***	-0.858
			(0.306)	(0.698)
PHI*REO			7.075***	-0.413
			(0.302)	(0.358)
Constant	90.97***	95.12***		83.61***
	(0.384)	(0.376)		(0.486)
Observations	79,096	79,096	79,096	79,096
R-squared	0.002	0.957	0.632	0.959
YRQ FE	No	Yes	Yes	No
Tract FE	No	Yes	Yes	Yes
City*YRQ FE	No	No	Yes	Yes
Clusters	.	3665	.	3665

Table 14. Blockface Level Analysis – Pooled Models of Effect of REO on Total Crime

	(1)	(2)	(3)	(4)	(5)
DV: Total Crime	Raw	Blockface & Tract*YRQ FE	Raw	Blockface & Tract*YRQ FE	DV: Ln(crime)
REO	0.0659***	-0.00971***			
	(0.00240)	(0.00223)			
ATL*REO			0.0255***	-0.000380	-0.000279
			(0.00243)	(0.00229)	(0.000392)
CHI*REO			1.812***	-0.194***	-0.0190***
			(0.0168)	(0.0118)	(0.00166)
NYC*REO			1.061***	0.000287	-0.00572
			(0.0346)	(0.0329)	(0.00454)
MIA*REO			-1.228***	-0.866***	-0.0381***
			(0.0731)	(0.0422)	(0.00527)
PHI*REO			0.169**	0.000187	0.00626
			(0.0573)	(0.0299)	(0.00472)
Observations	7016760	7016760	7016760	7016760	2953643
R-squared	0.174	0.845	0.176	0.845	0.779
YRQ FE	No	No	No	No	No
Blockface FE	No	Yes	No	Yes	Yes
Tract*YRQ FE	No	Yes	No	Yes	Yes

Table 15. Blockface Level Analysis – Pooled Models of Effect of Foreclosures in Process and REOs on Total Crime (Chicago, New York, and Philadelphia)

	(1)	(2)	(3)	(4)
	Raw	Blockface &YRQ FE	Blockface & City*YRQ FE	Blockface & Tract*YRQ FE
InForeclosure	0.804***	0.0324***	0.0340***	0.0222***
	(0.00658)	(0.00662)	(0.00402)	(0.00399)
REO	1.190***	-0.160***	-0.155***	-0.154***
	(0.00790)	(0.0124)	(0.00557)	(0.00554)
Observations	6081840	6081840	6087908	6081840
R-squared	0.140	0.796	0.796	0.806
City FE	Yes	No	No	No
YRQ FE	No	Yes	No	No
Blockface FE	No	Yes	Yes	Yes
Tract*YRQ FE	No	No	No	Yes
City*YRQ FE	No	No	Yes	No

Standard errors in parentheses. * p<0.05 ** p<0.01 *** p<0.001

Table 16. Blockface Level Analysis – Stratified Models of Effect of Foreclosures and REOs on Total Crime

	(1)	(2)	(3)
DV: Total Crime	Chicago	New York	Philadelphia
InForeclosure	0.0284***	0.0281**	0.00656
	(0.00573)	(0.00972)	(0.00576)
REO	-0.198***	0.0000433	-0.00186
	(0.00686)	(0.0186)	(0.0106)
Observations	2833224	1938160	1123248
R-squared	0.676	0.874	0.804
Blockface FE	Yes	Yes	Yes
Tract*YRQ FE	Yes	Yes	Yes
Years	2006-11	2004-08	2005-10

