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**A COST-BENEFIT ANALYSIS OF  
JUDICIAL FORECLOSURE DELAY AND A  
PRELIMINARY LOOK AT NEW MORTGAGE  
SERVICING RULES**

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March 2015

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# **A Cost-Benefit Analysis of Judicial Foreclosure Delay and a Preliminary Look at New Mortgage Servicing Rules\***

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## **Abstract**

Since the start of the financial crisis, we have seen an extraordinary lengthening of foreclosure timelines, particularly in states that require judicial review to complete a foreclosure but also recently in nonjudicial states. Our analysis synthesizes findings from several lines of research, updates results, and presents new analysis to examine the costs and benefits of judicial foreclosure review. Consistent with previous studies, we find that judicial review imposes large costs with few, if any, offsetting benefits. We also provide early analysis of the new mortgage servicing rules enacted by the Consumer Financial Protection Bureau (CFPB) and find that these rules are contributing to even longer timelines, especially in nonjudicial states.

*Keywords:* Mortgage, foreclosure, regulation

*JEL Codes:* G21, G28, L85, R21

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## **A Cost-Benefit Analysis of Judicial Foreclosure Delay and a Preliminary Look at New Mortgage Servicing Rules**

One of the consequences of the financial crisis has been an extraordinary lengthening of foreclosure timelines. Courts have issued temporary foreclosure moratoria in response to improper servicing practices, and some state legislatures have passed specific interventions designed to delay foreclosures to give borrowers more time to pursue foreclosure alternatives. Most recently, mortgage servicing rules enacted by the Consumer Financial Protection Bureau (CFPB) have also directly and indirectly affected foreclosure procedures and the time it takes to initiate and complete a foreclosure. Partly as a result of policy interventions, servicers have increased the number of modifications completed. But foreclosure timelines have extended significantly. Moreover, timelines have extended the most in states that require a judicial review to carry out a foreclosure, as opposed to statutory, or “power of sale,” states. In those states, borrowers sign over to lenders at loan origination the rights to complete foreclosures without judicial review.

Our analysis summarizes and expands upon findings from several lines of research on the costs and benefits of foreclosure delay, focusing primarily on the judicial versus statutory process of foreclosure review. We begin by reviewing and updating analysis conducted by Cordell et al. (2015), who measure foreclosure durations and the timeline-related costs investors incur in their paper, “The Cost of Foreclosure Delay.” Then, we consider the possible benefits to borrowers of foreclosure delays, namely the potential for increased cure and modification rates, along with the money saved by borrowers who continue to live in their homes while not making mortgage payments. Finally, we examine benefits to borrowers of these delays as well as other costs, namely external costs imposed on neighbors in terms of crime, under maintenance, and house price spillovers, as well as impacts on broader house price recovery and the subsequent mortgage borrowing behaviors of post-foreclosure households.

Our paper has four main findings. First, we estimate the average foreclosure timeline for borrowers in judicial states has increased 72% over the course of the mortgage crisis; in statutory states, we estimate the increase at 57%. For borrowers who defaulted in 2014, the average timeline in judicial states is forecast to be 43 months, compared with 30 months in statutory states. These longer timelines impose significant costs on mortgage investors who must cover timeline-related costs. In some long-timeline judicial states such as New Jersey, these costs,

expressed as a percentage of the unpaid principal balance of the loan, have risen by 20 percentage points since the start of the crisis.

Second, despite these increased costs to lenders, the longer timelines associated with judicial intervention in the foreclosure process have led to neither more cures nor more modifications, just more persistently delinquent borrowers. Third, there are other potentially large costs in terms of slower house price recovery and less “boomerang borrowing” by post-foreclosure consumers in judicial states, greater house price depreciation from nearby foreclosures, and negative neighborhood-level effects caused by foreclosure delays. In short, judicial review of foreclosures imposes large costs with few, if any, offsetting benefits. Without some way to price into mortgage contracts the extraordinary costs associated with delays from judicial review, the cost of foreclosure delay is likely to have negative consequences for the provisioning of credit.<sup>1</sup>

Finally, our paper is the first to examine empirically the new servicing rules enacted by the CFPB that took effect on January 10, 2014, to “protect consumers from detrimental actions by mortgage servicers and to provide consumers with better tools and information when dealing with mortgage servicers.”<sup>2</sup> We estimate these new rules will increase timelines by an average of three months in judicial states, as compared with timelines for borrowers who defaulted in 2013, before the rules took effect. But their biggest effect will be on statutory states, where we estimate timelines will increase by six months. So far, we observe no measurable, lasting change in the performance of distressed mortgages. Because these results are preliminary and could be affected by the overhang of existing foreclosures, they are an important area for future research.

## **I. Foreclosure Timelines in Judicial and Statutory States**

Three main types of foreclosure laws emerged in the U.S. over time, providing a basis of comparison for examining costs and benefits (see Ghent, 2012). To foreclose on a mortgage in a *judicial* foreclosure state, the lender must petition the court, which then executes the foreclosure by auctioning the property. Alternatively, in *statutory*, or power-of-sale, states, the borrower signs over to the lender at origination the right to carry out a foreclosure auction if the borrower

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<sup>1</sup> Pence (2006) documented a measurable impact of judicial foreclosure on the characteristics of loans originated. She explains that in judicial states, “borrowers may pay more for their mortgages, purchase smaller houses, or have difficulty becoming homeowners” (p. 182).

<sup>2</sup> See the Consumer Financial Protection Bureau (2013) for a description of these rules.

defaults. As shown on the map in Figure 1, 28 states and the District of Columbia are classified as statutory, while 22 states primarily use judicial foreclosure. In addition, nine states (five judicial states and four statutory states) provide post-foreclosure rights of redemption, giving borrowers rights for a period of time to repossess their properties after foreclosure proceedings have been completed.

Since the onset of the foreclosure crisis, a number of interventions in the mortgage market have significantly affected timelines, measured here as the number of months from the last interest paid date to the time the lender liquidates the property serving as collateral.<sup>3</sup> We divide reported timelines into six distinct periods, which are illustrated in Figure 2. Period 1, which covers 1998 to the start of the financial crisis in February 2007, is characterized by relatively stable liquidation timelines. Period 2 encompasses the onset of the financial crisis in February 2007 through October 2008, when timelines held relatively stable. The third period begins in November 2008, which marks the start of an extraordinary series of interventions in the housing markets, including the government-sponsored enterprise (GSE) moratoria, announced on November 26, 2008, and the Home Affordable Modification Program (HAMP), announced on March 4, 2009. As shown in Figure 2, timelines grew to record highs in the months following the moratoria and HAMP roll-out. Period 4 begins in September 2010 with a landmark series of announcements by the major mortgage servicers that they were suspending foreclosures after defects were uncovered in the foreclosure process (termed “robo-signing”). Next, Period 5, February 2012 to January 2014, includes the attorneys general (AG) settlement resulting from the robo-signing revelations. Finally, Period 6 includes February 2014, the first full month after the Consumer Financial Protection Bureau’s mortgage servicing rules took effect, through September 2014, the last month for which data are available.

We caution readers that Figure 2 understates timelines because it does not include a large number of loans that were in the foreclosure pipeline but not yet liquidated when the data were collected. Simply using the observed real estate owned (REO) timeline data produces downward biases by excluding this large number of delinquent loans in the “shadow inventory” at the end of the sample period. Many of these loans have spent considerable time in delinquency. The extent of the censoring problem is made clear in Figures 3A and 3B, which show the rates of

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<sup>3</sup> Other types of liquidations, such as pre-foreclosure short sales, are not included because we cannot distinguish them in our data set from other types of nonforeclosure payoffs.

seriously delinquent loans from January 1998 to September 2014, along with the share of seriously delinquent loans greater than one and two years past due, reported separately for statutory and judicial states.

During the pre-crisis Period 1, loans more than one year past due hovered fairly steadily at around 15% of all seriously delinquent loans in statutory states and 30% in judicial states. Loans more than two years past due averaged 2% in statutory states and 7% in judicial states, many of which were due to bankruptcy. By the end of our sample period, the share of seriously delinquent loans that were more than one year past due averaged 47% in statutory states and 64% in judicial states. The share more than two years delinquent reached 26% in statutory states and 44% in judicial states. When these loans are eventually liquidated, they will substantially extend the timelines reported thus far.

We use survival analysis to overcome the data censoring problem. Specifically, following Cordell et al. (2015), we estimate an accelerated failure time (AFT) model with a combination of nearly 2.4 million uncensored observations of loans that terminated with REO liquidations between 2005 and September 2014 (0.75 million in judicial states, 1.6 million in statutory states) and 581,000 defaulted loans that were right-censored in delinquency in September 2014 (319,000 in judicial states, 262,000 in statutory states). The AFT model assumes that liquidation time follows a particular parametric probability distribution (lognormal in this case), and as a result, it can incorporate censored observations that contain valuable information regarding the distribution of foreclosure event times. Including loans that still remained in default as of September 2014 enables us to get a clearer picture of how recent legal and regulatory policies will affect liquidation timelines.

We estimate two sets of the model: one for loans in judicial states and one for loans in statutory states. In each model, we estimate the time to REO liquidation experienced by the cohorts of borrowers defaulting in the six time periods laid out above, controlling for each of the time periods; different investors on the loan; loan characteristics (i.e., purchase versus refinance, type of interest rate, balance, and mark-to-market loan-to-value ratio); borrower traits (credit score at origination and occupancy status); and area economic and legal factors (i.e., changes in the county house price index and unemployment rate since origination, as well as indicators for whether borrowers are provided with post-foreclosure redemption periods and whether lenders may pursue deficiency judgments).

Table 1 summarizes the mean timelines by cohort for judicial and statutory states. The findings illustrate the benefit of including censored data when estimating timelines. For example, liquidation timelines for uncensored loans that defaulted most recently (Period 6) averaged only 15 months for judicial states and 13 months for statutory states. But 93% of the loans in judicial states and 81% in statutory states were right censored (not yet liquidated) as of September 2014. When these censored observations are included, the model-estimated liquidation timeline for judicial states increases to 43 months, an 18-month increase compared with its 25-month pre-crisis average (see Period 1). This means that for the average borrower in a judicial foreclosure state, it will take more than three-and-a-half years from the time he stops paying his mortgage to the time the loan is liquidated. However, the borrower loses the home considerably earlier, after the foreclosure sale, and, in some cases, owners may leave the properties even sooner. One explanation for the phenomenon of dramatically longer foreclosure timelines in judicial states is that foreclosure moratoria enacted during the crisis, once lifted, took longer to resolve in judicial states because of court capacity constraints. Not all policy changes and other events we profile lengthened timelines more in judicial states than statutory states, however. The most recent period studied, Period 6 (February 2014–September 2014), begins with the implementation of the CFPB’s mortgage servicing rules. As discussed previously and displayed in Table 1, we estimate that the total foreclosure timelines for borrowers defaulting during this period will average 43 months in judicial states and 30 months in statutory states. Relative to Period 5, these figures amount to increases in the timelines of three and six months, respectively. For statutory states, this six-month increase accounts for more than half the increase in foreclosure timelines that has occurred in recent years. Those timelines have lengthened 11 months, from 19 months in Period 1 to a forecasted 30 months for loans defaulting in the most recent period (since February 2014).

