Foreclosure Timelines and House Prices

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July 2017

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All views expressed herein are those of the authors and not the official position of Fannie Mae. We wish to thank Robert Avery and Andy Leventis of FHFA, Brian Brooks, David Greene, Todd Barton, Sarah Goldfrank, Michael LaCour-Little and Ying Pan for valuable feedback on earlier drafts. Earlier versions of the paper were also presented at the American Real Estate and Urban Economics meetings in June 2016 and Fannie Mae's Affordable Housing Advisory Council meeting in November 2016. Participants at those events also provided helpful comments.

Abstract

A number of policy interventions introduced during the housing crisis, together with differing state legal environments, have resulted in a general lengthening of the foreclosure timeline. Here we utilize a unique data set of Fannie Mae distressed properties to explore how foreclosure timeline variation may have affected housing market dynamics. We find that during the period of declining house prices from 2007 to 2011, extending the average foreclosure timeline by one month was associated with a reduction in cumulative house price decline from county peak to trough by 1.0% and shortening of the time to reach the trough in prices by half a month. During the subsequent home price recovery, extending the average foreclosure timeline by one month was associated with a reduction in the cumulative home price increase from county trough by 0.3% with no significant effect on the timing of recovery. Using a well-established method that matches pairs of counties in MSAs that straddle judicial and statutory legal jurisdictions, we find additional support for this price volatility dampening effect. Finally, in separate analyses we find no meaningful impact of extended foreclosure timelines on borrower performance outcomes, but materially greater loss severities, in judicial states.

Keywords: Foreclosure Timeline; Home Price; State Laws

JEL Codes: G18, R20, R30, R38

1. Introduction

It is well documented that declining house prices contributed to the increase in mortgage delinquencies and subsequent foreclosures as the Great Recession took its toll on housing markets.[1] A number of recent works have focused on the downward pressure on home values from neighboring foreclosures (see for instance Lin et al. (2009)).[2] A separate strand of research has investigated how state laws affect the foreclosure process and how, in turn, those differences affect house prices. In this paper our interest is in the effect of the foreclosure timeline (defined as the time from last payment made to completion of the foreclosure process) on house prices dynamics at the county level. In particular we investigate the extent to which longer timelines affect house prices. We examine these effects during periods of both declining and recovering house prices. In supplemental analyses, we also examine how extended foreclosure timelines affect borrower outcomes and loss severities.

Our research is motivated by the simple observation that states with judicial laws generally have longer foreclosure timelines and experience less dramatic house price volatility (Figure 1). As more fully described below, we rely on these state-level differences in judicial status as an instrument for the foreclosure timeline, demonstrating states requiring judicial foreclosure have longer timelines than non-judicial states, all else equal.[3] Our working hypothesis is that longer foreclosure timelines affect the timing and degree of house price recovery. We aim to identify the marginal effect of a longer foreclosure timeline on housing market dynamics using county-level foreclosure timelines based on Fannie Mae loan-level data, controlling for key county-level macroeconomic and housing variables.

A number of studies estimate the effect of foreclosures on home prices and other market outcomes. One branch of this literature addresses the effect of nearby foreclosures on neighboring property values. For instance, Immergluck and Smith (2006) and Lin et al. (2009) both use hedonic

[1] Haughwout, Peach and Tracy (2008) find that the house price decline played a larger role than credit standards in driving the sharp increase in early delinquency among nonprime mortgages.

[2] Lin et al., like many of the works in the literature, focus on the property level and identify effects on individual transactions from the presence of foreclosed properties nearby.

[3] In housing markets across the country house prices declines, rising delinquency and lengthening foreclosure timelines were the hallmarks of the housing crisis and, in all likelihood, fed on each other during the downturn. Foreclosure timelines extended as the entire mortgage market was dealing with a larger influx of distressed loans/properties. To address the endogeneity issue between, for instance home prices and foreclosure timelines, we use the state mortgage laws as instrumental variables throughout our analysis, as is standard in the literature.

models to estimate the effect of a foreclosure on the value of nearby non-distressed single-family homes, finding a reduction in value of 0.9% and 2.0%, respectively. Harding et al. (2009) adopt a repeat sales approach and find a contagion discount to be roughly 1% of the property price of non-distressed properties per nearby foreclosed property with a diminishing effect as the distance to the distressed properties increases. Campbell et al. (2011) estimate that spillover effects of foreclosures on non-distressed homes is 1.1% per foreclosure within 0.25 miles or 7.2% within a 0.1-mile radius. More recently, Gerardi et al. (2015) compare the spillover effects of all stages of distress from minor delinquency to REO sale and find that the contagion effects are greater for poorly maintained properties.

Two primary channels for this spillover effect have been proposed. The first is the supply channel in which downward pressure on prices results from the increase in supply arising from the volume of foreclosed properties. The second is the disamenity channel in which prices fall as a result of apparent neighborhood deterioration in the vicinity of a foreclosure due to deferred maintenance and, sometimes, abandonment. Gerardi et al. (2015) provide evidence of the disamenity mechanism at the micro level whereby distressed properties affect non-distressed home prices arising from deferred maintenance. Hartley (2014) attempts to isolate separate effects of the presence of foreclosed properties into the supply and disamenity channels. He concludes that an extra unit of distressed supply decreases the sales price of non-distressed properties by 1.2% within 0.05 miles while the disamenity effect is near zero. Anerberg and Kung (2014), using real estate listings, find that listing agents of non-distressed properties immediately drop their list price when an REO property is listed for sale nearby, providing additional empirical support for the supply channel. Mian et al. (2015, discussed further below) also find evidence for the supply channel mechanism.

Turning to the effect of state law differences, Pence (2006) finds that defaulter-friendly foreclosure laws at the state level are correlated with a 4–6% decrease in loan size and that lenders price for the difference in legal regimes. Ghent and Kudlyak (2010) study the effect of deficiency judgments or the threat of their use. They find recourse (i.e. lenders can go after borrower assets outside of the mortgage collateral) affects default by lowering the borrower's sensitivity to negative equity. Mian et al. (2015) analyze the effect of state statutes on a number of economic outcomes and find that, as the foreclosure crisis subsided from 2011 to 2013, non-judicial states

experienced a stronger housing market recovery.[4] Mian et al. utilize differences across states for zip codes that span states with differing foreclosure regimes based on judicial status to isolate the exogenous effect of foreclosure rates on housing market outcomes. We extend that approach here to isolate the marginal effect of changes in the foreclosure timeline on home price dynamics. Our findings are similar to Mian et al. in suggesting that longer foreclosure timelines have different effects during housing market downturn and recovery periods and that non-judicial states have experienced stronger home price recovery.

A final relevant strand of the foreclosure literature examines directly the impacts of foreclosure timing on outcomes for delinquent homeowners. Collins et al. (2011) find judicial foreclosure proceedings and foreclosure prevention initiatives are associated with modest increases in loan modification rates. But subsequent analyses by Gerardi et al. (2013) as well as Goodman and Yang (2015) find no effect on self-cure rates and loan modification. Cordell et al. (2015) estimate that delayed foreclosures increase time-related costs from 11% in the pre-crisis period to 19% in 2012, as foreclosures were delayed. Cordell and Lambie-Hanson (2015) find that delays in the foreclosure timeline in judicial states impose substantial costs on borrowers, with limited benefits. Calem et al. (2014), using credit report data, find 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 if they stay in foreclosure longer. More recently, Herkenhoff and Ohanian (2015) find that foreclosure delay decreases borrower employment but increases job match quality.

We begin our analysis with a national sample of counties and distinguish between two distinct time periods based on national home-price movements: the period from 2007 to 2011 (when house prices were falling) and the period from 2012 to 2015 (when house prices were recovering). We find that the length of the foreclosure timeline produced different effects in the two periods. During the housing downturn, a longer foreclosure timeline leads to a reduced price decline and shorter time to reach market bottom. During the housing recovery, on the other hand, a longer foreclosure timeline seems to lead to less house price appreciation but no effect on the timing of recovery. More specifically, during the national housing crisis period, holding everything else equal, a one-month increase in the foreclosure timeline reduced the cumulative home price decline from county-

[4] Desai, Elliehausen and Steinbuks (2012) and Price et al (2015) also evaluate the effect of various state statutes and find significant effects on foreclosure starts of some but not all laws.

level peak to trough by 1.0% and reduced the time to reach the trough by a half-month. The effect of foreclosure timeline appears to be smaller in the recovery period, when, holding everything else equal, a one-month increase in foreclosure timeline can reduce the county-level home price recovery by 0.3%, with no significant effect on the months until recovery (defined as a return to 2004 house price levels).

We then conduct a similar non-parametric analysis of foreclosure timeline effects on home price dynamics using matched pairs of counties that share an MSA but differ in their state foreclosure laws. We construct 120 pairs of counties from the MSAs that straddle state borders with different foreclosure legal regimes (judicial versus statutory). By using this matched pair sample, we assume that unobserved features of the market outside of our other county-level housing and macro variables are uniform within an MSA. We first conduct one-tailed *t*-tests to examine the significance of the differences in home price dynamics and timelines between judicial and statutory counties in the pairs. Results show that judicial counties have longer foreclosure timelines and total timelines[5] (months from last paid installment date to REO disposition date where applicable) than their statutory counterparts in all periods. We also observe a substitution effect between foreclosure timelines and REO timelines (months from foreclosure completion to REO disposition, for those properties not selling to third parties at auction). That is, REO timelines tend to be shorter for judicial counties relative to their statutory counterparts. Results suggest that lenders may accelerate the disposition of the property to offset the delays encountered from the judicial process. Results on house price dynamics are consistent with our findings from the national analysis. Judicial counties have experienced less volatile house prices than their statutory counterparts in both the crisis and recovery periods, judicial counties took less time to reach their pre-crisis house price level (2004 level), and judicial counties have smaller house price declines than their statutory counterparts during the crisis but also less appreciation during the recovery.

We then control for the same county-level factors we used in the national sample and investigate how any remaining differences in housing market outcomes across county pairs are explained by the foreclosure timeline. Results show that after controlling for other local economic factors, the effects of foreclosure timeline remain robust. We again find that judicial counties have experienced reduced house price volatility in both the crisis and recovery periods, judicial counties

[5] Properties that sell to third parties at the foreclosure auction do not become REO and so their REO timeline is zero.

took less time to reach their pre-crisis home price level, and judicial counties have smaller house price declines than their statutory counterparts during the crisis but also less home price appreciation during the recovery.

Finally we investigate the effect of longer foreclosure timelines on distressed mortgage outcomes and find that while longer foreclosure timelines may postpone foreclosures, they have no meaningful effect on the rate that borrowers self-cure or obtain modifications. We also present evidence that, not surprisingly, loss severities have been higher under judicial states as compared to non-judicial states.

