

Characteristics of High-Foreclosure Neighborhoods in the Tenth District

By Kelly D. Edmiston

The foreclosure crisis that began in earnest in 2006 continues to shrink the once valuable assets of homeowners, communities, and investors. From the fourth quarter of 2005 to the fourth quarter of 2008, both the U.S. foreclosure rate and the seriously delinquent rate (the share of outstanding mortgages 90 or more days past due) more than tripled—and the severity of the problem is far from over. More than 3 million households have lost their homes in the last three years, and as many as 5 million more could lose their homes in the next three years (Simon).

A striking feature of the foreclosure crisis is the variation in its severity across both time and space. Initially, the foreclosure crisis hit low-income neighborhoods disproportionately.¹ Foreclosures remain concentrated in these neighborhoods. But in recent months, the foreclosure epidemic has spread more deeply into higher-income neighborhoods. These higher-income neighborhoods have not been hit uniformly, however. Thus, foreclosure rates now vary widely across both lower- and higher-income neighborhoods.

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The variability in foreclosure rates raises important questions: What accounts for the evolving pattern of foreclosure rates across neighborhoods, and where might concentrations of foreclosures occur in the future? The answers to these questions are critical for home buyers, sellers, and investors. They are also key pieces of information for policymakers in stemming the tide of foreclosures. And, lenders need these answers to effectively evaluate risk.

This article analyzes the seven states of the Tenth Federal Reserve District to help shed light on the foreclosure rate pattern and to explore where foreclosure trends are likely to head. The analysis confirms that foreclosure rates have been high in low-income neighborhoods—but only to the extent that subprime mortgages penetrated those neighborhoods. It finds further that the foreclosure crisis is seeping into higher-income neighborhoods—due primarily to unfavorable conditions in local economies and residential real estate markets.

The first section of the article describes recent foreclosure trends and points out how unevenly the crisis has cut across both time and space. The second section explores how incomes have influenced the variability of foreclosures in neighborhoods. The third examines the critical, perhaps dominant, role that housing market conditions play in the uneven effects of the crisis. The fourth section examines how local economic conditions, primarily unemployment and self-employment, can help explain why high foreclosure rates have spread to higher-income neighborhoods, where most homeowners hold prime loans.

I. RECENT TRENDS IN FORECLOSURE RATES

Mortgage foreclosure and delinquency rates have increased dramatically over the last few years. The crisis has hit a variety of mortgage holders and, as it evolves, its scope continues to broaden. In addition, the evidence shows that the crisis has spread unevenly across regions, states, and neighborhoods.

From 2006 to 2008, the housing market was marked by mass defaults of subprime loans. Subprime loans were generally made to borrowers with insufficient credit to qualify for a conventional prime mortgage. Typically, such borrowers have credit scores below 620.² As the crisis began, 3.3 percent of subprime loans were in foreclosure (Mortgage Bankers Association). By the end of 2008, 13.7 percent of

subprime loans were in foreclosure, and 23.9 percent were past due. The crisis will probably get worse before it gets better, as millions of subprime mortgages remain outstanding.

Many subprime loans had a fixed rate for an initial two or three years, at which point the loan “reset” to an adjustable-rate mortgage (ARM). The new variable interest rate was generally higher than the original fixed rate. Anecdotal evidence abounds of subprime mortgagors unable to make the payments on their mortgages upon reset (Christie 2007a), but many subprime borrowers have defaulted before the reset date (Christie 2008).

Another type of reset mortgage, payment option ARMs, is likely to have even more substantial resets than subprime mortgages. These adjustable-rate mortgages give the borrower the option to pay a minimum monthly amount for the first few years of the mortgage. Typically, this minimum payment is substantially below the amount required to cover the interest accrued on the loan. Thus, the principal amount can grow significantly in a short time.

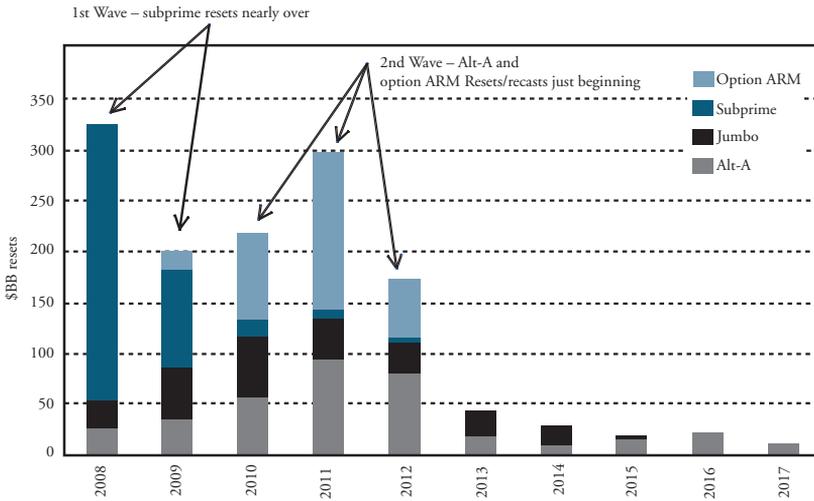
Payment option ARMs typically reset to a fully amortizing rate after five years. Unlike subprime loan originations (and therefore resets), which have diminished over time with the near eradication of the market, payment option ARMs are just beginning to reset. They will continue to reach considerably higher rates through 2012 (Chart 1).

Nontraditional mortgages are not alone in fueling the crisis. Foreclosures on prime mortgages, especially adjustable-rate mortgages, have increased considerably in recent quarters (Chart 2). Foreclosures on fixed-rate mortgages, both prime and subprime, have also increased. Two main factors account for these foreclosures—relentlessly declining property values and the increasingly severe economic recession.