Although the CFPB rules are numerous and varied in nature, they have a direct impact on the foreclosure timeline by prohibiting lenders and servicers from beginning foreclosure proceedings on owner occupants until they are more than 120 days delinquent (see Consumer Financial Protection Bureau, 2013). Studying a sample of loans that were 90 or more days delinquent in the first quarters of 2007–2014 and ultimately were referred to attorneys to begin foreclosure, we find evidence that the rule had a measurable impact on the timing of foreclosure initiations or “referrals.” As reported in Figure 4, through 2013, 42%–60% of the foreclosures

that lenders and servicers initiated took place when the loans became 120 days delinquent. However, for loans defaulting in the first quarter of 2014, just 2% experienced a foreclosure start by 120 days. It appears lenders and servicers shifted most of these foreclosure referrals to the month the loans became 150 days delinquent, though it was not until 180 days delinquent that most had “caught up.” This does not explain the entire six-month increase, indicating that other factors are also lengthening timelines in statutory states.

Interestingly, the distributions of foreclosure referral timing from 2007 to 2013, and the subsequent change in 2014, appear very similar in the judicial and statutory states, which seems to indicate that lenders and servicers do not act in greater haste to begin foreclosures in places they expect the foreclosure process to last longer.<sup>4</sup> Early evidence on borrower cure and foreclosure rates indicates little initial impact of the CFPB rules on loan outcomes, aside from slowing foreclosures somewhat.<sup>5</sup> Unlike policy changes and events in previous periods, the CFPB’s rules actually seem to affect timelines in statutory states more than those in judicial states. This is intuitive, considering that the 120-day delinquency rule pertains to the initial part of the timeline, and few foreclosures in judicial states are completed at so rapid a pace as to be influenced. However, the mean foreclosure timelines we estimate are projected to increase by three months and six months in judicial and statutory states, respectively, when comparing loans that defaulted in the periods just before and just after the CFPB rules took effect. Since this evidence is so recent and the CFPB rules include many more changes than simply the 120-day delinquency requirement we discuss here, we recommend researchers and policy analysts track these new rules closely, especially since costs associated with these longer timelines are so large, as we document below.

## **II. Estimating the Direct Cost of Delay to Mortgage Investors**

As explained in Cordell et al. (2015), the unconditional severity rate lenders experience, defined as total losses as a percentage of loan balance, is positively correlated with the time loans spend in delinquency. Total losses, however, are a function of several types of costs, most notably collateral losses from the decline in house prices and time-related losses, which we

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<sup>4</sup> Results are available upon request.

<sup>5</sup> See Appendix A for more details.

describe below. Cordell et al. (2015) consider three components of time-related losses, which they treat separately from other types of costs:

1. *Property taxes*: If the borrower is not paying, the servicer must continue to make tax payments. Nationwide, property taxes average 1.54%, ranging from a high of just over 3.0% per annum in New Jersey to a low of 0.54% in Arizona.
2. *Insurance*: The lender must also continue to make hazard insurance payments. If force-placed insurance is used, the insurance payments can be quite large.
3. *Excess depreciation*: This includes deferred maintenance costs, property maintenance costs after a property is in REO, and the costs of preparing a property for sale. Unlike property taxes and insurance, this cost is not a pure wealth transfer from investors to borrowers; parts of it can be considered a deadweight loss.

In addition to these costs, lenders may also face costs such as homeowner or condominium association dues, particularly in so-called superlien states (Fisher, Lambie-Hanson, and Willen, 2015).

Cordell et al. (2015) decompose the increase in severity into the factors they can estimate — principal and interest advances and property tax payments while attributing the remaining, unexplained severity amount to insurance and excess depreciation. As shown in Table 2, together, these costs amounted to 12% of the unpaid loan balance for loans defaulting 2005–2007 but had risen to 21% by 2013 (Period 5). In judicial states, mean timeline costs amounted to 31% in judicial states, 14% in statutory states, and 30% in the subset of nine redemption states, which can be either judicial or statutory. An extraordinary variation of total estimated timeline costs among states in Period 5 is shown in Figure 5, from a low of about 10% in California and Arizona to a high of 45% in New Jersey. The figure also documents the dramatic increase in costs over the crisis, which primarily affected the judicial states, displayed along with mean foreclosure timelines. As we argue below, costs of this size can have large effects on borrowers and neighborhoods, and ultimately, they may even influence the provisioning of mortgage credit.

### **III. Benefits of Longer Timelines to Distressed Borrowers**

Before examining other types of costs, it is important to evaluate the benefits of longer timelines to borrowers. Longer foreclosure durations could, in fact, help distressed borrowers —

and reduce deadweight costs, if having more time enables the borrowers to self-cure their mortgage defaults or work with lenders to renegotiate mortgage terms and agree to more mortgage modifications. If longer timelines were beneficial, we would expect to see better mortgage outcomes (that is, greater incidence of cures and modifications) in judicial states.

Table 3 displays some characteristics of a large national sample of borrowers and their mortgages, focusing on those that defaulted between January 2005 and August 2011. The mortgages and borrowers in the two types of states are fairly similar. All of the loans included in the sample are first-lien mortgages.

Focusing on the subsample of borrowers who defaulted between February 2007 and August 2008, we classify their status each month after becoming 90 days delinquent as (1) cured (i.e., becoming current or paying off their mortgages); (2) completed foreclosure (i.e., foreclosure auction has occurred); (3) still delinquent; or (4) no longer observed in the sample, usually due to a servicer change. Figure 6 and Table 4 show that unconditional cure rates in the two types of states are similar, and most borrowers who cure do so within the first 12 months after defaulting. The cumulative foreclosure rate at 12 months after defaulting is much higher in statutory states than in judicial states (32% and 14%, respectively). The gap narrows over time, with cumulative foreclosure rates 60 months after defaulting rising to 49% (statutory) and 41% (judicial). The difference in the foreclosure rates is largely attributable to the share of borrowers in judicial states who persist in serious delinquency. At 12 months after default, 50% of borrowers in judicial states were still delinquent, as opposed to 30% in statutory states. Over time, the delinquency group shrinks as loans cure and are terminated through foreclosure. Some other loans exit the sample as they are transferred to new servicers, perhaps who specialize in liquidating distressed assets. At 60 months post-default, 6% of mortgages in judicial states are still delinquent, and another 11% have left the sample. In statutory states, only 2% are still delinquent, and 8% have left the sample.

Figure 7 displays the cumulative share of defaulting loans that received a mortgage modification. Unconditional modification rates were similar in the two types of states for borrowers who defaulted at the beginning of the crisis (Period 2), February 2007–October 2008. Borrowers who defaulted in the next cohort (November 2008 through August 2010) experienced higher modification rates. This is one positive effect of the increased policy focus on modifications. However, this is clearly not due to judicial review. The similarity between judicial

and statutory states persists. Also, the types of modifications in the two groups appear similar in nature: About 6%–7% involved principal reduction, and 77%–78% involved payment reduction.

Gerardi, Lambie-Hanson, and Willen (2013) also find no evidence of higher cure or modification rates for borrowers in judicial states, even after controlling for observable borrower and loan characteristics, such as FICO score at origination, loan-to-value ratio, origination amount, and change in area unemployment rates and house prices. In fact, they find that cure and modification rates, conditional on these characteristics, are 2–3 percentage points *higher* in statutory states than in judicial states.

While borrowers may not be more likely to ultimately cure their mortgage defaults or receive mortgage modifications if they experience longer foreclosure timelines, they may still benefit in other ways; namely, extending the foreclosure timeline benefits delinquent borrowers by allowing them to live in their homes longer without making mortgage payments. Foreclosure timelines from the date of the last payment to the foreclosure auction — the time at which borrowers typically lose possession of their homes — lengthened from the pre-crisis period to mid-2012 by 15 months in judicial states and three months in statutory states. As shown in Table 5, the typical monthly principal and interest payment for a delinquent mortgage in a judicial state was about \$1,200. A timeline increase of 15 months means borrowers could expect to pay about \$18,300 less. In contrast, the savings associated with increased timelines in statutory states is around \$4,300, since the typical monthly payment there is \$1,450. All told, borrowers who defaulted in the post-crisis period had estimated foreclosure timelines of 32 months in judicial states (from the time of first missed payment to auction), totaling \$38,400 in unpaid mortgage payments. For borrowers in statutory states, the typical timeline was 14 months, totaling \$20,300. It is important to note that these savings are overstated by the fact that some borrowers will not stay in their homes the entire period because many properties are abandoned. The saved monthly payments are a benefit to the borrowers only to the extent that they proxy for rental expenses; such analysis is beyond the scope of this study.

Longer foreclosure timelines may enable borrowers to pay off other debt with the money they save while not making mortgage payments. A recent study by Federal Reserve Bank of Philadelphia economists finds that borrowers who are delinquent on their credit card accounts when they default on their mortgages are more likely to pay off credit card debt and to become current on the accounts if foreclosure timelines in their ZIP codes are longer (Calem, Jagtiani,

and Lang, 2014). Future work on this topic will hopefully quantify the magnitude of these balance reductions and the improvement in delinquency rates. Based on their initial results, it appears the marginal effects of longer timelines are not particularly large. Comparing the model coefficients for foreclosure timelines with other controls, the negative effect of having a subprime mortgage on the likelihood of curing a credit card delinquency is equivalent to the effect of having an 81-month-shorter area foreclosure timeline. Similarly, the negative effect on the probability of credit card delinquency cures of having a previous consumer account delinquency in the 12 months leading up to the mortgage default is equivalent to having a 48-month-shorter foreclosure timeline. Future work will ideally also investigate the impacts of longer foreclosure timelines, if any, on the indebtedness of borrowers who are current on their credit card payments.

In sum, judicial review of foreclosures does not lead to better outcomes for borrowers in terms of more or better modifications, just more persistently delinquent borrowers. Pecuniary benefits from foregone rental expenses or paying off other debts also do not appear to be large, especially when considered against the prospects of losing a home and damaging a credit rating. We now turn to the costs of these foreclosure delays.

