

## **Determinants of the Incidence of Loan Modifications**

**Vicki Been and Mary Weselcouch\*; Ioan Voicu and Scott Murff\*\***

October 2011

\* Furman Center for Real Estate and Urban Policy, New York University.

\*\* Office of the Comptroller of the Currency. The views expressed in this paper are those of the authors alone and do not necessarily reflect those of the Office of the Comptroller of the Currency or the Department of the Treasury.

We thank Sewin Chan, Kostas Tzioumis, Michael Gedal, and participants at the OCC Economics Seminar, NYU Law School's Law and Economics Brown Bag Lunch series, the Furman Center's Brown Bag Lunch series, the 2011 Federal Reserve Community Affairs Research Conference, and the American Real Estate and Urban Economics 2011 Mid-year Conference for their comments and suggestions, and the OCC Economics Department for their hospitality and financial support for Vicki Been and Mary Weselcouch. Professor Been is grateful for the support of the Filomen D'Agostino and Max E Greenberg Research Fund at New York University School of Law. We are also grateful to Andrew Tschirhart at the OCC and Ken Adler at the Furman Center for excellent research assistance

## 1. Overview

Loan modifications give borrowers in default<sup>1</sup> the opportunity to reduce their interest rate, extend the term of their loan, reduce their principal balance, or add missed payments to the principal (Adelino, Gerardi, and Willen, 2009; Mason, 2007). If a loan modification helps a borrower to stay current on his or her loan, the modification may allow the borrower to avoid both the financial costs of foreclosure and the disruption and social and psychological costs of moving, and may save the borrower's credit record (Kingsley, Smith, and Price, 2009; Schloemer, Li, Ernst, and Keest, 2006). Successful modifications help the neighborhood as well, by avoiding vacancies and high rates of turnover (and the crime and other negative impacts that they may cause), avoiding decreases in neighboring property values associated with foreclosures, and promoting stability (and the social cohesion it produces) (Ellen, Lacoë, and Sharygin, 2011; Harding, Rosenblath, and Yao, 2009; Immergluck and Smith, 2006; Schuetz, Been, and Ellen, 2008). Lenders may benefit from modifications by avoiding the costs associated with foreclosure, such as reduced property values, loss of income and deterioration in quality as the property sits vacant and legal and administrative fees (Gerardi and Li, 2010; Pennington-Cross, 2006).

Policymakers have put considerable emphasis on the desirability of modifications to help borrowers avoid losing their homes through foreclosures. A chronology of the modification programs lenders and the federal government have adopted over the past few years is attached as Appendix A. Modifications play a central role in the federal Making Home Affordable Plan the Obama administration announced in February 2009 (U.S. Department of Treasury, 2009a). The plan includes financial incentives for servicers to complete modifications of delinquent loans, principal reduction rewards for borrowers who stay current, incentive payments to servicers and borrowers for modifying at-risk loans before they become delinquent, and an insurance fund to

---

<sup>1</sup> Some modifications are arranged before default, but such loans are excluded from the analysis in this paper for reasons we discuss in the Data section.

encourage lenders to modify loans even if they fear that home prices will fall in the future. Through the Home Affordable Modification Program (HAMP), the U.S. Department of the Treasury partnered with banks and other regulatory agencies to issue guidelines to standardize loan modification practices throughout the mortgage industry (U.S. Department of Treasury, 2009b).

For policymakers as well as lenders, understanding the determinants of successful modifications – those that allow the homeowner to stay current over the long-term – is crucial. Yet too little is known even about the most basic questions that would help us understand why some modifications are successful and others are not: Which borrowers receive what kinds of modifications? Are certain loan provisions associated with the likelihood that the loan will be modified? Do the characteristics or identity of lenders or servicers affect the propensity of borrowers to receive modifications? How do characteristics of the property, or the neighborhood in which it is located, affect the propensity of loans to be modified? What role, for example, does residential segregation – the concentration of minorities in a neighborhood – play (if any) in the propensity of borrowers to get modifications?

In this paper, we shed new light on these issues about the borrowers and loans receiving modifications by using a unique combination of data on borrowers in New York City. In a subsequent paper, we will use that information to examine the features of the borrower, loan, lender, neighborhood and property that predict which modifications will succeed in keeping borrowers in their homes over the long term.

This paper will build upon the existing literature by combining a dataset the Furman Center for Real Estate and Urban Policy has built on borrower, neighborhood, and property characteristics for loans originated in New York City with the OCC's Mortgage Metrics dataset to examine the determinants of loan modifications. Identifying the features of borrowers, loans, lenders, servicers, properties and neighborhoods that are associated with loan modifications will allow lenders and

policy-makers to target modification programs for distressed mortgage borrowers more effectively. The unusually rich combination of data also will shed some light on whether borrowers and servicers are acting rationally in deciding whether to modify a loan, and whether there are any characteristics of loans, borrowers or neighborhoods that make modifications especially challenging given the current economic and regulatory framework.

## 2. Background and Literature Review

When a borrower falls behind on her home mortgage payments, a variety of resolutions or outcomes are possible. First, if the borrower is delinquent or in default, but has not yet received a notice of foreclosure (*lis pendens*), the borrower and/or lender have several options: (i) the borrower can cure the delinquency or default by making some or all of the missed payments; (ii) the borrower and the lender can agree to modify the loan; (iii) the borrower can refinance the mortgage; (iv) the borrower can sell the property either for enough to pay off the balance remaining on the mortgage, or through a “short sale,” whereby the lender agrees to accept a purchase price of less than the balance remaining in satisfaction of the mortgage; (v) the borrower can pre-pay the mortgage by drawing on other resources; or (vi) the borrower can continue to be delinquent or in default, but the lender can choose to forbear on the delinquency or default without beginning foreclosure, or set a repayment plan in which the borrower typically pays back any late payments in small installments on top of the existing mortgage installments. Second, if the lender (or servicer acting on behalf of the lender or on behalf of the investors in securitized mortgages) has begun the foreclosure process, either by filing a *lis pendens* in a judicial foreclosure state or by sending a Notice of Default to the borrower in a non-judicial foreclosure state<sup>2</sup>, the borrower can pursue any of those six paths, and in addition may: (vii) give the lender/servicer a deed in lieu of foreclosure; (viii) lose the property to the

---

<sup>2</sup> In this paper, we focus only on loans in New York, a judicial foreclosure state where a *lis pendens* can be filed if a borrower is at least 90 days delinquent.

lender/servicer in the foreclosure auction (“REO” property); or (ix) lose the property to a third party in a foreclosure auction.

The lender/servicer and borrower accordingly may reach an agreement to modify the terms of the loan either before or after the foreclosure process has officially begun. We will refer to the borrower’s counter-party as the servicer. The servicer is, of course, acting on behalf of the lender or investors, and presumably is seeking to minimize losses to the investors or lender. The servicer’s interests are unlikely, however, to be perfectly aligned with the lender’s or investors’ interests. The servicer may lack sufficient information about the lender’s or investors’ interests to serve those interests well, or may lack the technology or other resources to serve those interests even when they are clear (Cordell et al., 2008). Further, the payment structure for servicing may provide incentives for servicers to forego a modification even if modification would serve the lender’s or investors’ interests. (Cordell et al., 2009; Levitin and Twomey, 2011; Magder, 2009; Mason, 2007; Thomson, 2009). We cannot separate the decision of the servicer from that of the lender or investors in this paper, however, except indirectly by analyzing the outcomes of securitized loans versus those held in the lender’s portfolio. We therefore will refer to the decision maker as the servicer, and assume that the servicer generally, though not perfectly, is acting to minimize losses to the lender or investors.

According to U.S. Department of Treasury (2008, 2009, 2010, 2011), the number of loan modifications issued has been consistently increasing since November 2007 (the inception of the OCC data collection), with over 2.1 million permanent modifications completed nationally as of March 2011. Nearly 400,000 of these modifications have been achieved through HAMP (U.S. Department of Treasury, 2011).

Despite the importance of modifications to both the Bush and Obama Administration’s efforts to limit the effects of the foreclosure crisis, the literature on modifications is relatively thin. A series of papers offer a theoretical framework for assessing how lenders will view the decision to

modify. Ambrose and Capone (1996), for example, posit that lenders will modify a loan when the benefits of not losing principal and interest payments outweigh the costs of making the modification. Similarly, Adelino, Gerardi, and Willen (2009) theorize that low rates of modifications result from lenders determining that foreclosure is more profitable for them than modification. Riddiough and Wyatt (1994) postulate that lenders will only consider options other than foreclosure when the cost of foreclosure exceeds the cost of encouraging more defaults by displaying a willingness to negotiate workouts, and Wang, Young, and Zhou (2002) build on that insight. Foote, Gerardi, and Willen (2008) explain that because all borrowers, regardless of the amount of equity in their homes, have an incentive to seek modifications to lower their mortgage costs, it becomes difficult for lenders to determine which applicants legitimately need modifications to avoid default and which have the ability to pay their mortgage without a modification.

Several researchers have theorized about subprime borrowers' decisions about whether to suffer a foreclosure or prepay a delinquent mortgage. Danis and Pennington-Cross (2005a; 2005b), for example) explain the delinquent subprime borrower's concerns, drawing in part on the option value theory of mortgages -- borrowers can exercise the call option to prepay when interest rates fall, and exercise the put option to allow the loan to be foreclosed when the balance of the loan exceeds the underlying asset.

A variety of research explores empirically the factors that determine whether or not a loan is modified. The most robust debate in the literature concerns the effect of securitization. Piskorski, Seru, and Vig (2009) find that, controlling for differences in securitized and retained loans, delinquent loans held in the lenders' portfolios were less likely to enter foreclosure. They infer from that finding that servicers are better able to renegotiate loan terms for portfolio loans, and theorize that servicers are restricted in their ability to renegotiate securitized loans due to the contractual constraints of securitization servicing. Agarwal et al. (2011) use more direct evidence about

modifications and find that loans held in portfolio are between 4.2 and 5.8 percent more likely to be modified often than securitized loans.

Footnote, Gerardi, Goette, and Willen (2009) and Adelino, Gerardi, and Willen (2009), on the other hand, find that the rate of modification is similar for loans retained in the lender's portfolio and those that are securitized. Adelino, Gerardi, and Willen (2010) detail their disagreement with the methodology and interpretation of the Piskorski, Seru, and Vig research.

Researchers agree, however, that the identity of a loan's servicer is a significant determinant of whether it is modified. Abt Associates (2009) finds wide variation among servicers' propensity to modify loans in five mid-Atlantic states and the District of Columbia. Agarwal et al. (2011) and Chan, Sitgraves, Been and Haughwout (2011) also find significant variation in the number and type of modifications different servicers enter into.

Recent empirical work examines the association between loan characteristics and post-default outcomes. Adelino, Gerardi, and Willen (2009) find that loans with higher LTVs are less likely to be modified. Agarwal et al. (2010) explore how the combination of borrower credit score and LTV affect post-default outcomes. Ambrose and Capone (1998) find that the LTV of delinquent FHA loans is a major predictor of whether the loan is reinstated, sold, assigned to HUD, or foreclosed. Capozza and Thomson (2006) find that foreclosure is more likely on loans with high LTVs.

Evidence is mixed about how the type of interest rate (fixed or adjustable rate) affects post-default outcomes. Capozza and Thomson (2006) find that foreclosure is more likely to occur on properties encumbered by fixed rate mortgages. Haughwout, Okah, and Tracy (2009) and Voicu, Jacob, Rengert, and Fang (2011), on the other hand, determine that adjustable rate mortgages are more likely to receive modifications than fixed rate mortgages. But Chan, Sitgraves, Been and Haughwout (2011) find that fixed rate mortgages are more likely to receive modifications.

Cordell, Dynan, Lehnert, Liang, and Masukopf (2008) argue that subprime loans are especially challenging to modify because such mortgages are harder than prime mortgages to make affordable and because subprime loans are more often paired with junior liens. Data that cover both subprime and prime loans are limited, however. Gerardi, Shapiro, and Willen (2007), analyzing loans originated between 1990 and 2007 in Massachusetts, find that subprime borrowers are significantly more likely to have their homes foreclosed upon than prime loans. Capozza and Thomson (2005) find that among loans 90 days or more delinquent, subprime loans are twice as likely as prime loans to end up as REO.

The literature also has examined the effect borrower characteristics have on the likelihood of modification. Chan, Sitgraves, Been and Haughwout (2011) and Adelino, Gerardi, and Willen (2009) find that, other things being equal, borrowers with lower credit scores are more likely to receive modifications. Piskorski, Seru, and Vig (2009) determine that borrowers with higher credit scores are more likely to be foreclosed upon, and Pennington-Cross (2010) finds that high credit scores are associated with a greater propensity to become REO.

Capozza and Thomson (2006) find that borrowers that have made more payments are less likely to become REO. Adelino, Gerardi, and Willen (2009) similarly find that a lender is also more likely to forebear where the borrower has a high payment to income ratio.