To the extent that economic conditions and property values continue to deteriorate, foreclosure rates are expected to climb even higher. In particular, as the ranks of the unemployed continue to swell, savings accounts will likely be unable to keep pace with mortgage payments.

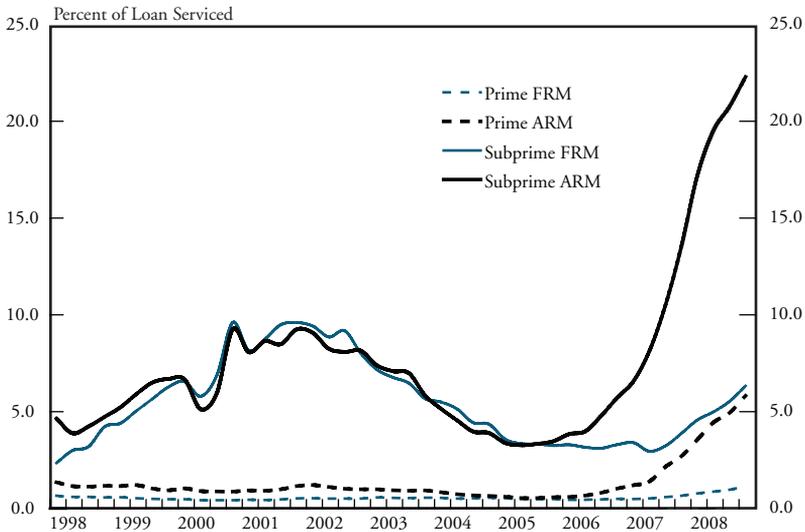
Just as the scope of the foreclosure crisis has varied over time, foreclosure rates have also varied significantly over space. In other words, the performance of mortgage loans has varied across regions of the country, across states, and even across neighborhoods.

Chart 1
LOAN RESETS, 2008 – 2017



Source: LoanPerformance, UBS

Chart 2
NATIONAL FORECLOSURE RATES BY MORTGAGE TYPE

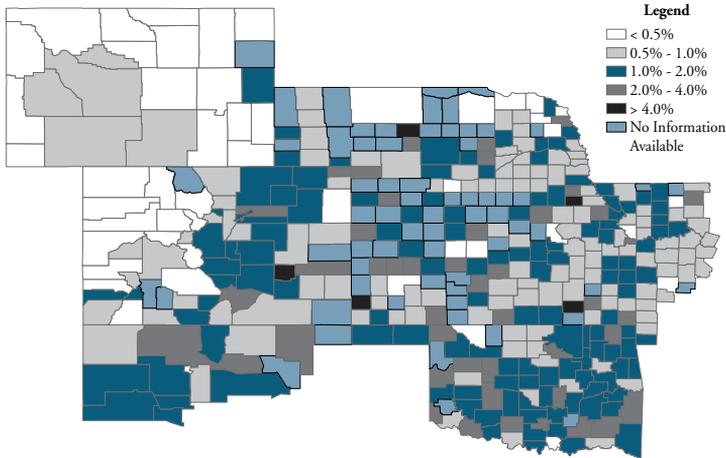


Source: Mortgage Bankers Association

Map 1

FORECLOSURE RATES BY COUNTY, TENTH FEDERAL RESERVE DISTRICT

December 2008



Source: Lender Processing Services, Inc. Applied Analytics

There is considerable evidence of variation in mortgage loan performance across geographic regions. In the fourth quarter of 2008, foreclosure rates varied from as low as 0.7 percent in Wyoming to as high as 9.0 percent in Florida (Mortgage Bankers Association). In the Tenth Federal Reserve District, foreclosure rates ranged from 0.7 percent in Wyoming to 2.2 percent in Colorado.³ Although foreclosures are increasing significantly in the Tenth District, the rise is much less dramatic than in other parts of the country, particularly in the Sunbelt and on the coasts.

Counties showed even more variation in foreclosure rates than did states. In Tenth District counties, the foreclosure rate ranged from 0.03 percent in Albany County, Wyoming, to 6.67 percent in Thomas County, Nebraska (Map 1) (Lender Processing Services, Inc.). Significant variation also occurred within these counties—that is, across neighborhoods, where foreclosure rates ranged from zero percent to 17 percent.⁴

Why have mortgages performed so unevenly across space? The next three sections of this article examine some of the factors that may be responsible for these spatial differences.

II. INCOME

The link between income and mortgage default and foreclosure has been well-documented at the individual level. The same holds true at the neighborhood level. In the Tenth District, neighborhood foreclosure rates increase consistently with the share of the population that is low-income.⁵

Specifically, in Tenth District neighborhoods where less than 5 percent of the population is low-income, the average foreclosure rate is 3.0 percent.⁶ In neighborhoods where more than 50 percent of the population is low-income, the average foreclosure rate rises to 13.0 percent.

The Tenth District analysis offers an explanation for the pattern of foreclosure rates with respect to income over the last few years. (Table 1)⁷ Although high foreclosure rates are associated with low-income neighborhoods, the analysis reveals that low-income populations lead to greater foreclosure rates *only to the extent that subprime lending has penetrated the neighborhood*.⁸ In particular, for neighborhoods with a subprime share of mortgage originations of less than 38 percent, higher low-income populations lead to *lower* foreclosure rates. Roughly 72 percent of Tenth District neighborhoods fall into this category.

