Mortgage Servicing and Household Financial Distress

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March 3, 2023

Abstract

Debt servicers directly interact with household borrowers, make key decisions about creditor leniency, and may have a significant impact on borrower financial health. However, servicers often have incentives that are not aligned with the lender or the borrower. Servicer regulations intended to align incentives may be ineffective or could significantly change borrower financial health. Using the introduction of mortgage servicing regulations by the Consumer Financial Protection Bureau (CFPB), we study whether requiring servicers to communicate with borrowers about foreclosure avoidance and to wait a minimum of 120 days before foreclosure filing improves consumer outcomes. We find that servicing regulations significantly decrease foreclosure filing and increase the probability that a loan is in current payment status. Treated borrowers show indications of improved financial health, including higher credit scores and fewer bankruptcy filings. We show that servicer-driven, rather than household-driven, shifts in foreclosure filing are associated with higher credit demand. Our results suggest that servicer regulation has the potential to alleviate debt burdens and facilitate consumption in non-crisis environments.

Keywords: Household finance, Debt relief, Mortgage regulation, Law and economics

JEL Codes: D00, D14, D18, G00, G23, G38, G51, K00, K22

1 Introduction

Debt servicers interact directly with borrowers and make key decisions about loan resolution, including foreclosure. Servicers can provide alternatives to foreclosure to households, such as loan modification or forbearance, defined as a time period where servicers choose not to foreclosure on borrowers in default. Policies that shift servicer behavior have been implemented during financial crises, including both the 2008 recession (Piskorski and Seru (2021)) and the 2020 COVID-19 pandemic (Cherry et al. (2021)). Even during non-crisis times, however, servicers regularly provide discretionary debt relief to borrowers (Piskorski et al. (2010)). Indeed, differential behavior by debt servicers towards borrowers from disadvantaged backgrounds may be a significant contributor to social inequality (Kermani and Wong (2021), Padi (2021), An et al. (2022)). Servicers also impact mortgage holders and investors whose returns are lower when repossessions are too aggressive (Aiello (2021)). Little causal evidence exists about the impact of servicer behavior on borrower outcomes, particularly on indicators of financial health such as foreclosure, credit scores, and bankruptcy.

This project fills the gap by studying the effect of mortgage servicing requirements proposed in 2013 and implemented in 2014 by the Consumer Financial Protection Bureau. Introduced after the 2008 financial crisis, the mortgage servicing rule required servicers to delay foreclosure filings. In the meantime, servicers were required to attempt to establish early and continuous live contact with delinquent borrowers. Servicers were required to communicate with borrowers about the cause of their loan's non-performance and inform borrowers about alternatives to foreclosure. The impact of this regulation on loan borrowers in uncertain for two reasons.

First, unlike the mortgage forbearance introduced during the COVID-19 pandemic, there was no requirement that servicers avoid foreclosure. Servicers could comply by simply delaying foreclosure, or could communicate with borrowers proactively to offer modifications, forbearance, or help borrowers cure their default. Although foreclosure avoidance is more costly than simply delaying foreclosure filing (Bandyopadhyay (2022)), there are significant benefits. Foreclosures have been associated with distress for both homeowners and renters (Diamond et al. (2020)), worsened physical health (Currie and Tekin (2015)), lower neighborhood house prices (Anenberg and Kung

(2014)), and higher crime rates (Ellen et al. (2013)).

Second, servicing regulation can also impact borrowers' other credit lines and their overall financial health. When a borrower experiences financial distress, such as job loss, cooperative servicers can offer borrowers breathing room to recover while aggressive servicers may exacerbate borrowers' distress. Quantifying the causal effect of servicer behavior is challenging, however, due to the endogeneity of borrower distress. Servicers may be more likely to act aggressively with more distressed borrowers with lower likelihood of recovery.

To identify the causal effect of servicing regulation on borrowers' financial distress, we use a difference-in-differences identification strategy. The CFPB rule applied differently to mortgages owned or serviced by the government sponsored entities (GSEs), relative to those that were privately securitized on held on lenders' balance sheets. Since 2008, the GSEs have been run by the Federal Housing Finance Agency under conservatorship, which established guidelines in 2011 for servicers that largely mirror the later CFPB regulation. Therefore, GSE mortgages were already subject to a similar "treatment" as to that generated by CFPB regulations, leaving only non-GSE loans to be treated in 2013. Since contemporaneous regulations targeted originations (Defusco et al. (2020)), we limit the sample to mortgages that were originated prior to the crisis (2000-2007), following their performance until 2018. We compare GSE to non-GSE loan performance before and after the 2013 regulation using both a linear probability model and a discrete time duration model to estimate the impact of regulation on foreclosure and loan modifications. To use this approach, we make the assumption that if not for the CFPB regulation, GSE and non-GSE loans would have had parallel trends in mortgage and borrower credit outcomes between 2010 and 2017, conditional on observables.

Results show that servicing regulations significantly improved loan performance. Primarily, the rule caused a significant and persistent drop in foreclosure filings. Though the rules encouraged servicers to process loan modification applications, we do not see an increase fraction of loans coded as "in loss mitigation." Instead, fewer treated loans are in loss mitigation, and fewer loans are "dual tracked" into the foreclosure process while simultaneously being considered for a loan modification. These shifts in performance coincided with a large increase in the fraction of mortgages reported

as "current" by creditors. Ultimately, the CFPB rule decreased foreclosure sales in non-GSE loans by more than 40% relative to comparable GSE loans.

Servicing regulation impacted other credit lines as well. Borrowers whose loans were treated experienced an increase in credit score of about 10 points, had a higher propensity to take on auto debt, paid off more credit card debt, had higher credit limits, and were less likely to file for bankruptcy. The effects are consistent with an expansion in both credit demand and credit supply. Examining heterogeneous impacts across the population, we find that borrowers who started with the lowest credit scores received the largest expansion in credit from the regulation. The effects do not appear to be driven by foreclosure delay alone, suggesting that communication requirements had an impact. Finally, the CFPB rule had a larger impact on borrower outcomes than the analogous 2011 GSE servicer guidelines. One potential explanation is that CFPB enforcement mechanisms were key to the regulation's effect.

We then isolate the impact of the servicer-driven changes in foreclosure filing on credit outcomes. Using the predicted probability of foreclosure filing based on exposure to the CFPB rule, we create an instrument for foreclosure filing that is uncorrelated with unobservable borrower characteristics and is driven only by regulatory changes. We regress credit outcomes on observed foreclosure filing, instrumenting with predicted filing, and interpret the results as the causal impact of servicers' foreclosure decisions. Results show that foreclosure filing lowers auto expenditures and increases unpaid card balances. There is no causal effect of foreclosure filing on credit scores, bankruptcy filings, or credit limits, suggesting that credit supply is unaffected by the filing margin. The results suggest that avoiding foreclosure filing due to servicer regulation increases credit demand and may encourage spending by distressed borrowers. Viewing our results in the context of COVID-19 forbearance programs, we calculate that forbearance allowed households to finance auto purchases and pay off credit card debt, increasing spending by $2500 per capita.

This paper contributes to several strands of literature. We quantify the impact of servicer regulations on indebted households, following previous work on modification and refinancing programs (Piskorski et al. (2010), Agarwal et al. (2015), Ganong and Noel (2020), Abel and Fuster (2021)). The nature of the regulatory intervention is different here. CFPB rules were less costly

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than modification and refinancing programs that began during the 2008 crisis. We also aim to assess the causal impact of foreclosure, though the mortgage servicing regulation most directly shifts foreclosure filing rather than sale. Our results are comparable with the causal effect of foreclosure sales as assessed by Diamond et al. (2020) for homeowners, landlords and tenants, using a judge IV approach. We also show some similar effects to the impact of eviction on renters demonstrated by Collinson et al. (2022), also using a judge IV to shift the propensity for repossession.

We shed new light on the COVID-19 forbearance policies instituted in 2020 by studying a related policy instituted in *non-crisis* times. In comparison, Cherry et al. (2021), Golding et al. (2021), Kim et al. (2021), Shi (2021) and Bandyopadhyay (2022) demonstrate how forbearance policy acted as an essential source of emergency liquidity during crisis times, albeit with heterogeneous distributional impacts. Finally, this paper relates to micro level research in finance on mortgage servicing rights during non-crisis times (Mayock and Shi (2019), Lin et al. (2006), Sandler (2021), Aiello (2021)). Of these, the most similar piece is Sandler (2021), who studies the same servicing intervention. Our results largely agree with Sandler's results, though the identification strategy in this paper depends more heavily on comparing treated non-GSE loans to GSE loans. Our contribution to the literature is in documenting servicers' response to regulation, and using that response to study the causal effects of foreclosure filing on distressed borrowers' credit outcomes.

2 Data and Empirical Strategy

Our analysis utilizes CRISM data, which includes loan level McDash mortgage performance data, collected from large servicers, merged with a panel of credit records from Equifax. To study the effect of servicer regulation on foreclosure avoidance and subsequent impacts on credit outcomes, we restrict the data to a sample of loans where origination characteristics would be unaffected by regulation. First, we limit our data to loans that were originated in advance of the financial crisis, at which time post-crisis servicer regulations were not widely contemplated or expected. This restriction limits any anticipation effects that could cause differential selection into treated loans. Second, we limit our sample to 30 year, fixed rate mortgages. This limitation excludes loans with high risk features such as balloon payments, interest only loans and negative amortization that were

restricted around the 2008 crisis by state and federal rules. Adjustable rate mortgages (ARMs) were excluded because a contemporaneous CFPB rule was introduced in 2013 that required disclosures to be sent to borrowers when ARMs were reset. Third, all our analyses include controls for state, origination year, interest rate, credit score at origination, and total loan amount. Our results can therefore be interpreted as the impact of servicing regulations on performance and credit outcomes, holding fixed origination characteristics. Finally, all regression standard errors are clustered at the state level to account for correlations within state outcomes driven by foreclosure procedures, which are decided at the state level.

For analytical tractability, we study a 10% sample, which includes more than 24 million observations at the loan-month level. There are approximately 645,000 unique loans in the data, which includes every month in which the mortgage loan was active, as well as six months before and after the loan was originated or exited the sample. Loans are originated between 2000 and 2007 and performance data runs from 2010-2017. It is important to note that mortgage performance may not always be furnished to all credit bureaus, so it is possible for that not being current on their mortgage does not directly affect credit score for all borrowers. Our results reflect the equilibrium effects of supply and demand. For example, if a credit supplier observes a foreclosure on a borrower's credit report, it may be less likely to extend credit to the borrower. On the other hand, the borrower may demand less credit in response to a foreclosure filing. To the extent that servicers do not furnish negative performance information to Equifax, the credit supply response to the change in foreclosure filings we observe as a result of regulatory changes is a lower bound of the true effect.

The empirical strategy has three stages of analysis. First, we study the causal impact of the 2013 regulation on loan performance and credit outcomes. The primary comparison is a difference-in-differences, comparing loan performance before and after 2013, for GSE and non-GSE loans. We report these results in two ways. We show event study graphs reporting the difference-in-differences effect each quarter in the 12 quarters before and after the rule was announced in January 2013. The event study shows pre-trends and detects trend breaks as well as level effects. Then, we aggregate the results to report a standard difference-in-differences coefficient, pooling the effect across quarters. Second, we estimate differences between subpopulations in the effect of servicer regulation. Third, we use an instrumental variables approach to study the causal effect of foreclosure

filing on credit outcomes.

The event study is estimated as:

$$y_{lt} = \alpha d_{lt}^{nonGSE} + \Sigma_{q \in \{-12,12\}} \beta_q d_{lt}^q d_{lt}^{nonGSE} + X' \zeta + \epsilon_{lt} \tag{1}$$

where l is a loan, t is a month, and the primary outcomes of analysis y_{lt} are loan performance and credit variables. Controls ζ include mortgage balance at origination, original credit score, interest rate, and state and time fixed effects. Standard errors are clustered at the state level.

The difference-in-differences is estimated as:

$$y_{lt} = \alpha_1 d_{lt}^{post2013} + \alpha_2 d_{lt}^{nonGSE} + \alpha_3 d_{lt}^{post2013*nonGSE} + X' \zeta + \epsilon_{lt} \tag{2}$$

We then study how credit variables changed for these populations around treatment using both event study and difference-in-difference approaches, estimating Equations 2 and 1. We focus on key credit outcomes that describe a household's credit score, debt burden and other indicators of financial health. Specifically, C_{lt} includes current credit score as measured by the VantageScore formula, an indicator for a significant increase in auto loans (greater than \$3000), total past due on bank cards, an indicator for bankruptcy filing, and the total credit limit a household faces. These indicators provide a relatively complete picture of consumption, credit availability, and financial distress. Once again, standard errors are clustered at the state level.