Standard errors in parentheses. * p<0.05 ** p<0.01 *** p<0.001

C. Figures

Figure 1. Geographic Unit of Analysis: Blockface

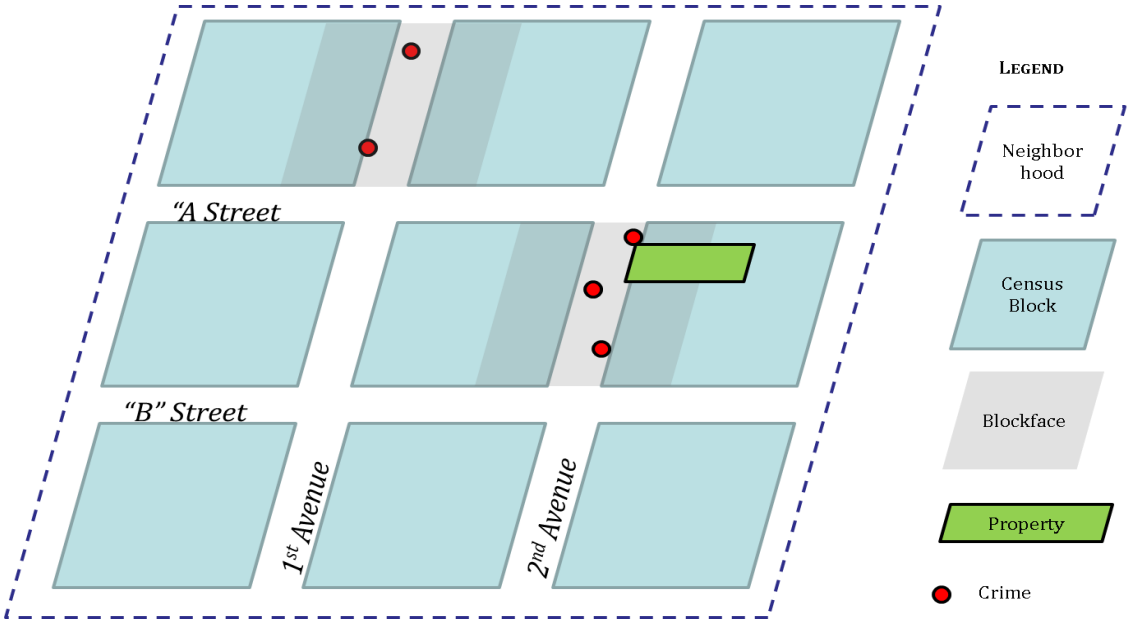


Figure 2. Total Crime Rate (per 1000 population)