Studies have generally found that the borrower's race does not predict the likelihood of receiving a modification. Ambrose and Capone (1996) present descriptive statistics suggesting that minorities and whites are roughly equally likely to receive a modification once in default. Collins and Reid (2011) find no differences in the number or nature of modification received across races. The authors note, however, that there may be differences in the rates of modifications given to minorities and whites among those who applied, but cannot test that hypothesis because they do not have data on the number of borrowers actually applying for modifications, Cotterman (2001) finds



no significant difference between blacks and Hispanics in the proportion receiving modifications after default. Capozza and Thomson (2006), however, find that non-Hispanic Asians are more likely than non-Hispanic whites to terminate their loans as REO if they enter foreclosure, and are less likely to cure at all stages of the process. Voicu, Jacobs, Rengert and Fang (2011) also find some racial differences in the propensity to remain in default, enter foreclosure or cure.

There are a few researchers who have examined the role of neighborhood characteristics in post-default outcomes. Collins and Reid (2011) find that the unemployment rate in an area is not a significant factor in predicting modifications. Agarwal et al. (2010), however, find that defaults are more likely to result in foreclosure where unemployment rates are high. Voicu, Jacob, Rengert and Fang (2011) and Pennington-Cross and Ho (2010), on the other hand, find that higher area unemployment rates are associated with lower propensity to enter foreclosure.

Agarwal et al. (2010) and Chan, Sitgraves, Been and Haughwout (2011) find foreclosure to be more likely in areas with house price depreciation or lower rates of appreciation. Collins and Reid (2011), on the other hand, find that the modification rate is not significantly affected by the area's current house price index.

The research to date is difficult to reconcile and incomplete, for several reasons. Some studies rely on data from just one servicer or lender, and therefore may be of limited generalizability. Others study outcomes of defaults that occurred prior to the current housing crisis, and may not be applicable to defaults in the rapidly falling market or for the types of loans that characterized the current crisis. Most face serious data limitations -- some infer modifications in the absence of direct data, for example, and others are missing key controls, such as the presence of junior liens. Because of data limitations or methodological choices, many studies focus on one or just a few post-default outcomes (which the various researchers also define quite differently) or model the outcomes as independent events. While findings about the predictors of, for example, foreclosure may shed

some light on the propensity of a loan to be modified, modifications are likely to be influenced by somewhat different factors, both because modifications require more interaction between the borrower and lender than many of the other outcomes studied, and because the political and economic climate of the foreclosure crisis may be leading to modifications that would not take place in less difficult times. While various researchers have studied the factors associated with the probability of modifications and other post-default outcomes, therefore, the results are divergent, hard to reconcile and plagued with data and methodological problems.

### 3. Empirical Model

This paper provides an empirical analysis of the factors that determine the outcomes of seriously delinquent loans (loans at least 60 days delinquent). Our empirical strategy employs multinomial logit models in a hazard framework to explain how loan, borrower, and neighborhood characteristics affect which of the following four outcomes, as depicted in Figure 1, results from a seriously delinquent loan: (1) the borrower cures the delinquency (all past due amounts are paid by the borrower or the loan balance is paid off via a regular sale or refinance); (2) the borrower and lender agree to modify the loan or agree to some other non-liquidation workout (i.e., forbearance, repayment plan, FHA partial claim,<sup>3</sup> loan reaged/deferred/extended,<sup>4</sup> other<sup>5</sup>); (3) the borrower suffers a liquidation (short sale, deed in lieu, foreclosure auction sale or REO); or (4) the loan

---

<sup>3</sup> An FHA partial claim might be used if the Federal Housing Administration (FHA) insured the loan. A one-time payment is made by the FHA to the lender to cover all or a portion of the default; the borrower is required to sign an interest free note for the amount of the advance claim payment payable to the FHA; the promissory note is not due and payable until the homeowner either pays off the first mortgage or no longer owns the property

<sup>4</sup> "Reaged/Deferred/Extended" includes, according to the data provider, workouts where there has been an agreement between servicer and borrower to defer principal and interest but with no other terms to enhance affordability.

<sup>5</sup> "Other" typically includes, according to the data provider, alternative loss mitigation strategies designed to provide temporary help, such as partial claims and Fannie Mae's HomeSaver Advance. The former is similar to the FHA partial claim except that the insurer is a private entity. The latter is designed for the borrower who is otherwise capable of meeting his obligations and will be able to resume timely payments once the arrearage is brought current; under the program, Fannie Mae authorizes its servicers to offer an unsecured personal loan that will enable a qualified borrower to cure the payment default on a Fannie Mae owned or securitized loan; this personal loan has fewer up-front costs and can be put in place more quickly than many other options.

becomes more months delinquent.<sup>6</sup> Although our data includes detailed information on the type of modification (e.g., interest rate reduced; term extended; principal write-down, etc.), we do not distinguish among the different types in this paper primarily due to the large number of types and the relatively small number of loans in a given type. These features of the modification data together with the large number of categorical covariates used in the empirical model and the large sample size make the estimation practically infeasible if detailed modification types were included.<sup>7</sup>

The data is organized in event history format, with each observation representing one month in which a seriously delinquent loan remains in default, to allow for time-varying covariates. A loan drops out of the sample after one of the outcomes 1 to 3 occurs. With the data structured in event history format, the multinomial logit has the same likelihood function as a discrete time proportional hazards model (Allison, 1995). In addition, the multinomial logit model directly accounts for the competing risks of the various outcomes (i.e., in each month, the loan can be in only one state - delinquent, cured, modified, etc.) by imposing the restriction that the sum of the probabilities of the possible outcomes is equal to one. In the multinomial logit framework, the probability of each of the 5 outcomes described above is given by:

$$\text{PROB}(O_{it} = j) = \frac{e^{\beta_j X_{it}}}{1 + \sum_{j=1}^4 e^{\beta_j X_{it}}}, \text{ for } j=1, 2, 3, 4$$

$$\text{PROB}(O_{it} = j) = \frac{1}{1 + \sum_{j=1}^4 e^{\beta_j X_{it}}}, \text{ for } j=5,$$

---

<sup>6</sup> The “Cure” outcome also includes loans that become 30-day delinquent, as long as they stay 30 DPD until the end of the study period or become current by then, with none of the other outcomes occurring; however, if a loan becomes 30DPD or current and then reverts to serious delinquency, we consider the loan seriously delinquent and follow it until the end of the study period or until another outcome occurs – whichever comes first. If a non-

<sup>7</sup> More specifically, the small number of observations for a given modification type together with the large number of categorical covariates would likely result in many empty cells which would make it impossible to reliably estimate many coefficients in the multinomial logit models we use. In addition, the large number of modification types together with the large sample size would require extraordinary computer resources to estimate our multinomial logit models.

where  $\text{PROB}(O_{it} = j)$  is the probability that the  $i$ th loan will have outcome  $j$  in month  $t$ , outcome (5), the loan becoming additional months delinquent, is the reference outcome,  $X_{it}$  are the explanatory variables, and  $\beta_j$  are the coefficients to be estimated. To put this notation in the hazard framework,  $\text{Prob}(O_{it}=j)$  is the hazard rate for outcome  $j$ . For example, if outcome  $j$  is (1), cure, then  $\text{Prob}(O_{it}=j)$  is the conditional probability that the loan will leave delinquency through cure in month  $t$  conditional on the loan “surviving” in delinquency until then.

We include time since default among the covariates to allow the hazard rate to be time-dependent. The coefficient estimates are used to calculate the marginal effects of the explanatory variables on the probability of each outcome. To control for city-, state-, or nation-wide macroeconomic factors, we include quarterly fixed effects. To control for systematic changes in mortgage lending over time, we include origination year fixed effects.

To control for unobserved heterogeneity and possible dependence among observations for the same loan, we use a cluster-robust variance estimator that allows for clustering by loan. The independence of irrelevant alternatives (IIA) assumption<sup>8</sup> - a main drawback of the multinomial logit model - is not a concern in our case, because the Small-Hsiao test cannot reject the IIA assumption for our data.

#### 4. Data Description

To investigate the determinants of modifications, we analyze outcomes between January 2008 and November 30, 2010 for all first lien mortgages originated in New York City from 2004 to 2008 and still active as of January 1, 2008 in OCC Mortgage Metrics. OCC Mortgage Metrics is a special extract of the LPS Applied Analytics database that includes detailed information about loan

---

<sup>8</sup> This assumption implies that the odds ratio of a pair of outcomes is independent of any of the alternative outcomes.

modifications not usually reported in LPS.<sup>9</sup> As with the standard LPS database, Mortgage Metrics includes loans serviced by 12 large mortgage servicers covering approximately two-thirds of all mortgages outstanding in the United States and includes all types of mortgages serviced, including subprime mortgages.<sup>10</sup> Nationally, the loans in the OCC Mortgage Metrics dataset represent a large share of the overall mortgage industry, but they do not represent a statistically random sample of all mortgage loans. For example, only the largest servicers are included in the OCC Mortgage Metrics, and a large majority of the included servicers are national banks. Thus, the characteristics of these loans may differ from the overall population of mortgages in the United States. Indeed, subprime mortgages are underrepresented and conforming loans sold to the GSEs are overrepresented in the OCC Mortgage Metrics data (U.S. Department of Treasury, 2008).

An observation in the data set is a loan in a given month. Although we look at originations between 2004 and 2008, monthly performance history for those loans is only available from January 2008 through January 2010. If a loan was originated in 2004 and went through foreclosure proceedings in 2007, therefore, we will never see that loan. Although OCC Mortgage Metrics provides detailed information on borrower characteristics, loan terms, payment history, and modifications, it contains no information on borrower race or gender and provides little information about property or neighborhood characteristics. We therefore supplement the loan level data with information from multiple sources.

To match loan level information from the OCC Mortgage Metrics database to other sources, we relied on mortgage deeds contained within the Automated City Register Information System

---

<sup>9</sup> In addition, the quality of OCC Mortgage Metrics data is likely higher than that of the LPS data because the OCC and OTS went to great lengths to standardize the reporting of the variables across lenders and to correct data entry errors. On the other hand, the LPS data follows loan performance since origination, while the OCC Mortgage Metrics follows loan performance only since the beginning of 2008.

<sup>10</sup> The number of servicers in the OCC Mortgage Metrics has varied over time since the onset of the data collection in 2007, primarily due to mergers and acquisitions among the initial servicers that provided the data. As of the end of 2009, the servicers in the OCC Mortgage Metrics included nine national banks and three thrifts with the largest mortgage-servicing portfolios among national banks and thrifts (U.S. Department of Treasury, 2010). The OCC Mortgage Metric extract for New York City includes 11 servicers.

(ACRIS) of the New York City Department of Finance (DOF). Using a hierarchical matching algorithm, we were able to match 65 percent of the loans in the OCC Mortgage Metrics database back to the deeds records, which thus gave us the exact location of the mortgaged property.<sup>11</sup> This 65 percent sample is not significantly different from the full universe in terms of the loan and borrower characteristics that we use in the analyses below.

After we had a unique parcel identifier matched to each loan record, we were able to match on many other sources. First, we attach some additional borrower characteristics, including race and ethnicity, from Home Mortgage Disclosure Act (HMDA) data.<sup>12</sup> Second, we incorporate information on whether the borrower took on additional mortgage debt following loan origination, obtained from DOF's ACRIS. Third, we merge information from the DOF's Real Property Assessment Database (RPAD) on building characteristics. Fourth, we merge information on whether the borrower received foreclosure prevention counseling or other assistance (including legal

---

<sup>11</sup> Our procedure for matching OCC Mortgage Metrics to ACRIS is similar to the method used by Chan et al. (2010) to match LoanPerformance to ACRIS. Our data from ACRIS do not include Staten Island and thus we had to drop this borough from our analysis. We merged OCC Mortgage Metrics loans to ACRIS mortgage deeds using three common fields: origination or deed date, loan amount and zip code, using six stages of hierarchical matching. At the end of each stage, loans and deeds that uniquely matched each other were set aside and considered matched, while all other loans and deeds enter the next stage. Stage 1 matched loans and deeds on the raw values of date, loan amount and zip code. Stage 2 matched the remaining loans and deeds on the raw values of date and zip code, and the loan amount rounded to \$1,000. Stage 3 matched on the raw values of date and zip code, and the loan amount rounded to \$10,000. Stage 4 matched on the raw values of zip code and loan amount, and allowed dates to differ by up to 60 days. Stage 5 matched on the raw value of zip code, loan amount rounded to \$1,000, and allowed dates to differ by up to 60 days. Stage 6 matched on the raw value of zip code, loan amount rounded to \$10,000, and allowed dates to differ by up to 60 days. We believe it is valid to introduce a 60-day window because in ACRIS, there may be administrative lags in the recording of the deeds data. The chance of false positive matching is low because we are matching loans to the full universe of deed records, and only considering unique matches. The relatively low match rate of 65 percent is due to the fact that we were unable to match loans made on coop units in the OCC Mortgage Metrics data to ACRIS deeds because coop mortgages are recorded differently in ACRIS and do not list a loan amount. During our study period, 28.2% of residential property sales in the four boroughs studied were coops. Further, our match rate was lowest (44%) in Manhattan where 48% of sales during the study period were of coop units. This evidence suggests that had we been able to exclude coop loans from our original OCC Mortgage Metrics dataset prior to matching to ACRIS, our final match rate would have been much higher (around 90%).

