The Variance in Foreclosure Spillovers Across Neighborhood Types

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Abstract

The estimation of foreclosure spillover effects has been the subject of a number of studies following the most recent housing market crash. An important issue largely overlooked by these studies is the extent to which these spillovers vary across neighborhoods. In this paper, we use data from the South Florida metropolitan area to study the variance in these foreclosure spillovers across neighborhoods with different income levels and racial concentrations. We find that the largest foreclosure spillovers occur in higher income neighborhoods. In low income, minority neighborhoods, we find no evidence of spillover effects.

Keywords: Foreclosure, Housing Prices, Spillovers

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1 Introduction

After peaking in early 2006, housing prices – as measured by the Case-Shiller 20-City-Composite House Price Index – fell nearly 34 percent through the end of 2011. This precipitous decline in housing values, coupled with a sharp increase in the unemployment rate, led to an unprecedented wave of mortgage defaults, with many of these defaults resulting in foreclosure. Although some foreclosure auctions result in a home being transferred directly to another homeowner or investor, a common outcome of the foreclosure proceedings is a repossession of the property by the holder of the note, in which case the home becomes real estate owned (REO) by a financial institution, loan guarantor, or government entity.

Researchers and policymakers alike have expressed concern that these REO properties, which are often dilapidated and vandalized, generate substantial negative externalities and depress the value of nearby properties. This “foreclosure contagion” hypothesis has been the subject of eight recent papers, all of which find evidence in support of the hypothesis. As is well known, negative externalities indicate market failure, which from a social welfare perspective merits government intervention. However, the appropriate policy response requires that we know more about the foreclosure contagion problem than what can be learned from reading the eight papers that have tested the foreclosure spillover hypothesis. One important question on which more information is needed is whether the negative spillover effects generated by foreclosures vary across neighborhoods. This question, which has largely been overlooked in prior studies, is important because resources are limited and therefore only the most affected neighborhoods should be targeted by government support programs. Of greatest concern is that the negative spillover effects from foreclosures may be the largest within lower-income neighborhoods. Indeed, what limited evidence exists suggests that this is the case. Since it is already known that REOs are concentrated within low income neighborhoods [Ellen, Madar and Weselcouch, 2012], the aggregated home value losses suffered by their residents could be staggering, depending on the magnitude of the spillover effects. Such losses would obviously further worsen the growing gap in wealth inequality within the United States.

\footnote{This evidence is reviewed below in Section 4.}
The purpose of this paper is to empirically investigate how the magnitude of the negative spillover effect from foreclosures varies across different types of neighborhoods, defined by their racial makeup and income level. We estimate fixed effect hedonic price models that measure the effect of having an additional REO within specified distance rings from a single–family home on its sales value. Our empirical models are based on more than 600,000 sales transactions from the South Florida metropolitan area. This is an excellent study area for the inquiry at hand, because South Florida is one of the most racially diverse regions in the U.S. and was also beset by a large influx of bank-owned properties during the most recent housing crisis. In the next section (2), we offer four hypotheses for why the negative spillover effects of REOs may vary across neighborhoods. In Section 3, we review the results of a recent study by the National Fair Housing Alliance (NFHA) that is pertinent to our second hypothesis. In Section 4, we review prior studies that have estimated REO spillovers, giving special attention to those that have allowed the negative externalities of spillovers to vary across different types of neighborhoods. Section 5 describes our data and models. Our methodology is outlined in Section 6 and our results are presented in Section 7. Lastly, our conclusions and policy recommendations are contained in Section 8.

2 Hypotheses

Two reasons are commonly offered for why REOs have a negative effect on the values of nearby homes. One reason is that they produce a negative sight externality because they are in poor physical condition. This is the most popular explanation for the REO spillover effect, and it is supported by recent evidence provided by Gerardi et al. [2012]. The other reason suggested for the REO spillover effect is that REOs raise the level of neighborhood crime, which has been found to affect nearby property values. The REO/crime connection is attributed to two factors. First, because REOs are typically vacant, they become occupied by criminals who use the REO as a base for their operations. Crime increases in the vicinity of the REO because criminals tend to strike
close to their home location [Pope, 1980; Repetto, 1974]. Second, REOs lower the capacity and incentive of neighborhood residents to come together to informally monitor and police their space. Goodstein and Lee [2010] have labeled this “passive policing.” Foreclosures are hypothesized to reduce the capacity to police because they reduce the number of homeowners in the neighborhood who are most motivated to keep their neighborhood safe. Foreclosures reduce the incentive to police because, by causing abandonment and blight, residents come to view their neighborhood as a “lost cause.” As foreclosures erode passive policing, criminals are attracted to the neighborhood because they have less fear of getting caught.

Based on the sight externality and REO/crime connection arguments for the REO spillover effect, four hypotheses can be posited for why the effect may vary between low and high income neighborhoods. The first two assume that the REO effect stems from a sight externality. The other two are based on the assumption that the REO effect is due to its association with crime.

To develop our first hypothesis, assume that all REOs are maintained at the same level resulting in a uniform quality condition across neighborhoods; say, for example, a 3 on a 5 point rising quality scale. An REO in a neighborhood where the average condition is a 4 or 5 would be expected to have a negative impact on the value of nearby properties. However, in a neighborhood where the average condition is a 1 or 2, an REO would not be expected to cause a negative spillover effect and may, in fact, raise the values of nearby homes. Because the average condition of homes in low income neighborhoods is lower than in high income neighborhoods, the expectation is that the magnitude of negative spillovers from REOs may be larger in high income neighborhoods. This we label the neighborhood condition hypothesis.

There is, however, recent evidence from the National Fair Housing Alliance (NFHA) – which we review below – that suggests REOs are not uniformly maintained, but are instead under maintained in low in comparison to high income neighborhoods. This suggests that the negative spillovers from REOs may be greater in low income neighborhoods. We label this hypothesis the REO condition hypothesis.

