# Recourse and the Residential Mortgage Market: the Case of Nevada

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**Abstract**

The state of Nevada passed a legislature in 2009 that abolished deficiency judgments for purchase mortgage loans made after October 1, 2009 and collateralized by primary single family homes. In this paper, we study lenders' mortgage lending and households' mortgage application and subsequent default decisions in response to the law change. Using unique mortgage loan level application and performance data, we find strong evidence that lenders tightened their lending standards. In particular, lenders reduced approval rates and loan sizes for affected mortgages after the implementation of the law. Households, by contrast, did not delay their mortgage applications till after the law change. Furthermore, the law change does not appear to have affected borrowers' default decisions. These results thus cast a cautionary note on the effectiveness of policy recommendations that intend to use deficiency laws to curb mortgage defaults.

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# 1 Introduction

In the United States, state laws govern residential mortgage defaults and house foreclosure process. In most states, mortgage loans are recourse loans, that is, lenders can apply the difference between mortgage balance and proceeds from foreclosure sales to debtors' other assets or earnings, a process also known as deficiency judgments.[1] Theory predicts that recourse should deter default since default puts debtors' other assets at risk (Ambrose, Buttimer, and Capone 1997, and Corbae and Quintin 2010). Empirically, however, the findings have been mixed. For instance, Clauretie (1987) finds that whether a state allows for deficiency judgments does not affect mortgage default rates significantly, consistent with the observation that deficiency judgments are not carried out much in practice, if at all, due to the high cost associated with pursuing deficiency judgments (Capone 1996, Leland 2008, and Brueggeman and Fisher 2011).[2] By contrast, Ghent and Kudlyak (2011) find lower default rates in recourse states, particularly for higher-priced homes whose owners are likely to have other financial resources that can be seized by mortgage lenders. Many policy discussions have also centered on this provision. The most prominent is the recommendation by Feldstein (2008) that turning nonrecourse mortgage loans into recourse loans maybe an effective way to solve the mortgage debt overhang problem and, thus, the current mortgage crisis.[3]

In this paper we show that the current debate on deficiency judgements as useful tools to curb mortgage defaults is incomplete and perhaps even misleading. The reason is because lenders and borrowers respond to changes in regulations. With deficiency judgements, lenders may decide to lend to riskier borrowers, lend more, and/or lend at lower interest rates. Borrowers may decide not to apply for mortgages or apply for smaller mortgages. Analysis of the default behavior of approved mortgage loans is, thus, subject to selection bias. For example, a finding that borrowers are less likely to default in states with deficiency judgements may simply reflect the fact that approved borrowers in those states are less risky.

To illustrate the point, we conduct a unique event study using proprietary mortgage loan level application and performance data. In 2009, Nevada, one of the crisis states, passed a legislature that made significant changes to its deficiency judgment law. For homeowners who enter into a mortgage in conjunction with a purchase of a single family

[1] There are some exceptions, such as purchase money mortgages in California and 1-4 family residences in North Dakota. Some states also limit deficiencies if a creditor proceeds through a non-judicial foreclosure. See Ghent and Kudlyak (2011) table 1 for a summary of different state recourse laws.

[2] It is costly and time consuming to persue deficiency judgments on foreclosures. Additionally, debtors can file for bankruptcy and get rid of the unsecured deficiency debt.

[3] This suggestion has been controversial as summarized in Adam Levitin's blog at http://www.creditslips.org/creditslips/2008/12/the-role-of-rec.html

primary home after October 1, 2009, their mortgage lenders will not be able to pursue a deficiency judgment if the house is taken in a foreclosure. We test whether lenders respond to the law change by altering their mortgage approval rates, mortgage loan sizes, and interest rates, and whether borrowers change their mortgage applications by applying for more and larger loans. To facilitate the comparison with the aforementioned literature, we also test whether this new legislation had any effect on borrowers' default decisions. Our identification comes from both time differences in the behavior of primary single home purchase loans before and after the law change, and cross-sectional differences between primary single home refinanced loans and primary single home purchase loans.

The paper has three main results. First, we uncover evidence that lenders tighten their lending standards by reducing approval rates and loan sizes for those affected after the implementation of the law. They do not, however, increase mortgage interest rates significantly. Second, we do not find that mortgage applications for purchase loans for one-to-four family owner-occupied homes increase significantly after the implementation of the law, nor does it increase more than applications for other loans for owner-occupied homes. Finally, we do not find that borrowers' default behavior responds to the change in Nevada law in any statistically significant way. What is more, we do not find any evidence that the change in recourse law makes borrowers' default behavior more sensitive to home equity or house value. Our analysis thus casts a cautionary note on treating deficiency judgments as useful tools to curb mortgage defaults as they may lead to ex ante riskier lending by lenders.

In addition to the researches cited above, our paper is also related to two other strands of literature. The first is the literature that studies the impact of various aspects of state laws on lending cost. For example, Clauretie and Herzog (1990) and Ciochetti (1997) document greater lender costs in states that require judicial foreclosure and statutory right of redemption. Lin and White (2001) and Berkowitz and Hynes (1999) show that bankruptcy exemptions do and do not affect, respectively, whether a mortgage application is approved. Pence (2006) finds that lenders approve smaller loans in default-friendly states everything else the same. The second is the vast literature examining various aspects of mortgage borrowers' decision to default. Among the recent studies, Gerardi, Shapiro, and Willen (2007), Foote, Gerardi, and Willen (2008), and Demyanyk and van Hemert (2011) focus on negative equity as an important condition for defaults for mortgages originated in the state of Massachusetts. Bajari, Chu, and Park (2008), Bajari, Chu,Nekipelov, and Park (20013), Bhutta, Dokko, and Shan (2010), Guiso, Sapienza, and Zingales (2013), and Elul, Souleles, Chomsisengphet, Glennon, and Hunt (2011) study both negative home equity and illiquidity as two important drivers of the

rise in mortgage defaults during the recent crisis.