The linear difference-in-differences estimates the likelihood of a loan being a particular status in any given month, conditional on the loan having remained in the dataset until that month. However, this approach can be subject to survival bias, since loans that survive are already less likely to be subject to financial distress. To generate an estimate robust to survival bias, we use a duration model. The duration approach deals with two limitations of our data - first, loan performance indicators are not observed after 2018 and second, performance indicators are not observed before

a servicer acquires the right and after a loan is disposed of due to payoff, foreclosure sale or servicing transfer. Moreover, we observe a discrete change in the hazard rate of foreclosure filing after 2013, but only for non-GSE loans. Discrete time duration models are ideally suited for this setting because there is no need to assume a parametric baseline hazard rate that could smooth over the treatment effect (Han and Hausman (1990)).

Time to foreclosure is a discrete random variable T that takes the values $t_1 < t_2 < ...$ with probabilities $f(t_j) = f_j = \Pr[T = t_j]$. The survival function is defined as the probability that foreclosure occurs after time t_j as follows:

$$S(t_j) = S_j = \Pr[T \geq t_j] = \sum_{k=j}^{\infty} f_j$$

For estimation, we assume that the baseline survival function S_0 is scaled exponentially by time-invariant covariates X and time varying covariates W. The empirical survival function can therefore be written as

$$S(t_j \mid X_i, W_{ij}) = S_0(t_j)^{\alpha_1 d_{lt}^{post2013} + \alpha_2 d_{lt}^{nonGSE} + \beta_1 d_{lt}^{post2013*nonGSE} + X'\zeta}$$

A complementary log-log transformation linearizes the estimating equation:

$$\log(-\log(1 - \lambda(t_j \mid X_l, d_{lj}))) = \alpha_1 d_{lt}^{post2013} + \alpha_2 d_{lt}^{nonGSE} + \beta_1 d_{lt}^{post2013*nonGSE} + X'\zeta \qquad (3)$$

where $\alpha_j = \log(-\log(1 - \lambda_0(t_j)))$, the transformed baseline hazard rate. To operationalize this, we utilize our observable hazard rate and assume a nonparametric baseline hazard to run maximum likelihood estimation:

$$\lambda(t_j \mid X_i, W_{ij}) = 1 - \exp(-\exp(\alpha_j + X'\beta + W'\psi))$$

$$L(\beta, \psi \mid X, W) = \prod_j \left(\lambda(t_j) \prod_{k=1}^{j-1} (1 - \lambda(t_k)) \right)^{y_i} \left(\prod_{k=1}^{j} (1 - \lambda(t_k)) \right)^{1-y_i}$$

where y is an indicator for foreclosure filing. Duration model standard errors are clustered at the state level to match the linear regression specification.

We then study differential effects of the regulation on subpopulations of interest. First, we interact treatment with categories of credit score, to show differential effects by borrower's creditworthiness. Second, we compare the effect of treatment on states with non-judicial foreclosure procedures to those with judicial foreclosure procedures. Judicial foreclosures take longer, and may therefore be more affected by delay in foreclosure filing. Third, we limit to loans that never experience a change in monthly principal and interest payments. These loans were not modified by the Home Affordable Mortgage Program (HAMP) or any private modification program.

Finally, we separately identify the effect of the 2011 GSE treatment to compare its effects to the CFPB rule. To do so, we limit the data to loan performance and credit outcomes before 2013. The regression specification is:

$$y_{lt} = \alpha_1 d_{lt}^{post2011} + \alpha_2 d_{lt}^{GSE} + \alpha_3 d_{lt}^{post2011*GSE} + X'\zeta + \epsilon_{lt} \tag{4}$$

Additional controls include loan amount, interest rate, original credit score, origination year, and state and current quarter fixed effects. Standard errors are clustered at the state level.

Finally, to assess the causal effect of foreclosure filing on credit outcomes, we utilize the results from the duration model estimated in Equation 3 to generate a "first stage" instrument for filing that is correlated with servicer response to regulation but is uncorrelated with unobservable loan characteristics. We can generate a predicted probability of transition into foreclosure, $\hat{\lambda}$. This predicted probability acts as an instrument for the true probability of transition into a particular status, y, as long as there is significant predictive power from the covariates in the first stage regression. The predicted probability $\hat{\lambda}$ should be uncorrelated with financial outcomes directly, especially conditional on loan characteristics and time fixed effects, since there is no anticipation effect for lenders who originated loans between 2000 and 2007, and the regulations were not announced more than a few quarters prior to final promulgation. Moreover, as we show below, there is no borrower reaction directly to the regulation.

The second stage is a linear instrumental variables regression where measures of financial distress D, taken from the Equifax credit data, are regressed on a dummy for foreclosure filing, as well as controls.

$$y_i = \eta \hat{\lambda} + X'\beta_1 + \epsilon_1 \tag{5}$$

$$D_i = \gamma \hat{y}_i + X'\beta_2 + \epsilon_2 \tag{6}$$

The coefficient of interest here is the causal effect of foreclosure filing on other indicators of financial health, γ.

3   The Impact of Servicers on Borrower Outcomes

In many household contexts, including mortgages, the right to service a debt is assigned and traded separately from ownership of the loan. Ownership of securitized loans is further distributed across investors. Figure 1 is a stylized illustration of the relationships between parties in a mortgage transaction. Though the lender approves and disburses funds to the borrower, ownership of the mortgage is split between the note and the servicing right. Owners or investors have the right to the stream of payments from borrowers, but servicers have the right to *collect* these payments. Servicers therefore have the authority to begin repossession proceedings and act as a liaison between the note's owner and the payee. As such, they are the first point of contact for distressed borrowers. Servicers do not have a share in interest payments or a right to claim the proceeds of a foreclosure sale. Instead, they are typically compensated with a flat fee per loan, as required by contracts with the loan's owner or the debt securitization vehicle. When borrowers stop making payments, servicers are required to advance payments on their behalf to the owners or investors until foreclosure can occur or the servicing right can be sold. The compensation structure creates a conflict of interest between servicers and lenders - servicers have an incentive to repossess property or sell underperforming loans quickly in order to minimize their costs, even if that may damage the ultimate resale value

of property, leading to losses for both the borrower and lender (Levitin and Twomey (2011), Aiello (2021)).

Despite this risk, servicers can play a key role in minimizing the burden of household financial distress. Figure 2 shows the timeline of decisions made by distressed borrowers and servicers. After origination, borrowers choose whether or not to make a payment each month. Once a payment is missed, servicers have an opportunity to intervene and help a borrower make payments, collectively referred to as "loss mitigation." First, servicers may choose to do nothing, also known as providing forbearance. Forbearance entails pausing collection activity and avoiding filing for foreclosure, though the debt continues to be owed. Second, servicers can offer informal loan modifications. Informal modifications include repayment plans that allow borrowers to repay arrears, sometimes tailored to borrowers' specific circumstances. Third, servicers can formally modify the mortgage. Formal modifications involve a change in outstanding principal, interest rate, term, or monthly payments. These modifications are usually provided through formal loss mitigation programs, for which the borrower submits a written application. Each of these options can give borrowers breathing room to resolve the loan and avoid foreclosure.

Once a borrower is in default, meaning more than three months behind on payments, servicers may begin the foreclosure filing process. Usually, this begins with a notice of default or a notice of acceleration of the loan. At this point, the servicer works with a lawyer to comply with local, state, and federal rules for foreclosure processes. Note that is it possible that the loan enters the loss mitigation process after foreclosure filing. For example, after experiencing the shock of the foreclosure filing, a borrower may reach out to their servicer to ask about options to stop the foreclosure process. Ultimately, if the foreclosure is carried out, the property is sold at foreclosure auction or is repossessed directly by the lender and held until sale. Prior to the foreclosure filing, the borrower has the right to cure her default, meaning that the borrower can decide at any time to sell the property or refinance the loan. After the filing, the borrower may still dispose of the property through short sale, but has less bargaining power to remain in possession of the property.

Despite servicers having the legal right to start and complete foreclosure proceedings, not every default results in a foreclosure sale. Figure 3 shows that propensity of defaulted borrowers to cure

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their default, engage in loss mitigation, face a foreclosure filing, or experience a foreclosure sale in the months after default. Even three years after a default, only 60% of loans in default have faced a foreclosure action. Fewer than 40% have reached the point of being sold at a foreclosure auction. Many loans, nearly 20%, are engaged in loss mitigation programs with their servicers. Note that loss mitigation is self-reported by servicers, and is coded as 1 if any attempt is being made to help the borrower recover from default. Finally, nearly 30% of defaulted loans are cured, which is defined as returning to being current with no remaining delinquency.[1]

We utilize changes in servicer regulation as a natural experiment to identify the effect of servicer behavior on consumer outcomes. Inefficiencies in servicing came into focus during the 2008 financial crisis, when mortgage servicers failed to work with borrowers to avoid foreclosure when house prices dropped. Relatively few loans were modified, and many were "dual tracked," meaning that they were considered for a modification after a foreclosure filing. Foreclosure rates spiked, lowering house prices further and accelerating downturns in sectors of the economy overly exposed to mortgage risk through mortgage backed securities. In the initial foreclosure spike, evictions were temporarily frozen while rules were introduced by the government sponsored entities (GSEs) to encourage foreclosure avoidance in publicly owned or insured mortgages. The GSEs sustained significant losses due to the Financial Crisis, and in 2008 the Federal Housing Finance Agency was appointed as conservator to avoid liquidation. Starting at the end of 2010, each of the GSEs promulgated a servicing guide that was incorporated into their agreements with servicers, specifying certain actions that servicers must take to minimize inefficient foreclosures. The guidelines specified how servicers must attempt to establish live contact, encourage loss mitigation applications, and avoid dual tracking by delaying foreclosure filings.

At the same time, the CFPB was authorized by Dodd Frank to make permanent rules regarding mortgage servicing. The CFPB issued a notice for proposed rulemaking in September 2012, and the final rule was promulgated in January 2013 and was effective in January 2014.

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[1] Each loan may be in multiple status in a particular month. Loss mitigation and foreclosure filing, for example, can regularly coexist, and is called "dual tracking". Individuals can cure a default in payments by paying the amount due, plus any allowable costs and fees, by a specific time before a foreclosure sale. The cure amount includes just overdue payments, plus fees, costs, and interest—not future payments or accelerated payments. After the default is cured, the foreclosure stops. The amount of time to cure a default varies depending on state law and the terms of the loan contract.

The CFPB rules modified provisions under Regulation X (12 CFR 1024), originally promulgated under the Real Estate Settlement Procedures Act (RESPA) and Regulation Z (12 CFR 1026), originally promulgated under the Truth in Lending Act (TILA). Changes to TILA included requirements to send regular statements, provide information on how past payments had been credited, and changes to the error resolution process that were intended to ensure servicers were properly accounting for payment attempts. Changes to RESPA included requirements that servicers wait until 120 days of delinquency to begin foreclosure proceedings and establishes a process for evaluating loss mitigation applications in a timely manner. Moreover, it included a suite of communications requirements that were intended to give distressed borrowers early and regular contact with their servicers. Servicers are required to attempt to "establish live contact" with borrowers by the 36th day of delinquency, provide written information about loss mitigation by the 45th day of delinquency, and establish continuity of conduct by, for example, assigning a single point of contact for borrowers from that point onwards.

These rules applied to all mortgages in the country, with exceptions for small servicers and other special cases, but in practice did not bind equally on all loans. The rules were explicitly to harmonize with existing GSE guidelines, in order to limit any additional regulatory burden on GSE servicers in complying with CFPB rules. Despite this, the requirements of the two sets of rules are not identical - GSE guidelines went into more specific detail about compliance by specifying the timing of phone calls but did not come with explicit enforcement authority. GSE guidelines were incorporated into the contract between the GSEs, servicers, and investors. Servicer violations would have to be detected through lawsuits or other unusual actions. CFPB rules, however, were enforced through regular servicer examinations or through borrowers' private right of action. We report the impact of both interventions separately.

4   Causal Effects of Regulating Servicers

We begin by plotting the raw data, comparing loan performance and credit outcomes for treated and control loans over time in Figure 4 and Figure 5. The plots include each key time period in servicer regulation. The dotted red line marks the January 2011 implementation of the GSE

guidelines. In this intervention, the GSE loans in blue are the treated group. The lighter gray period marks the quarter during which the proposed rule was announced. Then, the darker gray period marks the time between the final rule's promulgation and its enforcement.

Figures 4 and 5 show these plots for all our outcomes. Figure 4a demonstrates the main result of the paper - foreclosure rates for non-GSE loans drop proportionally more than rates for GSE loans after the CFPB rule. In 2010, GSE and non-GSE loans are on relatively parallel trends. Between 2011 and 2013, non-GSE loans experience a larger increase in foreclosure filings, consistent with a relative drop in GSE foreclosures after the 2011 Guidelines. After the CFPB rule's introduction in 2013, non-GSE loans experience a drop in foreclosure rates larger than the drop in GSE foreclosure rates. The rates remain similar and parallel after the 2014 enforcement of the rule begins. In summary, throughout the time period, GSE and non-GSE loans followed the same general trends, but each shows a relative drop in foreclosure filings concurrent with the timing of their respective servicing regulations. The patterns for loans being reported as current show similar, though slightly less clear features, as shown in Figure 4b. While the rates of loans being reported as current for both types of loans were falling around the 2011 Guidelines, the rates of being reported current fell slightly less for GSE loans immediately after 2011. Similarly, after the CFPB's regulation was announced, the gap between GSE and non-GSE loans closed substantially.