<sup>12</sup> We merged HMDA records to ACRIS deeds based on date, loan amount and census tract, using the same six stage hierarchical matching technique as for the OCC Mortgage Metrics-ACRIS match. We then paired each of the OCC Mortgage Metrics records with HMDA records based on the unique deed identification number from ACRIS. In the end, we were able to match 73 percent of the OCC Mortgage Metrics-ACRIS matched loans (or 48 percent of all OCC Mortgage Metrics loans) to the HMDA records. While other researchers have matched loan level data (such as OCC Mortgage Metrics) directly to HMDA by using the zip code as a common geographic identifier, our matching strategy is likely more reliable as it uses a more precise common geographical identifier (census tract).

services) from any of the non-profit organizations coordinated by the Center for New York City Neighborhoods (CNYCN)<sup>13</sup>. Fifth, we merge in repeat sales house price indices the Furman Center for Real Estate and Urban Policy compiles to track appreciation in 56 different community districts of New York City.<sup>14</sup> Sixth, we link information on the demographic characteristics of census tracts using the 2000 Census. Seventh, we add the rate of mortgage foreclosure notices (*lis pendens*) at the census tract level.<sup>15</sup> Finally, using all loans in the LPS data (not just the seriously delinquent ones), we construct each servicer's share of the loans which were originated in the zip code between 2004 and 2008 and were outstanding and serviced by one of the LPS servicers at some point in 2008 or 2009.

When available, we matched data at the observation level to show information about the specific property being studied. When observation level data was not available (e.g., educational attainment) or was not appropriate (e.g., the neighborhood *lis pendens* rate in the prior 6 months) we used neighborhood level data instead. For neighborhood level data, we used census tract level data, the smallest geographic level available, whenever possible. Census tract data was not available for the unemployment rate and the rate of house price appreciation, which we calculated instead at the community district level,<sup>16</sup> and the servicer's share of the outstanding loans, which we computed at the zip code level. To illustrate the relative size of each jurisdiction, Figure 2 shows census tract

---

<sup>13</sup> CNYCN is a non-profit organization, funded by grants from government, foundations, and financial institutions, to coordinate foreclosure counseling, education, and legal services from a variety of non-profit providers throughout New York City to homeowners and tenants at risk of losing their home to foreclosure. CNYCN directs borrowers facing trouble with their mortgages who call 311 to local foreclosure counseling or legal services. Each of its partner organizations then reports back to CNYCN on which borrowers received foreclosure prevention counseling or legal services.

<sup>14</sup> See Armstrong et al. (2009) for a description. We transform quarterly indices into monthly series by linear interpolation.

<sup>15</sup> The *lis pendens* are from Public Data Corporation. The rate is computed as the number of *lis pendens* per 1000 housing units recorded over the 6-month period preceding the month of loan performance.

<sup>16</sup> Community districts are political units unique to New York City. Each of the 59 community districts has a Community Board whose members are appointed by the Borough President of that district; half of the members are nominated by the City Council members who represent the district. The Community Boards review applications for zoning changes and other land use proposals, and make non-binding recommendations about those proposals. They also recommend budget priorities.

boundaries, community district boundaries and foreclosures in the four boroughs of New York City in 2009.<sup>17</sup>

## 4.1 Descriptive Statistics

Table 1 presents descriptive statistics for the dataset used in the estimation, organized in four panels: A – distribution of outcomes; B – loan characteristics; C – borrower and property characteristics; and D – neighborhood characteristics. Panel A shows that almost 32 percent of the seriously delinquent loans in our data received a modification. About 17 percent of the loans were cured through the borrower’s own efforts, about 8 percent experienced liquidation, and the remaining loans (43 percent of the total) remained in serious delinquency during the whole study period. The shares of loans going into particular outcomes may differ between New York City and other cities or the nation as a whole for two reasons: 1) house prices in New York City peaked later and have fallen less precipitously than in many other cities and 2) New York State has a longer, more protracted judicial foreclosure process than most states.

Panel B presents descriptive statistics for the characteristics of the loans in our dataset. Our dataset covers a range of loan products. Of the 28,956 seriously delinquent loans in our dataset, there is a nearly even split between prime and non-prime loans, 60% have fixed interest rates while the remainder have adjustable rate mortgages, 19% were interest only at origination and 78% are conventional mortgages. Home purchase loans make up 43% the loans in our sample, while 35% are refinances. Our sample also includes a mix of loans that have been privately securitized, bought by the GSEs and held in portfolio. This robust mix of loan products, uses and investors allows us to advance the literature because our conclusions are not limited to only one loan type or group of

---

<sup>17</sup> For readability purposes, we do not show zip code boundaries in this map. We note however that the typical zip code size, both in terms of area and population, is larger than the typical census tract size but smaller than the typical community district size.



loans. The servicers in our sample serviced an average of 19% of the outstanding loans in each zip code in which loans in our sample were originated.

The relative interest rate at origination for FRMs is calculated as the interest rate minus the Freddie Mac average interest rate for prime 30-year fixed rate mortgages during the month of origination. For ARMs, it is the interest rate minus the six-month London Interbank Offered Rate (LIBOR) at origination. In our sample, over 47% of the fixed rate loans have relative interest rates between 0 and 1 percent and nearly 45% of the adjustable rate loans have relative interest rates between 2 and 4 percent at origination.

Because certain characteristics of the loans change over time, we construct loan-months for every month during our study period in which a loan was active, for a total of 413,985 loan-months. The last two descriptives in Panel B are measured across all loan-months in our sample, and show that in 33% of the loan months, the borrower had a junior lien on the property, originated either at the same time as the first lien or after the first lien but prior to the loan-month. The average LTV for all of the loan months in our sample was 99.7%.<sup>18</sup> This reflected an average 25 percentage point increase in LTV since origination.

As Panel C shows, 89% of the borrowers in our sample report that they are owner-occupiers. About 44 percent of the mortgages in the sample are secured by single family homes or condominium units while 54 percent are secured by 2-4 family homes. That mix is fairly reflective of the owner-occupied housing stock in New York City. According to the 2009 American Community Survey, just 42 percent of homeowners in New York City live in single-family homes, compared to 88 percent nationwide. The remainder of homeowners in New York City live in one unit of a two to four unit building or own a condominium or cooperative apartment in a larger building.

---

<sup>18</sup> LTV is based on the first lien only. We do not have data on outstanding balances, delinquencies or other outcomes for junior liens.

We constructed borrower months for those borrower level variables that change over time. The current FICO score (reported quarterly for each borrower) has a mean of 556 across all borrower-months, and almost 80% of borrower-months have FICO scores of 620 or less. On average, FICO scores of delinquent borrowers in our sample declined by 115 points from origination to the month being studied. Foreclosure counseling is also measured in loan-months to ensure that we are capturing counseling that occurred prior to the outcome; 2.4 percent of all borrowers received counseling at some point prior to the outcome (or the end of the study period if no resolution occurred).<sup>19</sup>

The characteristics of the neighborhoods in which the properties in our sample are located (shown in Panel D) largely mirror the neighborhood characteristics of the four boroughs of New York City included in our analysis, except that properties in our sample are: (1) more likely to be located in neighborhoods with high concentrations of non-Hispanic blacks; (2) less likely to be located in neighborhoods with high concentrations of Hispanics; and (3) more likely to be in neighborhoods with median incomes between \$40,000 and \$60,000 and less likely to be in neighborhoods with median incomes less than \$20,000 or more than \$60,000.<sup>20</sup>

Panel D also reveals some interesting neighborhood shifts from loan origination to loan month studied. On average, the community district unemployment rate increased by two percentage points.<sup>21</sup> Further, in the neighborhoods where the loans in our sample are located, house prices decreased by an average of 20.2 percent between origination and the loan month being studied.

Our model also includes servicer fixed effects. Panel E shows the range of FICO scores and LTV ratios at the time of loan origination for the delinquent loans in our sample across the 11

---

<sup>19</sup> Note, however, that our counseling data only records counseling received between 01/01/2008 and 05/05/2010.

<sup>20</sup> Not surprisingly, given that owner-occupier borrowers are by definition homeowners, properties in our sample are located in neighborhoods with higher homeownership rates than the average neighborhood in the four boroughs we studied.

<sup>21</sup> The change in unemployment rate – not shown in Panel D – is based on the authors' calculations.

servicers covered in the OCC Mortgage Metrics Data for New York City.<sup>22</sup> Average FICO scores range from 658.5 to 704. LTVs range from .30 to .80.

For this analysis, we chose to focus on seriously delinquent loans because borrowers who receive modifications without ever being seriously delinquent may differ from seriously delinquent borrowers who receive modifications in several ways. First, those borrowers who receive modifications without ever being seriously delinquent may be savvier and better able to negotiate the modification process than the seriously delinquent borrowers who receive modifications. Second, borrowers who have never been seriously delinquent may receive modifications because loan servicers target certain borrowers for modifications (e.g., borrowers for whom the default is deemed imminent due to a forthcoming lay-off or other event that will affect the ability to pay in the foreseeable future). Third, borrowers who receive modifications without being seriously delinquent may have loans that are systematically different in ways that made those loans easier or more attractive for servicers to modify. Although we are unable to empirically explore the first and second hypotheses, Table 2 presents descriptive evidence that supports the third hypothesis.

## 5. Results

Table 3 presents odds ratio estimates for the multinomial logistic regression described above. Below, we review in detail the results on the determinants of loan modifications (which are the focus of this paper) and provide an overview of the results for the other default outcomes included in the analysis.

### 5.1 Determinants of Modifications

**Loan characteristics.** The first set of rows in Table 3 show the impact the loan type has

---

<sup>22</sup> Note, however, that our models only have 9 servicer dummy variables (one of which is excluded as the reference servicer) because two servicers had too few loans to be accounted for with separate indicators..

on outcomes. Loans that the servicer defines as non-prime at origination were more likely to be modified than prime loans. Adjustable rate mortgages were more likely to be modified than fixed rate mortgages, although the difference diminishes as the ARM margin increases, but interest only mortgages were less likely to be modified than fixed rate mortgages, perhaps because these risky loans would require the most drastic modifications. Government and conventional mortgages with private mortgage insurance are less likely to be modified than conventional mortgages without PMI. Fully documented loans are more likely to be modified than no-doc loans, perhaps because lenders require full documentation before issuing a modification. The purpose of the loan (whether for home purchase or refinance) does not affect the likelihood of receiving a modification.<sup>23</sup> Contrary to Foote, Gerardi, Goette, and Willen (2009) and Adelino, Gerardi, and Willen (2010), but consistent with Piskorski, Seru, and Vig (2010) and Agarwal, et al. (2011), we found that loans held in portfolio were more likely to be modified than securitized loans held by private investors. Securitized loans guaranteed by the GSEs were more likely than all other loans to be modified, perhaps because the GSEs impose different requirements for servicers, or supervise those servicers more closely, than private investors do (Levitin and Twomey, 2011). We next focus on the pricing of loans at origination. For FRMs, interest rate spreads above the market average rate are associated with a lower likelihood of modification and a higher likelihood of an involuntary liquidation. Consistent with other research (Chan, et al., 2010), if we interpret the loan pricing terms to reflect *ex ante* risk pricing by lenders, these coefficients could be picking up some borrower risk that is not reflected in the specific risk controls we include in our model. If so, the servicer might be wary of extending modifications to borrowers that the originating lender had evaluated as being more risky.

For ARMs, loans with interest rates at origination that are up to two points higher than the index are more likely to be modified, but relative interest rate at origination above two points does

---

<sup>23</sup> Refinance mortgages are somewhat more likely than home improvement loans to modify, but the finding is statistically significant only at the 90% level.

not seem to affect the likelihood.<sup>24</sup> It may be that teaser rates for ARMs make the interest rate at origination for ARMs a less accurate signal of borrower risk than the rate at origination for FRMs. Or higher rates at origination for ARMs may be associated with lower probabilities of default after reset (because the adjustment may be lower than the adjustments of low teaser rates), and thereby make the borrower a more attractive candidate for modification. We find that the likelihood that a loan is modified decreases as the time since the initial adjustment increases. Again, this finding may reflect a reasonable concern of either the borrower or the servicer about the likelihood that the modification will be successful in the long run. Defaults further out from the adjustment may be more likely to be related to job loss or other crises that would make any modification difficult to sustain, while delinquencies soon after an adjustment may signal that the family is just having trouble with the increase, but is otherwise still solvent.

A property's current LTV has a significant, large, and monotonically increasing effect on both the likelihood of modification and the likelihood of liquidation. As LTV increases, the servicer may realize that the borrower will not cure, either because the borrower can't afford the mortgage or because a borrower who could make the payments would be tempted to strategically default on the underwater mortgage. The servicer would then understand that it will have to take the loss either through a modification or foreclosure.

