

# 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, policymakers at the state level implemented a number of measures designed to protect consumers and stem the tide of foreclosures. These policies were designed under incomplete information and in some cases created incentives for mortgage lenders to take actions on distressed loans. Such policies represented a shift from the status quo—doing nothing with non-paying loans to wait for more information to be revealed—to either foreclosing or offering a modification of loan terms. This is an example of how reporting policies can, perhaps inadvertently, re-frame firm behavior. Using a difference-in-difference-in-differences empirical strategy, we exploit one policy implemented in the state of Maryland for a subset of mortgage servicers and find evidence of more modifications (the goal of the policy) as well as more foreclosures (the opposite of the goal of the policy).

*Keywords:* Status quo bias; loss aversion; mortgage foreclosure

*JEL Classification:* D1, I3, G21

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## 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). There has been an ongoing debate about the actions of borrowers and lenders during the housing market recession. One key player in this market is the mortgage loan servicer.<sup>1</sup> These firms, typically specialty units compensated on a per-loan or per-dollar-collected fee, deal directly with borrowers to collect payments and then remit principal and interest proceeds to investors. When loans are delinquent, the servicer engages in collections with the goal of maximizing cash flow on the loan, including repossessing the property serving as collateral for the mortgage if 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 payment stream.<sup>2</sup>

Consider two borrowers, indistinguishable from a servicer's perspective: Borrower 1 cannot maintain his loan payments in the absence of a modified

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<sup>1</sup>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 reporting to lenders and investors in a security about the status of each loan each month.

<sup>2</sup>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.

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, about 25% had been modified, about 10% were in some stage of foreclosure and the remaining 65% were not involved in modifications or foreclosures, despite cumulative delinquency rates as high as 20% (Anderson et al. 2012).

This study takes advantage of a policy in Maryland for a subset of mortgage servicers which 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 initiated a new policy which required selected servicers to provide monthly aggregated reports. This was primarily a surveillance exercise; the policy had no regulatory sanction or penalty for high or low modification or foreclosure rates. The reports were not made public or shared with investors or other servicing firms. Yet, this policy illustrates how firms significantly change their decisions based on a shift in the status quo.

The behavioral decision-making literature related to Prospect Theory suggests that people in studies show a preference 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 a vaccine as much worse than a death resulting from not getting 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. Doing nothing, even if ex post it turns out to be a poor choice, is perceived as better than proactively making a bad decision. As a result, investors are biased toward inaction, and underweight the opportunity cost

of not taking action (Zeckhauser and Viscusi 1996; Zeckhauser et al. 1991).<sup>3</sup> Servicing managers seem likely to exhibit the same bias as other decision makers, preferring to avoid an error of commission.<sup>4</sup>

Yet, such a response would not be predicted in standard models of economics or finance. 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, behavioral studies predict reporting requirements could change the status quo of ‘do nothing’ for servicers to taking actions, 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 privately securitized, non-agency mortgages serviced by firms covered by Maryland’s reporting policy, as well as loans in Maryland not covered by the policy.<sup>5</sup> 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 among three dimensions: 1) servicers that were and were not subject to the reporting regulation 2) loans that were held in Maryland compared to those in surrounding states and 3) the same loans before and after the initiation of the policy. The results demonstrate that the Maryland reporting policy is consistent with servicers taking more actions on loans 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 rel-

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<sup>3</sup>Further, Pope and Schweitzer (2011) show that even in a high stakes environment, professional golfers exhibit loss aversion.

<sup>4</sup>See, for example, Ritov and Baron (1992).

<sup>5</sup>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 because they are not backed by Government Sponsored Enterprises (GSEs) such as Freddie Mac, Fannie Mae or FHA/Ginnie Mae.

ative change in foreclosures. However, we find robust evidence that state supervision of selected servicers is highly related to both modifications and foreclosures—and may serve as an instructive example of how behavioral biases can play out with policy changes to generate outcomes not initially intended by policymakers. Our results stand up to a variety of specification checks, where we control for loan-level and zip-code-level characteristics, as well as include servicer, state, and time dummies. The results are also consistent when providing difference-in-difference tests within Maryland, as well as various border-state variations.

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.

## 2. Background

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

There are a number of problems documented in the mortgage market that appear to impede the modification of loans. Several studies suggest that modifications are costly because of information asymmetry—the servicer cannot observe willingness to pay or re-default. In fact, Gerardi et al. (2011) and Piskorski et al. (2010) suggest only about 63% of modified loans remain current on payments after 9 months. A report by the Office of Comptroller of the Currency shows of loans modified in 2008, by early 2012, almost 15% were in foreclosure, and another 23% were delinquent (Office of the Comptroller of the Currency 2012). Servicers and investors may have conflicting motivations since servicers face steep upfront costs of modifications and investors face steep losses from completed foreclosures (Campbell 2012).

The federal Home Affordable Modification Program began in 2009 at the national level the goal of stimulating more loan modifications.<sup>6</sup> States began to experience rising foreclosures as early as 2007, however, and policy proposals emerged locally and nationally far in advance of HAMP to try and address the perceived problem of too many foreclosures (where people lose

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<sup>6</sup>For more details on HAMP, see [www.makinghomeaffordable.gov](http://www.makinghomeaffordable.gov)

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 default and foreclosure under Maryland Financial Institutions Code 11-501. Maryland’s model followed a policy proposal California introduced in late 2007. Dubbed the *Emergency Servicer Reporting Regulation* (ESRR) the state 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). About one-third of mortgage loans in the state were subject to the regulation, as the remaining servicers were regulated by federal agencies which preempt Maryland’s guidelines. The regulation was in place for 3.5 years, ultimately suspended on January 1, 2012.

Each covered servicer reported:

- 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 surveillance policy is unique relative to other states in its implementation so early in the housing market downturn, before federal programs were launched. It also applied only to a subset of servicers, creating a unique opportunity to examine the effect of state supervision in this market. These policies potentially could change the calculus servicers used in assessing asymmetric information about whether to modify loans or pursue foreclosures.