The rest of the paper is organized as follows. Section 2 discusses the law change in Nevada and its potential impact on debtors and creditors. Section 3 presents our data source. Section 4 reports our empirical analysis and section 5 concludes.

# 2 The Nevada Deficiency Judgment Law and Its Impact

## 2.1 The Nevada Deficiency Judgment Law

The state of Nevada is a recourse state, it allows lenders to pursue deficiency judgments - the difference between the balance owed on a mortgage loan and what the lender sells the house for at auction - within six months of the auction. After the six months, lenders are barred from filing a law suit to collect the judgments. Since the onset of the mortgage crisis in 2007, Nevada, as with many other states, has begun to implement new laws to mitigate foreclosures. In 2009, eight laws were passed in Nevada alone.[4] Table 1 summarizes the eight laws. As can be seen, almost all laws made foreclosure more cumbersome and costly by either imposing additional regulatory procedures or assigning more rights to owners or renters during a foreclosure. The only exception is Bill AB 140, which also increased owners/tenants' responsibility to maintain the property during the foreclosure sale.

This paper concerns one the most important new laws – Assembly Bill No. 471. This bill made significant changes to Nevada's deficiency judgment law. Under the new legislation, a financial institution holding a residential mortgage may not be awarded a deficiency judgment under the following circumstances: (1) the real property is a single-family house owned by the debtor; (2) the debtor used the money loaned from the bank to buy the house (as in a typical mortgage); (3) the house was owner-occupied; and (4) the loan was never refinanced. What this means is that, for many homeowners who enter into a mortgage in conjunction with a purchase after October 1, 2009, their mortgage lender will not be able to pursue a deficiency judgment should the house be taken in a foreclosure. Rather, upon foreclosure, the risk that the house has depreciated in value shifts back to the bank. Mortgages that do not satisfy these conditions continue to be

[4]In total, 33 states enacted at least 99 new laws in 2009. These states include Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Maine, Maryland, Michigan, Minnesota, Missouri, Nevada, New Jersey, New Mexico, North Carolina, North Dakota, Oregon, Puerto Rico, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, and West Virginia.

subject to the prior law.[5]

Nevada passed no other laws in 2010 for Nevada (the 26th Special Session). In the summer of 2011, to combat robosigning, the Nevada legislature passed a set of pre-foreclosure rules that essentially required the big banks to prove their chain of title before the foreclosure can take place (AB 273, AB 284, AB 388, and SB 414). These changes made judicial foreclosure process more attractive to the banks which allowed them to sidestep the new robosigning law and to seek a deficiency judgment at the same time on properties not covered by AB 471.

## 2.2 The Impact of Deficiency Judgments on Mortgage Lending, Borrowing, and Default

The impact of the deficiency law on borrowers' default behavior hinges crucially on the borrowers' non-housing asset. If the borrower has other assets that can be collected after house foreclosure, then the permission of a deficiency judgment will deter the borrower from becoming seriously delinquent. The more assets the borrower has, the stronger the deterrence will be. Another important factor that affects the impact of the deficiency law on borrowers' default behavior is the cost of collecting deficiency judgments. If the cost is high, then the effect will be small. Finally, in a dynamic setting, future local house price movement, borrower's income, and the cost of defaulting (less access to future credit) will all be factored into borrowers' decision. See Ghent and Kudlyak (2011) and Corbae and Quintin (2010) for more discussion.

If lenders are not allowed to collect on debtors' other assets, they will be reluctant to foreclose on a house, especially when foreclosure cost is high because there is no financial gain from doing so. Furthermore, if lenders perceive default probabilities to rise as a result of the elimination of deficiency judgments, they will tighten their lending standards by lending to less riskier people, lending smaller amount of loans, or lending at higher mortgage rates. Borrowers, on the other hand, may decide to apply for mortgages or to apply for larger loans since they do not risk their other assets in the event of being foreclosed.

Based on this theory, we seek to test several hypotheses. First, are lenders less willing to lend, lend a smaller amount, or lend at higher rates to primary single family

[5] Aside from recourse, in Nevada, lenders may foreclose on mortgages in default using either a judicial or non-judicial foreclosure process. The judicial process of foreclosure involves filing a lawsuit to obtain a court order to seek foreclosure and is used when no power of sale is present in the mortgage. The borrower has 12 months after the foreclosure sale to redeem the property. When a power of sale clause exists in a mortgage or deed of trust, the non-judicial process is used. Borrowers have no right of redemption under the power of sale.

purchase mortgage loans after the implementatin of the law (October 1, 2009)? Second, do borrowers apply for more and/or larger primary single family purchase mortgage loans after October 2009? Finally, are primary single family mortgage loans made after October 2009 more likely to become delinquent than primary single family loans made earlier or primary single family refinance loans? Are lenders less likely to foreclose on a single-family property with loans originated after October 2009 than other loans?

# 3 Data and Empirical Methodologies

## 3.1 Data and Data Sampling

We use two main data sets. The first is the Home Mortgage Disclosure Act (HMDA), which covers almost all mortgage applications as well as originations in US. It records each applicant's final status (denied/approved/originated), purpose of borrowing (home purchase/refinancing/home improvement), occupancy type (primary residence/second or investment homes), loan amount, race, sex, income, as well as lender institution.[6] We drop loans insured by Federal Housing Administration (FHA) or Veterans Administration (VA) because deficiency judgments are prohibited on FHA loans and strongly discouraged on VA loans. We also drop mortgage loans for manufacturing housing as in Ghent and Kudlyak (2011).

The second, LPS Applied Analytics, Inc., provides information from homeowners' mortgage applications concerning their financial situation, characteristics of the property, terms of the mortgage contract, and information about securitization, plus updates on whether homeowners paid in full or defaulted, whether lenders started foreclosure and whether the home was sold in foreclosure. LPS covers some two-thirds of installment-type loans in the residential mortgage servicing market for the post-2005 period that we are analyzing. As with the HMDA data, we delete from the sample FHA and VA loans.