Consistent with the arguments of Cordell, et al (2008), if the property secures a second lien, the loan is significantly less likely to be modified. Without the cooperation of the second lien holder, it makes no sense for a servicer to modify a loan. Older loans are slightly more likely to be modified, perhaps indicating a servicer's willingness to work with a borrower who has a track record of being reliable. A longer time in default is associated with a decreased propensity for modifications, perhaps because borrowers who want modifications seek them out very soon after

---

<sup>24</sup> ARM interest rates at origination of two to four points higher than the index are less likely to be modified, but only at the 90% significance level.

defaulting on their loan or because servicers target modifications to borrowers who have only recently become delinquent.

Finally, we find that the propensity to modify loans and to reach other workouts varies substantially across servicers.<sup>25</sup> Additionally, we find that the probability of modification increases as the percentage of outstanding loans in the neighborhood serviced by a particular servicer increases, but only at a 10 percent significance level. .

**Property and Borrower characteristics.** Consistent with prior literature and the current regulatory framework, loans on owner-occupied properties are more likely to be modified than investor-owned properties. Further, loans on 2-4 unit or 5+ unit rental apartment buildings are less likely to be modified than loans on single-family buildings or condominium units. A greater decline in a borrower's FICO score from loan origination to the first delinquency (so, before the delinquency itself had an impact on the score) is correlated with a lesser likelihood of the loan being modified. Servicers may see borrowers whose FICO scores had declined significantly as bad candidates for modifications because they appear to be undergoing some other financial hardship. However, controlling for this decline, borrowers with higher current FICO scores were less likely to receive modifications, perhaps indicating that servicers were unwilling to modify loans of a borrowers who the servicer is particularly concerned may be strategically defaulting. The race or ethnicity of the borrower had no significant impact on the likelihood that a loan would be modified. We find a significant relationship between a borrower's receipt of foreclosure counseling and the likelihood that their loan will be modified.

**Neighborhood characteristics.** Table 3 also explores how the housing market conditions in a neighborhood affect the likelihood that a loan on a property within the neighborhood will be modified. Loans on properties in neighborhoods with high foreclosure rates in the six months

---

<sup>25</sup> For confidentiality purposes, we cannot show the specific estimates for the servicer fixed effects.

prior to the loan month being studied are less likely to be modified, and the likelihood decreases as the foreclosure rate increases. One of the strongest predictors of modification in our model is how the rate of house price depreciation compares to rates in other neighborhoods.<sup>26</sup> The probability of getting a modification is higher in those neighborhoods that are losing value, but at lower rates than other neighborhoods. Curiously, borrowers in appreciating neighborhoods with relatively higher rates of appreciation are less likely to cure on their own. These findings suggest that servicers acting to minimize lender/investors' losses may be wary of offering modifications in the hardest hit neighborhoods because those may have little chance of recovering in the short term. The lower the depreciation rate in markets with falling prices, the stronger the servicer's incentives to modify in order to minimize lender/investor's losses. In appreciating neighborhoods, on the other hand, servicers are unlikely to want to modify the loan because they may be able to sell the property with minimal loss, and because they will not want to encourage strategic defaults. Struggling borrowers in those neighborhoods should have options to cure on their own, such as selling the home for the full amount of the loan or refinancing, so the borrowers may be less likely to seek modifications.

We find that higher area unemployment rates are associated with lower propensity to modify, although this effect is only significant at the 10 percent level. Perhaps servicers are reluctant to offer modifications to the unemployed because modified loans still require monthly payments and these may not be affordable without a steady income stream.

Loans on properties in neighborhoods that are greater than 40% black are more likely to be modified than loans on properties in other neighborhoods. One possible explanation is that

---

<sup>26</sup> The results pertain to house price appreciation since origination. We also experimented with recent house price appreciation (appreciation over the four quarters preceding the performance quarter) and the effects are consistent (similar significance levels and slightly lower magnitude)

foreclosure outreach efforts are targeted to primarily African American neighborhoods, which are thought to be more vulnerable to foreclosure.

Several findings suggest that servicers are less likely to modify loans of borrowers who the servicers fear may be especially likely to strategically default. Loans in neighborhoods with high educational attainment, for example, are less likely to be modified. Neighborhood educational attainment is likely to be a rough proxy for borrower educational attainment, and lenders may suspect that those borrowers may be more financially sophisticated and therefore more likely to strategically default. Loans in neighborhoods where many households have children also are less likely to be modified, which may reflect servicers' assumptions that those families are unlikely to actually walk away from their homes but may default strategically in order to reduce their payments through modifications. It turns out, however, that households in those neighborhoods also are less likely to cure on their own. On the other hand, in neighborhoods with homeownership rates above 60% (a very high rate for New York City) borrowers are more likely to receive modifications. The percentage of a neighborhood's population that is foreign-born is significant only for neighborhoods with 40 to 60 percent foreign born. The percentage of a neighborhood's population over 65 years old is not a significant predictor of modification, nor is the median household income of the neighborhood.

## **5.2 Determinants of Other Outcomes**

**Cure by borrower.** In general our findings regarding the determinants of a borrower curing the delinquency themselves are consistent with prior literature. Borrowers who are more financially stable (as indicated by higher FICO scores or FICO scores that have declined less) and live in neighborhoods whose residents have higher incomes and greater educational attainment, are more likely to cure the delinquency through their own actions, a sale or a refinance. Borrowers who took



out loans that were less risky at origination – those with fixed rate, full documentation, lower relative interest rates, or lower current LTVs, and those without junior liens – also were more likely to cure their delinquencies themselves. Those findings may indicate that savvy borrowers may be able to refinance their loans or otherwise catch up on missed payments. Borrowers in neighborhoods with higher foreclosure rates in the 6 months prior to the loan month were less likely to cure on their own, possibly indicating that they had lost one of the options for curing: the ability to sell. Borrowers who received foreclosure counseling were less likely to cure on their own, but this may be a selection effect: borrowers may seek counseling only when they have run out of other options and cannot cure on their own.

**Liquidation.** Our findings on the likelihood that a servicer will complete foreclosure of a property through liquidation support some of the findings of prior research. We find that fully documented loans are less likely to be liquidated. As the relative interest rate at origination for FRMs increases, the probability of liquidation increases. As current LTV increases, the probability of liquidation increases. We found little difference in the liquidation rate based on the race or ethnicity of the borrowers, affirming the descriptive findings of Ambrose and Capone (1996). . We also find that mortgages held in the lender's portfolio are more likely to be liquidated. Borrowers with FICO score that declined from origination to delinquency were slightly more likely to have their property liquidated. A FICO score that already declined prior to the delinquency probably indicates that the borrower was suffering from financial hardship beyond just the cost of the mortgage payments. Such borrowers were probably not good candidates for modifications or other non-liquidation workouts. Loans on properties in neighborhoods with higher concentrations of non-Hispanic blacks or Hispanics are less likely to be liquidated than loans on properties in neighborhoods with lower percentages of such minorities. Servicer fixed effects are very strong predictors of liquidation. Finally, the borough fixed effects in our model indicate that properties in

the Bronx and Brooklyn that are in delinquency are significantly less likely to be liquidated than properties in the other boroughs.

**Sensitivity Analysis.** Because we focused our analysis on New York City, for which a considerable amount of detailed data is available, we were able to include both variables that are not available in national models (foreclosure counseling, individual borrower's race and the presence of a junior lien) and variables that have not been used in national models before but that could be added (neighborhood foreclosure rate and neighborhood house price appreciation). As Table 4 shows, our fully controlled model is a slightly better fit for explaining the incidence of modifications than the models that have fewer controls. However, with few exceptions, all of the variables in the fully controlled model point in the same direction and have similar magnitudes as in the leaner models. The one stark exception is the neighborhood racial composition. In the simplest model, borrowers in black neighborhoods appear to be less likely to cure the delinquency on their own. However, when we add in the neighborhood foreclosure rate in the prior six months, and neighborhood house price appreciation, these differences disappear.

## 6. Conclusion

The rich data set used in this paper allowed us to improve on the existing literature by assessing the impact that loan, servicer, borrower and neighborhood characteristics have on the outcome of a seriously delinquent loan. The OCC's MortgageMetrics data allowed us to pay particular attention to the determinants of loan modifications. Although our work is limited to the context of New York City, we believe our results will be generalizable to many other areas. Manhattan may be a fairly unique housing market, but the majority of the mortgages we examine were originated in the other boroughs, which are similar in density, housing stock, and other measures to many other cities across the country. For example, most foreclosures in the city have

taken place in the outer borough neighborhoods with a high concentration of one- and two-family housing, and most of the homes affected by foreclosure are one- to four- family homes. More importantly perhaps, we cannot think of strong reasons why the more distinct economic environment of New York City would affect the relationships between post-default outcomes and their determinants.<sup>27</sup> Indeed, our analysis on New York City confirms the basic findings with respect to the relatively narrow set of variables used in national-level analyses, even when controlling for data which are difficult to incorporate or have not been previously used in national models.

We find that both borrowers and servicers appear to be acting to minimize their (or their lender/investors') losses in their propensity to cure, modify or come to another non-liquidation workout or liquidate the property. As we would expect, current LTV is one of the strongest and most statistically significant predictors of either cure or modification, with the likelihood of curing falling and the likelihood of modification or liquidation rising as the LTV rises. Our evidence suggests that borrowers who live in highly educated, high income neighborhoods and have high credit scores or FICO scores that have declined less since loan origination are likely to find a way to cure on their own.

The neighborhood's housing price appreciation also is a strong predictor of outcomes. Our findings suggest that servicers may be wary of offering modifications in neighborhoods with high house price depreciation rates because those neighborhoods may have little chance of recovering in the short term.

Especially risky loan characteristics, including junior liens, ARMs with high margins, interest only loans, very high interest rate FRMs, and loans without full documentation result in bad outcomes for both the borrowers and the servicers. Unsurprisingly, having these high risk (and now relatively unavailable) characteristics on a loan made a borrower less likely to be able to cure the

---

<sup>27</sup> Housing and labor market variables may have smaller variation in the stronger housing and labor markets of New York City, however this would only affect the precision of the coefficients on those variables.

default on their own. Most of these characteristics also made it less likely that a loan would be modified, either because the cost of modification would be too high for the most exotic loans (such as interest only) or because the actual process of modifying is more difficult, as in the case of junior liens that would require coordination with another servicer or in the case of loans originated without the full documentation necessary to complete a modification.

Additional evidence that servicers are acting to minimize lender's or investors' losses in their modification decisions can be gleaned from the finding that adjustable rate loans are less likely to be modified many months after the rate adjustment. As more time passes from adjustment, a borrower's delinquency likely has less to do with the payment shock at adjustment and more to do with some unobserved financial difficulty such as the loss of a job. Taking this into account, it appears that servicers are modifying loans when the borrower could afford payments were it not for the big payment shocks.

We find no evidence that servicers are discriminating by race in their decisions about whether to modify loans, or foreclose. In this analysis, we cannot, however, rule out the possibility that the terms of modifications or other workouts might differ by race or some other characteristics of borrowers. Although an individual borrower's race is not a good predictor of the outcome of delinquency, the race of the neighborhood in which the property is located is a good predictor of loan modifications and liquidations. Our model includes controls for many demographic characteristics of a neighborhood, as well as the recent foreclosure rate in the neighborhood, but even controlling for those factors, neighborhoods with large shares of black residents are *more* likely to get modifications and to avoid foreclosure. This could be because foreclosure prevention efforts are concentrated in African American neighborhoods. We find that foreclosure counseling significantly increases the likelihood of a loan being modified or coming to some other workout, and decreases the probability of liquidation.

Finally, servicers vary considerably in their granting of modifications, and especially vary in their propensity to liquidate mortgages. This may reflect some unobservable factors about the loans or staffing, training, or incentive differences among servicers.

Our study suggests that modification programs may need to be refined in several ways. First, modification programs should learn from counseling programs. We find that borrowers who receive counseling services are more likely to reach a modification or come to some sort of workout agreement with the servicer.

Further, we found that local house price dynamics are a good predictor of whether a loan will be modified. Although the Furman Center neighborhood level repeat sales indices in New York City are more detailed than indices available in other areas, there are opportunities to include house price dynamics in the criteria to determine eligibility for a modification. Case-Shiller sells zip code level house price appreciation indices and makes tiered indices available at the MSA level for free.

Finally, our findings suggest a need for additional attention to certain servicers. Even controlling for characteristics of the loan, borrower, property and neighborhood, servicers have pursued modifications and especially liquidations at wildly different rates. This suggests that some servicers may need additional incentives or penalties to avoid liquidation or need more time and assistance to build the capacity to do so.

We plan to extend this study by analyzing the default rate and determinants of outcomes for borrowers who have gotten modifications. That extension will reveal the characteristics of a modification that are most correlated with success while controlling for characteristics of the borrower, the neighborhood and the original loan.