Figure 4c shows the counter-intuitive effects of the CFPB rule on loss mitigation. Non-GSE loans experience a drop in the rate of loans in loss mitigation throughout the pre-treatment and treatment period. There is a small relative rise in loss mitigation in GSE loans after the 2011 Guidelines. The rates of dual tracking drop for non-GSE loans during the treatment period at a faster rate than GSE loans, as shown in Figure 4d, following a relatively slower growth in dual tracking by GSE loans following the 2011 Guidelines. Foreclosure sales exhibit a more complex pattern. Before the CFPB rules, non-GSE loans have more sales than GSE loans, with a spike in 2012. During the treatment period, non-GSE sale rates drop below GSE foreclosure sale rates. However, in 2015, the trend reverses again, with GSE foreclosure rates once again dropping below non-GSE rates.

Credit outcomes also show changes concurrent with the introduction of the CFPB rules. No-

tably, current credit scores, proxied by VantageScore, are shown in Figure 5a. They both increased during the treatment period, with the credit scores of borrowers with Non-GSE loans increasing more than those for borrowers with GSE loans. Differences in auto debt increases are difficult to see in Figure 5b due to significant seasonality in car purchases, but trends look parallel before treatment with a slight divergence starting in 2012. Past due bank card balances are quite different for GSE and non-GSE mortgagors though both are downward sloping and parallel prior to treatment. Figure 5c shows that while borrowers with GSE loans had a small increase in past due bank card balances during the treatment period, non-GSE borrowers have a large drop. GSE and non-GSE balances are much more similar in the post-treatment period than pre-treatment, though the trends diverge about three years after treatment.

Bankruptcy rates are largely parallel across treatment and control groups both before and after treatment, as shown in Figure 5d, but there appears to be a slight relative increase in bankruptcy for non-GSE borrowers after the 2011 Guidelines were introduced and then a slight convergence in bankruptcy rates after the CFPB rules were introduced. Finally, credit card limits vary significantly during the pre- and post-treatment periods. GSE and non-GSE loans are on similar trends before the 2011 Guidelines. At that point, GSE credit limits are slightly higher than non-GSE limits. The trend reverses during the treatment period, with non-GSE credit limits being nearly $2000 higher than GSE credit limits in 2013. By 2016, however, the difference had lessened significantly.

4.1 Event Study and Difference-in-Differences

To estimate the causal effect of servicing regulation, we estimate event studies (Equation 1), difference-in-difference (Equation 2), and duration models (Equation 3). GSE and non-GSE loans are different prior to treatment because they include different pools of borrowers and loans of different sizes. To deal with this, we control for the loan's original interest rate, loan amount, and the original credit score of the borrower. We also deal with seasonality and macroeconomic fluctuations by including time fixed effects, both for current quarter and origination year. Finally, we include state fixed effects to deal with differences in state foreclosure laws and variation in local housing markets.

Figure 6 shows the impact of servicing regulation on mortgage performance outcomes, conditional on controls. Figure 6a shows that treated loans are on a parallel trend with control loans until the 2011 Guidelines. Between 2011 and 2013, non-GSE foreclosure filings are higher than GSE filings, consistent with GSE loans experiencing "treatment." Then, there is a sharp drop in the probability of non-GSE loans being in foreclosure in 2013, with a total decrease of about 1.5 percentage points in foreclosure filing rates. By itself, this could be evidence of a delay in foreclosures or an increase in loss mitigation, as alternatives to cure. Figure 6b shows that an increase in loss mitigation cannot account for the drop. The servicing rule is in fact associated with a decrease in the rate of loss mitigation. Since the 2011 Guidelines were introduced, non-GSE loans were on a parallel trend with GSE loans. The drop in loss mitigation in 2013 is sustained in 2014 and onwards, suggesting that foreclosure is not being replaced by loss mitigation. Similarly, there is a small but significant drop in dual tracking of slightly less than 0.5 percentage points, as shown in 6c.

The largest impact of the servicing rule on loan performance is in loans being reported in "current" status. Figure 6d shows that the rule is associated with more than a 3 percentage point increase in the fraction of loans considered current on payment. Note that the 2011 Guidelines were associated with a slight decrease in non-GSE loans being current relative to GSE loan, though the difference is not statistically significant. This is consistent with GSE loans being subject to an analogous treatment in 2011. The difference in current status is flat between 2011 and 2013, but jumps up in 2013. The difference is sustained after the treatment period. Figure 6e shows that these shifts resulted in a small but sustained drop in foreclosure sales of about 0.2 percentage points.

An alternative method to measuring the effects of the rule would be in a competing risks model, since, for example, a loan obviously cannot be in foreclosure and current status at the same time, though loss mitigation is possible during foreclosure. Sandler (2021) uses a competing risks model and also finds a fall in foreclosure and increase in loans curing. For computational simplicity and comparison with the credit event study results, which are not competing risks, we take the event study approach but consider the results holistically. For example, we can see that the the about half of the increase in current status is explained by the decrease in foreclosure filings, though it is

not clear that the difference in the two is statistically significant. The difference could be explained by a decrease in the likelihood of other statuses, such as 90 or 120 days delinquent. Consistent with this, we discuss later a statistically significant drop in the likelihood in being 90 days delinquent after the rule. This drop in foreclosure filings is not driven by loan modifications. In the years after the rule, the slight increase in the probability of foreclosure filing and slight decrease in the probability of being current mirror one another.

Figure 7 shows event study results for credit outcomes. Current credit scores show a small, though not statistically significant drop after the 2011 Guidelines, and a significant increase after the 2013 CFPB rule's implementation, as shown in Figure 7a. Non-GSE loans had a lower credit score by 5 points than GSE loans during the 2011-2013 period, but after the rule was implemented, the treatment group experienced a relative increase in credit scores of about 10 points. The slight relative increase in non-GSE credit scores in the quarter before treatment is shown in the small fall in credit GSE credit scores in 5, while the post-rule reflects that both groups experienced a large increase, but the increase for GSE borrowers was larger. The "auto increase" variable showing in Figure 7b measures whether there has been an increase of $3000 or more in a consumer's auto balance, suggesting that they purchased a car. For the most months in the pre-period, there is no significant difference between GSE and non-GSE loans in auto purchases. After the rule, increased probability of a purchasing a car for non-GSE loans is higher by approximately 0.1% in most months. There is a higher probability for Q2 of 2014, which can also be seen in the raw time series as shown in Figure 5b, but it is imprecisely estimated.

Figure 7c shows that average unpaid bankcard balances relative to the period before treatment was higher for non-GSE loans than GSE loans. Before treatment, the relative difference was declining slightly, though the decline was statistically equal to zero. After treatment, there is a larger decline starting in the second quarter of 2013. After the rule, non-GSE loans experienced a significant and persistent drop in unpaid bank card balances. Figure 7d shows a statistically significant and persistent drop in bankruptcy filings after the CFPB rule was introduced, mirroring a smaller increase after the 2011 Guidelines. Finally, credit card limits shown in Figure 7e show no significant difference between GSE and non-GSE loans before the 2011 Guidelines. Following the 2011 Guidelines, non-GSE loans experienced a small drop relative drop in credit card limits,

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followed by a large and persistent increase following the 2013 rule, with the largest jump in the second quarter of 2013, similar to fraction of balances unpaid.

The results from the difference-in-differences models parallel the event study results and are shown in Tables A1 to A10. These results parallel the event study results, and due to the inclusion of quarter fixed effects are also within-quarter. In general, the coefficient of interest, NonGSE × Post, is close to the average of the post-treatment event study coefficients. The difference-in-differences tables show the stability of our results to the inclusion of controls. In general, the results are quite similar regardless of whether we include state fixed effects, controls for origination year or control for loan and borrower characteristics at origination. The primary exception to this is bankruptcy, shown in Table A9 whose effect is noticeably larger with the inclusion of controls, but the coefficient is statistically significant even without controls. The stability of the results suggests that, for example, the modest increase in credit scores that we observe is not dependent on controlling for observable borrower or loan characteristics at origination.

4.2   Duration Model

The linear regression results are subject to survival bias, meaning that outcomes are observed only for loans that survive until a particular time period. Our loan performance outcomes of interest may be highly correlated with exit from the sample, since distressed borrowers are likely to sell or refinance the property.[2]

We estimate a duration model for each performance outcome to quantify the unconditional change of the probability of *entering* a particular status in any given month. Each estimate also includes controls for loan characteristics, as well as year of origination and state fixed effects. The results are Table 2. The foreclosure result shows that per time quarter, the probability of being in foreclosure in the post-period is reduced by 12.2% for non-GSE loans relative to GSE loans. The probability of being in loss mitigation fell by 44% for non-GSE loans, and the probability of dual tracking fell by a similar amount, -47.9%. The probability of being current rose by 12.1%

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[2]Credit outcomes are provided for several months after the loan is not observed in our data, attenuating the effect of survival bias.

nearly exactly the same as the point estimate for the fall in the probability of being in foreclosure filing. The probability of being in foreclosure sale in a given quarter after the rule fell by 32.6% for non-GSE loans relative to GSE loans. Overall, the signs of all of the duration model results agree those in the event studies and difference-in-differences models.

5 Heterogeneous Effects

5.1 Heterogeneity by Credit Score

To study the drivers of these results, we consider whether any subcategories of mortgages are largely responsible for the loan performance outcomes we observe. Since our data does not include race or income information, we look at heterogeneous effects across individuals' original credit score as a proxy for race and income. The treatment does have a significant differential impact across credit score categories, as shown in Figures 8 and 9. Figure 8a shows that low credit score categories experience the largest drop in foreclosure filing. The size of the effect decreases as credit scores increase, with the credit scores above 800 experiencing a statistically insignificant increase in foreclosure filing. This effect is consistent with servicers targeting filing more carefully after the rule was introduced. This result for borrowers with above an 800 credit score persists across the results, and is statistically insignificant other than loss mitigation, current, and credit card limits. Note that mortgage borrowers in our sample are likely to be prime, limiting precision in lower credit score categories. Figure 8b shows a similar impact for the drop in loss mitigation, where low credit score borrowers see a large drop, while high credit score borrowers experience an increase in loss mitigation. Figure 8c shows that low credit score borrowers are most heavily impacted by the drop in dual tracking, though the highest credit score borrowers are simply unaffected.

The effect of CFPB rules on loans being current show the opposite pattern. Figure 8d shows that the lowest credit scores see the largest increase in the probability of being current, with an increase of over .05. In contrast, borrowers with a credit score above 800 experience a drop in being current after the rules were introduced. The effect on foreclosure sales is shown in Figure 8e. Foreclosure sales drop most for credit scores between 700 and 800. Very low credit score borrowers

actually experience an increase in foreclosure sales, as do high credit score borrowers.

Figure 9a shows the differential effect of treatment on borrowers' *current* credit scores, separately by original credit score. Borrowers with original credit scores around 550 see a 15 point increase due to servicing regulation, with the size of the effect decreasing as credit score increases. Similar to the results in mortgage outcomes, borrowers with above an 800 credit score actually see a slight decrease. Figure 9b and Figure 9c show no significant differences in credit outcomes across credit score categories for both increases in auto debt and past due bank card amounts.

Figure 9d shows a slightly different effect across credit scores in bankruptcy filings. Low credit score borrowers appear to see a significant decrease in filings of about .012 due to servicing rules, while other credit score groups see statistically insignificant decreases, and those with credit scores above 800 see a statistically significant increase. Finally, Figure 9e shows a different pattern across credit card limits. Here, high credit score borrowers with scores between 750 and 850 see a drop in credit limits of about $2000, while other credit score categories have an increase in credit limits of a similar size.

5.2   Effect Mechanisms

Finally, we study whether shifts in loan performance were driven primarily by expansions in foreclosure timeline. Literature on foreclosure delay (Calem et al. (2017), Cordell et al. (2015)) suggest that longer timelines to foreclosure are more borrower friendly, increasing liquidity and improving consumer outcomes in the short run. States had different foreclosure timelines prior to the servicing rule - judicial foreclosures take longer to complete than non-judicial foreclosures. Using standard designations for judicial vs. non-judicial foreclosure by state, we compare the impact of the regulations on both groups in Tables A11 and A12. There is only a statistically significant difference between judicial and non-judicial states in dual tracking and loss mitigation, with non-judicial states driving the results in those cases. In the cases in which the NonGSE $\times$ Post $\times$ Judicial coefficient is statistically insignificant, it still goes in the direction of non-judicial states driving the effect. Table A12 does not indicate a statistically significant difference between judicial and non-judicial states in credit outcomes. However, for all outcomes other than bank card past

due amount, the point estimates go in the direction of the credit effects being more substantial in non-judicial states, mirroring the mortgage results. Taken together, this point to the rule potentially having a larger effect in states with shorter pre-existing foreclosure timelines, though the effects are for the most part imprecisely estimated.

These results suggest that the servicing rule effects are not driven by delays alone. Recent research describes the key role of communication in efficient servicing (Bandhyopadhyay (2022)). The results suggest that regulation providing incentives to share soft information, alongside delays in foreclosure filing, can improve loan performance.