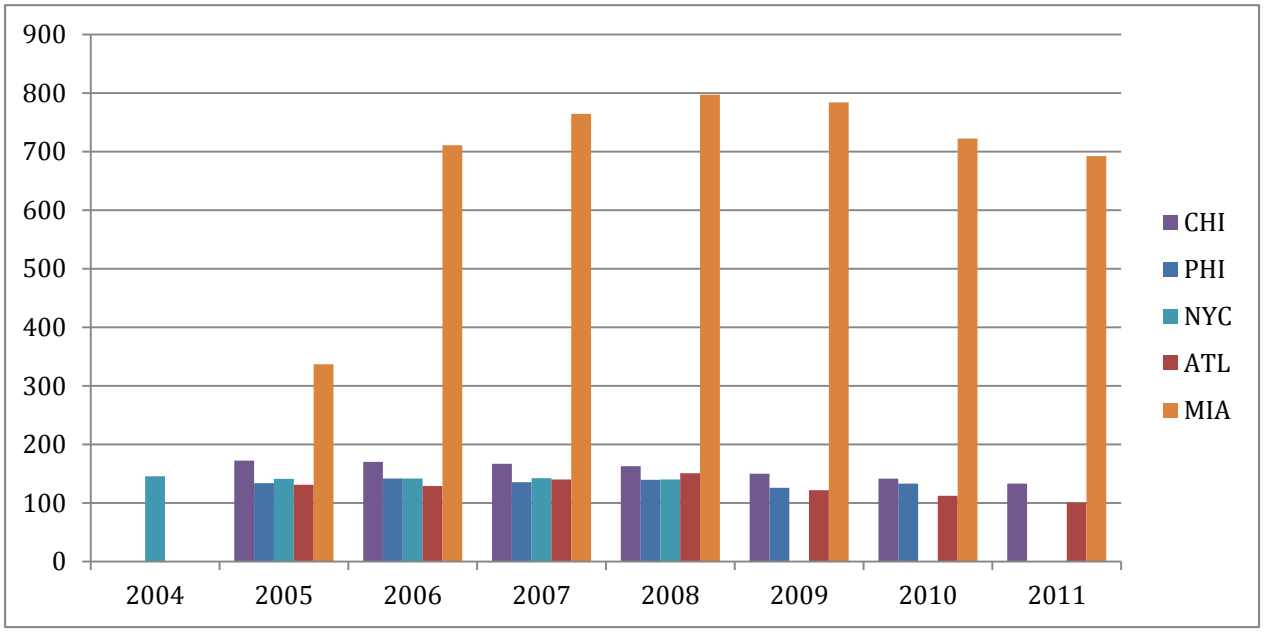
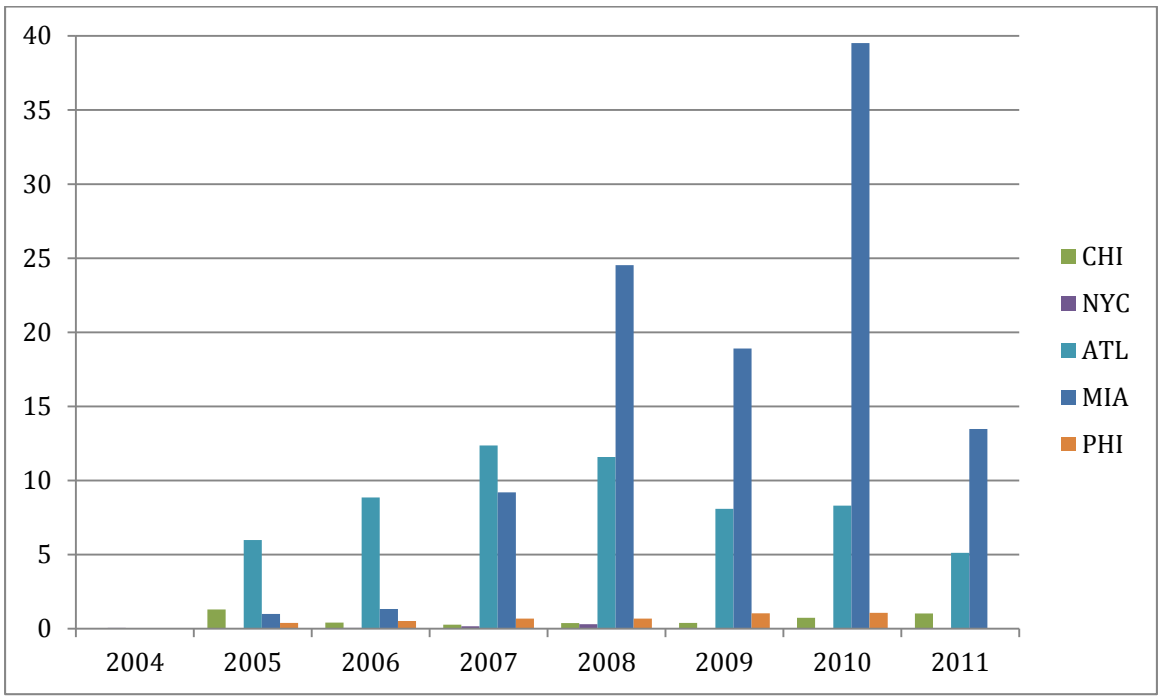


Figure 3. REO Rate (per 1000 population)



IV. Conclusions

A. Discussion of Findings

Using more detailed spatial analysis than most previous researchers, our results suggest that foreclosures lead to elevated crime on the blockfaces where they occur, and have more modest effects on crime on neighboring blockfaces as well. Estimated effects are relatively small, but consistent with theoretical predictions, they are larger for violent crime than for property crime. We find that effects of foreclosures may be heightened when foreclosure activity is concentrated.

In Chicago, we additionally find that foreclosures tend to increase crimes inside of residences but not outside. And importantly, in Chicago, New York City, and Philadelphia, we find no evidence that the presence of REO properties increases crime after we control for properties in the foreclosure process. Rather, it is the properties on the way to foreclosure auctions that appear to increase crime. In other words, the spillover costs imposed by foreclosures appear to be driven more by the presence of properties that are in the foreclosure process than by the presence of bank-owned properties. Our results suggest that the positive relationship between foreclosure and crime is less the result of changes in ownership (say, breaking social ties/reducing social capital) and more the result of reduced maintenance and investment of properties in transition to bank ownership. The ownership of these transitional properties is essentially in limbo, as those who technically hold title have little stake in the long-term value of the property (that is, "nobody's home").

