Servicer Heterogeneity: Does Servicing Matter for Loan Cure Rates?

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Abstract

Mortgage servicing has garnered increased attention since the foreclosure crisis. As the interface between borrowers and investors, servicers make decisions to grant a loan modification or to foreclose. This study examines servicer behavior for a national sample of delinquent non-conforming loans. There are significant differences across servicers in loan cure rates, which are strongly related to servicers' propensity to offer loan modifications and the level of relief offered to borrowers. Differences across servicers are not explained by borrower, loan, or market characteristics, and underscore the importance of policies to increase both the uniformity and transparency of servicing practices.

Keywords: Mortgage Default and Foreclosure; Servicer Heterogeneity; Loan Cures

1. Introduction

Until recently, the mortgage servicing industry—which collects loan payments on residential mortgages and remits those payments to either the originating lender or an investor—has operated largely in the background, receiving little public, regulatory, or academic scrutiny. However, since the start of the foreclosure crisis, mortgage servicing has garnered increased attention for its role

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in processing mortgage delinquencies. As the interface between borrowers and investors, servicers often make the decision to grant either a loan modification or to start foreclosure proceedings. To handle the volume of delinquent loans in the recession, many servicers opened special loss mitigation offices in hard hit communities, held borrower outreach fairs to reach delinquent mortgage holders, and developed one-on-one relationships with foreclosure counselors to help marshal paperwork through the loan modification process. Yet the mortgage servicing industry has also been broadly criticized for its lack of capacity to deal with the scale of delinquencies, and has been besieged by scandals related to its mishandling of loan documents (e.g. "robo-signing") and the practice of "dual tracking" delinquent mortgages.[1] These practices have led to significant legal and regulatory actions, including the National Mortgage Settlement and the Independent Foreclosure Review. In January of 2013, the Bureau of Consumer Financial Protection (CFPB) also finalized stricter servicing rules and exam procedures to ensure greater accountability and transparency in mortgage servicing.

Indeed, it has become increasingly apparent that mortgage servicing plays a critical role in determining the likelihood that a delinquent borrower will be able to save his home from foreclosure. When a borrower receives his first notice of default, there are multiple possible resolutions, and working with a servicer to renegotiate loan terms can take many months. Recent research has suggested that there is significant heterogeneity among servicers in terms of the types of resolutions they offer to borrowers, and that this heterogeneity has undermined the effectiveness of federal policies designed to prevent foreclosures (Agarwal et al., 2013). Servicer heterogeneity is particularly problematic from the perspective of the borrower. Borrowers have very little control over who services their loan, whether or not the servicing rights are transferred to a new entity, or what contractual provisions govern the servicing their loan (Levitin and Twomey, 2011). In addition, as Levitin and Twomey (2011) point out, homeowners are rarely in the position to correct the principal-agent problem in mortgage servicing by pricing their mortgage to compensate for servicing externalities.

[1] Dual tracking occurs when a mortgage servicer continues to foreclose on a homeowner's home while simultaneously considering the homeowner's application for a loan modification.

Despite the importance of the servicing aspect of mortgage lending, there is relatively little research that empirically explores servicer heterogeneity. In this paper, we examine the impact of variation in resolution practices among bank and non-bank servicers on loan cure rates, focusing specifically on the experiences of low-income and minority borrowers. While differences in resolution practices among servicers are likely due to a set of complex and inter-related factors, understanding which loss mitigation practices are the most likely to contribute to loan cures, especially for historically underrepresented borrowers, can help to inform policies that seek to develop consistent and effective servicing standards.

Using a national level sample of subprime and Alt-A loans in private label securities, we address four key questions. First, what is the impact of servicer heterogeneity on loan cure rates, and do these impacts differ for lower-income and minority borrowers? Second, how do servicers differ from one another in the extent to which they are willing to offer modifications, as well as the type of relief that they are willing to provide? Third, to what extent do differences in the types of modifications servicers offer influence borrower re-default rates? And fourth, how do servicing practices vary across bank and non-bank servicers and over time?

We find that servicers—and servicing practices—matter significantly for borrower outcomes. There is vast heterogeneity across servicers in both loan cure rates and the propensity to offer a loan modification. Servicers with higher cure rates performed permanent modifications on almost 48 percent of their delinquent loans, while servicers with the lowest cure rates only granted modifications to 2 percent of delinquent borrowers over the course of our study period. These differences across servicers are not explained by borrower, loan, or market characteristics. We also find that there is a strong correlation between the granting of a modification and loan cures; in particular, loan modifications that address borrowers' affordability constraints significantly reduce the likelihood of re-default one year after modification. With respect to low-income and minority borrowers, while we find significant cross-servicer heterogeneity in outcomes (as we do for the sample as a whole), it does not appear from this analysis that within their own servicing portfolio, individual servicers treat either low-income or African-American, Latino and Asian borrowers differently from either higher-income or white borrowers. We also find that loan cure rates are significantly higher among non-bank servicers, even after controlling for the fact that they are more likely to service a

more distressed loan pool. Finally, we find that both bank and non-bank servicers have changed their modification practices over time, perhaps in response to public policies or changing market conditions.

The paper proceeds as follows. First, we provide a brief background on the development of the mortgage servicing industry, as well as federal policy efforts to increase the incentives and remove barriers for servicers to modify delinquent loans. Second, we review the existing literature on servicer heterogeneity, and discuss some of the reasons why there may be differences across servicers in their propensity to modify loans. In the third section, we present information about our data and variables. Fourth, we turn to our empirical analysis, providing a description of our models and findings for each of the four questions articulated above. We conclude with a discussion of the findings, their implications for policy, and suggestions for additional research.

2. Development of the Mortgage Servicing Industry

Historically, mortgage servicing was handled by originating lenders, who kept loans in their portfolios and who would work directly with delinquent borrowers. The rise of securitization, however, has led banks to delegate the servicing of their loans to other institutions that specialize in loan servicing, or to set up a separate line of business to manage loan processing. These servicing entities manage the day-to-day responsibilities of collecting loan payments, and are responsible for undertaking loss mitigation if a loan becomes delinquent. The specialization of mortgage lending has also led to the emergence of a separate asset class known as "mortgage servicing rights" (MSR); banks and other institutions invest and trade in MSRs, much in the same way they invest and trade mortgage backed securities. The credit rating agencies conduct periodic reviews of servicer quality, rating servicers against their peers. For example, Moody's assesses servicers along five dimensions: collections, loss mitigation, foreclosure timeline management, administration, and servicer sustainability (Moody's Investor Service, 2013).

The returns to servicing come from three primary sources (Buttimer and Lin, 2005). First, servicers receive a fee for collecting, reporting and disbursing loan payments: this fee is equivalent to approximately 25 to 50 basis points per year on the outstanding balance of the loan (Buttimer

and Lin, 2005). [2] Second, servicers earn interest on borrowers' monthly payments. This "float" is possible because borrowers pay their mortgages throughout the month, but servicers only make a single, monthly remittance to the investor. Third, servicers can levy fees on borrowers, for example, for late payments or for providing additional reports or documentation (e.g. payment history or tax/escrow statements).

Because the returns to any one loan are small, servicers' profits come from reducing costs and increasing the scale and efficiency of their operations (LaCour-Little, 2000). Delinquent loans are particularly costly to the servicer. Typically, servicers must remit all payments to the investor each month, even if the borrower has not made the payment on their mortgage. As a result, if a borrower is delinquent, the servicer must make the payment on the borrower's behalf; the servicer is not reimbursed for these advances until the loan has gone through foreclosure (Buttimer and Lin, 2005). In addition, the increase in administrative work load and the time consuming nature of collections activity, workouts, loan modifications, default and foreclosure processing, and real estate-owned (REO) management increases servicer costs (Cochran and Shelnutt, 2014). Standard servicing fees are often inadequate to cover the costs of these efforts (Ding, 2013). These factors, coupled with the fact that servicers lacked the capacity to respond to the volume of seriously delinquent loans during the financial crisis (Cordell et al., 2010; Holden et al., 2012), meant that early efforts to extend loan modifications were limited and rarely led to loan cures.[3]

Recognizing that voluntary efforts to expand loan modifications were unsuccessful at stemming the wave of foreclosures, federal policy-makers have initiated a series of efforts designed to overcome servicer-related barriers to loan modification. In February 2009, the Treasury Department rolled out the federal government's landmark foreclosure prevention initiative, the "Making Home Affordable" (MHA) program. As part of MHA, the "Home Affordable Modification Program" or HAMP, sought to increase the scale of successful loan modifications by providing servicers with incentives to bring

[2] Servicer fees are not explicitly negotiated; instead, the fees are related to the yield on the mortgage backed security (MBS), which is negotiated between the seller of the MBS and the investor. The required yield on MBSs at any given time is generally lower than the interest rate paid by the borrower. The difference between the two is the service fee (Cochran, Coffman and Harless, 2004).

[3] Alan White, for example, showed that the majority of voluntary modifications at the start of the crisis typically increased a borrower's monthly payment, as well as the principal owed on the loan (White, 2009*a*,*b*).

loan payments in line with borrower incomes (GAO, 2014). Under the program, eligible borrowers[4] work with the servicer to reduce their monthly payment to 38 percent of their income. HAMP then provides a government subsidy to further reduce the payment to 31 percent. Servicers also receive an up-front fee of $1,000 for each modification, plus "pay for success" fees on performing modified loans of $1,000 per year for up to 5 years.[5] To help servicers make a determination if a modification would help to protect the investors' interests in the loan, HAMP also introduced a standardized net present value (NPV) model to compare expected discounted cash flows from a modified loan to the same loan with no modification (Holden et al., 2012).

As of November 2013, 1.3 million borrowers had received modifications under the HAMP program, well below Treasury's initial estimate of 3 million to 4 million (GAO, 2014). However, HAMP did help to increase the scale of loan modifications, provided affordability guidelines for modifications, and introduced greater oversight of the servicing industry (Holden et al., 2012).[6] Evaluation of HAMP modifications shows that the program has led to significant reductions in borrower monthly payments–an average of $544 each month, or approximately 40 percent of their pre-modification payment (US Department of the Treasury, 2014). There is also emerging evidence that HAMP modifications have led to higher loan cure rates for delinquent borrowers; in a study of borrowers in New York City, Voicu and his colleagues (Voicu et al., 2012) find that HAMP loans were more effective at preventing re-default than proprietary loan modifications, after controlling for a wide range of variables.

In addition to the HAMP program, servicers have been subject to a number of legal actions that have also required that they undertake modifications and provide relief for delinquent and underwater homeowners. In February 2012, 49 state Attorneys General and the federal government

[4]Borrowers are eligible for a HAMP modification on first-lien loans for owner-occupied properties with an unpaid principal balance of less than $729,750, originated on or before January 1, 2009.

[5]HAMP also provides a bonus incentive of $1,500 to lender/investors and $500 to servicers for modifications made while a borrower is still current on mortgage payments but at imminent risk of default.

[6]HAMP includes outreach and solicitation requirements; participating servicers must solicit all borrowers who become 60 or more days delinquent for a HAMP modification, and they are required to evaluate every eligible loan using the standardized modification terms and the standardized net present value test (Holden et al., 2012)

announced an historic settlement with the country's five largest mortgage servicers,[7] requiring that these servicers provide $25 billion in relief in the forms of first and second lien principal reductions, refinance options for underwater borrowers, direct payments to borrowers, as well as financial support for state foreclosure prevention efforts.[8] The settlement also implemented reforms to servicing standards, including requiring that servicers provide a single point of contact, increase staffing levels and training, improve communication with borrowers, and introduce appropriate standards for executing documents in foreclosure cases. In 2013, 15 financial institutions settled with banking regulators, agreeing to make payments that totaled $3.9 billion to more than four million homeowners.[9] However, concerns over abuses in mortgage servicing practices have continued, resulting in additional individual settlements and lawsuits between mortgage servicing companies and federal and state regulatory agencies.

More recently, regulators have raised concerns about the rapid growth of non-bank servicers. Mortgage servicing has long been dominated by the large financial depository institutions. In 2013, the top 3 mortgage servicers were Wells Fargo, Chase, and Bank of America, together representing over a third of the market (37 percent). However, the most rapid growth in servicing has occurred among non-bank servicers such as Ocwen and Nationstar Mortgage. As of 2013, five of the top 10 mortgage servicing firms were non-banks (accounting for 15 percent of the total mortgage servicing market) (Goodman and Lee, March 31, 2014). This shift is in large part due to banks selling the servicing rights on their distressed mortgages, which are more costly to service and which present reputational risks for the banks. In addition, Basel III–a set of banking reforms designed to strengthen the safety and soundness of the financial markets–establishes new capital requirements for MSR and will likely increase the cost of holding MSR assets (Goodman and Lee, March 31, 2014). Given the increased role of non-bank servicers in the market, and the fact that they are more likely to be servicing distressed loans, it is important to understand whether their servicing practices are effective at helping delinquent borrowers.

[7]The five banks signing onto the settlement were Ally/GMAC, Bank of America, Citi, JPMorgan Chase, and Wells Fargo. In addition, Bank of America, JP Morgan Chase, and Wells Fargo signed a separate settlement with the California Attorney General to provide an additional $12 billion in relief to California homeowners.