#### **IV. Direct Costs of Longer Timelines to Distressed Borrowers**

Longer foreclosure timelines may have some negative effects on homeowners' balance sheets. Namely, longer timelines may slow the reentry into homeownership. RealtyTrac (2014) projects that, between 2015 and 2022 nationwide, nearly 7.3 million so-called boomerang buyers who experienced foreclosure during the crisis will have passed the seven-year period they "conservatively need to repair their credit and qualify to buy a home." In fact, a number of post-foreclosure consumers have already bought homes using mortgages.

Using credit bureau data from the Federal Reserve Bank of New York/Equifax Consumer Credit Panel, we analyze a random sample of 43,000 U.S. consumers who defaulted on their mortgages in 2007–2010 and experienced a completed foreclosure by the end of 2013. As reported in Table 6, we find that 8.9% of borrowers in statutory states who defaulted in 2007 had taken out a new mortgage by March 2014, compared with 7.3% of borrowers in judicial states. This roughly 2-percentage-point gap persists for borrowers who defaulted in 2008 and 2009. The unconditional cumulative rates of new mortgage borrowing are displayed in Figure 8 for each

cohort of defaulting borrowers. Boomerang borrowing becomes much more common starting 12–16 quarters (three to four years) after default.

To control for differences in borrower characteristics and local economic conditions, we estimate a simple logit model, in which the dependent variable takes on a value of one for borrowers who took out a new mortgage by the first quarter of 2014. The results are displayed in Table 7. In line with the summary statistics reported previously, borrowers in statutory states were about 1.3 times as likely to take out a new mortgage as those in judicial states, after controlling for whether the borrower experienced a bankruptcy event since defaulting, the age of the borrower, his credit score at default, and the percentage changes in the county unemployment rate and house price index since origination. The judicial-statutory differential is largest and most significant for borrowers who defaulted in 2009, and it is weakest for those defaulting in 2010, when the odds ratio is not statistically different from one.

We find that older consumers are less likely to take out new mortgages post-foreclosure than their younger counterparts are. Consumers aged 66 or older at the time of default are only about one-third to one-half as likely as consumers under the age of 35 to take out a new loan. Consumers in areas with larger house price declines from origination to default were more likely to take out a boomerang loan, though places with a larger percentage change in the unemployment rate during this period saw lower subsequent borrowing. Interestingly, borrowers who had experienced a bankruptcy event since defaulting on their mortgages were actually more likely to take out a new mortgage.

These results indicate a meaningful difference in the rates of boomerang borrowing in judicial and statutory states. Of course, some post-foreclosure consumers may reenter homeownership by paying cash, though we feel this does not undermine our findings. Borrowers who have longer foreclosure timelines have the opportunity to put the money saved on housing payments while in foreclosure toward a future purchase. However, the differential we report previously in the amount that can be saved on these payments, an average of about \$18,000 in recent periods, is too small to enable consumers to buy homes debt free.

Future research should be conducted to determine if and when judicial state borrowers catch up to their statutory state counterparts in terms of new mortgage borrowing. In addition, time will tell if a statistically significant gap in boomerang borrowing emerges for the 2010 cohort of defaulting borrowers, as well as later cohorts.

## V. Costs of Foreclosure Delay Borne by Third Parties

In addition to the direct costs lenders face from longer foreclosure timelines, additional costs may be borne by society. For example, some of the costs of foreclosure are the negative externalities imposed by a property on its neighbors. The longer a property spends in foreclosure, the more damage may occur.

Foreclosures have been shown to have a small but measurable impact on neighboring house prices. Immergluck and Smith (2006), studying Chicago; Campbell, Giglio, and Pathak (2011), studying Massachusetts; and Harding, Rosenblatt, and Yao (2009) and Gerardi et al. (2012), both using national data sets, all find that each foreclosure located nearby (typically within 0.1 mile) lowers a seller's price by an average of 1%. Further, Gerardi et al. (2012) find that, in many metro areas, the negative effects from foreclosures are most severe when the properties are owned by borrowers who have spent long periods in default.

Collectively, these studies have evolved over time in their econometric sophistication. Gerardi et al. (2012), for example, helps control for underlying neighborhood and housing traits that would both affect house prices and be correlated with the incidence of foreclosures nearby by using a repeat sales approach — that is, studying the difference in a home's appreciation between two sales, controlling for the number of foreclosures located nearby at the time of each sale.<sup>6</sup>

One way that foreclosures may hurt neighboring property values is by increasing crime. Ellen, Lacoë, and Sharygin (2012) use precise data on crime and foreclosure locations to show that an additional foreclosure on a block face leads to more total crimes, including violent and nonviolent crimes. The effects appear to be the largest for foreclosed properties that are on their way to auction or have reverted to bank ownership.

Foreclosures may also hurt neighboring home values if foreclosed properties are poorly maintained, becoming a nuisance to neighbors. Using data on constituent complaints to the City of Boston about property conditions, Lambie-Hanson (2013) finds that neighbors are increasingly likely to complain about the conditions of properties after their owners have spent long periods in default and foreclosure.

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<sup>6</sup> To control for unrelated house price trends in the neighborhoods, Gerardi et al. (2012) use census tract — purchase year — sale year controls, which help separate the influence of being in a declining neighborhood with the effect of being located near a foreclosure.

Early evidence suggests that house price recovery has been slower in judicial foreclosure states (Aragon, Peach, and Tracy, 2013). As shown in Figure 9, judicial foreclosure states have experienced slower house price growth, on average, from the trough of house prices through April 2014, even after accounting for the extent to which prices initially fell. Put differently, for any level of house price decline from peak to trough (measured along the horizontal axis), statutory states have experienced higher rates of recent house price appreciation, on average, than judicial states — statutory states have higher values along the vertical axis. The size of the state markers in Figure 9 reflect the mean time in months from default to the REO liquidation, for borrowers who defaulted in Period 3 (November 2008–August 2010). As documented in Section I, judicial state timelines have been considerably longer than those in most statutory states, though there is heterogeneity across states.

## **VI. Conclusions and Policy Implications**

One rationale for the large number of moratoria implemented by federal and local governments is that longer timelines are beneficial to borrowers because they give them more time to recover. This implicitly assumes that further delay does not generate additional costs to borrowers, either because they will be absorbed by investors or the costs are offset by preventing foreclosures. We have shown that judicial foreclosure review imposes large costs to investors in the form of time-related costs, but it does not appear to generate benefits to borrowers in terms of prevented foreclosures, just more persistently delinquent borrowers. Having more persistently delinquent borrowers imposes costs to neighborhoods, slows the reentry of boomerang borrowers back into the mortgage market, and appears to have slowed house price recovery in judicial foreclosure states. Direct benefits to borrowers from these delays appear to be small.

Cutts and Merrill (2008) propose a harmonization of state foreclosure laws built on timelines found in statutory states. They argue that the optimal time in delinquency is 270 days, made up of 150 days of pre-foreclosure loss mitigation activity and 120 days in foreclosure. It is possible the GSEs and their regulator, the Federal Housing Finance Agency (FHFA), could encourage harmonization through the pricing of guarantee fees.

The new CFPB servicing rules that took effect on January 10, 2014, have had the effect of imposing a set of standards on a mortgage-servicing industry with few incentives to do so on its own (see Cordell et al., 2009). This is a harmonization of sorts, even as it preserves existing

state laws. One byproduct of these new rules is a further lengthening of timelines. Interestingly, as shown in Figure 4, the modal pre-foreclosure timeline since the implementation of the new CFPB servicing rules is 150 days, matching the optimal timeline proposed by Cutts and Merrill (2008). However, the remaining in-foreclosure and REO timelines are longer, too. While results are preliminary with only eight months of observations, we estimate that total REO liquidation timelines will extend by three months in judicial states, six months in statutory states.

An area for future work will be to monitor developments to examine whether these new servicing rules are increasing the number of foreclosure alternative actions taken by servicers, as well as to study their effects on the provisioning of credit. Goodman (2014) argues that the extraordinary post-crisis tightening of credit stems not from a contraction of the credit boxes of the GSEs or the Federal Housing Administration “but from lenders applying tighter credit standards *within* the credit box.” She attributes the “costs and burdens of servicing delinquent loans” to be an important factor leading to this tightening of credit.

Although our initial results indicate that foreclosure timelines have lengthened in the wake of these new rules, particularly in statutory states, so far, we observe no measurable, lasting change in the performance of distressed mortgages. Since these results are preliminary and likely to be affected by the overhang of existing foreclosures, the effects of the new servicing rules on improving outcomes for borrowers and on the provisioning of credit is an important area for future research.