## **7. Bibliography**

Abt. Associates. (2009). *Loan Modifications as a Response to the Foreclosure Crisis: An Examination of Subprime Loan Outcomes in Maryland and Surrounding States.*

- Adelino, Manuel, Gerardi, Kristopher, and Willen, Paul. "What Explains Differences in Foreclosure Rates? A Response to Piskorski, Seru, and Vig." FRB of Boston Working Paper No. 10-2 (2010).
- Adelino, Manuel, Gerardi, Kristopher, Willen, Paul. "Why Don't Lenders Renegotiate More Home Mortgages? Redefaults, Self-Cures, and Securitization." FRB of Atlanta Working Paper No. 2009-17 (2009).
- Ambrose, B. W. and Capone, C. A. (1996a). Cost-Benefit Analysis of Single Family Foreclosure Alternatives. *Journal of Real Estate Finance and Economics*, 13(2), 105-120.
- Ambrose, Brent A., Capone, Jr., Charles A. "Do Lenders Discriminate in Processing Defaults?," *Cityscape*, Vol. 2, No. 1 (1996b).
- Capozza, Dennis., and Thomson, Thomas. "Optimal Stopping and Losses on Subprime Mortgages." *Journal of Real Estate Finance and Economics*, 30(2) (2005): 115-131.
- Capozza, D. R., and Thomson, T. A. (2006). Subprime Transitions: Linger or Malingering in Default? *The Journal of Real Estate Finance and Economics*, 33(3), 241-258.
- Chan, Sewin, Sharygin, Claudia, Been, Vicki, Haughwout, Andrew F. "What happens to seriously delinquent mortgage borrowers and their homes?" Unpublished manuscript (2011).
- Collins, J. Michael and Reid, Carolina. Who Receives a Mortgage Modification? "Race and Income Differentials in Loan Workouts." (2011). Available at SSRN: <http://ssrn.com/abstract=1743159>
- Cordell, L., Dynan, Karen, Lehnert Andreas, Liang, Nellie, Mauskopf, Eileen. "Designing Loan Modifications to Address the Mortgage Crisis and the Making Home Affordable Program." *Finance and Economics Discussion Series*, Federal Reserve Board, Washington, D.C. 2009-43 (2009).
- Cordell, L., Dynan, K., Lehnert, A., Liang, N., and Mauskopf, E. (2008). The Incentives of Mortgage Servicers: Myths and Realities. *Finance and Economics Discussion Series*, Working Paper No. 2008-46, Divisions of Research and Statistics and Monetary Affairs, Federal Reserve Board, Washington, D.C.
- Cotterman, Robert F. "Neighborhood Effects in Mortgage Default Risk." Office of Policy Development and Research, U.S. Department of Housing and Urban Development (2001).
- Danis, Michelle A. and Pennington-Cross, Anthony N. "The Delinquency of Subprime Mortgages." FRB of St. Louis Working Paper No. 2005-022A (2005). Available at SSRN: <http://ssrn.com/abstract=761804>

- Danis, Michelle A. and Pennington-Cross, Anthony (2005), "A Dynamic Look at Subprime Mortgage Performance" *The Journal of Fixed Income* 11(1): 28-39.
- Ellen, Ingrid, Laco, Johanna, and Sharygin, Claudia (2011). "Do Foreclosures Cause Crime?" Draft Manuscript.
- Foote, C., Gerardi, K., Willen, P. "Negative equity and foreclosure: Theory and evidence." *Journal of Urban Economics*, 64(2) (2008): 234-245
- Foote, C., Gerardi, K., Goette, L., and Willen, P. (2009). Reducing Foreclosures: No Easy Answers. National Bureau of Economic Research, Working Paper No. 15063. <http://www.nber.org/papers/w15063>.
- Gerardi, Kristopher and Li, Wenli (2010), Mortgage Foreclosure Prevention Efforts, *Federal Reserve Bank of Atlanta Economic Review* 95(2): 1-13.
- Harding, J.P., Rosenblath, E., and Yao, V.W. (2009). The contagion effect of foreclosed properties. *Journal of Urban Economics*, 66, 164-178.
- Haughwout, Andrew F., Okah, Ebiere and Tracy, Joseph S. "Second Chances: Subprime Mortgage Modification and Re-Default." FRB of New York Staff Report No. 417 (2009).
- Immergluck, D. and Smith, G. (2006). The Impact of Single-Family Mortgage Foreclosures on Neighborhood Crime. *Housing Studies*, 21(6), 851-866.  
18
- Kingsley, G. T., Smith, R., and Price, D. (2009). The Impacts of Foreclosures on Families and Communities. The Urban Institute.
- Levitin, Adam J. and Twomey, Tara, "Mortgage Servicing." *Yale Journal on Regulation* Vol. 28, No. 1 (2011).
- Magder, Dan. "Mortgage Loan Modifications: Program Incentives and Restructuring Design." Working Paper (2009).
- Mason, J. R. (2007). Mortgage Loan Modification: Promises and Pitfalls. Available at SSRN: <http://ssrn.com/abstract=1027470>.
- Pennington-Cross, A. (2006). The Duration of Foreclosures in the Subprime Mortgage Market: A Competing Risks Model with Mixing. Federal Reserve Bank of St. Louis Working Paper No. 2006-027A, April 2006.
- Pennington-Cross, A. and Ho, G. (2010) The Termination of Subprime Hybrid and Fixed-Rate Mortgages. *Real Estate Economics* 38(3), 399-426
- Piskorski, T., Seru, A., and Vig, V. (2010). Securitization and Distressed Loan Renegotiation: Evidence from the Subprime Mortgage Crisis. *Journal of Financial Economics*, 97(3), 369-397.

- Riddiough, Timothy J., and Steve B. Wyatt. "Strategic Default, Workout, and Commercial Mortgage Valuation." *Journal of Real Estate Finance and Economics* 9 (1994): 5-22.
- Schuetz, J., Been, V., and Ellen, I. G. (2008). Neighborhood Effects of Concentrated Mortgage Foreclosures. *Journal of Housing Economics*, 17(4), 306-319.
- Schloemer, E., Li, W., Ernst, K., and Keest, K. (2006). Losing Ground: Foreclosures in the Subprime Market and Their Cost to Homeowners. The Center for Responsible Lending. <http://www.centralvalleybusinesstimes.com/links/foreclosure%20report.pdf>
- U.S. Department of Treasury. (2008). OCC Mortgage Metrics Report for the First Quarter of 2008. June 11, 2008. <http://www.occ.gov/publications/publications-by-type/other-publications-reports/mortgage-metrics-q1-2008/mortgage-metrics-q1-2008-pdf.pdf>
- U.S. Department of Treasury. (2010). OCC Mortgage Metrics Report for the First Quarter of 2010. June 23, 2010. <http://www.occ.gov/publications/publications-by-type/other-publications-reports/mortgage-metrics-q1-2010/mortgage-metrics-q1-2010-pdf.pdf>
- U.S. Department of Treasury. (2009). OCC Mortgage Metrics Report for the First Quarter of 2009. June 30, 2009. <http://www.occ.gov/publications/publications-by-type/other-publications-reports/mortgage-metrics-q2-2009/mortgage-metrics-q2-2009-pdf.pdf>
- U.S. Department of Treasury. (2011). OCC Mortgage Metrics Report for the First Quarter of 2011. June 29, 2011. <http://www.occ.gov/publications/publications-by-type/other-publications-reports/mortgage-metrics-q1-2011/mortgage-metrics-q1-2011.pdf>
- Voicu, I., Jacob, M., Rengert, K., and Fang, I. 2011. Subprime Loan Default Resolutions: Do They Vary across Mortgage Products and Borrower Demographic Groups? *The Journal of Real Estate Finance and Economics*, doi:10.1007/s11146-011-9305-4, 1-26.
- Wang, Ko, Leslie Young, and Yuqing Zhou. 2002. Nondiscriminating foreclosure and voluntary liquidating costs. *Review of Financial Studies* 15(3), 959–85.



**Table 1. Descriptive Statistics****A. Outcomes of Seriously Delinquent Loans**

Outcome	% of all loans
Cure	17.3
Modification	31.7
Liquidation	8.1
Delinquency Continues	42.9

**B. Loan Characteristics**

Variable	Mean
Credit Class	
Prime	0.463
Non-Prime	0.476
(missing credit class indicator)	0.061
Product Description	
FRM	0.601
ARM 2/28	0.110
ARM 3/27	0.041
ARM (other)	0.205
Other	0.043
ARM * Margin at Origination <sup>1</sup>	1.970
(ARM * missing margin at origination indicator) <sup>2</sup>	0.305
Interest Only at Origination	0.192
(missing interest only indicator)	0.047
Full Documentation	0.362
(missing full documentation indicator)	0.006
Product Group	
Government (FHA, VA)	0.067
Conventional with PMI	0.132
Conventional	0.775
Other	0.026
Loan Purpose	
Home Purchase	0.428
Refinance	0.350
Home Improvement	0.020
(missing loan purpose indicator)	0.202
Relative interest rate at origination (FRMs): <sup>3</sup>	
<0	0.242
0-1	0.474
1-2	0.160
2-3	0.037
>3	0.016
(missing interest rate indicator)	0.070
Relative interest rate at origination (ARMs): <sup>2</sup>	
<0	0.108
0-2	0.348
2-4	0.447

	4-6	0.083
	>6	0.008
	(missing interest rate indicator)	0.006
Debt-to-income at origination		
	<45%	0.373
	45-50%	0.114
	>50%	0.135
	(missing DTI indicator)	0.378
Investor type		
	Private Investor	0.436
	GSE	0.359
	Held in Portfolio	0.166
	(missing investor type indicator)	0.038
Percentage of outstanding loans in neighborhood serviced by the servicer		0.192
log (Current Unpaid Balance)		12.895
Number of months post-adjustment (ARMs): <sup>2</sup>		
	before 1st adjust or no adjust	0.573
	0-3	0.054
	4-6	0.044
	>6	0.329
Loan Age (months)		36.764
Default Time (months)		10.923
Current LTV	Mean	0.997
	<80%	0.223
	80-100%	0.293
	100-120%	0.261
	>120%	0.208
	(missing LTV indicator)	0.015
LTV increase between origination and current month <sup>4,5</sup>		0.251
	(missing LTV increase indicator)	0.017
Has a Junior Lien on the Property		0.326
Number of Loans		28,956
Number of Loan-Months		413,985

### C. Borrower and Property Characteristics

Variable		Mean
Owner Occupier		0.891
Property Type		
	Single Family or Condo	0.438
	2-4 Family	0.543
	5+ Family	0.019
Borrower Race/Ethnicity		
	Non-Hispanic Black	0.267
	Non-Hispanic Asian	0.088
	Non-Hispanic Other	0.012
	Non-Hispanic White	0.162

Hispanic	0.142
(missing race/ethnicity indicator)	0.329
Received Foreclosure Counseling <sup>6</sup>	0.024
Current FICO Score <sup>4</sup>	555.560
<560	0.537
560-620	0.261
620-650	0.066
650-680	0.037
680-720	0.024
>720	0.021
(missing FICO score indicator)	0.054
FICO Score decline between origination and current month <sup>4</sup>	115.132
(missing FICO Score decline indicator)	0.119
Number of Loans	28,956
Number of Loan-Months	413,985

#### D. Neighborhood Characteristics

Variable		Estimation Sample	NYC (4 boroughs)
		Mean	Mean
Neighborhood Racial Composition			
% Non-Hispanic Black			
	<20%	0.397	0.584
	20-40%	0.092	0.117
	40-60%	0.086	0.085
	60-80%	0.141	0.089
	>80%	0.284	0.125
% Hispanic			
	<20%	0.621	0.551
	20-40%	0.201	0.203
	>40%	0.178	0.246
% Non-Hispanic Asian			
	<20%	0.878	0.840
	20-40%	0.105	0.124
	>40%	0.017	0.036
Other Neighborhood Characteristics			
% Foreign Born			
	<20%	0.139	0.181
	20-40%	0.455	0.414
	40-60%	0.327	0.307
	>60%	0.078	0.098
% >65 Years Old			
	<10%	0.494	0.443
	10-20%	0.458	0.462
	>20%	0.048	0.095
% of households with Children			
	<25%	0.089	0.345
	25-50%	0.835	0.605
	>=50%	0.076	0.049

Median Household Income (1999)			
	<\$20,000	0.057	0.121
	\$20,000-40,000	0.407	0.435
	\$40,000-60,000	0.445	0.312
	>\$60,000	0.091	0.132
% of adults with a Bachelor's degree or higher			
	<20%	0.648	0.530
	20-40%	0.293	0.309
	40-60%	0.037	0.082
	>60%	0.021	0.079
Homeownership Rate			
	<20%	0.167	0.333
	20-40%	0.265	0.312
	40-60%	0.245	0.182
	>60%	0.322	0.173
Origination Year			
	2004	0.089	
	2005	0.192	
	2006	0.322	
	2007	0.291	
	2008	0.107	
Borough			
	Manhattan	0.033	
	Bronx	0.135	
	Brooklyn	0.328	
	Queens	0.505	
Quarter of Loan Performance			
	2008 - 1	0.031	
	2008 - 2	0.054	
	2008 - 3	0.052	
	2008 - 4	0.061	
	2009 - 1	0.078	
	2009 - 2	0.089	
	2009 - 3	0.105	
	2009 - 4	0.125	
	2010 - 1	0.133	
	2010 - 2	0.117	
	2010 - 3	0.099	
	2010 - 4	0.058	
Unemployment Rate		0.090	
Recent Foreclosure Rate			
	<1%	0.275	
	1-2%	0.267	
	2-3%	0.228	
	>3%	0.230	
Positive HP Appreciation		0.112	
HP Appreciation		-0.202	
Number of Loans		28,956	
Number of Loan-Months		413,985	

#### E. Servicer Characteristics: Mean FICO and LTV at Origination<sup>4</sup>

Servicer	FICO	LTV
1	658.5	0.803
2	704.0	0.301
3	668.6	0.754
4	660.5	0.756
5	685.8	0.758
6	697.2	0.779
7	675.5	0.772
8	663.4	0.701
9	689.1	0.758
10	673.2	0.762
11	663.4	0.754

#### Notes

Statistics based on the loan-month-level sample are represented with gray shading. The other statistics are based on the loan-level sample.