[8]See http://www.nationalmortgagesettlement.com/ for more details on the National Mortgage Settlement.

[9]See http://www.federalreserve.gov/publications/other-reports/files/independent-foreclosure-review-2014.pdf for more details on the Independent Foreclosure Review.

3. Literature Review: Servicer Heterogeneity in Loan Renegotiations

Until recently, the issue of mortgage servicing and modifications has received little attention in the scholarly literature. However, mortgage servicing practices have emerged as central to the debate about how to respond to the foreclosure crisis, and a number of recent studies have examined the scale and effectiveness of loan modifications. Research has identified several institutional factors that may influence servicer practices, including servicer incentives and capacity, mortgage securitization and the associated pooling and servicing agreements, information asymmetries, and lack of borrower contact (Adelino, Gerardi and Willen, 2013; Cordell et al., 2010; Eggert, 2007; Gelpern and Levitin, 2009; Levitin and Twomey, 2011; Piskorski, Seru and Vig, 2010).

One important strand in the existing literature addresses the question of whether investor pooling and servicing agreements, or PSAs, limit a servicer's ability to offer a loan modification. While PSAs vary for different mortgage pools, in general they require servicers to manage the loans in a way that maximizes the returns to the investor. A loan modification may be more difficult for a servicer to undertake if they need to consider the multiple investor interests in a MBS, especially when there are different tranches of investors with competing interests (Cordell et al., 2010). However, the extent to which securitization influences modifications is still unclear. Adelino, Gerardi, and Willen (2013) found no differences in loan modification rates between loans held in portfolio and those held in private label securities, while Piskorski, Seru, and Vig (2010) found just the opposite. Subsequent research by Agarwal and coauthors (2011) and Been, Weselcouch, Voicu and Murff (2013) have supported Pikorski et al.'s (2010) findings that loans in private-label securities were the least likely to be securitized. Still, differences in data and methodology across the studies suggest that the debate over the role of securitization in loan renegotiations is likely to be ongoing.[10]

In addition to potential barriers associated with their obligations under MBS pooling and servicing agreements, a servicer's compensation structure and source of liquidity can also influence their loss

[10]The 2009 amendments to the Truth in Lending Act provide a safe harbor for servicers that modify a distressed loan, as long as that modification maximizes the loan's net present value. In addition, it specifies that the duty to maximize the NPV of the mortgage is a duty owed to all investors, rather than to any one investor in particular, protecting servicers from competing obligations to different tranches of MBS investors (Levitin and Twomey, 2011).

mitigation practices. As mentioned earlier, loan modifications are costly: they are both labor and time intensive, and unlike the costs associated with foreclosure, these costs are not billable back to investors.[11] Estimates for the cost of processing a loan modification range from $500 to over $1000 per modification (Levitin and Twomey, 2011). If the modified loan re-defaults before the servicer has recouped the cost of the modification, then the modification is a money-loser for the servicer. Complicating the issue is the fact that non-bank servicers have less stringent regulatory and financial requirements than banks, and also face a different cost-benefit calculus than servicers affiliated with depository institutions due to their capital structures. Ocwen–the largest non-bank servicer–began aggressively modifying defaulted loans in 2008, including principal write-downs. By modifying the loans and bringing them out of delinquency, Ocwen was able to reduce its obligation to make servicing advances, which reduced the strains on its own liquidity (Levitin and Twomey, 2011).[12]

A third explanation for servicer heterogeneity may lie in individual servicer's institutional response to the foreclosure crisis. One option for a servicer is to implement a highly automated process of default management, which allows the servicer to keep the costs of managing delinquencies low. The practice of "robo-signing"–in which servicers employed individuals to sign foreclosure affidavits without reviewing the documents or following established notary practices and legal requirements– is emblematic of this push for automation and efficiency (Levitin and Twomey, 2011). In contrast, other servicers created loss mitigation units to work with distressed borrowers, often in concert with housing counselors or foreclosure prevention specialists. Servicers describe the renegotiation process as more "art than science" [13]; *ex ante*, it is difficult to know whether or not a modification will actually lead to a cure, or whether it merely postpones delinquency. In addition, a significant

[11] As Levitin and Twomey (2011) point out, servicers' compensation structures create significant principal-agent conflicts between them and the investors, to the detriment of delinquent borrowers who need a loan modification to prevent foreclosure.

[12] Despite Ocwen's modification efforts, it too has faced regulatory scrutiny for systematic misconduct in its servicing practices. See http://www.consumerfinance.gov/newsroom/cfpb-state-authorities-order-ocwen-to-provide-2-billion-in-relief-to-homeowners-for-servicing-wrongs/ for the CFPB consent order against Ocwen.

[13] Quoted in article: "It's more art than science," said Guy Cecala, publisher of Inside Mortgage Finance. "Who knows whether the borrower will default, what the value of the property is, what will happen to home values," he said. "I'm skeptical of all of it." Quoted in Andrews, A. and E. Witt, 2009. "The Secret Test that Ensures Lenders Win on Loan Mods," *ProPublica*, September 15, 2009. Available online http://www.propublica.org/article/the-secret-test-that-ensures-lenders-win-on-loan-mods-915.

percentage of loans self-cure, meaning that the servicer must also make a judgment as to whether the modification is really necessary for any individual borrower. The extent to which the servicer is willing to invest in staff and time to perfect this "art" may lead to different determinations about the benefits of offering a borrower a modification. In addition, the "science" of the loss mitigation process also matters; differences in modification rates may arise if servicers use different assumptions in calculating the NPV of a loan. While Treasury released an NPV model as part of HAMP and its efforts to streamline modifications (Holden et al., 2012), many servicers rely on internal models that may include different assumptions about the anticipated future value of properties, the relative costs of renting versus owning in a particular market (which may influence the likelihood that a borrower decides to strategically default), and the servicers ability to manage and resell REO properties (Moody's Investor Service, 2014).

All of these factors have material effects for a borrower who is seeking to obtain a loan modification and stay in their home. However, borrowers have very little control over the ownership or administration of their loan after origination; they cannot decide whether their loan will be securitized, who their servicer is (or will be, in case of a mortgage servicing right transfer), or what contractual provisions govern the servicing their loan (Levitin and Twomey, 2011). Consumer rights regarding loss mitigation are fairly narrow, and the process by which loss mitigation decisions are made are often opaque not only to the consumer, but also to the housing counselors working with borrowers to resolve their delinquencies.

All of this suggests that we need to develop a better understanding of servicer heterogeneity and the impact of servicing practices on loan cures and re-defaults. To date, the literature on servicers and servicing practices has been limited, in part due to lack of loan level performance data that identifies individual servicers. However, the studies that do exist have found significant heterogeneity across servicers in their propensity to modify loans. Agarwal et al. (2013), for example, document that following the rollout of HAMP, a few large servicers responded at half the rate of others, and find that the effect of HAMP was muted by these nonresponsive servicers. They show that HAMP would have led to approximately 70 percent more permanent modifications if all the loans by less active servicers were renegotiated at the same rate as their more active counterparts. They find similar heterogeneity in the rate of proprietary modifications offered across servicing entities.

Other studies similarly point to the importance of servicer heterogeneity in predicting the likelihood of receiving a loan modification. In earlier studies examining servicer behavior pre-HAMP, Agarwal et al. (2010, 2011) find that lenders and servicers pursue their own loss mitigation practices, and that servicer fixed effects explain at least as much variation in modification terms as do borrower characteristics. In a study of loan modifications in five Mid-Atlantic states and Washington, DC, Collins and Herbert (2009) also find evidence for servicer heterogeneity. In their analysis, five servicers account for 58 percent of all the modifications in Maryland, despite only representing 28 percent of 60-day delinquencies. Ding (2013) also finds significant heterogeneity across small and large servicers in their propensity to offer a modification. Using data from Corporate Trust Services (CTS), Ding examines loan modification activities from January 2010 to May 2011 in two different types of markets: four Rustbelt states (Michigan, Indiana, Illinois, and Ohio) and four sand states (California, Arizona, Florida, and Nevada). He finds that compared with those served by small servicers (the reference group), the relative odds of receiving a loan modification conditional on 60-day delinquency varied significantly by servicer: to provide just one example, the relative odds of loan modification were 436% higher for troubled loans in the hands of the "best" servicer, whereas the odds of modification were 60% lower for those serviced by the "worst".

However, very few of these studies focus on loan cures, and more specifically, on the role that servicers play in determining borrower outcomes. In this paper, we seek to address this gap by extending Ding's (2013) analysis of the CTS data and examine whether differences in servicer practices lead to different rates of loan cures (not just modifications), as well as the servicing practices that can shed light on differences in cure rates. In addition, we focus specifically on the experience of low-income and minority homebuyers. The lack of public data on individual loan modifications, coupled with the fact that most loan performance datasets do not include any information about the borrower with the exception of a FICO score, means that we still have a limited understanding of whether loan modifications help to prevent foreclosures, and for whom.[14]

[14]In early 2011, Treasury released the first loan level data on the HAMP program. However, 79 percent of active permanent modification records and 82 percent of trial modification records in the data file lack information identifying the race or ethnicity of the borrower. The handful of studies that do exist on loan modifications by borrower type have generally found no differences in the number or nature of loan modifications by race or ethnicity (Ambrose and Capone, 1996; Been et al., 2013; Chan et al., 2014; Collins and Reid, 2010; Mayer and Piven, 2012).

While differences in resolution practices among servicers are likely due to a set of complex and interrelated factors, understanding which loss mitigation practices are the most likely to contribute to loan cures, especially for historically underrepresented borrowers, can help to inform policies that seek to develop consistent and effective loss mitigation standards.

4. Data Description

This paper uses data downloaded from Corporate Trust Services (CTS), a service of Wells Fargo Bank, N.A. that provides information on a variety of investment vehicles administered by the bank.[15] The CTS data cover privately securitized, subprime and Alt-A mortgages for which Wells Fargo serves as the trustee, and includes mortgages with different interest rate structures, different purposes, different property types, and different lien statuses (Quercia and Ding, 2009; White, 2009*b*). The database includes loans originated as early as the 1980s and tracks performance until the loan is paid off or foreclosed upon, and includes over 4 million individual loans. Each monthly loan record contains the borrower's FICO credit score, loan-to-value (LTV) ratio at origination, the last 12 month's delinquency history, the property zip code, the type of loan, and the original and current balance of the loan.

In addition to detailed information on loan terms and performance, the CTS dataset also includes two important fields that make it relevant to our research question. First, the CTS reports include a modification indicator, which represents all permanent loan modifications, including both HAMP and proprietary modifications. The reports also have information about the loan balance, mortgage payment, and interest rate, both before and after modification, which enables us to identify whether the modification changes the total mortgage debt, interest rate, or mortgage payments for individual homeowners. We create additional variables to distinguish between different types of modifications. To assess the extent of payment relief, we calculate the percentage change in the interest rate (*Rate Change*), loan balance (*Balance Change*), and monthly payment (*Payment Change*) before and after modification. We also construct two dummy variables, *Rate Decreased* and *Balance Decreased* that

[15] These investor report files are available at www.ctslink.com.

equal one if the rate decreased or the balance decreased, respectively.[16] We further provide an interaction of the two variables to capture loans whose balance and interest rate both fell after modification, *Balance and Rate Decreased*. Third, we construct a continuous variable, *Months to Mod* that equals the number of months between the last 60-day delinquency and the modification. Finally, we determine if any of the loans have undergone a second modification (*Second Mod*) over the period of observation.

Second, the CTS data include loans from over 100 servicers across the country, allowing us to identify servicer heterogeneity in loan modification practices. To minimize the effect of servicer size or regional variations in our analysis, we focus solely on the 20 largest servicers in the CTS data, calculated as a measure of the number of loans serviced. Each of these servicers represent at least 3,000 loans in our sample, and geographically cover at least 20 states.[17] We also drop all loans for which the servicer changed, though this is a small subset in the data.[18] The top 20 servicers in our data cover both bank and non-bank servicers, and include 7 out of the 10 largest servicers in terms of market share in 2013. The largest servicer in our data handles over 13 million loans, while the smallest has approximately 70,000 loans in their portfolio (Moody's Investor Service, 2014).

The CTS dataset, however, does not include any information on the borrower other than their FICO score. To provide more detail on the impact of servicer practices on different demographic and socio-economic groups, we merge the CTS data with loan level Home Mortgage Disclosure Act (HMDA) data. The HMDA data provide information on the race and ethnicity of the borrower, their income, and the geographic location of the property securing the loan. To match the data, we sorted CTS and HMDA loans into the census tracts of the purchased property using a geographic crosswalk file, and then matched loan originations on the following variables: origination date, loan amount, lien status, and loan purpose. Only loans which provided for a direct match on these

[16] The data do not allow us to see whether the decline in the balance is related to principal forbearance or forgiveness.

[17] Collins and Urban (2014) found that state policies can influence servicer behavior; in Maryland, state level reporting requirements for state-chartered servicers led to both more modifications and foreclosure filings than those not subject to the state rules. For this reason, we were hesitant to include servicers operating only in one or two states.