Both data are then merged with county level monthly unemployment rates obtained from the Bureau of Labor Statistics and monthly zip code level house price index available from CoreLogic. When zip code house price index is not available due to low transaction volume for the calculation of repeated index, we substitute with county level house price index and when county level house price index is not available either, we use Nevada state house price index.

We use HMDA to examine lenders' mortgage loan approval decision and mortgage loan size decision and to detect changes in mortgage applications for affected mortgages

[6] Only lenders who doe not do business in any metropolitan statistical area are not required report (e.g., small community banks) to HMDA.

after the implementation of the new deficiency judgment law. As our benchmark, we restrict the sample to first lien mortgages made in Nevada for one-to-four family properties around October 2009 – 6 months before and after.[7] We delete those applications that are withdrawn without an approval decision or closed for incompleteness. We also delete from the sample loans insured by Federal Housing Administration (FHA), Veterans Administration (VA), and Farmers Home Administration (FmHa).

We use LPS to analyze lenders' interest rate decision conditional on mortgage loan approval, borrowers' default behavior, and lenders' foreclosure decision. We focus on first lien mortgages for single family properties made in Nevada around October 2009 and follow the performance of these loans till the end of 2012. As with the HMDA data, we delete from the sample loans insured by the government including FHA, VA, and FmHa and loans with private mortgage insurance.

## 3.2 Empirical Methodologies

We use various regression techniques to study the impact of the deficiency law change in Nevada on lenders as well as borrowers' behavior. As mentioned earlier, mortgage loan application approval and mortgage loan size decisions come from HMDA. For the hypothesis regarding borrowers' mortgage application decision which also uses HMDA data, we aggregate the data to the zip code level and by purpose of the loan – whether the loan is for purchase or refinance. We measure borrowers' default behavior by becoming for the first time 60 days or more delinquent, and 90 days or more delinquent, as well as lenders' foreclosure decision as reported by LPS. Mortgage interest rates at origination also come from LPS.

Our identification comes from the interaction of two terms, whether the loan is a purchase loan for single family homes of primary residence and whether the loan is made after October 1, 2009. Given rich information contained in the data, we will conduct robustness analysis using other information such as primary versus investment purchase loans as identification.

A generic regression in our analysis takes the following form,

$$y_{it} = \alpha Z_{it} + \beta X_{it} + \varepsilon_{it}, \tag{1}$$

where $y_{it}$ is the variable of interest, $Z_{it}$ is the key interaction variable discussed above, and $X_{it}$ is a vector of control variables. For the HMDA data, $X_{it}$ includes the gender of the applicant, race, income, whether the applicant has a cosigner for the mortgages, whether the applicant comes from an area with 30 percent or more minorities, whether

[7] HMDA does not distinguish single family properties from two-to-four family properties.

the lender is a commercial bank or its subsidiary, independent mortgage bank, thrift, or credit union. When we aggregate the data to test for trend in mortgage application, we can no longer control for any mortgage loan level or applicant level information. Instead, $X_{it}$ will include county unemployment rates and zip code house price growth rates. For the LPS data, it includes borrowers' FICO score at origination and mortgage loan contract information such as mortgage loan age, loan-to-value ratio at origination, whether the loan has full documentation, of fixed interest rate, the level of the current interest rate, and whether the loan is sold to private investors.[8] For both data, we further control for county and time (monthly) fixed effects and separate linear time trends for each county. Finally, we cluster standard errors at the loan level for all the analysis except mortgage demand .

We use ordinary least square regressions (OLS) when the dependent variable $y_{it}$ is continuous and Probit regression when the dependent variable is binary. When testing for mortgage loan size, we use Tobit analysis because the data are censored in the sense that rejected loans effectively have zero loan amount. Unfortunately, LPS does not include any rejected loans, we thus use OLS for our interest rate analysis.

# 4 Empirical Analysis

Our empirical analysis consists of three parts. First, we investigate how lenders respond to the deficiency law change in terms of mortgage loan approval rates, loan sizes, and interest rates. Then we examine whether borrowers respond to the law change with regard to loan applications. Finally, we study the relationship between the change in deficiency judgments and mortgage default and house foreclosure rates.

## 4.1 Mortgage Lending

We use three measures for the lending standard, mortgage approval rates, approved mortgage loan sizes, and interest rates of approved mortgage loans. As discussed earlier, we use HMDA data for the analysis on approval rates and mortgage loan sizes and LPS data for the test on mortgage interest rates.

### 4.1.1 Descriptive Statistics

Table 2 reports summary statistics for the HMDA sample. For the six months before and after October 1, 2009, there are in total 35,008 mortgages originated for one-to-four

[8] We observe virtually no subprime loans, and very few interest only and balloon mortgage loans during our sample period.

family primary residence with no government guarantee. Of the 35,008 applications, 69 percent are for refinance. About 14 percent of the applications are affected by the change in deficiency judgments. The overall mortgage approval rate is 72 percent. About 73 percent of the applications are filed by male. Close to 80 percent of the applicants are white and a little over 2 percent are black. Over half of the applications have cosigners suggesting that these applicants are likely married. There exists significant income disparity among the applicants with the average (nominal) income at application at $105,000 and the median income at $73,000. The average loan amount is $217,000 and the median is $179,000. Less than 3 percent of the applicants live in areas with over 30 percent of the residents are minorities. The majority of the applications are filed at commercial banks (67 percent), followed by independent mortgage banks (19 percent), thrifts (9 percent), and credit unions (5 percent). Unemployment rates are high in all counties of Nevada with both mean and median at over 12 percent. House prices decline for most of the state during that period.

Table 3 reports summary statistics for the LPS sample. Between April 2009 and March 2010, 13,478 mortgage loans are made for first lien single family primary mortgages without government guarantees or private insurance. Note that this number is smaller than the 24,850 approved mortgage loans calculated from HMDA. This is because we delete from LPS sample mortgages with private insurance and 2-to-4 family mortgages while such information is not available in HMDA. LPS also has smaller data coverage than HMDA.

