# The Dark Side of Sunshine: Regulatory Oversight and Status Quo Bias

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## Abstract

As the mortgage foreclosure crisis accelerated in the U.S. in the late 2000s, state-level policymakers implemented measures designed to protect consumers and stem the tide of foreclosures. One form of policy was simply to require lenders to report on foreclosure prevention activities. Such policies represented a shift from the status quo for mortgage loan servicing firms operating under incomplete information—doing nothing with non-paying loans while waiting for more information to be revealed—to either foreclosing on the borrower or offering the borrower a modification of loan terms. Using a difference-in-difference-in-differences empirical strategy, we exploit one policy implemented in Maryland for a subset of mortgage servicers and find evidence that firms perform more loan modifications, as well as file more foreclosures. Increasing foreclosure filings was contrary to the intent of the policy, suggesting that policymakers should be aware of how firms exhibit systematic biases, much like individuals.

*Keywords:* Status quo bias; loss aversion; mortgage foreclosure
JEL Classification: D1, I3, G21

## 1. Introduction

In early 2011 alone, the Mortgage Bankers Association reported that nearly 2 million borrowers were in some stage of the foreclosure process, and another 3.6 million borrowers were at least 30 days past due (Mortgage Bankers Association 2011). In this context, there has been ongoing debate about the actions, or inactions, of borrowers and lenders during the housing market recession. One key player in this market is the mortgage loan servicer.[2] These firms, typically specialty units that are compensated on a per-loan or per-dollar-collected basis, deal directly with borrowers to collect payments and then remit principal and interest proceeds to investors. When loans are delinquent, the servicer engages in collection actions with the goal of maximizing cash flow on the loan, including repossessing the property serving as collateral for the mortgage as necessary. What might appear to be a simple or mechanical process is in fact a choice under uncertainty, and a useful illustration of how firms may exhibit status quo biases. Consider the following stylized example of the servicer's options when a borrower fails to pay on a mortgage:

1. **Do nothing.** Missing payments may be due to inattention or a temporary income shock. Some portion of borrowers will self-cure their delinquency, catching up and providing cash flow in the future.

2. **File foreclosure.** The servicer can start the legal repossession process. Declining home values, high transaction costs of legal filings and property auctions, and holding costs can make this a costly option, but can return some portion of principal and interest upon liquidation of the property.

3. **Modify the mortgage.** The servicer can negotiate with the borrower to lower the interest rate, extend the loan term or forgive principal. Modifications incur transaction costs and give up future cash flow, and do so formally in the mortgage contract, but may result in a regular

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[2]Although a mortgage loan may be serviced by a third party or by a lender directly, this paper will use the term "servicer" to indicate the party responsible for collecting payments and reporting to lenders or investors in a mortgage-backed security about the status of each loan each month.

payment stream.[3]

Consider two borrowers, indistinguishable from a servicer's perspective: Borrower 1 cannot maintain his loan payments in the absence of a modified interest rate, principal balance or loan term—but could become current if offered a modification of loan terms. If the servicer does not offer a modification to Borrower 1, this loan will go to foreclosure and repossession, incurring thousands of dollars of costs. Borrower 2 cannot become current even with a loan modification. Even if the servicer modifies this loan, the borrower will still default, and the costs and delay of the modification will exacerbate losses. Doing nothing offers the borrower time to cure the default and the potential for home values to stabilize. Taking action could result in outcomes that appear to be in error, at least ex post. This presents a situation where managers at the servicing firm may prefer doing nothing—which can be considered the status quo—over taking action. Indeed, among high-risk non-agency mortgage loans as of May 2012, as much as two-thirds of troubled loans were not modified or in foreclosure proceedings (Anderson et al. 2012). Gerardi et al. (2011) and Piskorski et al. (2010) show that a large proportion of modified loans redefault; servicers may resist making modifications under such uncertainty.[4]

This study takes advantage of a policy in Maryland that changed the status quo from ''wait and see'' to ''taking action'' simply by requiring servicers to report monthly on actions taken on loans being serviced. In February of 2008, Maryland adopted an ''emergency'' regulation requiring mortgage loan servicers to report their efforts to help homeowners facing foreclosure. The intent of the law was to ''shine a light'' on servicer loan modification rates, based on a presumption that servicers were failing to modify loans for deserving borrowers and allowing too many borrowers to lose their home to foreclosure. Maryland's reporting policy required state-regulated servicers to provide monthly aggregated reports on the number of loans in default, in foreclosure and in modifications, as well as several other summary statistics. This was primarily a surveillance exercise; the policy had no regulatory sanc-

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[3]Servicers can also offer forbearance, short sales, or refinancing, among other options, but these practices are similar to the concessions typically given in a modification.

[4]Further, servicers face upfront costs of finding borrowers and negotiating modification terms, which may not be reimbursed by investors/lenders (Campbell 2012; Anderson et al. 2012).

tion or penalty for high or low modification or foreclosure rates. The reports were not made public or shared with investors or other servicing firms. However, we are able to show that this policy changed firms' decisions based on a shift in the status quo.

The behavioral decision-making literature related to Prospect Theory suggests that people show preferences for the status quo over committing an act that could lead to regrettable outcomes. For example, surveys show that people perceive a death resulting from administering a vaccine as much worse than a death resulting from not administering a vaccine, even if the proportion of deaths from the vaccine are low (Kahneman and Tversky 1979; Kahneman et al. 1991). In behavioral finance, studies show that investors who own losing shares frequently do not sell (an action seen as ''locking in losses''), preferring to leave the success of an investment to chance, even if this is counter to a rationally informed decision based on investment fundamentals. Investors are biased toward inaction, and underweight the opportunity cost of not taking action (Zeckhauser and Viscusi 1996; Zeckhauser et al. 1991). Doing nothing, even if *ex post* it leads to worse state, is perceived as better than proactively making a decision that leads to a bad outcome. Decision makers prefer to fail to take an action, even if that action is optimal, than to take an action that turns out to be a failure (Dana 2010). Ritov and Baron (1992) offer a classic study documenting errors of omission, but more recently Wiles et al. (2010) shows how errors of commission and omission are treated in the marketplace, with errors of omission being treated more favorably.

Standard models of finance would predict that servicers will foreclose or modify loans based on the expected value of each option. Mason (2009) summarizes how servicers operationally approach loan modifications based on a review of industry documents, reports and ratings agency guidance on mortgage servicing. He summarizes that there is ''general agreement in the industry that the ultimate loss to the transaction should be the only consideration in determining the execution of the best loss mitigation strategy'' (page 40). Based on this rationally informed perspective, a change in reporting or surveillance should not be expected to change the expected value of loan modifications or foreclosures. Yet, a behavioral perspective would predict that reporting requirements could change the status quo of ''do nothing'' for servicers to "taking action," including both modifications of loans (the goal of the policy) and more foreclosures (the opposite of the goal of the policy).

This study uses data on securitized mortgages serviced by firms covered by Maryland's reporting policy and loans in Maryland serviced by firms that were not covered by the policy.[5] Because the same servicers are active in nearby states, this provides a comparison group to compare differences in loan modification and foreclosure outcomes in the region after the policy was implemented. Using a difference-in-difference-in-differences (DDD) framework, we compare loans along three dimensions: 1) servicers that were subject to the reporting regulation compared to those not subject to reporting, 2) loans that were located in Maryland compared to those in surrounding states and 3) the same loans compared before and after the initiation of the policy. The results are consistent with servicers taking more actions on loans subject to reporting compared to loans not subject to reporting.

If servicers are merely responding to a goal of performing more modifications, we would expect to see an increase in modifications and no relative change in foreclosures. However, we find robust evidence that state reporting requirements are highly related to both modifications and foreclosures—and may serve as an instructive example of how behavioral biases can play out in response to reporting policies. Our results are robust to a variety of specification checks, including loan-level and postal zip code-level controls, as well as servicer, state, and time fixed effects. The results are also consistent when conducting difference-in-difference (DD) tests only within Maryland, as well as for various border-state variations and hazard models conditional on borrower payment status.

The following section provides background on Maryland's reporting policy as well as the role of regulation and the relevance of status quo biases. Section 3 describes the data and provides descriptive statistics. Section 4 explains the DDD specification and provides results, and Section 5 describes a variety of robustness exercises and a falsification test, followed by a discussion and conclusion in Section 6.

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[5]All of the loans in this study were packaged and sold in private mortgage-backed securities to investors; they are referred to as non-agency loans because they are not backed by government-sponsored enterprises (GSEs) such as Freddie Mac, Fannie Mae or FHA/Ginnie Mae.

## 2. Background

*2.1. The Emergency Servicer Reporting Requirement (ESRR) Policy*

The federal Home Affordable Modification Program (HAMP) began in 2009 with the goal of stimulating more loan modifications.[6] States had begun to experience rising foreclosures as early as 2007, however, and policy proposals emerged locally and nationally far in advance of HAMP to address the perceived problem of too many foreclosures (where people lose their home) and too few loan modifications (where people keep their homes, at least for a time).