By definition, poor credit histories are associated with mortgage default. Evidence from Fannie Mae, however, suggests that up to 50 percent of subprime borrowers could have qualified for prime loans (Christie 2007b), which indicates that the relationship between subprime loans and foreclosure goes beyond simply reflecting poor credit histories. In fact, the Tenth District analysis shows that the relationship between foreclosure rates and subprime mortgage penetration persisted even after accounting for variations in average credit score across neighborhoods. Further, subprime borrowers have been found to be less knowledgeable about the mortgage process, less likely to shop for the best terms, and less likely to be offered a choice in mortgage products, which puts them at greater risk for unfavorable outcomes (Courchane, Surette, and Zorn).

The combination of the low-income share of the population and the subprime share of 2000-06 mortgage originations was the dominant factor in explaining variation in foreclosure rates across Tenth District neighborhoods. The result that a high density of low-income residents leads to lower foreclosure rates in the absence of subprime mortgages

Table 1
SUMMARY OF REGRESSION RESULTS

| Variable / Model | Effect on foreclosure rate |
|---|-------------------------------|
| A five-percentage-point increase in the vacancy rate | .3 percentage-point increase |
| An increase of ten violent crimes per thousand residents | 1.0 percentage-point decrease |
| A ten-percentage-point increase in the share of residents with a low credit score | .5 percentage-point increase |
| A ten-percentage-point increase in the share of the population with a moderate credit score | .3 percentage-point increase |
| A one-percentage-point increase in the unemployment rate | .3 percentage-point increase |
| A five-year increase in the median age | .4 percentage-point increase |
| A five-percentage-point increase in the rate of home price appreciation | 1.4 percentage-point decrease |
| An increase of 10 housing permits per thousand existing homes | .3 percentage-point decrease |
| An increase of 10 self-employed workers per thousand residents | .3 percentage-point increase |
| An increase of 1,000 people per square mile | .3 percentage-point increase |
| A five-percentage-point increase in the low-income share of the population | .5 percentage-point decrease |
| A five-percentage-point increase in the moderate-income population | .2 percentage-point increase |
| A five-percentage-point increase in subprime originations | .1 percentage-point increase |
| A 50-point increase in (subprime originations x low-income population) | .1 percentage-point increase |
| A 100-point increase in (subprime originations x moderate-income population) | .1 percentage-point increase |
| A 10-year increase in the median age of homes | .03 percentage-point increase |
| A 5-percent increase in the owner-occupancy rate | .5 percentage-point increase |
| A one-percentage-point increase in the effective property tax rate | .6 percentage-point increase |

may be surprising to some, but previous evidence suggests that, having accounted for the nature of the loans, mortgages in low- and moderate-income areas actually perform better than mortgages nationally (Mills and Lubuele).

Another possible explanation for this finding is that low-income people, who tend to have relatively low credit standing, were able to secure home financing only when subprime mortgages became available. In neighborhoods with little subprime lending, many low-income people were likely unable to secure home financing. About 53 percent of mortgages originated between 2000 and 2006 in the Tenth District were for refinancing. In turn, over 50 percent of refinanced subprime mortgages cashed out at least part of the equity in the home (Chom-sisengphet and Pennington-Cross).⁹ To the extent that low-income people with relatively poor credit histories cashed out when they refinanced, the lack of available credit in some neighborhoods may have mitigated increases in the foreclosure rate.

III. HOUSING MARKET CONDITIONS

Much recent research on the current foreclosure crisis suggests that the condition of housing markets plays a critical, perhaps dominant, role in explaining mortgage defaults. When homeowners fall behind on their mortgages in the face of declining property values, they often find they have insufficient equity in their homes to refinance or sell their homes at a price sufficient to cover the outstanding balance of their mortgages. Thus, upon default, the only option is foreclosure. This section discusses the role that housing market conditions play in explaining variation in foreclosure rates across neighborhoods—specifically, home price appreciation, vacancy rates, and owner-occupancy rates.

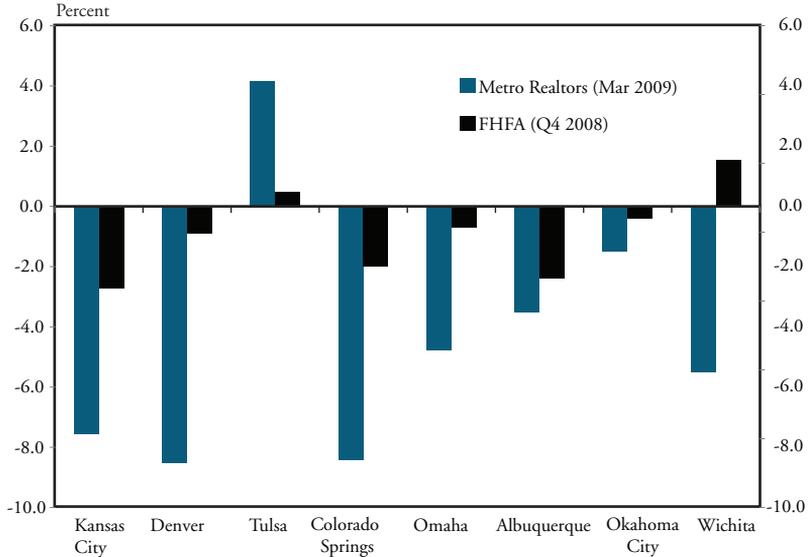
Home price appreciation

An especially critical factor in explaining foreclosure rates is appreciation (or depreciation) in home values. This factor is especially relevant today, when property values have come under immense downward pressure. According to regional Realtor associations in the Tenth District, metropolitan areas have seen the median price of homes sold decline as much as 8.5 percent year-over-year (Chart 3). The Realtor association numbers are in some sense artificially low, as 45 percent

Chart 3

RECENT HOUSE PRICES IN TENTH DISTRICT METROPOLITAN AREAS

(Percent Change, Year-over-Year)