Based on a possible connection between REOs and crime, two additional hypotheses can be

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Some evidence that well-maintained REOs raise nearby home values is provided by Gerardi et al. [2012].
posited for why the REO spillover effect may vary between low and high income neighborhoods. Immergluck and Smith [2006a] suggest that an REO may be more likely to yield a significant increase in crime in lower income areas, compared to higher income areas, because of greater pre-existing vulnerabilities for crime in the former places. Arnio, Baumer and Wolff [Forthcoming] provide support for this idea in that they find that the effect of foreclosures on crime is greater where economic disadvantage is greater. Hence, our third hypothesis is that the REO spillover is greater in lower income neighborhoods because an REO attracts relatively more crime into these areas. We label this the crime attraction hypothesis. Our final hypothesis is that the REO spillover effect is greater in high income neighborhoods because additional crime may have more impact on property values where existing levels of criminal activity are lower, which is the case in high income neighborhoods. Some direct empirical support for this idea comes from Tita, Petras and Greenbaum [2006], who estimate hedonic price models including crime as an explanatory variable separately for low and high income neighborhoods. Indirect support is also provided by Cullen and Levitt [1999], who find that higher income households, in comparison to lower income households, are more likely to suburbanize in response to higher central city crime rates. We label our fourth hypothesis the marginal crime hypothesis.

The neighborhood condition and the marginal crime hypotheses point to REOs having a greater externality effect in high income neighborhoods. The REO condition and crime attraction hypotheses suggest just the opposite is true. Hence, there are both reasons to believe that REOs will have a greater and a smaller spillover effect in low income in comparison to high income neighborhoods. The issue therefore cannot be settled a priori, and must be resolved by empirical investigation. This serves as the motivation underlying the estimated models we present below.

3 The National Fair Housing Alliance Report

The conclusion of the 2012 NFHA report “The Banks Are Back - Our Neighborhoods Are Not: Discrimination in the Maintenance and Marketing of REO Properties” [National Fair Housing Alliance, 2012] is that the banks, lenders, investors, and other entities that manage REO properties
are maintaining these properties less well in communities of color in comparison to the maintenance received by REO properties in predominantly white communities. This conclusion was drawn after the NFHA staff conducted on-site evaluations of 1,036 REOs located in neighborhoods with predominantly Latino and African–American residents, as well as in neighborhoods with a majority of white residents. In addition to their racial makeup, neighborhoods were selected based upon having a high foreclosure rate in comparison to other neighborhoods within the same metropolitan area. The neighborhoods are located in nine metropolitan areas covering all four regions of the U.S.: Washington, DC; Baltimore, MD; Philadelphia, PA; Phoenix, AZ; Oakland, CA; Dayton, OH; Miami, FL; Dallas, TX; and Atlanta, GA. The evaluations of the REOs required each inspector to assess 39 maintenance–related factors that were weighted to form a 100 point quality scale. In each of the nine metropolitan areas, REO maintenance quality levels were lower in minority than in white neighborhoods.

NFHA offers two explanations for their findings: (1) A bank’s failure to maintain an REO property in a minority neighborhood may be due to a false perception of the house’s actual value or the bank’s erroneous assumptions about a potential return on its investment, and (2) banks may weigh the cost of any maintenance or repair against the projected income the bank will receive from the sale of the property. In other words, the return from maintaining REOs in minority neighborhoods may be underestimated by banks or they may correctly estimate the return and the return is, in fact, lower in minority neighborhoods. While not the subject of the present paper, determining which of these explanations is the correct one is an important topic for future research. If the first explanation is correct, the problem potentially can be easily rectified by providing the banks’ with the requisite information.

The differences in REO maintenance levels across communities found by the NFHA may be due to differences in the race of the these neighborhoods, as alleged by the NFHA, but they may also reflect income differences, because neighborhood race and neighborhood income are highly correlated and the NFHA did not control for income differences. As described below, we separately estimate REO spillover effects for different types of neighborhoods, defined by both race and income level.
4 Literature Review

There have been eight recent studies that empirically estimated the spillover effects of foreclosures on the values of nearby properties. While these studies all find support for the foreclosure contagion hypothesis, they employ widely different methodologies, making comparisons among them difficult. However, there is some consistency in the magnitudes of the estimated effects, with most studies finding that homes within roughly a tenth of a mile of an additional REO experience between a 1 to 2 percent decline in market value. The data, year(s) of analysis, foreclosure measure, methodology, and results of each study are summarized in Table 1. Of particular interest to our analysis is the last column of the table, which indicates whether the study allowed the estimated REO spillover effect to vary across neighborhoods. Of the eight studies, three make such an allowance. These three studies are reviewed in detail below.

The first study is by Immergluck and Smith [2006a]. They utilize single-family sales transactions from the City of Chicago to estimate a cross-sectional hedonic price model for 1999. Foreclosures are measured as new REOs in the two-year period preceding the year of sale. For the full sample, they find that an REO within 1/8 of a mile reduces sales price by 0.9 percent. When they estimate their hedonic model for sales that occurred in only low and moderate income Census tracts, they find that the spillover effect climbs from 0.9 percent to 1.44 percent. Because they do not estimate their hedonic model for high income tracts, it cannot be determined definitively whether the spillover effect is larger in low and moderate income neighborhoods in comparison to high income neighborhoods. A major drawback of Immergluck and Smith’s [2006a] methodology is that it relies completely on cross-sectional data, which opens up the possibility that omitted variables may have biased their results. For example, there may be differences in job accessibility across neighborhoods that affect both property values and the number of foreclosures that is not accounted for in their model [Ihlanfeldt and Sjoquist, 1998].