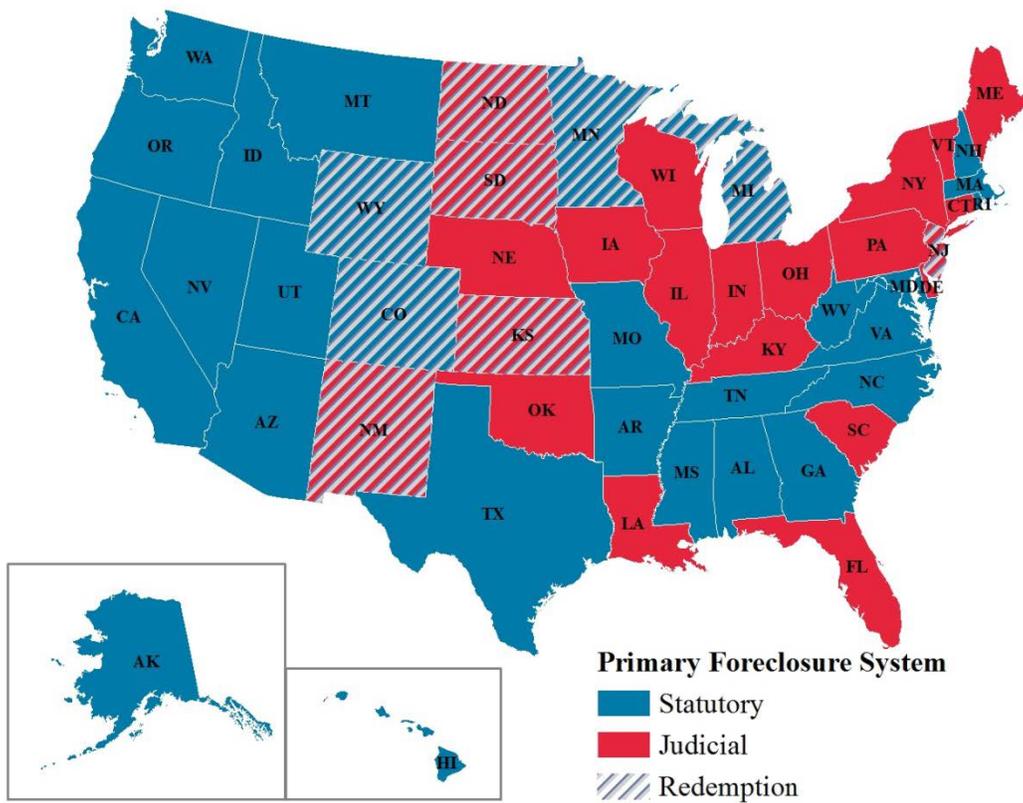
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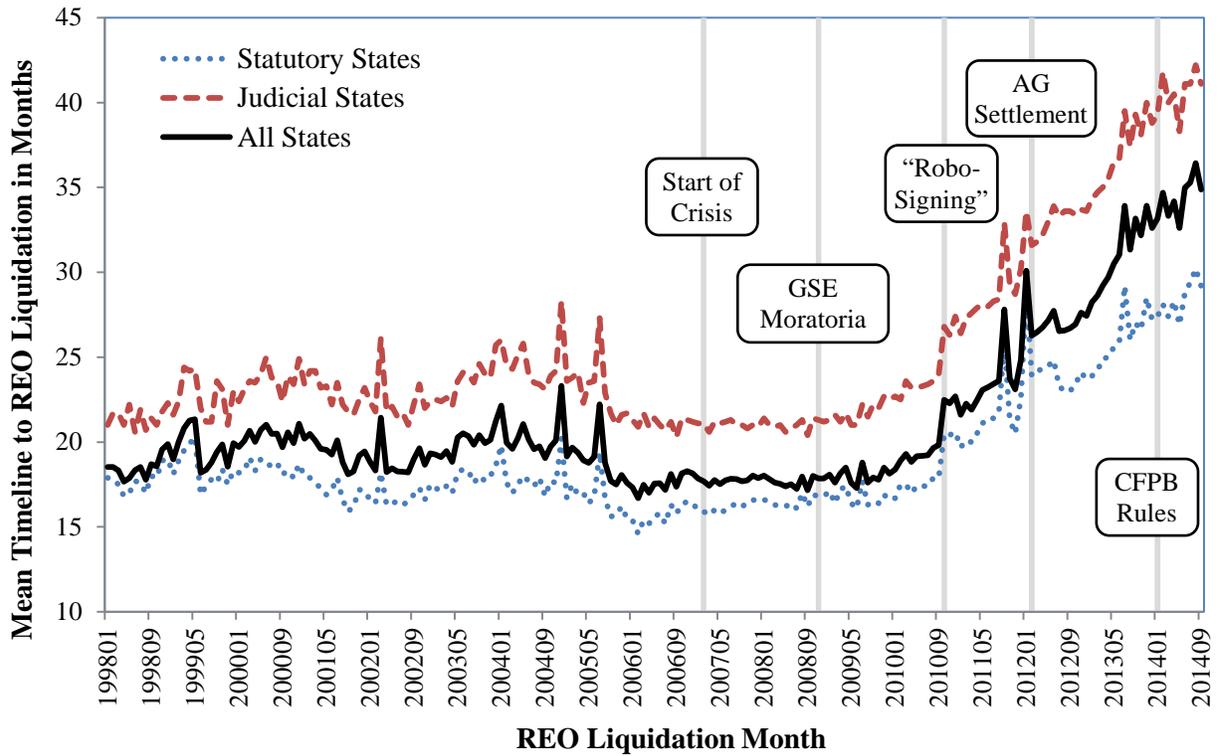
## Figures and Tables

Figure 1. Dominant State Foreclosure Practices



Note: We use the same categorizations of states as Cordell et al. (2015) and Cutts and Merrill (2008).

Figure 2. Mean REO Timelines by Liquidation Dates



Source: Authors' calculations of data from Black Knight Financial Services; note: This figure shows the average REO timelines, measured as the months elapsed from last interest paid date to REO liquidation date.

Figure 3A. Seriously Delinquent Rates and 1- and 2-Year Past Due Shares Among Seriously Delinquent Loans in Statutory States

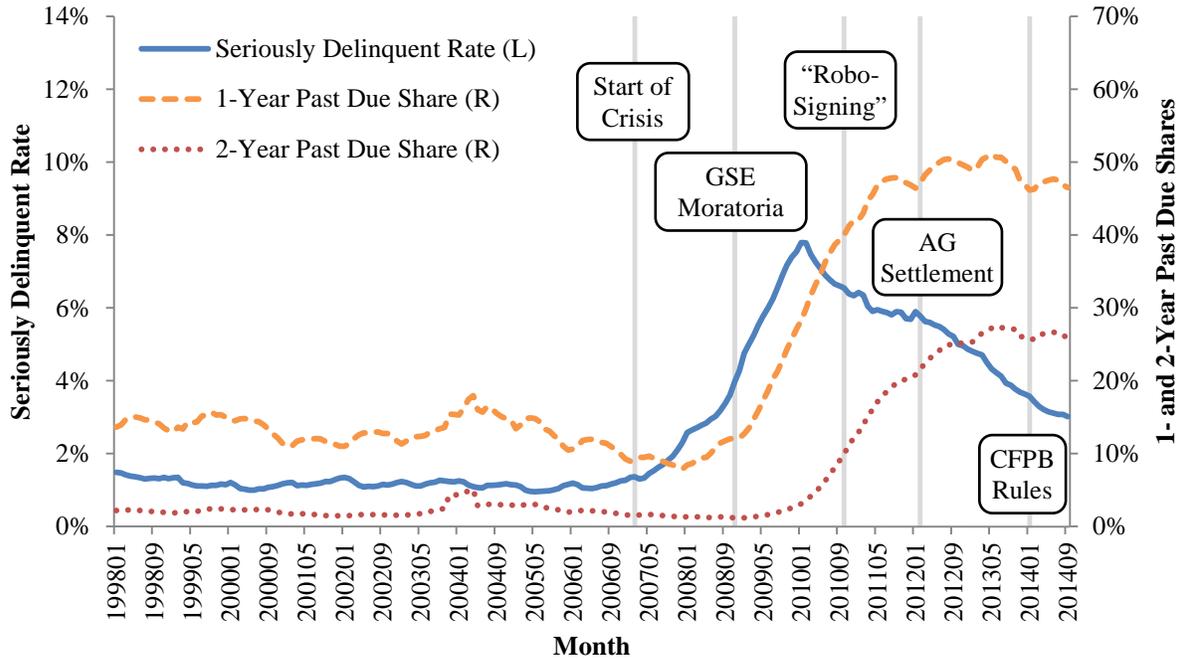
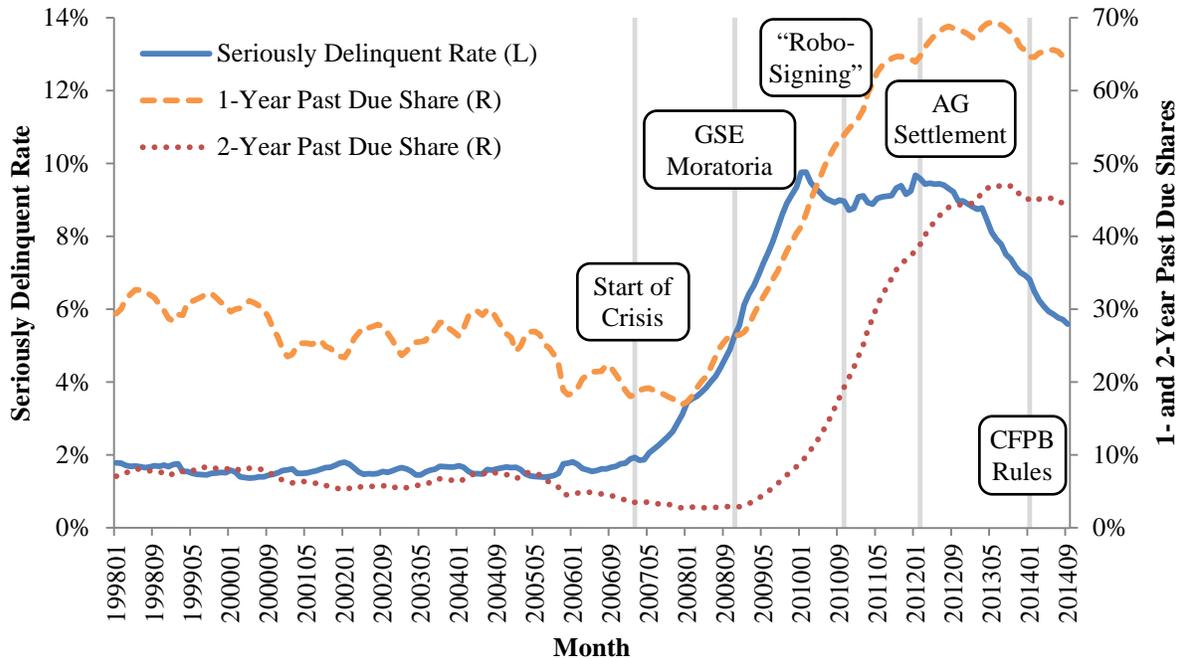
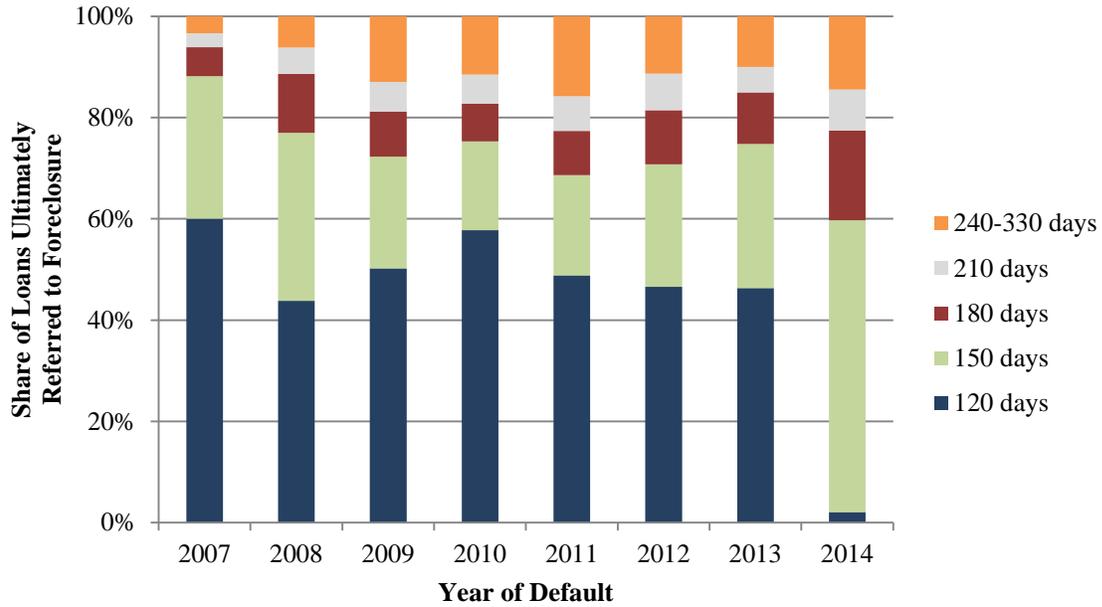