Next, we study whether loan modifications outside the loss mitigation process may be driving the effects we observe. For instance, HAMP was in place throughout our study time period, with an expansion in 2012. To do so, we keep the sample of loans for whom payment size does not change throughout the performance time period. The results are reported in Tables A13 and A14. The results look almost identical to the baseline effects, except that loss mitigation is no longer significantly affected and dual tracking decreases by a smaller amount. This suggests that modifications in monthly payments are not driving these effects. Instead, improvements in loan performance and credit outcomes are likely driven by error correction, resolution of documentation issues, and additional breathing room provided by servicers for borrowers to cure their default.

5.3 Comparing GSE and Non-GSE Treatments

To study the impact of regulatory design on borrower outcomes, We compare the effect of the CFPB rules with the earlier introduction of the GSE guidelines in 2011. CFPB rules largely agreed with earlier GSE guidelines, but there were some important differences. First, GSE foreclosure filing timelines were not explicitly limited to 120 days of default. Instead, services could file for foreclosure anytime after communication requirements were met and foreclosure alternatives were considered. Second, GSE guideline changes were contractual, meaning that the guidelines were enforced privately by the GSEs and their investors. In contrast, CFPB rules were publicly enforced using CFPB supervision and examinations procedures. To compare these two mechanisms, we can estimate the size of the 2011 treatment effect. For this, we define treatment as being post-2011 but

pre-2014 for GSE loans. The results are reported in Tables 3 and 4.

Unlike the CFPB rule, we observe an increase in loss mitigation for GSE loans after the 2011 guidelines as shown in Table 3. Similarly to the CFPB rule, we observe a small but significant increase in the probability of a loan being current, though the point estimate is smaller. There is a negative but statistically insignificant effect on foreclosure filing, and the point estimate is less than half of that for the CFPB rule. We do not see a significant effect on dual tracking or foreclosure sales.

The smaller effects on mortgage outcomes are reflected in the credit outcome results, shown in Table 4. All of the results are small and statistically insignificant other than credit limit, which like the CFPB rule shows a significant increase, though the point estimate is small. Unlike the CFPB rule, we observe a significant increase in the fraction of bankcard balances unpaid, but the 0.1 percentage point increase is small and marginally statistically significant.

This comparison suggests that the GSE contractual changes in 2011 were more effective in encouraging servicers to provide loss mitigation to borrowers, resulting in some borrowers curing their default. However, GSE loans did not see a significant change in foreclosure filings and sales, resulting in fewer subsequent effects on other indicators of financial health such as credit score, bankruptcy, and debts.

6   Isolating the Effect of Foreclosure Filing

A servicer's decision to file for foreclosure depends on the legal environment relevant to a particular loan. The CFPB rules provide a random shifter of foreclosure filing. We use predicted foreclosure from exposure to the regulation as an instrument for foreclosure filing, to estimate the causal effect of a foreclosure filing on distressed borrowers. Given the context in which we are estimating, our estimate should be interpreted as the effect of servicer-driven foreclosure filing choice, holding all else fixed, on the margin of borrowers impacted by the regulation (eg. compliers).

Our instrument is predicted foreclosure generated from the duration model, which is robust

to survival bias in the data. To be a valid instrument, the predicted foreclosure measure must be correlated with observed foreclosure ("relevance") and should not directly influence outcomes except through shifting the instrumented variable ("exclusion restriction"). Figure 10a plots predicted and actual foreclosure probabilities, showing a significant correlation between predicted foreclosure and actual foreclosure. The first stage F statistic is 22.1, which allays the concern that the instrument is weak based on standard test methods (Lee et al. (2021)). Moreover, our model is just-identified, since duration model covariates are combined to generate a predicted foreclosure probability. Just-identified models are more robust to weak instrument bias than models with many weak instruments (Angrist and Kolesár (2022).

Since the prediction is generated based on loan characteristics, including the loan's status as non-GSE and the performance date being past 2013, it should be uncorrelated with any unobservable borrower traits. The exclusion restriction would be violated if borrowers were aware of the rule's introduction and changed their behavior in direct response to the policy. Figures 10b and 10c show that borrower behavior, both in choosing to miss one payment or to default by missing more than 3 payments, do not appear to be directly impacted by the regulation. Treatment has no effect on delinquency at all. There is a small and statistically significant decrease in default after the rule's introduction. This is consistent with early communication and intervention by servicers averting serious default.

It is important to note that we were not able to document any evidence of strategic default as a result of the servicing rule, despite the incentives created by the regulatory delay. Strategic default is defined as the decision to stop making mortgage payments despite having the ability to pay. As documented by Gerardi et al. (2013), Ferreira and Gyourko (2015), Mayer et al. (2009), there was a large uptick in defaults during the Great Recession, with Guiso et al. (2013) documenting that 35% of defaults were strategic. If borrowers were defaulting in response to less aggressive servicing, we would be concerned that the regulation could impact credit outcomes directly through changes in savings or spending behavior. There is no evidence here of delinquency or default responding strategically to servicing regulation, suggesting that mortgage servicing regulation would impact credit outcomes only by shifting servicer-driven loan performance variables.

We then use the predicted foreclosure instrument to study the causal effect of being in the foreclosure process on credit outcomes, with results shown in Table 5. There is a positive effect of foreclosure filing on credit score, though the effect is not statistically significant. Foreclosure filing causes a decrease of more than 5% in auto purchase and increases bank card debt by $2,357. There is no significant effect of foreclosure filing on bankruptcy filing or credit card limits, though both effects are imprecisely estimated.

These results are quite different from the direct effect estimated with event study and difference-in-difference methods, suggesting that servicing regulation had impacts on credit separate from foreclosure avoidance. For instance, the difference-in-difference results could be driven by loans who return to current from delinquency, without being at risk of foreclosure.

The IV results show that avoidance of foreclosure filing increases household leverage and utilization of existing credit. There is no significant effect on credit scores or on bankruptcy filings, but fraction of bank card balances unpaid does increase. It appears that foreclosure lowers the likelihood of purchasing a car, suggesting that borrowers may be less likely to seek new credit if they experience foreclosure filing, or may be more likely to be denied. Our results are consistent with existing evidence about the causal effect of repossession, as demonstrated by Collinson and Reed (2199). In essence, borrowers' distress is caused by an underlying financial shock such as job loss, divorce, illness, or death. Borrowers then go into default on mortgages and other debts, leading to worse financial circumstances such as lowered credit scores and higher bankruptcy filing rates. Foreclosure filing itself, therefore, does little to impact these outcomes.

What mechanism is driving the IV results? We consider three alternative explanations: a supply side explanation driven by credit access, a demand side explanation driven by debt overhang, and a demand side explanation driven by a precautionary decrease in spending. First, our credit results could be driven by a drop in credit access due to foreclosure. The drop in auto loans observed in the IV regressions could be driven by lack of access to new credit, meaning that foreclosure filing limits the availability of auto loans, and causes borrowers to utilize existing credit lines more heavily despite being unable to make additional payments. However, this contradicts the statistically insignificant effect of foreclosure filing on credit scores and credit card limits, though they are not

estimated as precise zero effects. In addition, the increase in past due bank card balances suggests that borrowers are utilizing credit extensively when they receive a foreclosure filing

Another potential explanation for our results would be household debt overhang. A broad literature on debt overhang shows that high household debt burdens can decrease consumption (see Ogawa and Wan (2007), Dynan (2012), Dynan and Edelberg (2013), Mian and Sufi (2010), Mian et al. (2013), Cooper (2012) Olney (1999) Albuquerque and Krustev (2018)). This theory would predict that before foreclosure, households would experience a drop in consumption. Post-foreclosure, as the debt burden is relieved, households would receive a positive liquidity shock. However, this would mean that the causal effect of foreclosure filing on auto loans would be positive, since most car purchases are made with credit.[3] Moreover, bank cards should be more likely to get paid off after the regulation. Our data shows the opposite -foreclosure causes auto debt to drop and increases bank card debts.

The third interpretation is that foreclosure filing causes households to stop spending in response to the threat of foreclosure. We cannot definitely conclude that this mechanism is at work, because none of our outcomes comprehensively measure consumption. However, the credit lines we study show a contraction in credit utilization with no symmetric effect on credit supply. If this interpretation is correct, limiting foreclosure filing causes more spending and decreased late payments on other credit lines.

To quantify this effect, we can do a back of the envelope calculation to estimate the spending effect of a pause on foreclosure filings. An average individual in our data who randomly receives forbearance instead of a foreclosure filing will have a .051 increase in spending at least $3000 on an auto purchase, and will pay off $2356.9 in past due bank card debt. Total spending increased by more than $2500. Note that this number is likely an underestimate because it accounts only for two trade lines, and covers a population of borrowers who qualify for 30 year, fixed rate, purchase mortgage loans - in other words, the safest population of borrowers.

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[3]At least, the effect would be zero, since Melzer (2017) shows that household quarterly spending on automobiles is not elastic with respect to negative equity and default risks.

7   Conclusion

This paper shows that mortgage servicing regulations lower foreclosure rates and significantly improve loan performance, as well as positively impacting credit outcomes. We study the introduction of the CFPB's mortgage servicing rule in 2013. The rule required servicers to wait 120 days before foreclosure, to establish early and continuous contact with borrowers, and to work with borrowers to consider loss mitigation strategies. Introduction of the rule caused a persistent drop in foreclosure rates and a significant uptick in loans that were current on payment. Moreover, the mortgage servicing effects spill over onto other credit lines, causing higher credit scores, higher credit limits and more auto debt. These effects are driven by improvements in the financial health of borrowers with the lowest credit scores, and appear to be due to communication requirements as well as foreclosure delays.

Assessing the causal effect of foreclosure on credit outcomes, we show that foreclosure avoidance increases household leverage without impacting their credit scores or bankruptcy filings. These results are consistent with debt relief acts as a source of temporary liquidity for distressed households, even in non-crisis periods. Subsidizing the provision of private debt relief through forbearance policies or debt collection policies could improve household welfare by specifically targeting the most vulnerable borrowers.

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A   Appendix

Figure 1: Servicing Relationships

Lender —Loan→ Borrower

Lender —Servicing Right→ Servicer

Servicer ↕ Performance Borrower

Lender —Note→ Owners/Investors

Servicer —Advances→ Owners/Investors
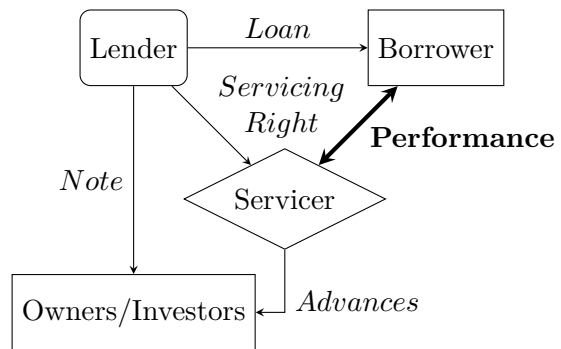
Figure 2: Decision Timeline