Of the 13,478 mortgages, 48 percent are for refinance. This number is substantially lower than the 72 percent at application indicating that mortgage approval rates are lower for refinance mortgages during that period. About 4 percent of the mortgages are affected by the law change. The mean interest rate at origination is 4.98 percent and the median is 4.87 percent. The majority of the mortgages are fixed-rate mortgages (over 97 percent). The mean credit score at origination is 715 and the median is 771. About 41 percent of the mortgages have full documentation. A mere 2 percent are jumbo mortgages, and 18 percent are sold to private investors. These statistics are consistent with the observation of tight residential mortgage market at the time. Finally, the unemployment rates are about 12.3 percent on average and almost all areas experience house price declines.

### 4.1.2 Results

**Approval and Loan Size.** We chart the raw data for mortgage approval rates and approved average mortgage loan sizes measured as deviations from their respective October 2009 values in Figures 1 and 2. Figure 1 indicates that loan approval rates

seem to be trending up for unaffected refinance loans while stayed more or less flat for affected purchase loans. For approved mortgage sizes, the pattern is less clear.

We then conduct two analysis using HMDA. The first is a Probit analysis where the dependent variable takes the value of 1 if the loan is approved and zero otherwise. The second is a Tobit analysis where the dependent variable is the actual loan amount for approved loans and zero for rejected loans. We report the regression results in Table 4. The key variable, one-to-four family purchase loans made after October 2009, contributes negatively and statistically significantly to lenders' approval rate as well as mortgage loan size upon approval decisions. In particular, a one-to-four family mortgage purchase loan made after October 2009 has an approval rate that is 1.76 percentage points lower than that of a similar loan made earlier or a single family refinance loan, or 2.44 (1.76/72) percent less likely to be approved and the loan size is $9,703, or 4.47 (9.7/217) percent smaller after approval than loans not affected.

In terms of the other control variables, for approval rates, everything else the same a refinance mortgage loan is about 15 percentage points less likely to be approved. This result stems from the fact that loans made earlier during housing booms are of lower standards and are thus less likely to be approved for refinance once lenders tighten their lending standards after the crisis. As expected, higher income increases the probability of being approved while higher loan amount reduces the probability of being approved. Specifically, a $1,000 increase in income raises the approval rate by about 1 basis points while a $1,000 increase in loan amount reduces the approval rate by about 3 basis points. Living in minority areas substantially lowers the approval rates. Non-white, female, or applicants with no cosigners have much lower mortgage approval rates. Lending institutions also affect loan approval rates. In particular, compared with specialized mortgage banks, commercial banks and thrifts are less likely to approve mortgages while credit unions are more likely to approve.

In terms of loan sizes of approved mortgages, refinance loans are on average $54,000 smaller. Applicants with higher income borrow more with a $1,000 increase in income corresponding to about $363 increase in loan size. Borrowers living in minority areas get smaller loans, as do non-white, female, or applicants with no cosigners. Compared with mortgage banks, commercial banks and thrifts approve smaller loans while credit unions give out larger loans. Neither local unemployment rates nor house price growth rates contribute significantly to mortgage approval rates or loan sizes.

**Interest Rate** To further investigate whether lenders lend at higher interest rates to borrowers affected by the change in the deficiency law, we run an ordinary least squares regression (OLS) using LPS for loans made between April 2009 and March 2010. The

results are reported in Table 5.

According to our analysis, interest rates on first lien single family primary purchase mortgage loans made after October 2009 are not statistically different from those made after October 2009 or first lien single family primary refinance mortgage loans. This could result from our earlier result that the approved first lien single family purchase loans are already of relatively higher quality and of relatively smaller sizes after October 2009.

For the other control variables, mortgage rates for refinance loans are, on average, about 11 basis points lower. An increase of 10 percentage points in mortgage loan-to-value ratio raises the interest rate by about 3 basis points. An increase of 10 in FICO score, on the other hand, reduces the interest rate by about 2 basis points. Loans sold to private investors and loans with adjustable-rate mortgages all have lower interest rates but jumbo mortgages have much higher interest rates. Finally, areas with high local unemployment rates also face higher mortgage interest rates.

#### 4.1.3 Robustness Analysis

**Approval Rate and Mortgage Loan Size** To test the robustness of our results on mortgage loan approval rates and mortgage loan sizes, we conduct four additional analysis. First, we extend our sample to include loans made between October 2008 and September 2010, exactly one year before and one year after the deficiency law change. Second we use investment single property loans as well as primary single property refinance loans as control groups for the primary single property purchase loans that are affected by the law change. Third we use nonconventional primary single property purchase loans as the control group. Finally, we conduct two placebo tests, one assuming the law change occurred in April 2008 and the other assuming the law change occurred in April 2011. Loans made half a year before the assumed change date and half a year after are included. The results are reported in Table 6.

Extending the benchmark sample to include loans made one year before October 2009 and one year after strenghthens our results. Now the lenders are 5 percentage points more likely to reject a single family purchase loan made after the law change and the loan size is on average $36,000 smaller. Including refinance loans and investment property loans together still generate the significant results that after October 1, 2009, lenders reduce their approval rates of primary single family mortgage loans by 4.1 percentage points and once approved, their loan sizes are $9,000 smaller than before. Using nonconventional single family primary residence purchase loans as controls, the reduction in approval rates and approved mortgage loans sizes become 2.4 percentage points and $5,000, respectively. Tests using the two placebo dates generate very different results from the benchmark. For

the April 2008 and the April 2011 date, the coefficients are both statistically significant but have positive signs. Note that we chose the placebo test dates so that they sufficiently removed from the policy date. All these experiments confirm that after the change in the deficiency judgement law, lenders tightened their lending standards in terms of loan approval rates and loan sizes for affected borrowers.

**Mortgage Interest Rate** For mortgage interest rates, we conduct four robustness tests, extending the sample by including loans made one year before and one year after the deficiency law change, including investment properties, and including multifamily properties, and use nonconventional purchase loans as controls, respectively. The results are presented in Table 7. As can be seen, with the exception of the case of including investor properties in the control group, the coefficient of interest, single family purchase loans made after October 2009 have statistically similar mortgage interest rates as other loans in the control groups.