On February 19, 2008, Maryland adopted an "emergency" regulation requiring mortgage loan servicers to report their efforts to help homeowners facing foreclosure under Maryland Financial Institutions Code §11-501. Maryland's policy was modeled on a proposal first introduced in California in late 2007. Dubbed the *Emergency Servicer Reporting Regulation* (ESRR), the regulation required mortgage loan servicers to report to the State Department of Labor, Licensing and Regulation. The due date for the first report was March 20, 2008 (later revised to April 7, 2008, to cover activity in March). Each covered servicer reported the following numbers in aggregate for the prior month:

- Number of mortgage loans being serviced.
- Number of mortgage loans in default.
- Number of loss mitigation activities undertaken.
- Number of foreclosure actions.
- Number of adjustable rate mortgages.

The ESRR reporting policy was implemented early in the housing market downturn, before federal programs were launched. It applied only to a subset of servicers, creating a unique opportunity to identify the effect of the policy. Only about one-third of mortgage loans in the state were subject to the regulation due to an exogenous feature of federal-state regulatory rules. Mortgage servicers operate under a state or national license issued when the firm first begins business. The ESRR applied to firms under state purview;

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[6]For more details on HAMP, see www.makinghomeaffordable.gov

the remaining servicers were under federal purview that preempted the state of Maryland from regulating these firms. There was no way for firms to change their regulatory status to become exempt from ESRR; coverage was determined by the legal form of the financial institution. The ESRR was in place in Maryland until January 1, 2012, and no nearby states implemented policies similar to ESRR during the study period.

## 2.2. The Role of Regulation

Public policies can create incentives or sanctions for servicing firms to take accelerated actions on loans at risk of foreclosure. Policies can trigger firms to make both Type I errors—where loans that could self-cure are either foreclosed on or modified (false-positives)—as well as Type II errors, where loans that would fail regardless are offered modifications (false-negatives). Yet, loan servicing firms may not be indifferent between these errors. Moreover, they may have a preference to "wait and see," taking no action at all. But this latter outcome is least satisfying to a policymaker, eager to show constituents the impact of legislative initiatives.

In 2007-2008, as attention to foreclosures mounted, state policymakers were under some pressure from the public to develop a response to problems in the housing market (Leland 2008). Aghion et al. (2010) describes how uncertainty and distrust increase demand for regulation, perhaps suggesting what motivated Maryland to pass this regulation early in the foreclosure crisis. Regulators often express a bias toward action in the face of uncertainty, even when the costs and benefits of policies are ambiguous (Zeckhauser and Viscusi 1996; Warren and Wilkening 2012).

While investors monitor mortgage-backed securities overall in terms of cash flow, they often lack directly observable information about loan modifications at the loan level. In contrast, government regulators can compel firms to reveal information, at the least to the regulating agency (Gerardi et al. 2011; Berger et al. 2000). Flannery (1998) concludes it is possible government mechanisms can reveal information over and above what private supervision provides. In the case of Maryland's supervision of servicers, data about individual servicers was not intended to be made public, although firms were aware of the reporting requirement and attuned to the potential for data to be revealed in the future. The ESRR had no formalized sanction provisions.

Yet, the imposition of ESRR introduces a shift in the servicer's problem of how to treat a delinquent borrower. Prior to the reporting requirement,

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servicers facing opaque information about a borrower might maintain the "do nothing" strategy as long as possible, in hopes of further information being revealed. This creates a status quo bias (Kahneman et al. 1991; Samuelson and Zeckhauser 1988) for the servicer toward doing nothing. Supervision changes this dynamic, making modifications and foreclosures the primary alternatives and leaving doing nothing as an inferior option. Filing the report focused the servicing managers on loan status and may have resulted in differential treatment of the loans subject to the ESRR.

We found no other studies examining the imposition of oversight as a potential avenue to shift status quo biases. There are studies of policies that make information less visible or salient. For example, Finkelstein (2009) studies the imposition of electronic tolls on highways, finding that making the toll less salient leads to rising toll costs.[7] In medical studies, reporting of specific treatment actions tends to increase the incidence of targeted procedures relative to the pre-monitoring period (McMullin et al. 2006). Reason (2002) suggests errors of omission are more likely when informational cues are ambiguous or uncertainty is present.

It is possible that the ESRR reporting policy resulted in a shift for firm managers to paying more attention to servicing procedures. This might be true if servicers were overwhelmed at the start of the foreclosure crisis, and simply neglected to review loans. The imposition of ESRR reporting and related heightened attention may have increased salience among impacted servicers even further (the regulation was proposed and implemented in less than four months). According to Mason (2009), the State Foreclosure Prevention Working Group, a coalition of state attorney general offices and related state regulators, found that some servicers did not have tracking systems to provide information on modification actions as of mid 2007 (footnote 165). It is possible that ESRR forced servicing firms to enhance technology systems to better monitor modifications. However, if ESRR functioned through enhanced data systems or managerial attention, this would suggest the policy would impact the overall operations of firms, not just loans in one state.[8]

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[7]Similarly, Chetty et al. (2009) find evidence of salience in taxation, where revealing prices with taxes included results in a decrease in purchases for similar goods.

[8]Servicers have centralized processing and call-center facilities and are not organized by the physical location of loans serviced.

## 3. Data

The data selected for this analysis are drawn from the Columbia Collateral File distributed through the Corporate Trust Services (CTS), a subsidiary of Wells Fargo. CTS serves as the trustee for 3.5 million securitized, privately placed mortgages originated predominately between 2000 and 2008 and placed into mortgage-backed securities purchased by investors. Although Wells Fargo services about 15% of the loans in the data, more than 90 other servicers are represented. The CTS distributes information monthly as loan-level remittance reports, primarily so that investors in mortgage backed securities can monitor cash flows. The loans would be labeled in the industry as subprime or alt-A mortgages sold into "private placement" securities. Data for this analysis are selected from January 2007 to December 2009, as a 36-month panel.[9]

Data contain information on the status of the loan for the current month in each period, as well as the date of any foreclosure filing, payoff, modification, repossession or other action. The foreclosure filing represents the servicer's decision to attempt to repossess the property; once repossessed it becomes real estate owned (REO). Additional data include initial loan amount and term, as well as current information on the balance owed, current interest rate and credit score.

The data are restricted to first-lien mortgage loans on owner-occupied, single-family residences. We further drop a small number of observations for which the initial interest rate exceeds 20%, judging these as highly esoteric or miscoded. Additionally, approximately 2% of loans were dropped from the sample because of censoring due to payoff. The final dataset contains 159,032 loans that are tracked throughout 36 months, although some records are missing loan-level characteristics, which may result in lower numbers of observations in some tables.[10] We use all loans that are current and delinquent in order to capture the average treatment effect of the reporting policy. This can be thought of as an "intent to treat" measure across all loans poten-

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[9]The CTS data are also used in Collins and Urban (2013), where the authors study the effects of mediation on mortgage outcomes, and Collins et al. (2013), where the authors determine the effects of the interaction of race and counseling on the performance of modified loans.

[10]The observations with missing data are not systematic in geography or loan characteristics.

tially subject to reporting regardless of delinquency status. Restricting the analysis to delinquent loans is another approach; this would calculate a "local average treatment effect" conditional on loans at higher risk of foreclosure (a loan rarely would foreclose without first missing a series of payments). As a robustness exercise, we do calculate this conditional estimate. The average effects are likely most instructive with regard to the effects of the ESRR policy, however.

Four states and Washington, DC, are included in this analysis.[11] Maryland represents about 30% of the total, with a similar proportion in Pennsylvania and Virginia. DC and Delaware each account for less than 4% of the total. Figure 1, shows the distribution of loans by state and servicer type, where ESRR indicates if a servicer was ever covered by the reporting requirement in any state. Optically, the states in the sample seem to be similarly represented across the two types of servicers, with perhaps a slight overweighting of firms subject to ESRR held in Pennsylvania. State-regulated servicers were subject to ESRR only for loans on properties located in Maryland, and nearby states had no reporting requirements for any servicers or loans.

### 3.1. Descriptive Statistics

We begin by documenting in Table 1 that the loans in these data represent similar borrowers and similar loan types across all the states included before the ESRR policy is implemented. The data describe the period immediately before the announcement of the ESRR reporting policy in Maryland. Table 1 shows interest rates and terms, delinquency status, loan age, borrower credit scores, loan-to-value ratios and other factors across Maryland and neighboring states. Loan balances vary quite a bit, with Maryland a quarter of a standard deviation above the mean. This is to be expected, as housing values are higher in Maryland than in surrounding states.[12] All the loans in the data had characteristics expected of subprime mortgages. For example, just over 13% of the loans were behind on a payment as of January 2008, almost half of the loans in the data had an adjustable rate mortgage and the

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[11] For ease of reference, we will refer to these areas as comprising five "states", although Washington, DC is technically not a state.

[12] According to the 2008 Census American Community Survey (ACS) median home values are as follows: Delaware 250,900; DC 474,100; Pennsylvania 164,700; Maryland 341,200 and Virgina 269,600.

mean interest rates was 7.3%. Two-thirds of the sample had a FICO credit score under 720. The average loan was first originated between 2004 and 2005, near the peak of the mortgage and housing boom in the U.S..