Borrower Actions

Servicer Actions

Current

Cure

Delinquent

Loss Mitigation

Default

Foreclosure Filing
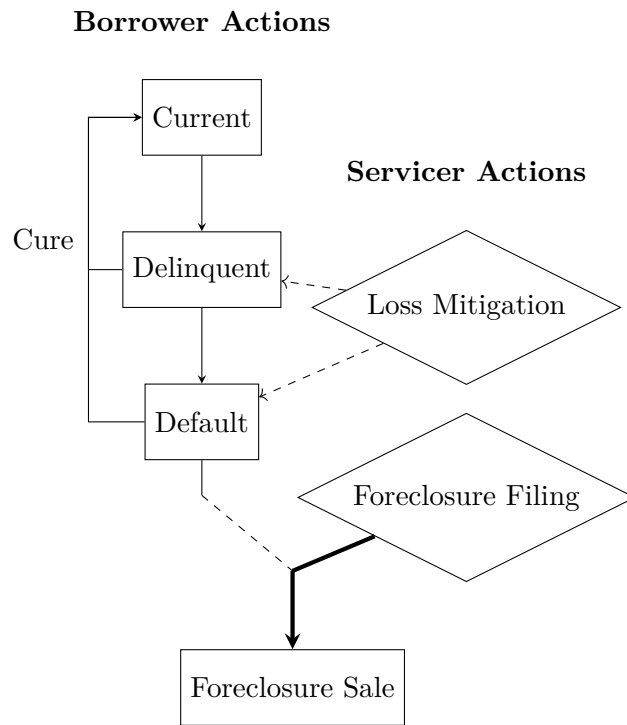
Foreclosure Sale

Figure 3: Hazard Rate Post-Default Outcomes
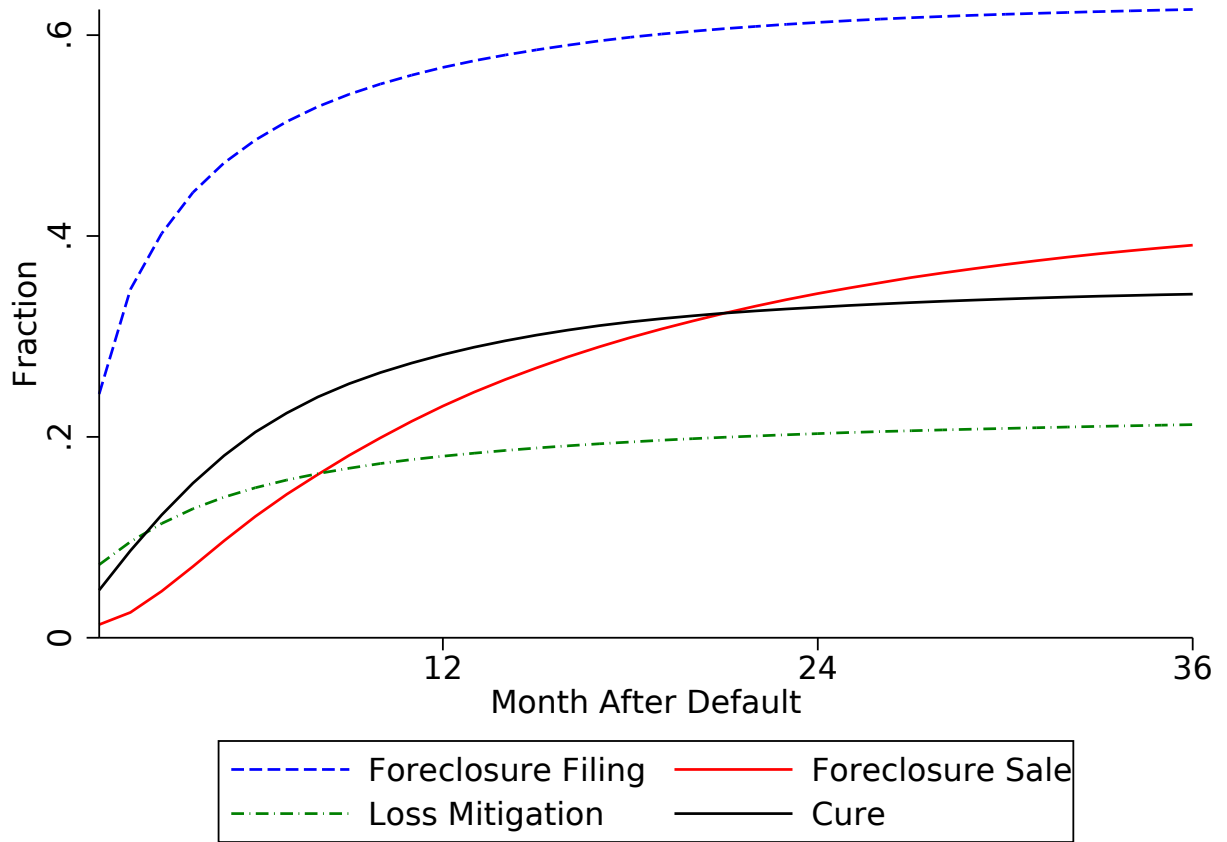
Notes: Graph shows the propensity of defaulted borrowers to cure their default, engage in loss mitigation, face a foreclosure filing, or experience a foreclosure sale in the months after default. Data comes from McDash mortgage loan performance data.

Figure 4: Mortgage Outcome Time Series for Treatment and Control Loans
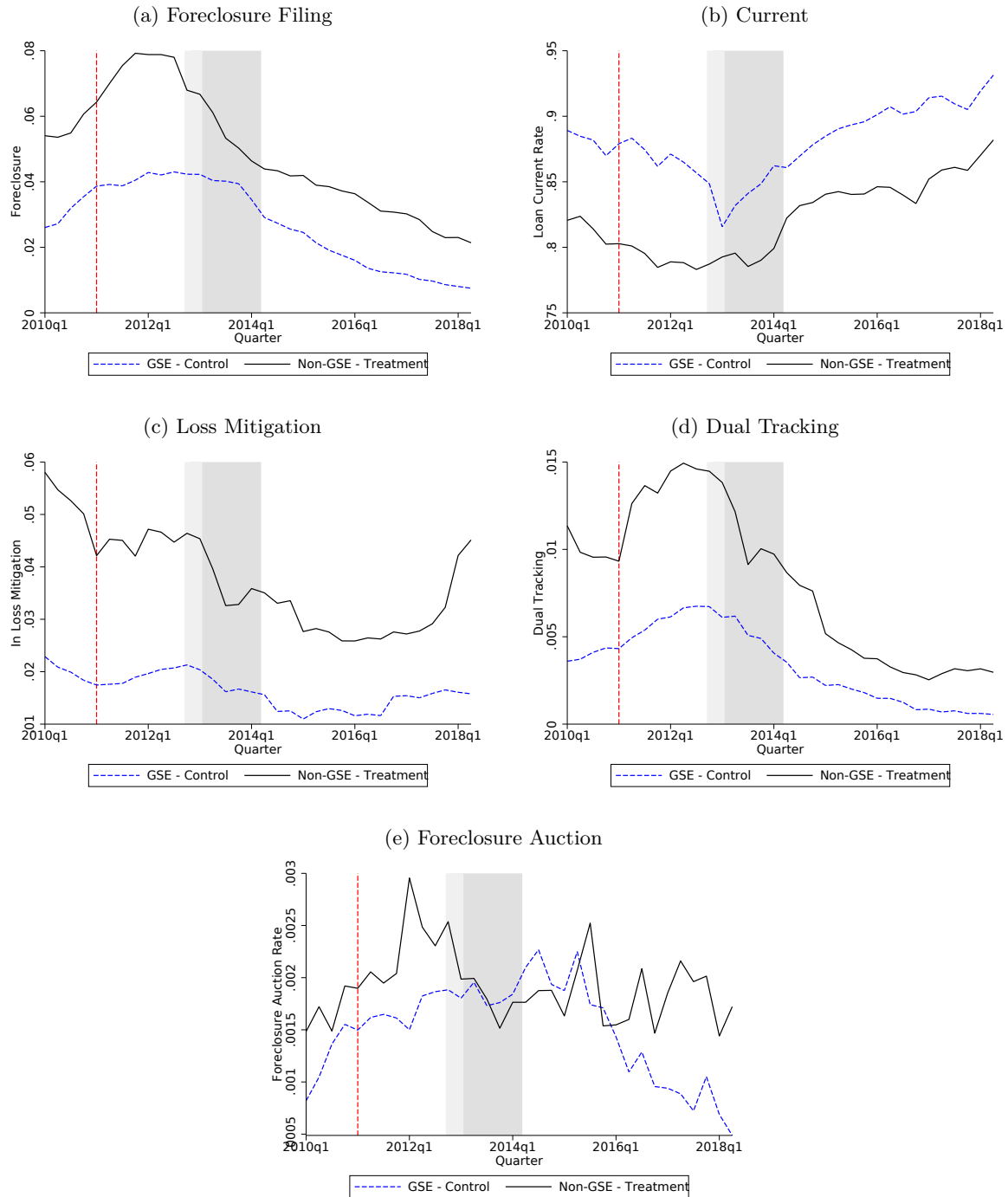
(a) Foreclosure Filing

(b) Current

(c) Loss Mitigation

(d) Dual Tracking

(e) Foreclosure Auction

Notes: Graph shows raw averages of outcomes in each quarter for GSE and non-GSE loans. Dataset is from McDash mortgage loan performance data. The first red line marks the passage of the final rule in January 2013, and the second red line marks the date of implementation in January 2014.

Figure 5: Credit Outcome Time Series for Treatment and Control Loans
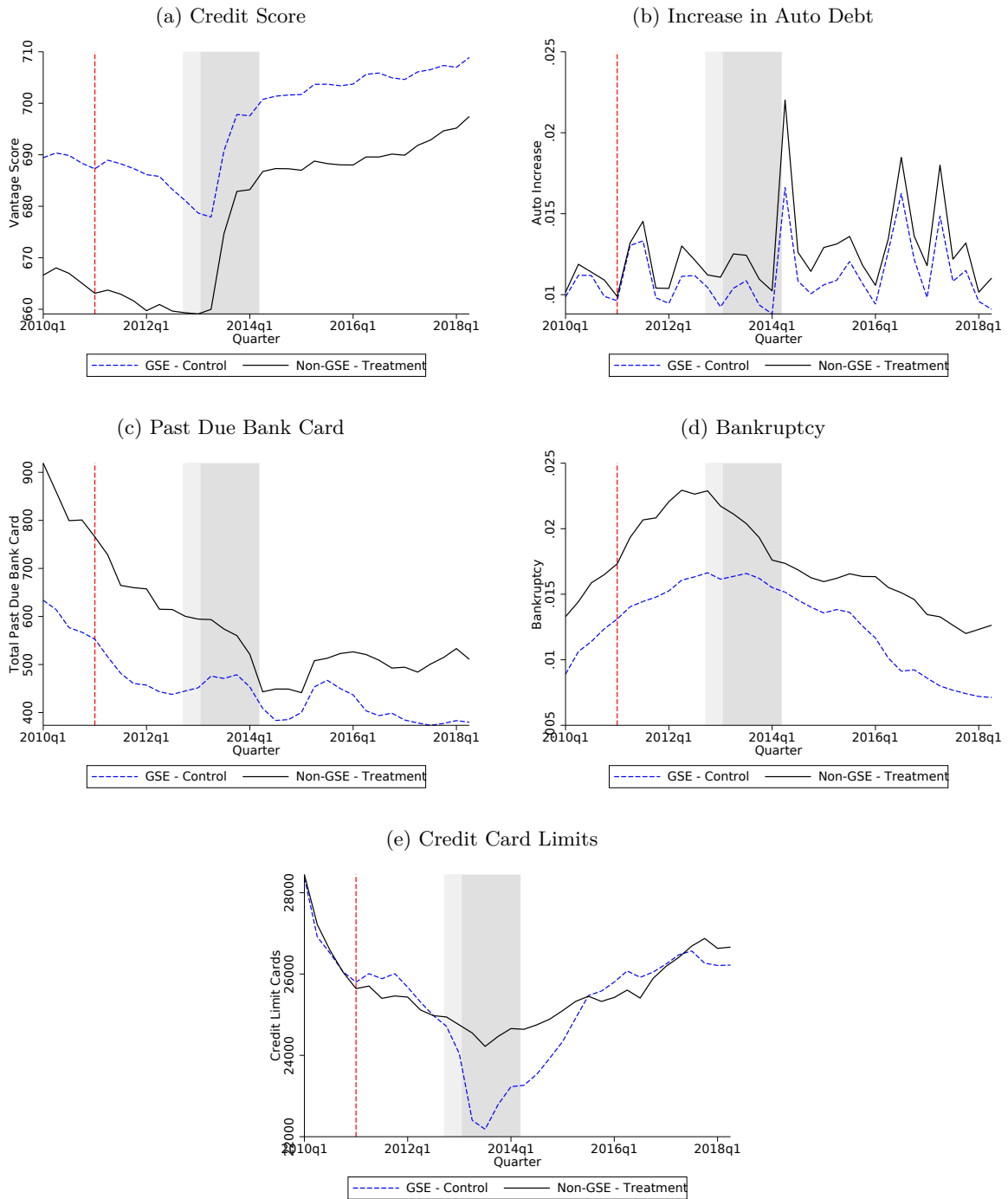
(a) Credit Score

(b) Increase in Auto Debt

(c) Past Due Bank Card

(d) Bankruptcy

(e) Credit Card Limits

Notes: Graph shows raw averages of outcomes in each quarter for GSE and non-GSE loans. Dataset is from Equifax credit data. Graph shows raw averages of outcomes in each quarter for GSE and non-GSE loans.