Figure 3B. Seriously Delinquent Rates and 1- and 2-Year Past Due Shares Among Seriously Delinquent Loans in Judicial States



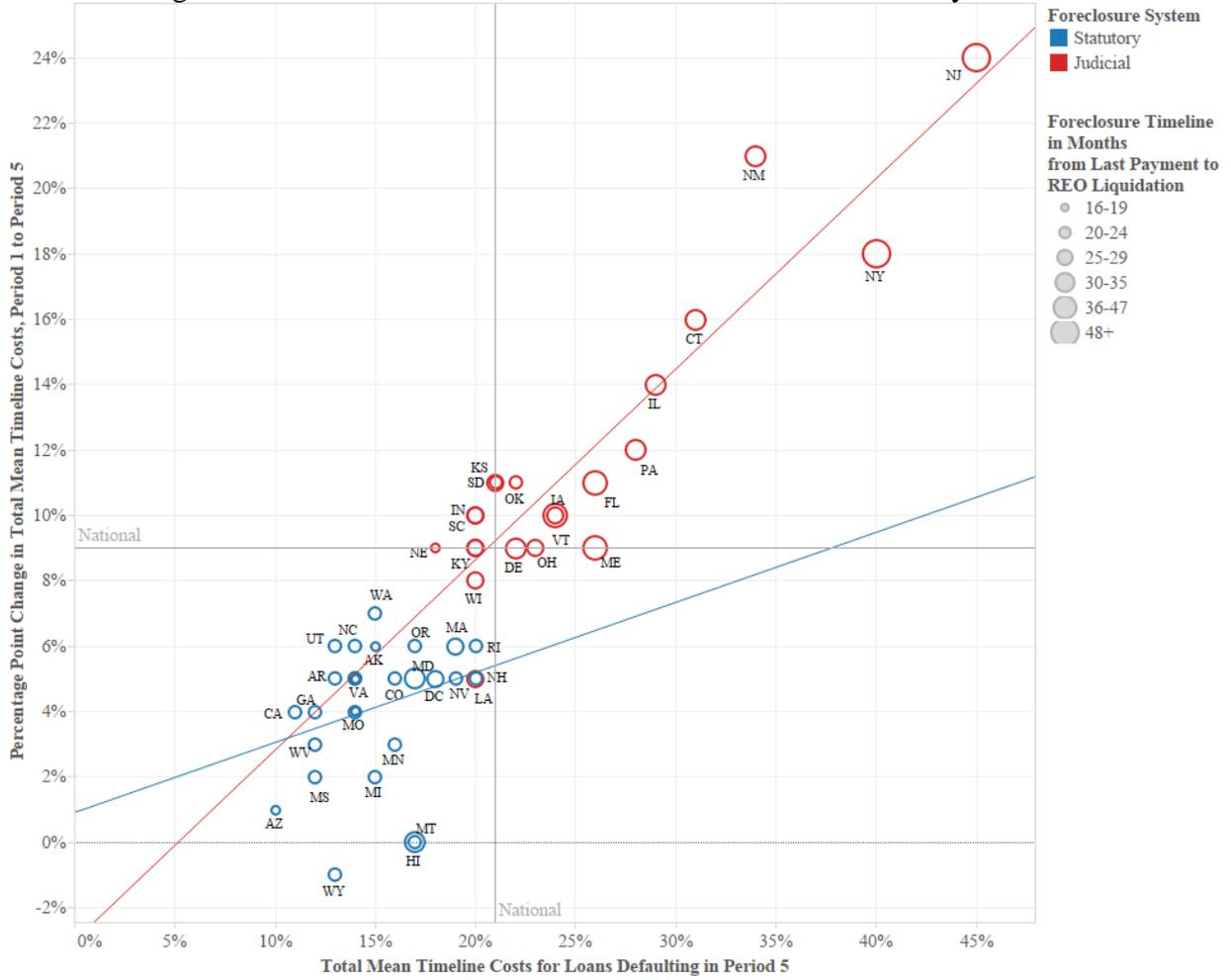
Source: Authors' calculations of data from Black Knight Financial Services McDash data; note: The serious delinquency rate includes active first-lien mortgages 90+ days delinquent (left axis). The figure also shows the share of seriously delinquent loans that were more than one- and two-years past due (right axis).

Figure 4. Speed at Which Servicers Begin Foreclosures  
by Period Loans Become 90+ Days Delinquent



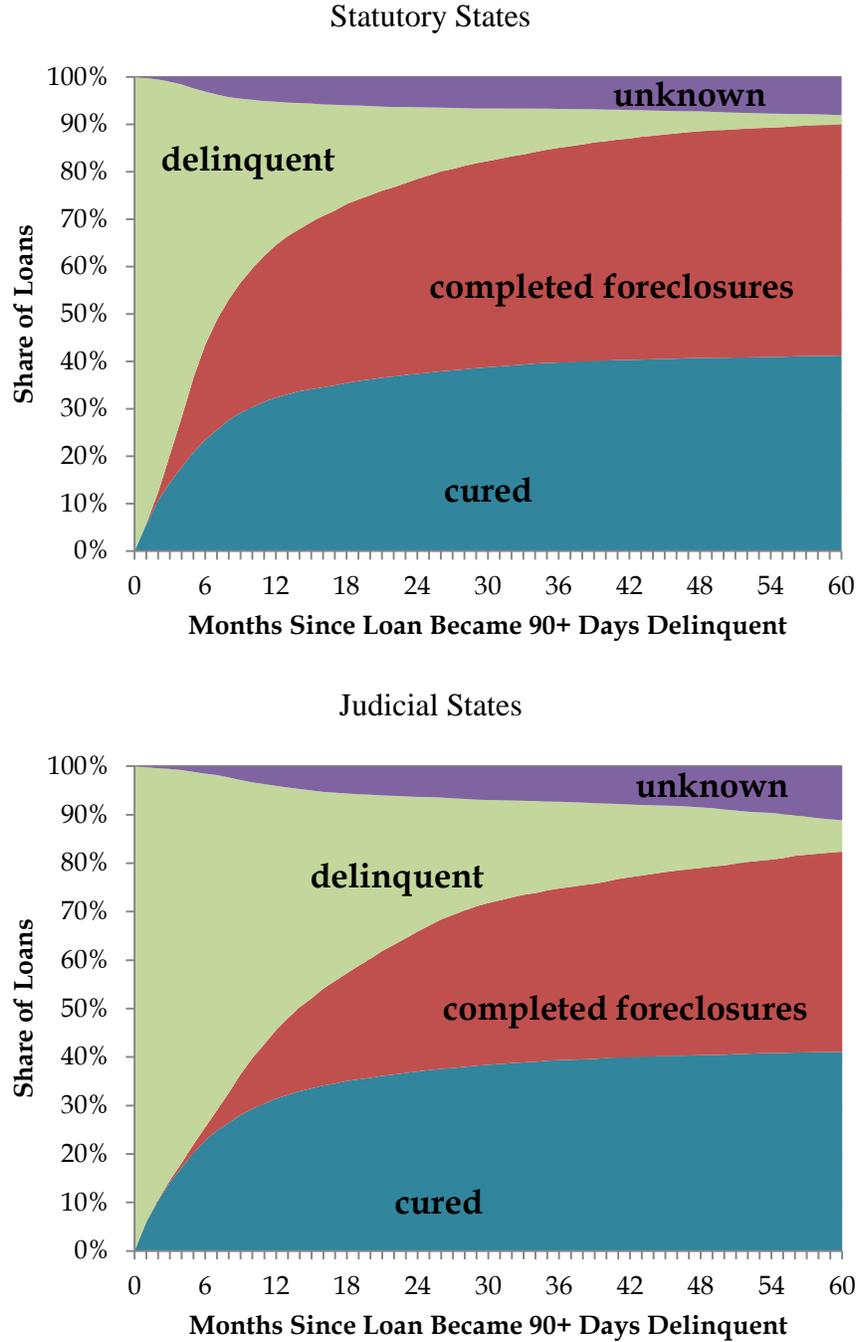
Source: Authors' calculations of Black Knight Financial Services McDash data; note: Loans included became 90+ days delinquent in the first quarter of the years displayed, and the lender/servicer began foreclosure proceedings in the following eight months (by 330 days past due). Loans are excluded from the sample if the borrower resumed payments after defaulting.

Figure 5. Levels and Growth in Mean Timeline-Related Costs by Location



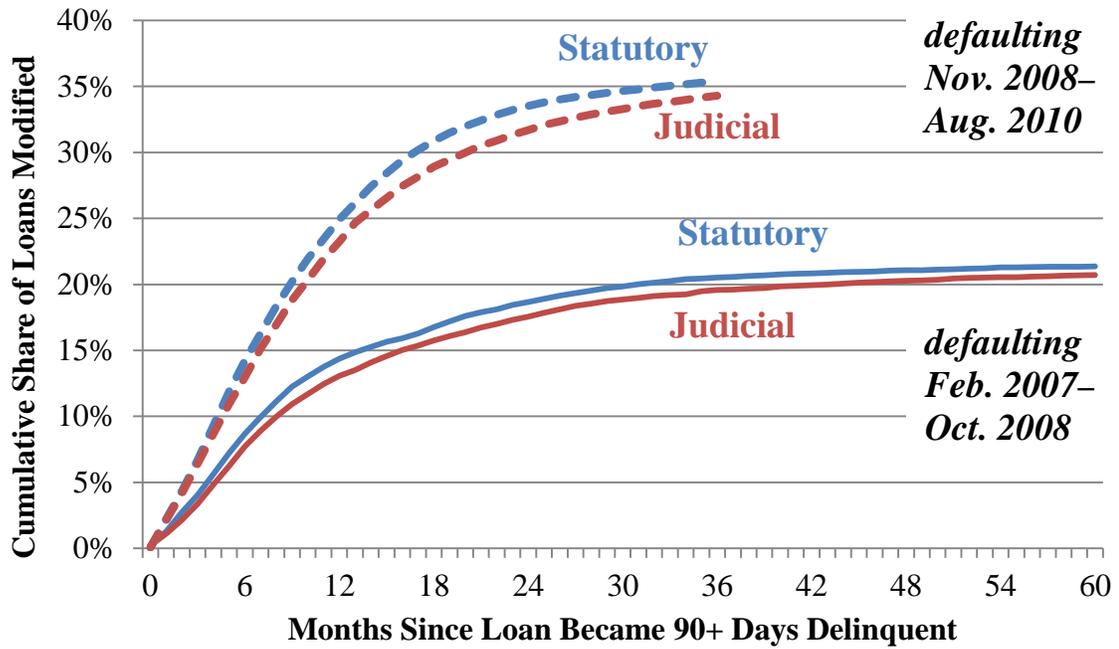
Source: Displayed data are taken from Cordell et al. (2015). Note: This figure presents the calculated mean timeline costs (property taxes, insurance, and excess depreciation) as a percentage of the unpaid principal balance. Default is defined as 180+ days past due. The horizontal axis measures the timeline costs for loans defaulting (becoming 180+ days past due) in Period 5 (February 2012–September 2013, as defined by Cordell et al.). The vertical axis measures the percentage point change in state mean timeline costs from Period 1 (January 2005–January 2007) to Period 5. The size of the markers indicates the mean modeled foreclosure timeline for the middle cohort of defaulters, Period 3 (November 2008–August 2010). The marker for Virginia overlaps with Idaho, Tennessee, and Texas (unlabeled), while Kentucky overlaps with North Dakota (unlabeled), and Missouri overlaps with Alabama (unlabeled).