In Table 2, key dependent variables—a modification and a foreclosure filing indicator—for Maryland are summarized relative to surrounding states as of the first period of the study (before ESRR was proposed or implemented). Table 2 also shows three independent variables to explore potential demographic differences between loans in Maryland and neighboring areas. Maryland loans have a lower concentration of male subprime borrowers, a higher concentration of minority race borrowers, and a higher average borrower income than the surrounding states. This suggests caution when directly comparing Maryland to its surrounding states. We instead use time trends and geographical variation to "difference out" observable and unobservable characteristics at the state level. Note there are 47,948 loans in the data in Maryland in total, and 111,082 in surrounding states (with no reporting in place during the time frame we study).[13]

Next, we compare the loans across servicer types, in order to determine whether servicers ever subject to ESRR regulations differ substantially from those not required to report on loans. In other words, we test whether the servicers regulated by the state of Maryland were observationally different from those exempt from state regulation. Table 3 shows the difference in loan-level characteristics by servicer type. Here we see 17,464 loans serviced by firms subject to ESRR. Of these, as shown in Figure 1, 4,322 were in Maryland and thus subject to the reporting policy. While the rate of modifications and foreclosure starts seem to be relatively consistent across servicer types, servicers subject to reporting regulations have lower original balances and higher interest rates. Regulated servicers are slightly less likely to have loans with adjustable rate mortgages and have higher probabilities of default. While borrowers with loans from ESRR servicers tend to have lower credit scores, their combined loan-to-value ratio is similar to borrowers covered by non-ESRR servicers.

Since we rely on changes in outcomes, we expect that these groups of servicers are similar enough to satisfy our identifying assumptions outlined

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[13]Although not shown, we dropped each state one at a time to determine that one particular state is not driving the DDD estimates. This is particularly important in the case of DC, since it is the only nonjudicial foreclosure state in the sample (tables available upon request).

in Section 4. Specifically, the difference-in-difference-in-differences (DDD) specification will only assume that the change in trends between ESRR servicers and non-ESRR servicers before and after the initiation of the policy in Maryland would have been comparable to the change in trends between ESRR and non-ESRR servicers before and after the initiation of the policy in Maryland's surrounding states. However, we provide additional robustness tests that relax these assumptions in Section 5. Here, we provide results from two different difference-in-difference (DD) results, where the effect is identified from 1) changes within ESRR servicers before and after the policy in Maryland and its border states, or 2) changes within Maryland across ESRR servicers and non-ESRR servicers. These tests produce comparable results. One thing we cannot control for is the potential that ESRR servicers in the border states became fearful of a future reporting policy and adopted similar policies. If this was the case, it would bias against finding a result since control servicers and loans by servicers subject to ESRR outside Maryland would also change in response to ESRR. These estimates of the effect of the ESRR policy based on differences in differences are likely to be more conservative if indeed servicers are responding to anticipated future policies.

Figure 2 plots average modification rates in each period by the type of servicer (ESRR or non-ESRR). The vertical line represents the start of ESRR reporting in Maryland. For each period, we report the difference between Maryland and the surrounding states.[14] There are two key takeaways from this figure. First, in the period leading up to the policy, the difference in modification rates between Maryland and the surrounding states within each servicer type is nearly identical. These two lines trend together until the policy line. Second, by June 2008, ESRR servicers begin modifying at a much higher rate than non-ESRR servicers in Maryland when compared to surrounding areas. The first report was due in April. It appears servicing practices did not respond until June, perhaps due to delays in administrative capacity or managerial attention. The initial drop in activity may also be consistent with a transitional phase as reporting was first adopted—servicers were unsure and all loans subject to reporting were placed on hold until the new regulation was fully absorbed.

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[14]For instance, in period 1, January 2007, we take the average modification rate for ESRR servicers in Maryland, subtract from that the average modification rate for ESRR servicers in surrounding states, and plot that point.

Figure 3 replicates this exercise for foreclosure filings. The findings are consistent in that the difference in average foreclosure filings between Maryland and its surrounding states is similar for ESRR and non-ESRR servicers before the policy took effect. After the policy took effect, ESRR servicers had a larger difference in foreclosure filing rates between Maryland and its surrounding states. This is the specific effect we seek to identify in this paper.

Similarly, Figure 4 shows the difference in the rate of doing nothing for servicers subject to and not subject to ESRR reporting between Maryland and non-Maryland servicers. Since loans that are always current should show constant "do nothing" rates, these plots are conditional on loans being delinquent. These results complement Figures 2-3, where the rate of inaction of servicers is declining in Maryland for ESRR servicers when compared to non-Maryland ESRR servicers. These three figures provide evidence of a shift in the status quo bias, where ESRR servicers in Maryland move away from doing nothing toward initiating foreclosures and performing modifications.

Further, Figure 5 shows the rate of doing nothing for ESRR and non-ESRR servicers in all areas. This displays the high rate of inaction in the pre-period, close to 80%, or the status quo bias. The rate decreases for all servicers after the policy, though this decrease is more pronounced for ESRR servicers, dropping to 50% by June 2009.

These figures show that under ESRR, doing nothing was no longer the status quo. Servicers took the action policymakers desired—offering more loan modifications—but also foreclosed on loans more frequently. Other servicers not subject to the regulation, and the same servicers in border states servicing loans not subject to ESRR, did not follow this pattern. Only the loans subject to reporting show increased modifications and foreclosures. The simple requirement to submit aggregated monthly reports seems to have shifted servicer behavior for covered loans. While these illustrations are provocative, we attempt to formally identify the effects of the policy, controlling for other factors, in the next section.

## 4. Empirical Model: Difference-in-Difference-in-Differences

The goal of this paper is to estimate the effects of mandatory reporting requirements on the incidence of modifications and foreclosure filings. There are many factors that may systematically alter modifications or foreclosure filing rates for the servicers subject to ESRR that are correlated

with, but not due to, the policy. Since these servicers also operated in neighboring states, we use four surrounding mid-Atlantic states (Delaware, the District of Columbia, Pennsylvania, and Virginia) as a comparison group, as well as servicers in Maryland not required to report under ESRR, in order to identify the effect of the policy. Specifically, we employ a difference-in-difference-in-differences (DDD) strategy similar to that described in Gruber (1994), comparing the changes in modification and foreclosure filing rates for ESRR (treatment) loans and non-ESRR (control) loans along three different dimensions:

1. Compare loans with servicers subject to ESRR requirements to those not subject to ESRR within the same state (servicer type).

2. Compare loans in Maryland to those in other mid-Atlantic states, which do not require ESRR reporting (state).

3. Compare loans within Maryland by ESRR servicer status before and after the policy was enacted (time).

The identifying assumption of the DDD estimate requires that: 1) The trends in outcomes for loans with ESRR servicers and non-ESRR servicers would be similar in the absence of the policy. 2) The trends in outcomes for loans in Maryland and loans in the surrounding Mid-Atlantic regions would be similar in the absence of the policy. 3) Borrowers did not self-select into their servicers given any *ex-ante* knowledge of the policy. While we can assure that the latter is not a concern since these loans were originated before the policy was even proposed, assumptions 1 and 2 are harder to justify since the counter factual is not observable. Thus, we will also provide difference-in-difference (DD) estimates, so we do not entirely rely on either of these two assumptions in a single model.

*4.1. Regression Framework*

We begin with a linear probability model to calculate the average treatment effect of the policy, controlling for additional loan-level, postal zip code-level, and time-varying observable characteristics in order to decrease our sampling variance. In doing so, we estimate Equation 1, for loan $i$ in year-month $t$, covered by servicer $s$, in state $j$:

$$Y_{i,s,t,j} = \beta_0 + \beta_1(\text{ESRR x Post})_{i,s,t} + \beta_2(\text{ESRR x MD})_{i,s,j} + \beta_3(\text{MD x Post})_{t,j}$$
$$+ \beta_4(\text{ESRR x Post x MD})_{i,s,t,j} + \gamma_s + \kappa_j + \delta_t + \boldsymbol{\phi}\boldsymbol{Z}_{i,t} + \eta_{i,s,t,j},$$
$$(1)$$

where $Y_{i,s,t,j}$ equals one if loan $i$ was modified at time $t$ and zero otherwise, or in another specification, $Y_{i,s,t,j}$ equals one if loan $i$ received a foreclosure filing at time $t$ and zero otherwise. Post is an indicator that equals one after the policy takes effect (February 2008) and equals zero before.[15] ESRR equals one for loans with servicers that were ever required to report in Maryland, regardless of state, and equals zero for loans with servicers not required to report under ESRR. For example, GMAC Mortgage, LLC, was required to report to the state of Maryland. Thus, any loan serviced by GMAC will be labeled as an ESRR servicer loan, whether it was in Maryland or not and whether it was in the pre- or post-implementation period. This will allow us to difference out any servicer-specific factors and eliminate any bias associated with the servicers the state chose to report. ESRR x Post is an interaction term between these first two variables, creating an indicator variable for loans with servicers subject to the ESRR policy after it was implemented. Thus, ESRR x MD creates a binding constraint for a loan in Maryland with a servicer required to report, and MD x Post is a dummy indicating that the loan was held in Maryland after the policy took effect. Finally, ESRR x Post x MD is the DDD estimate we are specifically interested in, with $\beta_4$ as the coefficient of interest.