The remainder of this paper proceeds as follows. In Section 2, we explain the data, sample design, and identification strategy. Section 3 explains the regression analysis based on the national sample of all counties, while Section 4 describes results based on matched pairs of counties located in the same jurisdiction-straddling MSAs. Section 5 conducts further analysis of the effects of foreclosure timelines on distressed borrower outcomes. Section 6 provides concluding remarks.

2. Data

In this section we review the data sets and variable definitions we use throughout the analysis, including our method of classifying state foreclosure laws.

The data we use generally is loan-level records[6] supplemented with macro-level variables at the county level. There are three loan-level datasets. The first consists of prime conventional conforming loans acquired by Fannie Mae that were foreclosed upon, were sold at auction to third parties, or became REO and were sold between 2001 and 2015.[7] This sample is different from other data sources used in the existing literature. For example, Cordell et al. (2015) uses loan-level data from Lender Processing Services Inc. (LPS) which includes loans from all parts of the mortgage market, not just the sub universe of conventional conforming GSE loans we analyze here. The LPS data, however, only contains observations from the largest servicers while our data

[6] The majority of the foreclosure population (approximately 79%) are traditional 30-year fixed rate mortgages.
[7] There were fewer foreclosures as well as policy interventions prior to 2006, compared with the period since 2006. Prime loans refer to loans given to borrowers with relatively good credit quality (typically credit score above 620). Conventional loans refer to non-government loans (i.e. not guaranteed by Federal Housing Administration or Veteran Affairs, etc). Conforming loans do not exceed the loan limits established by the Federal Housing Finance Agency, which vary by number of units (1-4) and geographic area. The conforming loan limits reflect house price trends and have tended to increase over time.

includes loans serviced by a broader segment of servicers. We aggregate statistics from the micro-level data to the county level to create measures of foreclosure and REO timelines and combine these with macro data at the county level. The top section of Table 1 presents summary statistics at the county level for the 1,562 counties for which we have data.

For our analysis of the effect of foreclosure timelines on borrowers, we use a second loan-level dataset consisting of all Fannie Mae loans that became 90-days delinquent (seriously delinquent or SDQ) for the first time in 2011[8]. By that point in time, virtually all of the foreclosure mitigation policy initiatives had been implemented. We examine seriously delinquent borrower outcomes over different time horizons, (i.e. 3, 6, 12, 24 and 36 months after the SDQ event) in our analysis. The data covers loan and borrower characteristics at origination as well as economic conditions before delinquency. Table 3 reports summary statistics for this sample.

The final dataset we use is for the purposes of severity analysis and is a slightly longer series consisting of prime conventional conforming loans acquired by Fannie Mae that were foreclosed upon, went to REO and were sold between 1999 and 2015. Foreclosure cost is the cost incurred after a borrower stops monthly payment and until the foreclosure process is completed and the property is liquidated, whether by third-party sale at auction or REO sale. Foreclosure cost has four components: property taxes, homeowner and flood insurance (if applicable); mortgage insurance premium and non-tax and non-insurance foreclosure costs such as attorney/trustee fees; liquidation and eviction expenses; and title insurance and other holding costs, most importantly, accrued interest. Disposition cost refers to the cost incurred for property disposition purposes after title has been acquired. Disposition cost has two main components: property taxes and non-tax and insurance disposition costs. The latter which includes appraisal and inspection fees, closing costs (including broker commissions), utilities and other repair and maintenance expenses.

Table 1 reports foreclosure timelines, cumulative house price growth rates and price volatility by different time periods according to the national house price movements: pre-crisis (2002-2006), crisis (2007-2011) and post-crisis (2012-2014). On average, the foreclosure timeline has lengthened since the housing crisis. As might be expected, we see negative house price growth during the crisis period and a slow recovery in the post-crisis period. Price volatility is measured

[8] As additional robustness checks, we also constructed loan-level samples of Fannie Mae first-time SDQ loans in 2012, 2013 and 2014 respectively. Results are available upon request.

by the standard deviation of house price indices at the county level, rescaled by dividing by 100. We also identify the county-level home price peak and trough during the national home price crisis from 2007 to 2011 and measure the cumulative home price growth rate from county-level peak to trough and from the trough to 2015. The timing of price decline and recovery at the county level is measured by the months it took from peak to trough and from trough to the pre-crisis recovery level (which is set at the 2004 level). For those counties which have not fully recovered, we use linear extrapolation to estimate the future full recovery date.

The first two variables in Table 1 provide information on judicial and redemption state indicators, respectively. We see that 45 % of the counties in our sample are in states that require judicial foreclosure. As illustrated in the map on Figure 2, these states are concentrated in the Northeast and Midwest regions of the United States, although Florida, South Carolina, Louisiana, and New Mexico also require judicial foreclosure. In other states, lenders generally have the option of using the simpler, quicker and cheaper non-judicial foreclosure process known as power of sale, in which a trustee oversees the sale of the property.

We must acknowledge that there is some disagreement in the literature as to which states should be characterized as requiring judicial, versus non-judicial, foreclosure. Authors cite three main sources: (1) *The Survey of State Foreclosure Laws* conducted by the National Consumer Law Center (NCLC); (2) *The National Mortgage Servicer's Reference Directory* published by USFN (2007); and (3) Ghent (2014). The NCLC surveys seven different consumer protection provisions and reports the most common method of foreclosure.[9] They report that a few states employ a hybrid form between judicial and power of sale: Colorado, Louisiana, North Carolina, Oklahoma, and Vermont. Based on this survey, Gerardi et al. (2015) conclude that there are 33 statutory states and 18 judicial states. The USFN classification was first cited by Crews Cutts and Merrill (2008) and was later adopted by Cordell et al. (2015). They reference 29 statutory states including the District of Columbia and 22 judicial states. Additionally, there are 9 states that provide borrowers an extended period of time to recover their properties after foreclosure proceedings have been completed, so called redemption states (discussed below). Ghent (2014) traces the history of

[9] The seven questions are: 1. Do borrowers have easy access to the courts prior to sale? 2. Is there a state law right to cure the default before loan is accelerated? 3. Is there a state law right to cure the default and reinstate the loan before the foreclosure sale? 4. Is the servicer/ holder required to engage in loss mitigation before the loan is foreclosed? 5. Is personal service of the Notice of Sale or Foreclosure Complaint required? 6. Is there a state emergency fund or similar program available to assist borrowers in default? 7. Does state law provide any protections for borrowers?

mortgage laws and shows that the most enduring aspects of these state laws stem from case law rather than statute, complicating classification. Ghent's analysis results in 32 statutory states (where Delaware and Pennsylvania are listed as half-half hybrids) and 19 judicial states. She also has identified 12 redemption states which require at least six months for borrower redemption. Our definition largely follows the USFN classification adopted by Cordell et al. (2015) with the only exception that Hawaii is classified as a judicial state based on the 1905 precedent as documented by Ghent (2014).

The second row of Table 1 shows that 16 % of the counties in the population we study are in states that can be classified as redemption states. In these states, after completion of the foreclosure sale, the homeowner can still regain title to the property (the nine redemption states are shown in Figure 2).[10] In particular, for up to a year after the sale (depending on the state) homeowners can redeem their property for the foreclosure sale price plus foreclosure expenses.[11] While our classification scheme follows the existing literature for tractability, it is not entirely precise, especially with respect to redemption periods[12]. For example, redemption rights in Colorado were curtailed after 2008; the redemption period is New Jersey is only ten days; and, if ten days is a sufficiently long period to qualify a state as a redemption state, then North Carolina (which also has a ten day redemption period) really should also be so characterized.

The bottom section of Table 1 presents summary statistics for our matched pair sample. The foreclosure, REO and total timelines are summarized according to the distinct time periods defined by national home price movements: pre-crisis, crisis and post-crisis. County-level house price dynamics, including cumulative price growth rate from county peak to trough and from the trough to 2015 level, timing of county-level home price decline and recovery, and home price volatility, are measured in the same way as in the national sample.

In order to provide historical context, Figure 4 depicts the average foreclosure timeline and default volume over time by four distinct state classifications: judicial non-redemption, judicial

[10] Statutory rights of redemption are prevalent in farming states, where crops may fail one year and succeed the next.
[11] A final state-level foreclosure law regime that we do not investigate in this paper is recourse availability by state. Most states allow deficiency judgments to be pursued against other borrower assets, at least in some instances. Although these deficiency judgments are reportedly rarely exercised, the threat of their use can be used to obtain concessions from the borrower. Nine states located in the western half of the United States prohibit deficiency judgments for the typical home mortgage default case.
[12] We are particularly indebted to David Greene for his detailed comments on the subtleties of redemption rights across states.

redemption, statutory non-redemption, and statutory redemption. We observe great variation across categories. More defaults occurred in statutory states before 2014 yet their average timelines have been consistently shorter than judicial states. The difference in timelines between judicial and statutory states was stable over time until 2012, when it began to widen rapidly. Comparing redemption and non-redemption states, there were fewer defaults in redemption states while timelines are similar to their non-redemption counterparts.

We summarize the foreclosure and REO timelines across time and by state mortgage laws in Table 2. Unlike foreclosure timelines, there is little difference in REO timelines between judicial and statutory states, but there are some significant differences between redemption and non-redemption states. REO timelines have been relatively stable over time, around 6 and 5 months, respectively, for judicial non-redemption and statutory non-redemption states, and 5-7 and 8-11 months, respectively, for judicial redemption and statutory redemption states. The difference in REO timeline is most evident between statutory redemption and statutory non-redemption states.

Since other researchers have focused on the foreclosure rate, as opposed to the foreclosure timeline we focus on in this paper, we examine the relationship between these two measures during 2007 to 2011 using county-level data from Fannie Mae's loan-level liquidation dataset. For the foreclosure rate, we construct two alternative measures. The unconditional foreclosure rate is similar to the measure used by Mian et al. (2015) and computed based on the number of outstanding loans at the beginning of the period, namely 2007. The second measure, the conditional foreclosure rate, is conditional on the number of loans that became first-time 90-day delinquent during the measurement period 2007-2011. As might be expected, both of the two measures are negatively correlated with the foreclosure timeline. The correlation coefficient between unconditional foreclosure rate and timeline is -0.23 and the correlation coefficient between conditional foreclosure rate and timeline being -0.36. Figure 3 plots all the counties in the sample by their foreclosure timelines and conditional and unconditional foreclosure rates in 2007-2011. The trend lines illustrate the negative relationship between the foreclosure timeline and foreclosure rate. Since these two measures are imperfectly correlated, we expect additional information from studying the foreclosure timeline itself.

The next three sections present our empirical results, beginning with the national sample of counties.