## *2.2. The Role of Regulation*

In general, public policies can create incentives or sanctions for firms to take accelerated actions on troubled loans. 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 to develop a response to problems in the housing market from the public (Leland 2008). Aghion et al. (2010) describes how uncertainty and distrust increase demand for regulation, perhaps motivating why Maryland passed this regulation early in the foreclosure crisis. Warren and Wilkening (2012) demonstrate that regulators lacking information face uncertainty, which results in differing policy options and choices than would occur under full information. Regulators often express a bias toward action in such a situation, even when the costs and benefits of policies are ambiguous (Zeckhauser and Viscusi 1996).

Berger et al. (2000) provides a useful review of the political economy of regulatory actions involving supervision. Government can be an efficient monitor on behalf of private outside stakeholders—this might include investors as well as local communities or jurisdictions facing the negative externalities of foreclosure (Gerardi et al. 2011), and potentially borrowers themselves. There is no clear market mechanism for such oversight in the absence of government action. While investors do monitor mortgage-backed securities overall in terms of cash flow, they often lack directly observable information about loan modifications at the loan level. Credit rating agencies rate servicers and structured mortgage backed securities, but rarely examine issues at more granular levels of detail. In contrast, government regulators can compel firms to reveal information, at the least to the regulating agency. Flannery (1998) examines literature on the relative effect of government versus market supervision. He concludes it is possible government mechanisms can reveal additional 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 was primarily a surveillance mechanism with no formal sanction provision.

Yet, the imposition of ESRR oversight introduces a shift in the servicer’s problem of how to treat a delinquent borrower. Prior to supervision, 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 doing nothing as an inferior option.

Dana (2010) discusses status quo and omission/commission bias. Related to loss aversion, this bias is rooted in the psychology literature that predicts that decision makers will prefer to fail to take an action, even if that action is optimal, than to take an action that turns out, *ex post*, to be a failure. Ritov and Baron (1992) offer a classic study documenting omission bias, 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.

We found no other studies examining the imposition of oversight as a potential avenue to shift status quo biases. There are studies of policies which 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. Making the tolls more opaque in effect recalibrates expected utility calculations of using a toll road.<sup>7</sup> In medical studies, surveillance and reporting of specific treatment actions tend to increase the incidence of targeted procedures relative to the pre-monitoring period (McMullin et al. 2006). Medical literature asserts that errors have several causes, including cognitive depletion or neglect when multiple or complicated steps are involved. Surveillance in part increases the salience of taking intended actions and results in more attention. Reason (2002) suggests errors of omission are more likely when informational cues are ambiguous or uncertainty is present.

Maryland's ESRR could work through several mechanisms. It is possible that the reporting policy resulted in a shift 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 'sudden' 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 4 months). According to Mason (2009), the State Foreclosure Prevention Working Group, a coalition

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<sup>7</sup>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.



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, this would suggest the policy would impact the overall operations, not just loans in one state. Servicers have centralized processing and call-center facilities and are not organized by physical location.

### 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 private 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 of the security. The loans are generally not in government-backed or Fannie Mae/Freddie Mac securities; most are what would be labeled 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.

The CTS data contains 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 such as initial loan amount and term are also available, 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 mis-coded. Additionally, if loans were prepaid or became REO, which happens infrequently in the data (approximately 2%), they were dropped from the sample. The final dataset contains 159,032 loans that are tracked throughout thirty-six months, although some records are missing loan-level

characteristics, which may result in lower numbers of observations in some tables.<sup>8</sup>

Four states and Washington, DC, are included in this analysis.<sup>9</sup> Maryland represents about 30% of the total, 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. There are a sufficient number of loans serviced by firms subject to ESRR in each state to be able to conduct the planned contrasts. 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.<sup>10</sup>

### *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 as of January 2008, before the ESRR policy is implemented. The data describe the period immediately proceeding the announcement of the ESRR reporting policy before Maryland had servicing supervision policies in place.<sup>11</sup> Table 1 shows interest rates and terms, delinquency status, loan age, borrower credit scores, loan-to-value ratios and other factors are similar across Maryland and neighboring states. Loan balances vary significantly, with Maryland a quarter of a standard deviation above the mean. This is to be expected, as housing values are higher in Maryland than surrounding states.<sup>12</sup> These loans also had characteristics expected of subprime mortgages. For example, 13% of the loans were behind on a payment as of January 2008, and almost half of the sample had an adjustable rate mortgage. Interest rates are on average 7.5%. Approximately 30% of the sample had a credit score under 720 (FICO score).

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<sup>8</sup>The observations with missing data are not systematic in geography or loan characteristics.

<sup>9</sup>For ease of reference, we will refer to these areas as comprising five “states” although Washington, DC is technically not a state.

<sup>10</sup>Again, only the servicers subject to ESRR and residing in Maryland are required to report.

<sup>11</sup>No surrounding states had ESRR reporting in place during this time frame.

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

In Table 2 variables of interest—a modification and a foreclosure filing indicator—for Maryland are compared to surrounding states (DE, DC, PA, VA). There are no stark differences in the dependent variables in January of 2008. Table 2 also shows three independent variables to explore potential demographic differences. Here, Maryland appears to 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 propose to instead use time/geographic trends to difference out observable and unobservable characteristics at the state level. Note there are 47,949 loans in the data in Maryland in total, and 111,083 in surrounding states.

Next, we compare the loans across servicer types, in order to determine whether servicers subject to ESRR regulations differ substantially from those not required to report on loans serviced in Maryland. Table 3 shows the difference in loan-level characteristics by servicer type. Here we see 17,468 loans serviced by *firms* subject to ESRR. Of these, as show in Figure 1, 4,325 were in Maryland and thus subject to ESRR. 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. They are slightly less likely to be adjustable rate mortgages and have slightly 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 in Section 4. However, we provide additional robustness tests that relax these assumptions in Section 5 and our results continue to hold.

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 (for instance, in period 1, January 2007, we take the average modification rate for ESRR servicers in Maryland and subtract from that the average modification rate for ESRR servicers in surrounding states and plot that point.) 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, the ESRR servicers begin modifying at a much higher rate than non-ESRR servicers in Maryland when compared to surrounding areas.

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. In this plot, we only look at loans that are at least one payment behind. Figure 4 shows the complement of Figures 2-3, where the rate of in-action 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, close to 80% in the pre-period, or the status quo bias. The rate decreases after the policy, though this decrease is more pronounced for ESRR servicers, dropping to 50% by June 2009.