We further control for time-invariant unobservables at the servicer and state levels, including fixed effects $\gamma_s$ and $\kappa_j$ respectively, as well as month by year fixed effects $\delta_t$ to account for any changes in federal housing policies or other unobserved time-related effects. We chose to include these dummies instead of including a Post, ESRR Servicer, and Maryland dummy, as would be done in a traditional DDD, since this will soak up additional heterogeneity at the month, servicer, and state levels. In some models, we additionally control for loan-level characteristics (denoted $\boldsymbol{Z}_{i,t}$ in Equation 1) such as the log of the original loan balance, the current loan rate, dummies for delinquency status (90+ days, at least 60 days, at least 30 days), credit score quartiles,

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[15]The ESRR policy was implemented in April to report on March, but was announced in February.

combined loan-to-value quartiles, an adjustable rate mortgage indicator, and origination year dummies. Finally, we include two postal zip code-level variables from the Census Bureau, including the percent of white residents and the log of median income.

While linear probability models (LPM) can sometimes generate inaccurate fitted values, Angrist and Pischke (2008) find that LPM performs reasonably well when estimating marginal effects from a policy, as this study does.[16] We additionally estimate a model with marginal effects from a probit specification,[17] as recommended by Wooldridge (2002), though we present the linear probability model estimates in the main text for ease of interpretation (Ai and Norton 2003). Further, we are careful to cluster our standard errors by date (a month-year combination) and provide robust standard errors throughout to control for heteroskedasticity in all of our LPMs (Haughwout et al. 2008).

Table 4 provides evidence of a shift from the do nothing status quo to taking action, including modifications and foreclosure filings, for loans subject to ESRR in Maryland after the policy was initiated.The DDD estimate for loan modifications shows that loans with servicers covered by ESRR in Maryland had an increase in modification rates close to 1 percentage point. Similarly, Columns (3) and (4) show that the DDD estimate is close to 2 percentage points. In both Columns (2) and (4), where we include controls for loan-level and zip code-level characteristics, this effect shrinks slightly. The DDD estimates in Table 4 show that the ESRR supervision makes the covered servicers view the do nothing option as inferior for loans for which the firms will be required to report to the state the following month. Thus, reporting shifts the status quo bias.[18]

It should be noted that the control variables included the specifications in Table 4 are consistent with predictions and prior literature, including

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[16]Wooldridge (2002) asserts that the leading difference between LPM and probit or logit specifications is that LPM assumes constant marginal effects, while logit and probit specifications imply diminishing marginal returns to covariates [page 469].

[17]The marginal effects found here are substantively consistent with the estimates found with the linear probability models (tables available upon request).

[18]Loan-level unobservable heterogeneity arguably could explain the differences, meaning that there is selection into servicers and states due to some expectation of the policy. We include loan-level fixed effects, and our results remain similar (tables available upon request).

increased foreclosures and decreased modifications for riskier borrowers as measured by loan-to-value ratio, credit score and the severity of delinquencies. Borrowers with greater reported income and loan amounts when the loan was first originated are modestly more likely to experience a foreclosure filing, and less likely to have a loan modification. It also appears modified loans obtained much lower interest rates (about 3 percentage points). Neighborhood racial composition (percent whites in postal zip code) and the adjustable interest rate features of the mortgage loan (ARM dummy) suggest statistically significant but small relationships. These observable characteristics moderate the simple estimates, but the estimated effects of the DDD models are consistent in direction and relative magnitude.

## 5. Robustness

The identifying assumption of the difference-in-difference-in-difference (DDD) requires that there are no contemporaneous shocks that affect the relative outcomes of the treatment servicers when compared to the control servicers within the same state and time period of the policy. We assume that the changes in housing market characteristics between Maryland and the surrounding mid-Atlantic states would have followed the same trend in the absence of the policy. Similarly, the treatment and control servicers would follow similar trends in the absence of the policy. In order to be sure that our identification is not over-relying on either of these two assumptions, we provide two difference-in-difference (DD) specifications. The first looks at treated and untreated servicers in Maryland, removing the surrounding states from the analysis. The second includes only treated servicers but includes both Maryland and the surrounding states.

First, we estimate Equation 2, where the new coefficient of interest is $\beta_1$, the interaction on the DD term, including only loans in Maryland.[19]

$$Y_{i,s,t,j} = \beta_0 + \beta_1(\text{ESRR x Post})_{i,s,t} + \kappa_j + \delta_t + \boldsymbol{\phi Z}_{i,t} + \eta_{i,s,t,j} \qquad (2)$$

The findings in Table 5 are consistent with an increase in modifications due to the policy, though this effect appears to be inflated in the difference-in-difference setup using only Maryland loans. Foreclosure filings, however,

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[19]All variables are defined synonymously to Equation 1.

seem to show the same effect as earlier, where the regulation increases fore-closure filings by approximately 2 percentage points for covered servicers after the policy. These results show that there may be more of a difference between servicers that were and were not covered by the policy.

We perform one additional difference-in-difference (DD) estimation, where we examine loans held by covered servicers only in treatment (MD) and control (DE, DC, PA, VA) states. Specifically, we estimate Equation 3, where the coefficient of interest is $\beta_1$, or the interaction between loans in Maryland after the regulation was in place. Again, this sample will include only servicers subject to ESRR reporting regulations.

$$Y_{i,s,t,j} = \beta_0 + \beta_1(\text{MD x Post})_{t,j} + \gamma_s + \kappa_j + \delta_t + \boldsymbol{\phi}\boldsymbol{Z}_{i,t} + \eta_{i,s,t,j} \qquad (3)$$

Table 6 reports the results, where DD estimates are consistent with the DDD estimates from Table 4. Thus, this provides additional evidence that errors of commission become less costly to servicers once ESRR surveillance is implemented.

While the ESRR reporting clearly altered the incentives of servicers, the policy should not directly affect a borrower's behavior. Thus, we use delinquency as a dependent variable to ensure that the DDD estimator from Equation 1 is not simply picking up contemporaneous changes in the housing markets across states or other differences between servicers. Specifically, our dependent variable equals one if the loan is 60 days or more delinquent in the given month-year period. We choose this variable as this is generally the threshold for which servicers label a loan as seriously delinquent and payments are in doubt. If the incidence of borrowers being behind on two or more payments is simply rising for ESRR servicers in Maryland at a higher rate after the policy than the control servicers and surrounding states, this could be driving the effect. Table 7 reports these results. Reassuringly, it appears there is no effect of the policy on delinquency rates of 60 days or more. These effects are not statistically distinguishable from zero; note also the average 60+ delinquency rate of 10% for the sample. We additionally demonstrate in Figure 6 that delinquency rates across all types are similar across states for Q1 2011, and in Figure 7 foreclosure inventory rates are similar across the sample states.

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*5.1. Conditional on Delinquencies: Hazard Model*

We now consider a risk hazard model to determine whether the rate of foreclosures, modifications, and cures increased due to the policy, using a similar setup as Clotfelter et al. (2008).[20] Here, we include only loans that have become 60 days delinquent in our sample and control for additional loan-level, zip code-level, and time-varying observable characteristics in order to decrease our sampling variance. We treat each of these outcomes as independent "exits", since a modified loan can be cured, a loan with a foreclosure filing can obtain a modification, a modified loan can go into foreclosure, and a loan with a foreclosure filing can be cured. Looking at these separately allows us to account for the fact that these are not mutually exclusive events (or competing risks). In doing so, we estimate Equation 4, for loan $i$ in year-month $t$, covered by servicer $s$, in state $j$:

$$logit[\lambda(Y_{i,s,t,j})] = \beta_0 + \beta_1(\text{ESRR x Post})_{i,s,t} + \beta_2(\text{ESRR x MD})_{i,s,j} + \beta_3(\text{MD x Post})_{t,j}$$
$$+ \beta_4(\text{ESRR x Post x MD})_{i,s,t,j} + \gamma\text{ESRR} + \kappa_j + \phi\boldsymbol{Z}_{i,t} + \eta_{i,s,t,j}$$
$$(4)$$

The coefficient $\beta_4$ represents the DDD estimate of ESRR's impact on the terminal state hazard, where we look at foreclosures, modifications, and cure rates each as a separate terminal state. Table 8 presents the results from Equation 4, where Columns (1) and (2) show that $\beta_4$, the hazard rate of foreclosure is statistically different from 1. This shows that the ESRR policy increased the rate at which servicers filed foreclosure in Maryland when ESRR was in effect relative to other loans. Similarly, the estimate of the rate of modifications is much greater than and statistically different from one at the 1% level. This implies that the ESRR policy not only increased modification rates, but that servicers modified troubled loans more quickly than in the absence of the policy. The final two columns of Table 8 show that loan cure rates (loans moving from 60 or more days delinquent to current again) also increased. Thus, the one alternative servicers have—to do nothing—was less likely to occur after the initiation of the ESRR policy. This could

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[20]Gerardi et al. (2013) use a use a hazard specification to measure the effect of non-time varying judicial/nonjudicial status of state foreclosure policies on borrower outcomes. That paper also includes a study of the Massachusetts Right-to-Cure law, though the authors use a logit to estimate the difference-in-difference setup, not a hazard.

partially explain why Figure 4 shows a convergence between the difference between Maryland and surrounding states and ESRR versus non-ESRR servicers to "do nothing". Likewise, Figure 5 shows a trend for ESRR servicers to fall to a lowered steady state of doing nothing in the long run. After the ESRR policy was in effect for a year, the elevated rate of modifications and foreclosure filings resulted in a point where a larger share of loans were acted upon, leaving fewer loans even available for servicers to act upon, holding the "do nothing" rate constant.