[18] However, as we discuss in the conclusion, some of the servicers in our sample were acquired or transferred to other institutions over the observed time period, suggesting that the consolidation of the servicer industry is an important area of future research.

variables were included in the resulting sample (Ding, 2013; Ding et al., 2012).[19] We limited the matching to loans originated between 2004 and 2007, and garnered a 69.2 percent match rate.

The sample used in this paper consists of all first-lien mortgages for owner occupied, single family residences originated in 2004, 2005, and 2006 that were at least 60 days delinquent as of June 2009. We drop observations that went into bankruptcy during the panel, as well as loans which were prepaid in the first period of observation (June 2009). Loans with an original balance over $1 million are also removed, as they are arguably a different subset of loans.[20] The sample is thus a monthly panel of delinquent loans; we observe monthly changes from June 2009 through December 2012. Data on modifications from the Office of the Comptroller of the Currency shows that the volume of modifications peaked in early 2010 and then declined throughout 2011 and 2012, meaning that our sample captures the period during which the vast majority of modifications were made (Office of the Comptroller of the Currency, 2014).

One significant limitation of the CTS data is its coverage of the mortgage market, in particular, the lack of coverage of prime loans and loans held by banks in portfolio. Nevertheless, given that subprime mortgages account for more than half of all foreclosures, and that the vast majority of subprime loans that led to the crisis were privately securitized, this sample provides important insights into servicer practices for this mortgage market segment. Also, given the potential that modifications are more challenging among privately securitized loans (meaning loans not managed by Fannie Mae, Freddie Mac or Ginnie Mae), this sample is particularly relevant for policy-makers (Agarwal et al., 2011; Been et al., 2013; Piskorski, Seru and Vig, 2010). Finally, the national coverage of the CTS data and its inclusion of servicer information make it a unique source of data to study servicer heterogeneity. However, as we argue in the conclusion, additional research is needed to develop a better understanding of servicing practices across the entire mortgage market.

[19] The matching procedure was completed while one of the authors was working at the Federal Reserve Bank of San Francisco, providing access to the non-public HMDA data which includes origination date. CTS loans were matched to HMDA on site, and then all identifying HMDA variables (including loan number) were deleted from the matched record, resulting in a CTS data file with race/ethnicity and income attached to each loan record, but no ability to re-generate the origination date or link to the public HMDA file.

[20] This is less than 0.5 percent of observations.

4.1. Summary Statistics

In the first part of the analysis, we present a series of descriptive statistics that show the high degree of servicer heterogeneity in our data. In Table 1, we present summary statistics for each of the servicers in our sample, ranked by the percentage of delinquent loans that cure over our period of observation. A cure occurs when a loan goes from being delinquent or in foreclosure to "current".[21] The data show significant heterogeneity among even the 20 largest servicers - not only in the cure rates, but also in their propensity to offer a modification. We also provide information about the size of the mortgage servicing portfolio and servicer rating for each of the servicers from Moody's servicer rating reports (Moody's Investor Service, 2014). Large servicers are those with a servicing portfolio valued at over $1 trillion, medium are those with servicing portfolios valued at over $100 billion and less than $1 trillion, and small are those with a servicing portfolio valued at under $100 billion. The data also reflect a broad range of servicer quality as ranked by Moody's credit rating services, including servicers who scored an SQ1-, which represents strong combined servicing ability and stability, and SQ4, which is given to servicers with below average servicing ability and stability. Servicer size and rating is based on the most recent Moody's evaluation of their subprime residential mortgage servicing business, however, given the rapid changes in the mortgage servicing industry and the varied dates on which the ratings were developed, these ratings may not reflect the servicer's current status.

In Table 2, we aggregate these summary statistics into two buckets for ease of comparison: servicers with the "Worst" 5 cure rates (meaning the lowest) and the "Best" 5 cure rates (meaning the highest). Differences in servicer performance and practices are immediately apparent; the "Worst" 5 servicers have cure rates of close to 10 percent, whereas the "Best" 5 have cure rates near 38 percent. We also find that these two groups of servicers vary greatly in their propensity to modify a loan. Servicers with higher cure rates perform permanent modifications on almost 48 percent of their delinquent loans at some point in our time frame, while the group of 5 servicers with the lowest cure rates only granted modifications to 2 percent of delinquent borrowers. Conditional on granting a modification, high cure rate servicers are also more likely to reduce interest and

[21] In a later analysis, we look at the likelihood of re-default after cure.

principal, decrease interest rates by a greater amount, and modify a loan a second time after the initial modification. However, for both groups of servicers, average principal balance changes are modest, and we do not observe any differences in the number of months between the last 60-day delinquency and the granting of a modification between the two groups.

Table 2 also demonstrates that borrower characteristics do not differ substantially across these two groups of servicers. For example, the "Best" and "Worst" servicers are equally likely to service loans held by Black, Hispanic, and Asian borrowers. The servicers with higher cure rates actually tend to service loans held by borrowers with slightly lower incomes (though the lower cure rate servicers just have a higher variance), as well as borrowers with lower credit scores, and slightly lower initial balances (though these are not statistically different from one another at the 10 percent level). Thus, there does not appear to be clear selection into servicers with different cure rates by specific types of borrowers, despite the fact that servicers do not necessarily have the same representation of different demographic and socio-economic groups within their portfolio (Table 1).

Figure 1 shows the ranking of servicer by cure rates. In the analysis that follows, we retain this cure rate ranking to identify each of the servicers in the data. Servicer_1 has the lowest cure rate, whereas Servicer_{20} has the highest cure rate. The differences in outcomes across servicers is dramatic. Servicer_1 had less than 10 percent of their delinquent loans cure by December 2012, compared to nearly 40 percent for Servicer_{20}.

Figure 2 shows that foreclosure sale rates are equally dispersed across servicers, although interestingly they do not directly correlate with the cure rate rankings. There is a loose, inverse relationship between cure rates and foreclosure sale rates. Servicer_8 forecloses on the highest percentage of delinquent loans, over 60 percent, even though it had a cure rate close to the average (approximately 15 percent). Similarly, Servicer_{13} has the lowest foreclosure sale rate, right around 10 percent, and its cure rate of delinquent loans was near the average of approximately 22 percent. Servicer_1 had the lowest cure rate, but only an average foreclosure sale rate (just over 30 percent), and Servicer_{20} had the highest cure rate and a slightly below average foreclosure sale rate (just under 20 percent). Thus, there is not a direct tradeoff between cure rates and foreclosure sale rates, and there appears to be additional variation in servicer behavior than what can be explained away by borrowers who

cure.

In Figure 3, we see a direct correlation between servicer-level cure and modification rates. Servicers 1 through 8 have the lowest cure rates, and these servicers are also the least likely to modify delinquent loans. Among the bottom 8 performing servicers, none modified more than 10 percent of their delinquent loans, and many only modified 1-2 percent. In contrast, servicers 9 through 20 were much more likely to modify delinquent loans in their portfolio. Specifically, Servicer_{20} has the highest cure rate as well as the highest modification rate, modifying nearly 50 percent of delinquent loans. However, this correlation is again not perfect, with a few servicers modifying a higher percentage of loans but not seeing quite as high rates of loan cures.

Figures 4 and 5 present descriptive data on the modified loans in the sample to see if there is heterogeneity across servicers in the types of modifications they implement. In Figure 4, Servicer_{20}, with the highest modification and cure rates, offers the most modifications including both interest and principal forgiveness. Figure 4 also shows that the majority of modifications entail decreases in the interest rate; while there is some heterogeneity in the likelihood that servicers decrease the loan principal, overall servicers seem reluctant to give borrowers this form of relief. There does seem to be a correlation between the extent of relief a servicer is willing to provide; in general, servicers with a greater propensity to offer lower interest rates were also more likely reduce the balance on the loan, with Servicer_{18} being an exception to the pattern. Figure 5 shows that Servicer_{18} is also an outlier in the amount of relief it grants borrowers; this servicer makes smaller reductions in the interest rates than other servicers post modification, yet still sees higher than average cure rates. Figure 5 further outlines that it is not uncommon for servicers to increase loan balances when they decrease the interest rates in a modification package. On average, modified loans experience an increase in their loan balance, suggesting that many servicers add payments onto the unpaid principal of the loan.

While these descriptive statistics paint a picture of significant servicer heterogeneity, it is not clear to what extent differences in the loan portfolio are driving these differences. As discussed above, the decision to grant a loan modification is shaped by factors such as the NPV of the loan, as well as the servicers' determination of the likelihood that the borrower will re-default after modification.

Differences in servicer loan modification and cure rates may be driven in part by the characteristics of the loans in the portfolio, including local housing market dynamic, borrower FICO score, and original mortgage terms. In the next section, we examine the question of servicer heterogeneity in a multivariate framework to assess whether we continue to observe differences in servicer practices and outcomes after controlling for borrower, loan, and market characteristics.

5. Analysis

In our empirical analysis, we explore four key questions. First, we examine the extent to which servicer heterogeneity exists in loan cures, after controlling for borrower, loan, and market characteristics. Second, we analyze servicer heterogeneity in the likelihood of modifying a loan, and contingent upon modification, assess whether servicers differ in the amount of relief they provide. Third, we review the effect of different kinds of modifications on loan cures. Fourth, we present analysis on the differences in behavior between bank and non-bank servicers, and how their respective servicing practices have evolved over time. Each of these questions is examined with the specific models described in more detail below.

5.1. Loan Cure Rates

For the first question, we chose to use a duration model to assess the relationship between servicer effects and loan cure rates, which allows us to account for the speed of cures based on the servicer. Specifically, we estimate Equation 1, where $Y_{i,s,t,j}$ alternatively equals one if loan i in state s held by servicer j, cures in month by year combination t and zero otherwise. Servicer_j equals one if the loan is serviced by Servicer_j and zero otherwise. These servicer fixed effects allow us to pick up on any heterogeneity across servicers in cure rates. We select Servicer_{11} as the excluded servicer since it has the average cure rate as demonstrated by Figure 1. This way, coefficients $\beta_1 - \beta 19$ represent the comparison of each servicer to the cure rate of the average servicer, as measured by descriptive statistics.

$$logit[\lambda(Y_{i,s,t,j})] = \alpha_0 + \sum_{j=1}^{10} \beta_j \text{ Servicer}_j + \sum_{j=12}^{20} \beta_j \text{ Servicer}_j + \boldsymbol{\gamma X_i} + \delta \text{ HPI}_{i,t} + \eta_s + \kappa_t + \epsilon_{i,s,t,j} \quad (1)$$

The vector $\boldsymbol{X_i}$ includes borrower and loan-level characteristics at the time of origination. These include: FICO score, number of months delinquent in the first period of observation, ln(original balance), race dummies, ln(income), a no documentation dummy, a refinance dummy (vs. new purchase), a prepayment penalty dummy, and an adjustable rate mortgage (ARM) indicator. We also develop a measure to capture the strength of the housing market for each loan based on Zillow's monthly zip-code level house price index. We use the change in prices between the loan origination month and the current month as a measure of local house price change and its effect on the equity position of the borrower. This variable, $\text{HPI}_{i,t}$, has the advantage of not relying on a given average price measure at a particular time period but focuses instead on relative prices, and allows us to assess whether a borrower is underwater on their mortgage. We also include state-leve fixed effects, η_s, to control for any state-level variation in policies or legislative procedures that might influence servicer practices, such as judicial vs. non-judicial foreclosure states. Finally, we include origination year dummies κ_t to control for any differences in the environment in which the loan was initiated, especially the extent to which origination period may be correlated with selection into servicers.

We run this model six times; first, we present results for the entire sample of loans, and include controls for borrower race and ethnicity as well as income. We then stratify the sample into five separate buckets - four representing the major racial and ethnic groups in our data, and one focusing specifically on low-income households. We coded the race and ethnicity variables in the HMDA data as "Black\African American," "Hispanic\Latino," and "Asian\Hawaiian\Pacific Islander,"[22] and "Non-Hispanic white." Low-income households are designated as those borrowers with an income of less than 80 percent of their area median at origination. To test for robustness and to see if results would change with a different model specification, we also ran a series of linear

[22]This category also includes small percentage of Native American and other races.

probability models (LPM), and added month by year fixed effects to account for any differences in the probability of curing or foreclosing in a given time period. These results provide comparable findings to those of the duration model in Equation 1, so we present only the hazard in this article for simplicity of exposition.[23]

Table 3 presents the results from Equation 1, where we show the hazard rates on the likelihood that a loan cures for each of the servicers in our sample. Again, Servicer_{11}, the average cure rate, is the excluded group. Servicer_1- Servicer_{20} are ranked based on their cure rates, where 1 is the lowest (less than 10 percent of delinquent loans cured) and 20 is the highest (just under 40 percent of delinquent loans cured). Column (1) reports results for the full sample. Interestingly, once we control for a wide range of borrower, loan, and market characteristics, there is no longer a monotonic relationship between a servicer's ranking and their loan cure rates. While in the descriptive statistics, Servicer_1- Servicer_{10} all had lower cure rates than Sericer_{11}, in the model, only Servicer_5 and Servicer_{17} have hazard rates under 1, meaning that these have lower probabilities of curing than Servicer_{11}. The remaining servicers, after controlling for other factors that may be correlated with servicer practices as well as cure rates, actually are more likely to cure than Servicer_{11}. In addition, the model highlights the degree of heterogeneity across servicers in their cure rates; some servicers are more than 2.5 times as likely to cure than our excluded servicer. These results cannot be explained away by any observable controls or fixed effects.