Sources: Federal Housing Finance Agency; Metro Realtors associations.

of homes sold in the fourth quarter of 2008 were foreclosures, which are predominantly on the lower end of the price spectrum and heavily discounted. Nevertheless, other properties must compete with these foreclosure properties on price, which should depress values for all properties. An alternative housing price index produced by the Federal Housing Finance Agency (FHFA) showed declines across virtually all Tenth District metro areas, but the declines were much less severe.¹⁰

A 1998 study of national foreclosure rates from 1950 forward showed that home price appreciation and foreclosure rates for the U.S. as a whole move in opposite directions. But the authors of this study suggested that home price appreciation was only a minor factor and did not explain trends after the 1980s (Elmer and Seelig). More recent studies at a lower level of geography have found a more convincing connection. One analysis focused on the variation in subprime mortgage delinquency rates across metro areas, finding a strong relationship between the delinquency rate of subprime mortgages and house price

appreciation (Doms and others). Similarly, recent research found that house price appreciation in Massachusetts dominated other factors in explaining subprime mortgage foreclosures (Gerardi, Shapiro, and Willen). Much of the large increase in Massachusetts foreclosures in 2006-07 was due to house prices that began falling in the summer of 2005. Another state-level study by the Federal Reserve Bank of Chicago examined foreclosures for all types of loans, finding that higher rates of appreciation over a five-year period were associated with lower foreclosure rates (McGranahan).

In the Tenth District analysis, as expected, neighborhood foreclosure rates were negatively correlated with home price appreciation. That is, foreclosure rates were lower in neighborhoods where area home price appreciation was stronger. Compared to a neighborhood in a metro area with little change in home values, a neighborhood in a metro area with a 5 percent decline in home values would be expected to suffer a 33 percent increase in the foreclosure rate (1.4 percentage points on average). In most areas, home price appreciation ranged between 1.5 percent and 6.3 percent. About 10 percent of the total variation in foreclosure rates across Tenth District neighborhoods can be explained by metro-wide home price appreciation. This relationship, however, was evident only in urban areas of the Tenth District.

In recent years, property values in some areas have fallen so much that some homeowners are choosing to walk away from mortgages even when they have the capacity to pay (Calculated Risk; *The Economist*). Thus, an increasingly robust relationship between home price appreciation and foreclosure rates would not be surprising. In the Tenth District, home price appreciation had a marginally stronger effect on foreclosures in 2007-08 than in 2006-07.

Vacancy rates

Neighborhood vacancy rates likely encourage neighborhood flight or depression of property values—both of which should lead to increased foreclosure rates.¹¹ Property values are reduced directly by increasing the supply of available housing in the neighborhood. But more important, proximity to vacant properties and their associated problems makes a property less attractive to potential buyers. A study conducted in Philadelphia calculated that houses on blocks with aban-

doned properties sold for \$6,715 less, on average, than houses on blocks with no abandoned properties (Research for Democracy). The loss increased with closer proximity to abandoned properties.

Existing research on the relationship between vacancy rates and foreclosure rates is sparse, however, and the results are mixed. The Tenth District analysis explores the relationship across a range of neighborhoods in multiple cities, recognizing that other factors also explain neighborhood foreclosure rates.

In the analysis, vacancy rates were positively associated with foreclosure rates, suggesting that homeowners in neighborhoods with many vacant properties are more likely to default on their mortgages.¹² A doubling of a neighborhood's vacancy rate, say from 4 to 8 percent, would be associated with a 6 percent increase in the foreclosure rate for the average Tenth District neighborhood (0.25 percentage points on average). This relationship likely reflects instability in the neighborhood, providing an impetus for residents to flee. Although changes in home values were included in the analysis, the relationship between vacancy rates and foreclosure rates at the neighborhood level could have further refined this effect.

Vacancy rates were a much stronger factor in explaining foreclosure rates in the Tenth District's urban neighborhoods than in its rural neighborhoods. The average vacancy rate in the Tenth District during the period was 4.2 percent.

Owner-occupancy

During the real estate boom early in this decade, many property investors entered the market, often buying dozens of homes at a time, and sometimes virtually entire blocks. These properties typically were held for a short period of time and then resold (or "flipped") at a higher price, generating an attractive profit. Many were rented to receive the highest payoff from a combination of renting and capital gain. Higher leverage generates higher returns, and thus many investment properties were mortgaged with as little money down as possible.¹³ Investors often acquired interest-only or payment option ARMs to minimize monthly payments while the property was being renovated, rented, or held for appreciation. In years past, such loans generally were made only to affluent homeowners or well-heeled investors with strong credit records.

More recently, however, underwriting standards were weakened significantly.

As property values declined, investors often found themselves with properties that could not be sold for sums sufficient to pay off the mortgages, much less to make a profit. According to research by the Mortgage Bankers Association, investors are among the first to default if they see that home prices are falling and there is little chance of recouping their money (Brinkmann). Some investors have lost numerous properties to foreclosure at one time.

The analysis of foreclosure rates in the Tenth District relies on owner-occupancy rates as an inverse measure of investor-owned properties. The reasoning is that Census-based owner-occupancy statistics can account for properties owned by investors but fraudulently recorded as owner-occupied in mortgage applications, which would underestimate the share of properties in a neighborhood that are investor-owned. Underwriting standards tend to be more lax for mortgages on owner-occupied dwellings, so investors could benefit substantially from falsely reporting that they would live in the properties being mortgaged. Such mortgage fraud has been rampant in this decade and continues to increase, even as the real estate market has significantly deteriorated (James, Butts, and Donahue). Missouri and Colorado were the ninth- and tenth ranked states for mortgage fraud among 2004-08 originations. Many of the top states for mortgage fraud, including Rhode Island, Florida, Illinois, and Michigan, also have some of the highest foreclosure rates.