## 6. Conclusion

Cooper and Kovacic (2012) discuss the many behavioral issues facing regulators in a bounded rationality framework. Policymakers use simple heuristics in decisions, including focusing intently on desired outputs rather than outcomes—in this case emphasizing loan modifications rather than socially beneficial levels of modifications *and* foreclosures that enhance markets overall. Based on press releases issued by the State of Maryland, regulatory supervision under ESRR was intended to spur more modifications.[21] Doing so changed the status quo for impacted servicers, shifting a bias toward taking action, including modifications, but also including foreclosures.

The finding that modification actions responded at all to the requirement of compiling backward-looking monthly reports is surprising in and of itself from the perspective of a classical rational actor framework. The reports did not alter the underlying net present value of these loans or of foreclosures or modifications. Firms behaved differently for loans subject to reporting in Maryland, but not for similar loans in surrounding states with the same servicer. This is a parallel finding to the work of Pope and Schweitzer (2011), where the authors use par as a salient reference point to show that even in high-stakes competitions, professional golfers exhibit loss aversion. The current study instead examines servicers across states and time, allowing for the same servicers to operate with or without ESRR (i.e., in a domain of "losses" or "gains"). While servicers ideally will strive to maximize returns to modifications and foreclosure filings, servicers working on loans under ESRR

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[21] From a February 19, 2008 press release: "Everyone in the mortgage industry has said they want to help homeowners avoid foreclosure. We want to ensure their actions are matching their words," said Secretary Perez. "This data collection will shine a bright light on servicers, and will help DLLR help homeowners."

surveillance initiated modifications and foreclosures more (in the domain of "gains") and were less likely to stick with inaction (in the domain of "losses") under ESRR.

It is an open question whether the treatment of loans under ESRR was better or worse from a consumer or social welfare perspective. Doing nothing remained relatively more likely in nearby states than in Maryland. Doing nothing preserved some flexibility for the servicer to respond to changes in house prices and for borrowers to self-cure. Delinquent borrowers also would be able to remain in their homes without making mortgage payments, perhaps an economic benefit for them. Modifying the loan incurred administrative costs for servicer and borrower, but potentially restored some (reduced) cash flow to the investor while ending the borrower's rent-free housing. Even a failed modification still preserves the servicer's foreclosure option (albeit delayed). The costs of premature or failed modifications are therefore relatively modest. The costs of foreclosure actions might be more significant in terms of servicer/lender expenses and losses. Foreclosure is costly for the borrower as well, including added borrowing costs in the future and reduced ability to purchase another home. The net costs of ESRR reporting provisions are not well defined by this analysis, but clearly failed modifications and premature foreclosure filings ought to be included in any full accounting of the policy.

The overall results of this analysis suggest that indeed firms are subject to behavioral biases similar to those observed in controlled lab studies or in field experiments with individuals. Focusing attention on a particular behavior can skew even firm decisions. A seemingly "low-touch" supervision such as mandated reporting of decisions becomes an incentive to reassess action and inaction. Surveillance can distort the value of patiently waiting towards (perhaps hastily) taking action. The ESRR illustrates the potential for a policy to have unintended—but predictable—effects.

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## 8. Tables and Figures

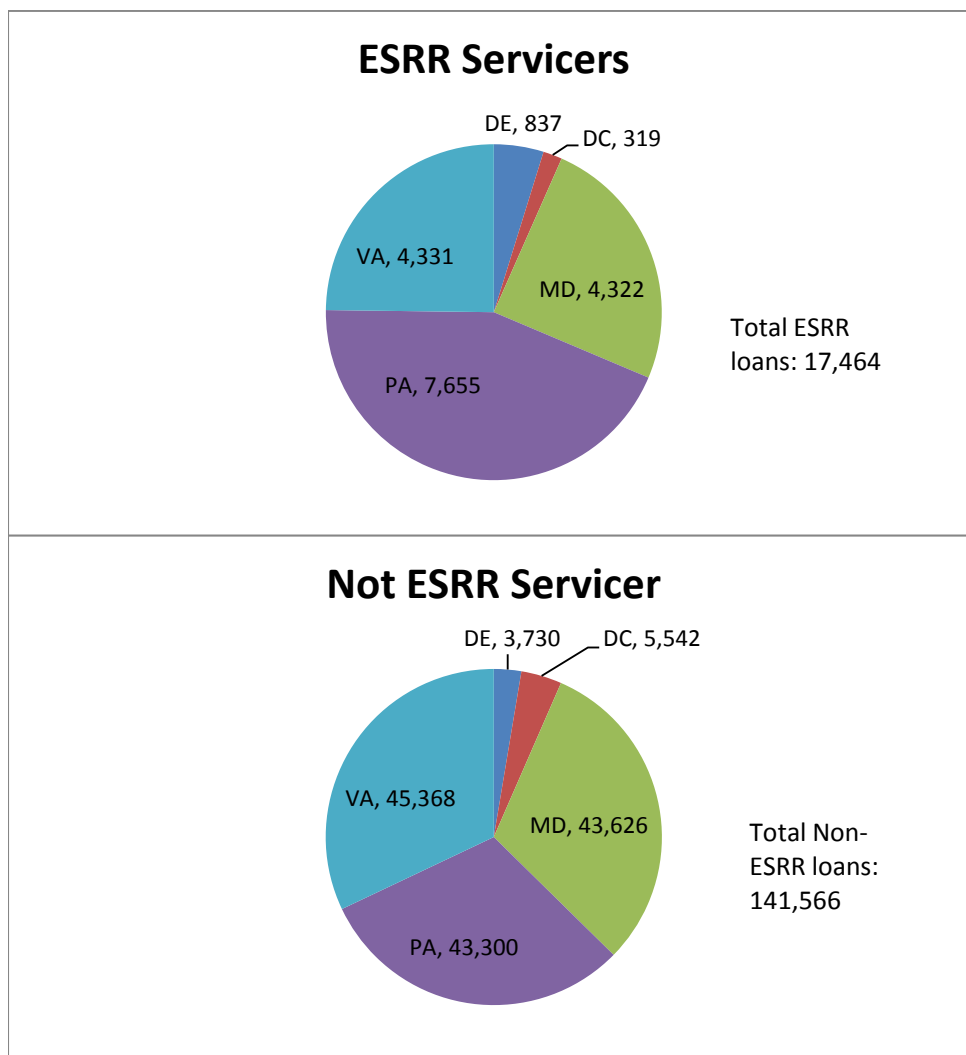Figure 1: Loan Sample Composition of Maryland and Surrounding States by Servicer Type



**ESRR Servicers**

DE, 837
DC, 319
VA, 4,331
MD, 4,322
PA, 7,655

Total ESRR loans: 17,464

**Not ESRR Servicer**

DE, 3,730
DC, 5,542
VA, 45,368
MD, 43,626
PA, 43,300

Total Non-ESRR loans: 141,566

Table 1: Summary Statistics by Area

| | Surrounding States | Maryland | Total |
|---|---|---|---|
| Original Balance | 264.079 | 342.510 | 287.732 |
| | (217.317) | (214.575) | (219.465) |
| Current Loan Rate | 7.5090 | 7.0599 | 7.3735 |
| | (1.8943) | (1.5474) | (1.8085) |
| ARM Indicator | 0.4707 | 0.5077 | 0.4819 |
| | (0.4991) | (0.4999) | (0.4997) |
| 90+ days delinquent | 0.0820 | 0.0706 | 0.0786 |
| | (0.2744) | (0.2561) | (0.2691) |
| 60 days delinquent | 0.1008 | 0.0879 | 0.0969 |
| | (0.3010) | (0.2831) | (0.2958) |
| 30 days delinquent | 0.1378 | 0.1220 | 0.1330 |
| | (0.3447) | (0.3273) | (0.3396) |
| Origination Date (year) | 2004.6 | 2005.0 | 2004.7 |
| | (2.2839) | (1.8486) | (2.1697) |
| FICO $< 520$ | 0.0456 | 0.0301 | 0.0410 |
| | (0.2087) | (0.1710) | (0.1982) |
| FICO $521 - 620$ | 0.2475 | 0.1868 | 0.2292 |
| | (0.4316) | (0.3898) | (0.4203) |
| FICO $621 - 720$ | 0.4233 | 0.4711 | 0.4377 |
| | (0.4941) | (0.4992) | (0.4961) |
| FICO $> 720$ | 0.2836 | 0.3119 | 0.2921 |
| | (0.4507) | (0.4633) | (0.4547) |
| CLTV $< 80$ | 0.4802 | 0.5553 | 0.5029 |
| | (0.4996) | (0.4969) | (0.5000) |
| CLTV $81 - 90$ | 0.3440 | 0.2860 | 0.3265 |
| | (0.4750) | (0.4519) | (0.4689) |
| CLTV $91 - 95$ | 0.0603 | 0.0444 | 0.0555 |
| | (0.2380) | (0.2061) | (0.2290) |
| CLTV $96 - 100$ | 0.1125 | 0.1126 | 0.1126 |
| | (0.3160) | (0.3162) | (0.3161) |
| CLTV $100+$ | 0.0030 | 0.0017 | 0.0026 |
| | (0.0543) | (0.0408) | (0.0506) |
| Observations | 111082 | 47948 | 159030 |

Note: Data from Corporate Trust Services CCF, Jan. 2008.
Surrounding states include PA, VA, DC, DE.
Mean of each variable reported with standard deviation in parentheses.
All variables statistically different at the 1% level, except CLTV $96 - 100$.