It is worth underscoring that our identification strategy does not allow us to determine net increases in overall crime in a city or metropolitan area. Our results may not suggest a net increase in new crimes – the increases in crime on blockfaces that we find to be associated with foreclosure activity on that blockface and neighboring blockfaces may be roughly matched by corresponding decreases in crime on surrounding blockfaces. Thus, our results do not necessarily imply that cities reeling from the foreclosure crisis are at risk of increases in overall crime – but they do suggest that police and residents should closely monitor the blocks and neighborhoods that were disproportionately affected.

B. Implications for Policy and Practice

Our work offers important implications for policy. First, our results contribute to the growing evidence of neighborhood spillover effects of mortgage foreclosures. In addition to detrimental effects on property values, housing formation, and educational outcomes for children, we show that heightened foreclosure activity increases crime in the micro-neighborhoods immediately surrounding the property in foreclosure. Importantly, however, our results show that it is not bank-owned properties that are the key problem, though they have been the focus to date of research and policy attention. We find that the presence of bank-owned properties has a mixed effect on crime, consistent with other research. Rather, it is, the properties that are on the way to foreclosure auctions, but that are still technically controlled by their original owners, that lead to increases in crime. These results suggest that local law enforcement should work with local courts and other relevant agencies to collect data on the location and timing of foreclosure notices. They should then incorporate this information into their targeting strategies. Reaching out to residents in surrounding buildings and encouraging them to report any and all criminal activity in the area of the foreclosure may help stimulate the neighborhoods social control networks, and also improve reporting in areas that have experienced residential turnover and vacancy. The effects are not large, but they emerge as significant when at least three properties are in foreclosure on a blockface. Thus, local law enforcement officials should monitor the blocks and neighborhoods that have concentrations of properties in the midst of the foreclosure process.

Second, our results in Chicago suggest that foreclosures may change the location of crime, pushing more crime indoors into unmonitored homes, especially vacant homes. Thus, the results suggest that local law enforcement agencies may want to coordinate with local housing agencies to identify properties that are vacant

and those that are in the foreclosure process and closely monitor activities in those buildings. Local law enforcement officials should also work with neighbors and community groups to identify vacant or suspicious buildings, as they may learn about them before official agencies.

Third, our results suggest reforms to the laws governing foreclosure. Again, given that we find that it is the properties on the way to foreclosure auctions that are the key driver in any increase in neighborhood crime, our results suggest that changes in policies, regulations or resources that reduce the time that properties spend in limbo may effectively reduce the impact of foreclosure on neighborhood crime. While extended foreclosure timelines may bring greater protections to borrowers, they may impose costs on communities through spillover effects. Although some recent work suggests that reforms that extend already lengthy foreclosure timelines make little difference in the probability that borrowers will keep their properties, policy makers should surely consider both benefits to homeowners and costs to the surrounding neighborhood in deciding on reforms to the foreclosure process.

Finally, this research also suggests important lessons for local code enforcement. They suggest that lengths should be taken to secure buildings that are currently in the foreclosure process that might already be vacant, to make them less attractive targets for crime. One promising possibility is to introduce vacant property ordinances that require owners to register their properties when vacant. Some cities, like Chicago are now introducing such ordinances, which also require that owners physically secure entrances, windows, and yards and properly maintain their properties and grounds so the buildings become less visible targets. More generally, cities may want to step up their code enforcement efforts and to identify the owners who are not maintaining their properties. Cities rarely keep these records of property ownership but those that do often find that the problem properties are owned by a small handful of owners. Columbus, Ohio has recently found such a pattern and is now targeting those properties and owners.

C. Implications for Further Research

Our research has added to our understanding of whether and at what point properties in the foreclosure pipeline affect crime. But future work is needed to pinpoint the precise mechanisms through which distressed properties cause crime. Our research suggests the problem lies in the lack of clear ownership – or rather the fact that the official owners no longer have a stake in the long-term value of the property. But more work should be conducted to understand this mechanism. For example, researchers might consider other instances when properties are in ownership limbo, perhaps in situations of looming tax foreclosure, to test for similar results. In addition, qualitative work could help to shed lights on how unmonitored and unmaintained properties affect crime. Such work would help to pinpoint the problems that should be immediately addressed to stem any negative effects on the community.