These figures show that under surveillance, doing nothing was no longer the status quo. Servicers took the action policymakers desired—more loan modifications—but also foreclosed on mortgage loans more frequently. Other servicers not subject to the regulation, or 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 still operate in the 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.
2. Compare loans in Maryland to those in other mid-Atlantic states, which do not require ESRR reporting.
3. Use the timing of the policy to compare outcomes among loans within the same state and servicer before and after the policy was enacted.

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 this counterfactual is not observable. Thus, we will additionally provide difference-in-difference (DD) estimates, so we do not entirely rely on either of these two assumptions in a single model.

To further clarify the experiment we propose, Tables 4-5 conduct the comparison in means for modification and foreclosure rates, respectively. In Table 4 we first confirm this difference of means, looking first at modification rates. The upper panel shows the mean modification rate in the “Pre-” period, before ESRR was required in Maryland, and similarly, the lower panel represents the mean modification rate in the “Post-” period. The data are then divided into four separate cells, where the means for servicers required and not required to report, as well as those in and not in Maryland

are analyzed. Standard errors are reported in parentheses below the means, and observations (loan-month pairs) are in brackets.

We find that in the pre-period, ESRR servicers were slightly less likely to modify loans, but this difference is very small. For all servicers and states in the sample, modification rates are close to 0. However, after ESRR was required, loans in Maryland serviced by firms subject to ESRR strongly increased modification rates. Taking the difference between the two panels, we find an increase in the modification rate for loans subject to ESRR in Maryland of approximately 1 percentage point, which is statistically different from zero. Given that modification rates are traditionally low (close to 0.5% in the pre-period and 8.0% in the post period) this increase is quite high.

Table 5 replicates this exercise for foreclosure rates. Rates of foreclosure are less than 3% in the mid-Atlantic region and less than 2% in Maryland in the period before ESRR is required, and the difference between servicer types and states are quite small, as illustrated by the  $DD_{\text{Pre}}$  estimate of approximately -0.003. In the post-period, ESRR servicers begin filing more foreclosures, and this is amplified in Maryland, where the reporting is required. In this bottom panel, the  $DD_{\text{Post}}$  estimate demonstrates that loans subject to ESRR reporting (the servicer is under ESRR and the loan is in Maryland) have a higher rate of foreclosure filings, which is statistically different from zero. This effect holds relative to other loans with the same servicers or within the same state. Further, the DDD estimate shows that due to the policy, the probability of receiving a foreclosure filing from an ESRR servicer in Maryland after the policy increased by 2.2 percentage points. Since the mean foreclosure probability before the policy was close to 2% and was close to 6% after the policy, this increase is large in magnitude.

#### 4.1. Regression Framework

We next formalize our comparison of means estimates with a linear probability model to control for additional loan-level, 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  $j$ :

$$\begin{aligned}
 Y_{i,s,t,j} = & \beta_0 + \beta_1 \text{Post}_{i,t} + \beta_2 \text{ESRR}_{i,s} + \beta_3 (\text{ESRR} \times \text{Post})_{i,s,t} + \beta_4 (\text{ESRR} \times \text{MD})_{i,s,j} \\
 & + \beta_5 (\text{MD} \times \text{Post})_{t,j} + \beta_6 (\text{ESRR} \times \text{Post} \times \text{MD})_{i,s,t,j} + \gamma_s + \kappa_j + \delta_t + \phi \mathbf{Z}_{i,t} + \eta_{i,s,t,j}
 \end{aligned}
 \tag{1}$$

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.<sup>13</sup> ESRR equals one for loans with servicers that were required to report, regardless of state, and equals zero for loans with servicers not required to report under ESRR. 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. Similarly, 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  $\beta_6$  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. In some models we additionally control for loan-level characteristics (denoted  $\mathbf{Z}_{i,t}$  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, combined loan-to-value quartiles, an adjustable rate mortgage indicator, and origination year dummies. Finally, we include two 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.<sup>14</sup> We additionally estimate this linear probability model with marginal effects from a probit specification in Table 11, 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 care-

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<sup>13</sup>The ESRR policy was implemented in April to report on March, but was announced in February.

<sup>14</sup>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 [pg. 469].

ful 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).

Tables 4 and 5 provide 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. We corroborate this finding with our regression framework in Table 6, where the DDD estimate for loan modifications remains consistent with Table 4, or 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 a consistent effect for foreclosure filings when compared to Table 5, where the DDD estimate remains 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 6 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.

## 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  $\beta_3$ , the interaction on the DD term, including only loans in Maryland.<sup>15</sup>

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<sup>15</sup>All variables are defined synonymously to Equation 1.



$$Y_{i,s,t,j} = \beta_0 + \beta_1 \text{Post}_{i,t} + \beta_2 \text{ESRR}_{i,s} + \beta_3 (\text{ESRR} \times \text{Post})_{i,s,t} + \kappa_j + \delta_t + \phi \mathbf{Z}_{i,t} + \eta_{i,s,t,j} \quad (2)$$

The findings in Table 7 are consistent with an increase in modifications due to the policy, though this effect appears to be inflated in the DD setup using only Maryland loans. Foreclosure filings, however, seem to have the same effect as earlier, where the regulation increases foreclosure 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, 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  $\beta_2$ , or the interaction between loans in Maryland after the regulation was in place. Again, this sample will only include servicers subject to ESRR reporting regulations.

$$Y_{i,s,t,j} = \beta_0 + \beta_1 \text{Post}_{i,t} + \beta_2 (\text{MD} \times \text{Post})_{t,j} + \gamma_s + \kappa_j + \delta_t + \phi \mathbf{Z}_{i,t} + \eta_{i,s,t,j} \quad (3)$$

Table 8 reports the results, where DD estimates are consistent with the DDD estimates from Table 6. 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 justify 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 1 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 2 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 9 reports these results. Reassuringly, it appears

there is no effect of the policy on 60+ day delinquency rates. While these effects are not statistically distinguishable from zero, the point estimates are still very close to zero in magnitude, particularly given the average 60 + delinquency rate of 10% for the sample. We additionally demonstrate that delinquency rates across all types are similar across states in Figure 6, as well as foreclosure inventory rates across the sample states in Figure 7 for Q1 2011.