In Columns (2)-(5) of Table 3, we replicate the analysis in Column (1) but we split the sample by the race of the borrower as identified in the HMDA data. Note that some servicers do not hold enough minority loans to identify servicer effects in cure rates for these subsamples (e.g. Servicer_{12} and Servicer_{16} for African Americans and Servicer_6 for Asian borrowers), so the coefficients in the table are left blank. Again, the variation in cure rates across servicers is striking, and some servicers appear to perform much better for minorities than others. Servicer_6, for example, while falling below average in descriptive cure rates, is significantly more likely to cure a loan held by an African American borrower, while Servicer_{17} performs worse than average after adding in controls. With the exception of the Asian subsample in Column (4), only Servicer_5 and Servicer_{17} have a

[23]The LPM models are available from the authors upon request.

lower propensity to cure than Servicer_{11}. However, consistent with studies that have examined the incidence of modification by race and ethnicity (Been et al., 2013; Chan et al., 2014; Collins and Reid, 2010), we do not find that cure rates within a servicer are significantly higher for white borrowers than for African American or Latino borrowers. In other words, while there are different outcomes for borrowers across servicers, for the most part, cure rates within servicers are consistent across racial and ethnic demographic groups. Column (6) of Table 3 shows the results for low income borrowers, finding heterogeneity across servicers in terms of cures, but to a lesser extent than in the racial and ethnic stratifications. While we cannot explain the reason for this heterogeneity with the CTS data, the analysis here suggests that descriptive statistics that rank servicers based on their loan cure rates, without considering the characteristics of the loans that they are servicing, may not be the best measure of servicer performance.

5.2. Modifications

We next seek to understand how servicers vary in their choice to grant modifications to borrowers, and what types of modifications they are willing to undertake. We estimate Equation 2 (a modified version of Equation 1 using a linear probability model. In addition to all the control variables included in the previous model, in this specification we also include $\lambda_{m,y}$, month by year fixed effects.[24] The dependent variable is whether a delinquent loan was modified at some point between June 2009 and December 2012.

$$\begin{aligned} Y_{i,s,t,j} = \alpha_0 + \sum_{j=1}^{10} \beta_j \text{ Servicer}_j + \sum_{j=12}^{20} \beta_j \text{ Servicer}_j \\ + \boldsymbol{\gamma X_i} + \delta \text{ HPI}_{i,t} + \eta_s + \kappa_t + \lambda_{m,y} + \epsilon_{i,s,t,j} \end{aligned} \tag{2}$$

Table 4 represents the results from estimating Equation 2, where we continue to use Servicer_{11} (Servicer_{11} has the average modification rate, near 20 percent) as the excluded servicer. In comparison to the hazard model, the interpretation of these coefficients depend on the sign - a negative

[24] We obtain comparable results if we model this as a hazard similar to Equation 1.

coefficient means that a servicer is less likely than Servicer_{11} to grant a modification, and a positive coefficient means that the servicer is more likely to do so. Again, we find that analyzing modification rates in a regression framework is important for tracking servicer behavior. We find that only Servicer_6 is less likely to perform modifications than the excluded servicer, suggesting that Servicer_{11} takes a "hands off" approach to delinquent loans. Further, consistent with previous studies (Agarwal et al., 2013; Collins and Herbert, 2009; Ding, 2013), we find that even after controlling for a wide range of factors, there is a substantial degree of variation in servicers' willingness to provide modifications.

This heterogeneity across servicers continues to exist for the race-based subsamples. To provide just one example, for African American borrowers, working with Servicer_4 increases the likelihood of receiving a modification by 46 percent in comparison to those working with Servicer_{11}. In contrast, Latinos are more likely to receive a modification if their loan is being serviced by Servicer_8 or Servicer_{12}. For Asian borrowers, there is less significant variation across servicers in the propensity to offer a modification. As with cures, we also do not find evidence that there are systemically different modification rates for African American, Latino or Asian borrowers within the same servicer. On average, if a servicer is more likely to grant a modification, they are more likely to do so for all borrowers. Servicer heterogeneity is also less pronounced with low-income borrowers, suggesting that there are perhaps more systematic ways to decide whether or not to provide modifications for these borrowers, such as the HAMP income guidelines.

In Table 5, we present the results from an analysis of the types of modification that different servicers are willing to grant. Here, we restrict the analysis to loans that were modified, and observe the loan changes cross-sectionally at the time of modification. We use the six variables discussed in the data section to determine if some servicers vary in the types of modifications they offer, conditional on observable characteristics. Specifically, we estimate a modified version of Equation 2, where we remove month by year fixed effects, and revise $\text{HPI}_{i,t}$ to be the change in house prices from origination to the first period of modification. We remove Servicers 1, 8, and 17 since these did not perform enough modifications to evaluate the distribution of renegotiated terms. Servicer_{11} remains the omitted category.

Even among servicers who are willing to extend relief, we find considerable heterogeneity in the types of relief that they provide. Columns (1) and (2) of Table 5 look at servicers' decisions to decrease the principal balance and interest rate, respectively. Specifically, we find a divide between servicers in their inclination to provide interest versus principal reductions. For example, while Servicer_{15} is more likely to do both interest rate and principal balance reductions than Servicer_{11}, Servicer_{18} is more likely to give an interest rate reduction, but less likely to do a modification that entails a decrease in the loan balance. When we look at the amount of relief provided, Column (3) - (4), we similarly find significant heterogeneity in the percent by which servicers reduce the balance or interest rate, even after controlling for loan characteristics and borrower income. For example, in Column (3) of Table 5, we find that five servicers (2, 4, 6, 13, and 14) reduced borrowers' interest rates by less than Servicer_{11} as part of a modification, while five servicers (10, 12, 15, 16, and 18) provided borrowers with more relief. The remainder of servicers were not statistically different from one another in the amount by which they reduced interest rates pre- and post-modification. Column (4) reports that 6 servicers lowered loan balances by more than Servicer_{11}, while 2 increased the balance after modification by more; however, the magnitude of differences across servicers are small. Overall, evidence for significant decreases in loan principal across servicers is slight. In Column (5), we present the analysis for changes in monthly payment before and after modification, where 10 servicers differed from Servicer_{11} (and each other), with eight decreasing payments by more than Servicer_{11}. The continued presence of strong heterogeneity across interest rate and payment changes is interesting given the presence of HAMP, which provides clear modification guidelines and should in theory be nudging all servicers, when they do a modification, to offer a modification aligned with the HAMP benchmarks.

The final column of Table 5 shows that a handful of servicers appear to be more willing to extend a second modification than Servicer_{11}. Interestingly, despite having the strongest cure rates in the descriptive statistics, Servicer_{20} does not appear to be more aggressive in terms of its willingness to work with borrowers after controlling for a wide range of characteristics. In contrast, Servicer_{18} and Servicer_{19} do seem to rise to the top in the extent of the relief they provide; however, neither places as much emphasis on reducing the loan balance, focusing instead on reducing payments.

5.3. The Impact of Modifications on Borrower Outcomes

Our third question is whether servicer heterogeneity in modifications leads to different outcomes for borrowers. Focusing on the universe of modified loans, we examine whether the terms of the modification influence the likelihood of re-default 12 months after modification. We include all of the controls from Table 5 except for the servicer dummies.

Table 6 reports the results for re-default after modification. First, we look at rate and balance decreases expressed as dummy variables, disregarding the amount of the relief. In Columns (1)-(2), we find that a modification that lowers the interest rate decreases the likelihood of re-default by approximately 10 percent. While balance decreases on their own appear to have no statistically significant effect on re-default rates, Column (2) includes an interaction term that captures loans where both balances and interest rates were decreased. We find that decreasing the current balance of the loan after modification actually increases the probability of re-default by 12 percent, when done in a vacuum. However, performing both a balance decrease and an interest rate decrease (the additive effect of the three coefficients reported) wipes out the effect of just reducing balances on their own and ends up having a comparable effect to reducing the interest rate.

In Columns (3) - (4), we examine the effects of the percentage change in the interest rate or loan balance associated with a modification. We find that a 10 percent increase in the borrower's interest rate increases re-default by 2.8 percent.[25] Column (4) reports that a 10 percent increase in loan balance post modification results in a decrease in re-default by 0.5 percent. While this may seem counter-intuitive, the effect is small in magnitude. In addition, the analysis reveals the importance of looking at the totality of a modification, given the relationship between interest rate and loan balance on payment terms. Borrowers who see their balance increase by more likely received larger interest rate reductions, thereby increasing the affordability of the loan even if the amount owed is increased over the long-term. Indeed, the importance of affordability in predicting the success of a modification is shown in Column (5), where we find that a 10 percent decrease in a borrower's monthly payment decreases the probability of default by approximately 3.5 percent.

[25]Or, alternatively, reducing the interest rate by 10 percent (i.e. an interest rate moving from 10 percent before modification to 9 percent after modification) reduces the likelihood of re-default by approximately 2.8 percent.

Because servicers' modification decisions, as well as the likelihood of re-default, may be shaped by state foreclosure laws as well as expectations about the strength of the housing market, we re-ran the models testing the relationship between different types of modifications and loan re-default rates separately for two states: California and Florida. The results of this analysis are presented in Table 7. In both states, we find that reductions in the monthly payments significantly reduce the re-default rate; a 10 percent decrease in a borrower's monthly payments after modification reduces the likelihood of re-default by 4.3 percent in Florida and 3.3 percent in California. However, we find that in Florida, a decrease in the loan balance, as well as a larger percentage reduction in the amount owed, reduces the likelihood of re-default. In California, the findings are reversed. The different findings across these two states suggests that additional research is needed to understand the complex interplay between the different potential aspects of loan modifications and re-default rates.

5.4. Differences between Bank and Non-Bank Servicers

The analysis thus far has revealed significant heterogeneity across servicers in terms of both modifications and borrower outcomes. The final question we explore is whether these differences can in part be explained by the nature of the servicers themselves, and specifically whether a servicer is a "bank" or "non-bank" servicer. As discussed earlier, the foreclosure crisis has resulted in the growth of a non-bank servicing sector specializing in distressed loans. These non-bank servicers have different capital structures than bank servicers, and may have different incentives to undertake modifications. To explore whether there are differences in loan cure rates and modifications between bank and non-bank servicers, we grouped the 20 servicers in our sample into a simple binary category that distinguishes servicers by type. Non-bank servicers are given a value of 1, and include servicers that specialize in managing distressed loan portfolios. (While the servicing industry is far from transparent, we identified non-bank servicers through news articles in trade publications including Inside Mortgage Finance, Bloomberg News, and National Mortgage News.) Bank servicers are given a value of 0. We replicate the models presented in Table 3 and 5 above, including all control variables but replacing the servicer dummies with one simple dummy for non-bank servicer. In Table 8, we present the coefficient for the non-bank servicer dummy for each of

the models.

In Column (1), we model the likelihood that a loan cures, and find that loans serviced by non-bank servicers are significantly more likely to cure, although the difference in performance between bank and non-bank servicers has become smaller over time. Although we do not present the results in the table, we also find that all other things being equal, having their loan serviced by a non-bank servicer increases the likelihood of cure for African American and Latino borrowers by approximately 40 percent and 36 percent respectively. In Columns (2) - (7), we present the coefficient of a linear probability model estimating various loan modification outcomes, stratifying the sample by the year modified. Interestingly, the models do reveal changes in servicer practices over time. In 2009, loan modifications undertaken by non-bank servicers involved greater reductions in both interest rates and monthly payments, although there were no significant differences in the likelihood or amount of principal reduction across the servicer types. By 2011, however, bank servicers were actually more likely to decrease the interest rate on a modification, as well as offer a more significant discount on the interest rate. While we cannot directly measure this, it is possible that HAMP and its clear guidelines shifted servicing practices in the broader market, leading even servicers that do not specialize in distressed loans to offer clear interest rate reductions. In contrast, the non-bank servicers in our data clearly shifted more of their focus to offering balance reductions- they were more likely to decrease the loan balance than bank servicers, as well as reduce a greater amount of the remaining loan balance, with the difference between bank and non-bank servicers increasing over time. Interestingly, in 2010 and 2011, non-bank servicers were also significantly more likely to offer borrowers a second modification.