## 4.2 Mortgage Application

In this subsection, we investigate mortgage applicants' behavior. Theory predicts that those affected by the change in the deficiency law should postpone their application for mortgages. Using the constructed HMDA sample, we calculate by month the total number, total and average values of mortgages made for single family primary residence purchase loans versus refi loans made six months before and six months after October 2009. Figure 4 charts the demand in average loan sizes as deviations from its October 2009 level. As can be seen, compared with the average loan size of purchase mortgages, there is a downward trend in average refi loan sizes.

We then regress the number/amount on whether the loans are purchase or refi loans, lagged average local unemployment rates, lagged average local house price growth rates, average local income, whether minority households are more than 30 percent of the population, and separate time trends and their squares.[9] The regression results are reported in Table 8.

As can be seen, there does not exist a structural break for loan applications for one-to-four primary mortgage loans after October 2009 in terms of total number of mortgage applications, total dollar amount of mortgage applications, or average loan sizes. Regarding other control variables, there appear to be more people applying for refinance loans than purchase loans, reflecting the effect of low mortgage interest rates at the time. Over time, the demand for mortgages decline for total number of mortgage

[9] We can no longer have separate time dummies given the much smaller sample size.

applications but not total mortgage loan amount or average mortgage size. Higher average MSA(Metropolitian Statistical Area) income also increases average loan sizes at application. County dummies are also important determinants of mortgage application.

**Robustness Analysis** We conduct three additional robustness tests, examining loan applications made one year before and after October 2009, including investment properties in the control group, and using nonconventional single family purchase loans for primary residence as the control group. According to the results reported in Table 9, we do not detect any trend break for demand for single family primary mortgage properties after October 2009.

## 4.3 Mortgage Default and House Foreclosure

This subsection seeks to test whether single family borrowers that borrowed after October 1, 2009 are more likely to default and whether lenders are less willing to foreclose on these borrowers. We define defaults to be the first time that the loan becomes 60 days delinquent or 90 days delinquent, respectively. The foreclosure decision is defined as entering foreclosure process.

### 4.3.1 Descriptive Statistics

We use LPS for the default and foreclosure analysis. In particular,we focus on mortgage loans originated six months before and six months after the change in the deficiency judgment law in October 2009 which spans April 2009 to March 2010. The control group includes single family purchase loans made before October 2009 and single family refinance loans made during the whole sample period. We follow these mortgage loans from the time of their origination to the first time the loan becomes 60-day, 90-day delinquent, enters into foreclosure, or reaches the end of the sample period December 2012.

Table 10 reports the summary statistics for 60+ delinquency sample. In total, we have 352,534 observations. The monthly 60 day delinquency rate is 0.09 percent. About 63 percent of the loans are refinance loans and 9 percent are purchase loans made after October 1, 2009 and thus affected by the deficiency law change. The average loan age is 21 months and the median is 24 months. The mean mortgage loan-to-value ratio is 68 percent with a median of 73 percent. The interest rate averages about 5 percent. The average credit score (FICO) is 659 and median is 763, on the high end of the FICO score range of 300 and 850. Slightly over half of the loans have full documents, a small 2 percent are jumbo loans, 3 percent are sold to private investors, and about 2 percent

are of adjustable rates. The monthly unemployment rate averages 13 percent while the monthly gross real house price growth rate averages about 1.0055 percent with large variances. The sample statistics for the 90 days delinquency and foreclosure sample are very similar except that the 90 day delinquency rate averages 0.04 percent monthly for the 90+ day delinquency sample and the foreclosure rate is 0.02 percent monthly for the foreclosure start sample. The three samples also have very similar sizes indicating that many mortgages that have become 60 days delinquent have subsequently become 90 days or more delinquent and enter into foreclosure process.

Figure 4 charts the cumulative 60 days or more mortgage delinquency rates for affected mortgage loans and non-affected mortgage loans over the sample period by loan age. The two series track each other, but no one series appears to be dominating the other. Note that the line depicting cumulative default rates for affected mortgages are choppier than that for the unaffected ones because there are much fewer affected mortgages in total and in default.

### 4.3.2 Results

As discussed in the empirical methodologies, we run Probit regressions with the dependent variable being the binary variable that takes the value of 1 if the loan becomes delinquent or being foreclosed by the lender and 0 otherwise. We cluster standard errors at the loan level. Table 11 reports our regression results including marginal effects of each explanatory variable and its associated standard error.

The variable of interest, single family mortgage loans made after October 2009, is not statistically significant in any of the three regressions. Refinance loans are much likely to default reflecting lower lending standards when these loans were first made as purchase loans. The older the mortgage loan is, the more likely it becomes 60 days, 90 days delinquent or enters into foreclosure though the speed of the increase declines with the age. As expected, mortgage loans with high mortgage loan-to-value ratios at origination and loans with adjustable mortgage interests are more likely to become delinquent or being foreclosed. Current interest rate also contributes positively to default and foreclosure probabilities. Interestingly, having full document also increases mortgage default probability. By contrast, having high FICO scores at origination reduces default as well as foreclosure probability. County and time fixed effects are included in all three regressions.

### 4.3.3 Robustness Analysis

We extend the sample to include loans made one year before or after October 2009. The results are reported in Table 12. As can be seen, the mortgage default rates are not affected by the law change. To test the hypothesis that the change of the deficiency law may have differential effect on borrowers with low home equity or high assets as theory predicts. We conduct two additional analysis. In one of the analysis, we restrict our sample to those with mortgage loan-to-value ratio to be above 90 percent.[10] In the other analysis, we focus on loans with house value that is above the median of all properties at the time of origination. The key coefficient of interest, single family mortgage loans made after October 2009 as well as the interaction terms, remains statistically insignificant.