We outline additional robustness tests in the appendix. First, in Table 11 we replicate our DDD and DD estimates using a probit specification. The marginal effects found here are substantively consistent with the estimates found with the linear probability model in Tables 6, 7, and 8. Second, we drop each control state one at a time to determine that one particular state is not driving the effect in Table 12.<sup>16</sup> The DDD estimates remain consistent. Finally, if concern arises that loan-level unobservable heterogeneity can 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 in Table 13.

## 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. Regulatory supervision under ESRR was intended to spur more modifications. 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 a rational actor framework. The reports did not alter the underlying net present value of these loan or of foreclosures/modifications. Firms behaved differently for loans subject to reporting in Maryland, but not for similar loans in surrounding states. This is a parallel finding to the work of Pope and

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<sup>16</sup>This is particularly important in the case of D.C., since it is the only non-judicial foreclosure state in the sample.

Schweitzer (2011), where the authors use “par” as a salient reference point to show that even in competitions of high stakes, professional golfers exhibit loss aversion. This study instead examines servicers across states, allowing for the same servicers to enter a world with or without regulation (i.e. in a domain of “losses” or “gains”). While servicers should strive to maximize returns to modifications and foreclosure filings as possible, servicers working on loans under ESRR surveillance initiate modifications and foreclosures more (in the domain of “gains”) and are less likely to stick with inaction (in the domain of “losses”) under ESRR.

An open question is if the treatment of loans under ESRR was better or worse from a consumer or social welfare perspective. Doing nothing remained more likely in nearby states. Doing nothing preserved some flexibility for the servicer to respond to changes in house prices and for borrowers to self-cure. The borrower was able to remain in the home without making mortgage payments, perhaps an economic benefit. Modifying the loan required administrative costs for servicer and borrower, but potentially restored some (reduced) cash flow to the investor while ending the borrower’s rent-free housing. A large portion of modified loans do in fact default or re-default later (Anderson et al. 2012). Even a failed modification still preserves the foreclosure option (albeit, delayed). The costs of premature or failed modifications are probably relatively modest. The costs of foreclosure actions might be more significant in terms of servicer/lender expenses. 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 accounting of the policy.

The overall results of this analysis are instructive for policymakers. Firms are subject to the same behavioral biases observed in controlled lab studies or in field experiments with individuals. Focusing attention on a particular behavior can skew decisions. Even 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

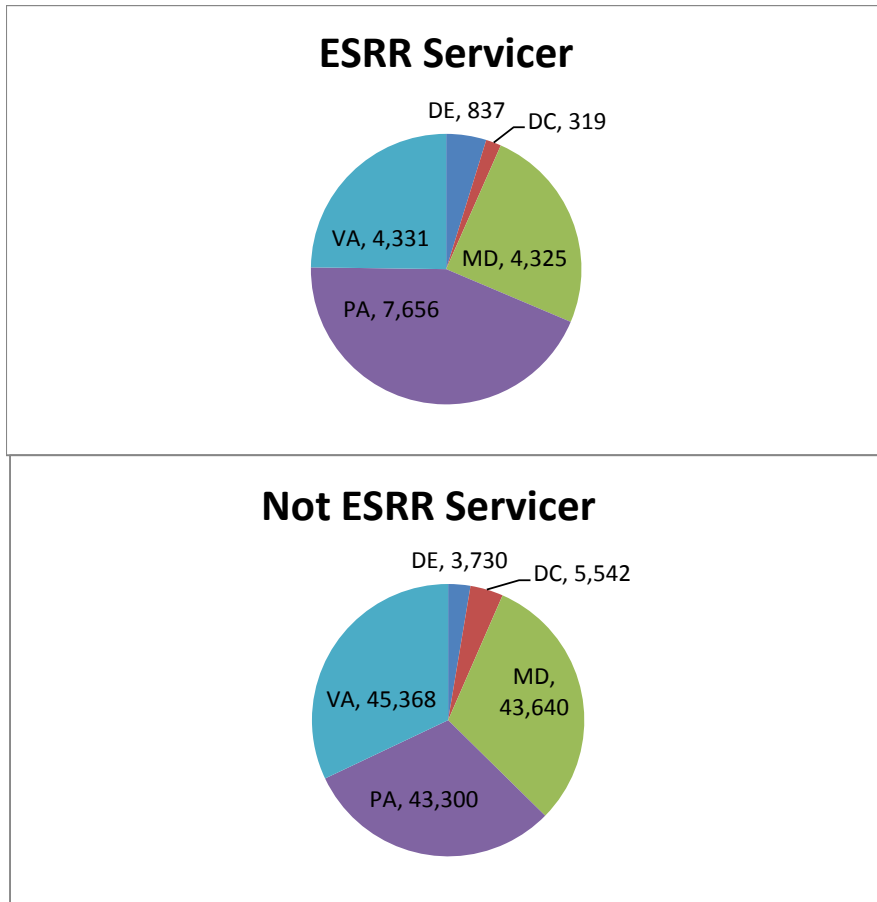




Table 1: Summary Statistics by Area

	Surrounding States	Maryland	Total
Original Balance	264.079 (217.317)	342.510 (214.575)	287.732 (219.465)
Current Loan Rate	7.5090 (1.8943)	7.0599 (1.5474)	7.3735 (1.8085)
Adjustable Rate Mortgage Indicator	0.4707 (0.4991)	0.5077 (0.4999)	0.4819 (0.4997)
90+ days delinquent	0.0820 (0.2744)	0.0706 (0.2561)	0.0786 (0.2691)
60 days delinquent	0.1008 (0.3010)	0.0879 (0.2831)	0.0969 (0.2958)
30 days delinquent	0.1378 (0.3447)	0.1220 (0.3273)	0.1330 (0.3396)
Origination Date (year)	2004.6 (2.2839)	2005.0 (1.8486)	2004.7 (2.1697)
FICO < 520	0.0456 (0.2087)	0.0301 (0.1710)	0.0410 (0.1982)
FICO 521 – 620	0.2475 (0.4316)	0.1868 (0.3898)	0.2292 (0.4203)
FICO 621 – 720	0.4233 (0.4941)	0.4711 (0.4992)	0.4377 (0.4961)
FICO > 720	0.2836 (0.4507)	0.3119 (0.4633)	0.2921 (0.4547)
CLTV < 80	0.4802 (0.4996)	0.5553 (0.4969)	0.5029 (0.5000)
CLTV 81 – 90	0.3440 (0.4750)	0.2860 (0.4519)	0.3265 (0.4689)
CLTV 91 – 95	0.0603 (0.2380)	0.0444 (0.2061)	0.0555 (0.2290)
CLTV 96 – 100	0.1125 (0.3160)	0.1126 (0.3162)	0.1126 (0.3161)
CLTV 100+	0.0030 (0.0543)	0.0017 (0.0408)	0.0026 (0.0506)
Observations	111083	47949	159032

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.