Figure 6. Mortgage Outcomes in First 60 Months Following Default



Source: Authors' calculations of Black Knight Financial Services McDash data; note: This figure shows the subsample of borrowers who defaulted between February 2007 and August 2008, classifying their status each month after becoming 90 days delinquent as (1) cured (i.e., becoming current or paying off their mortgages), (2) completed foreclosure (i.e., foreclosure auction has occurred); (3) still delinquent, or (4) no longer observed in the sample, usually due to a servicer change.

Figure 7. Cumulative Mortgage Modification Rates for Two Cohorts of Defaulting Mortgages in Judicial and Statutory States



Source: Authors' calculations of Black Knight Financial Services McDash data; note: Mortgage modifications are determined using an algorithm explained by its creators in Adelino, Gerardi, and Willen (2009).

Figure 8. Cumulative Percentages of Post-foreclosure Consumers Taking Out New Mortgages, by Year of Default

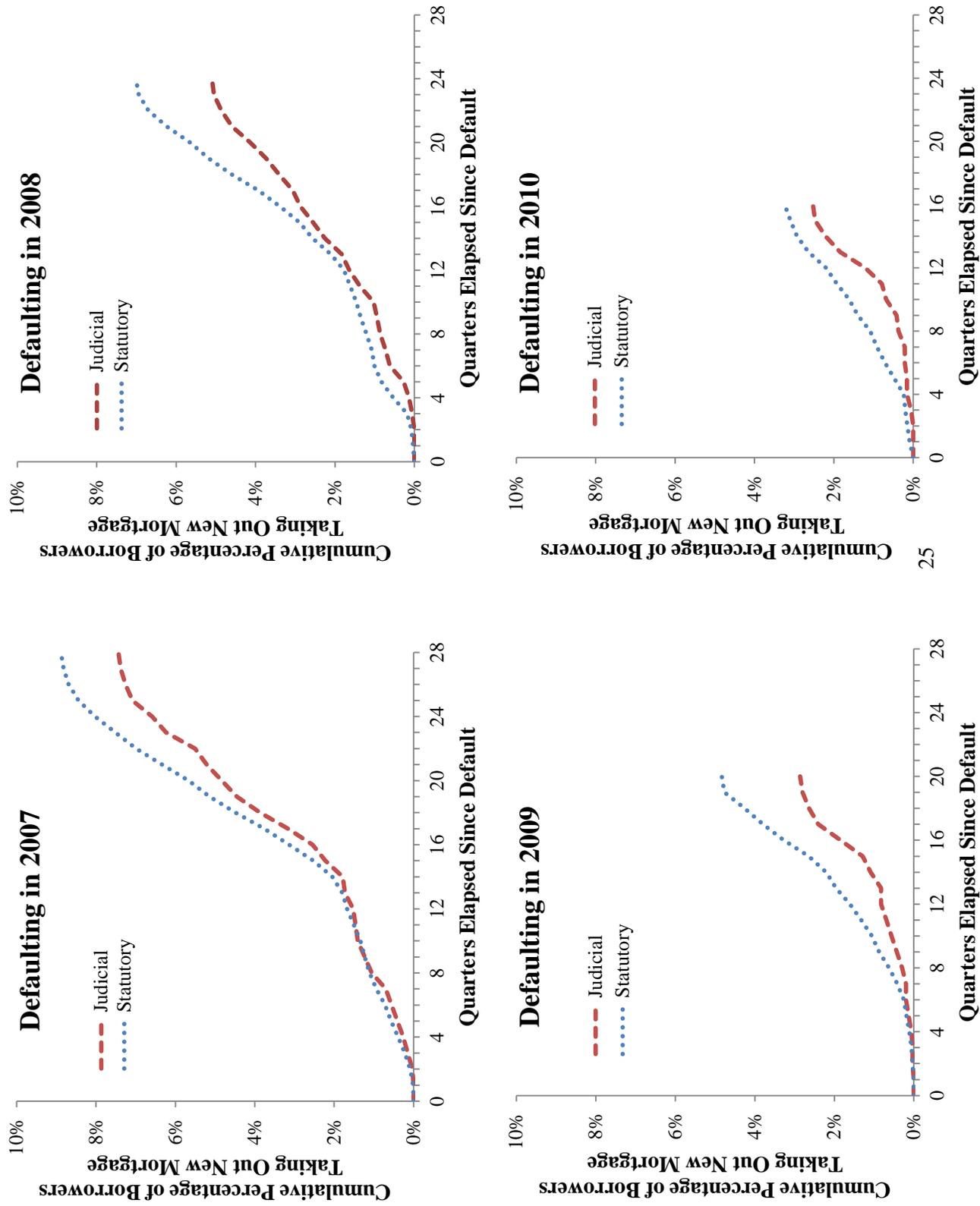
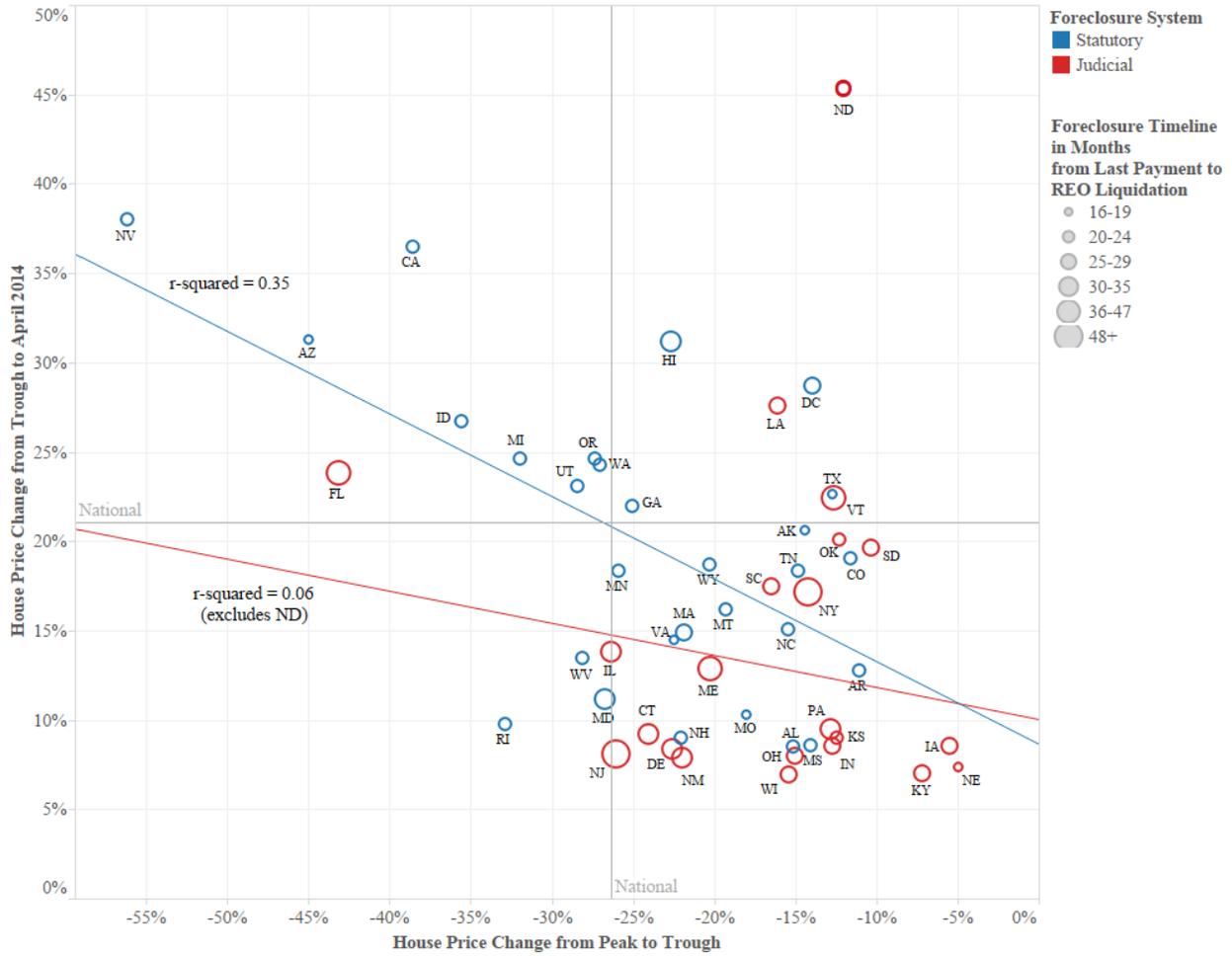


Figure 9. Recent House Price Recovery in Judicial and Statutory States



Source: Authors' calculations of CoreLogic house price index and Black Knight Financial Services McDash data; note: This analysis updates and expands work by Aragon, Peach, and Tracy (2013). The size of the markers indicates the mean modeled foreclosure timeline for the middle cohort of defaulters, Period 3 (November 2008–August 2010).