About 30 percent of all foreclosures nationally are investor-owned properties.¹⁴ In the Tenth District, mortgage applications in 2008 showed that roughly 27 percent of foreclosures were investor-owned properties. Across Tenth District states, the investor share of foreclosures ranged from 14 percent in Wyoming to 49 percent in New Mexico. Of course, to the extent that mortgage fraud is prevalent, this number underestimates the degree of investor penetration in Tenth District neighborhoods. The average owner-occupancy rate in the district is 59 percent.¹⁵

While investors clearly are susceptible to default and foreclosure in the face of declining property values, the role of investor-owned properties in explaining foreclosure rates is not altogether clear from a conceptual perspective. On one hand, the prototypical investor likely has higher, more diversified net worth than most owner-occupants and is

therefore better positioned to suffer through losses. On the other hand, foreclosure often leaves owner-occupants without their valued homes, giving them more of an incentive to stay and find solutions to their mortgage problems.

The Tenth District analysis revealed that foreclosure rates in neighborhoods tend to be higher when owner-occupancy rates are higher. In other words, larger shares of investor-owned property surprisingly lead to lower foreclosure rates. But the magnitude of the effect is small. Specifically, a five-percentage-point rise in an owner-occupancy rate is associated with a 0.1-percentage-point rise in the foreclosure rate, a negligible effect. This result suggests that the effect of the typically larger, more diversified portfolios of assets of investors roughly cancels out the often risky nature of investor mortgages.

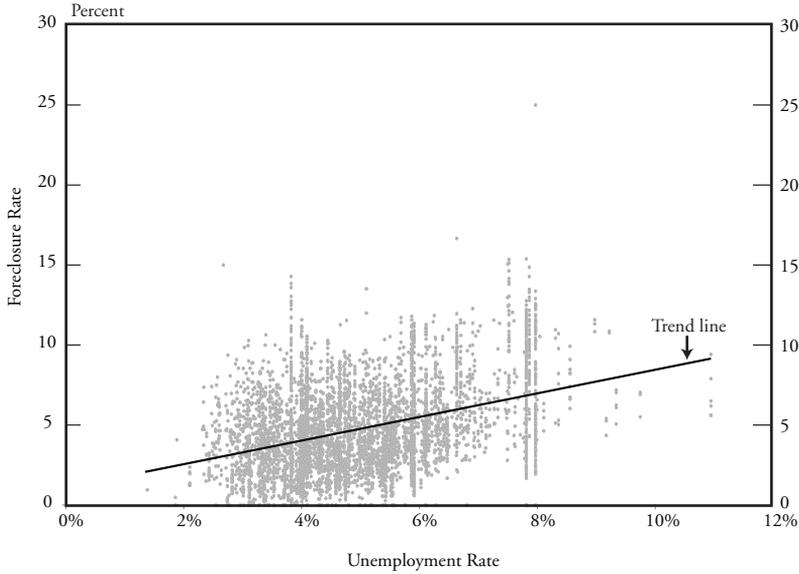
IV. LOCAL ECONOMIC CONDITIONS

The local economy is an important factor in rising foreclosure rates, both in higher-income neighborhoods and in neighborhoods overall. This section explores the roles of unemployment and self-employment in neighborhood foreclosure rates.

Unemployment

Loss of a job or income is one of the most common triggers for mortgage default. A late 1980s study of a large mortgage lender found that 24 percent of seriously delinquent borrowers cited “general financial problems” as the cause of their delinquency, and 21 percent cited job loss specifically (Gardner and Mills).

A cursory look at foreclosure numbers across the nation over the last few years reveals an important role for local economic conditions in determining local foreclosure rates. The Gulf states of Mississippi and Louisiana suffered very high delinquency and foreclosure rates in the aftermath of Hurricanes Katrina and Rita. Likewise, “rustbelt states” like Ohio, Michigan, and Indiana, which have suffered the brunt of the downward trend in manufacturing employment, have maintained some of the highest foreclosure rates over the last few years, at least until recently.¹⁶ A review of recent unemployment rates across Tenth District neighborhoods shows a clear relationship between economic conditions and foreclosure rates (Chart 4).

*Chart 4*UNEMPLOYMENT AND FORECLOSURE RATES,
TENTH DISTRICT NEIGHBORHOODS

Sources: U.S. Bureau of Labor Statistics; RealtyTrac.

Existing research at the national level suggests a weak relationship “at best” between unemployment rates and foreclosure rates over time (Elmer and Seelig). But studies that focus on the state level and zip-code level suggest there is such a relationship (McGranahan; Mian and Sufi). The Tenth District analysis confirms the relationship. Every one-percentage-point rise in the unemployment rate is associated with a 7 percent increase, on average, in the neighborhood foreclosure rate (0.3 percentage points on average).

Self-employment

An additional factor in the Tenth District analysis accounts for differences in rates of self-employment. Self-employed people tend to have larger incomes than wage and salary workers (Fairlie). At the same time, their incomes generally are more volatile (Jensen and Shore). Given the volatility of income and the recent sharp downturn in economic activ-

ity, the self-employed would be more likely to face insufficient funds to make mortgage payments than wage and salary workers, for any given level of income.

Further, the self-employed are more likely to be offered Alt-A and other nontraditional products, like option-ARMs, than wage and salary workers.¹⁷ These borrowers often do not qualify for prime loans because their incomes can be hard to document and can be volatile over time.