Table 2: Summary Statistics by Area

	Surrounding States	Maryland	Total
<b>Dependent Variables</b>			
Modification Indicator	0.0055 (0.0737)	0.0063 (0.0788)	0.0057 (0.0753)
Foreclosure Starts	0.0333 (0.1794)	0.0269 (0.1617)	0.0314 (0.1743)
<b>Zip Code Level Covariates</b>			
Male	0.6640 (0.0730)	0.6153 (0.0921)	0.6493 (0.0823)
Minority	0.2850 (0.2405)	0.4721 (0.3056)	0.3414 (0.2756)
Income	105.3475 (51.4257)	119.8741 (51.5263)	109.7273 (51.8860)
Observations	111083	47949	159032

Note: Data from Corporate Trust Services CCF Jan, 2008. Zip code data from 2000 Census.

Mean of each variable reported with standard deviation in parentheses.

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
<b>Dependent Variables</b>			
Modification Indicator	0.0060 (0.0772)	0.0034 (0.0580)	0.0057 (0.0753)
Foreclosure Starts	0.0297 (0.1697)	0.0448 (0.2069)	0.0314 (0.1743)
<b>Covariates</b>			
Original Balance (000s)	299.016 (221.700)	196.276 (175.446)	287.732 (219.465)
Current Loan Rate	7.2509 (1.7727)	8.3680 (1.7884)	7.3735 (1.8085)
Adjustable Rate Mortgage Indicator	0.4930 (0.5000)	0.3919 (0.4882)	0.4819 (0.4997)
90+ days delinquent	0.0751 (0.2636)	0.1067 (0.3087)	0.0786 (0.2691)
60 days delinquent	0.0170 (0.1291)	0.0292 (0.1684)	0.0183 (0.1340)
30 days delinquent	0.0336 (0.1803)	0.0566 (0.2311)	0.0362 (0.1867)
Origination Date (year)	2004.7319 (2.1002)	2004.8139 (2.6657)	2004.7409 (2.1697)
FICO < 520	0.0332 (0.1791)	0.1040 (0.3052)	0.0410 (0.1982)
FICO 521 – 620	0.2126 (0.4091)	0.3639 (0.4811)	0.2292 (0.4203)
FICO 621 – 720	0.4419 (0.4966)	0.4033 (0.4906)	0.4377 (0.4961)
FICO > 720	0.3123 (0.4634)	0.1289 (0.3351)	0.2921 (0.4547)
CLTV < 80	0.5106 (0.4999)	0.4405 (0.4965)	0.5029 (0.5000)
CLTV 81 – 90	0.3216 (0.4671)	0.3664 (0.4818)	0.3265 (0.4689)
CLTV 91 – 95	0.0548 (0.2276)	0.0615 (0.2402)	0.0555 (0.2290)
CLTV 96 – 100	0.1106 (0.3137)	0.1282 (0.3344)	0.1126 (0.3161)
CLTV 100+	0.0025 (0.0495)	0.0034 (0.0585)	0.0026 (0.0506)
Observations	141580	17468	159032

Note: Data from Corporate Trust Services CCF Jan, 2008. See Table 10 in the Appendix for a list of servicers subject to ESRR. Mean of each variable reported with standard deviation in parentheses.

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

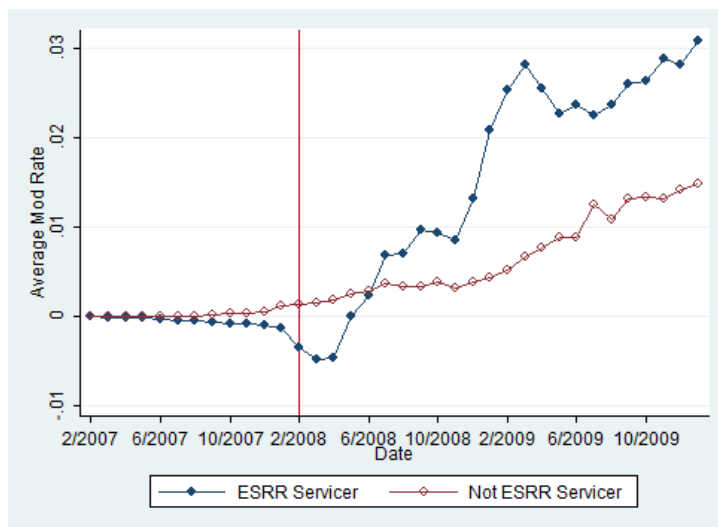


Figure 3: Average Foreclosure Rates By Date, Servicer (Difference between Maryland and Surrounding States)

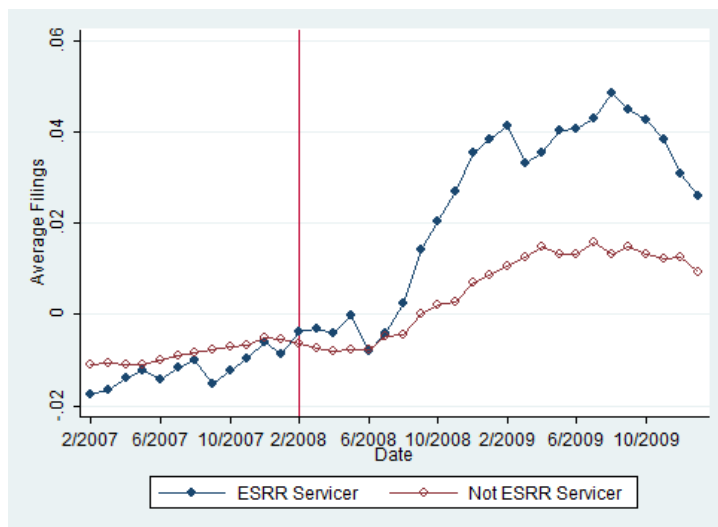


Figure 4: Average “Do Nothing” Rates By Date, Servicer (Difference between Maryland and Surrounding States)