The second study is by Schuetz, Been and Ellen [2008]. Their sales transactions are from New York City and include both single-family and multi-family properties. Their hedonic price model is estimated using data pooled over three years, 2002-2005. They acknowledge that their foreclosure
<table>
<thead>
<tr>
<th>Study</th>
<th>Data</th>
<th>Sample Year(s)</th>
<th>Foreclosure Measure</th>
<th>Method</th>
<th>Results</th>
<th>Allow for Differential Effect by Neighborhood Type?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leonard and Murdoch [2009]</td>
<td>Single-family transactions from Dallas County, TX</td>
<td>2006</td>
<td>Properties in some stage of foreclosure process between 2005 and 2007</td>
<td>Cross-sectional hedonic price model with spatial error correction</td>
<td>Additional foreclosure within 250 feet in neighborhoods with homeownership rate below 80% reduces value by 0.5%</td>
<td>No</td>
</tr>
<tr>
<td>Rogers and Winter [2009]</td>
<td>Single-family sales transactions from St. Louis County, MO</td>
<td>1998-2007</td>
<td>REO properties</td>
<td>Pooled cross-section hedonic price model with spatial error correction</td>
<td>Additional foreclosure within 200 yards and within 6 months of sale reduces value by 2%</td>
<td>No</td>
</tr>
<tr>
<td>Campbell, Giggio and Pathak [2011]</td>
<td>Single-family, multi-family and condo sales transactions from Massachusetts</td>
<td>1987-2009</td>
<td>REO properties</td>
<td>Differences-in-differences hedonic model with Census-tract-year fixed effects</td>
<td>Additional foreclosure within 18 months of filing reduces value by 0.05 miles reduces value by 1%; only condos experience negative spillover effect when sample is split</td>
<td>Yes; properties in low-priced neighborhoods experience a larger negative spillover effect</td>
</tr>
<tr>
<td>Schuetz, Been and Ellen [2008]</td>
<td>Single-family and multi-family sales transactions from NYC</td>
<td>2002-2005</td>
<td>Foreclosure filings</td>
<td>Hedonic price model with zip code fixed effects; future foreclosures control for unobservables</td>
<td>Additional foreclosure within 500 to 1000 feet and within 0.05 miles reduces value by 1%; only condos experience negative spillover effect when sample is split</td>
<td>Yes; no difference found between low- and high-density neighborhoods</td>
</tr>
<tr>
<td>Lin, Rosenblatt and Yao [2009]</td>
<td>Single-family sales transactions from Chicago MSA</td>
<td>2006</td>
<td>REO stock in year of transaction</td>
<td>Cross-section hedonic price model with county and zip code fixed effects</td>
<td>Foreclosures have a negative effect up to 0.9km away from sale and up to 5 years after the foreclosure</td>
<td>No</td>
</tr>
<tr>
<td>Mikelbank [2008]</td>
<td>Single-family sales transactions from Franklin County, OH</td>
<td>2006</td>
<td>Number of foreclosures filings in year of transaction</td>
<td>Cross-section hedonic price model with spatial error specification</td>
<td>Additional foreclosure reduces value by 2% within 250 feet; spillover declines to 1% at 1000 feet</td>
<td>No</td>
</tr>
<tr>
<td>Immergluck and Smith [2006a]</td>
<td>Single-family sales transactions from Chicago, IL</td>
<td>1999</td>
<td>New foreclosures in 1997 and 1998</td>
<td>Cross-section hedonic price model</td>
<td>Additional foreclosure within 1/8 of a mile reduces value by 0.9%</td>
<td>Yes; estimation based on sales in only low- and moderate income neighborhoods</td>
</tr>
<tr>
<td>Harding, Rosenblatt and Yao [2009]</td>
<td>Single-family repeat sales from 7 MSAs</td>
<td>1998-2007</td>
<td>Foreclosure stock in year of transaction by foreclosure phase</td>
<td>Change in price function of change in number of nearby foreclosures</td>
<td>Additional foreclosure within 300 feet reduces value by 1%; estimates vary by MSA</td>
<td>No</td>
</tr>
</tbody>
</table>
measure is imperfect since they count as foreclosures new foreclosure filings, and not actual REOs, in the year preceding the sale of the home. New filings may overestimate the number of REOs, because the borrower may avoid foreclosure by restructuring the loan with the existing lender, refinance the property with a different lender, or satisfy the loan by selling the property to a third party. Nevertheless, their methodology does have an advantage over that employed by Immergluck and Smith [2006a] in that they control for unobservables by including future foreclosure filings in their hedonic model. This mitigates the possibility that both prices and foreclosures are being driven by some unknown force, resulting in endogeneity bias. One odd finding of Schuetz, Been and Ellen’s [2008] study noted by Frame [2010] is that they find that the spillover effect is larger for foreclosures located farther away from the sale in both physical space and time. Frame [2010] concludes from this that there may be some issues with the empirical specification. He suggests, as an example, that the estimated model includes very few neighborhood characteristics as controls.

To allow the estimated spillover effects from foreclosures to vary across neighborhoods, Schuetz, Been and Ellen [2008] stratify their sample into high and low density neighborhoods and estimate separate hedonic models for each type of neighborhood. The authors find that there is little difference in impacts, from which they conclude that their results may not be applicable to cities other than New York, which is unique in having, on average, extremely high levels of population density.

The last study is by Campbell, Giglio and Pathak [2011]. To estimate their hedonic model they utilize 1.8 million sales transactions of single-family, multi-family, and condominium properties located throughout the state of Massachusetts covering the years 1987-2009. Their foreclosure measure is the stock of REOs. Of the three papers that allow for differential spillover effects across neighborhoods, their methodology most convincingly controls for unobservable heterogeneity across neighborhoods. They include in their estimated hedonic price models both current and future REOs in order to compute difference–in–differences estimates. They find that an additional REO within 0.05 miles lowers sales price by 1 percent. To investigate whether the spillover effect varies between high and low price neighborhoods, they interact their spillover estimates with tract–year fixed

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4 This stratification may be relevant to our posited hypotheses to the extent that neighborhood income varies between low and high density neighborhoods.
effects. Their results, which are reported only in an online appendix to their paper, suggest that the spillover effect is greater in low price neighborhoods. The robustness of these results, however, is questionable because the estimated spillover effect, while statistically insignificant in high price neighborhoods, is only weakly significant - the t-statistic is 1.33 - in low-price neighborhoods.