3. National County Sample

In this section we use the national sample of county-level data to identify the marginal effect of a longer foreclosure timeline on home price dynamics controlling for other relevant factors. As previously shown in Figure 1, judicial states generally have longer foreclosure timelines and experienced less house price volatility during both up and down markets. We investigate the extent to which this relationship between the foreclosure timeline and home price dynamics still holds after we control for additional factors as well as the potential endogeneity of foreclosure timelines to home prices.

We use the following regression framework to model county-level home price appreciation (HPA for county i at time t) separately over the national decline and recovery periods using county-level foreclosure timelines from Fannie Mae loan-level data, county-level HPA in the previous time periods, unemployment rate changes and median household income growth in the previous time period, and the *ex ante* credit risk probability of Fannie Mae acquisitions in the previous time period.[13]

$$\begin{aligned} HPA_{i,t} = \ & \beta_0 + \beta_1 Foreclosure\ Timline_{i,t} + \beta_2 HPA_{i,t-1} + \beta_3 HPA_{i,t-2} + \beta_4 HPA_{i,t-3} \\ & + \beta_5 \Delta unemployemeny\ rate_{i,t-1} + \beta_6 \Delta income_{i,t-1} \\ & + \beta_7 Aqsn\ Credit\ Risk_{i,t-1} + \varepsilon_{i,t} \end{aligned}$$

Table 4 presents the regression results for the two distinct periods defined by the national home price movements: 2007 to 2011 (the downturn) and 2011-2015 (the recovery period). Columns (1) – (4) show the effect of foreclosure timeline on home prices during the declining period with varying specifications. The relationship is insignificant with no controls (reflecting the importance of omitted variables as well as the endogeneity of foreclosure timelines, discussed below). After additional controls are introduced, during the period of home price declines there is 3 – 4% less house price decline for each additional month of foreclosure timeline as reflected in columns (2) – (4). Columns (5) – (8) repeat the exercise for the recovery period and show that regardless of the controls used, an extra month in the foreclosure timeline is associated with a 1% reduction in house price appreciation.

[13] This last measure is the predicted probability of loans becoming 90-day delinquent in the first year after acquisition, based on Fannie's internal credit risk model.

Results in Table 4 may suffer from serious endogeneity issues, if extended foreclosure timelines may be partly driven by declining home prices. This is because declining prices result in more foreclosures and, therefore, longer timelines given resource constraints, particularly in judicial environments where court systems were often overwhelmed. If the conditional foreclosure rate is a function of home prices, then the foreclosure timeline is also endogenous to home prices. To address this problem, we use an instrumental variable approach to identify the independent effect of the foreclosure timeline. Following others in the literature (e.g. Mian et al (2015)), we use the state-level legal system as instruments in a two-stage lease square regression (2SLS) framework. We extend the approach in Mian et al. to control for redemption status as well as the judicial status and also add a lagged term of the foreclosure rate.[14]

In the first step of the 2SLS, we estimate foreclosure timelines using the following regression.

$$Foreclosure\ Timline_{i,t} = \alpha_1 \times Judicial_i + \alpha_2 \times Redemption_i + \alpha_3 \times Foreclosure\ Timline_{i,t-1} + \eta_{i,t}$$

Table 5 contains the results of the first stage regression and shows the significant explanatory power of state laws on the foreclosure timeline, with the judicial and redemption indicators along with the previous period foreclosure timelines explaining 63 to 66 % of the variation in foreclosure timelines. Judicial states have, on average, 2.4 to 2.5 months of longer foreclosure time after controlling for lagged timelines. In contrast, state redemption rights are only predictive during the period of declining house prices, not during the recovery period.[15] The redemption indicator has a negative coefficient in the former, suggesting shorter timelines by one month, after controlling for judicial status.

In the second step, we use the instrumented foreclosure timeline and estimate the effects on various measures of house price dynamics:

[14] We included the lagged term to ground the foreclosure timeline in the historical experience of the county. Our results were robust whether we included the lagged term or not.

[15] We keep the redemption indicator for the recovery period for the purpose of symmetry between the two time periods. Our results were robust whether we included the redemption indicator or not.

$$Y_{j,i,t} = \gamma_{j,0} + \gamma_{j,1} Foreclosure\ Timline_{i,t} + \gamma_{j,2} HPA_{i,t-1} + \gamma_{j,3} HPA_{i,t-2} + \gamma_{j,4} HPA_{i,t-3} + \gamma_{j,5} \Delta unemployment\ rate_{i,t-1} + \gamma_{j,6} \Delta income_{i,t-1} + \gamma_{j,7} Aqsn\ Credit\ Risk_{i,t-1} + \varepsilon_{j,i,t}$$

In this second stage, we also analyze the effect of the foreclosure timeline on other dependent variables beyond simply house price appreciation. In particular, we measure months from county-level peak to trough in the downturn to assess timing of the effect in the local market. Months to recovery is a linear extrapolation (where necessary) of the time it takes from trough to reach the pre-crisis level (defined as the 2004 price level). The third metric is the percentage change in home prices from county-level peak to trough and from county-level trough to recent level (2015 levels). The final metric measures the volatility of house prices during both the crisis and recovery. Here Y_j indicates the jth of J dependent variables in our analysis, which include HPA, months from county peak to trough, growth from county peak to trough/trough to recent and home price volatility.

Table 6 shows results from the most comprehensive specification (analogous to columns (4) and (8) in Table 4) with a full complement of controls. These results show that during the downturn, longer foreclosure timelines lead to smaller declines in house prices, a shorter time to reach the trough, and in general reduced house price volatility. During the home price recovery, longer foreclosure timelines dampened home price appreciation and volatility but had no significant effect on the timing of recovery. More specifically, during the national housing crisis period, holding everything else equal, a one-month increase in foreclosure timeline reduced the cumulative home price decline by 7%, reduced the time to reach the trough by 0.5 month, reduced the county-level peak to trough change by 1%, and reduced volatility by 3% (in units of the December 1999 HPI).

The effect of the foreclosure timeline appears to be smaller in the recovery period. During the national housing recovery period, holding everything else equal, a one-month increase in foreclosure timeline dampened cumulatively home price appreciation by 1%, shortened the time to recovery by 0.1 month, reduced the county-level trough to recent home price change by 0.3%, and reduced price volatility by 1% (in units of the December 1999 HPI). Also of note, the instrumented foreclosure timelines remain significant after changes in our specification. Despite the inclusion of lagged measures of home price movements, local unemployment rates, loan

origination quality, and MSA fixed effects, the coefficient on foreclosure timelines changes very little.

Most of the models have strong explanatory power, especially for cumulative house price changes and price volatility. In particular, the model explains 72 to 78% of variation in home price dynamics. Other variables are also generally statistically significant and exhibit intuitively appropriate signs. For instance, if a county has experienced greater growth in median household income in the previous year, then the county will have relatively less decline in house prices and more home price appreciation in coming time periods. Likewise, if a county had a faster deterioration in labor market conditions, as measured by the change in the unemployment rate, then it will experience greater home price depreciation and also less price appreciation during the recovery. The acquisition credit risk probability is a Fannie Mae internal measure of default risk at acquisition based on both borrower and loan attributes – the higher the value, the higher the credit risk we expect for a given loan.

4. Matched Pairs Study

In this section we use a well-established non-parametric approach to isolate the effect of foreclosure timelines on home price appreciation and other housing variables. In particular, we control for county-level factors as well as any other market-level unobserved features (e.g. the supply elasticity of housing at the MSA-level) that may affect market dynamics. To do this, we construct 120 pairs of counties from the set of MSAs that straddle state borders with different foreclosure regimes. Table 7 lists these MSAs along with the numbers of counties, loans, and default rates in the corresponding states. Figure 5 maps these MSAs.

By using this matched pairs sample, we assume that MSA are relatively economically homogeneous. Figure 6 provides a set of charts to show the actual differences across a set of home price metrics between judicial and statutory areas within each representative MSA that straddles state borders. We observe that all judicial counties have longer foreclosure timelines post crisis period than their statutory counterparts and that they also experienced less price depreciation (county-level peak to trough (on average)) during the downturn.

As a first test, we examine whether the differences in home price dynamics and timelines are significantly different between judicial and non-judicial counties within an MSA. In particular, we test whether the following metrics are different from zero:

$$\hat{\mu}_{j,t} = \frac{\sum_k \sum_{\tilde{\imath}} \sum_{i^*} \left(Y_{j,\tilde{\imath} \in MSA_k,t} - Y_{j,i^* \in MSA_k,t} \right)}{\sum_k n_{\tilde{\imath} \in MSA_k} \times n_{i^* \in MSA_k}}$$

$$H_{0,j}: \mu_{j,t} = 0$$

Here, $\tilde{\imath}$ denotes those counties in judicial states, i^* denotes those counties in non-judicial states, k indexes the MSA and Y_j again represents the collection of dependent variables, which are listed in Table 8. Even after controlling for market heterogeneity (within an MSA), judicial counties still have significantly longer foreclosure and total timelines across all periods. Furthermore, we observe what may be a substitution effect between foreclosure and REO timelines, although this effect is not significant in the crisis period. The results on home price dynamics are generally consistent with our findings from the national analysis, with a dampening of house price movements in judicial counties. The time to reach market trough is no longer statistically significant while recovery time remains significant. Finally, the volatility effect persists with judicial counties experiencing less volatile home price paths than their statutory counterparts in both rising and falling home price environments.

Next we introduce additional county-level controls into the matched pair analysis to address unemployment and income patterns, prior home price dynamics, and *ex ante* credit risk measures as in the national sample regressions. To do this, we first calculate the following residuals at the county level:

$$e_{j,i,t} = Y_{j,i,t} - \widehat{Y_{j,i,t}}$$

$$\begin{aligned} = \; & Y_{j,i,t} - \left(\hat{\delta}_{j,0} + \hat{\delta}_{j,2} HPA_{i,t-1} + \hat{\delta}_{j,3} HPA_{i,t-2} + \hat{\delta}_{j,4} HPA_{i,t-3} \right. \\ & + \hat{\delta}_{j,5} \Delta unemployment\ rate_{i,t-1} + \hat{\delta}_{j,6} \Delta income_{i,t-1} \\ & \left. + \hat{\delta}_{j,7} Aqsn\ Credit\ Risk_{i,t-1} \right) \end{aligned}$$

We then take these model residuals and compare them across judicial and non-judicial counties within an MSA as follows:

$$\hat{v}_{j,t} = \frac{\sum_k \sum_{\tilde{\imath}} \sum_{i^*} \left(e_{j,\tilde{\imath} \in MSA_k,t} - e_{j,i^* \in MSA_k,t} \right)}{\sum_k n_{\tilde{\imath} \in MSA_k} \times n_{i^* \in MSA_k}}$$

$$H_{0,j}: v_{j,t} = 0$$

These residuals should reflect the incremental effect of the exogenous component of different foreclosure timelines within a given market. The bottom panel of Table 8 contains the one-tailed t-tests used to examine the statistical significance of the net effect of longer foreclosure timeline. The results are similar to the t-tests of the dependent variables discussed above, with minimal changes after introducing the additional controls. We still find a dampening of home price depreciation in judicial counties during the market downturn and reduced price appreciation during the period of home price recovery. Results are mixed for the timing variables, while house price volatility is significantly less for judicial counties during both the downturn and the recovery.