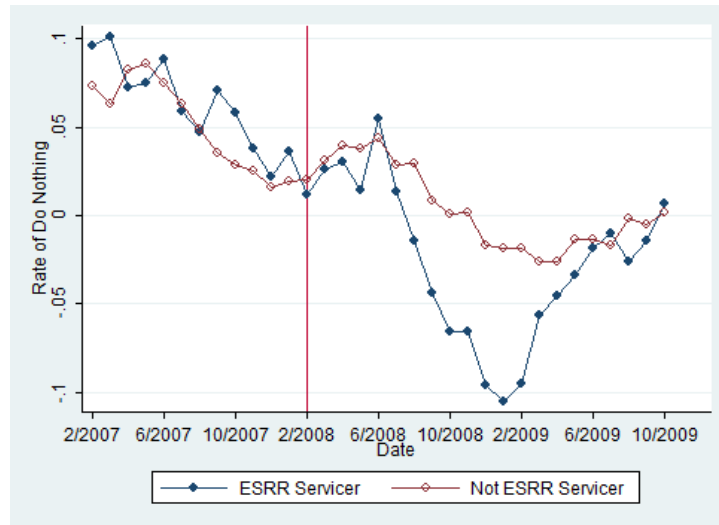


Figure 5: Average “Do Nothing” Rates By Date, Servicer

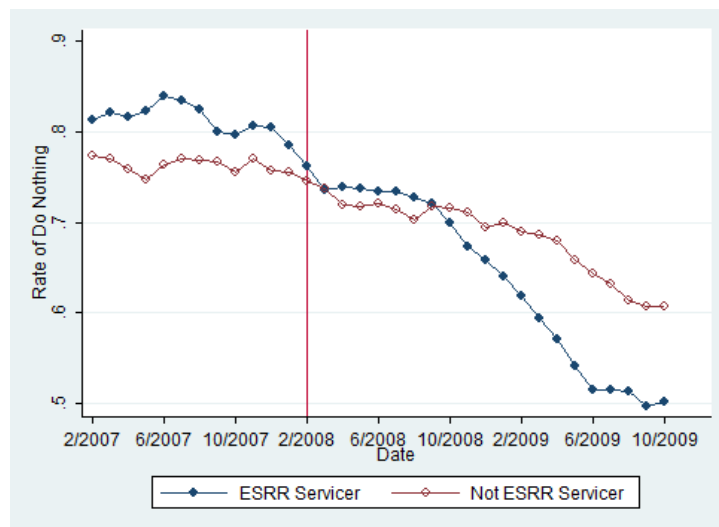


Table 4: Comparison of Means: Difference-in-Difference-in-Differences Estimate of Modification Rates

<b>Before ESRR Required</b>			
	Maryland	Mid-Atlantic (Non-Maryland)	<b>Difference</b> (over state)
Servicer Required	0.000073 (0.000037) [54721]	0.00093 (0.000058) [161145]	-0.00086 (0.00013) [215866]
Servicer Not Required	0.0020 (0.000076) [595042]	0.0018 (0.000036) [1323309]	0.00022 (0.000067) [1918351]
<b>Difference</b> (over servicer)	-0.0019 (0.00019) [649763]	-0.00083 (0.00011) [1484454]	$\underline{DD}_{Pre}$ -0.0011 (0.00021) [2134217]
<b>After ESRR Required</b>			
	Maryland	Mid-Atlantic (Non-Maryland)	<b>Difference</b> (over state)
Servicer Required	0.138 (0.0012) [82843]	0.121 (0.00064) [256630]	0.0166 (0.0013) [339473]
Servicer Not Required	0.059 (0.00026) [848477]	0.052 (0.00016) [1864319]	0.00698 (0.00030) [2712796]
<b>Difference</b> (over servicer)	0.0786 (0.00090) [931320]	0.069 (0.00050) [2120949]	$\underline{DD}_{Post}$ 0.00959 (0.0010) [3052269]
$\underline{DDD} = \underline{DD}_{Post} - \underline{DD}_{Pre}$			
0.0107 (0.0012) [5186486]			

Means reported, standard errors in parentheses, observations in brackets.

Table 5: Comparison of Means: Difference-in-Difference-in-Differences Estimate of Foreclosure Rates

<b>Before ESRR Required</b>			
	Maryland	Mid-Atlantic (Non-Maryland)	<b>Difference</b> (over state)
Servicer Required	0.0184 (0.00057) [54721]	0.0299 (0.00042) [161145]	-0.0116 (0.00080) [215866]
Servicer Not Required	0.0145 (0.00015) [595042]	0.0229 (0.00013) [1323309]	-0.00849 (0.00022) [1918351]
<b>Difference</b> (over servicer)	0.00387 (0.00054) [649763]	0.00694 (0.00040) [1484454]	$\underline{DD}_{Pre}$ -0.00306 (0.00074) [2134217]

<b>After ESRR Required</b>			
	Maryland	Mid-Atlantic (Non-Maryland)	<b>Difference</b> (over state)
Servicer Required	0.0847 (0.00097) [82843]	0.0605 (0.00047) [256630]	0.0242 (0.00099) [339473]
Servicer Not Required	0.0522 (0.00024) [848477]	0.0471 (0.00016) [1864319]	0.00515 (0.00028) [2712796]
<b>Difference</b> (over servicer)	0.0324 (0.00083) [931320]	0.0134 (0.00045) [2120949]	$\underline{DD}_{Post}$ 0.0190 (0.00092) [3052269]

$$\underline{DDD} = \underline{DD}_{Post} - \underline{DD}_{Pre}$$

0.0221  
(0.0013)  
[5186486]

Means reported, standard errors in parentheses, observations in brackets.