Figure 6: Event Study Graphs for Loan Performance
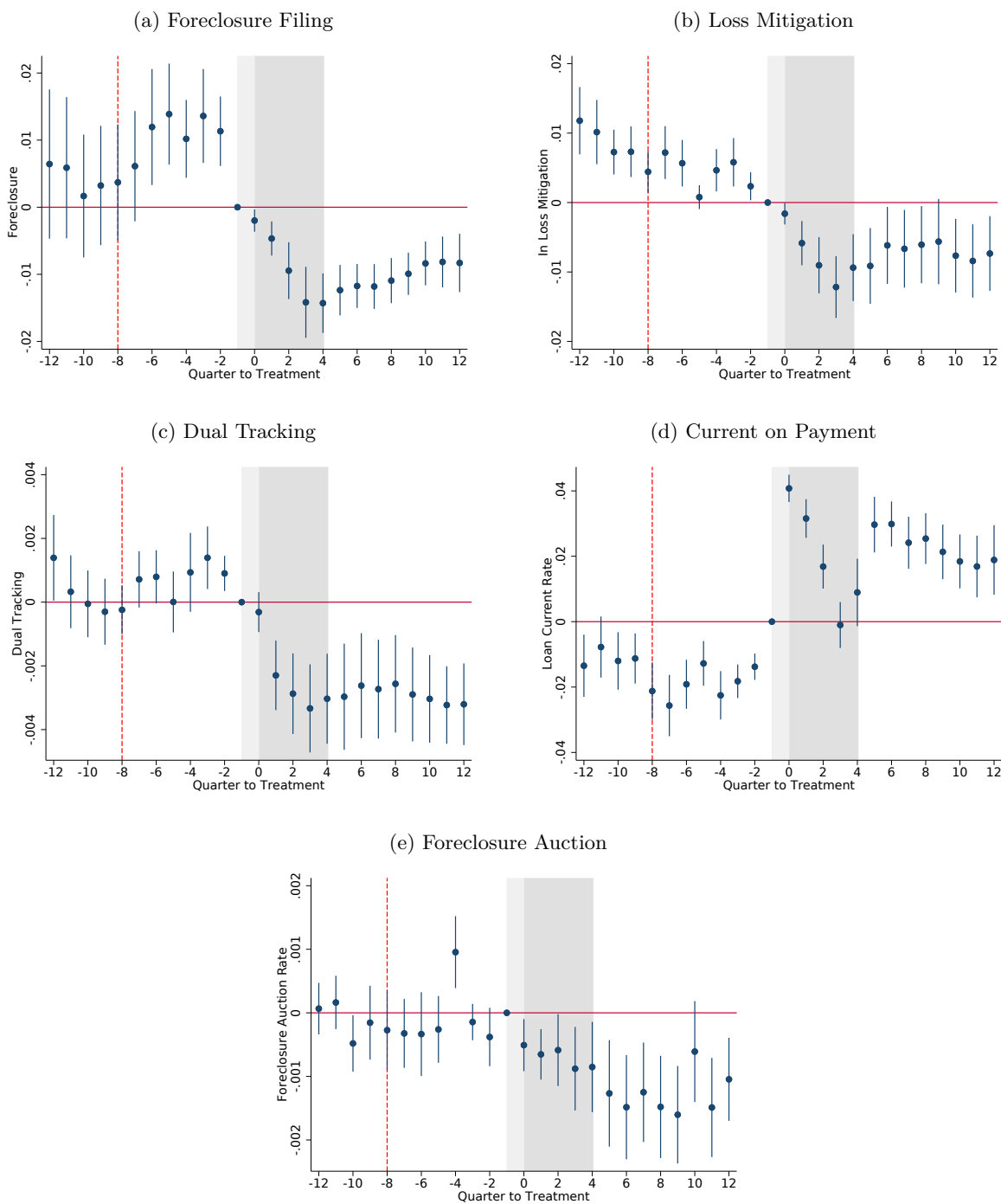
(a) Foreclosure Filing

(b) Loss Mitigation

(c) Dual Tracking

(d) Current on Payment

(e) Foreclosure Auction

Notes: Quarters from Q1 2013 to Q1 2014 are shaded, showing the time from announcement to implementation of the servicing rule, estimating equation 1. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample comes from McDash mortgage loan data and includes all purchase loans originated between 2000 and 2008, with fixed interest rate and 30 year term, resulting in a sample size of 8.2 million loan months.

Figure 7: Event Study Graphs for Credit Outcomes
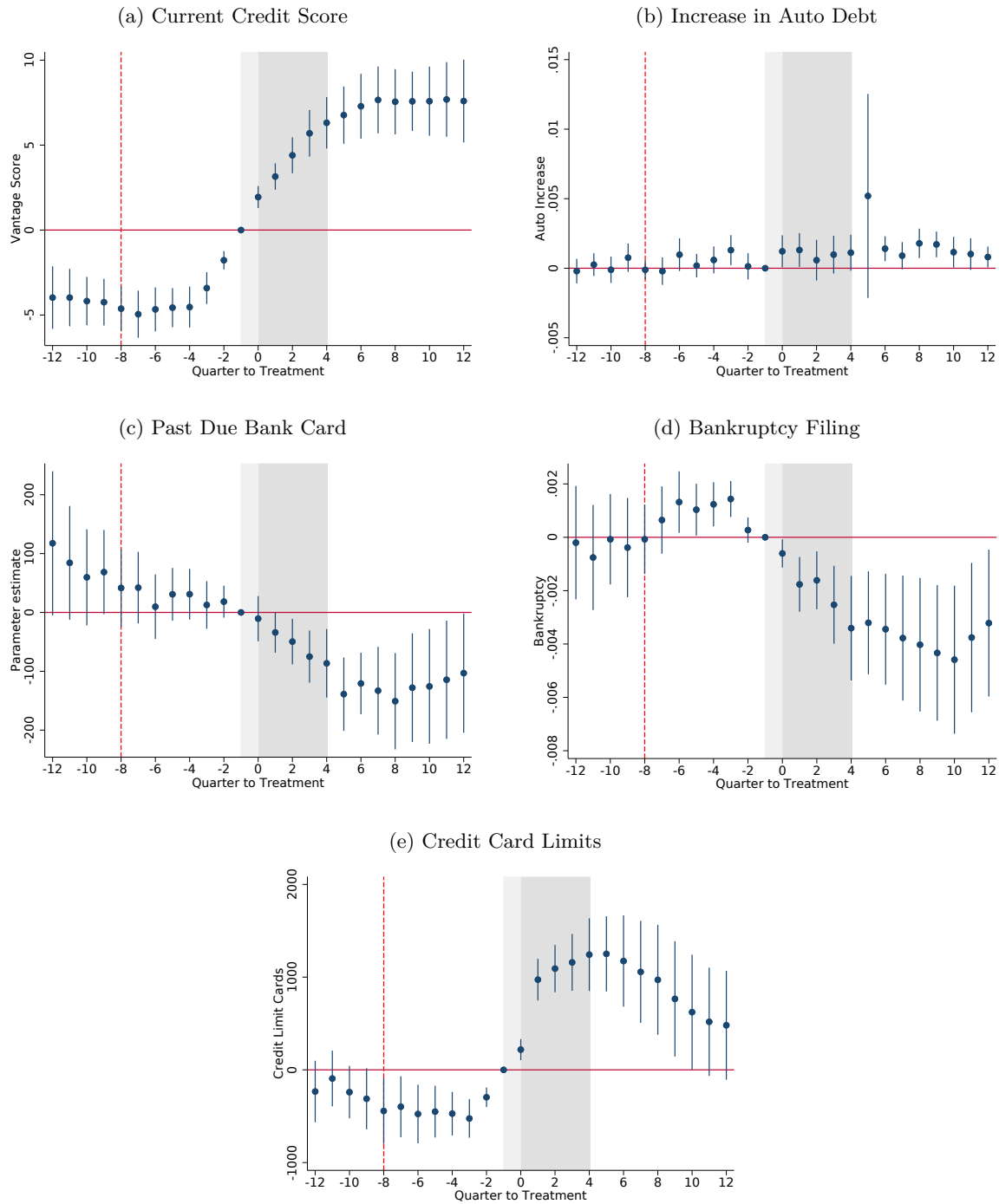
(a) Current Credit Score

(b) Increase in Auto Debt

(c) Past Due Bank Card

(d) Bankruptcy Filing

(e) Credit Card Limits

Notes: Quarters from Q1 2013 to Q1 2014 are shaded, showing the time from announcement to implementation of the servicing rule, estimating equation 1. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample comes from Equifax credit data and includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term, resulting in a sample size of 8.2 million loan months.

Figure 8: Heterogeneous Loan Performance by Credit Score

(a) Foreclosure Filing

(b) Loss Mitigation

(c) Dual Tracking

(d) Current on Payment

(e) Foreclosure Auction

Notes: Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample comes from McDash mortgage loan data and includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term.

Figure 9: Heterogeneous Credit Outcomes by Credit Score

(a) Current Credit Score

(b) Increase in Auto Debt

(c) Past Due Bank Card

(d) Bankruptcy Filing

(e) Credit Card Limits
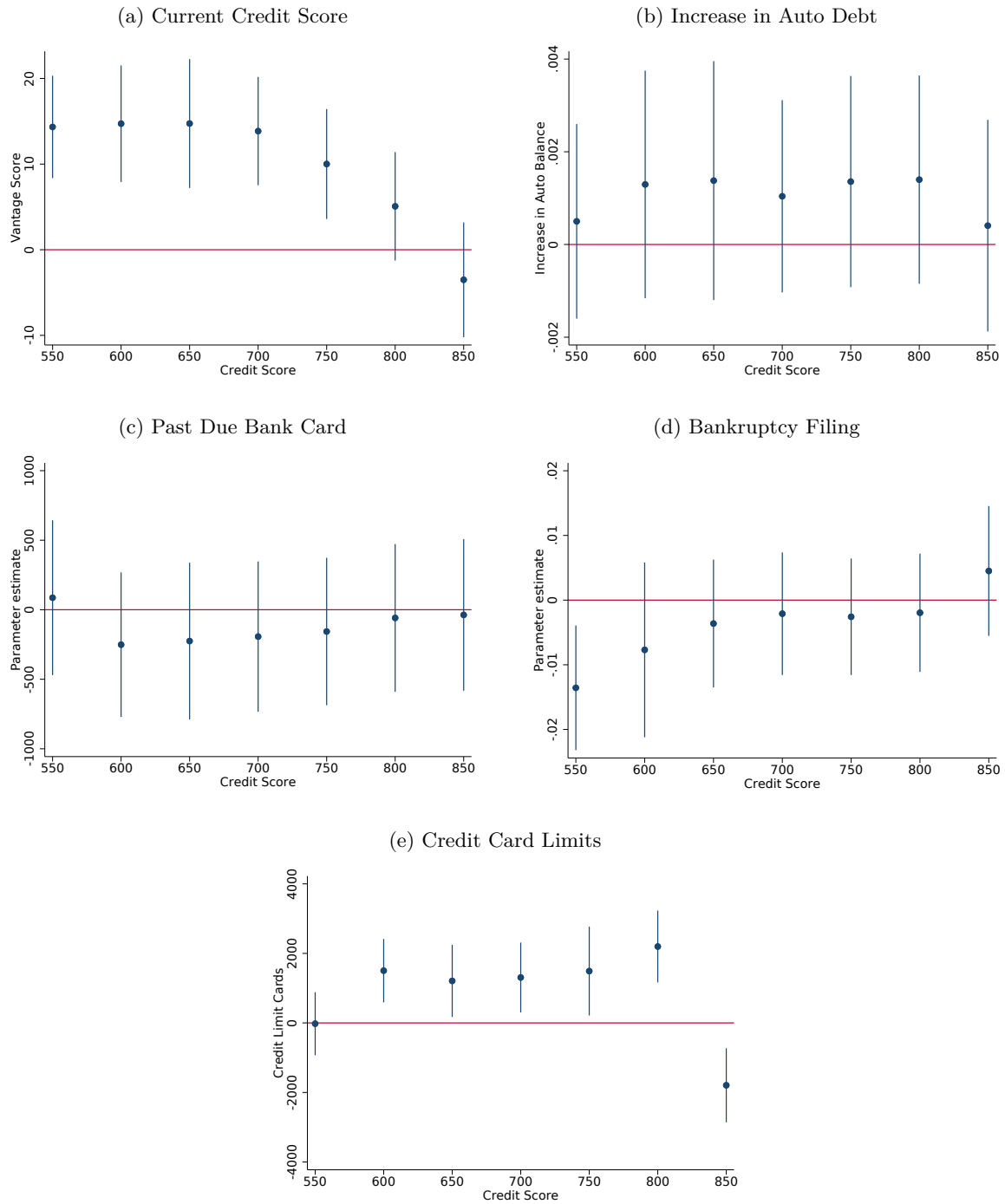
Notes: Each graph shows the point estimate and confidence intervals of the Post2013*Non-GSE treatment interacted with credit score category dummies. Dataset is from Equifax credit data. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample comes from Equifax credit data and includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term.