1) The mean is computed using only the ARMs with non-missing margin

2) The means are computed using only the ARMs

3) The means are computed using only the FRMs

4) The mean is computed using only non-missing values

5) This variable and its missing value indicator are not included in regressions due to high correlation with the house price appreciation.

6) Although this variable varies with the loan-month, the mean is computed at the loan level and thus represents the share of borrowers who received counseling before the default resolution occurred (or before the end of the study period if no resolution was reached).

**Table 2. Characteristics of Loans Modified Before and After Becoming 60+DPD**

Variable	Modified Before Becoming 60+ DPD	Modified After Becoming 60+ DPD (used in our analysis)	Absolute Difference in Means
	Mean	Mean	
N	2816	9185	
Relative interest rate at origination (FRMs): <sup>1</sup>			
<0	0.364	0.302	0.062
0-1	0.441	0.420	0.021
1-2	0.099	0.149	0.050
2-3	0.025	0.031	0.006
>3	0.007	0.009	0.002
(missing interest rate indicator)	0.065	0.090	0.025
Relative interest rate at origination (ARMs): <sup>2</sup>			
<0	0.160	0.103	0.057
0-2	0.398	0.446	0.048
2-4	0.359	0.369	0.010
4-6	0.053	0.064	0.010
>6	0.005	0.004	0.001
(missing interest rate indicator)	0.025	0.014	0.010
Investor type			
Private Investor	0.354	0.405	0.052
GSE	0.415	0.406	0.008
Held in Portfolio	0.206	0.151	0.055
(missing investor type indicator)	0.025	0.037	0.012
Product Group			
Government (FHA, VA)	0.043	0.076	0.033
Conventional with PMI	0.126	0.126	0.000
Conventional	0.813	0.777	0.036
Other	0.018	0.021	0.002
Product Description			
Fixed	0.582	0.580	0.001
ARM 2/28	0.064	0.066	0.001
ARM 3/27	0.044	0.027	0.017
ARM (other)	0.233	0.229	0.004
Other	0.077	0.098	0.021
ARM * Margin at Origination <sup>3</sup>	1.563	1.506	0.057
(ARM * missing margin at origination indicator) <sup>2</sup>	0.417	0.256	0.161
Interest Only at Origination	0.155	0.167	0.012
(missing interest only indicator)	0.052	0.083	0.030
Full Documentation		0.380	0.006
(missing full documentation indicator)	0.010	0.003	0.006
Credit Class			
Prime	0.500	0.428	0.072
Non-Prime	0.438	0.480	0.043
(missing credit class indicator)	0.063	0.092	0.029

**Notes:**

1) The means are computed using only the FRMs

2) The means are computed using only the ARMs

3) The mean is computed using only the ARMs with non-missing margin

**Table 3. Multinomial Logistic Regression Results for Determinants of Outcomes (Odds Ratio Estimates)**

Variable	Odds Ratio <sup>1</sup>		
	Cure	Modification	Liquidation
Credit Class Non-Prime	0.889***	1.309***	0.989
(missing credit class indicator)	1.309**	3.537***	1.608***
Product Description [REF: FRM]			
ARM 2/28	0.501***	1.736***	1.408
ARM 3/27	0.693**	1.480***	1.197
ARM (other)	1.041	1.748***	1.249
Other	0.979	2.401***	1.188
ARM * Margin at Origination	1.024	0.828***	0.962*
(ARM * missing margin at origination indicator)	0.568***	0.305***	1.308***
Interest Only at Origination	0.892**	0.593***	1.011
(missing interest only indicator)	1.002	0.777***	1.228
Full Documentation	1.164***	1.147***	0.772***
(missing full documentation indicator)	1.543***	1.193	1.682***
Product Group [REF: Conventional]			
Government (FHA, VA)	0.98	0.793***	0.719*
Conventional with PMI	1.094*	0.874***	1.105
Other	1.039	1.082	1.11
Loan Purpose [REF: Home Improvement]			
Home Purchase	0.894	1.024	1.058
Refinance	1.031	1.180*	0.728*
(missing loan purpose indicator)	0.97	1.054	0.742
Relative interest rate at origination (FRMs) [REF: <0]			
0-1	0.730***	0.552***	1.325**
1-2	0.661***	0.583***	1.351**
2-3	0.476***	0.547***	1.912***
>3	0.250***	0.339***	1.014
(missing interest rate indicator)	0.535***	0.549***	0.764*
Relative interest rate at origination (ARMs) [REF: <0]			
0-2	0.864	1.422***	0.983
2-4	0.802**	0.861*	0.955
4-6	0.799*	1.107	0.993
>6	0.843	0.88	1.223
(missing interest rate indicator)	0.531	1.255	1.018
Number of months post-adjustment (ARMs) [REF: <0]			
0-3	0.958	0.796**	1.179
4-6	0.981	0.445***	1.22
>6	1.05	0.166***	0.951
Debt-to-income at origination [REF: <45%]			
45-50%	0.962	1.110***	1.192**
>50%	0.856***	1.015	1.068
(missing DTI indicator)	1.171***	0.988	1.508***
Investor type [REF: Private Investor]			
GSE	1.011	1.453***	0.972
Held in Portfolio	0.945	1.208***	1.332***
(missing investor type indicator)	1.11	1.089	6.642***
Current LTV [REF: <80%]			
80-100%	0.682***	1.227***	1.277**
100-120%	0.615***	1.468***	1.419***
>120%	0.594***	1.953***	1.748***
(missing LTV indicator)	13.517***	19.397***	18.886***
Has a Junior Lien on the Property	0.887***	0.942**	0.998

log (Current Unpaid Balance)	0.509***	1.111***	0.701***
Loan Age	1.011**	1.007*	0.978***
Default Time	0.880***	0.972***	1.136***
Percentage of outstanding loans in neighborhood serviced by the servicer	1.143	1.905*	0.985

---

### Borrower and Property Characteristics

---

Owner Occupier	0.942	1.288***	0.718***
Property Type [REF: Single Fam & Condo]			
2-4 Family	0.968	0.887***	1.037
5+ Family	0.882	0.831*	1.127
Current FICO Score [REF: <560]			
560-620	1.003	0.879***	1.318***
620-650	1.039	0.790***	1.555***
650-680	1.306***	0.655***	1.295*
680-720	1.284***	0.688***	1.304
>720	1.298***	0.602***	1.35
(missing FICO score)	1.371***	0.553***	3.516***
FICO Score decline between origination and delinquency	0.998***	0.997***	1.003***
(missing FICO Score decline indicator)	0.628***	0.667***	1.064
Borrower Race/Ethnicity [REF: Non-Hispanic White]			
Non-Hispanic Black	0.909*	0.98	0.92
Non-Hispanic Asian	0.895*	0.985	0.911
Non-Hispanic Other	0.797	0.885	1.346
Hispanic	0.771***	0.94	1.005
(missing race/ethnicity)	0.942	0.976	1.016
Received Foreclosure Counseling	0.534***	1.299***	0.430***

---

### Neighborhood Characteristics

---

Recent Foreclosure Rate [REF: <1]			
1-2%	0.917**	0.971	1.004
2-3%	0.841***	0.921**	0.99
>3%	0.769***	0.865***	0.99
Positive HP Appreciation	1.077	0.917	1.026
Positive HP Appreciation * HP Appreciation	0.571**	1.573	1.483
Negative HP Appreciation * HP Appreciation	0.999	3.132***	1.221
<i>Neighborhood Racial Composition [REF: 0-20%]</i>			
% Non-Hispanic Black			
20-40%	0.99	1.015	0.915
40-60%	0.94	1.196***	0.789**
60-80%	0.984	1.115**	0.731***
>80%	0.951	1.165***	0.651***
% Hispanic			
20-40%	0.958	1.02	0.790***
>40%	1.081	1.056	0.785**
% Non-Hispanic Asian			
20-40%	0.956	1.005	1.084
>40%	1.111	0.942	1.249
% Foreign Born [REF: 0-20%]			
20-40%	0.935	1.018	1.077
40-60%	0.987	1.096**	0.887
>60%	0.958	1.032	0.86
% >65 Years Old [REF: 0-10%]			
10-20%	0.984	0.997	1.051
>20%	1.036	0.928	1
% of households with Children [REF: 0-25%]			
25-50%	0.826***	0.897**	1.309**
>=50%	0.738***	0.925	1.452**
Median Household Income (1999) [REF: 0-\$20,000]			



\$20,000-40,000	1.251***	1.028	1.014
\$40,000-60,000	1.365***	1.051	0.888
>\$60,000	1.408***	1.143	0.818
% of adults with a Bachelor's degree or higher [REF: 0-20%]			
20-40%	1.124**	0.969	0.904
40-60%	1.221**	0.861*	1.155
>60%	1.369**	0.589***	0.82
Homeownership Rate [REF: 0-20%]			
20-40%	0.958	0.95	0.976
40-60%	0.877**	1.081	1.03
>60%	0.887	1.141**	0.949
Unemployment Rate			
	3.16	0.309*	1.223
Origination year [REF: 2004]			
2005	1.147*	1.213***	1.396**
2006	1.078	0.978	1.031
2007	1.136	1.075	0.691
2008	1.169	1.027	0.823
Borough [REF: Manhattan]			
Bronx	0.681***	1.285**	0.599**
Brooklyn	0.799**	1.098	0.483***
Queens	0.692***	1.17	1.251
Quarter of Loan Performance [REF: 2008 - 1]			
2008 - 2	1.404***	1.660***	1.374**
2008 - 3	1.827***	1.442***	1.446**
2008 - 4	1.983***	1.332***	1.115
2009 - 1	2.149***	3.949***	0.955
2009 - 2	1.688***	2.711***	1.061
2009 - 3	1.757***	2.384***	1.208
2009 - 4	1.407**	2.296***	1.058
2010 - 1	1.671***	4.842***	0.797
2010 - 2	2.321***	6.750***	0.681
2010 - 3	2.048***	6.099***	0.539**
2010 - 4	2.372***	7.486***	0.352***
Servicer fixed effects included			
Pseudo-R2		0.1322	
N		413,985	

*Notes:*

1) The reference outcome for the odds ratio computation is "Delinquency Continues"