Table 6: DDD: ESRR Increases Modification and Foreclosure Rates

	Loan was Modified		Foreclosure Began	
	(1)	(2)	(3)	(4)
<b>DDD Estimate</b>	0.0131*** (0.00264)	0.00898*** (0.00172)	0.0223*** (0.00274)	0.0134*** (0.00188)
<b>Control Variables</b>				
MD x Post Regulation	0.00592*** (0.000776)	0.00736*** (0.00108)	0.0130*** (0.00213)	-0.00151** (0.000716)
MD x ESRR Servicer	0.00499*** (0.000909)	0.00478*** (0.000829)	-0.00250*** (0.000726)	-0.00344*** (0.000441)
ESRR Servicer x Post Regulation	0.0617*** (0.00940)	0.0560*** (0.00819)	0.00699*** (0.00145)	0.0103*** (0.00156)
Log(Income)		-0.00607*** (0.00102)		0.00365*** (0.000384)
Log(Original Loan Balance)		-0.00228*** (0.000510)		0.000636** (0.000276)
Current Loan Rate		-0.0290*** (0.00556)		0.000324*** (0.0000826)
90+ days delinquent		-0.0361*** (0.00552)		0.318*** (0.00436)
60 days delinquent		0.00323* (0.00190)		0.0460*** (0.00400)
30 days delinquent		0.0319*** (0.00520)		0.00505*** (0.000440)
<b>Models Also Include:</b>				
Month Dummies	X	X	X	X
Servicer Dummies	X	X	X	X
State Dummies	X	X	X	X
Origination Year Dummies	X	X	X	X
FICO Quartiles	-	X	-	X
CLTV Quartiles	-	X	-	X
ARM Dummies	-	X	-	X
Percent White (Zip code level)	-	X	-	X
Observations	5186486	5181154	5186486	5181154
Loans	159032	159032	159032	159032

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 7: DD: ESRR Increases Modification and Foreclosure Rates in MD

	Loan was Modified		Foreclosure Began	
	(1)	(2)	(3)	(4)
<b>ESRR Servicer x Post Regulation</b>	0.0756*** (0.0121)	0.0635*** (0.00939)	0.0294*** (0.00353)	0.0233*** (0.00275)
<b>Control Variables</b>				
Log(Income)		-0.00873*** (0.00154)		0.00372*** (0.000573)
Log(Original Loan Balance)		0.00140*** (0.000343)		0.000436** (0.000214)
Current Loan Rate		-0.0372*** (0.00672)		-0.000578*** (0.000132)
90+ days delinquent		-0.0445*** (0.00606)		0.301*** (0.00895)
60 days delinquent		0.00527* (0.00303)		0.0464*** (0.00524)
30 days delinquent		0.0334*** (0.00446)		0.00484*** (0.000595)
<b>Models Also Include:</b>				
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
ARM Dummies	-	X	-	X
Percent White (Zip code level)	-	X	-	X
Observations	1581083	1579751	1581083	1579751
Loans	47949	47949	47949	47949

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

	<b>Loan was Modified</b>		<b>Foreclosure Began</b>	
	(1)	(2)	(3)	(4)
<b>MD x Post Regulation</b>	0.0182*** (0.00321)	0.0161*** (0.00232)	0.0352*** (0.00473)	0.00992*** (0.00207)
<b>Control Variables</b>				
Log(Income)		-0.0118*** (0.00229)		0.00726*** (0.000858)
Log(Original Loan Balance)		-0.00386*** (0.000646)		-0.00277*** (0.000532)
Current Loan Rate		-0.0483*** (0.00801)		-0.00307*** (0.000217)
90+ days delinquent		-0.0426*** (0.00790)		0.376*** (0.0103)
60 days delinquent		-0.00526 (0.00334)		0.0241*** (0.00194)
30 days delinquent		0.0267*** (0.00800)		0.00260*** (0.000453)
<b>Models Also Include:</b>				
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
ARM Dummies	-	X	-	X
Percent White (Zip code level)	-	X	-	X
Observations	555339	555253	555339	555253
Loans	17468	17468	17468	17468

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 9: DDD: ESRR Does not Change Delinquency Rates

	<b>60+ Days Delinquent</b>	
	(1)	(2)
<b>DDD Estimate</b>	0.000892 (0.000933)	0.000598 (0.000942)
<b>Control Variables</b>		
MD x Post Regulation	0.00325*** (0.000376)	0.00312*** (0.000383)
MD x ESRR Servicer	0.000989 (0.000708)	0.000309 (0.000707)
ESRR Servicer x Post Regulation	-0.00193*** (0.000645)	-0.00315*** (0.000641)
Log(Income)		-0.00248*** (0.000358)
Log(Original Loan Balance)		0.00326*** (0.000206)
Current Loan Rate		0.00247*** (0.000284)
<b>Models Also Include:</b>		
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	5186486	5181154
Loans	159032	159032

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.