6. Conclusion

In an article published before the subprime crisis, Michael LaCour-Little (2000) cites a quotation by Mozilo, then the Chief Executive Officer of Countrywide, as saying "There are really only two important people in the mortgage process: the borrower and the investor. Everyone else, including lenders, are just friction." In this paper, we have shown that the "friction" of mortgage servicing significantly shapes outcomes for delinquent borrowers. We find that the "Worst" 5 servicers have

cure rates of close to 10 percent, whereas the "Best" 5 have cure rates near 38 percent. These differences across servicers are not explained away by borrower, loan, or market characteristics; indeed, across the models, the recurring theme is that there are persistent differences across servicers in all forms of relief and borrower outcomes. With respect to borrowers of color, while we find significant cross-servicer heterogeneity in outcomes (as we do for the sample as a whole), it does not appear from this analysis that within their own servicing portfolio, individual servicers treat African American, Latino or Asian borrowers differently from their white counterparts. Once we account for borrower, loan, and market characteristics, the 'rank order' of servicer cure rates based on descriptive calculations largely disappears. Given the fact that loan terms as well as borrower FICO and/or income, and housing market conditions, are important contributors to default, accounting for the composition of a servicers' portfolio is critical to understanding the efficacy of their loss mitigation practices.

A second important finding in this paper is that despite federal efforts to streamline modifications, there remain significant differences in both the scale and depth of modification efforts undertaken by the servicers in our sample. We find that servicers vary greatly in their propensity to modify a loan. Servicers with higher cure rates perform permanent modifications on almost 48 percent of their delinquent loans, while servicers with the lowest cure rates only granted modifications to 2 percent of delinquent borrowers over the course of our study period. In addition, even with HAMP affordability guidelines, servicers vary significantly in their propensity to offer a modification that decreases the loan's interest rate or principal, as well as in the amount of relief they offer. We also find that there is a strong correlation between the granting of a modification and loan cures; in particular, loan modifications that address borrowers' affordability constraints significantly reduce the likelihood of re-default one year after modification. Contrary to some other studies, we try and tease out the interplay between interest rate and principal balance modifications. We find that interest rate decreases—which focus on the affordability of monthly payments—reduce re-default one year after modification by about 10 percent, however, when coupled with principal reductions—which focus on equity position—the effect is even stronger. We find less of an effect of principal decreases on their own, possibly due to the fact that a principal reduction that does not address short-term affordability constraints may not help the borrower keep their home.

Third, we find that there are significant differences between bank and non-bank servicers in cure rates and loan modification terms, even after controlling for borrower, loan, and market characteristics. Overall, non-bank servicers are more likely to have loans in their portfolio cure, and they are also more likely to offer modifications with principal decreases as well as second modifications. However, over time, bank servicers have increased their propensity to offer interest rate reductions and greater payment reductions, perhaps due to the effect of HAMP and other legal actions (such as the National Mortgage Settlement).

This paper makes an important, initial contribution to understanding variation in servicer practices. While it is still possible that these differences are due to undisclosed private information that servicers have about borrower creditworthiness, the wide range of controls in our models mean that servicer heterogeneity cannot be explained by observed differences in the risk profile of borrowers, the mix of loans being served, or variations in the market. This variation has important implications for public policy, especially given the fact that borrowers have very little control over their loan after it is originated; they cannot decide whether their loan will be securitized, who their servicer is (or will be, in case of a mortgage servicing right transfer), or what contractual provisions govern the servicing their loan (Levitin and Twomey, 2011). In addition, the findings in this paper suggest that voluntary programs such as HAMP are insufficient to ensure consistent practices across servicers. The CFPB recently issued servicer rules which include improvements in borrower communication and disclosure, specific obligations to respond to borrower requests for information within specified timeframes, rules related to early intervention with delinquent borrowers and a single point of contact, and a prohibition on 'dual tracking.'[26] Future research should seek to assess whether these new rules reduce servicer heterogeneity and improve outcomes for delinquent borrowers.

Despite its contributions, this research is also limited in several important ways, and there is significant need for additional research that can help to explain why these differences across servicers persist. While the CTS data are one of the few that reveal information about the servicer, there are some limitations to the data that need to be kept in mind. First, the data represent only

[26]Effective January 2014, the CFPB's Mortgage Servicing Rules, 12 C.F.R. §§1026 & 1024, is a collection of nine separate rules, exceeding 1,100 pages.

one mortgage market segment - privately securitized subprime and Alt-A loans. More research is needed to understand modification practices among loans held in portfolio as well as those held by Fannie Mae and Freddie Mac. Second, we are unable to identify whether loan balance decreases are due to principal forbearance or principal forgiveness. Given that we might expect differences in re-default rates across these two types of relief, additional research into the effectiveness of forbearance versus forgiveness is critically important to understanding which types of loan modifications produce the best outcomes. Third, the CTS data do not allow us to identify principal forgiveness on second liens. Anecdotal evidence suggests that many banks have forgiven second liens as part of their relief packages under the National Mortgage Settlement, so we are likely underestimating the impact of balance relief on loan outcomes. Fourth, the rapid changes and consolidation in the mortgage servicing industry are not captured in these data; more research is needed to understand the impacts on borrowers when servicing companies are bought by other institutions or as servicing rights are transferred from bank to non-bank servicers. Finally, the CTS data can not reveal the"art" of mortgage servicing, or illuminate how institutional factors are driving observed differences across servicers. Research that can provide insights into servicers' proprietary NPV models, their institutional strengths and constraints, and their capital structures is needed to help explain variations in servicer modification practices and their impact on both borrowers and investors.

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8. Tables and Figures

Table 1: Summary Statistics by Servicer Ranked by Cure Rate

Servicer	Value of Servicing Portfolio	Servicer Rating	Loans	Cure	Modification	Black	Hispanic	Asian	Income	FICO
1	Large	SQ2-	42,350	0.083	0.0088	0.086	0.363	0.072	122,346	672
2	Small	SQ3	44,230	0.103	0.0055	0.225	0.298	0.044	96,432	626
3	Small	SQ4	47,657	0.115	0.0330	0.157	0.296	0.044	90,046	631
4	NA	NA	15,808	0.121	0.0721	0.120	0.224	0.048	105,105	640
5	Small	SQ3+	7,449	0.122	0.0158	0.131	0.343	0.044	97,343	641
6	Medium	SQ3+	11,504	0.146	0.0017	0.062	0.265	0.114	142,449	729
7	Small	SQ2	8,927	0.149	0.0222	0.156	0.225	0.037	74,280	637
8	Small	SQ2+	10,393	0.157	0.0174	0.190	0.297	0.039	85,540	614
9	NA	NA	77,086	0.160	0.2138	0.215	0.297	0.044	99,603	612
10	Small	SQ2	4,294	0.207	0.1986	0.091	0.264	0.051	136,671	690
11	Large	SQ2-	55,457	0.225	0.2221	0.172	0.335	0.055	101,659	636
12	Medium	NA	5,923	0.229	0.2018	0.093	0.330	0.042	169,146	674
13	Small	SQ1-	70,925	0.236	0.2708	0.121	0.396	0.079	130,885	678
14	NA	NA	3,351	0.246	0.2358	0.096	0.271	0.011	128,244	672
15	Large	SQ2+	345,369	0.262	0.3656	0.214	0.283	0.036	90,938	563
16	Small	NA	6,573	0.303	0.2891	0.074	0.357	0.115	134,585	696
17	Small	SQ2	19,292	0.357	0.4510	0.235	0.296	0.011	80,411	599
18	NA	NA	13,635	0.368	0.3260	0.086	0.328	0.071	116,340	682
19	Medium	SQ3	4,490	0.368	0.4327	0.048	0.506	0.055	126,885	687
20	Medium	SQ2-	105,457	0.393	0.5154	0.198	0.268	0.031	82,942	563

Notes: Servicers numbered based on cure rate, from lowest to highest. Cure rate, modification rate, Black, Hispanic, Asian, income, and FICO are each means at the servicer level. Number of loans are the total for each servicer in the CTS sample. Servicer size and rating is based on the most recent Moody's evaluation of their subprime residential mortgage servicing business. Large servicers are those with a servicing portfolio valued at over $1 trillion, medium are those with servicing portfolios valued at over $100 billion and less than $1 trillion, and small are those with a servicing portfolio valued at under $100 billion. NA means no Moody's data were available for that servicer in our sample.

Table 2: Summary Statistics by Best 5 and Worst 5 Servicers in terms of Cure Rates

	Worst 5 Cure Rates		Best 5 Cure Rates		Total	
	mean	sd	mean	sd	mean	sd
Cure rate	.104	.305	.381	.486	.236	.425
Loan Modified	.022	.147	.475	.499	.239	.426
Balance Decreased	.002	.049	.089	.284	.044	.204
Interest Rate Decreased	.015	.121	.423	.494	.210	.407
Interest Rate Change (%)	-.364	.225	-.425	.263	-.421	.261
Balance Change (%)	-.025	.359	-.007	.314	-.009	.315
Months to Mod	9.5	2.4	10.2	1.7	10.1	1.8
Second Mod	.0191	.135	.254	.435	.242	.429
Black	.152	.359	.179	.384	.165	.371
Hispanic	.310	.463	.294	.456	.303	.459
Asian	.052	.222	.037	.189	.045	.207
Income	102,390	116,167	89,337	73,969	96,151	98,502
FICO Score	639	65	593	82	617	77
Original Balance	276,630	172,429	247,414	149,763	262,663	162,645

Notes: Balance Decreased, Interest Rate Decreased, Interest Rate Change, Balance Change, and Months to Mod are all conditional on modification. Months to Mod is the time between the last 60-day delinquency and modification.