5. Effect of Longer Foreclosure Timelines on Distressed Mortgage Outcomes

Mortgage Performance of Distressed Borrowers

Next, we address the experience of delinquent borrowers and whether the extension of foreclosure timelines can be shown to benefit borrowers in any measurable way. Although foreclosures typically lead to negative effects on borrower credit, finances, and lifestyle, there may also be some benefits from extended foreclosure timelines including, most obviously, the ability of the borrower to live "rent free" at least for some period of time. One might imagine, for example, that foreclosure delay allows borrowers more time to recover from a spell of unemployment, pull together additional financial resources perhaps through asset liquidation, or negotiate workouts with lenders[16]. Here, we consider three possible outcomes for distressed homeowners: self-cure, successful permanent modification, and voluntary prepayment/refinance. Our data covers borrowers who became seriously delinquent for the first time in calendar year 2011, and we follow outcomes over different horizons (i.e. 3, 6, 12, 24 and 36months after the SDQ event)[17]. Table 9 compares these outcomes over time by judicial and statutory states based on our national sample of all counties. Self-cure is the most likely of the three outcomes in the first three months. Within 12 months after first SDQ event, more than 10% of distressed borrowers self-cure in both judicial and non-judicial counties. Notably, the cumulative self-cure rate is slightly higher in the statutory

[16] The existing literature generally finds no effect of longer timelines on self-cure rates or the likelihood of renegotiation between borrowers and lenders resulting in loan modification.

[17] We also examine first-time SDQ loans in 2012, 2013 and 2014. Results are largely the same especially for loan modification outcome.

counties within 36 months after first-time SDQ (15.4% vs 15.1%) For cumulative prepayment rates, statutory counties are slightly higher than their judicial counterparts within the first 6 months and then falling below the judicial counties after 12 months, with the cumulative prepayment rate equal to 4.8% for both judicial and non-judicial counties after 12 months and slightly lower for statutory counties versus judicial counties in 36 months (10.2 vs 10.9%). The successful modification rate[18] is relatively low in the first 3 months after first-time SDQ event, with cumulative rates of 2.9% for statutory counties and 3.1% for judicial counties. After 12 months, the rate becomes much higher in both statutory and judicial states, and remains higher for judicial counties after 24 months.[19]

We then estimate whether any of these differences are significant after controlling for the foreclosure timeline using the instrumental variable approach discussed in Section 3. Table 10 shows the effect of foreclosure timeline on these three outcomes by controlling for other loan and borrower characteristics as well as local market conditions including changes in home price, unemployment rates and time since SDQ. For the self-cure outcome, the coefficients on predicted foreclosure timeline are significant at 1% significance level for all the time periods after first-time SDQ event, although the magnitude of the coefficient estimates is very small. Controlling for everything else, in 12 months from first-time SDQ, a one month increase in foreclosure timeline will lower the cumulative self-cure rate by about 0.2%. And this marginal effect on cumulative self-cure rate remains low at about the same level in 36 months. The effects of extended foreclosure timeline on cumulative prepayment rate are generally insignificant, either statistically or economically. The effects of longer foreclosure timelines are statistically significant, though also small in magnitude for the modification rate after two years. In 36 months after first-time SDQ event, controlling for everything else, one month increase in foreclosure timeline will increase the cumulative successful modification rate by about 0.3%. We conclude that while longer foreclosure timelines may postpone foreclosures, they have little, if any, effect in terms of improving delinquent borrower ultimate outcomes within three years after first-time SDQ.

Loss Severity Outcomes

[18] Successful modification is defined here as loan modification that has successfully completed the trial period if there was a trial.
[19] This last finding is consistent with Collins et al. (2011) discussed in the Introduction.

Our last empirical analysis focuses on the comparison of various components of losses and the net severity rate incurred by lenders between judicial and non-judicial states. For this analysis we employ Fannie Mae's liquidation database and find that longer foreclosure timeline leads to higher foreclosure cost and disposition cost, as well as a higher net loss severity rate.

Figure 7 shows that foreclosure cost rate (the ratio of foreclosure cost to default UPB) in non-judicial states has always been lower than that in judicial states. The rate reached the lowest level in roughly 2009 then began to rise in both judicial and non-judicial states, with judicial states showing more rapid growth. Figure 8 shows that both foreclosure legal regimes had about the same disposition cost rate until 2002, after which that rate has been consistently lower in non-judicial states. Figure 9 shows that the net loss severity rate in judicial states increased from 21% in 2009 to 38% in 2014, while in non-judicial states, it peaked in 2012 at 34% before falling to 28% in 2014.

6. Discussion and Conclusions

We began our analysis in this paper with the observation that judicial states generally have longer foreclosure timelines and experienced less dramatic housing price movement during the crisis. We hypothesize here that longer foreclosure timelines affects the timing and degree of recovery after controlling for other economic factors. We also consider whether, and to what extent, longer foreclosure timelines benefit borrowers and impose costs on lenders.

Our analysis uses two distinct time periods defined by the national home price movements: the house price downturn from 2007 to 2011 and the house price recovery period from 2012 to 2015. We find that the foreclosure timeline has different effects on house price dynamics in the crisis and post-crisis time periods. In particular, both the national and matched pair studies show that longer foreclosure timelines lead to reduced price depreciation during the crisis period, but also less house appreciation during the recovery period. The local housing markets with longer foreclosure timelines exhibit less home price volatility during and after the housing crisis. Results are robust to different measures and approaches.

Our findings have important policy implications. In the aftermath of the US mortgage crisis, federal and local governments implemented unprecedented housing programs and policies affecting the foreclosure process. First, court delays in certain judicial states have, at times, brought the foreclosure rate to a near standstill. Second, the temporary and self-imposed GSE moratorium

in late 2008 and early 2009 contributed to the backlog. Third, and finally, the "robo-signing" allegations brought forth in 2010 had the effect of producing a de facto moratorium for a time. Operating cumulatively, these factors significantly reduced the foreclosure rate and extended the foreclosure timeline.

The analysis presented here shows that judicial foreclosure environments do tend to dampen price declines, possibly by constraining the flood of REO property onto the market. However, in these same environments, we find a slower pace of recovery, perhaps because the surfeit of REO properties persists longer. Meanwhile, markets with statutory processes recover more quickly. Finally, extending foreclosure timelines do not seem to have either an economically or statistically significant effects on distressed borrower outcomes, while clearly imposing higher costs on lenders as suggested by our observation of higher loss severities in judicial states. In the end, legal regimes and policy interventions which extended the foreclosure timeline do not seem to have effectively helped distressed borrowers and local housing markets prices recover.

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Appendix

As a robustness check for the national sample analysis, we control for long-term home price growth from the base year of 1999 in the second step of the two-stage least square approach. The results in Table A-1 show that the model does not yield more explanatory power by including the long-term home price appreciation. The instrumented foreclosure timeline remains highly significant but slightly reduced in magnitude (from 0.07 to 0.06) for the crisis period with no change for the post-crisis period. Long-term home price appreciation has significant and intuitive parameter estimates during the crisis period: the more HP growth an MSA gained pre-crisis, the more its house prices dropped during the crisis. Long-term house price appreciation is insignificant for the post-crisis period.

Table 1 Data Summary Statistics

	Variables	N	Mean	SD	10th Pctl	50th Pctl	90th Pctl
National Sample	Judicial States	1562	0.45	0.50	0.00	0.00	1.00
	Redemption States	1562	0.16	0.36	0.00	0.00	1.00
	Foreclosure Timeline: 2002-2006	1557	12.17	3.08	8.75	11.56	16.07
	Foreclosure Timeline: 2007-2011	1562	14.39	2.77	11.15	13.97	18.15
	Foreclosure Timeline: 2012-2014	1561	19.37	6.34	12.41	18.40	28.33
	Cum HP Growth: 2002-2006	1562	1.05	0.71	0.42	0.77	2.21
	Cum HP Growth: 2007-2011	1562	-0.62	0.84	-1.68	-0.37	0.15
	Cum HP Growth: 2012-2014	1562	0.38	0.34	0.06	0.29	0.87
	Months from cnty peak to trough	1356	45.44	11.84	27.00	51.00	57.00
	Months for recovery to pre-crisis level	1356	39.10	8.31	31.22	37.18	49.41
	HP Growth from cnty peak to trough	1356	-0.21	0.13	-0.39	-0.17	-0.07
	HP Growth from cnty trough to recent	1562	0.15	0.11	0.05	0.11	0.30
	HP Volatility: 2007-2011	1562	0.33	0.40	0.06	0.18	0.78
	HP Volatility: 2012-2014	1562	0.21	0.23	0.06	0.15	0.39
	Annual Median HH Income Growth: 2006	1562	0.04	0.02	0.02	0.04	0.07
	Annual Median HH Income Growth: 2011	1562	0.02	0.02	-0.01	0.02	0.05
	Annual Unemployment Rate Change: 2006	1555	-0.07	0.09	-0.16	-0.08	0.03
	Annual Unemployment Rate Change: 2011	1562	-0.08	0.06	-0.15	-0.08	-0.01
	Acquisition Credit Risk:2006	1562	1.54	0.55	0.89	1.47	2.24
	Acquisition Credit Risk:2011	1562	0.12	0.06	0.06	0.11	0.20
Matched Pairs Sample	Judicial States	74	0.43	0.50	0.00	0.00	1.00
	Foreclosure Timeline: 2002-2006	74	12.62	3.65	8.96	11.37	17.90
	Foreclosure Timeline: 2007-2011	74	14.26	2.88	11.42	13.51	18.13
	Foreclosure Timeline: 2012-2014	74	18.78	5.67	12.20	18.88	26.21
	REO Timeline: 2002-2006	74	8.04	1.92	5.86	7.78	10.36
	REO Timeline: 2007-2011	74	8.90	2.13	6.57	8.54	11.93
	REO Timeline: 2012-2014	74	9.22	2.07	6.89	8.75	12.36
	Total Timeline: 2002-2006	74	20.66	3.51	15.98	20.33	26.43
	Total Timeline: 2007-2011	74	23.16	3.44	18.47	23.35	27.98
	Total Timeline: 2012-2014	74	27.99	5.90	19.74	27.34	34.84
	HP Growth from cnty peak to trough	71	0.20	0.08	0.10	0.18	0.32
	HP Growth from cnty trough to recent	74	0.13	0.07	0.05	0.12	0.24
	Months from cnty peak to trough	71	48.80	8.97	42.00	51.00	57.00
	Months for recovery to pre-crisis level	71	38.18	6.43	32.53	36.65	45.60
	HP Volatility: 2007-2011	74	0.32	0.23	0.12	0.25	0.64
	HP Volatility: 2012-2014	74	0.19	0.10	0.07	0.16	0.31

Note: All timelines are in months. All growth rates are in decimal.