Two recent surveys by the National Association for the Self-Employed showed the vulnerability of the self-employed. A March 2009 survey showed that 40 percent of participants were concerned about the affordability of their home mortgages due to their type of mortgage. An October 2008 survey showed that 73 percent of survey participants were concerned about the recent downturn in the economy.

The Tenth District analysis revealed that foreclosure rates are higher in neighborhoods where a greater share of the work force is self-employed—and the magnitude of the effect was quite large. Across Tenth District neighborhoods, the average neighborhood had 74 self-employed workers per thousand residents. Rates ranged from 35 to 245 self-employed workers per thousand residents. Given two neighborhoods with similar incomes and other factors, ten additional self-employed workers per thousand residents were associated with a 7 percent increase in the average Tenth District neighborhood foreclosure rate (0.3 percentage points on average).

V. CONCLUSION

The analysis of neighborhoods in the Tenth Federal Reserve District discloses a number of factors that should draw the attention of buyers, lenders, community organizations, and policymakers.

As expected, foreclosures in the Tenth District have been concentrated in lower-income neighborhoods. Low-income neighborhoods, however, were likely to see higher foreclosure rates only to the extent that subprime mortgages penetrated those neighborhoods. Otherwise, large low-income populations lead to lower foreclosure rates. Together, low-income shares of the population and subprime shares of mortgage originations accounted for about 30 percent of the total variation in foreclosures explained by the analysis.

During the current recession, the foreclosure crisis has crept from low-income neighborhoods in the Tenth District into higher-income neighborhoods. Two factors help explain variations in foreclosure rates across these neighborhoods: residential real estate market conditions and local economic conditions.

Real estate market conditions are perhaps the most important factor. Lower price appreciation was associated with higher foreclosure rates. The reasoning is that, in the face of declining property values, homeowners having difficulty making mortgage payments may be unable to sell their homes for an amount sufficient to cover their mortgages. Further, if home equity becomes sufficiently negative, homeowners may choose to walk away from their mortgage obligations. Home value appreciation accounted for about 10 percent of the total variation in foreclosures explained by the analysis.

Somewhat unexpected was that higher owner-occupancy rates, or lower shares of investor-owned property, were associated with higher foreclosure rates. A likely factor contributing to this finding is that investors tend to have larger, more diversified financial assets, which makes them better positioned to weather losses. Higher vacancy rates, which diminish neighborhood quality, were also shown to lead to higher neighborhood foreclosure rates.

Local economic conditions, specifically higher rates of unemployment and self-employment, were also associated with higher foreclosure rates. The magnitude of the unemployment rate effect was quite large: a three-percentage-point difference in the unemployment rate was associated with a 21 percent difference in the foreclosure rate (one percentage point on average). That higher rates of self-employment income were associated with higher foreclosure rates likely reflects the relative volatility of self-employment income, especially during economic recessions. Local economic conditions, though significant, had a much smaller impact on neighborhood foreclosure rates than did income, subprime mortgage penetration, and property appreciation.

Early in the crisis, foreclosures were heavily concentrated in low-income neighborhoods. While low-income neighborhoods continue to suffer from high foreclosure rates, the problem is increasingly seeping into higher-income neighborhoods. This article suggests that buyers, lenders, community organizations, and policymakers should look to

neighborhood property conditions and economic conditions to uncover likely future hotspots. Such an analysis would help community organizations and policymakers to best target future preventative resources and buyers and lenders to appropriately gauge risk.

APPENDIX

Table A1

VARIABLES, SOURCES AND DESCRIPTIVE STATISTICS

| Variable | Source | Mean (Std. Dev.) |
|---|--|------------------------|
| Foreclosure Rate (starts), July 2006 – June 2007 | RealtyTrac | 2.77% (5.65%) |
| Foreclosure Rate (starts), July 2007 – June 2008 | RealtyTrac | 3.71% (6.81%) |
| Vacancy Rate | U.S. Department of Housing and Urban Development (Estimate) | 4.16% (5.42%) |
| Violent Crime Rate Offenses/1,000 Population | Federal Bureau of Investigation, Uniform Crime Reports | 0.725 (16.2) |
| Low Credit Score (% of population) | Federal Reserve Board of Governors | 21.1% (8.91%) |
| Moderate Credit Score (% of population) | Federal Reserve Board of Governors | 19.6% (7.00%) |
| Unemployment Rate | U.S. Department of Housing and Urban Development (Estimate) | 4.98% (1.41%) |
| House Price Appreciation | Office of Housing Enterprise Oversight | 4.21% (3.15%) |
| Housing Permits (per 1,000 existing homes) | U.S. Census Bureau | 0.905 (1.39) |
| Self-Employment Rate (per 1,000 population) | U.S. Census Bureau | 74.3 (20.4) |
| Population Density | ESRI Arcview | 2,158 (2,570) |
| Median Income | Federal Financial Institutions Examination Council (FFIEC) [Home Mortgage Disclosure Act Data] | \$57,389 (\$11,065) |
| Low-Income Population | Author's calculations using data from the FFIEC | 10.9% (8.94%) |
| Moderate-Income Population | Author's calculations using data from the FFIEC | 22.9% (9.12%) |
| Subprime Originations (Share of total, 2000 – 2006) | Author's calculations using data from the FFIEC | 30.8 (15.5) |
| Median Year House Built | U.S. Census Bureau | 1967 (15) |
| Owner-Occupied (Share of all dwellings) | U.S. Department of Housing and Urban Development (Estimate) | 62.4 (19.0) |
| Property Tax (relative to house value) | U.S. Census Bureau | 1.51% (0.94%) |
| Median Age | U.S. Census Bureau | 36.1 (5.4) |