While the evidence provided by Immergluck and Smith [2006a] and Campbell, Giglio and Pathak [2011] support the REO condition and crime attraction hypotheses, the evidence is far from compelling and points to a clear need for improved estimates of the REO spillover effect by type of neighborhood. The next sections outline the data and methodological approach we adopted to accomplish this objective.

5 Data

Our REO stock variables and sales data are derived from the DataQuick transaction history database for the three counties that comprise the South Florida Metropolitan Statistical Area (MSA): Broward, Miami-Dade, and Palm Beach County. This database contains information on all financing and sales activity on residential real property from January 1st, 1999 through November 31st, 2011. For the purposes of this study, this transaction database is restricted to single-family homes. The geographic extent of the South Florida MSA and the spatial distribution of single-family units within its three counties are displayed in Figure 1.

This database includes many of the standard property characteristics used in valuation studies such as the property’s exact location, the property’s structural characteristics (e.g., number of bedrooms), the sales price, and the date on which the transaction took place. A critical piece of information provided by DataQuick for the present study is a variable indicating whether a transaction was "distressed" in some way. This distressed field indicates if the transaction fell into any of the following classifications: (1) the buyer was identified as a bank, lender, or government entity and title was transferred via a trustee’s deed; (2) a trustee’s deed was filed and the buyer was not a bank, lender, or government entity; (3) the property was transferred between a financial

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Figure 1: South Florida Metropolitan Area and Distribution of Single-Family Homes
institution and government agency or government-sponsored enterprise (GSE) (e.g., Fannie Mae); (4) the property was transferred from a financial institution to a guarantor; (5) the property was transferred from a financial institution, government entity, or GSE to a private buyer; or (6) the sale was likely a short sale. To construct the REO stock, we start by identifying all possible transitions into the REO stock ("REO starts"), which we define using cases (1), (2), and (3) above. Following the identification of the REO starts, we then search the transaction history for the date on which the property transitioned out of the REO stock ("REO exits"). For a given REO start date, the REO exit date is defined as the earliest date of the following two dates: the earliest subsequent type-(5) transaction on the property and 3 years after the entry into the REO stock. At any given point in time, the REO stock is defined as those properties that have entered into, but have yet to exit from, REO status. To study the impact of REOs on property values, we construct concentric rings around each of the properties in our sample; for a particular sale, the REO stock in each of these rings is defined as the number of properties in the REO stock as of the target property’s date of sale. Following Harding, Rosenblatt and Yao [2009], we use the following distances to construct our rings: 0-300 feet, 300-500 feet, 500-1000 feet, 1000-2000 feet, and 2000-3000 feet.

5.1 Data Summary

The summary statistics describing the sample of 627913 sales transactions we use to estimate our property value models are reported in Table 2. This sample is restricted to single-family units and

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6 DataQuick classifies a sale as a short sale if the sales price is more than 5 percent less than the estimated total loan balance at the time of sale.

7 In Florida, after a lender files suit against a borrower for defaulting on a note, if the default is not cured, the obligor’s property is put up for sale at a public auction. At this auction, the lender is given a credit at the auction equal to the amount of the final judgment handed down by the court. A property then enters REO status if there is no other party that outbids the lender; such a situation will generally be categorized as a type-(1) transaction under the typology above. However, after reviewing a large number of the documents underlying the distressed sale field, we identified that in a non-trivial number of cases, type-(2) and type-(3) transactions also represented an entry into the REO stock, which is why we include such transactions in the universe of REO starts. Experimentation with other REO-start classification systems (e.g., using only type-(1) observations) revealed that our empirical results are largely insensitive to the inclusion of type-(2) and type-(3) REO starts in the REO stock; such a finding is consistent with a high repossession rate conditional on a property being put up for auction. For more on the foreclosure process in Florida, see: http://www.realtytrac.com/foreclosure-laws/florida-foreclosure-laws.asp.

8 The 3-year limitation is imposed to guard against cases in which DataQuick’s distressed sale algorithm identifies an REO start but fails to identify the REO exit. In a small number of cases, a sale that is categorized as non-distressed occurs within the year 3-year REO start window. In these cases, this non-distressed sale is coded as an REO exit.
Table 2: Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Variable</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sale and Structural Characteristics</strong></td>
<td></td>
<td><strong>REO Count Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Sales Price</td>
<td>242766.1</td>
<td>Ring 1: 0-300 Feet</td>
<td>0.1208</td>
</tr>
<tr>
<td></td>
<td>(162879.5)</td>
<td>(0.4842)</td>
<td></td>
</tr>
<tr>
<td>Foreclosure Sale?</td>
<td>0.0817</td>
<td>Ring 2: 300-500 Feet</td>
<td>0.1494</td>
</tr>
<tr>
<td></td>
<td>(0.2739)</td>
<td>(0.5263)</td>
<td></td>
</tr>
<tr>
<td>Short Sale?</td>
<td>0.0411</td>
<td>Ring 3: 500-1000 Feet</td>
<td>0.6057</td>
</tr>
<tr>
<td></td>
<td>(0.1985)</td>
<td>(1.4676)</td>
<td></td>
</tr>
<tr>
<td>Has Pool?</td>
<td>0.2900</td>
<td>Ring 4: 1000-2000 Feet</td>
<td>1.9505</td>
</tr>
<tr>
<td></td>
<td>(0.4538)</td>
<td>(3.6855)</td>
<td></td>
</tr>
<tr>
<td>Bedrooms</td>
<td>2.426</td>
<td>Ring 5: 2000-3000 Feet</td>
<td>2.7651</td>
</tr>
<tr>
<td></td>
<td>(1.4313)</td>
<td>(4.6661)</td>
<td></td>
</tr>
<tr>
<td>Bathrooms</td>
<td>1.7538</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.9513)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lot Size (Acres)</td>
<td>0.2171</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.2062)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior Square Footage</td>
<td>1844.833</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(728.2763)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>26.9263</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(18.6915)</td>
<td></td>
<td></td>
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<tr>
<td>Observations:</td>
<td>627913</td>
<td>Standard Deviations in Parentheses</td>
<td></td>
</tr>
</tbody>
</table>