# 5 Conclusion

This paper studies whether the change in deficiency judgments that affected only purchase mortgages made on single family primary residence after October 2009 in the state of Nevada had affected mortgage borrowers' default behavior, lenders' foreclosure and lending decisions, as well as general households' mortgage application behavior. In doing so, the paper makes a contribution to several strands of literature that seek to understand the relationship between real estate laws and borrower and lender behavior. In contrast to some of the existing studies, the paper does not find any significant change in affected borrowers' mortgage default and lenders' foreclosure decisions. However, it does find strong evidence that lenders have tightened their lending standards substantially both in terms of loan approval rate and loan size, though not on mortgage interest rates. It further reveals that there were no delays in mortgage applications from households.

The paper thus casts a cautionary note on using deficiency judgments as a deterrence for mortgage default or mortgage foreclosure. Further policy analysis requires more structural analysis which we pursue in a separate project.[11]

[10] We estimate the current house value by applying local house price growth rates to home value at origination. Home equity is the difference between the current house value and mortgage balance.

[11] See "Consumer Bankruptcy and Mortgage Default" by Wenli Li, Costas Meghir, and Florian Oswald.

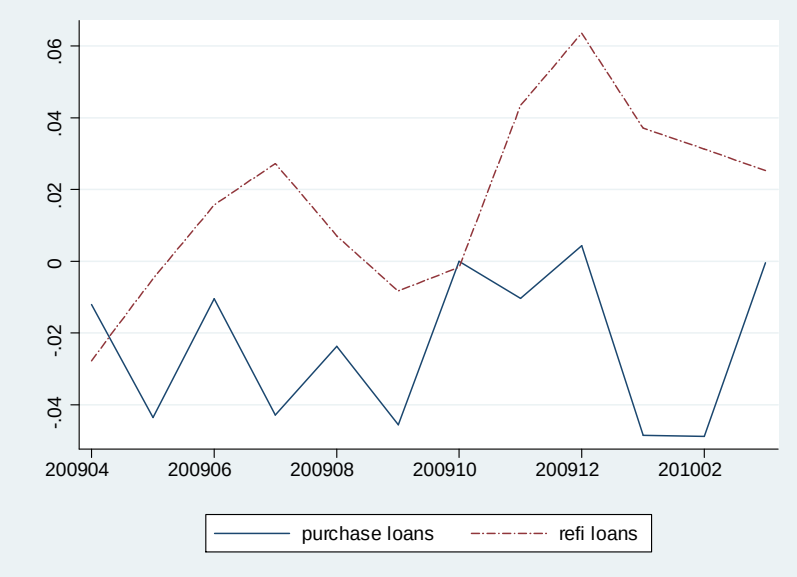


Figure 1. Deviations in Loan Approval Rates for One-to-Four Family Primary Residence Conventional Loans (deviations from 200910; Source: HMDA)

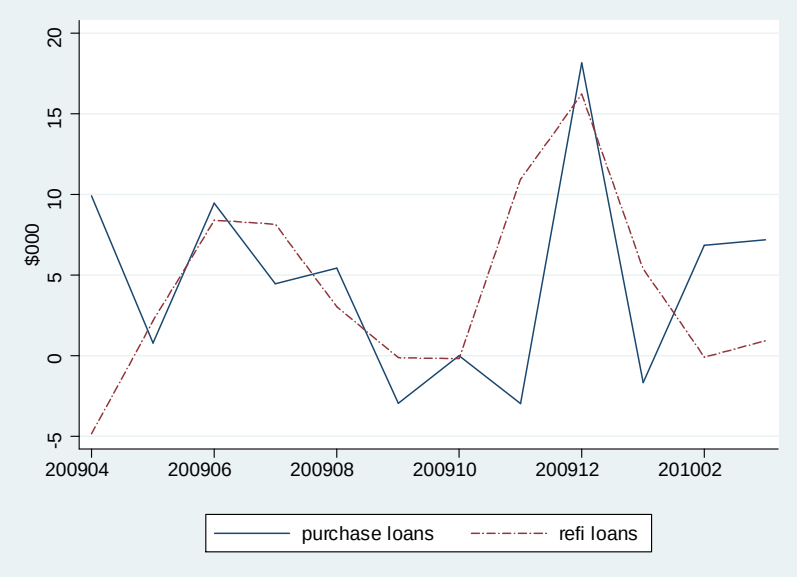


Figure 2. Deviations in Approved Loan Sizes or One-to-Four Family Primary Residence Conventional Loans ($000,deviations from 200910; Source: HMDA)

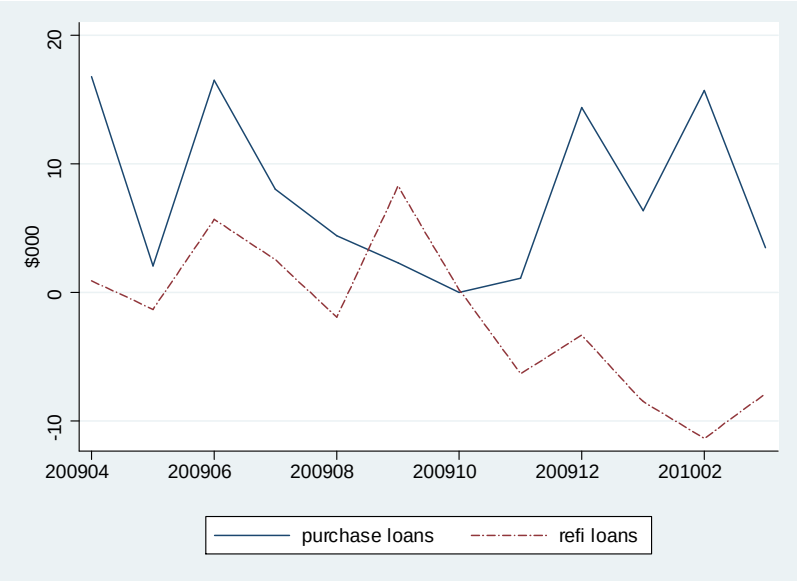


Figure 3. Mortgage Loan Applications for One-to-Four Family Primary Residence Conventional Loans ($000, deviations from 200910; Source: HMDA)