Acquisition credit risk probability is in percentage terms.

Table 2 Summary of Timelines by Foreclosure Laws and Liquidation Time

		Foreclosure Timelines		REO Timelines		Total Timelines	
	Liquidation Year	Judicial	Statutory	Judicial	Statutory	Judicial	Statutory
Non-Redemption	2001-2004	13	9	5	5	19	14
	2005-2006	14	9	6	6	20	16
	2007-2008	13	9	6	6	20	15
	2009-2010	17	13	6	5	23	18
	2011-2012	23	14	5	4	28	18
	2013-2014	31	18	6	5	37	23
Redemption	2001-2004	13	8	6	9	19	17
	2005-2006	12	8	7	10	19	18
	2007-2008	12	7	7	10	19	17
	2009-2010	17	11	6	8	23	19
	2011-2012	20	13	5	8	25	21
	2013-2014	31	12	7	8	37	21

Table 3 Summary Statistics for Distressed Borrowers

		Loans with first-time SDQ in 2011	
		Judicial	Statutory
Average Characteristics at Loan Origination	FICO Score	679	685
	Loan-to-value Ratio	82%	81%
	Purchase Mortgage	45%	42%
	Fixed Rate Mortgage	95%	92%
	Primary Residence	91%	88%
	Condominium	4%	4%
	One Borrower	58%	58%
Pre-delinquency Status	Loan Age at first-time SDQ	64	62
	House Price 1 year Growth Rate	-2%	-4%
	Change in Unemployment Rate	1%	4%
	Change in Median HH Income	0%	-1%
Outcomes	Self-Cured in 12 Months	13%	14%
	Prepaid in 12 Months	5%	5%
	Successfully Modified in 12 Months	20%	20%

Table 4 Foreclosure Timelines and House Prices, County-Level OLS (National Sample)

	House Price Change during Declining Period				House Price Change during Recovery Period			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.49	-0.40	-0.49	-0.26	0.57	0.42	0.41	0.42
Foreclosure Timelines, same period	-0.009	0.03***	0.03***	0.04***	-0.01***	-0.01***	-0.01***	-0.01***
House Price Change, lagged t-1	-	3.26***	2.40***	0.94**	-	1.00***	0.68***	0.18
House Price Change, lagged t-2	-	-7.17***	-7.42***	-5.64***	-	0.67***	0.51***	-0.61**
House Price Change, lagged t-3	-	-2.18***	-2.01***	-2.88***	-	-4.44***	-4.57***	-3.00***
Income Growth, lagged t-1	-	-	3.33***	3.05***	-	-	0.06	0.48*
Unemployment Growth, lagged t-1	-	-	-1.00***	-1.29***	-	-	-0.49***	-0.41***
Acquisition Credit Risk Probability, t-1	-	-	-0.04	-0.06**	-	-	-0.51***	-0.38***
MSA Fixed Effect	No	No	No	Yes	No	No	No	Yes
N	1555	1555	1555	1555	1561	1561	1561	1561
R2	0.00	0.51	0.52	0.77	0.03	0.46	0.47	0.74

Table 5 Effect of State Laws on Foreclosure Timelines (National Sample)

First Stage of 2SLS		
	Foreclosure Timelines in	
	HP Declining Period	HP Recovery Period
Constant	9.30	-2.79
Judicial	2.54***	2.36***
Redemption	-1.04***	-0.44
Foreclosure Timelines, Lagged	0.34***	1.47***
N	1557	1561
R2	0.66	0.63

Table 6 Foreclosure Timelines and Housing Price Dynamics, County-Level 2SLS (National Sample)

	During National HP Declining Period				During National HP Recovery Period			
	Cumulative HP growth rate	Mths from Cnty Peak to Trough	HP growth rate from Cnty Peak to Trough	HP Volatility	Cumulative HP growth rate	Mths in Recovery	HP growth rate from Cnty Trough to Recent	HP Volatility
Constant	-0.71	47.87	-0.22	0.56	0.41	32.58	0.15	0.22
Predicted Foreclosure Timelines, same period	0.07***	-0.51***	0.01***	-0.03***	-0.01***	-0.10*	-0.003***	-0.01***
House Price Change, lagged 1 year	1.22**	-3.49	-0.05	0.04	0.07	65.90***	0.17*	0.18
House Price Change, lagged 2 years	-5.66***	37.45***	-0.90***	1.91***	-0.58**	6.59	-0.09	-0.44**
House Price Change, lagged 3 years	-2.65***	10.36	-0.29***	1.21***	-2.80***	-32.03***	-0.81***	-0.81***
Income Growth, lagged 1 year	3.18***	-10.66	0.62***	-0.64*	0.59**	4.48	0.27**	0.02
Unemployment Growth, lagged 1 year	-1.15***	0.82	-0.14***	0.06	-0.52***	-16.34***	-0.16***	-0.14*
Acquisition Credit Risk Probability, lagged 1 year	-0.08***	2.03***	-0.01*	-0.03**	-0.40***	29.01***	-0.06	-0.04
MSA Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1550	1346	1346	1550	1562	1356	1562	1562
R2	0.78	0.46	0.76	0.78	0.72	0.40	0.62	0.75

Table 7 Summary of MSAs in Matched Pairs Study

CBSA code	CBSA name	State	Number of Counties	Number of Loans	Number of Defaults	Default Rate	Statutory State
12260	Augusta-Richmond County, GA-SC	GA	5	43482	1447	3%	1
		SC	2	23167	548	2%	0
16740	Charlotte-Concord-Gastonia, NC-SC	NC	7	377632	13126	3%	1
		SC	3	55999	1727	3%	0
20260	Duluth, MN-WI	MN	2	37472	1141	3%	1
		WI	1	4110	173	4%	0
26580	Huntington-Ashland, WV-KY-OH	KY	2	7026	190	3%	0
		OH	1	3724	140	4%	0
		WV	4	17831	538	3%	1
28140	Kansas City, MO-KS	KS	5	178903	4168	2%	0
		MO	9	225968	10752	5%	1
29100	La Crosse-Onalaska, WI-MN	MN	1	5601	54	1%	1
		WI	1	32322	338	1%	0
33460	Minneapolis-St. Paul-Bloomington, MN-WI	MN	14	768646	28272	4%	1
		WI	2	34496	1108	3%	0
34820	Myrtle Beach-Conway-North Myrtle Beach, SC-NC	NC	1	27473	897	3%	1
		SC	1	77887	4452	6%	0
37980	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	DE	1	109852	2317	2%	0
		MD	1	18746	393	2%	1
		NJ	4	271423	4462	2%	0
		PA	5	709728	10175	1%	0
41180	St. Louis, MO-IL	IL	8	122130	3088	3%	0
		MO	7	569096	14956	3%	1
43780	South Bend-Mishawaka, IN-MI	IN	1	35397	2000	6%	0
		MI	1	7691	441	6%	1

Table 8 Hypothesis Test (Matched Pairs)

		Alternative Hypothesis	Mean	t Statistic
Based on Actuals	Foreclosure Timeline (months)	Pre-crisis (Judicial > Statutory)	5.26	36.59***
		Crisis (Judicial > Statutory)	3.94	22.55***
		Post-Crisis (Judicial > Statutory)	6.24	19.75***
	REO Timeline (months)	Pre-crisis (Judicial < Statutory)	-1.14	-5.01***
		Crisis (Judicial < Statutory)	-0.31	-1.41*
		Post-Crisis (Judicial < Statutory)	-0.40	-1.65**
	Total Timeline (months)	Total Timeline, Pre-crisis (Judicial > Statutory)	4.12	19.20***
		Total Timeline, Crisis (Judicial > Statutory)	3.63	14.82***
		Total Timeline, Post-Crisis (Judicial > Statutory)	5.84	11.97***
	HP Dynamics	HP Change from Peak to Trough (Judicial > Statutory)	0.41	6.95***
		HP Change during Recovery (Judicial < Statutory)	-0.06	-1.80**
		Months from Peak to Trough (Judicial > Statutory)	-0.89	-0.90
		Months in Recovery (Judicial < Statutory)	-4.41	-6.74***
		Volatility during Peak to Trough (Judicial < Statutory)	-12.67	-7.14***
		Volatility during Recovery (Judicial < Statutory)	-4.48	-4.17***
Based on Residuals	HP Dynamics	HP Change from Peak to Trough (Judicial > Statutory)	0.31	6.10***
		HP Change during Recovery (Judicial < Statutory)	-0.08	-2.59***
		Months from Peak to Trough (Judicial < Statutory)	-1.02	-1.07
		Months in Recovery (Judicial < Statutory)	-1.70	-2.59***
		Volatility during Peak to Trough (Judicial < Statutory)	-10.17	-6.64***
		Volatility during Recovery (Judicial < Statutory)	-4.09	-4.04***

Note: Pre-Crisis refers to the period 2002 – 2006, Crisis refers to the years 2007 – 2011 and Post-Crisis refers to the period 2012 – 2014.