Table A2
ROBUST RECESSION RESULTS

| Variable / Model | Jan. 2006 – July 2008 | July 2006 – June 2007 | July 2007 – June 2008 | Urban Neighbor- hoods | Rural Neighborhoods | |
|---|-----------------------|-----------------------|-----------------------|-----------------------------------|----------------------|----------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Intercept | -13.6 (8.46) | -4.08 (8.46) | -7.97** (3.74) | -8.37* (4.50) | -14.3 (11.3) | 1.89 (14.1) |
| Vacancy Rate | 0.067*** (0.013) | 0.070*** (0.013) | 0.019*** (0.006) | 0.010 (0.007) | 0.112*** (0.019) | 0.038** (0.018) |
| Violent Crime Rate (per hundred thousand) | -0.010*** (0.003) | -0.009*** (0.003) | -0.006*** (0.001) | -0.004*** (0.001) | -0.008** (0.003) | 5.06*** (1.12) |
| Low Credit Score (%) | 0.051*** (0.010) | 0.035*** (0.010) | 0.027*** (0.004) | 0.026*** (0.005) | 0.083*** (0.013) | 0.015 (0.016) |
| Middle Credit Score (%) | 0.032*** (0.011) | 0.017 (0.011) | 0.018*** (0.005) | 2.5 x 10 ⁻⁴ (0.006) | 0.005 (0.014) | 0.038** (0.018) |
| Unemployment Rate | 0.333*** (0.041) | 0.354*** (0.041) | 0.055*** (0.018) | 0.212 (0.021) | 0.377*** (0.058) | 0.251*** (0.067) |
| Median Age | 0.072*** (0.012) | | 0.034*** (0.005) | 0.030*** (0.006) | 0.094*** (0.016) | 0.016 (0.018) |
| Age 65+ | | 0.013* (0.008) | | | | |
| House Price Appreciation | -0.270*** (0.018) | -0.255*** (0.018) | -0.129*** (0.008) | -0.138*** (0.010) | -0.350*** (0.023) | -0.124*** (0.044) |
| Housing Permits (2006) | -0.034 (0.040) | -0.038 (0.040) | -0.012 (0.016) | -0.044 (0.019) | 0.014 (0.066) | -0.081 (0.059) |
| Self-Employed (%) | 0.032*** (0.003) | 0.033*** (0.003) | 0.011*** (0.001) | 0.016*** (0.001) | 0.049*** (0.004) | 0.002 (0.004) |

| Variable / Model | Jan. 2006 – July 2008 | July 2006 – June 2007 | July 2007 – June 2008 | Urban Neighbor- hoods | Rural Neighborhoods |
|---|---|---|--|---|---|
| Population Density | 2.5 x 10 ^{-4***} (= 0) | 1.8 x 10 ^{-4***} (= 0) | 1.8 x 10 ^{-4***} (= 0) | 2.2x10 ^{-4***} (= 0) | < 8.1 x 10 ^{-4**} (= 0) |
| Low-Income Population (%) | -0.112*** (0.023) | -0.1024** (0.010) | -0.069*** (0.012) | -0.113*** (0.031) | -0.157*** (0.036) |
| Moderate-Income Population (%) | 0.033** (0.015) | -0.025*** (0.007) | 0.018** (0.008) | 0.021 (0.020) | 0.057*** (0.024) |
| Subprime Originations (%, 2000 – 2006) | 0.023* (0.012) | -0.041*** (0.005) | -0.006 (0.006) | -0.014 (0.018) | -0.029 (0.018) |
| Subprime x Low Income | 0.002*** (< 5.0 x 10 ⁻⁴) | -3.4 x 10 ^{-4*} (< 3.0 x 10 ⁻⁴) | 0.002*** (< 3.0 x 10 ⁻⁴) | 3.4 x 10 ⁻⁴ (< 7.0 x 10 ⁻⁴) | 0.006*** (< 7.0 x 10 ⁻⁴) |
| Subprime x Moderate Income | 8.8 x 10 ^{-***} (< 5.0 x 10 ⁻⁴) | 0.003*** (< 3.0 x 10 ⁻⁴) | 7.1 x 10 ^{-4***} (< 3.0 x 10 ⁻⁴) | 0.003*** (< 6.0 x 10 ⁻⁴) | -0.001 (< 7.0 x 10 ⁻⁴) |
| Median Year House Built | 0.003 (0.004) | 0.003 (0.002) | 0.003 (0.002) | 0.002 (0.006) | -0.002 (0.007) |
| Owner Occupied (%) | 0.013*** (0.003) | 0.006*** (0.001) | 0.008*** (0.002) | 0.011*** (0.004) | 0.005 (0.006) |
| Property Tax | 0.058 (0.076) | -0.066** (0.032) | -0.027 (0.040) | 0.064 (0.100) | -0.072 (0.136) |
| African-American | -0.053*** (0.010) | -0.033*** (0.004) | -0.015*** (0.005) | -0.118*** (0.016) | -0.039*** (0.012) |
| African-American x Subprime | 0.002*** (< 3.0 x 10 ⁻⁴) | 0.001*** (< 2.0 x 10 ⁻⁴) | 8.2 x 10 ^{-4***} (< 2.0 x 10 ⁻⁴) | 0.003*** (< 4.0 x 10 ⁻⁴) | 0.002*** (< 3.0 x 10 ⁻⁴) |
| Asian | 0.053** (0.024) | 0.027** (0.011) | 0.010 (0.013) | 0.091*** (0.030) | -0.010 (0.050) |
| Native Hawaiian or Other Pacific Islander | 1.57*** (0.334) | 0.064 (0.148) | 1.33*** (0.181) | 1.43*** (0.429) | -0.693 (0.628) |