"arm's length" transactions. The average property in the sample sold for about $243,000, had 2.4 bedrooms, 1.8 bathrooms, 1800 feet of interior space, and was situated on a lot of approximately two tenths of an acre. Eight percent of the sales were from a financial institution to a private buyer following a foreclosure, and 4 percent of the transactions were classified as short sales.

6 Methodology

To successfully identify the impact of REO properties on nearby housing values, we must be very careful to guard against omitted variables bias. To that end, in addition to including structural variables commonly found in property valuation studies (e.g., bathrooms and bedrooms) and indicators for whether the sales was distressed (e.g., a short sale or a foreclosure sale), the models that we estimate contain a large number of neighborhood-year fixed effects. These fixed effects should control for any shocks (e.g., rising unemployment, improving schools) that would affect property

9 Models estimated with neighborhood-specific trend terms yielded similar results to those reported here.
Table 3: Variable Names for Property Value Equation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_{i,j,t,m}$</td>
<td>Sales price of home $i$ on date $t$</td>
</tr>
<tr>
<td>$\omega_{j,y}$</td>
<td>Neighborhood-$j$ year-$y$ fixed effect</td>
</tr>
<tr>
<td>$\lambda_m$</td>
<td>Sale month fixed effect</td>
</tr>
<tr>
<td>$REO_{i,t,k}$</td>
<td>Active REO stock in ring $k$ at time of sale</td>
</tr>
<tr>
<td>FORECLOSURE$_{i,t}$</td>
<td>Foreclosure sale indicator</td>
</tr>
<tr>
<td>SHORTSALE$_{i,t}$</td>
<td>Short sale indicator</td>
</tr>
<tr>
<td>$X_i$</td>
<td>Structural characteristics of home $i$</td>
</tr>
<tr>
<td>$\varepsilon_{i,j,t,m}$</td>
<td>Error term</td>
</tr>
<tr>
<td>$i$</td>
<td>Property identifier</td>
</tr>
<tr>
<td>$t$</td>
<td>Sale date</td>
</tr>
<tr>
<td>$m$</td>
<td>Month of sale</td>
</tr>
<tr>
<td>$j$</td>
<td>Neighborhood identifier</td>
</tr>
<tr>
<td>$y$</td>
<td>Year of sale</td>
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</tbody>
</table>

values throughout the neighborhood. Because these fixed effects vary by year, our models effectively identify the impact of REOs on housing values by comparing properties transacting in the same neighborhood in the same year. To capture the seasonality of property markets, monthly fixed effects are also included. Consistent with previous studies, our empirical models allow for the impact of a distressed property on a transacting property to vary with distance. Specifically, we utilize the concentric ring structure of Harding, Rosenblatt and Yao [2009]. The specific empirical property value model that we estimate is Equation (1):

$$\ln (P_{i,j,t}) = \omega_{j,t} + \lambda_m + \sum_{k=1}^{5} REO_{i,t,k} \beta_{k}^{REO} + FORECLOSURE_{i,t} \beta^{F} + SHORTSALE_{i,t} \beta^{SS} + X_i \beta^{S} + \varepsilon_{i,j,t}$$

where the variables in Equation (1) are defined in Table 3.

For the construction of our fixed effects, we report results using three different geographic definitions of a neighborhood: Census tracts, Census block groups, and Sections from the Public.
Land Survey System (PLSS). Our identification strategy relies upon the properties within each of the neighborhoods being sufficiently similar so that the remaining variation in transaction prices can be attributed to highly localized effects; this assumption is most likely to hold when neighborhoods are small and homogeneous. The Census tract and block group geographies are widely used in empirical research and have boundaries that are constructed to ensure a degree of socioeconomic homogeneity within their boundaries. In densely populated areas, these Census geographies are generally small enough for our purposes. However, because the tract and block group boundaries are drawn with the aim of capturing a target population size, these geographies can be too large in more remote areas - such as the western portion of the South Florida MSA - to ensure a sufficient level of homogeneity to identify our models. As a robustness check, we thus estimate models using the Section geography from the PLSS. Drawn without regard for population, Section boundaries typically correspond to a one-mile-by-one-mile square; in all but the densest portion of the South Florida MSA, Sections are smaller than Census block groups.

To investigate the hypotheses set forth in Section 2, we must partition the full set of sales into subsets based on neighborhood racial and socioeconomic characteristics. For our neighborhood racial typology, we utilize block group data from the 2000 Census. A block group is characterized as non-Hispanic black if non-Hispanic black residents constitute a plurality in the block group. Non-Hispanic white and Hispanic neighborhoods are defined in a similar fashion. To split the sample along the socioeconomic dimension, we first analyze the distribution of median household incomes - computed at the block group level - in the South Florida MSA based on data from the 2000 Census. A block group is classified as "high income" ("low income") if the median household income in that block group is higher (lower) than the median of the median block group incomes for the entire MSA. Similarly, when we analyze the variance in REO spillovers across income terciles, the income tercile into which a block group falls is defined by comparing its median block group income with the distribution of the median block group incomes in the entire MSA. The results for the property value models estimated using each of these samples are reported in Section 7.