Table 9 Comparison of Outcomes for Distressed Borrowers

		Time since first-time SDQ in 2011				
		3 Mths	6 Mths	12 Mths	24 Mths	36 Mths
Self-Cure Rate	Judicial	6.6%	10.9%	13.4%	14.6%	15.1%
	Statutory	7.0%	11.1%	13.6%	14.8%	15.4%
Prepayment Rate	Judicial	1.4%	3.0%	4.8%	7.8%	10.9%
	Statutory	1.5%	3.1%	4.8%	7.4%	10.2%
Successful Modification Rate	Judicial	3.1%	9.8%	20.2%	28.0%	31.1%
	Statutory	2.9%	10.4%	20.3%	25.8%	27.9%
Default Rate	Judicial	0.9%	4.0%	15.0%	31.0%	38.2%
	Statutory	2.7%	16.1%	32.4%	42.3%	46.6%

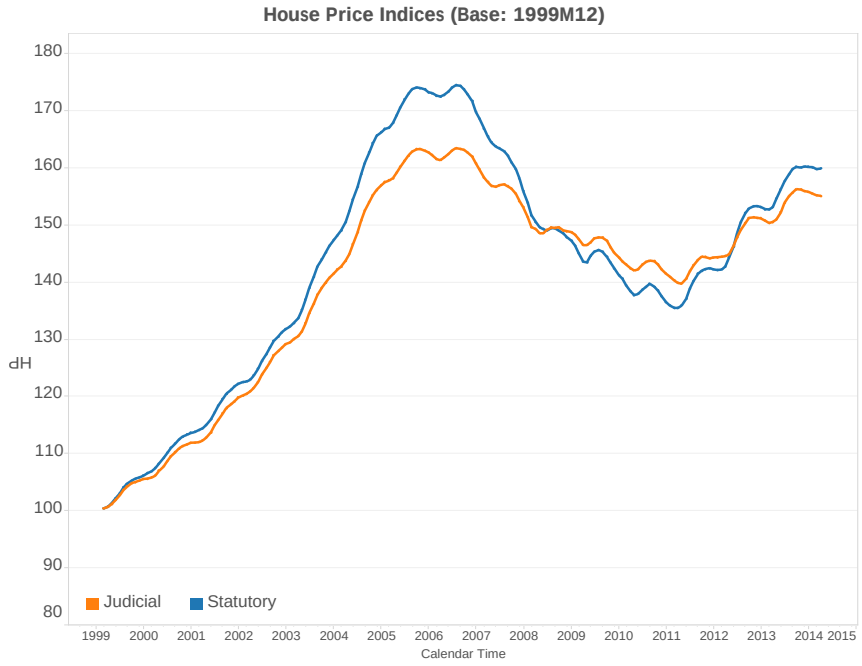
Table 10 Effects of Foreclosure Timelines on Mortgage Outcomes of Distressed Homeowners

		Self-Cure					Prepayment					Successful Modification				
		3 Mths	6 Mths	12 Mths	24 Mths	36 Mths	3 Mths	6 Mths	12 Mths	24 Mths	36 Mths	3 Mths	6 Mths	12 Mths	24 Mths	36 Mths
Intercept		0.32	0.65	0.72	0.81	0.90	0.21	0.21	0.37	0.73	1.07	0.15	0.21	0.56	0.45	0.63
Predicted Foreclosure Timeline, in Recovery Period		-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00	-0.00*	-0.00	-0.00	-0.00*	0.00**	-0.00	-0.00	0.00**	0.00***
Average Characteristics at Loan Origination	FICO Score	-0.00**	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	0.00	0.00	-0.00***	-0.00***	-0.00	-0.00	-0.00***	-0.00*	-0.00***
	Loan-to-value Ratio	0.00	0.00	0.00	0.00	0.00	-0.00***	-0.00***	-0.00***	-0.01***	-0.00***	-0.00***	-0.00**	-0.00***	-0.00***	-0.00***
	Purchase Mortgage	-0.01	-0.05**	-0.07***	-0.08***	-0.08***	0.01*	0.06***	0.09***	0.08***	0.06***	0.04***	0.03	0.10***	0.12***	0.08***
	Fixed-Rate Mortgage	-0.02	0.02	-0.01	-0.00	0.00	-0.03**	0.03	0.03	0.05	0.06	0.02	-0.00	0.15***	0.16***	0.18***
	Primary Residence	-0.02	-0.02	-0.01	-0.03	-0.01	0.01	0.03*	0.04*	0.06**	0.06**	0.03**	0.06**	0.07**	0.10***	0.11***
	Condominium	0.02	0.05	0.04	0.03	0.02	0.02	0.04	0.07**	0.13***	0.19***	-0.03	-0.05	-0.03	-0.02	0.00
	One Borrower	-0.01	-0.04**	-0.05**	-0.05***	-0.05**	-0.01	-0.06***	-0.07***	-0.09***	-0.14***	-0.01	-0.03**	-0.03	0.01	0.03
Pre-delinquency Status	Loan Age at first-time SDQ	0.00***	0.00	0.00**	0.00***	0.00**	-0.00	0.00***	0.00***	0.00***	-0.00	-0.00	-0.00***	-0.00***	-0.00***	-0.00***
	House Price 1 year Growth Rate	0.21***	0.37***	0.42***	0.43***	0.43***	0.08***	0.20***	0.21***	0.30***	0.44***	-0.06	-0.04	0.01	-0.02	-0.02
	Change in Unemployment Rate	0.03	0.06	0.08*	0.09**	0.11**	0.00	-0.01	0.01	0.05	0.11**	-0.03	-0.10***	-0.09**	-0.02	-0.01
	Change in Median HH Income	0.22**	0.27**	0.37***	0.34***	0.29**	-0.03	0.15**	0.15*	0.27***	0.36***	0.17***	0.07	0.05	0.19	0.24*
MSA Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N		1559	1559	1559	1559	1559	1559	1559	1559	1559	1559	1559	1559	1559	1559	1559
R2		0.24	0.30	0.32	0.33	0.34	0.21	0.21	0.25	0.31	0.31	0.14	0.18	0.26	0.30	0.34

Table A-1 Foreclosure Timelines and House Price, County-Level 2SLS (National Sample Robustness Check)

	During National HP Declining Period	During National HP Recovery Period
	Cumulative HP growth rate	Cumulative HP growth rate
Constant	-0.5	0.4
Predicted Foreclosure Timelines, same period	0.06***	-0.01***
Long-term HP Growth (00-06)	-0.10***	-
Long-term HP Growth (00-11)	-	0.004
House Price Change, lagged 1 year	1.19***	0.07
House Price Change, lagged 2 years	-5.61***	-0.58**
House Price Change, lagged 3 years	-2.42***	-2.80***
Income Growth, lagged 1 year	3.21***	0.59**
Unemployment Growth, lagged 1 year	-1.18***	-0.52***
Acquisition Credit Risk Probability, lagged 1 year	-0.10***	-0.40***
MSA Fixed Effect	Yes	Yes
N	1550	1561
R2	0.78	0.63

Figure 1 House Price Index and Annual Growth Rate by State Classification



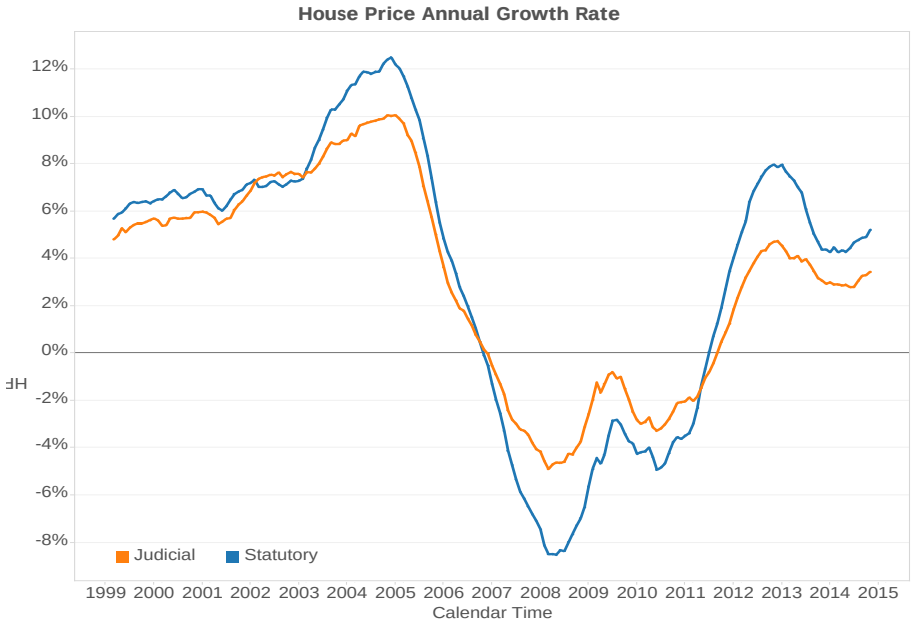
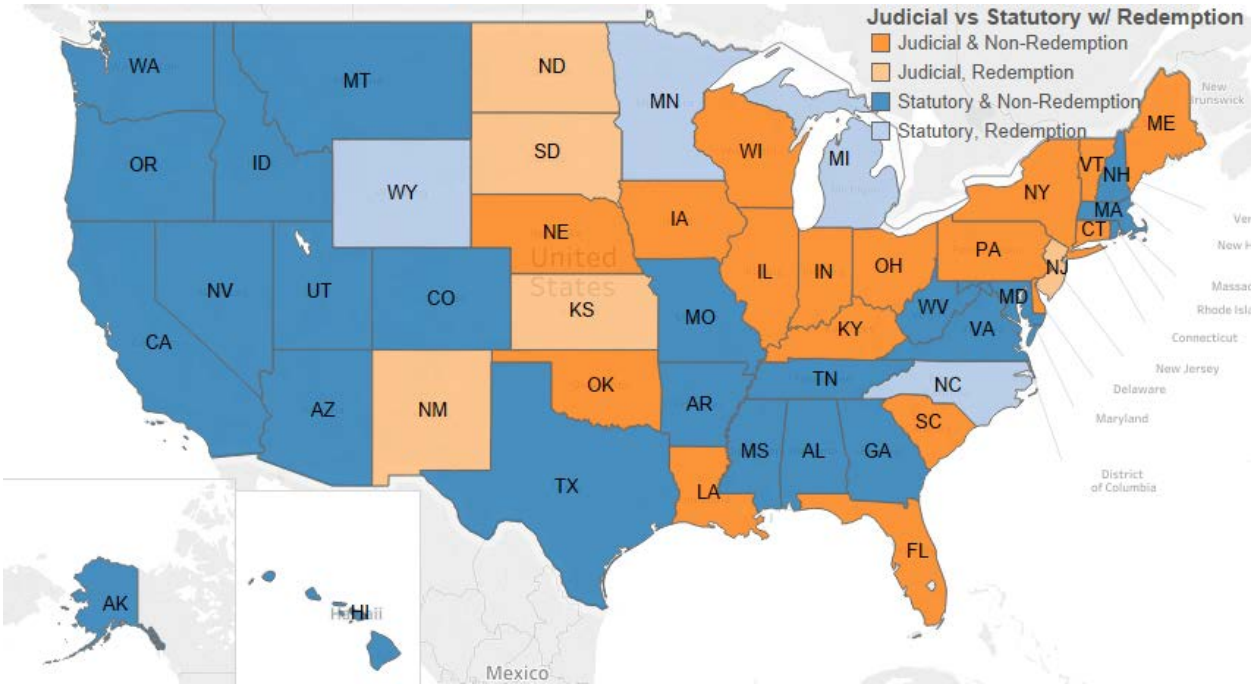


Figure 2 Map of State Classification



Note: Our definition is similar to the USFN classification, adopted by Cordell et al (2015), with the only exception that Hawaii is classified as a judicial state based on the 1905 precedent documented by Ghent (2014).