Table 2: Summary Statistics by Area

|  | Surrounding States | Maryland | Total |
|---|---|---|---|
| **Dependent Variables** | | | |
| Modification Indicator | 0.0055 | 0.0063 | 0.0057 |
|  | (0.0737) | (0.0788) | (0.0753) |
| Foreclosure Starts | 0.0333 | 0.0269 | 0.0314 |
|  | (0.1794) | (0.1617) | (0.1743) |
| **Zip Code-Level Covariates** | | | |
| Male | 0.6640 | 0.6153 | 0.6493 |
|  | (0.0730) | (0.0921) | (0.0823) |
| Minority | 0.2850 | 0.4721 | 0.3414 |
|  | (0.2405) | (0.3056) | (0.2756) |
| Income | 105.3475 | 119.8741 | 109.7273 |
|  | (51.4257) | (51.5263) | (51.8860) |
| Observations | 111082 | 47948 | 159030 |

Note: Data from Corporate Trust Services CCF, Jan. 2008.

Zip code-level data from 2000 Census.

Mean of each variable reported with standard deviation in parentheses.

All variables statistically different at the 1% level,

except modification indicator, which is different at the 10% level.

Surrounding states include PA, VA, DC, DE.

Denials, originations, and applications from HMDA data.

Table 3: Summary Statistics by ESRR Servicer

|  | Not ESRR Servicer | ESRR Servicer | Total |
|---|---|---|---|
| **Dependent Variables** | | | |
| Modification Indicator | 0.0060 | 0.0034 | 0.0057 |
|  | (0.0772) | (0.0580) | (0.0753) |
| Foreclosure Starts | 0.0297 | 0.0448 | 0.0314 |
|  | (0.1697) | (0.2069) | (0.1743) |
| **Covariates** | | | |
| Original Balance (000s) | 299.016 | 196.276 | 287.732 |
|  | (221.700) | (175.446) | (219.465) |
| Current Loan Rate | 7.2509 | 8.3680 | 7.3735 |
|  | (1.7727) | (1.7884) | (1.8085) |
| ARM Indicator | 0.4930 | 0.3919 | 0.4819 |
|  | (0.5000) | (0.4882) | (0.4997) |
| 90+ days delinquent | 0.0751 | 0.1067 | 0.0786 |
|  | (0.2636) | (0.3087) | (0.2691) |
| 60 days delinquent | 0.0170 | 0.0292 | 0.0183 |
|  | (0.1291) | (0.1684) | (0.1340) |
| 30 days delinquent | 0.0336 | 0.0566 | 0.0362 |
|  | (0.1803) | (0.2311) | (0.1867) |
| Origination Date (year) | 2004.7 | 2004.8 | 2004.7 |
|  | (2.1002) | (2.6657) | (2.1697) |
| FICO $< 520$ | 0.0332 | 0.1040 | 0.0410 |
|  | (0.1791) | (0.3052) | (0.1982) |
| FICO $521 - 620$ | 0.2126 | 0.3639 | 0.2292 |
|  | (0.4091) | (0.4811) | (0.4203) |
| FICO $621 - 720$ | 0.4419 | 0.4033 | 0.4377 |
|  | (0.4966) | (0.4906) | (0.4961) |
| FICO $> 720$ | 0.3123 | 0.1289 | 0.2921 |
|  | (0.4634) | (0.3351) | (0.4547) |
| CLTV $< 80$ | 0.5106 | 0.4405 | 0.5029 |
|  | (0.4999) | (0.4965) | (0.5000) |
| CLTV $81 - 90$ | 0.3216 | 0.3664 | 0.3265 |
|  | (0.4671) | (0.4818) | (0.4689) |
| CLTV $91 - 95$ | 0.0548 | 0.0615 | 0.0555 |
|  | (0.2276) | (0.2402) | (0.2290) |
| CLTV $96 - 100$ | 0.1106 | 0.1282 | 0.1126 |
|  | (0.3137) | (0.3344) | (0.3161) |
| CLTV $100+$ | 0.0025 | 0.0034 | 0.0026 |
|  | (0.0495) | (0.0585) | (0.0506) |
| Observations | 141566 | 17464 | 159030 |

Note: Data from Corporate Trust Services CCF, Jan. 2008.
See Table 9 in the appendix for a list of servicers subject to ESRR.
Mean of each variable reported with standard deviation in parentheses.
All variables statistically different at the 1% level, except CLTV 100+,
which is different at the 5% level.

Figure 2: Average Modification Rates By Date, Servicer (Difference between Maryland and Surrounding States)
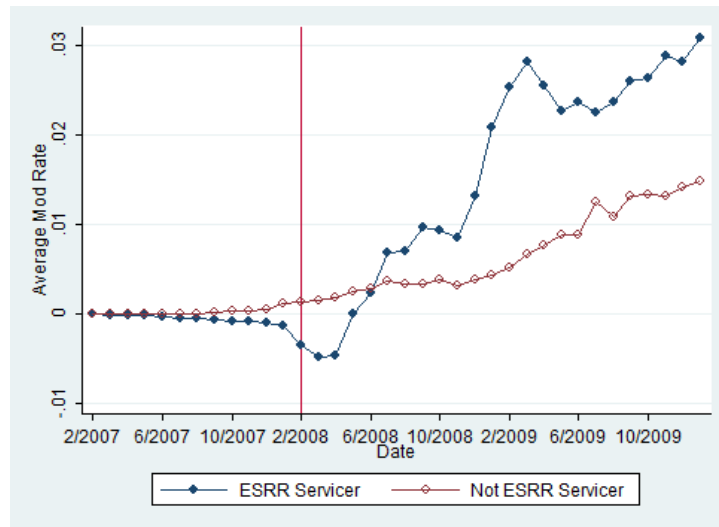


Figure 3: Average Foreclosure Rates By Date, Servicer (Difference between Maryland and Surrounding States)
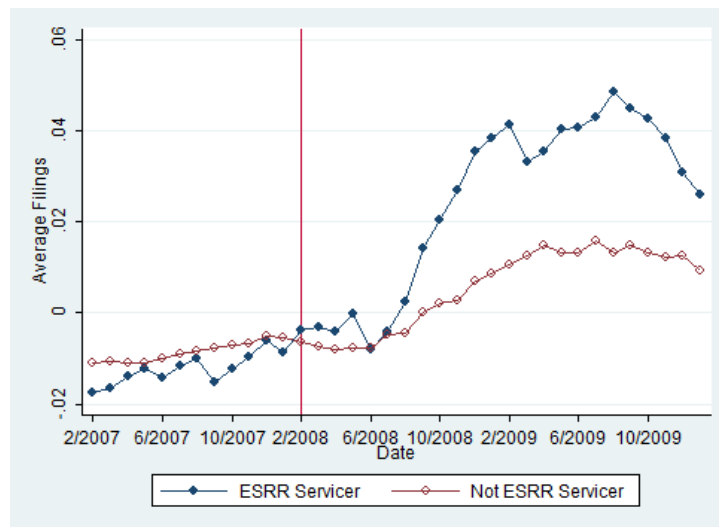
Figure 4: Average "Do Nothing" Rates By Date, Servicer (Difference between Maryland and Surrounding States)
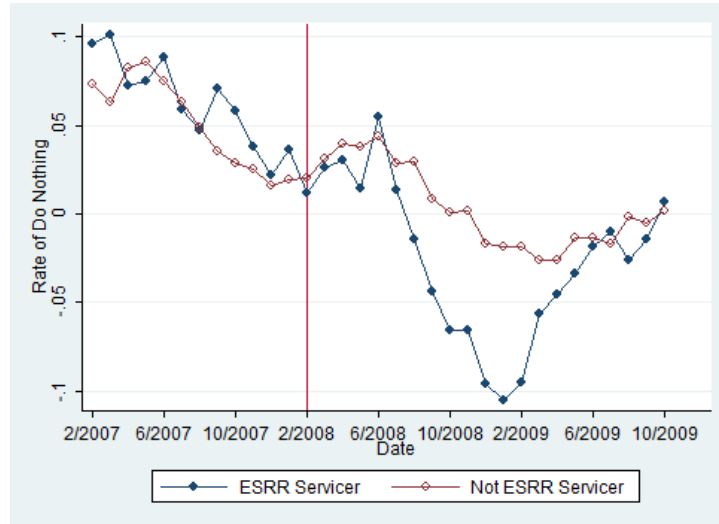