10 More information on the PLSS can be found at http://nationalatlas.gov/articles/boundaries/a_plss.html.
11 It can be the case that a Section is larger or smaller than a one mile square. Such cases will occur near jagged natural borders (e.g., coastlines).
12 There are no block groups in the South Florida MSA in which any other racial groups comprise a plurality.
Table 4: Full-Sample Housing Value Models

<table>
<thead>
<tr>
<th>Model Type</th>
<th>Coefficient</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
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<tbody>
<tr>
<td>REO Count Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ring 1: 0-300 Feet</td>
<td>-0.0155***</td>
<td>(0.00225)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.0145***</td>
<td>(0.00220)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ring 2: 300-500 Feet</td>
<td>-0.00768***</td>
<td>(0.00156)</td>
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</tr>
<tr>
<td></td>
<td>-0.00670***</td>
<td>(0.00158)</td>
<td></td>
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</tr>
<tr>
<td>Ring 3: 500-1000 Feet</td>
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<td>(0.000669)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>-0.00308***</td>
<td>(0.000652)</td>
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</tr>
<tr>
<td>Ring 4: 1000-2000 Feet</td>
<td>-0.00165***</td>
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</tr>
<tr>
<td></td>
<td>-0.00151***</td>
<td>(0.000377)</td>
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</tr>
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<td>Ring 5: 2000-3000 Feet</td>
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<td>(0.000245)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>-0.00183***</td>
<td>(0.000232)</td>
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<tr>
<td>Foreclosure?</td>
<td>-0.209***</td>
<td>(0.00238)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>-0.201***</td>
<td>(0.00215)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Sale?</td>
<td>-0.111***</td>
<td>(0.00281)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.112***</td>
<td>(0.00263)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Observations: 627,913 627,913 627,913
Predominant Neighborhood Race: N/A N/A N/A
Neighborhood Income Classification: N/A N/A N/A
Includes Month Dummies? Yes Yes Yes
Fixed Effect Geography: Tract Block Group Section
Fixed Effect Interacted With: Year Dummy Year Dummy Year Dummy

All models include the following variables: a pool indicator, square footage, lot size, bedrooms, bathrooms, age
Standard errors are clustered at the fixed effect geography-year level

*** p<0.01, ** p<0.05, * p<0.1

7 Results

Turning first to the full sample property model results reported in Table 4, we see that across all of the specifications, REO properties are found to exert downward pressure on the price of nearby transacting properties. As expected, REOs that are closest to the property being sold exert the strongest spillover effects, and the magnitude of these spillovers declines quickly with distance. For instance, whereas one additional REO within 300 feet is found to reduce a property’s value by approximately 1.6 percent - about $3641 on the average property in the sample - an REO located between 500 and 1000 feet from a property is found to reduce its value by between 0.3 and 0.5 percent. The highly localized nature of these spillovers is consistent with the findings in
the extant REO spillover literature. The sign, magnitude, and statistical significance of the REO terms are largely stable across the different fixed effect geographies. Lastly, consistent with previous studies, the foreclosure and short sale coefficients indicate that distressed sales occur at a significant discount.

In Table 5 we report the results from estimating the models in Table 4 using subsamples of the data based on the median block group income of the transacting property as of the 2000 Census. The low income sample is comprised of sales in neighborhoods with a median block group income below the median of the median block group incomes in the South Florida MSA; the high income group consists of property sales in neighborhoods with an above-median block group median income. For each of the geographies used to define the fixed effects, the foreclosure spillover effects are stronger in the high income neighborhoods: these results are consistent with the neighborhood condition hypothesis and the marginal crime hypothesis outlined above. Again, these results are insensitive to the choice of the neighborhood geography used to define the fixed effects. Because of the stability of the results across the various fixed effect definitions, for the remaining sample splits, we report the results obtained using the fixed effects for PLSS sections, which are generally geographically finer than either Census tracts or block groups.

The NFHA report cited above suggested that the condition of REO properties in neighborhoods of color were less well maintained than REO properties in predominantly white neighborhoods. If such a racial bias in REO maintenance does exist, then the magnitude of REO spillovers may be larger in minority neighborhoods. To investigate this possibility, we estimated the property value models partitioned by neighborhood type using the neighborhood typology based on racial plurality described above. The results from this exercise are reported in Table 6. For each of the five foreclosure rings, we see that the estimated coefficients based on the sales from the predominantly white neighborhoods are actually larger than the coefficients based on the black and Hispanic subsamples. For instance, whereas an additional foreclosure within 300 feet of a transacting property

\footnote{For each of the fixed effect geographies, the null hypothesis that the REO spillover effect on the innermost ring is equal across income classes is rejected at the 5 percent level and lower, and the null hypothesis that all of the REO spillover coefficients are equal across income classes is rejected at the 10 percent level and lower.}

\footnote{The null hypothesis that the REO coefficients from the white subsample are equal to those from the black sample is rejected at the 1-percent level, as is the hypothesis that the REO coefficients from white and Hispanic are equal. There is no statistically significant difference between the coefficients from the black and Hispanic subsamples.}
Table 5: Housing Value Models Split by Neighborhood Income