Figure 3 Relationship between Foreclosure Timeline (in months) and Foreclosure Rate

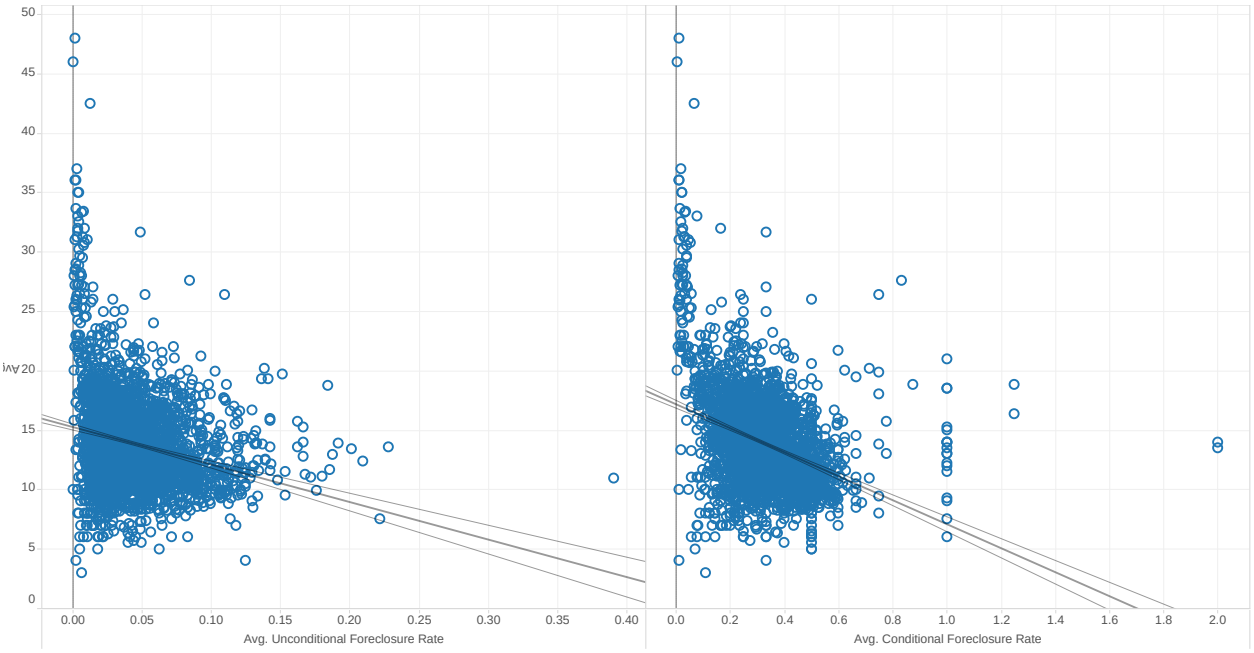


Figure 4 Average Foreclosure Timeline (in months) by Judicial/Statutory and Redemption /Non-Redemption

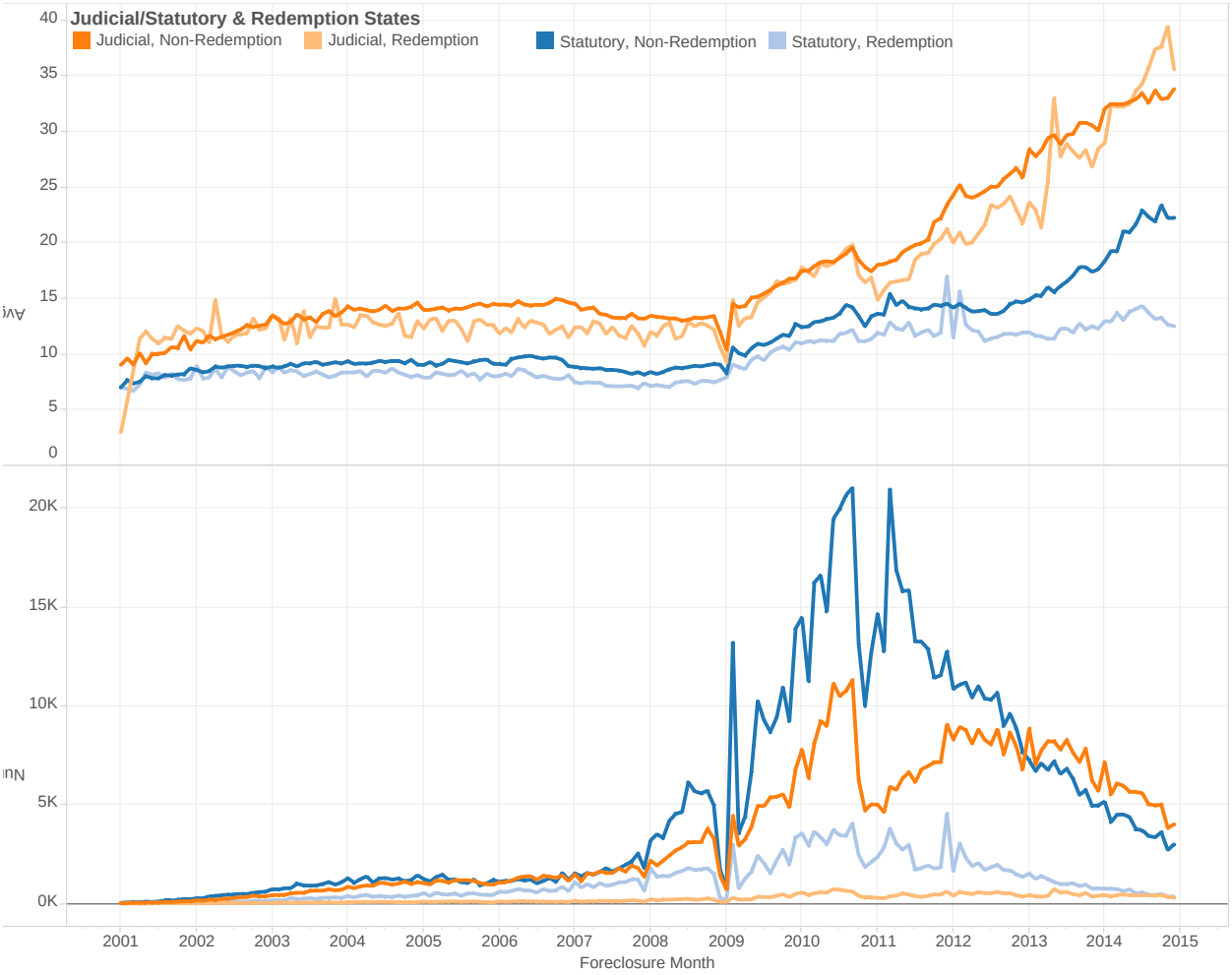
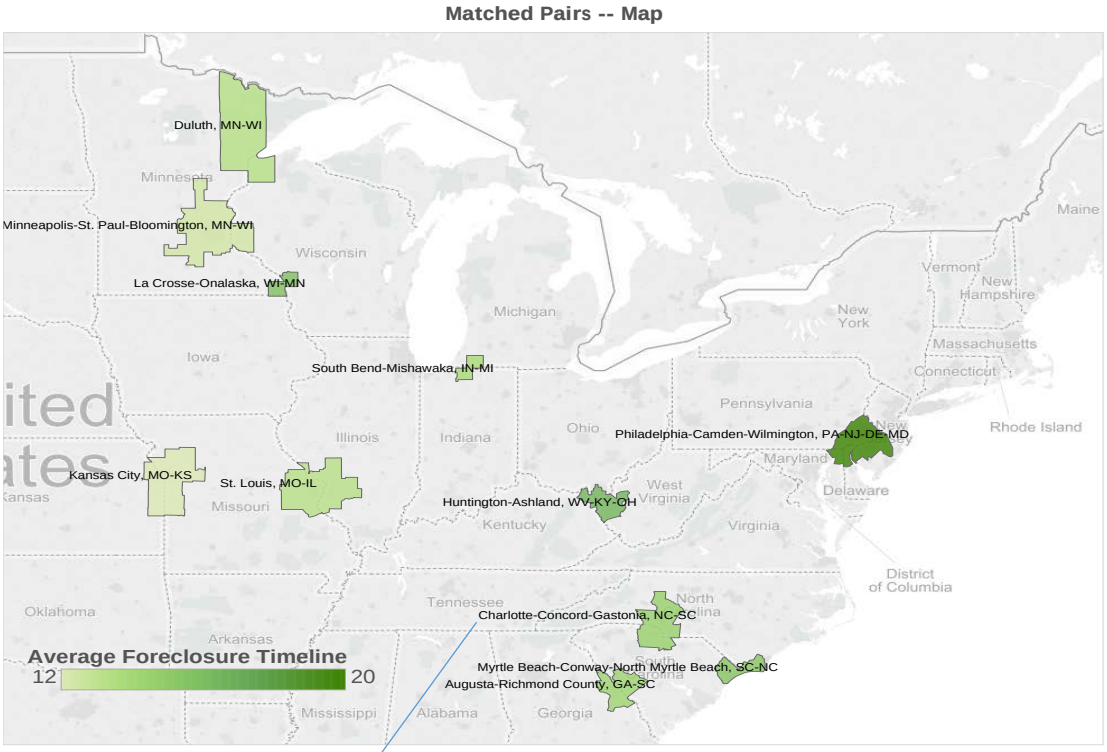


Figure 5 Map of Matched Pairs Sample



Charlotte-Concord-Gastonia, NC-SC with County-level Average Foreclosure Timelines