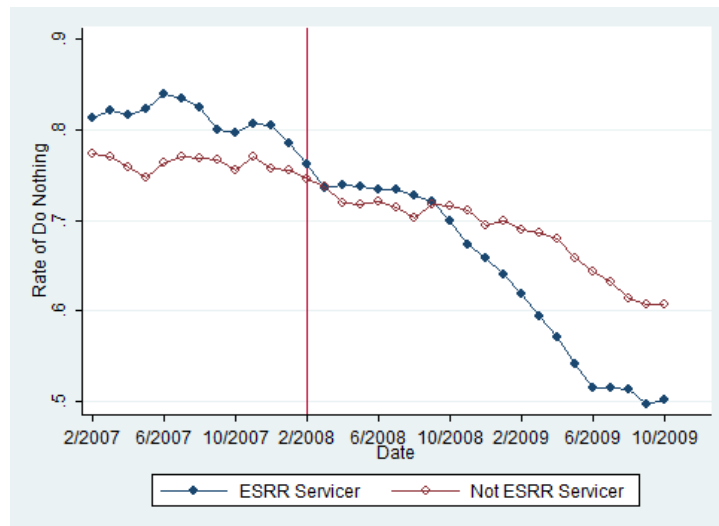Figure 5: Average "Do Nothing" Rates By Date, Servicer

Table 4: DDD: ESRR Increases Modification and Foreclosure Rates

| | Loan was Modified | | Foreclosure Began | |
|---|---|---|---|---|
| **DDD Estimate** | 0.0155*** | 0.0111*** | 0.0243*** | 0.0140*** |
| | (0.00300) | (0.00200) | (0.00301) | (0.00202) |
| MD x Post Regulation | 0.00592*** | 0.00736*** | 0.0130*** | -0.00151** |
| | (0.000776) | (0.00108) | (0.00213) | (0.000716) |
| MD x ESRR Servicer | 0.00467*** | 0.00408*** | -0.00273*** | -0.00371*** |
| | (0.000830) | (0.000720) | (0.000791) | (0.000488) |
| ESRR Servicer x Post Regulation | 0.0653*** | 0.0592*** | 0.00796*** | 0.0108*** |
| | (0.00996) | (0.00862) | (0.00158) | (0.00166) |
| Log(Income) | | -0.00616*** | | 0.00366*** |
| | | (0.00103) | | (0.000385) |
| Log(Original Loan Balance) | | -0.00229*** | | 0.000634** |
| | | (0.000513) | | (0.000277) |
| Current Loan Rate | | -2.900*** | | 0.0320*** |
| | | (0.556) | | (0.00844) |
| 90+ days delinquent | | -0.0364*** | | 0.317*** |
| | | (0.00556) | | (0.00439) |
| 60 days delinquent | | 0.00331* | | 0.0462*** |
| | | (0.00191) | | (0.00401) |
| 30 days delinquent | | 0.0320*** | | 0.00504*** |
| | | (0.00521) | | (0.000440) |
| Percent White (Zip code) | | -0.00242** | | -0.000973*** |
| | | (0.000919) | | (0.000306) |
| ARM Dummy | | 0.00554* | | 0.000261 |
| | | (0.00309) | | (0.000216) |
| FICO $521 - 620$ | | -0.0798*** | | -0.00591*** |
| | | (0.0103) | | (0.00109) |
| FICO $621 - 720$ | | -0.142*** | | -0.00608*** |
| | | (0.0219) | | (0.00148) |
| FICO $> 720$ | | -0.156*** | | -0.00513*** |
| | | (0.0246) | | (0.00141) |
| CLTV $81 - 90$ | | 0.0103*** | | -0.00131*** |
| | | (0.00174) | | (0.000113) |
| CLTV $91 - 95$ | | 0.0174*** | | -0.00107*** |
| | | (0.00306) | | (0.000282) |
| CLTV $96 - 100$ | | 0.0195*** | | -0.00105** |
| | | (0.00353) | | (0.000404) |
| CLTV $100+$ | | 0.0257*** | | -0.0147*** |
| | | (0.00348) | | (0.00188) |
| Observations | 4841986 | 4837393 | 4841986 | 4837393 |

Notes: Robust standard errors clustered at month level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Observations are loan months. Linear probability model. Estimated from Equation 1.
All models include servicer, state, month-by-year and origination year fixed effect dummies.

Table 5: DD: ESRR Increases Modification and Foreclosure Rates in Maryland

| | Loan was Modified | | Foreclosure Began | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **ESRR x Post Regulation** | 0.0756*** | 0.0635*** | 0.0294*** | 0.0233*** |
| | (0.0121) | (0.00939) | (0.00353) | (0.00275) |
| **Control Variables** | | | | |
| Log(Income) | | -0.00873*** | | 0.00372*** |
| | | (0.00154) | | (0.000573) |
| Log(Original Loan Balance) | | 0.00140*** | | 0.000436** |
| | | (0.000343) | | (0.000214) |
| Current Loan Rate | | -0.0372*** | | -0.000578*** |
| | | (0.00672) | | (0.000132) |
| 90+ days delinquent | | -0.0445*** | | 0.301*** |
| | | (0.00606) | | (0.00895) |
| 60 days delinquent | | 0.00527* | | 0.0464*** |
| | | (0.00303) | | (0.00524) |
| 30 days delinquent | | 0.0334*** | | 0.00484*** |
| | | (0.00446) | | (0.000595) |
| ARM Dummy | | -0.00475 | | 0.0000997 |
| | | (0.00371) | | (0.000280) |
| **Models Also Include:** | | | | |
| Month Dummies | X | X | X | X |
| Servicer Dummies | X | X | X | X |
| Origination Year Dummies | X | X | X | X |
| FICO Quartiles | - | X | - | X |
| CLTV Quartiles | - | X | - | X |
| Percent White (Zip code level) | - | X | - | X |
| Observations | 1481428 | 1480314 | 1481428 | 1480314 |

Notes: Robust standard errors clustered at month level in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Observations are loan months. Linear probability model. Estimated from Equation 2.

Table 6: DD: ESRR Increases Modification and Foreclosure Rates Looking at ONLY ESRR Servicers Across States

|  | Loan was Modified | | Foreclosure Began | |
|---|---|---|---|---|
|  | (1) | (2) | (3) | (4) |
| **MD x Post Regulation** | 0.0182*** | 0.0161*** | 0.0352*** | 0.00992*** |
|  | (0.00321) | (0.00232) | (0.00473) | (0.00207) |
| **Control Variables** |  |  |  |  |
| Log(Income) |  | -0.0118*** |  | 0.00726*** |
|  |  | (0.00229) |  | (0.000858) |
| Log(Original Loan Balance) |  | -0.00386*** |  | -0.00277*** |
|  |  | (0.000646) |  | (0.000532) |
| Current Loan Rate |  | -0.0483*** |  | -0.00307*** |
|  |  | (0.00801) |  | (0.000217) |
| 90+ days delinquent |  | -0.0426*** |  | 0.376*** |
|  |  | (0.00790) |  | (0.0103) |
| 60 days delinquent |  | -0.00526 |  | 0.0241*** |
|  |  | (0.00334) |  | (0.00194) |
| 30 days delinquent |  | 0.0267*** |  | 0.00260*** |
|  |  | (0.00800) |  | (0.000453) |
| ARM Dummy |  | 0.0280*** |  | -0.00340*** |
|  |  | (0.00816) |  | (0.000637) |
| **Models Also Include:** |  |  |  |  |
| Month Dummies | X | X | X | X |
| Servicer Dummies | X | X | X | X |
| Origination Year Dummies | X | X | X | X |
| FICO Quartiles | - | X | - | X |
| CLTV Quartiles | - | X | - | X |
| Percent White (Zip code level) | - | X | - | X |
| Observations | 516537 | 516469 | 516537 | 516469 |

Notes: Robust standard errors clustered at month level in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Observations are loan months. Linear probability model. Estimated from Equation 3.