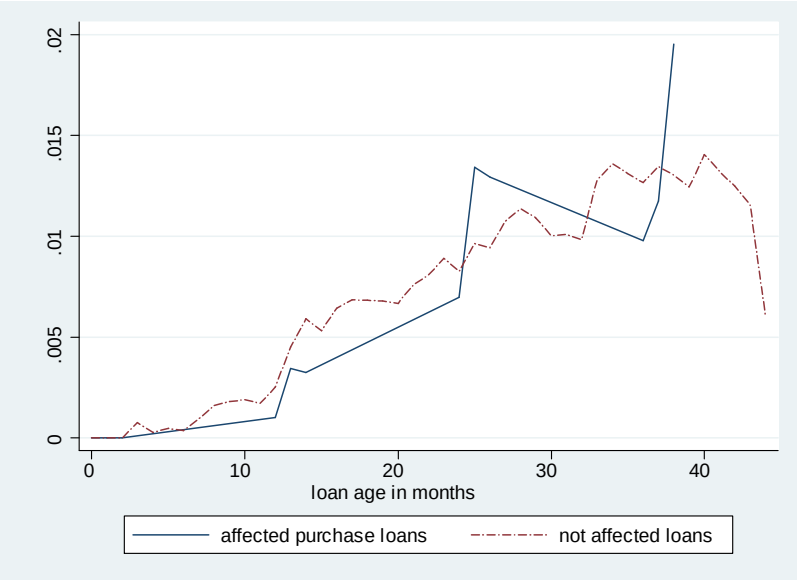


Figure 4. Cumulative 60 Days Or More Delinquency Rates for Loans Made Six Months Before and After october 2009 (Affected loans include single family purchase loans for primary residence made after October 2009; not affected loans include single family purchase loans for primary residence before October 29 and single family refi loans for primary residence. Source: LPS Applied Analytics.)

Table 1. Major Nevada Foreclosure Laws Enacted in 2009

| Bill # | Signed | Effective | Summary |
|---|---|---|---|
| AB 486 | 05/26 | 10/01 | Adds a provision to the escrow law that an escrow agent or escrow agency may be required to pay restitution to a person who suffered an economic loss due to a violation of NRS or NAC 645A. |
| AB 471 | 05/28 | 10/01 | Provided that a deficiency in a payment on a mortgage, deed of trust or other encumbrance may be cured under certain circumstance before foreclosure. Providing that a court shall not award a deficiency judgment on the foreclosure of a mortgage or deed of trust under certain circumstance. |
| AB 361 | 05/28 | 10/01 | Provides that, under certain circumstances, a unit-owner's association may enter the grounds of a vacant unit or a unit in foreclosure to abate a public nuisance or maintain the exterior of the unit. |
| SB 128 | 05/28 | 07/01 | Specifies certain reporting requirements during a foreclosure proceeding, and imposes a time frame of 30 days for reporting a foreclosure sale to the county. |
| AB 149 | 05/29 | 07/01 | Modifies existing foreclosure law and establishes a state Foreclosure Mediation Program. Foreclosure proceedings will be halted while borrowers pursuing mediation. |
| AB 151 | 05/29 | 10/01 | Requires mortgage loans to include the license number of the mortgage broker. |
| AB 152 | 05/29 | 07/01 | Modifies definitions and established requirements for "loan modification consultants," such as licensing and certain fees for services relating to foreclosure. |
| AB 140 | 06/09 | 07/01 & 10/01 | Establishes the rights and responsibilities of property owners and tenants during a foreclosure sale, including property maintenance. Imposes a $1000 file per day for failing to maintain the property. |

Note. For AB 140, Sections 10 and 11 ( ensure that social security numbers are redacted from the copy of the promisary note) became effective on July 1, 2009. Sections 1 to 9 inclusive became effective on October 1, 2009. Source: https://www.leg.state.nv.us/Session/75th2009/Bills/AB/AB140_EN.pdf.

Table 2. Sample Summary Statistics – HMDA

| variable | mean | median | standard deviation |
|---|---|---|---|
| approval rate* | 0.7117 | 1 | 0.4529 |
| refinanced mortgage loans* | 0.6860 | 1 | 0.4641 |
| loans affected by law changes* | 0.1409 | 0 | 0.2831 |
| female* | 0.2747 | 0 | 0.4463 |
| gender unknown* | 0.0671 | 0 | 0.2502 |
| race: black* | 0.0227 | 0 | 0.1490 |
| race: non-white and non-black* | 0.00908 | 0 | 0.2873 |
| race: unknown* | 0.1127 | 0 | 0.3162 |
| no cosigner* | 0.4707 | 0 | 0.4991 |
| income ($ thousands) | 105 | 73 | 191 |
| loan amount ($ thousands) | 217 | 179 | 198 |
| living in area with 30% or more minorities* | 0.0257 | 0 | 0.1581 |
| lender: commercial bank and their subsidiaries* | 0.6667 | 1 | 0.4714 |
| lender: independent mortgage banks* | 0.1911 | 0 | 0.3932 |
| lender: thrifts* | 0.0860 | 0 | 0.2804 |
| lender: credit unions* | 0.0542 | 0 | 0.2264 |
| lagged local unemployment rate (%) | 12.0379 | 12.1000 | 1.5494 |
| lagged net local house price growth rate | -0.0032 | -0.0027 | 0.0183 |
| Total number of observations | 35,008 | | |

Note. Mortgage loans for owner-occupied primary housing originated between April 2009 and April 2010. * indicates dummy variables.

Table 3. Sample Summary Statistics – LPS

| variable | mean | median | standard deviation |
|---|---|---|---|
| refinance mortgage loans* | 0.4780 | 0 | 0.4995 |
| loans affected by the law change* | 0.0378 | 0 | 0.1906 |
| current interest rate | 4.9765 | 4.8750 | 0.4532 |
| mortgage loan-to-value ratio at origination | 66.1604 | 70.3500 | 22.4217 |
| FICO at origination | 715 | 771 | 185 |
| full document* | 0.4059 | 0 | 0.4910 |
| jumbo loan* | 0.0198 | 0 | 0.1392 |
| loan sold to private investor* | 0.1844 | 0 | 0.3878 |
| adjustable-rate mortgage* | 0.0179 | 0 | 0.1328 |
| lagged local unemployment rate | 12.2901 | 12.6000 | 1.7665 |
| lagged gross local real house price growth rate | -0.0015 | -0.0076 | 0.1174 |
| Total number of mortgage loans | 13,478 | | |

Note. Purchase or refinance loans for owner-occupied single family housing originated between April 2009 and April 2010. These loans are not government guaranteed. * indicates dummy variables.