\*\*\* denotes results that are statistically significant at the 1 percent level

\*\* denotes results that are statistically significant at the 5 percent level

\* denotes results that are statistically significant at the 10 percent level

Table 4. Sensitivity Analyses

Variable	Baseline Model			without Counseling, Individual Race, Junior Lien			without Counseling, Individual Race, Junior Lien, Neighborhood Foreclosure Rate and HP Appreciation		
	Odds Ratio <sup>1</sup>			Odds Ratio <sup>1</sup>			Odds Ratio <sup>1</sup>		
	Cure	Modification	Liquidation	Cure	Modification	Liquidation	Cure	Modification	Liquidation
Credit Class Non-Prime	0.889***	1.309***	0.989	0.888***	1.313***	0.988	0.888***	1.313***	0.987
(missing credit class indicator)	1.309**	3.537***	1.608***	1.311**	3.546***	1.606***	1.309**	3.504***	1.603***
Product Description [REF: FRM]									
ARM 2/28	0.501***	1.736***	1.408	0.507***	1.743***	1.406	0.507***	1.792***	1.41
ARM 3/27	0.693**	1.480***	1.197	0.705*	1.485***	1.208	0.705*	1.525***	1.213
ARM (other)	1.041	1.748***	1.249	1.044	1.746***	1.249	1.05	1.794***	1.258
Other	0.979	2.401***	1.188	0.981	2.420***	1.169	0.982	2.499***	1.178
ARM * Margin at Origination	1.024	0.828***	0.962*	1.026	0.829***	0.961*	1.026	0.830***	0.961*
(ARM * missing margin at origination indicator)	0.568***	0.305***	1.308***	0.569***	0.306***	1.311***	0.567***	0.306***	1.312***
Interest Only at Origination	0.892**	0.593***	1.011	0.884**	0.591***	1.008	0.883**	0.596***	1.01
(missing interest only indicator)	1.002	0.777***	1.228	1.008	0.780***	1.223	1.012	0.787***	1.227
Full Documentation	1.164***	1.147***	0.772***	1.169***	1.149***	0.768***	1.170***	1.150***	0.768***
(missing full documentation indicator)	1.543***	1.193	1.682***	1.541***	1.197	1.657***	1.532***	1.179	1.658***
Product Group [REF: Conventional]									
Government (FHA, VA)	0.98	0.793***	0.719*	0.973	0.797***	0.709**	0.978	0.843***	0.715**
Conventional with PMI	1.094*	0.874***	1.105	1.100*	0.881***	1.107	1.106**	0.930*	1.118
Other	1.039	1.082	1.11	1.041	1.085	1.109	1.044	1.089	1.112
Loan Purpose [REF: Home Improvement]									
Home Purchase	0.894	1.024	1.058	0.871	1.009	1.049	0.87	1.029	1.054
Refinance	1.031	1.180*	0.728*	1.025	1.177*	0.724*	1.024	1.182*	0.724*
(missing loan purpose indicator)	0.97	1.054	0.742	0.988	1.046	0.771	0.986	1.059	0.774
Relative interest rate at origination (FRMs) [REF: <0]									
0-1	0.730***	0.552***	1.325**	0.729***	0.552***	1.331**	0.731***	0.557***	1.334**
1-2	0.661***	0.583***	1.351**	0.663***	0.583***	1.351**	0.665***	0.593***	1.357**
2-3	0.476***	0.547***	1.912***	0.479***	0.550***	1.915***	0.480***	0.563***	1.922***
>3	0.250***	0.339***	1.014	0.249***	0.338***	1.041	0.245***	0.349***	1.051
(missing interest rate indicator)	0.535***	0.549***	0.764*	0.534***	0.549***	0.764*	0.535***	0.555***	0.767*
Relative interest rate at origination (ARMs) [REF: <0]									
0-2	0.864	1.422***	0.983	0.857	1.416***	0.984	0.853	1.387***	0.979
2-4	0.802**	0.861*	0.955	0.797**	0.858*	0.958	0.795**	0.848**	0.955
4-6	0.799*	1.107	0.993	0.804	1.106	0.987	0.807	1.101	0.987
>6	0.843	0.88	1.223	0.844	0.877	1.233	0.832	0.86	1.234
(missing interest rate indicator)	0.531	1.255	1.018	0.532	1.259	1.033	0.53	1.23	1.025
Number of months post-adjustment (ARMs) [REF: <0]									
0-3	0.958	0.796**	1.179	0.958	0.796**	1.181	0.962	0.803**	1.184
4-6	0.981	0.445***	1.22	0.977	0.446***	1.222	0.978	0.449***	1.227
>6	1.05	0.166***	0.951	1.038	0.167***	0.954	1.042	0.168***	0.96
Debt-to-income at origination [REF: <45%]									
45-50%	0.962	1.110***	1.192**	0.958	1.110***	1.188**	0.957	1.114***	1.189**
>50%	0.856***	1.015	1.068	0.855***	1.015	1.067	0.857***	1.016	1.066

(missing DTI indicator)	1.171***	0.988	1.508***	1.174***	0.988	1.515***	1.176***	0.987	1.512***
Investor type [REF: Private Investor]									
GSE	1.011	1.453***	0.972	1.015	1.455***	0.969	1.015	1.448***	0.968
Held in Portfolio	0.945	1.208***	1.332***	0.947	1.212***	1.330***	0.945	1.214***	1.331***
(missing investor type indicator)	1.11	1.089	6.642***	1.124	1.088	6.665***	1.116	1.094	6.670***
Current LTV [REF: <80%]									
80-100%	0.682***	1.227***	1.277**	0.674***	1.226***	1.276**	0.665***	1.131***	1.223**
100-120%	0.615***	1.468***	1.419***	0.607***	1.469***	1.421***	0.594***	1.240***	1.343***
>120%	0.594***	1.953***	1.748***	0.587***	1.959***	1.748***	0.570***	1.488***	1.624***
(missing LTV indicator)	13.517***	19.397***	18.886***	13.384***	19.396***	18.707***	13.342***	18.054***	18.118***
Has a Junior Lien on the Property	0.887***	0.942**	0.998						
log (Current Unpaid Balance)	0.509***	1.111***	0.701***	0.504***	1.106**	0.702***	0.505***	1.153***	0.708***
Loan Age	1.011**	1.007*	0.978***	1.010**	1.006*	0.978***	1.010**	1.008**	0.979***
Default Time	0.880***	0.972***	1.136***	0.880***	0.972***	1.137***	0.880***	0.972***	1.137***
Percentage of outstanding loans in neighborhood serviced by the servicer	1.143	1.905*	0.985	1.146	1.855*	0.968	1.113	1.708	0.942
<b>Borrower and Property Characteristics</b>									
Owner Occupier	0.942	1.288***	0.718***	0.925	1.288***	0.715***	0.927	1.301***	0.716***
Property Type [REF: Single Fam & Condo]									
2-4 Family	0.968	0.887***	1.037	0.963	0.886***	1.036	0.954	0.869***	1.032
5+ Family	0.882	0.831*	1.127	0.898	0.830*	1.136	0.907	0.827*	1.134
Current FICO Score [REF: <560]									
560-620	1.003	0.879***	1.318***	1	0.879***	1.318***	0.999	0.883***	1.318***
620-650	1.039	0.790***	1.555***	1.031	0.791***	1.551***	1.03	0.797***	1.553***
650-680	1.306***	0.655***	1.295*	1.296***	0.653***	1.303*	1.299***	0.659***	1.304*
680-720	1.284***	0.688***	1.304	1.272***	0.688***	1.3	1.272***	0.694***	1.298
>720	1.298***	0.602***	1.35	1.295***	0.601***	1.348	1.299***	0.610***	1.344
(missing FICO score)	1.371***	0.553***	3.516***	1.369***	0.552***	3.548***	1.367***	0.556***	3.558***
FICO Score decline between origination and delinquency	0.998***	0.997***	1.003***	0.998***	0.997***	1.002***	0.998***	0.997***	1.002***
(missing FICO Score decline indicator)	0.628***	0.667***	1.064	0.625***	0.666***	1.055	0.626***	0.668***	1.054
Borrower Race/Ethnicity [REF: Non-Hispanic White]									
Non-Hispanic Black	0.909*	0.98	0.92						
Non-Hispanic Asian	0.895*	0.985	0.911						
Non-Hispanic Other	0.797	0.885	1.346						
Hispanic	0.771***	0.94	1.005						
(missing race/ethnicity)	0.942	0.976	1.016						
Received Foreclosure Counseling	0.534***	1.299***	0.430***						
<b>Neighborhood Characteristics</b>									
Recent Foreclosure Rate [REF: <1]									
1-2%	0.917**	0.971	1.004	0.910**	0.973	1.003			
2-3%	0.841***	0.921**	0.99	0.837***	0.922**	0.99			
>3%	0.769***	0.865***	0.99	0.763***	0.866***	0.991			
Positive HP Appreciation	1.077	0.917	1.026	1.08	0.917	1.027			
Positive HP Appreciation * HP Appreciation	0.571**	1.573	1.483	0.556**	1.575*	1.505			
Negative HP Appreciation * HP Appreciation	0.999	3.132***	1.221	0.989	3.139***	1.226			

Neighborhood Racial Composition [REF: 0-20%]										
% Non-Hispanic Black	20-40%	0.99	1.015	0.915	0.985	1.017	0.906	0.956	1.001	0.905
	40-60%	0.94	1.196***	0.789**	0.928	1.200***	0.764**	0.866**	1.143***	0.759**
	60-80%	0.984	1.115**	0.731***	0.962	1.114**	0.705***	0.877**	1.039	0.699***
	>80%	0.951	1.165***	0.651***	0.935	1.165***	0.627***	0.854***	1.105**	0.623***
% Hispanic	20-40%	0.958	1.02	0.790***	0.939	1.013	0.792***	0.928	0.995	0.789***
	>40%	1.081	1.056	0.785**	1.023	1.038	0.785**	0.975	1.01	0.783**
% Non-Hispanic Asian	20-40%	0.956	1.005	1.084	0.949	1.002	1.077	0.958	1.012	1.08
	>40%	1.111	0.942	1.249	1.096	0.938	1.234	1.124	0.993	1.245
% Foreign Born [REF: 0-20%]										
	20-40%	0.935	1.018	1.077	0.934	1.018	1.082	0.938	1.031	1.085
	40-60%	0.987	1.096**	0.887	0.982	1.099**	0.884	1.001	1.127***	0.887
	>60%	0.958	1.032	0.86	0.95	1.029	0.857	0.965	1.05	0.857
% >65 Years Old [REF: 0-10%]										
	10-20%	0.984	0.997	1.051	0.983	0.997	1.047	0.996	1.003	1.048
	>20%	1.036	0.928	1	1.03	0.93	1.006	1.056	0.924	1.004
% of households with Children [REF: 0-25%]										
	25-50%	0.826***	0.897**	1.309**	0.821***	0.896**	1.317**	0.818***	0.871***	1.310**
	>=50%	0.738***	0.925	1.452**	0.733***	0.925	1.454**	0.711***	0.876*	1.439**
Median Household Income (1999) [REF: 0-\$20,000]										
	\$20,000-40,000	1.251***	1.028	1.014	1.250***	1.03	1.016	1.255***	1.044	1.018
	\$40,000-60,000	1.365***	1.051	0.888	1.359***	1.052	0.891	1.385***	1.073	0.893
	>\$60,000	1.408***	1.143	0.818	1.402***	1.145	0.82	1.463***	1.182*	0.823
% of adults with a Bachelor's degree or higher [REF: 0-20%]										
	20-40%	1.124**	0.969	0.904	1.128**	0.97	0.902	1.156***	0.99	0.905
	40-60%	1.221**	0.861*	1.155	1.232**	0.864*	1.156	1.276***	0.884	1.162
	>60%	1.369**	0.589***	0.82	1.373**	0.589***	0.828	1.367**	0.600***	0.833
Homeownership Rate [REF: 0-20%]										
	20-40%	0.958	0.95	0.976	0.95	0.95	0.973	0.952	0.938	0.969
	40-60%	0.877**	1.081	1.03	0.868**	1.078	1.025	0.864**	1.074	1.023
	>60%	0.887	1.141**	0.949	0.881*	1.138**	0.944	0.881*	1.142**	0.942
Unemployment Rate										
		3.16	0.309*	1.223	3.306	0.302*	1.276	2.548	0.129***	1.132
Origination year [REF: 2004]										
	2005	1.147*	1.213***	1.396**	1.136	1.210***	1.378**	1.159*	1.150**	1.340*
	2006	1.078	0.978	1.031	1.06	0.977	1.01	1.078	0.911	0.979
	2007	1.136	1.075	0.691	1.121	1.076	0.676	1.135	1.014	0.661
	2008	1.169	1.027	0.823	1.164	1.032	0.805	1.164	1.03	0.803
Borough [REF: Manhattan]										
	Bronx	0.681***	1.285**	0.599**	0.667***	1.282**	0.596**	0.687***	1.367***	0.598**
	Brooklyn	0.799**	1.098	0.483***	0.796**	1.095	0.479***	0.787**	1.058	0.470***
	Queens	0.692***	1.17	1.251	0.677***	1.162	1.25	0.658***	1.094	1.219
Quarter of Loan Performance [REF: 2008 - 1]										
	2008 - 2	1.404***	1.660***	1.374**	1.406***	1.662***	1.374**	1.402***	1.628***	1.366**
	2008 - 3	1.827***	1.442***	1.446**	1.829***	1.445***	1.445**	1.829***	1.379***	1.421**
	2008 - 4	1.983***	1.332***	1.115	1.987***	1.339***	1.113	2.049***	1.263**	1.084

2009 - 1	2.149***	3.949***	0.955	2.152***	3.987***	0.951	2.340***	3.709***	0.918
2009 - 2	1.688***	2.711***	1.061	1.695***	2.749***	1.055	1.807***	2.457***	1.008
2009 - 3	1.757***	2.384***	1.208	1.772***	2.425***	1.202	1.805***	2.119***	1.145
2009 - 4	1.407**	2.296***	1.058	1.420**	2.337***	1.053	1.436***	2.001***	0.997
2010 - 1	1.671***	4.842***	0.797	1.689***	4.934***	0.792	1.742***	4.183***	0.748
2010 - 2	2.321***	6.750***	0.681	2.350***	6.898***	0.678	2.457***	5.833***	0.637
2010 - 3	2.048***	6.099***	0.539**	2.084***	6.237***	0.537**	2.181***	5.278***	0.505**
2010 - 4	2.372***	7.486***	0.352***	2.420***	7.658***	0.352***	2.546***	6.201***	0.327***

Servicer fixed effects included

Psuedo-R2	0.1322	0.1317	0.1311
N	413,985	413,985	413,985

Notes:

1) The reference outcome for the odds ratio computation is "Delinquency Continues"

The grey shading and bold font indicate estimates with more important differences in statistical significance relative to the estimates from the preceding panel (i.e., either significant vs. not significant or significant at 10% level vs 1% or 5% level).