Table 1. Observed and Modeled Total Foreclosure Timelines,  
Measured as Time from Last Payment to REO Liquidation, by Time of Default

| Default Period                  | Uncensored Sample |                                       | Censored Sample |  | Combined Sample        |                                      |
|---------------------------------|-------------------|---------------------------------------|-----------------|--|------------------------|--------------------------------------|
|                                 | Loans             | Mean Total<br>Timeline<br>(in Months) | Loans           | Mean Timeline<br>as of Sept. 2014<br>(in Months) | % of Loans<br>Censored | Estimated<br>Timeline<br>(in Months) |
| <b>Statutory States</b>         |                   |                                       |                 |  |                        |                                      |
| Period 1 (Jan. 2005-Jan. 2007)  | 31,500            | 19                                    | 0               | -  | 0%                     | 19                                   |
| Period 2 (Feb. 2007-Oct. 2008)  | 392,690           | 20                                    | 0               | -  | 0%                     | 20                                   |
| Period 3 (Nov. 2008-Aug. 2010)  | 728,774           | 22                                    | 13,172          | 60   | 2%                     | 23                                   |
| Period 4 (Sept. 2010-Jan. 2012) | 316,005           | 19                                    | 32,406          | 45   | 9%                     | 24                                   |
| Period 5 (Feb. 2012-Jan. 2014)  | 117,113           | 16                                    | 37,999          | 31   | 24%                    | 24                                   |
| Period 6 (Feb. 2014-Sept. 2014) | 41,632            | 13                                    | 178,531         | 14   | 81%                    | 30                                   |
| <b>Judicial States</b>          |                   |                                       |                 |  |                        |                                      |
| Period 1 (Jan. 2005-Jan. 2007)  | 18,917            | 25                                    | 0               | -  | 0%                     | 25                                   |
| Period 2 (Feb. 2007-Oct. 2008)  | 203,441           | 28                                    | 0               | -  | 0%                     | 28                                   |
| Period 3 (Nov. 2008-Aug. 2010)  | 332,690           | 31                                    | 34,197          | 60   | 9%                     | 37                                   |
| Period 4 (Sept. 2010-Jan. 2012) | 134,065           | 27                                    | 58,232          | 46   | 30%                    | 41                                   |
| Period 5 (Feb. 2012-Jan. 2014)  | 45,285            | 21                                    | 54,480          | 31   | 55%                    | 40                                   |
| Period 6 (Feb. 2014-Sept. 2014) | 12,538            | 15                                    | 172,125         | 14   | 93%                    | 43                                   |

Source: Authors' calculations of CoreLogic House Price Index and Black Knight Financial Services McDash data; notes: This table presents the observed real estate owned (REO) liquidation timelines from uncensored data and estimated REO liquidation timelines from combined data (both uncensored and censored) using a survival model. For uncensored data, the REO liquidation timeline is defined as the number of months from last interest paid date (LIPD) to REO liquidation; for censored data, the duration is defined as the number of months from LIPD to September 2014. The final set of columns describe the combined sample, in which timelines are observed for uncensored loans and estimated for censored loans using the accelerated failure time (AFT) model. "Default" is defined as becoming 180 or more days past due.

Table 2. Summary of Mean Timeline-Related Costs by Location and Time of Default

| <b>Default Period</b>               | <b>Statutory</b> | <b>Judicial</b> | <b>Redemption</b> | <b>Lowest-<br/>AZ</b> | <b>Highest-<br/>NJ</b> | <b>All<br/>States</b> |
|-------------------------------------|------------------|-----------------|-------------------|-----------------------|------------------------|-----------------------|
| Period 1 (Jan. 2005-Jan. 2007)      | 10%              | 16%             | 14%               | 9%                    | 21%                    | 12%                   |
| Period 2 (Feb. 2007-Oct. 2008)      | 9%               | 18%             | 15%               | 8%                    | 25%                    | 12%                   |
| Period 3 (Nov. 2008-Aug. 2010)      | 12%              | 31%             | 26%               | 9%                    | 59%                    | 18%                   |
| Period 4 (Sept. 2010-Jan. 2012)     | 13%              | 33%             | 28%               | 8%                    | 52%                    | 20%                   |
| Period 5 (Feb. 2012-Sept. 2013*)    | 14%              | 31%             | 30%               | 10%                   | 45%                    | 21%                   |
| <b>Change, Period 1 to Period 5</b> | <b>4%</b>        | <b>15%</b>      | <b>16%</b>        | <b>1%</b>             | <b>24%</b>             | <b>9%</b>             |

Source: Cordell et al. (2015); note: This table presents the calculated mean timeline-related costs as a percentage of the unpaid balance for loans that defaulted in different time periods. Default periods are based on the date the loan enters default at 180 days past due. The highest-cost state (New Jersey) and the lowest-cost state (Arizona) are based on the ranks of total timeline costs in Period 5. Redemption states represent a subset of nine states that can be either judicial or statutory. \* Cordell et al. follow Period 5 through September 2103 only.

Table 3. Describing Delinquent Loans in Judicial and Statutory States

|  | Loans Originated 2005-2007        |          |       |                                   |          |       |
|--|-----------------------------------|----------|-------|-----------------------------------|----------|-------|
|  | Defaulting<br>Jan. 2005-Aug. 2011 |          |       | Defaulting<br>Feb. 2007-Aug. 2008 |          |       |
|  | Statutory                         | Judicial | Total | Statutory                         | Judicial | Total |
| <i>Mean characteristics at origination</i> |                                   |          |       |                                   |          |       |
| Origination year                           | 2006                              | 2006     | 2006  | 2006                              | 2006     | 2006  |
| Loan-to-value ratio                        | 80                                | 81       | 80    | 81                                | 83       | 82    |
| FICO score                                 | 672                               | 661      | 668   | 651                               | 645      | 648   |
| <i>Loan purpose (%)</i>                    |                                   |          |       |                                   |          |       |
| Purchase                                   | 47                                | 51       | 48    | 52                                | 56       | 54    |
| Refinance                                  | 53                                | 49       | 52    | 48                                | 44       | 46    |
| <i>Type of mortgage interest (%)</i>       |                                   |          |       |                                   |          |       |
| Fixed rate                                 | 57                                | 68       | 61    | 46                                | 58       | 51    |
| Adjustable rate                            | 43                                | 32       | 39    | 54                                | 42       | 49    |
| <i>Occupancy status (%)</i>                |                                   |          |       |                                   |          |       |
| Primary residence                          | 91                                | 88       | 90    | 92                                | 88       | 90    |
| Second home or investment property         | 9                                 | 12       | 10    | 8                                 | 12       | 10    |
| <i>Property type (%)</i>                   |                                   |          |       |                                   |          |       |
| Single-family                              | 86                                | 78       | 83    | 87                                | 78       | 84    |
| Small multifamily (2-4 units)              | 2                                 | 5        | 3     | 2                                 | 5        | 3     |
| Condominium                                | 12                                | 17       | 14    | 11                                | 17       | 13    |
| <i>Pre-delinquency status</i>              |                                   |          |       |                                   |          |       |
| Months elapsed origination to default      | 29                                | 28       | 29    | 17                                | 16       | 17    |
| % change in house price index              | -20                               | -15      | -18   | -10                               | -6       | -9    |
| Change in unemployment rate                | 3.8                               | 3.4      | 3.6   | 0.7                               | 0.8      | 0.7   |

Source: Authors' calculations of Black Knight Financial Services McDash data; note: This table displays summary statistics for a sample of loans originated 2005–2007 that became 90+ days delinquent between January 2005 and August 2011 and in February 2007–August 2008, closely corresponding to Period 2.

Table 4. Mortgage Outcomes by State Foreclosure System and Months Elapsed Since Default

|                                     | <u>Statutory</u> |     |     |     | <u>Judicial</u> |     |     |     |
|-------------------------------------|------------------|-----|-----|-----|-----------------|-----|-----|-----|
|                                     | 12               | 24  | 36  | 69  | 12              | 24  | 36  | 60  |
| Cured                               | 32%              | 37% | 40% | 41% | 31%             | 37% | 39% | 41% |
| Foreclosure completed               | 32%              | 41% | 45% | 49% | 14%             | 29% | 35% | 41% |
| Still delinquent                    | 30%              | 15% | 8%  | 2%  | 50%             | 28% | 18% | 6%  |
| Status unknown (loan exited sample) | 5%               | 6%  | 7%  | 8%  | 4%              | 6%  | 7%  | 11% |

Source: Authors' calculations of Black Knight Financial Services McDash data; note: This table displays the share of loans in judicial and statutory foreclosure states in each of four status categories at 12, 24, 36, and 60 months after the loans became seriously (90+ days) delinquent. Columns may not sum to 100% due to rounding.

Table 5. Changes in Foreclosure Timelines and Savings to Borrowers in the Form of Unpaid Principal and Interest

|                               | Pre-Crisis<br>2005-Jan. 2007 | Post-Crisis<br>Feb.-Sept. 2012 | Change   |
|-------------------------------|------------------------------|--------------------------------|----------|
| <u>Statutory</u>              |                              |                                |          |
| Estimated average timeline    | 11                           | 14                             | 3        |
| Average payment (post-crisis) | \$1,450                      | \$1,450                        |          |
| Estimated total savings       | \$15,950                     | \$20,300                       | \$4,350  |
| <u>Judicial</u>               |                              |                                |          |
| Estimated average timeline    | 17                           | 32                             | 15       |
| Average payment (post-crisis) | \$1,200                      | \$1,200                        |          |
| Estimated total savings       | \$20,400                     | \$38,400                       | \$18,000 |

Source: Authors' calculations of Black Knight Financial Services McDash data; note: Average payments are calculated for loans that became 90 days or more delinquent in February-September 2012.