Figure 10: IV Assumptions

(a) Relevance of IV

(b) Event Study, 30 Day Delinquent

(c) Event Study, 90 Day Default
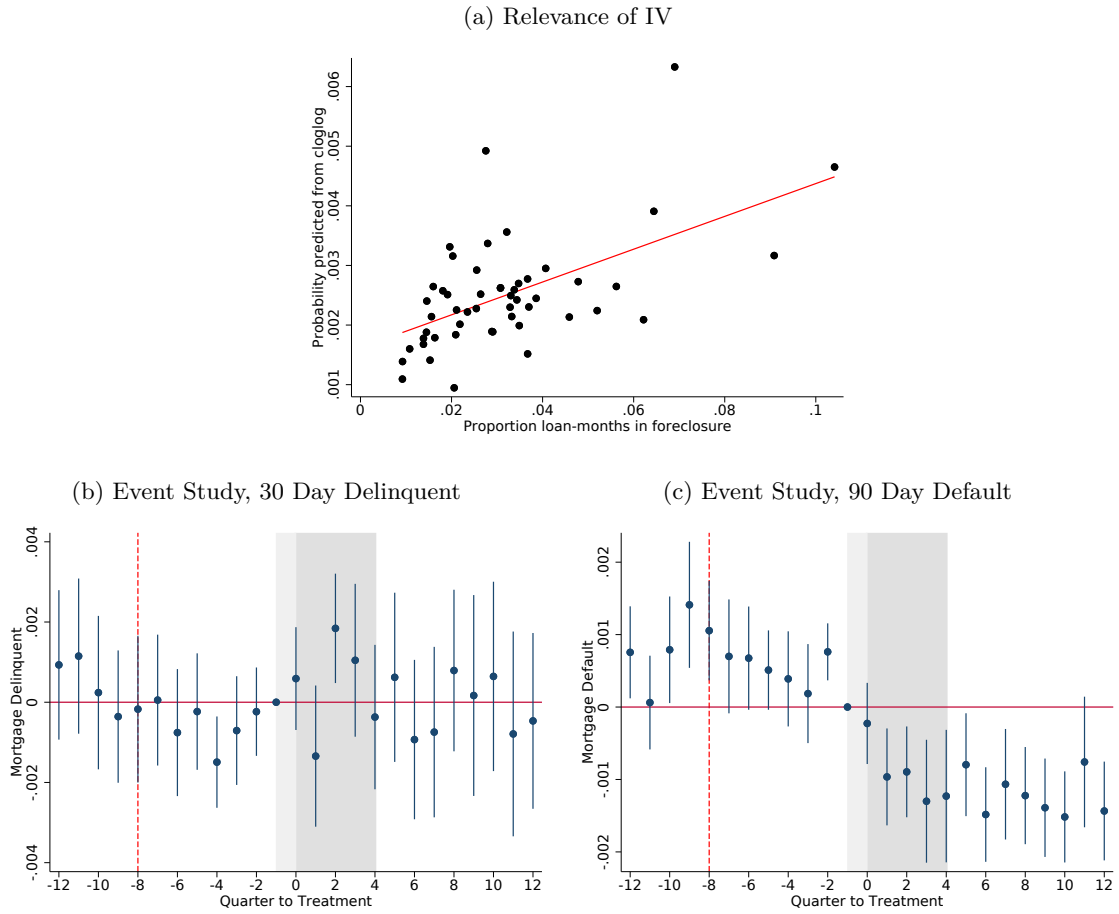
Notes: Dataset is from McDash mortgage loan performance data. Figure 10a plots the average predicted foreclosure rate vs. actual foreclosure rate for each of the 50 states, along with a best fit line. In Figures 10b and 10c, quarters from Q1 2013 to Q1 2014 are shaded, showing the time from announcement to implementation of the servicing rule. Controls include interest rate, borrower credit score and loan amount at origination, and state and origination year fixed effects. Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term.

Table 1: Summary Statistics

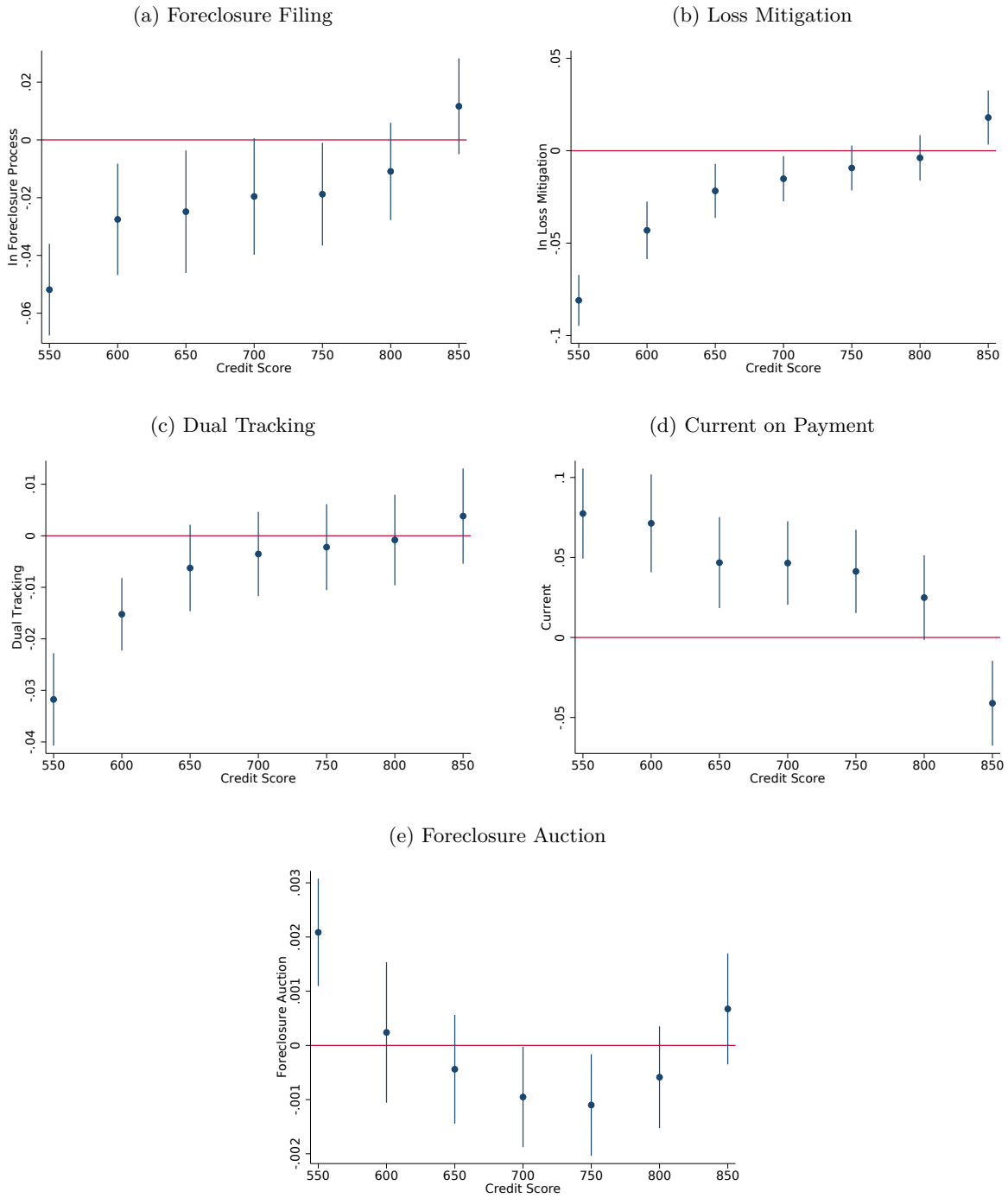|	Count	Mean	p10	p50	p90
Loan Characteristics					
Origination Year	2.35e+07	2004.778	2002	2005	2007
Orig Credit Score	1.93e+07	717.0332	635	724	790
Interest Rate	2.48e+07	.0631619	.055	.0625	.0725
Loan Amount	2.48e+07	167736.3	62000	134000	308000
Mortgage Status					
Foreclosure Filing	2.48e+07	.0387684	0	0	0
In Loss Mitigation	1.78e+07	.0236598	0	0	0
Dual Tracking	2.48e+07	.0057484	0	0	0
Current	2.48e+07	.8575286	0	1	1
Foreclosure Sale	2.48e+07	.0016393	0	0	0
Credit Outcomes					
Credit Score	2.41e+07	686.2813	540	711	810
Increase in Auto Debt	2.48e+07	.0112605	0	0	0
Bankruptcy	2.48e+07	.0144897	0	0	0
Credit Card Limit	2.48e+07	25543.92	0	17655	61600

Table 2: Duration Model Estimates

	(1) Foreclosure Filing	(2) Loss Mitigation	(3) Dual Tracking	(4) Current	(5) Foreclosure Sale
NonGSE	0.195***	0.499***	0.372***	-0.123***	0.0679***
	(0.0120)	(0.0171)	(0.0195)	(0.000920)	(0.0159)
Post	-0.297	-0.804**	-1.503**	0.0565***	0.560***
	(0.177)	(0.265)	(0.507)	(0.00614)	(0.147)
NonGSE*Post	-0.122***	-0.441***	-0.479***	0.121***	-0.326***
	(0.0246)	(0.0345)	(0.0463)	(0.00139)	(0.0252)
Loan Amount	0.000000122***	0.000000149***	0.000000169***	-0.000000447***	0.000000126***
	(1.25e-08)	(1.11e-08)	(1.19e-08)	(2.73e-09)	(1.34e-08)
Interest Rate	30.45***	23.52***	37.56***	-16.16***	29.93***
	(0.509)	(0.801)	(0.738)	(0.0400)	(0.588)
Orig Credit Score	-0.00600***	-0.00585***	-0.00667***	0.00417***	-0.00470***
	(0.0000527)	(0.0000791)	(0.0000827)	(0.00000521)	(0.0000725)
Constant	-5.778***	-5.785***	-7.782***	-0.760***	-6.773***
	(0.251)	(0.374)	(0.684)	(0.0119)	(0.256)
Quarter, State, and Orig Year FEs	x	x	x	x	x
N	17759252	18053087	18934059	19302853	19302733

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state.

Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term.

Table 3: 2011 GSE Treatment - Loan Outcomes

	(1) Foreclosure Filing	(2) In Loss Mitigation	(3) Dual Tracking	(4) Current	(5) Foreclosure Sale
GSE	-0.0101**	-0.0148***	-0.00208***	0.0254***	-0.000152
	(0.00296)	(0.00173)	(0.000375)	(0.00319)	(0.0000916)
GSE*Post-2011	-0.00422	0.00558***	-0.000120	0.00548**	0.0000258
	(0.00211)	(0.00114)	(0.000300)	(0.00161)	(0.0000933)
Loan Amount	4.43e-08**	2.45e-08**	7.73e-09***	-8.78e-08***	1.04e-09*
	(1.58e-08)	(8.48e-09)	(2.10e-09)	(2.33e-08)	(4.13e-10)
Interest Rate	3.175***	1.421***	0.465***	-6.864***	0.109***
	(0.640)	(0.149)	(0.0408)	(0.616)	(0.00911)
Orig Credit Score	-0.000292***	-0.000202***	-0.0000554***	0.00114***	-0.0000110***
	(0.0000460)	(0.0000137)	(0.00000793)	(0.0000366)	(0.000000998)
Constant	0.0549***	0.0832***	0.0159**	0.465***	0.00273***
	(0.0142)	(0.0170)	(0.00576)	(0.0297)	(0.000656)
All FEs	x	x	x	x	x
N	11512749	7214374	11512749	11512749	11512749

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state.

Sample comes from McDash mortgage loan data and includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term.

Table 4: 2011 GSE Treatment - Credit Outcomes

	(1) Credit Score	(2) Increase Auto Debt	(3) Past Due Bank Card	(4) Bankruptcy	(5) Credit Card Limit
GSE	10.06***	-0.000158	-126.5**	-0.00164**	148.1
	(0.671)	(0.000163)	(40.70)	(0.000604)	(476.1)
GSE*Post-2011	-0.685	-0.000175	61.53	-0.00103	170.9*
	(0.429)	(0.000155)	(33.43)	(0.000700)	(70.81)
Loan Amount	0.00000632*	7.23e-09***	0.000636***	8.83e-10	0.0272***
	(0.00000272)	(1.34e-09)	(0.000149)	(1.69e-09)	(0.00534)
Interest Rate	-2530.1***	-0.0451***	28100.7***	0.537***	-226532.8***
	(91.49)	(0.0106)	(1938.7)	(0.0586)	(19200.6)
Orig Credit Score	0.667***	-0.0000137***	-3.007***	-0.000148***	87.83***
	(0.00922)	(0.00000131)	(0.217)	(0.0000111)	(2.317)
Constant	352.2***	0.0227***	969.5***	0.0892***	-27614.0***
	(8.802)	(0.000921)	(165.2)	(0.00791)	(2713.3)
All FEs	x	x	x	x	x
N	11290272	11512749	9273579	11512749	11512749

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state.

Sample comes from Equifax credit data and includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term.

Table 5: IV Results

	(1) Credit Score	(2) Auto Increase	(3) Past Due Bank Card	(4) Bankruptcy	(5) Credit Card Limit
Foreclose	122.3	-0.0508***	2356.9*	0.00752	1288.5
	(79.95)	(0.0138)	(922.8)	(0.0568)	(15135.0)
Orig Credit Score	0.639***	-0.0000287***	-2.238***	-0.000132***	90.59***
	(0.0244)	(0.00000309)	(0.168)	(0.0000137)	(5.199)
Loan Amount	-0.00000573	1.02e-08***	0.000604***	4.24e-09	0.0272***
	(0.00000581)	(1.56e-09)	(0.000113)	(3.43e-09)	(0.00479)
Interest Rate	-2196.4***	0.0880***	13377.8***	0.363**	-182155.2***
	(251.1)	(0.0219)	(2091.3)	(0.128)	(45037.5)
All FEs	x	x	x	x	x
N	18210930	18210930	14689064	18210930	18210930

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state.

Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term.