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
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<td><strong>REO Count Variables</strong></td>
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<td></td>
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<td>Ring 1: 0-300 Feet</td>
<td>-0.0191***</td>
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<td>-0.0173***</td>
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<td>-0.0181***</td>
<td>-0.0101***</td>
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<td>(0.00362)</td>
<td>(0.00203)</td>
<td>(0.00345)</td>
<td>(0.00196)</td>
<td>(0.00284)</td>
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<tr>
<td>Ring 2: 300-500 Feet</td>
<td>-0.0102***</td>
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<td>-0.00895***</td>
<td>-0.00281*</td>
<td>-0.00944***</td>
<td>-0.00598***</td>
</tr>
<tr>
<td></td>
<td>(0.00265)</td>
<td>(0.00169)</td>
<td>(0.00252)</td>
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<td>(0.00229)</td>
<td>(0.00193)</td>
</tr>
<tr>
<td>Ring 3: 500-1000 Feet</td>
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<td>5.24e-05</td>
<td>-0.00473***</td>
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<td>-0.00592***</td>
<td>-0.00228**</td>
</tr>
<tr>
<td></td>
<td>(0.00128)</td>
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<td>(0.00116)</td>
<td>(0.000722)</td>
<td>(0.00103)</td>
<td>(0.000917)</td>
</tr>
<tr>
<td>Ring 4: 1000-2000 Feet</td>
<td>-0.00259***</td>
<td>-0.000603</td>
<td>-0.00218***</td>
<td>-0.000819*</td>
<td>-0.00800***</td>
<td>-0.00235***</td>
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<td>(0.000572)</td>
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<tr>
<td>Ring 5: 2000-3000 Feet</td>
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<td>-0.00186***</td>
<td>-0.00188***</td>
<td>-0.00193***</td>
<td>-0.00209***</td>
<td>-0.00286***</td>
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<td>(0.000284)</td>
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<td>(0.000281)</td>
<td>(0.000411)</td>
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<td>Foreclosure?</td>
<td>-0.187***</td>
<td>-0.235***</td>
<td>-0.183***</td>
<td>-0.231***</td>
<td>-0.180***</td>
<td>-0.238***</td>
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<td>(0.00262)</td>
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<td>-0.104***</td>
<td>-0.111***</td>
<td>-0.108***</td>
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<td>-0.110***</td>
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<td>(0.00301)</td>
<td>(0.00617)</td>
<td>(0.00290)</td>
<td>(0.00602)</td>
<td>(0.00262)</td>
<td>(0.00627)</td>
</tr>
</tbody>
</table>

| Observations | 458,319 | 169,594 | 458,319 | 169,594 | 458,319 | 169,594 |
| Predominant Neighborhood Race | N/A | N/A | N/A | N/A | N/A | N/A |
| Neighborhood Income Classification | High | Low | High | Low | High | Low |
| Includes Month Dummies? | Yes | Yes | Yes | Yes | Yes | Yes |
| Fixed Effect Interacted With: | Year Dummy | Year Dummy | Year Dummy | Year Dummy | Year Dummy | Year Dummy |

All models include the following variables: a pool indicator, square footage, lot size, bedrooms, bathrooms, age
Standard errors are clustered at the fixed effect geography-year level

*** p<0.01, ** p<0.05, * p<0.1
Table 6: Housing Value Models: Sample Split by Predominant Racial Group

<table>
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<tr>
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<th>Coefficient</th>
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<th>(2)</th>
<th>(3)</th>
</tr>
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</tr>
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<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Coefficient</td>
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<td><strong>REO Count Variables</strong></td>
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<td></td>
</tr>
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<td>Ring 1: 0-300 Feet</td>
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<td>-0.00827***</td>
<td>-0.0217***</td>
<td></td>
</tr>
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<td>(0.00240)</td>
<td>(0.00194)</td>
<td>(0.00401)</td>
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</tr>
<tr>
<td>Ring 2: 300-500 Feet</td>
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<td>-0.00837***</td>
<td>-0.0101***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00240)</td>
<td>(0.00145)</td>
<td>(0.00337)</td>
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</tr>
<tr>
<td>Ring 3: 500-1000 Feet</td>
<td>-0.00192**</td>
<td>-0.00229***</td>
<td>-0.00749***</td>
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<tr>
<td></td>
<td>(0.000937)</td>
<td>(0.000768)</td>
<td>(0.00167)</td>
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</tr>
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<td>(0.000541)</td>
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<td>(0.000383)</td>
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<td>(0.00514)</td>
<td>(0.00343)</td>
<td>(0.00273)</td>
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<td>Short Sale?</td>
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<td>(0.00913)</td>
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<td>371,011</td>
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<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Includes Month Dummies?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Fixed Effect Geography</td>
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<td>Section</td>
<td>Section</td>
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</tr>
<tr>
<td>Fixed Effect Interacted With:</td>
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<td>Year Dummy</td>
<td>Year Dummy</td>
<td></td>
</tr>
</tbody>
</table>

All models include the following variables: a pool indicator, square footage, lot size, bedrooms, bathrooms, age

Standard errors are clustered at the fixed effect geography-year level

*** p<0.01, ** p<0.05, * p<0.1
in a white neighborhood is found to reduce the property’s value by 2.1 percent, the estimated spillover effects in the black and Hispanic neighborhoods are around 0.8 percent. Thus, with the sample partitioned by race alone, our results provide no support for the REO condition hypothesis.

Because of the well documented racial disparities in income levels, however, the results in Table 6 may conflate the impact of any discriminatory bias in REO maintenance and differences in neighborhood quality - which we conjecture affect the size of REO spillovers - that is related to differences in income. To attempt to isolate the impact of any possible racial bias in REO maintenance from the impact of neighborhood quality, we first partition the block groups in our sample by income terciles to form low, middle, and high income neighborhood groups. These terciles are then partitioned by the predominant race of the neighborhood. Property value models are then estimated on each of the 9 subsamples (3 racial groups times 3 income groups). The results from these models are displayed in Table 7.

Focusing first on the results obtained within racial groups, we see that in the black and Hispanic neighborhoods, the estimated REO spillover effects within each distance ring increase with the neighborhood income level. These results, like those obtained for the sample partitioned only on income, provide support for the neighborhood condition and marginal crime hypotheses. In the white neighborhoods, the estimated spillover effects are larger in middle income than in low income neighborhoods, which is again consistent with the neighborhood condition and marginal crime hypotheses. However, in comparison to the estimated effects within the middle income neighborhoods, the estimated effects in high income neighborhoods are smaller for all distance rings. While unexpected, a number of factors may account for these results. For example

1. The negative sight externality exerted by an REO may be smaller in high income, white neighborhoods because of larger lot sizes or buffers (e.g., large trees and bushes) between parcels.