Figure 1: Cure Rate

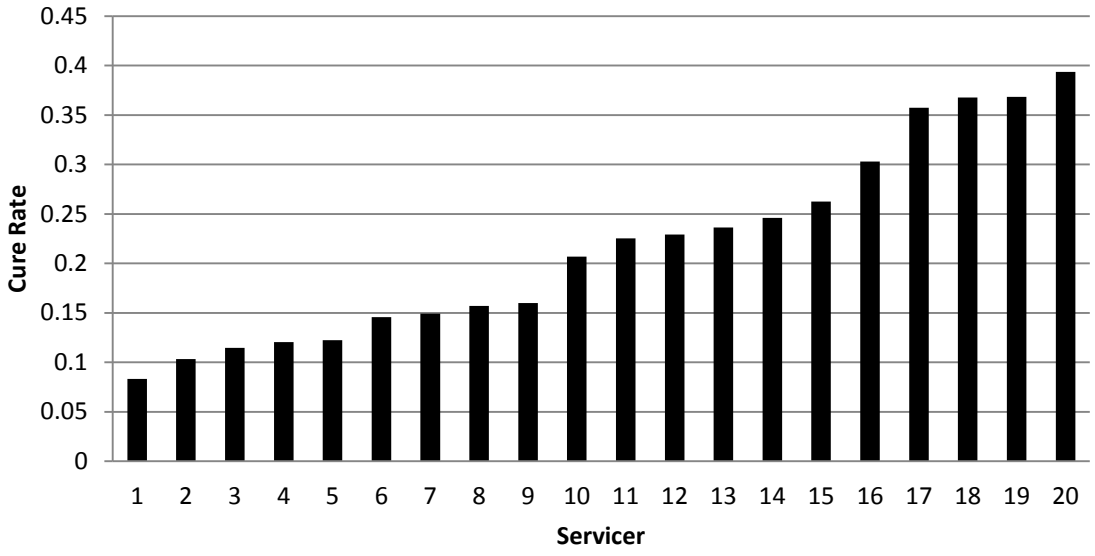


Figure 2: Foreclosure Sale Rate

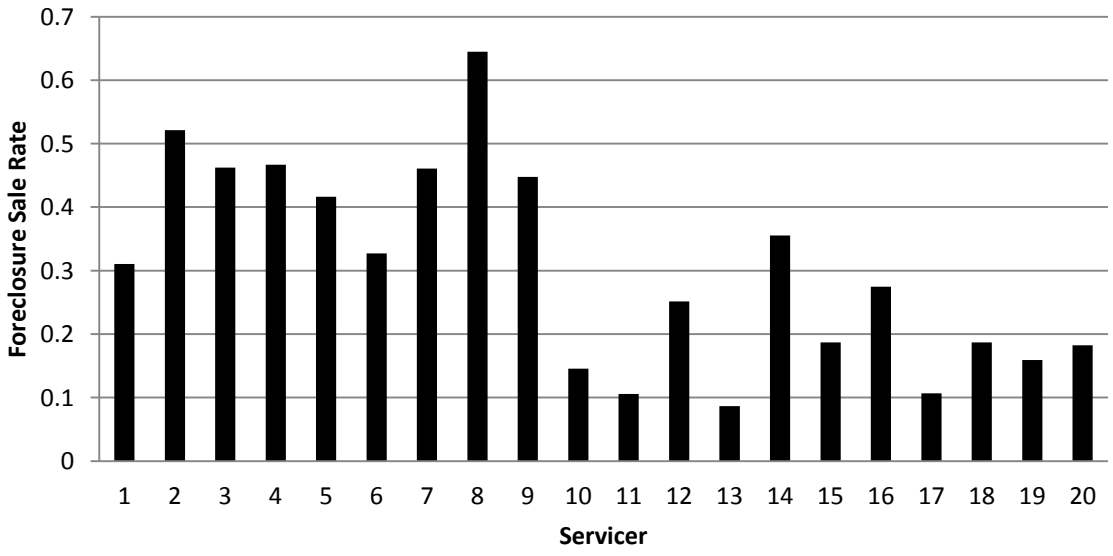


Figure 3: Servicer Mod Rate

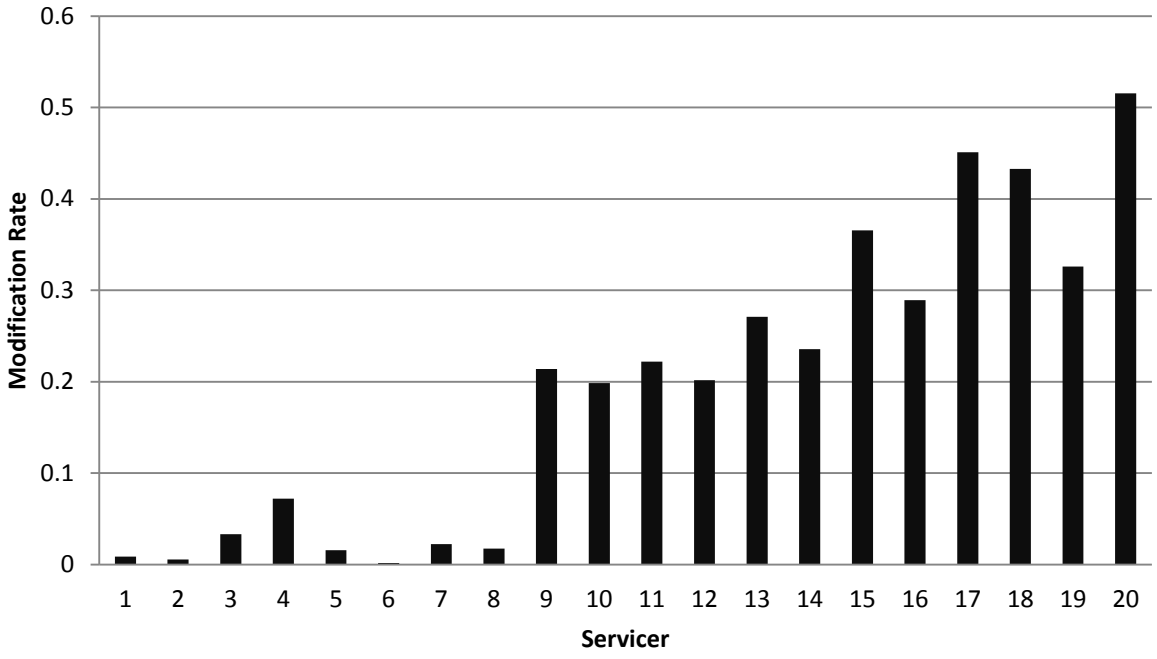
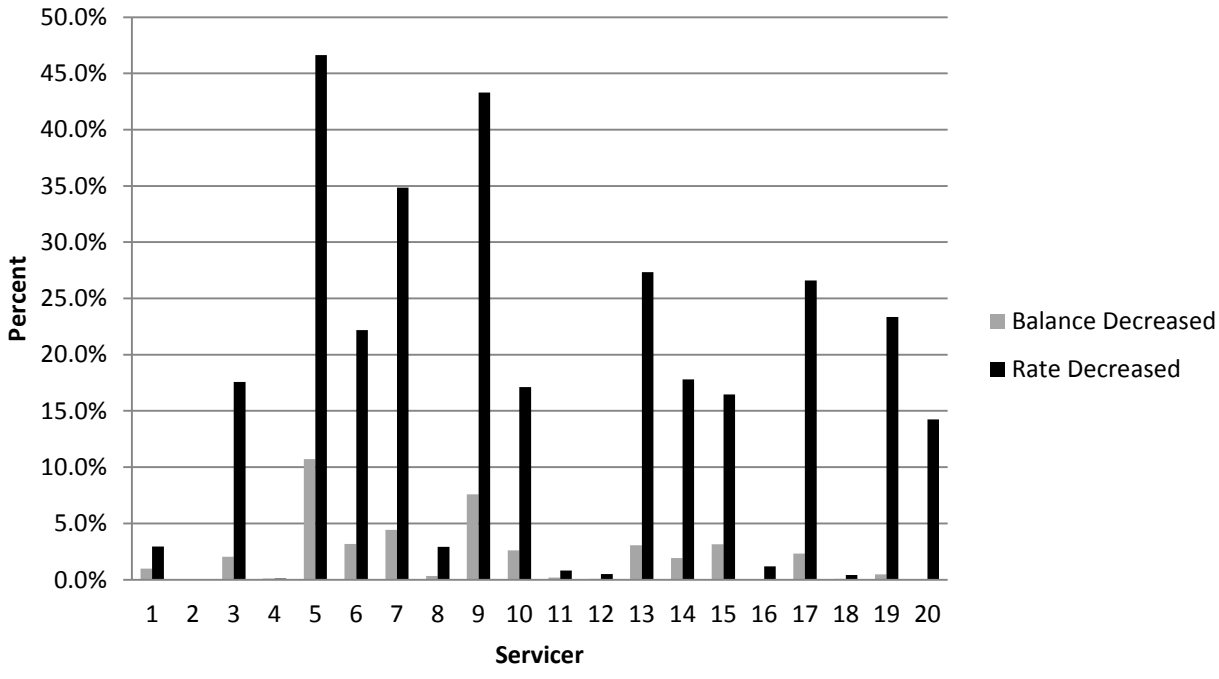


Figure 4: Balance and Rate Decrease Post modification



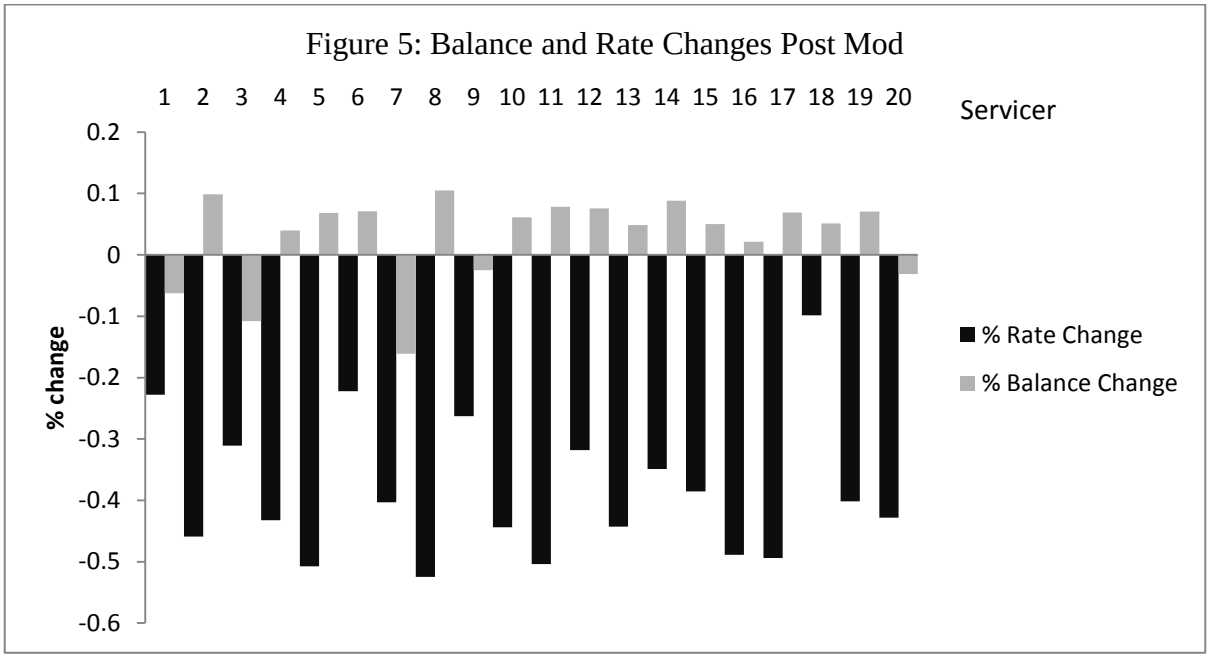


Figure 5: Balance and Rate Changes Post Mod
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Servicer
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
% change
% Rate Change
% Balance Change

Table 3: Hazard: Servicer Heterogeneity Exists in Cure Rates

	Dependent Variable =1 if loan was cured					
	Full Sample	Black	Hispanic	Asian	White	Low Income
	(1)	(2)	(3)	(4)	(5)	(6)
Servicer 1	1.207**	1.577*	0.934	1.669*	1.328**	0.519
	(0.101)	(0.398)	(0.152)	(0.471)	(0.153)	(0.256)
Servicer 2	1.185**	1.463	0.974	1.772*	1.320**	0.914
	(0.0942)	(0.372)	(0.150)	(0.528)	(0.148)	(0.442)
Servicer 3	1.959***	1.817**	1.991***	6.262***	1.840***	1.906
	(0.179)	(0.437)	(0.365)	(2.082)	(0.226)	(0.814)
Servicer 4	1.468***	1.422	1.518**	1.830*	1.512**	4.205***
	(0.145)	(0.563)	(0.264)	(0.621)	(0.249)	(1.289)
Servicer 5	0.800***	0.586**	0.740*	1.429	0.819*	0.658
	(0.0654)	(0.129)	(0.122)	(0.426)	(0.0935)	(0.195)
Servicer 6	1.009	4.815***	0.619		0.973	1.219
	(0.222)	(1.311)	(0.358)		(0.241)	(0.706)
Servicer 7	2.647***	2.182***	2.595***	6.185***	2.766***	1.982**
	(0.259)	(0.578)	(0.508)	(2.236)	(0.370)	(0.593)
Servicer 8	1.534***	1.211	1.789***	4.649***	1.388**	2.203*
	(0.168)	(0.330)	(0.340)	(1.641)	(0.225)	(1.015)
Servicer 9	1.728***	1.909***	1.633***	2.687***	1.722***	1.058
	(0.157)	(0.408)	(0.286)	(1.000)	(0.227)	(0.459)
Servicer 10	1.143	1.468	0.648	1.999	1.520**	0.422
	(0.159)	(0.480)	(0.178)	(0.922)	(0.274)	(0.323)
Servicer 12	1.077		1.988	0.991	1.188	1.116
	(0.218)		(0.931)	(0.600)	(0.268)	(0.385)
Servicer 13	1.790***	1.934***	1.809***	2.672***	1.720***	1.664**
	(0.135)	(0.361)	(0.275)	(0.802)	(0.180)	(0.416)
Servicer 14	1.267***	1.012	1.369*	2.402**	1.255*	0.882
	(0.106)	(0.197)	(0.230)	(0.915)	(0.149)	(0.234)
Servicer 15	1.306***	1.190	1.258	2.749***	1.311***	1.161
	(0.0936)	(0.213)	(0.183)	(0.781)	(0.129)	(0.267)
Servicer 16	1.248		2.294***	1.290	1.321*	
	(0.287)		(0.345)	(0.370)	(0.195)	
Servicer 17	0.621***	0.570***	0.543***	0.968	0.653***	0.420***
	(0.0488)	(0.115)	(0.0857)	(0.302)	(0.0713)	(0.131)
Servicer 18	1.640***	1.357	1.496**	3.334***	1.787***	1.326
	(0.141)	(0.311)	(0.250)	(1.120)	(0.213)	(0.370)
Servicer 19	2.732***	2.818***	2.516***	5.621***	2.624***	2.053**
	(0.237)	(0.569)	(0.461)	(1.986)	(0.314)	(0.623)
Servicer 20	1.658***	1.324	1.694***	2.527***	1.718***	1.392
	(0.130)	(0.251)	(0.264)	(0.870)	(0.189)	(0.368)
Observations	120523	20788	36708	6799	54756	6770

Notes: Hazard rates presented, robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Controls include: state dummies, origination year dummies, ARM indicator, change in zip code HPI since origination, months delinquent as of June 2009, FICO, ln(original balance), a no documentation dummy, a refinance (vs. initial purchase) dummy, and a prepayment penalty dummy. Excluded servicer is Servicer 11–the average cure rate (0.225). Models (1) and (6) also include race, Models (1)-(5) also include ln(income). Column (6) restricts the sample to those less than 80% of area median income (AMI) at origination.