Table A1: Diff-in-Diff on Foreclosure Filing

	Foreclosure Filing		
	(1)	(2)	(3)
NonGSE	0.0303***	0.0302***	0.0151***
	(0.00533)	(0.00531)	(0.00284)
NonGSE*Post	-0.0131**	-0.0131**	-0.0172**
	(0.00462)	(0.00447)	(0.00509)
Loan Amount			4.31e-08*
			(1.63e-08)
Interest Rate			2.097***
			(0.463)
Orig Credit Score			-0.000263***
			(0.0000407)
Constant	0.0324***	0.0324***	0.0848***
	(0.00696)	(0.00101)	(0.00992)
Quarter FEs	x	x	x
State FEs		x	x
Orig Year FEs			x
N	24833000	24833000	18649876

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: 10% sample of McDash mortgage performance data. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term, resulting in a sample size of 8.2 million loan months.

Table A2: Diff-in-Diff on Loss Mitigation

	In Loss Mitigation		
	(1)	(2)	(3)
NonGSE	0.0286***	0.0287***	0.0146***
	(0.00297)	(0.00274)	(0.00188)
NonGSE*Post	-0.0109**	-0.0111**	-0.0131***
	(0.00324)	(0.00325)	(0.00325)
Loan Amount			2.19e-08***
			(6.09e-09)
Interest Rate			0.764***
			(0.131)
Orig Credit Score			-0.000162***
			(0.00000966)
Constant	0.0178***	0.0179***	0.0822***
	(0.00148)	(0.000364)	(0.0142)
Quarter FEs	x	x	x
State FEs		x	x
Orig Year FEs			x
N	17785376	17785376	12226980

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: 10% sample of McDash mortgage performance data. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term, resulting in a sample size of 8.2 million loan months.

Table A3: Diff-in-Diff on Dual Tracking

	Dual Tracking		
	(1)	(2)	(3)
NonGSE	0.00699***	0.00696***	0.00272***
	(0.000559)	(0.000586)	(0.000362)
NonGSE*post	-0.00306***	-0.00307***	-0.00329***
	(0.000624)	(0.000632)	(0.000639)
Loan Amount			6.53e-09***
			(1.80e-09)
Interest Rate			0.291***
			(0.0273)
Orig Credit Score			-0.0000439***
			(0.00000591)
Constant	0.00428***	0.00429***	0.0160***
	(0.000727)	(0.000120)	(0.00406)
Quarter FEs	x	x	x
State FEs		x	x
Orig Year FEs			x
N	24833000	24833000	18649876

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: 10% sample of McDash mortgage performance data. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term, resulting in a sample size of 8.2 million loan months.

Table A4: Diff-in-Diff on Current

	Current		
	(1)	(2)	(3)
NonGSE	-0.0726***	-0.0744***	-0.0344***
	(0.00536)	(0.00528)	(0.00315)
NonGSE*Post	0.0235***	0.0236***	0.0365***
	(0.00638)	(0.00625)	(0.00685)
Loan Amount			-8.69e-08***
			(2.25e-08)
Interest Rate			-4.743***
			(0.483)
Orig Credit Score			0.00107***
			(0.0000341)
Constant	0.874***	0.874***	0.417***
	(0.00747)	(0.000986)	(0.0249)
Quarter FEs	x	x	x
State FEs		x	x
Orig Year FEs			x
N	24833000	24833000	18649876

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: 10% sample of McDash mortgage performance data. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term, resulting in a sample size of 8.2 million loan months.

Table A5: Diff-in-Diff on Foreclosure Sale

	Foreclosure Sale		
	(1)	(2)	(3)
NonGSE	0.000539***	0.000531***	0.000281***
	(0.000121)	(0.0000968)	(0.0000673)
NonGSE*Post	-0.000330*	-0.000365*	-0.000762***
	(0.000156)	(0.000153)	(0.000177)
Loan Amount			8.02e-10*
			(3.59e-10)
Interest Rate			0.0792***
			(0.00762)
Orig Credit Score			-0.0000104***
			(0.000000820)
Constant	0.00154***	0.00154***	0.00406***
	(0.000179)	(0.0000160)	(0.000472)
Quarter FEs	x	x	x
State FEs		x	x
Orig Year FEs			x
N	24833000	24833000	18649876

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: 10% sample of McDash mortgage performance data. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term, resulting in a sample size of 8.2 million loan months.

Table A6: Diff-in-Diff on Credit Score

	Current Credit Score		
	(1)	(2)	(3)
NonGSE	-23.99***	-25.87***	-11.48***
	(2.303)	(1.642)	(0.658)
NonGSE*Post	8.635***	8.257***	10.61***
	(1.272)	(1.245)	(1.062)
Loan Amount			0.00000504
			(0.00000261)
Interest Rate			-1860.1***
			(83.18)
Orig Credit Score			0.603***
			(0.0105)
Constant	691.6***	692.2***	372.7***
	(1.432)	(0.338)	(9.048)
Quarter FEs	x	x	x
State FEs		x	x
Orig Year FEs			x
N	24064199	24064199	18210930

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: 10% sample of McDash mortgage performance data. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term, resulting in a sample size of 8.2 million loan months.

Table A7: Diff-in-Diff on Increase in Auto Debt

	Increase in Auto Debt		
	(1)	(2)	(3)
NonGSE	0.000713***	0.000824***	0.000167
	(0.000134)	(0.000120)	(0.000168)
NonGSE*Post	0.00118***	0.00122***	0.00121***
	(0.000178)	(0.000187)	(0.000225)
Loan Amount			7.29e-09***
			(1.33e-09)
Interest Rate			-0.0282***
			(0.00739)
Orig Credit Score			-0.0000150***
			(0.00000116)
Constant	0.0109***	0.0109***	0.0225***
	(0.000339)	(0.0000448)	(0.000833)
Quarter FEs	x	x	x
State FEs		x	x
Orig Year FEs			x
N	24833000	24833000	18649876

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: 10% sample of McDash mortgage performance data. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term, resulting in a sample size of 8.2 million loan months.

Table A8: Diff-in-Diff on Past Due Bank Card

	Total Past Due Bank Card		
	(1)	(2)	(3)
NonGSE	213.4***	209.1***	110.3***
	(30.12)	(30.65)	(28.95)
NonGSE*Post	-122.0**	-118.6**	-133.8***
	(35.10)	(35.51)	(35.52)
Loan Amount			0.000645***
			(0.000136)
Interest Rate			16630.0***
			(1390.4)
Orig Credit Score			-2.603***
			(0.194)
Constant	490.7***	491.4***	1251.4***
	(27.46)	(5.074)	(164.0)
Quarter FEs	x	x	x
State FEs		x	x
Orig Year FEs			x
N	19208800	19208800	14689064

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: 10% sample of McDash mortgage performance data. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term, resulting in a sample size of 8.2 million loan months.

Table A9: Diff-in-Diff on Bankruptcy

	Bankruptcy		
	(1)	(2)	(3)
NonGSE	0.00527***	0.00605***	0.00254***
	(0.000925)	(0.000818)	(0.000619)
NonGSE*Post	-0.00139*	-0.00138*	-0.00321***
	(0.000654)	(0.000667)	(0.000759)
Loan Amount			3.76e-09*
			(1.73e-09)
Interest Rate			0.368***
			(0.0514)
Orig Credit Score			-0.000134***
			(0.0000110)
Constant	0.0133***	0.0131***	0.0863***
	(0.000713)	(0.000184)	(0.00824)
Quarter FEs	x	x	x
State FEs		x	x
Orig Year FEs			x
N	24833000	24833000	18649876

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: 10% sample of McDash mortgage performance data. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term, resulting in a sample size of 8.2 million loan months.

Table A10: Diff-in-Diff on Credit Card Limit

	Credit Card Limit		
	(1)	(2)	(3)
NonGSE	-99.12	-786.8	-294.4
	(785.8)	(618.7)	(434.1)
NonGSE*Post	865.5***	838.2***	1216.7***
	(241.0)	(235.4)	(189.5)
Loan Amount			0.0271***
			(0.00497)
Interest Rate			-181344.0***
			(18287.8)
Orig Credit Score			90.36***
			(2.099)
Constant	25468.4***	25651.6***	-31966.1***
	(425.2)	(145.6)	(1962.0)
Quarter FEs	x	x	x
State FEs		x	x
Orig Year FEs			x
N	24833000	24833000	18649876

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: 10% sample of McDash mortgage performance data. Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state. Sample includes all purchase loans originated between 2000 and 2007, with fixed interest rate and 30 year term, resulting in a sample size of 8.2 million loan months.

Table A11: Judicial vs. Non-Judicial States - Loan Outcomes

	(1) Foreclosure Filing	(2) Loss Mitigation	(3) Dual Tracking	(4) Current	(5) Foreclosure Sale
NonGSE	0.00904***	0.0182***	0.00315***	-0.0401***	0.000274***
	(0.00179)	(0.00288)	(0.000590)	(0.00360)	(0.0000745)
NonGSE*Post	-0.0122***	-0.00810*	-0.00245**	0.0238***	-0.000597**
	(0.00182)	(0.00355)	(0.000875)	(0.00456)	(0.000192)
NonGSE*Post*Judicial	0.00409	0.00920*	0.00235*	-0.0151	0.000409
	(0.0120)	(0.00413)	(0.00100)	(0.0151)	(0.000241)
All FEs	x	x.	x	x	x
N	23545659	16498035	23545659	23545659	23545659

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state.

Sample includes all purchase loans originated between 2000 and 2006, with fixed interest rate and 30 year term.

Table A12: Judicial vs. Non-Judicial States - Credit Outcomes

	(1) Credit Score	(2) Increase in Auto Debt	(3) Past Due Bank Card	(4) Bankruptcy	(5) Credit Card Limits
NonGSE	-16.12***	0.000455**	71.74*	0.00446***	-863.7
	(1.375)	(0.000132)	(29.17)	(0.00108)	(543.1)
NonGSE*Post	6.539***	0.00129***	-62.76	-0.00134	584.4*
	(1.457)	(0.000250)	(37.33)	(0.000744)	(258.7)
NonGSE*Post*Judicial	-0.741	-0.000192	117.4*	0.00127	-40.29
	(2.693)	(0.000329)	(46.48)	(0.00124)	(362.3)
All FEs	x	x.	x	x	x
N	22781580	23545659	18219670	23545659	23545659

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state.

Sample includes all purchase loans originated between 2000 and 2006, with fixed interest rate and 30 year term.

Table A13: No Payment Modification - Mortgage Outcomes

	(1) Foreclosure Filing	(2) Loss Mitigation	(3) Dual Tracking	(4) Current	(5) Foreclosure Sale
NonGSE	0.0236**	0.00263***	0.000648*	-0.0486***	0.00104***
	(0.00688)	(0.000736)	(0.000279)	(0.00844)	(0.000180)
NonGSE*Post	-0.0171*	-0.00272	-0.000948*	0.0313**	-0.00114***
	(0.00765)	(0.00145)	(0.000362)	(0.00990)	(0.000262)
Loan Amount	5.27e-08*	1.19e-08**	4.94e-09*	-9.36e-08**	1.29e-09**
	(2.39e-08)	(4.43e-09)	(1.93e-09)	(3.28e-08)	(4.67e-10)
Interest Rate	2.662***	0.344***	0.165***	-5.571***	0.119***
	(0.682)	(0.0875)	(0.0300)	(0.766)	(0.0135)
Orig Credit Score	-0.000267***	-0.000120***	-0.0000364***	0.000955***	-0.0000144***
	(0.0000448)	(0.00000235)	(0.00000547)	(0.0000405)	(0.00000115)
Constant	0.0565**	0.0768***	0.0193***	0.546***	0.00471***
	(0.0174)	(0.0109)	(0.00439)	(0.0320)	(0.000669)
All FEs	x	x	x	x	x
N	11813757	11813757	11813757	11813757	11813757

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state.

Sample includes all purchase loans originated between 2000 and 2006, with fixed interest rate and 30 year term.

Table A14: No Payment Modification - Credit Outcomes

	(1) Credit Score	(2) Auto Increase	(3) Past Due Bank Card	(4) Bankruptcy	(5) Credit Card Limit
NonGSE	-12.22***	0.000283	160.6***	0.00357***	91.12
	(1.447)	(0.000171)	(39.27)	(0.000792)	(561.1)
NonGSE*Post	11.17***	0.000996***	-168.1***	-0.00322**	1887.8***
	(1.527)	(0.000197)	(47.98)	(0.00111)	(306.3)
Loan Amount	0.00000389	5.75e-09***	0.000525**	2.80e-09	0.0230***
	(0.00000352)	(1.45e-09)	(0.000151)	(1.67e-09)	(0.00573)
Interest Rate	-2130.5***	-0.0340**	20502.2***	0.420***	-236813.2***
	(107.5)	(0.00973)	(2129.0)	(0.0463)	(24978.7)
Orig Credit Score	0.578***	-0.0000155***	-2.490***	-0.000125***	83.96***
	(0.0102)	(0.00000114)	(0.188)	(0.00000984)	(2.278)
Constant	410.3***	0.0233***& 936.2***	0.0760***	-23188.6***	
	(9.973)	(0.000861)	(151.2)	(0.00658)	(2258.6)
All FEs	x	x	x	x	x
N	11813757	11813757	9253816	11813757	11813757

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Controls include loan amount and borrower credit score at origination, interest rate, and fixed effects for origination year, current quarter and state.

Sample includes all purchase loans originated between 2000 and 2006, with fixed interest rate and 30 year term.