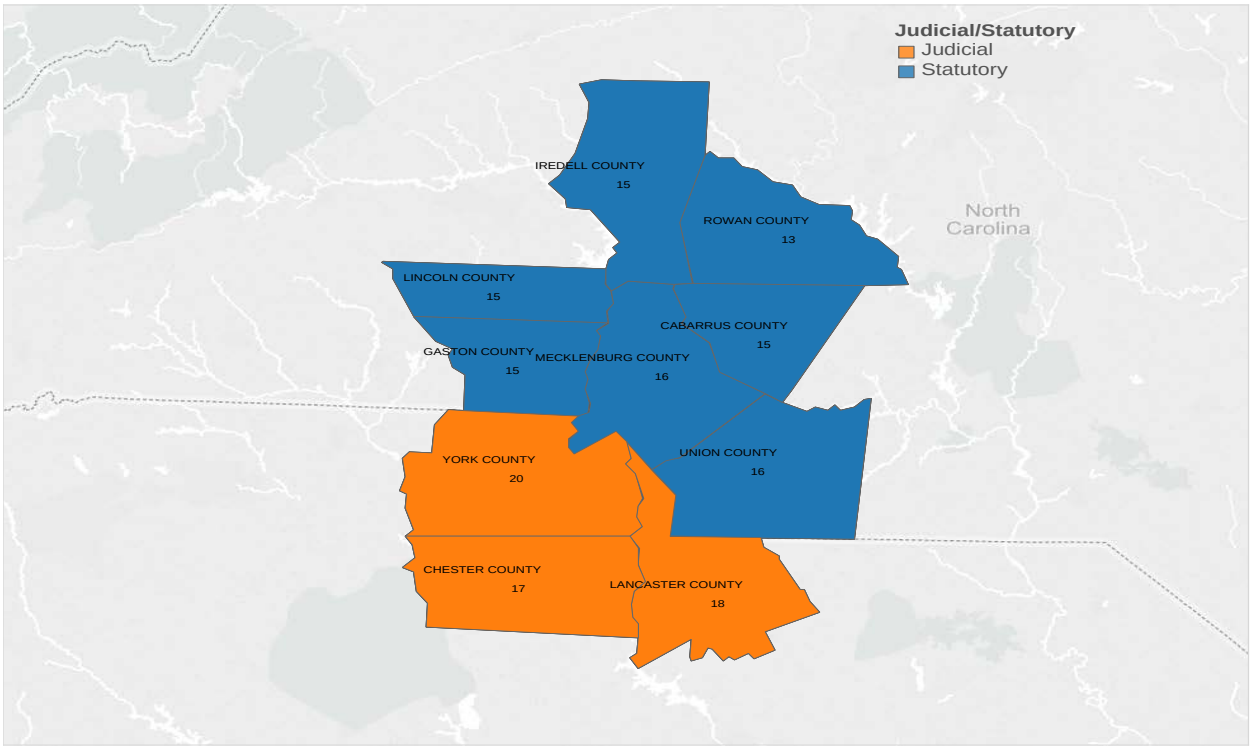


Figure 6 Comparison of Home Price Outcomes within the Matched Pairs

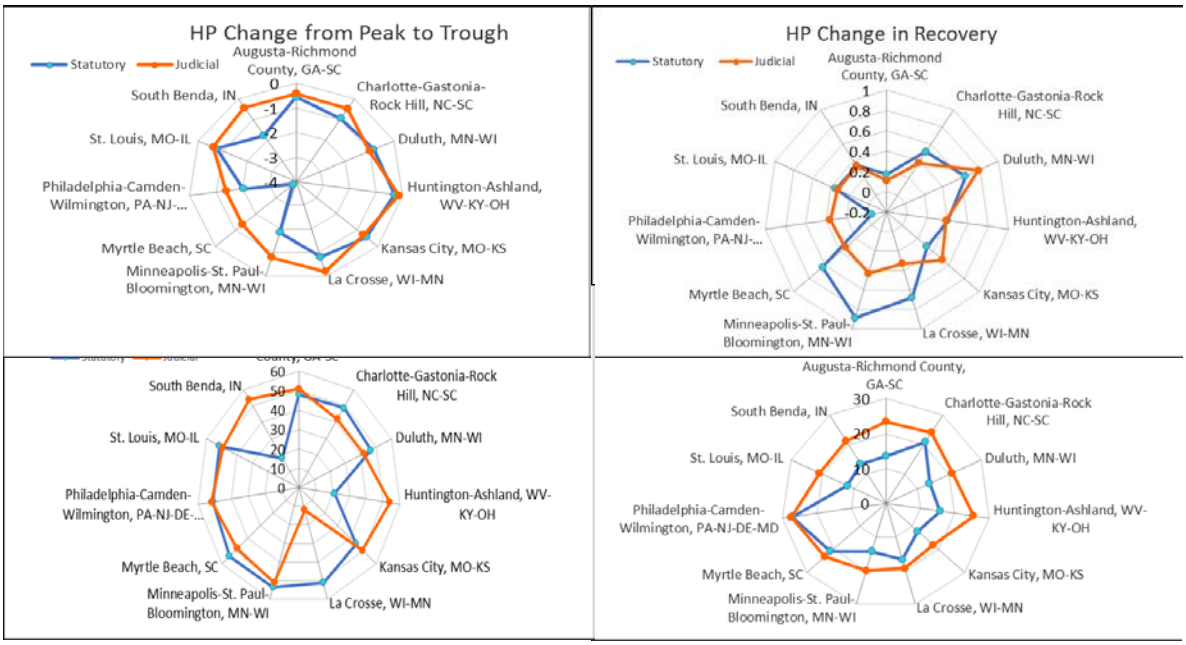


Figure 7 Comparison of Foreclosure Cost Rate between Judicial and Statutory States

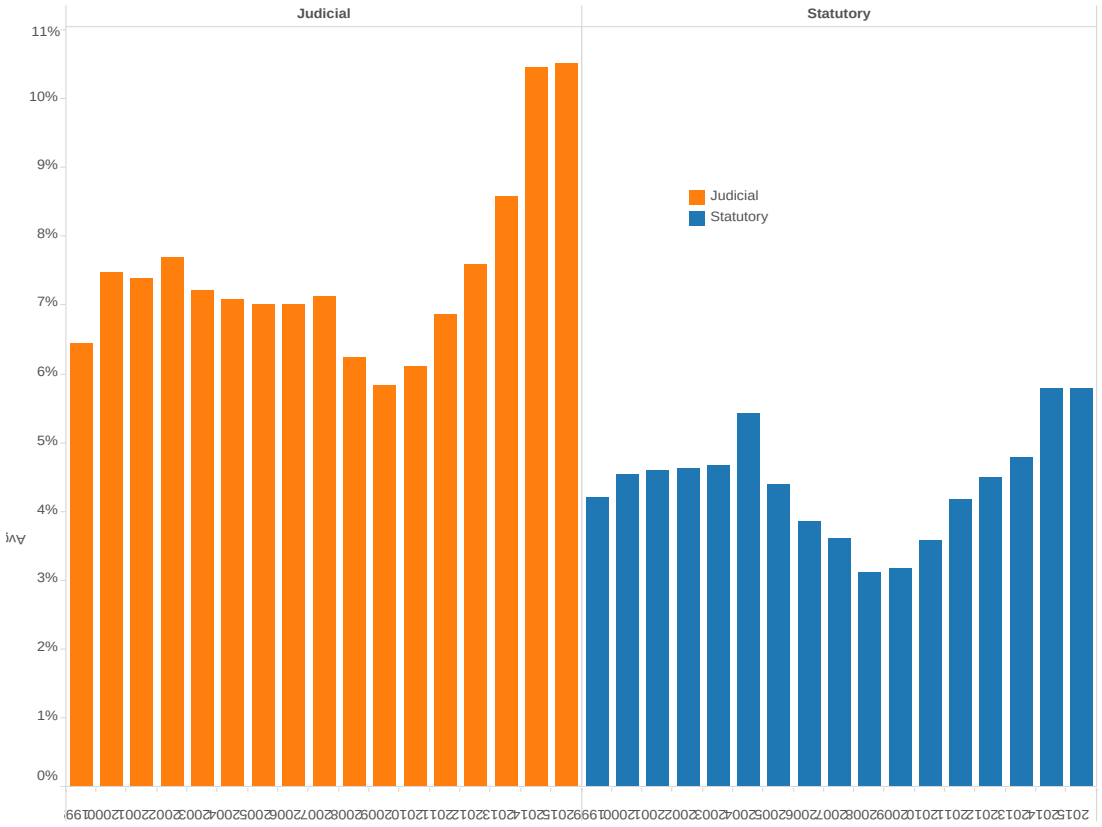


Figure 8 Comparison of Disposition Cost Rate between Judicial and Statutory States

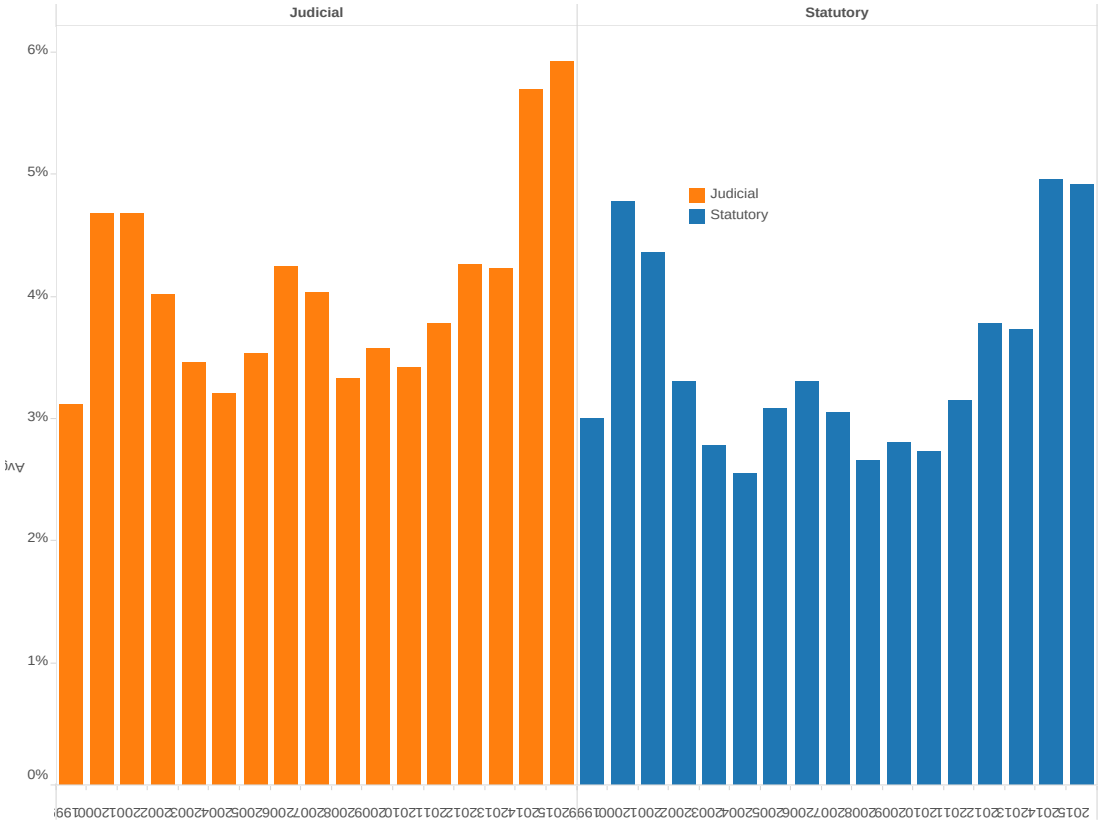


Figure 9 Comparison of Net Loss Severity Rate between Judicial and Statutory States