Figure 6: Delinquency Across States

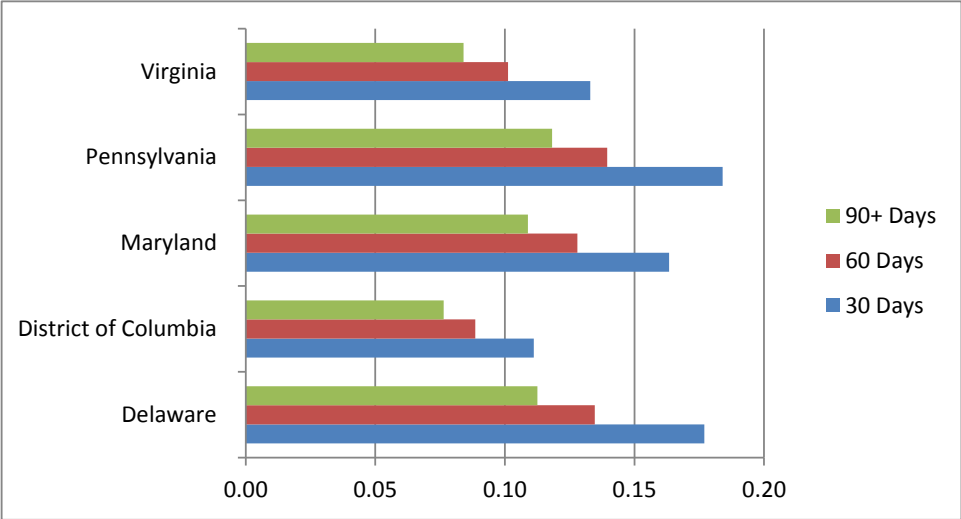


Figure 7: Foreclosed Mortgages Across Northeastern States

### Foreclosure Inventory by State for Q1, 2011

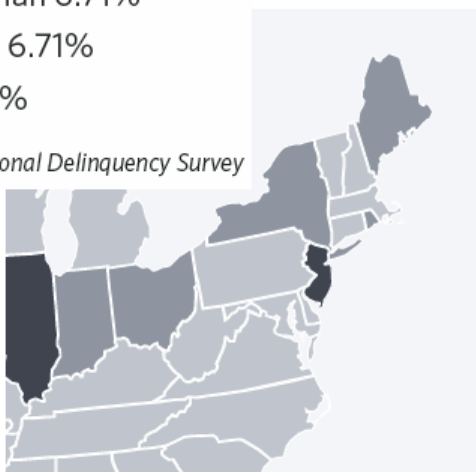
US Average: 4.52%

■ Greater than 6.71%

■ 4.53% — 6.71%

■ 0 — 4.52%

Source: MBA's National Delinquency Survey



## 9. Appendix

Table 10: 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

Table 11: Estimates Robust to using a Probit Specification

	Loan was Modified		Foreclosure Began	
	(1)	(2)	(3)	(4)
<b>DDD Estimate</b>	0.0228*** (0.00770)	0.0100*** (0.00380)	0.00809*** (0.00116)	0.000554*** (0.0000898)
<b>DD: ESRR x Post Regulation</b>	0.0663*** (0.0154)	0.0326*** (0.00884)	0.00721*** (0.000928)	0.00110*** (0.000131)
<b>DD: MD x Post Regulation</b>	0.0536*** (0.0127)	0.0256*** (0.00691)	0.0456*** (0.00235)	0.000443*** (0.0000848)
<b>All Three Models Include:</b>				
Month Dummies	X	X	X	X
Servicer Dummies	X	X	X	X
Origination Year Dummies	X	X	X	X
Log(Income)	-	X	-	X
Log(Original Loan Balance)	-	X	-	X
Current Loan Rate	-	X	-	X
90+ days delinquent	-	X	-	X
60 days delinquent	-	X	-	X
30 days delinquent	-	X	-	X
FICO Quartiles	-	X	-	X
CLTV Quartiles	-	X	-	X
ARM Dummies	-	X	-	X
Percent White (Zip code level)	-	X	-	X
Observations	555339	555253	555339	555253
Loans	17468	17468	17468	17468

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

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

Observations are loan months. Marginal effects from a probit model.

Each DD estimate and the DDD estimate are obtained from separate models.

The DDD estimate includes all data. The DD estimate for ESRR Servicer x Post Regulation only includes MD. The DD estimate for MD x Post Regulation only includes ESRR Servicers.

Table 12: Estimates Robust to Dropping Each State one at a Time

	Loan was Modified		Foreclosure Began	
	(1)	(2)	(3)	(4)
<b>DDD Estimate: Drops DC</b>	0.0130***	0.00862***	0.0227***	0.0131***
	(0.00264)	(0.00168)	(0.00272)	(0.00186)
Observations	4994039	4988714	4994039	4988714
Loans	198914	198742	198914	198742
<b>DDD Estimate: Drops DE</b>	0.0128***	0.00880***	0.0233***	0.0142***
	(0.00260)	(0.00170)	(0.00289)	(0.00198)
Observations	5037200	4988714	5037200	4988714
Loans	200401	200234	200401	200234
<b>DDD Estimate: Drops PA</b>	0.00478***	0.00146*	0.0140***	0.0118***
	(0.00140)	(0.000794)	(0.00261)	(0.00200)
Observations	3518702	3516170	3518702	3516170
Loans	141791	141717	141791	141717
<b>DDD Estimate: Drops VA</b>	0.0208***	0.0161***	0.0260***	0.0146***
	(0.00385)	(0.00272)	(0.00280)	(0.00200)
Observations	3590600	3586289	3590600	3586289
Loans	143209	143067	143209	143067
<b>All Three Models Include:</b>				
Month Dummies	X	X	X	X
Servicer Dummies	X	X	X	X
Origination Year Dummies	X	X	X	X
Log(Income)	-	X	-	X
Log(Original Loan Balance)	-	X	-	X
Current Loan Rate	-	X	-	X
90+ days delinquent	-	X	-	X
60 days delinquent	-	X	-	X
30 days delinquent	-	X	-	X
FICO Quartiles	-	X	-	X
CLTV Quartiles	-	X	-	X
ARM Dummies	-	X	-	X
Percent White (Zip code level)	-	X	-	X

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. DDD estimates obtained from separate models.



Table 13: DDD Effects Robust to Inclusion of loan-level fixed effects

	Loan was Modified		Foreclosure Began	
	(1)	(2)	(3)	(4)
<b>DDD Estimate</b>	0.0108** (0.00490)	0.00701* (0.00403)	0.0176*** (0.00298)	0.00975*** (0.00232)
<b>Control Variables</b>				
MD x Post Regulation	0.00518*** (0.000976)	0.00791*** (0.000852)	0.00816*** (0.000797)	-0.00276*** (0.000625)
MD x ESRR Servicer	0.116 (0.134)	0.247 (0.190)	-0.0574 (0.0353)	-0.179*** (0.0452)
ESRR Servicer x Post Regulation	0.0626*** (0.00233)	0.0441*** (0.00190)	0.00926*** (0.00136)	0.0106*** (0.00106)
Current Loan Rate		-7.777*** (0.0717)		0.0875*** (0.0300)
90+ days delinquent		-0.00675*** (0.00107)		0.319*** (0.00180)
60 days delinquent		-0.0137*** (0.000933)		0.0526*** (0.000921)
30 days delinquent		-0.0242*** (0.000809)		0.00843*** (0.000422)
<b>Models Also Include:</b>				
Loan-Level Fixed Effects	X	X	X	X
Month Dummies	X	X	X	X
Servicer Dummies	X	X	X	X
State Dummies	X	X	X	X
FICO Quartiles	-	X	-	X
CLTV Quartiles	-	X	-	X
ARM Dummies	-	X	-	X
Observations	5186486	5181154	5186486	5181154
Loans	159032	159032	159032	159032

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.