Table 4: LPM: Servicer Heterogeneity Exists in Probability of Modifying

Dependent Variable =1 if loan was modified						
	Full Sample	Black	Hispanic	Asian	White	Low Income
	(1)	(2)	(3)	(4)	(5)	(6)
Servicer 1	0.0511*	0.108**	-0.00694	-0.0835	0.0895***	0.0227
	(0.0285)	(0.0520)	(0.0218)	(0.0709)	(0.0245)	(0.0898)
Servicer 2	0.0483**	0.0861*	-0.00385	-0.109**	0.0846***	0.0279
	(0.0230)	(0.0439)	(0.0427)	(0.0475)	(0.0239)	(0.0635)
Servicer 3	0.0399	0.0610	0.00222	-0.0200	0.0469	0.0452
	(0.0260)	(0.0464)	(0.0515)	(0.0796)	(0.0321)	(0.0929)
Servicer 4	0.236***	0.459***	0.182***	-0.0631	0.307***	0.0806
	(0.0460)	(0.0674)	(0.0650)	(0.0709)	(0.0945)	(0.0668)
Servicer 5	0.150***	0.189***	0.113*	0.0650	0.166***	0.191**
	(0.0205)	(0.0562)	(0.0571)	(0.0521)	(0.0212)	(0.0700)
Servicer 6	-0.0757*	0.0145	-0.00352		-0.130***	-0.121
	(0.0396)	(0.0611)	(0.115)		(0.0370)	(0.131)
Servicer 7	0.0733***	0.163***	0.0558***	-0.103*	0.0711***	0.164***
	(0.0234)	(0.0490)	(0.0145)	(0.0569)	(0.0256)	(0.0376)
Servicer 8	0.190***	0.213***	0.304***	0.0431	0.147***	0.105
	(0.0377)	(0.0655)	(0.0500)	(0.0532)	(0.0485)	(0.0967)
Servicer 9	0.0230	0.0300	0.0217	-0.0944	0.0250	-0.126*
	(0.0149)	(0.0393)	(0.0317)	(0.120)	(0.0238)	(0.0651)
Servicer 10	-0.00744	-0.0836	0.0402	-0.157**	-0.0354	-0.166
	(0.0403)	(0.0795)	(0.0933)	(0.0579)	(0.0613)	(0.165)
Servicer 12	0.116*		0.493**	-0.129**	0.0917*	0.300***
	(0.0593)		(0.201)	(0.0510)	(0.0463)	(0.0639)
Servicer 13	0.0723***	0.118***	0.0624	-0.0547	0.0717***	0.119*
	(0.0203)	(0.0361)	(0.0370)	(0.0944)	(0.0219)	(0.0647)
Servicer 14	0.237***	0.232***	0.236***	0.230***	0.231***	0.226***
	(0.0310)	(0.0439)	(0.0824)	(0.0515)	(0.0222)	(0.0568)
Servicer 15	0.171***	0.219***	0.127**	0.130**	0.172***	0.139***
	(0.0306)	(0.0539)	(0.0554)	(0.0610)	(0.0241)	(0.0353)
Servicer 16	0.347**		0.0717	0.00612	0.509***	
	(0.143)		(0.0876)	(0.0468)	(0.0278)	
Servicer 17	0.0635***	0.0979***	0.0930*	-0.0719	0.0379*	-0.0503
	(0.0221)	(0.0323)	(0.0512)	(0.0799)	(0.0208)	(0.0306)
Servicer 18	0.0500***	0.0818*	0.0155	0.0411	0.0492***	0.0603
	(0.0183)	(0.0433)	(0.0456)	(0.0510)	(0.0158)	(0.0467)
Servicer 19	0.108***	0.144***	0.0903***	-0.0171	0.113***	0.136**
	(0.0207)	(0.0512)	(0.0322)	(0.0745)	(0.0203)	(0.0527)
Servicer 20	0.280***	0.304***	0.255***	0.102	0.289***	0.241***
	(0.0235)	(0.0417)	(0.0544)	(0.111)	(0.0292)	(0.0545)
Observations	156507	28078	46045	8372	71922	9594

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Controls include: state dummies, origination year dummies, month by year dummies, ARM indicator, change in zip code HPI since origination, months delinquent as of June 2009, FICO, ln(original balance), a no documentation dummy, a refinance (vs. initial purchase) dummy, and a prepayment penalty dummy. Excluded servicer is Servicer 11–the average cure rate (0.225). Models (1) and (6) also include race, Models (1)-(5) also include ln(income). Column (6) restricts the sample to those less than 80% of AMI at origination.

Table 5: Servicer Heterogeneity Exists in Type of Modification

	Interest Rate Decreased	Principal Balance Decreased	Interest Rate Change	Balance Change	Payment Change	Second Mod
	(1)	(2)	(3)	(4)	(5)	(6)
Servicer 2	-0.226***	-0.0352**	0.156***	0.00218	0.0607	-0.123***
	(0.0638)	(0.0148)	(0.0427)	(0.00857)	(0.0364)	(0.0227)
Servicer 3	0.0112	-0.0214	-0.0434	0.0378***	0.0162	-0.116***
	(0.0331)	(0.0159)	(0.0278)	(0.0113)	(0.0268)	(0.0132)
Servicer 4	-0.00431	-0.0114	0.137***	0.00745	-0.0552**	0.0946***
	(0.00907)	(0.00759)	(0.0144)	(0.00675)	(0.0249)	(0.0338)
Servicer 5	-0.109***	0.000786	-0.0381	0.0165	-0.126***	0.00845
	(0.0320)	(0.0354)	(0.0244)	(0.0198)	(0.0150)	(0.0347)
Servicer 6	-0.627***	-0.0351**	0.359***	-0.00991	0.278***	-0.0278**
	(0.0451)	(0.0133)	(0.0167)	(0.00848)	(0.0147)	(0.0124)
Servicer 7	-0.0456	-0.0543***	-0.0219	-0.0437***	-0.0761***	0.0308**
	(0.0385)	(0.0173)	(0.0304)	(0.0144)	(0.0189)	(0.0130)
Servicer 9	-0.0659	-0.0244**	-0.0216	0.0210*	-0.0739	-0.125***
	(0.0755)	(0.0102)	(0.0612)	(0.0105)	(0.107)	(0.0344)
Servicer 10	0.0382**	-0.0318***	-0.0831**	-0.0349***	0.0710***	-0.0803***
	(0.0185)	(0.00894)	(0.0391)	(0.0100)	(0.0205)	(0.0217)
Servicer 12	-0.0107	0.0702***	-0.104***	-0.0387***	-0.156***	0.0596***
	(0.0120)	(0.0104)	(0.0228)	(0.0114)	(0.0196)	(0.0188)
Servicer 13	-0.0666**	0.0311	0.0512**	-0.0125	0.0331	-0.135***
	(0.0262)	(0.0259)	(0.0223)	(0.0121)	(0.0229)	(0.0215)
Servicer 14	-0.00542	-0.0194*	0.0542**	0.00708	-0.00802	-0.0228
	(0.0385)	(0.0113)	(0.0245)	(0.0106)	(0.0331)	(0.0898)
Servicer 15	0.0293***	0.0740***	-0.119***	-0.0314**	-0.169***	0.00465
	(0.00804)	(0.0176)	(0.0168)	(0.0137)	(0.0163)	(0.0246)
Servicer 16	0.00746	-0.0144	-0.197**	0.0326***	-0.225***	-0.168***
	(0.0136)	(0.0120)	(0.0739)	(0.00622)	(0.0415)	(0.0244)
Servicer 18	-0.0361***	0.114***	-0.0366***	-0.0573***	-0.0865***	0.190***
	(0.0129)	(0.0187)	(0.00981)	(0.0127)	(0.00612)	(0.0396)
Servicer 19	-0.0461**	0.00115	0.0131	-0.0306***	-0.139***	0.0325**
	(0.0173)	(0.0305)	(0.0127)	(0.00798)	(0.0289)	(0.0138)
Servicer 20	0.0352**	0.0521	-0.0642	-0.00875	-0.0326	-0.0640***
	(0.0171)	(0.0662)	(0.0561)	(0.0122)	(0.0544)	(0.0180)
Observations	5287	5287	4889	4888	4885	5287

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Controls include: state dummies, origination year dummies, month by year dummies, ARM indicator, change in zip code HPI since origination, months delinquent as of June 2009, FICO, ln(original balance), race, ln(income), a no documentation dummy, a refinance (vs. initial purchase) dummy, and a prepayment penalty dummy. Excluded servicer is Servicer 11–the average cure rate (0.225). All Columns (1)-(6) are cross sections of modified loans in the period the loan was modified. Interest Rate Decreased and Principal Balance Decreased are dummy variables equal to one if principal or interest were reduced at the time of modification. Rate Change, Balance Change, and Payment Change are the percentage changes in interest rates, balances, and monthly payments before and after modification. Second Mod equals one if the servicer modified a second time in the sample. Servicers 1, 7, 9 did not have enough modifications to identify the type in these models, and are thus excluded.

Table 6: LPM: Types of Modification Influence Re-default Rates

	Dependent Variable =1 if loan re-defaulted after modification				
	(1)	(2)	(3)	(4)	(5)
Rate Decreased	-0.102***	-0.0949***			
	(0.0127)	(0.0127)			
Balance Decreased	0.0267	0.118**			
	(0.0207)	(0.0474)			
Balance and Rate Decreased		-0.102**			
		(0.0427)			
Rate Change			0.278***		
			(0.0261)		
Balance Change				-0.0546***	
				(0.0190)	
Payment Change					0.345***
					(0.0259)
Observations	103819	103819	93775	93751	93714

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Controls include: state dummies, origination year dummies, ARM indicator, change in HPI since origination, months delinquent as of June 2009, FICO, ln(original balance), race, ln(income), a no documentation dummy, a refinance (vs. initial purchase) dummy, and a prepayment penalty dummy.

Table 7: LPM: Types of Modification Influence Re-default Rates: by State

Dependent Variable =1 if loan re-defaulted after modification					
Panel A: Results for Florida Only					
	(1)	(2)	(3)	(4)	(5)
Rate Decreased	-0.138***	-0.124***			
	(0.0117)	(0.0122)			
Balance Decreased	-0.0479***	0.0939**			
	(0.0120)	(0.0391)			
Balance and Rate Decreased		-0.160***			
		(0.0409)			
Rate Change			0.334***		
			(0.0182)		
Balance Change				0.0252*	
				(0.0130)	
Payment Change					0.436***
					(0.0189)
Observations	14880	14880	13387	13387	13373
Panel B: Results for California Only					
	(1)	(2)	(3)	(4)	(5)
Rate Decreased	-0.0908***	-0.0893***			
	(0.00773)	(0.00803)			
Balance Decreased	0.00930	0.0292			
	(0.00826)	(0.0285)			
Balance and Rate Decreased		-0.0218			
		(0.0298)			
Rate Change			0.265***		
			(0.0106)		
Balance Change				-0.0530***	
				(0.00959)	
Payment Change					0.333***
					(0.0105)
Observations	30826	30826	28649	28649	28649

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Controls include: origination year dummies, ARM indicator, change in HPI since origination, months delinquent as of June 2009, FICO, ln(original balance), race, ln(income), a no documentation dummy, a refinance (vs. initial purchase) dummy, and a prepayment penalty dummy.

Table 8: Non-Bank Owned Servicers and Loan Modification Types by Year

	Cure	Rate Decreased	Balance Decreased	Rate Change	Balance Change	Payment Change	Second Mod
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
2009	1.311***	-0.0145	-0.00840	-0.0824***	0.0108	-0.0848***	0.0735
	(0.0216)						
	(0.0144)	(0.00528)	(0.0152)	(0.00782)	(0.0149)	(0.0494)	
2010	1.349***	-0.0691***	0.0517***	0.00445	-0.0434***	0.0175	0.113***
	(0.0236)	(0.0121)	(0.0104)	(0.00861)	(0.00571)	(0.0175)	(0.0324)
2011	1.112***	-0.0568**	0.302**	0.0625**	-0.218***	-0.0851*	0.0988***
	(0.0353)	(0.0229)	(0.131)	(0.0257)	(0.0647)	(0.0424)	(0.0261)

Note: Table presents the coefficients for the "non-bank" servicer dummy. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Controls include: state dummies, origination year dummies, month by year dummies, ARM indicator, change in HPI since origination, months delinquent as of June 2009, FICO, ln(original balance), race, ln(income), a no documentation dummy, a refinance (vs. initial purchase) dummy, and a prepayment penalty dummy. Column 1 presents the cure rate for delinquent loans in the sample. Columns (2)-(7) are cross sections of modified loans in the period the loan was modified. Interest Rate Decreased and Principal Balance Decreased are dummy variables equal to one if principal or interest were reduced at the time of modification. Rate Change, Balance Change, and Payment Change are the percentage changes in interest rates, balances, and monthly payments before and after modification. Second Mod equals one if the servicer modified a second time in the sample.