| Variable / Model | Jan. 2006 – July 2008 | July 2006 – June 2007 | July 2007 – June 2008 | Urban Neighbor- hoods | Rural Neighborhoods |
|-----------------------------------|--|--|--|--|-------------------------------------|
| American Indian or Alaskan Native | -0.039** (0.018) | -0.015** (0.007) | -0.009 (0.008) | 0.038 (0.029) | -0.024 (0.023) |
| Other Race | -0.073*** (0.023) | -0.047*** (0.010) | -0.037*** (0.011) | -0.179*** (0.031) | -0.214*** (0.039) |
| Multiracial | 0.275*** (0.043) | 0.158*** (0.018) | 0.100*** (0.021) | 0.121** (0.060) | 0.183** (0.080) |
| Hispanic | 0.043*** (0.012) | 0.013** (0.005) | 0.032*** (0.006) | -0.030* (0.016) | 0.035* (0.020) |
| Hispanic x Subprime | 5.5 x 10 ⁻⁴ *** ($< 3.0 \times 10^{-4}$) | $< 7.4 \times 10^{-4}$ *** ($< 2.0 \times 10^{-4}$) | $< 3.8 \times 10^{-5}$ ($< 2.0 \times 10^{-4}$) | 0.007*** ($< 4.0 \times 10^{-4}$) | 0.002 ($< 5.0 \times 10^{-4}$) |
| R ² | 0.2837 | 0.2794 | 0.2501 | 0.2963 | 0.2721 |
| Outliers | 6.2% | 5.1% | 7.1 % | 4.0% | 6.4% |
| Usable Observations | 3,445 | 3,661 | 3,868 | 2,610 | 835 |

Notes: *, **, *** indicate statistical significance at the 0.1, 0.05, and 0.01 levels, respectively (prob > χ^2); = 0 indicates number is too small to record. All estimates are generated from M-estimation (Huber, 1981).

ENDNOTES

¹In this article, a neighborhood is defined as a Census tract. A Census tract is a small, relatively homogeneous statistical subdivision of a county that numbers between 2,500 and 8,000 in population. Census tracts are designed to reflect the division of counties into neighborhoods.

²There is no universal definition of a subprime mortgage, and thus researchers have used a variety of rubrics to decide which mortgages are subprime and which are not. Options include: (1) loans reported as high-cost in Home Mortgage Disclosure Act (HMDA) data; (2) home loans originated by lenders who specialize in subprime mortgages, according to a list supplied by the U.S. Department of Housing and Urban Development (HUD); and (3) home loans in securitized pools marketed as subprime. Each method of collecting data on subprime home loans has its advantages and disadvantages (Mayer and Pence). In this study, loans with interest rates of 3 percent or greater above a Treasury security of the same maturity (high-cost loans) were considered subprime. This method was utilized because a larger share of home loans (around 80 percent) is covered in the HMDA data than in the securitized pools marketed as subprime (Avery, Brevoort, and Canner).

³The U.S. foreclosure rate was 3.3 percent in the fourth quarter.

⁴Five neighborhoods in the Tenth District had foreclosure rates above 15 percent, according to foreclosure broker RealtyTrac: three in Pueblo County, CO; one in Adams County, CO; and one in Jackson County, MO.

⁵Low-income residents are defined as those with income of less than 50 percent of the area (state or metropolitan) median income.

⁶The foreclosure rate is the number of foreclosure starts over the period January 2007 — June 2008 relative to the number of mortgages outstanding. Data on foreclosures are estimates from the U.S. Department of Housing and Urban Development (HUD).

⁷A summary of the analysis is presented in Table 1. A description of data used in the analysis is provided in Appendix Table A1, and full results are provided in Appendix Table A2.

⁸Because few subprime loans have been originated since mid-2007, the number of subprime loans has dwindled over the last couple of years as loans have cured by default, prepayment, or refinance. In the last two years, the number of subprime loans outstanding has decreased by 11 percent.

⁹A cash-out refinance is defined here as one where the new mortgage is at least 5 percent higher than the principal on the existing mortgage.

¹⁰For more information on housing price indexes, see Rappaport.

¹¹Vacancy rate is defined as the number of vacant homes in a neighborhood, expressed as a percentage of all homes in that neighborhood.

¹²Of course, just as vacancy rates may influence foreclosure rates, the reverse may also be true. While such a relationship is clearly sensible, efforts were taken to ensure that the time period in which vacancy rates were measured preceded the period in which foreclosure rates were measured. An extended analysis that accounts for this possibility in a more sophisticated way confirms the effect of vacancy rates on foreclosure rates.

¹³Despite late-night infomercials to the contrary, purchasing real estate as investment property with no money down is exceedingly rare.

¹⁴This figure is based on properties in the RealtyTrac database where the owner address is different than the property address.

¹⁵Data are from the American Housing Survey. Accessed February 10, 2009, at <http://www.2010census.biz/hhes/www/housing/ahs/ahs07/tab1a-1.pdf>. Roughly 68 percent of all occupied homes are owned by their occupants.

¹⁶More recently, states such as Florida and Nevada, which experienced especially rapid appreciation earlier in the decade and rampant building, have suffered the highest foreclosure rates.

¹⁷Alt-A mortgages are A- rated paper. Generally, the borrower is creditworthy for a prime loan but does not meet some other specified underwriting standard. About 75 percent of Alt-A mortgages were offered to borrowers who did not fully document their income. An option-ARM is an adjustable-rate mortgage where the borrower is allowed to make a minimum payment for a specified period of time. Generally, this payment is well below the fully amortizing payment, so principal builds over time.

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