V. References

Baumer, E. P., Wolff, K. T., and Arnio, A. N. (2012). A Multicity Neighborhood Analysis of Foreclosure and Crime. *Social Science Quarterly*, 577-601.

Campbell, J. Y., Giglio, S., Pathak, P. 2011. Forced sales and house prices. *American Economic Review*, 101(5), 2108-2131.

Clark, L. M., Teasdale, B. 2005. Subprime lending, crime, and neighborhood disorganization: Beyond internal dynamics, University of Akron.

Goodstein, Ryan M. and Yan Y. Lee. 2010. "Do Foreclosures Increase Crime?" Washington, DC: FDIC Center for Financial Research Working Paper No. 2010-05.

Groff, E. R., Weisburd, D., and Yang, S. 2010. Is is important to examine crime trends at a local "micro" level? A longitudinal analysis of street to street variability in crime trajectories. *Journal of Quantitative Criminology*, 26, 7-32.

Immergluck, D., Smith, G. 2006b. The impact of single-family mortgage foreclosures on neighborhood crime, *Housing Studies*, 21(6), 851-866.

Jacobs, Jane. 1961. *Death and Life of Great American Cities.* New York: Vintage.

Katz, Wallace, and Hedberg. 2013. "The Temporal Impact of Foreclosure on Neighborhood Crime and Disorder." *Journal of Research in Crime and Delinquency* 50: 359-389.

Kelling, George, and James Q. Wilson. 1982. "Broken Windows: The police and neighborhood safety" *The Atlantic Monthly*, (March 1982).

Kirk, David, and Derek Hyra. 2012. "Home Foreclosures and Community Crime: Causal or Spurious Association?" *Social Science Quarterly* 93: 648-670.

Newman, Oscar. 1972. *Defensible Space*. New York: Macmillan.

Schuetz, Jenny, Been, Vicki, Ellen, Ingrid Gould. 2008. Neighborhood effects of concentrated mortgage foreclosures, *Journal of Housing Economics*, 17(4), 306-319.

Spelman, William. 1993. "Abandoned Buildings: Magnets for Crime?" *Journal of Criminal Justice* 21: 481-495.

Stucky, T. D., Ottensmann, J. R., and Payton, S. B. (2012). The effect of foreclosures on crime in Indianapolis, 2003-2008. *Social Science Quarterly*, 93(3), 602-624.

VI. Dissemination of Results and Research Findings

As noted below, we have written three papers through this grant as well as one policy brief. The article and associated policy brief on foreclosures and crime in New York City have attracted a good deal of media attention and have highlighted the issue for policy makers. Media coverage included the following articles:

- Jaffe, E. (2012, November 07). Do Foreclosures Increase Crime After All? *The Atlantic Cities*. Retrieved from http://www.theatlanticcities.com/housing/2012/11/do-foreclosures-increase-crime-after-all/3828/
- HousingWire's The Ticker. (2013, February 27). *Report: Foreclosures Cause Neighborhood Crime*. Retrieved from http://www.housingwire.com/fastnews/2013/02/27/report-foreclosures-cause-neighborhood-crime
- Velsey, K. (2013, February 27). New York City foreclosures linked to crime. *The New York Observer*.

We have presented results at several academic conferences and seminars, as noted below. In addition, we hosted a presentation to NYU Furman Center staff and other invited guests on blockface methodology in July of 2012. Our research assistants – graduate students who plan to enter urban planning and policy analysis professions – received training on numerous policy-relevant technologies, including ArcGIS and SAS.

We have worked to disseminate results to the practitioner community as well. We have met with and discussed the results with NYPD officials on several occasions. We have also met with and discussed results with various housing practitioners. We held a roundtable discussion titled *Stabilizing Communities: Exploring Early Intervention Tools to Stem Spillover Effects of* Foreclosures on Wednesday, December 12, 2012 at New York University. The purpose of the roundtable was to convene a group of experts to consider how to respond more effectively to the spillover effects that concentrations of properties in foreclosure impose on surrounding communities. The National Institute of Justice sponsored research by the Furman Center shows that properties that are on their way to a foreclosure auction generate problems for their neighbors long before they become REO. While in the foreclosure process, they cause crime to increase, reduce neighboring property values, and trigger more foreclosures. However, community-centered responses to the foreclosure crisis typically focus on REO properties, not the properties still in the foreclosure pipeline. The roundtable began with a brief presentation of recent evidence showing the pre-auction impacts of concentrated foreclosures. With a focus on New York City, we discussed what factors drive these findings and what strategies and resources exist to combat them. Participants included local policymakers, homeowner advocates, local law enforcement officials, and community development practitioners.