9. Appendix

Table 9: Hazard: Servicer Heterogeneity Exists in Cure Rates - Control Variables

	Dependent Variable =1 if loan was cured					
	Full Sample	Black	Hispanic	Asian	White	Low Income
	(1)	(2)	(3)	(4)	(5)	(6)
2006 Origination	1.689***	1.590**	1.162	0.949	1.902***	1.580*
	(0.174)	(0.292)	(0.252)	(0.0517)	(0.261)	(0.391)
2005 Origination	1.656***	1.498**	1.174		1.829***	1.506*
	(0.170)	(0.276)	(0.255)		(0.251)	(0.375)
Black	0.918***					0.922
	(0.0155)					(0.0548)
Asian	1.038					0.965
	(0.0243)					(0.156)
Hispanic	0.977*					0.961
	(0.0132)					(0.0731)
Other Race	1.009					1.687
	(0.0478)					(0.708)
ln(income)	1.004	1.069*	0.991	0.995	0.988	
	(0.0138)	(0.0395)	(0.0269)	(0.0564)	(0.0188)	
Ficoscore	1.001***	1.001***	1.001***	1.001***	1.001***	1.001*
	(0.0000886)	(0.000226)	(0.000153)	(0.000369)	(0.000137)	(0.000426)
ARM	0.794***	0.752***	0.812***	0.834***	0.795***	0.777***
	(0.0116)	(0.0259)	(0.0221)	(0.0584)	(0.0170)	(0.0443)
HPI Change	0.792***	0.834	0.669***	0.525***	0.934	0.907
	(0.0360)	(0.0971)	(0.0545)	(0.0956)	(0.0659)	(0.190)
Months Delinquent Period 1	1.068***	1.051***	1.088***	1.092***	1.058***	1.061***
	(0.00202)	(0.00532)	(0.00365)	(0.00831)	(0.00299)	(0.00889)
ln(original balance)	0.841***	0.779***	0.868***	0.888	0.852***	0.867**
	(0.0144)	(0.0325)	(0.0302)	(0.0732)	(0.0205)	(0.0540)
Refinance Indicator	0.922***	0.989	0.891***	0.939	0.925***	0.917*
	(0.0106)	(0.0280)	(0.0181)	(0.0455)	(0.0162)	(0.0470)
Prepayment Penalty Indicator	1.000	0.999	1.000	0.996**	1.000	0.998
	(0.000470)	(0.00138)	(0.000839)	(0.00179)	(0.000684)	(0.00200)
No Documentation	0.946***	1.009	0.955*	0.930	0.922***	0.794**
	(0.0152)	(0.0470)	(0.0244)	(0.0550)	(0.0236)	(0.0853)
Observations	120523	20788	36708	6799	54756	6770

Notes: Hazard rates presented, Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Controls include: state dummies, origination year dummies, ARM indicator, change in HPI since origination, months delinquent as of June 2009, ficoscore, ln(original balance), a no documentation dummy, refinance (vs. initial purchase) dummy, prepayment penalty dummy. Excluded servicer is Servicer 11–the average cure rate (0.225). Models (1) and (6) also include race, Models (1)-(5) also include ln(income). Column (6) restricts the sample to those less than 80% of AMI at origination.

Table 10: Hazard: Servicer Heterogeneity Exists in Cure Rates - California Only

	Dependent Variable =1 if loan was cured					
	Full Sample	Black	Hispanic	Asian	White	Low Income
	(1)	(2)	(3)	(4)	(5)	(6)
Servicer 1	0.850***	0.916	0.733***	0.637***	0.957	
	(0.0426)	(0.193)	(0.0584)	(0.0875)	(0.0797)	
Servicer 2	0.746***	0.937	0.696***	0.610***	0.827***	1.836
	(0.0234)	(0.116)	(0.0309)	(0.0600)	(0.0481)	(1.931)
Servicer 3	1.258***	1.867***	1.246***	1.145	1.229**	9.557**
	(0.0683)	(0.275)	(0.0975)	(0.194)	(0.121)	(9.733)
Servicer 4	0.407***	0.515***	0.411***	0.278***	0.417***	0.0831**
	(0.0151)	(0.0609)	(0.0218)	(0.0363)	(0.0278)	(0.0835)
Servicer 5	0.692***	1.489	0.637**	0.521	0.710*	0.0321**
	(0.0962)	(0.811)	(0.131)	(0.348)	(0.148)	(0.0449)
Servicer 6	1.256***	1.128	1.299***	0.782	1.297**	
	(0.0727)	(0.402)	(0.0904)	(0.180)	(0.162)	
Servicer 7	0.521***	0.534***	0.500***	0.458***	0.548***	16.78***
	(0.0259)	(0.106)	(0.0358)	(0.0644)	(0.0514)	(13.35)
Servicer 9	1.966***	2.687***	1.960***	2.293***	1.711***	34.94***
	(0.120)	(0.652)	(0.163)	(0.470)	(0.187)	(37.25)
Servicer 10	1.195**	1.259	1.046	1.628**	1.411**	0.136
	(0.102)	(0.408)	(0.121)	(0.375)	(0.215)	(0.237)
Servicer 12	0.653***	0.955	0.612***	0.436***	0.736***	0.377
	(0.0374)	(0.180)	(0.0470)	(0.0743)	(0.0848)	(0.395)
Servicer 13	1.140***	1.409**	1.132**	0.883	1.165**	0.644
	(0.0416)	(0.188)	(0.0569)	(0.110)	(0.0798)	(0.923)
Servicer 14	1.075	2.095***	1.021	3.894***	1.060	
	(0.271)	(0.362)	(0.340)	(0.454)	(0.469)	
Servicer 15	0.951	1.057	0.872	1.030	1.136	22.37***
	(0.0863)	(0.225)	(0.106)	(0.325)	(0.193)	(24.69)
Servicer 16	2.173***	2.324***	2.153***	1.565***	2.444***	1.255
	(0.108)	(0.365)	(0.147)	(0.240)	(0.235)	(0.932)
Servicer 18	1.076*	1.080	1.089	1.083	1.033	7.652
	(0.0428)	(0.180)	(0.0572)	(0.143)	(0.0799)	(10.39)
Servicer 19	1.386***	1.061	1.257***	1.544***	1.638***	0.236
	(0.0790)	(0.298)	(0.0921)	(0.222)	(0.195)	(0.316)
Servicer 20	1.234***	1.327**	1.275***	1.137	1.176**	6.820*
	(0.0503)	(0.191)	(0.0655)	(0.177)	(0.0966)	(7.088)
Observations	122616	8950	61263	12283	37484	553

Notes: Hazard rates presented, Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Controls include: state dummies, origination year dummies, ARM indicator, change in HPI since origination, months delinquent as of June 2009, ficoscore, ln(original balance), a no documentation dummy, refinance (vs. initial purchase) dummy, prepayment penalty dummy. Excluded servicer is Servicer 11–the average cure rate (0.225). Servicers 8 and 17 are not identified since they did not have enough loans in California. Models (1) and (6) also include race, Models (1)-(5) also include ln(income). Column (6) restricts the sample to those less than 80% of AMI at origination.

Table 11: Hazard: Servicer Heterogeneity Exists in Cure Rates - Florida Only

	Dependent Variable =1 if loan was cured					
	Full Sample	Black	Hispanic	Asian	White	Low Income
	(1)	(2)	(3)	(4)	(5)	(6)
Servicer 1	0.850***	15.35***	1.232	0.524*	1.582***	
	(0.0426)	(2.393)	(0.263)	(0.192)	(0.244)	
Servicer 2	0.746***	2.179***	1.732***		1.529***	1.001
	(0.0234)	(0.335)	(0.144)		(0.110)	(0.327)
Servicer 3	1.258***	1.775***	2.295***	0.744	1.893***	2.999***
	(0.0683)	(0.262)	(0.346)	(0.916)	(0.167)	(0.887)
Servicer 4	0.407***	0.824*	0.762***	0.283***	0.682***	0.696
	(0.0151)	(0.0960)	(0.0625)	(0.133)	(0.0534)	(0.333)
Servicer 5	0.692***	0.359	1.131	0.526	0.732	
	(0.0962)	(0.402)	(0.482)	(0.823)	(0.304)	
Servicer 6	1.256***	3.518***	1.036		3.509**	
	(0.0727)	(0.468)	(1.244)		(2.154)	
Servicer 7	0.521***	1.014	0.619***	0.640	0.766*	0.186*
	(0.0259)	(0.252)	(0.0916)	(0.575)	(0.105)	(0.160)
Servicer 9	1.966***	3.978***	4.533***	1.627	2.661***	1.561
	(0.120)	(0.768)	(0.515)	(0.936)	(0.266)	(0.618)
Servicer 10	1.195**	3.400***	3.387***	2.525	2.631***	5.069***
	(0.102)	(0.802)	(0.594)	(1.423)	(0.385)	(1.661)
Servicer 12	0.653***	0.840	0.923	0.297**	0.865	0.403
	(0.0374)	(0.167)	(0.136)	(0.148)	(0.118)	(0.351)
Servicer 13	1.140***	1.920***	2.086***	1.453	1.841***	0.964
	(0.0416)	(0.224)	(0.161)	(0.504)	(0.126)	(0.280)
Servicer 14	1.075		0.973		0.920	
	(0.271)		(0.318)		(0.242)	
Servicer 15	0.951	1.190	1.362*	1.80e-20	1.173	1.633
	(0.0863)	(0.250)	(0.233)	(.)	(0.174)	(0.763)
Servicer 16	2.173***	5.797***	4.428***	4.024***	4.001***	6.453***
	(0.108)	(0.729)	(0.433)	(1.284)	(0.368)	(2.809)
Servicer 18	1.076*	1.868***	1.703***	1.516	1.488***	1.657*
	(0.0428)	(0.217)	(0.169)	(0.415)	(0.116)	(0.477)
Servicer 19	1.386***	4.823***	1.227	0.599	1.108	2.685
	(0.0790)	(2.062)	(0.383)	(0.752)	(0.215)	(1.798)
Servicer 20	1.234***	2.716***	2.767***	2.134	2.087***	1.545*
	(0.0503)	(0.255)	(0.184)	(1.001)	(0.134)	(0.403)
Observations	122616	20098	39999	1532	44677	2640

Notes: Hazard rates presented, Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Controls include: state dummies, origination year dummies, ARM indicator, change in HPI since origination, months delinquent as of June 2009, ficoscore, ln(original balance), a no documentation dummy, refinance (vs. initial purchase) dummy, prepayment penalty dummy. Excluded servicer is Servicer 11–the average cure rate (0.225). Servicers 8 and 17 are not identified since they did not have enough loans in California. Models (1) and (6) also include race, Models (1)-(5) also include ln(income). Column (6) restricts the sample to those less than 80% of AMI at origination.

Table 12: LPM: Servicers Heterogeneity Exists in Probability of Modifying - Control Variables

	Dependent Variable =1 if loan was modified					
	Full Sample	Black	Hispanic	Asian	White	Low Income
	(1)	(2)	(3)	(4)	(5)	(6)
2006 Origination	0.143***	0.0606	0.151**	0.0178	0.182***	0.245**
	(0.0264)	(0.0385)	(0.0661)	(0.0153)	(0.0378)	(0.0913)
2005 Origination	0.130***	0.0515	0.142**		0.167***	0.192**
	(0.0268)	(0.0383)	(0.0627)		(0.0397)	(0.0833)
Black	0.0185*					-0.0116
	(0.00954)					(0.0216)
Asian	-0.00688					-0.0599
	(0.00796)					(0.0541)
Hispanic	0.00502					-0.0123
	(0.00509)					(0.0281)
Other Race	0.0334**					0.200**
	(0.0136)					(0.0888)
ln(income)	-0.0231***	-0.0184	-0.0308***	-0.0426***	-0.0175**	
	(0.00472)	(0.0154)	(0.00880)	(0.0124)	(0.00700)	
Fico Score	-0.000105***	-0.0000473	-0.0000261	-0.000157	-0.000183***	-0.000321**
	(0.0000238)	(0.0000683)	(0.0000539)	(0.000117)	(0.0000359)	(0.000125)
ARM	-0.255***	-0.287***	-0.252***	-0.217***	-0.243***	-0.277***
	(0.0117)	(0.0114)	(0.0165)	(0.0197)	(0.0153)	(0.0210)
HPI Change	0.0485*	-0.0125	0.0986**	-0.0593	0.0563**	0.0488
	(0.0240)	(0.0411)	(0.0392)	(0.0469)	(0.0239)	(0.0669)
Months Delinquent Period 1	-0.00704***	-0.00823***	-0.00678***	-0.00435**	-0.00719***	-0.00151
	(0.000742)	(0.00153)	(0.000646)	(0.00192)	(0.00125)	(0.00289)
ln(original balance)	0.00183	0.0200	-0.00144	0.0320**	-0.00411	-0.0190
	(0.00731)	(0.0160)	(0.00726)	(0.0151)	(0.00903)	(0.0249)
Refinance Indicator	0.00614	0.0257***	0.00912	0.0101	-0.00400	-0.00569
	(0.00567)	(0.00747)	(0.00771)	(0.0110)	(0.00803)	(0.0165)
Prepayment Penalty Indicator	0.000472**	-0.000270	0.000685*	-0.000110	0.000617***	-0.00161*
	(0.000232)	(0.000774)	(0.000353)	(0.000384)	(0.000165)	(0.000852)
No Documentation Indicator	-0.0383***	-0.0324**	-0.0353***	-0.0246	-0.0423***	-0.155***
	(0.0106)	(0.0134)	(0.00971)	(0.0179)	(0.0144)	(0.0311)
Observations	156507	28078	46045	8372	71922	9594

Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Controls include: state dummies, origination year dummies, month by year dummies, ARM indicator, change in HPI since origination, months delinquent as of June 2009, ficoscore, ln(original balance), a no documentation dummy, refinance (vs. initial purchase) dummy, prepayment penalty dummy. Excluded servicer is Servicer 11–the average cure rate (0.225). Models (1) and (6) also include race, Models (1)-(5) also include ln(income). Column (6) restricts the sample to those less than 80% of AMI at origination.