2. While we have no hard evidence, casual observation suggests that many of the high income, white neighborhoods in South Florida are gated communities, many of which are occupied primarily by retirees. An REO in these communities is unlikely to attract much crime.
Table 7: Housing Value Models: Sample Split by Predominant Racial Group and Income Tercile

<table>
<thead>
<tr>
<th>Model Type</th>
<th>Coefficient</th>
<th>Model Type</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
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<td>REO Count Variables</td>
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<td></td>
</tr>
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<td>Ring 5: 2000-3000 Feet</td>
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<td>-0.00877 (0.00689)</td>
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<td>-0.210*** (0.00648)</td>
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<tr>
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<td>-0.0036* (0.00299)</td>
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<td>-0.174*** (0.00626)</td>
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<td>-0.221*** (0.00620)</td>
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<td>-0.180*** (0.00263)</td>
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<tr>
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<td></td>
<td>-0.231*** (0.00013)</td>
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<tr>
<td></td>
<td>-0.178** (0.00013)</td>
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<tr>
<td></td>
<td>-0.210*** (0.00026)</td>
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<td>-0.174*** (0.00013)</td>
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<td>-0.139*** (0.00026)</td>
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<td>-0.221*** (0.00037)</td>
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<td>-0.200*** (0.00062)</td>
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<td>-0.180*** (0.00047)</td>
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<td>-0.115** (0.00148)</td>
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</tr>
<tr>
<td>Predominant Neighborhood Race</td>
<td>Black</td>
<td>Black</td>
<td>Black</td>
</tr>
<tr>
<td>Includes Month Dummies?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Fixed Effect Geography Interacted With</td>
<td>Year Dummy</td>
<td>Year Dummy</td>
<td>Year Dummy</td>
</tr>
</tbody>
</table>

All models include the following variables: a pool indicator, square footage, lot size, bedrooms, bathrooms, age. Standard errors are clustered at the fixed effect geography-year level.
3. The covenants within these gated communities are generally quite restrictive, which may result in REOs being maintained at a higher level.

Comparing the results across racial groups, what is most striking (and relevant to the NFHA report) are the contrasting REO effects within the innermost distance ring for low income neighborhoods. For black and Hispanic neighborhoods, the spillover effect is not statistically significant, while within white neighborhoods, it is relatively large (2.2%) and highly significant. These results, like those in Table 6, are inconsistent with the idea that REO spillover effects are worse in communities of color because REOs are maintained less well within these communities. Perhaps the NFHA’s overall conclusion that REOs are less well maintained in minority neighborhoods is not applicable to our study area. The City of Miami was studied by the NFHA, but our study area is much larger, encompassing the entire three-county South Florida MSA. Also worth noting is that the NFHA results for Miami show REO maintenance differentials that are smaller than those reported for the other eight cities in their sample. For example, the maintenance condition score is 79.6 for predominantly white neighborhoods versus 79.0 for predominantly black neighborhoods - a difference of only 0.6. Another explanation for the contrasting results found between minority and white low income neighborhoods is that there may be racial differences in neighborhood preferences. That is, perhaps within low income communities, the condition of nearby properties matters less to minorities than it does to whites. Boehm and Ihlanfeldt [1991] provide some empirical support for this hypothesis. They find that, among low income homeowners living in the suburbs, a white owner’s perception of neighborhood quality depends on the condition of nearby properties, whereas the black homeowner’s does not.\footnote{This racial difference in perceived neighborhood quality was only found in the suburbs. Within central cities, both black and white occupants of single-family housing in low income neighborhoods equally based their perception of neighborhood quality on the condition of nearby properties.}

8 Conclusion

The recent collapse in housing values and the resulting wave of foreclosures has attracted much attention from researchers. Of particular interest has been the negative externalities generated by
the presence of bank-owned properties. The large and growing number of studies investigating "foreclosure contagion" notwithstanding, little is known about the extent to which the magnitude of these foreclosure externalities varies across different neighborhoods. From a policy perspective, a better understanding of how these externalities vary across neighborhoods is needed so that scarce foreclosure relief resources can be targeted more effectively. The four hypotheses that we advanced in Section 2 make it clear that it is a priori ambiguous how foreclosure externalities will vary across neighborhoods of different racial compositions and socioeconomic characteristics. An empirical investigation of such variation is thus needed, and this paper is an attempt to fill that gap in the literature.

The results from our empirical models suggest that in predominantly black and predominantly Hispanic neighborhoods, the magnitude of the foreclosure spillovers increase with a neighborhood’s income. Also, in predominantly white neighborhoods, spillovers are greater in middle income than in low income neighborhoods. These results are consistent with REO properties being of below-average quality in better neighborhoods and attracting crime - which in turn affects property values - to areas that previously had little criminal activity. Of perhaps greatest importance is our failure to find that the spillover effect exists within low income, minority neighborhoods. Because REOs are concentrated within these areas and their residents can least afford losing their housing wealth, there has been great concern over the magnitude of REO spillovers in these neighborhoods. We leave it up to future research to uncover why REOs do not emit negative externalities within low income, minority neighborhoods. However, such an inquiry should look into the possibility that REOs within these neighborhoods are being maintained at the neighborhood standard. Differences in neighborhood racial preferences should also be considered. As suggested by Boehm and Ihlanfeldt’s [1991] results, what neighborhood attributes are most important in evaluating the overall quality of the neighborhood may differ across racial groups. Within low income, minority neighborhoods, other factors - such as crime and vice - may be more bothersome than rundown housing.

While more research is needed to account for the differences we find in REO spillover effects across neighborhoods, our results clearly demonstrate that such differences do exist. These differences have two important implications: (1) they cast into question the reliability of the extant
evidence, because none of the eight studies reviewed in Section 4 adequately account for these differences and (2) policies addressing the foreclosure crisis should be targeted to specific neighborhoods, with one of the selection criteria being the magnitude of the local REO spillover effects.
References