\*\*\* denotes results that are statistically significant at the 1 percent level

\*\* denotes results that are statistically significant at the 5 percent level

\* denotes results that are statistically significant at the 10 percent level

Figure 1: Outcome Categories

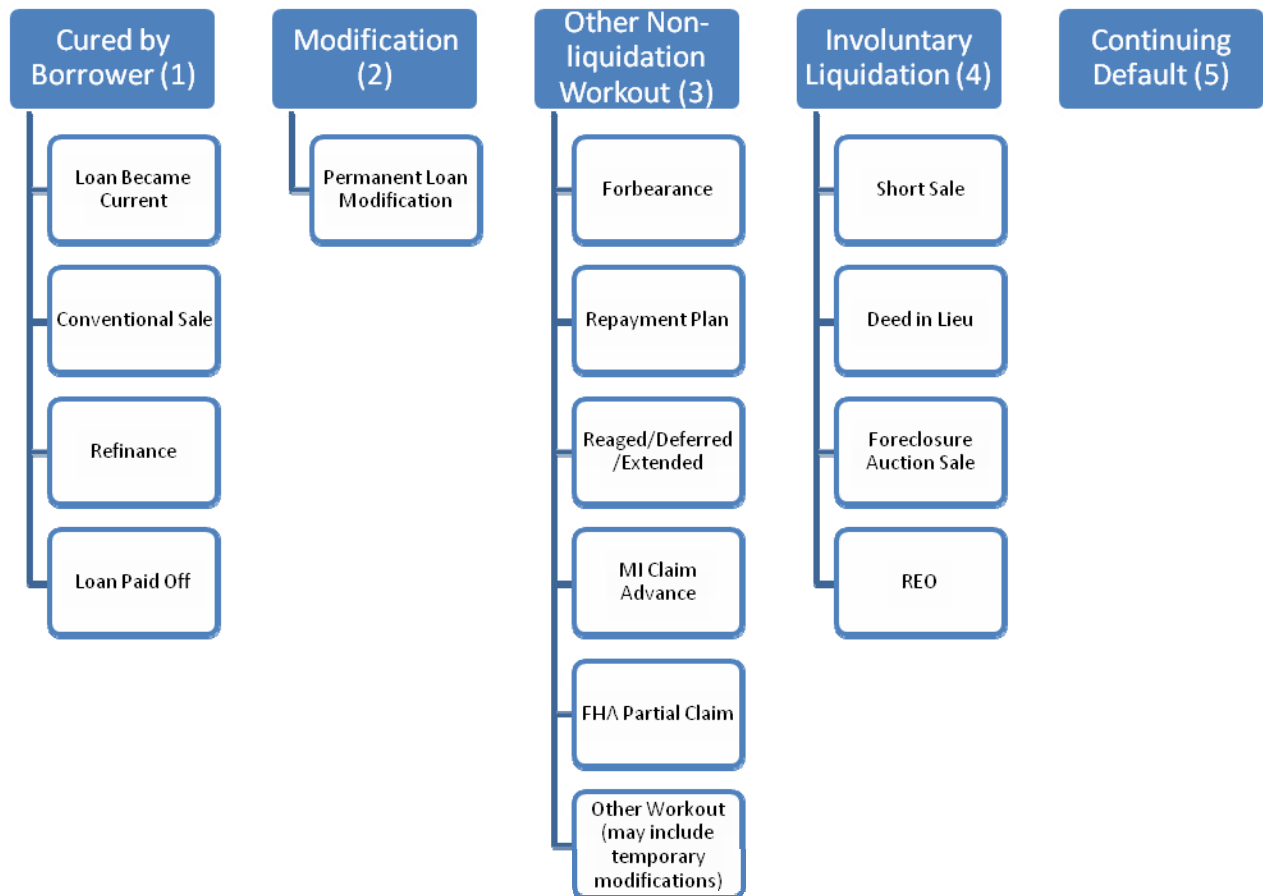
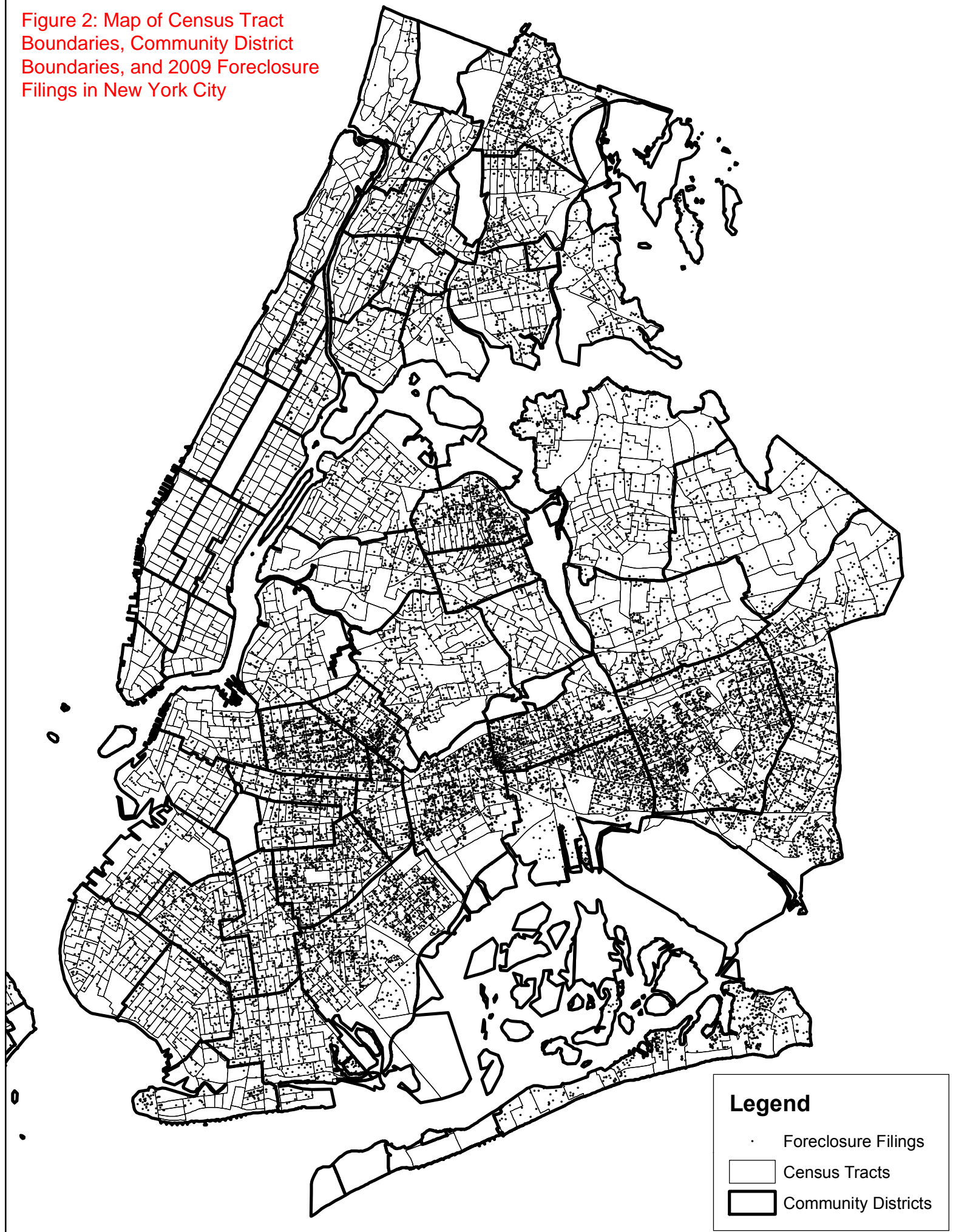


Figure 2: Map of Census Tract  
Boundaries, Community District  
Boundaries, and 2009 Foreclosure  
Filings in New York City



## Appendix

### Evolution of Loan Modification Policies

**August 2007:** The Bush Administration announces the FHASecure refinancing program for borrowers delinquent on their adjustable rate mortgages or current on fixed or adjustable rate mortgages. The program offered borrowers the option to refinance into a traditional, fixed rate, FHA guaranteed loan. The program required proof of a dependable income and the ability to make future mortgage payments. FHASecure was ended in December 2008 and only refinanced about 4,000 loans.

**October 10<sup>th</sup>, 2007:** the US Treasury Department and the U.S. Department of Housing and Urban Development (HUD) announces the HOPE NOW initiative to help homeowners avoid foreclosure. HOPE NOW consists of mortgage servicers, mortgage insurers, GSEs, non-profits, mortgage-related trade associations and mortgage counselors, and seeks to coordinate the efforts of those organizations to keep homeowners in their homes. HOPE NOW helps distressed homeowners to communicate with their servicers in order to negotiate home modifications.

**July, 2008:** Congress authorizes the Federal Housing Administration (FHA) under the Housing and Economic Recovery Act (HERA) to insure up to \$300 billion in loans through a new program, HOPE for Homeowners. This program required existing lenders to accept as payment in full of the original first lien mortgage an amount equal to no more than 90 percent of the current appraised value of the property (87 percent after payment of the upfront premium to FHA)—a substantial



principal write-down in many cases. Hope for Homeowners was voluntary for both borrowers and lenders, and resulted in very few modifications.

**November 11<sup>th</sup>, 2008:** The Federal Housing Finance Agency announces a new streamlined loan modification program, modeled largely on the FDIC's IndyMac protocol (IndyMac was a mortgage company taken over by the FDIC). The program encourages servicers to restructure loans for eligible borrowers so that monthly mortgage payments are no more than 38% of a borrower's monthly gross income. Servicers can reduce monthly mortgage payments by lowering the interest rate, extending the life of the loan, deferring the payment of some of the principal, or a mix of these actions. Eligible loans include Fannie Mae and Freddie Mac loans along with portfolio loans by participating servicers. Borrowers under this program must be at least 90 days delinquent, owe more than 90% of the value of their homes, must have not filed for bankruptcy, and must certify that they are suffering some sort of economic hardship. Servicers are awarded \$800 by the government for each loan that they modify.

**February 18<sup>th</sup>, 2009:** The Obama administration announces the Homeowner Affordability and Stability Plan, which includes a plan to help financially distressed homeowners. Two weeks later, the details of this plan, the Making Home Affordable (MHA) plan, are announced. MHA has many components, including the Home Affordable Refinance Program (HARP), the Home Affordable Unemployment Program (UP), the Second Lien Modification Program (2MP), and the Home Affordable Foreclosure Alternatives Program (HAFA). The key component of MHA regarding loan modifications, however, is the Home Affordable Modification Program (HAMP). . HAMP provides a streamlined structure for modifications and financial incentives for servicers to modify loans. The program requires that servicers reduce monthly payments to 38% of gross monthly income, after

which Treasury will match the servicer dollar-for-dollar for the cost of further reducing the monthly payment to 31% of gross income. Servicers also receive an upfront payment of \$1,000 for each modification, and a further \$1,000 per year for three years if the borrower remains in the HAMP program.

In order to receive a modification under HAMP, a borrower must meet the following conditions: (1) the property must be owner-occupied and the borrower's primary residence, (2) the property must be a single-family property with a maximum unpaid principal balance of \$729,750 or less, (3) the loan must have originated on Jan. 1, 2009 or before, and (4) the monthly payment must be more than 31% of the homeowner's gross monthly income.

If a borrower is eligible, a servicer will adjust the monthly mortgage payment to 31% of a borrower's total monthly income by first reducing the interest rate to as low as 2%, then if necessary, extending the loan term to 40 years, and finally, if necessary, forbearing a portion of the principal until the loan is paid off and waiving interest on the deferred amount.

If these conditions are met, a servicer will then apply a Net Present Value (NPV) test to determine whether the value of the loan to the investor will be greater if the loan is modified (<http://makinghomeaffordable.gov/borrower-faqs.html#18>). The incentives provided by HAMP will be included in this figure. If the modified loan is worth more than the loan without the modification, the servicer is required to provide the modification on a (usually three month) trial basis (<http://makinghomeaffordable.gov/borrower-faqs.html#18>). If the modified loan is not worth more than the loan in its original state, it is at the servicer's discretion whether to modify the loan.

The purpose of the trial period is to provide immediate relief for the borrower while providing a check that the modification is sustainable for the borrower and that the borrower indeed meets the qualification requirement of HAMP. If the borrower makes timely payments for the

duration of the trial period and no problems are found with the borrower's financial information, the servicer will execute a permanent modification. The modified rate will remain constant for the first five years, and then can only increase 1% until it reaches whatever the market rate was at the time the modification was set.

As a part of the Helping Families Save Their Homes Act of 2009, HAMP also now covers FHA loans under a sub-program, FHA-HAMP, which combines a loan modification with a partial claim, which is a one-time loan offered only in conjunction with FHA loans to help borrowers get current on their loans by repaying past due interest and escrow. Like the rest of HAMP, FHA-HAMP covers homeowners in default as well as homeowners facing imminent default, and requires a three-month trial period.

**May 20<sup>th</sup>, 2009:** President Obama signs the Helping Families Save Their Homes Act of 2009. The act was originally intended to allow bankruptcy judges to modify the principals of mortgages in bankruptcy courts, but that provision was eliminated from the bill before passage by Congress. The legislation increases legal protections for servicers against lawsuits by investors, and it allows FHA lenders to make more significant modifications for FHA loans.