Table 6. Descriptive Statistics for Sample of Post-Foreclosure Borrowers

|   | Year in Which Borrower Defaulted |       |       |       |           |
|---|----------------------------------|-------|-------|-------|-----------|
|   | 2007                             | 2008  | 2009  | 2010  | All Years |
| <u>Statutory</u>                              |                                  |       |       |       |           |
| Taking out new mortgage (%)                   | 8.9                              | 7.1   | 4.9   | 3.2   | 6.2       |
| Credit score at default (median)              | 479                              | 499   | 522   | 537   | 506       |
| Experienced bankruptcy (%)                    | 25                               | 20    | 17    | 14    | 19        |
| Age at default (%)                            |                                  |       |       |       |           |
| 18-34   | 31                               | 30    | 26    | 24    | 28        |
| 35-50   | 49                               | 48    | 47    | 46    | 47        |
| 51-65   | 16                               | 18    | 21    | 24    | 20        |
| 66+   | 4                                | 4     | 5     | 6     | 5         |
| % Change in unemployment rate (median)        | -7                               | 23    | 97    | 96    | 37        |
| % Change in house price index (median)        | -5                               | -18   | -27   | -25   | -17       |
| Quarters from default to foreclosure (median) | 3                                | 4     | 5     | 4     | 4         |
| Observations                                  | 7,238                            | 9,434 | 8,711 | 5,460 | 30,843    |
| <u>Judicial</u>                               |                                  |       |       |       |           |
| Taking out new mortgage (%)                   | 7.3                              | 4.8   | 2.7   | 2.6   | 4.6       |
| Credit score at default (median)              | 474                              | 484   | 503   | 521   | 491       |
| Experienced bankruptcy (%)                    | 29                               | 21    | 18    | 16    | 22        |
| Age at default (%)                            |                                  |       |       |       |           |
| 18-34   | 30                               | 28    | 26    | 23    | 27        |
| 35-50   | 47                               | 46    | 46    | 43    | 46        |
| 51-65   | 18                               | 20    | 21    | 25    | 21        |
| 66+   | 5                                | 6     | 7     | 8     | 6         |
| % Change in unemployment (median)             | -8                               | 22    | 86    | 87    | 31        |
| % Change in house price index (median)        | -1                               | -10   | -15   | -14   | -8        |
| Quarters from default to foreclosure (median) | 5                                | 7     | 8     | 8     | 7         |
| Observations                                  | 3,416                            | 3,726 | 3,039 | 1,901 | 12,082    |

Source: Authors' calculations of Federal Reserve Bank of New York/Equifax Consumer Credit Panel data, matched with county-level house price indices from CoreLogic and county-level unemployment rates from the Bureau of Labor Statistics; note: Borrowers who defaulted (became 90+ days delinquent) in 2007–2010 and experienced a foreclosure completed by 2013 are included. "Taking out new mortgage" is coded as 1 if the borrower took out a new mortgage at some point between the quarter in which the foreclosure was completed and 2014 Q1. Variables measured at default capture values in the quarter the borrower became 90+ days delinquent. Credit scores used are Equifax Risk Scores. Changes in unemployment and house price index are measured from origination to the time of default. "Quarters from default to foreclosure" measures the time elapsed from becoming 90+ days delinquent to the end of the foreclosure (the auction). Because this may be endogenous, we omit it as a control in the logit model.

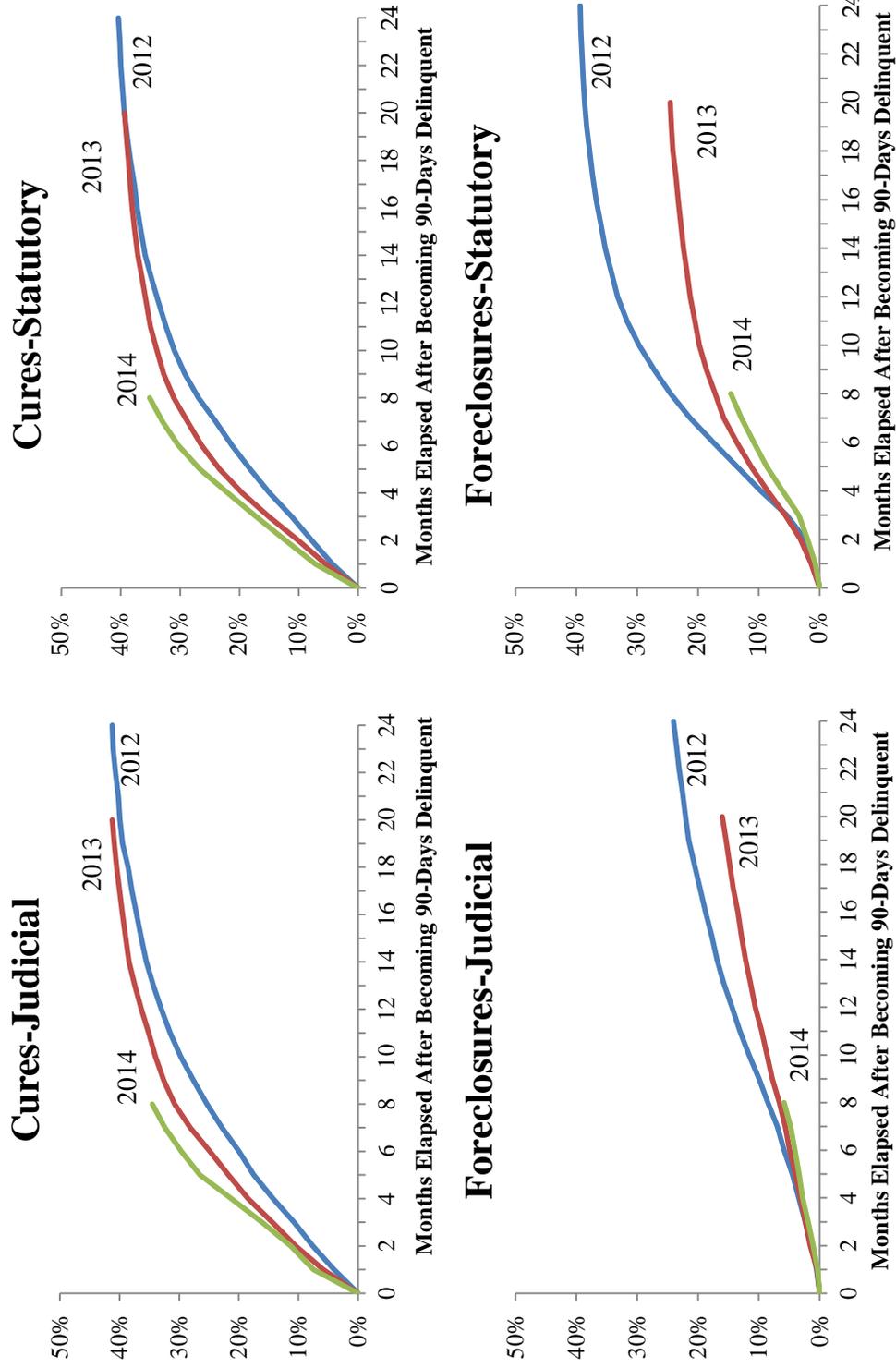
Table 7. Probability of Post-Foreclosure Borrowers Taking Out New Mortgages

|                                 | Year in Which Borrower Defaulted |                                 |                                 |                                 |                                 |
|---------------------------------|----------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|                                 | 2007                             | 2008                            | 2009                            | 2010                            | All Years                       |
| Statutory foreclosure state (D) | 1.190 <sup>*</sup><br>(2.21)     | 1.357 <sup>***</sup><br>(3.45)  | 1.621 <sup>***</sup><br>(3.85)  | 1.149<br>(0.83)                 | 1.291 <sup>***</sup><br>(5.16)  |
| Bankruptcy (D)                  | 1.281 <sup>**</sup><br>(3.20)    | 1.377 <sup>***</sup><br>(3.78)  | 1.331 <sup>*</sup><br>(2.51)    | 1.183<br>(0.89)                 | 1.299 <sup>***</sup><br>(5.36)  |
| Age of borrower at default      |                                  |                                 |                                 |                                 |                                 |
| 18-34 (D)                       | <i>(omitted category)</i>        |                                 |                                 |                                 |                                 |
| 35-50 (D)                       | 0.830 <sup>*</sup><br>(-2.39)    | 0.886<br>(-1.49)                | 0.969<br>(-0.29)                | 0.830 <sup>*</sup><br>(-2.39)   | 0.913 <sup>~</sup><br>(-1.93)   |
| 51-65 (D)                       | 0.598 <sup>***</sup><br>(-4.50)  | 0.671 <sup>***</sup><br>(-3.63) | 0.771 <sup>~</sup><br>(-1.90)   | 0.598 <sup>***</sup><br>(-4.50) | 0.697 <sup>***</sup><br>(-5.69) |
| 66+ (D)                         | 0.321 <sup>***</sup><br>(-4.44)  | 0.351 <sup>***</sup><br>(-4.19) | 0.481 <sup>**</sup><br>(-2.72)  | 0.321 <sup>***</sup><br>(-4.44) | 0.421 <sup>***</sup><br>(-6.68) |
| Credit score at default         | 1.003 <sup>***</sup><br>(6.11)   | 1.004 <sup>***</sup><br>(7.71)  | 1.003 <sup>***</sup><br>(4.31)  | 1.003 <sup>***</sup><br>(6.11)  | 1.003 <sup>***</sup><br>(10.94) |
| % change in unemployment        | 0.667 <sup>*</sup><br>(-2.42)    | 0.724 <sup>**</sup><br>(-3.01)  | 0.679 <sup>***</sup><br>(-4.16) | 0.667 <sup>*</sup><br>(-2.42)   | 0.803 <sup>***</sup><br>(-4.09) |
| % change in house price index   | 0.750<br>(-1.29)                 | 0.604 <sup>*</sup><br>(-2.19)   | 0.355 <sup>***</sup><br>(-3.66) | 0.750<br>(-1.29)                | 0.545 <sup>***</sup><br>(-4.65) |
| Default Cohort (D, by year)     |                                  |                                 |                                 |                                 | Included                        |
| Borrowers                       | 10,654                           | 13,160                          | 11,750                          | 7,361                           | 47,033                          |
| Chi-square                      | 90.1                             | 129.8                           | 87.8                            | 18.2                            | 738.31                          |
| Log likelihood                  | -3,032.8                         | -3,091.1                        | -2,048.6                        | -997.2                          | -95,57.35                       |

Source: Authors' calculations of Federal Reserve Bank of New York/Equifax Consumer Credit Panel data, matched with county-level house price indices from CoreLogic and county-level unemployment rates from the Bureau of Labor Statistics; note: (D) indicates a dichotomous variable. ~, \*, \*\*, and \*\*\* indicate significance at the 0.1, 0.05, 0.01, and 0.001 levels, respectively. Odds ratios are reported, along with z-statistics in parentheses. Borrowers who defaulted (became 90+ days delinquent) in 2007–2010 and experienced a foreclosure completed by 2013 are included. The dichotomous dependent variable is coded as 1 if the borrower took out a new mortgage at some point between the quarter in which the foreclosure was completed and 2014 Q1. Variables measured at default capture values in the quarter the borrower became 90+ days delinquent. Credit scores used are Equifax Risk Scores. Changes in unemployment and house price index are measured from origination to the time of default.

## Appendix A

Figure A-1. Unconditional Cumulative Cure and Foreclosure Rates by Timing of Default in Judicial and Statutory States



Source: Authors' calculations of Black Knight Financial Services McDash data; note: This figure shows the outcomes of loans defaulting in the first quarters of 2012, 2013, and 2014. Delinquencies are considered "cured" if the borrower becomes current or pays off the mortgage.