In November of 2011, we held a roundtable discussion titled *Foreclosures and Neighborhood Decay: Implications for Housing and Criminal Justice Policy* focused on our initial results on foreclosures and crime in New York City. We presented our findings and Professor Gould Ellen moderated a discussion about implications for housing and criminal justice policy. Participants represented a broad array of stakeholders, including representatives from local government (including those working in both housing and criminal justice), nonprofit organizations, foundations, and academia.

Journal Publications

Ellen, I.G., Lacoe, J. & Sharygin, C.A. (March 2013). Do foreclosures cause crime? *Journal of Urban Economics 74,* 59-70. Status: Published. Acknowledgement of federal support: Yes.

Lacoe, J., & Ellen, I. G. (2013). *Mortgage Foreclosures and the Shifting Context of Crime in Micro-Neighborhoods*. Status: Under review. Acknowledgement of federal support: Yes.

Policy Briefs

Furman Center for Real Estate and Urban Policy. (February 2013). Do foreclosures cause crime? New York, NY. http://furmancenter.org/files/publications/DoForeclosuresCauseCrime.pdf

Conference Presentations

Ellen, I.G. (2013, November). "Nobody's Home: The Impact of Foreclosures on Neighborhood Crime." Paper presented at the Association for Public Policy and Management Annual Meeting, Washington, DC.

Ellen, I.G. (2013, October). Results from New York City Analysis presented at seminar at Urbanization Project, New York University, New York, NY.

Lacoe, J. (2013, August). *Mortgage Foreclosures and the Shifting Context of Crime in Micro-Neighborhoods*. Paper to be presented at the American Sociological Association Annual Meeting, New York, NY.

Lacoe, J. (2012, November). *Variation in the Impact of Foreclosures on Neighborhood Crime: Evidence from Chicago*. Paper presented at the American Society of Criminology Annual Meeting, Chicago, IL.

Ellen, I. G. (2012, October). Results from New York City analysis presented at Federal Reserve Bank of New York conference "Distressed Residential Real Estate: Dimensions, Impacts, and Remedies".

Sharygin, Claudia. (2011, June). Do Foreclosures Cause Crime? Paper presented at Mid-Year Meetings of the American Real Estate and Urban Economics Association (AREUEA), Washington, DC.

Ellen, I.G. (2011, May). Do Foreclosures Cause Crime? Paper presented at May session of the Weimer School of Advanced Studies in Real Estate and Land Economics, Singer Island, FL.

Ellen, I.G. (2011, April). Do Foreclosures Cause Crime? Paper presented at invited seminar at Harvard University Graduate School of Design, Cambridge, MA.

Sharygin, Claudia. (2011, April). Do Foreclosures Cause Crime? Paper presented at 2011 *Federal Reserve Community Affairs* Research Conference, Arlington, VA.

Website(s) or other Internet Site(s)

http://furmancenter.org/

This is the Furman Center's general website where we have posted all of our public activity for this project, including news releases and publications.

Publications we have posted online include:

- Ellen, I.G., Lacoe, J. & Sharygin, C.A. (June 2011). Do foreclosures cause crime? [Working paper]. Retrieved from the Furman Center website: http://furmancenter.org/files/publications/Ellen_Lacoe_Sharygin_ForeclosuresCrime_June27_1.pdf
- Ellen, I.G., Lacoe, J. & Sharygin, C.A. (October 2011). *Do foreclosures cause crime?* [PowerPoint slides]. Retrieved from the Furman Center website: http://furmancenter.org/files/testimonies/Foreclosures_Crime_NIJ.pdf
- *Do foreclosures cause crime?* (February 2013). [Policy Brief]. Retrieved from the Furman Center website: http://furmancenter.org/files/publications/DoForeclosuresCauseCrime.pdf