Table 7: DDD: ESRR Does Not Change Delinquency Rates

| | 60+ Days Delinquent | |
|---|---|---|
| | (1) | (2) |
| **DDD Estimate** | 0.000892 | 0.000598 |
| | (0.000933) | (0.000942) |
| **Control Variables** | | |
| MD x Post Regulation | 0.00325*** | 0.00312*** |
| | (0.000376) | (0.000383) |
| MD x ESRR Servicer | 0.000989 | 0.000309 |
| | (0.000708) | (0.000707) |
| ESRR Servicer x Post Regulation | -0.00193*** | -0.00315*** |
| | (0.000645) | (0.000641) |
| Log(Income) | | -0.00248*** |
| | | (0.000358) |
| Log(Original Loan Balance) | | 0.00326*** |
| | | (0.000206) |
| Current Loan Rate | | 0.00247*** |
| | | (0.000284) |
| **Models Also Include:** | | |
| Month Dummies | X | X |
| Servicer Dummies | X | X |
| State Dummies | X | X |
| Origination Year Dummies | X | X |
| FICO Quartiles | - | X |
| CLTV Quartiles | - | X |
| ARM Dummies | - | X |
| Percent White (Zip code level) | - | X |
| Observations | 4861668 | 4857075 |

Notes: Robust standard errors clustered at month level in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Observations are loan months.
Linear probability model. Estimated from Equation 1.

Table 8: DDD: ESRR Speeds up Modification, Foreclosure, and Cure Rates

| | Foreclosure Began | | Loan was Modified | | | Loan Cured |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **DDD Estimate** | 1.726*** | 1.679*** | 3.654*** | 3.691*** | 1.347*** | 1.239*** |
| | (0.0646) | (0.0664) | (0.727) | (0.729) | (0.0884) | (0.0876) |
| **Control Variables** | | | | | | |
| MD x Post | -1.631*** | -1.559*** | -1.618*** | -1.691*** | -1.521*** | -1.405*** |
| | (0.0222) | (0.0229) | (0.0835) | (0.0847) | (0.0291) | (0.0292) |
| MD x ESRR Servicer | -1.240*** | -1.203*** | -3.600*** | -3.700*** | -1.051*** | -0.986*** |
| | (0.0509) | (0.0535) | (0.725) | (0.727) | (0.0719) | (0.0720) |
| ESRR Servicer x Post | -1.418*** | -1.341*** | -0.105 | -0.369** | -0.903*** | -0.800*** |
| | (0.0327) | (0.0336) | (0.149) | (0.151) | (0.0400) | (0.0401) |
| ESRR Servicer | 1.201*** | 1.146*** | 0.747*** | 0.861*** | 0.919*** | 0.811*** |
| | (0.0273) | (0.0285) | (0.148) | (0.150) | (0.0335) | (0.0343) |
| Log(Income) | | 0.188*** | | -0.327*** | | 0.113*** |
| | | (0.0277) | | (0.0576) | | (0.0286) |
| Log(Loan Balance) | | 0.125*** | | -0.297*** | | -0.251*** |
| | | (0.0132) | | (0.0254) | | (0.0134) |
| Current Loan Rate | | 15.40*** | | -57.85*** | | -11.22*** |
| | | (0.369) | | (0.830) | | (0.486) |
| Percent White | | -0.133*** | | 0.0629 | | 0.136*** |
| | | (0.0217) | | (0.0417) | | (0.0220) |
| FICO $521-620$ | | -0.129*** | | -0.269*** | | -0.136*** |
| | | (0.0191) | | (0.0283) | | (0.0172) |
| FICO $621-720$ | | -0.109*** | | -1.555*** | | -0.563*** |
| | | (0.0201) | | (0.0331) | | (0.0190) |
| FICO $> 720$ | | -0.173*** | | -2.705*** | | -0.960*** |
| | | (0.0287) | | (0.0801) | | (0.0333) |
| CLTV $81-90$ | | 0.0498*** | | 0.0252 | | -0.0186 |
| | | (0.0135) | | (0.0256) | | (0.0136) |
| CLTV $91-95$ | | 0.0727*** | | 0.0623 | | -0.0147 |
| | | (0.0227) | | (0.0435) | | (0.0238) |
| CLTV $96-100$ | | 0.254*** | | -0.0540* | | 0.0491*** |
| | | (0.0154) | | (0.0313) | | (0.0161) |
| CLTV 100+ | | 0.179* | | -0.269* | | 0.00794 |
| | | (0.103) | | (0.149) | | (0.0838) |
| ARM Dummy | | 0.164*** | | -0.212*** | | 0.0744*** |
| | | (0.0132) | | (0.0248) | | (0.0140) |
| Observations | 372756 | 371929 | 678573 | 677196 | 516989 | 516143 |

Notes: Hazard rates displayed. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Models include state, origination
Includes year fixed effects dummies. Survival function for each outcome. Loans enter the sample after 60 days del
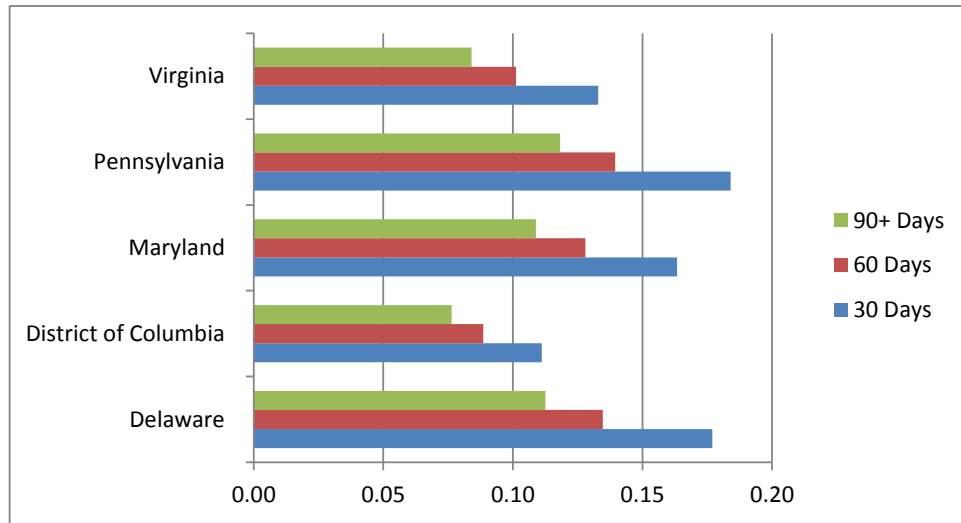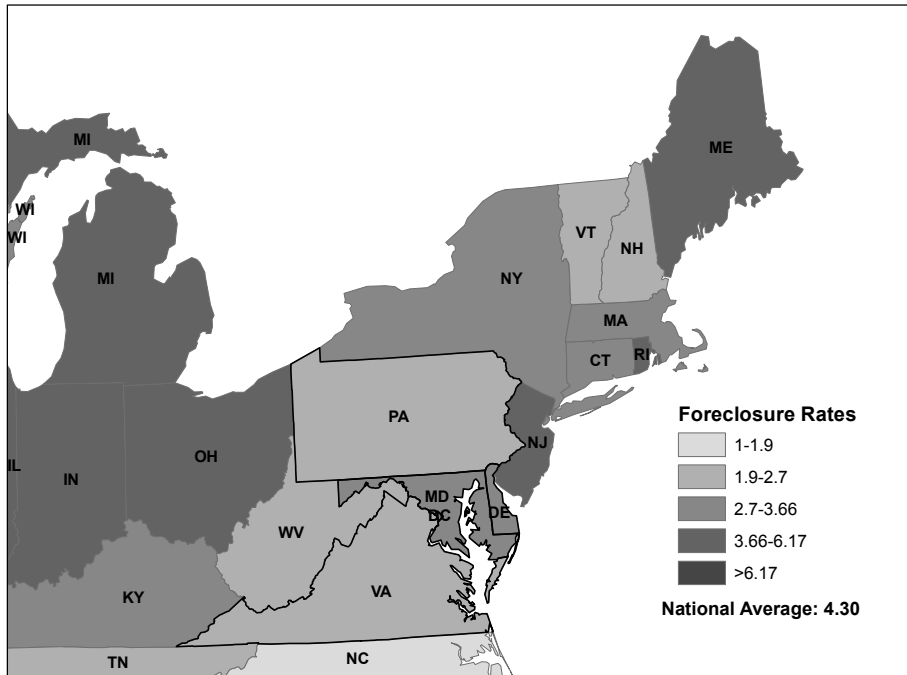
Figure 6: Delinquency Across States

Figure 7: Foreclosed Mortgages Across Northeastern States



**Foreclosure Rates**
- 1-1.9
- 1.9-2.7
- 2.7-3.66
- 3.66-6.17
- >6.17

**National Average: 4.30**

# 9. Appendix

Table 9: Servicers Reporting to Emergency Servicer Reporting Regulation

AMERICAN HOME MORTGAGE
BAYVIEW LOAN SERVICING
CARRINGTON MORTGAGE
CENTRAL MORTGAGE
DOVENMUEHLE MORTGAGE
EMC MORTGAGE CORP
FRANKLIN BANK
GMAC MORTGAGE, LLC
GREEN TREE SERVICING
HOMEQ SERVICING CORP
HSBC MORTGAGE CORP
LITTON LOAN SERVICING
LOANCARE SERVICING
MARIX SERVICING
NATIONSTAR MORTGAGE
OCWEN LOAN SERVICING
PHH MORTGAGE CORP
PROVIDENT FUNDING
SAXON MORTGAGE SERVICING
SELECT PORTFOLIO SERVICING
SPECIALIZED LOAN SERVICING
TAYLOR, BEAN & WHITE
WILSHIRE CREDIT CORP