Table 4. Mortgage Lending: Approval Rates and Loan Size – Benchmark (HMDA)

| | Mortgage Approval (Probit, Marginal Effect) | | Mortgage loan size (Tobit) | |
|---|---|---|---|---|
| variable | marginal effs | s.e. | coefficient | s.e. |
| purchase loans made after reform | -0.0176*** | 0.0718 | -9.7027*** | 1.7957 |
| refinance loan | -0.1480*** | 0.0041 | -54.2885*** | 3.4139 |
| income at origination ($ thousands) | 1.34e-04*** | 2.34e-05 | 0.3633*** | 0.0161 |
| loan amount ($ thousands) | -2.52e-04*** | 2.45e-05 | | |
| MSA with over 30% minorities | -0.2468*** | 0.0046 | -131.8096*** | 3.3272 |
| being black | -0.1181*** | 0.0063 | -47.1998*** | 2.5399 |
| being non-white and non-black | -0.0607*** | 0.0044 | -23.6160*** | 1.3324 |
| race unknown | -0.0903*** | 0.0022 | -28.8026*** | 2.8364 |
| female | -0.0168* | 0.0081 | -17.7182*** | 3.6263 |
| gender unknown | 0.0321*** | 0.0075 | 25.3257*** | 4.6304 |
| no cosigner | -0.0591*** | 0.0023 | -36.1738*** | 1.9821 |
| lender: commercial bank | -0.0868*** | 0.0074 | -23.4369*** | 2.3646 |
| lender: thrift | -0.0115*** | 0.0109 | -8.9440*** | 2.6794 |
| lender: credit union | 0.0749*** | 0.0110 | 3.3887*** | 2.4575 |
| lagged monthly unemployment rate | 0.0297 | 0.0578 | 5.4625 | 3.3684 |
| lagged hpi growth rate | 0.0472 | 0.2269 | 66.3319 | 110.8624 |
| linear county time trends | yes | | yes | |
| county fixed effects | yes | | yes | |
| time fixed effects | yes | | yes | |
| Pseudo R-squared | 0.0563 | | 0.0151 | |
| number of observations | 35,008 | | 35,008 | |

Note. * indicates statistical significance at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

Table 5. Mortgage Lending: Interest Rate – Benchmark (LPS)

| | interest rate at origination | |
|---|---|---|
| variable | coefficient | s.e. |
| purchase loan made after reform | -0.0263 | 0.0264 |
| refinance loan | -0.1053*** | 0.0100 |
| loan-to-value ratio at origination | 0.0025*** | 0.0002 |
| FICO score at origination | -0.0018*** | 0.0001 |
| full document | 0.0126 | 0.0104 |
| private investor | -0.0600*** | 0.0135 |
| jumbo mortgage | 0.4269*** | 0.0645 |
| adjustable rate mortgage | -0.7500*** | 0.0387 |
| lagged monthly unemployment rate | 0.0466*** | 0.0150 |
| lagged real hpi growth rate | 0.0306 | 0.0344 |
| linear county time trend | yes | |
| county fixed effects | yes | |
| time fixed effects | yes | |
| R-squared | 0.1858 | |
| number of observations | 13,478 | |

Note. * indicates statistical significance at 10 percent level,
** at 5 percent level, and *** at 1 percent level.

Table 6. Mortgage Lending: Approval Rates and Loan Size – Robustness Analysis (HMDA)

| | loan approval rate | | loan size ($) | |
|---|---|---|---|---|
| | coefficient | s.d. | coefficient | s.d. |
| loans originated: 200810 – 201009 | -0.0530*** | 0.0092 | -35.7594*** | 4.0883 |
| include investment loans | -0.0414*** | 0.0059 | -8.8168*** | 1.7057 |
| conventional vs nonconventional purchase loans | -0.0238*** | 0.0046 | -4.6432*** | 1.7388 |
| placebo law change date: April 2008 | 0.0441*** | 0.0086 | 24.4289*** | 4.8536 |
| placebo law change date: April 2011 | 0.0709*** | 0.0099 | 26.0907*** | 5.5897 |

Note. * indicates statistical significance at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

Table 7. Mortgage Lending: Interest Rate – Robustness Analysis (Static LPS)

| Sample | mortgage rate (%) | |
|---|---|---|
| | coefficient | s.d. |
| loans originated: 200810 - 201009 | -0.0091 | 0.0217 |
| include investment properties | -0.1204*** | 0.0192 |
| include multifamily properties | -0.0097 | 0.0184 |
| conventional vs nonconventional purchase loans | -0.0236 | 0.0168 |

Note. * indicates statistical significance at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

Table 8. Mortgage Applications – Benchmark (HMDA)

| | # loan applications | | loan amount ($1000) | | Average loan size | |
|---|---|---|---|---|---|---|
| variable | coefficient | s.e. | coefficient | s.e. | coefficient | s.e. |
| purchase loans made after reform | 35.9650 | 22.2631 | 9038.04 | 5499.25 | 0.5473 | 6.5978 |
| refinance loans | 101.44*** | 16.70 | 25394*** | 4125.15 | 18.3825*** | 4.9492 |
| average income of the MSA | -0.1628 | 0.2918 | -30.5580 | 72.0755 | 1.0608*** | 0.0865 |
| MSA with over 30% minorities | -453.12 | 530.82 | -137326.8 | 131118.7 | 116.15 | 157.31 |
| lagged unemployment rate | -12.7225 | 9.6513 | -3100.375 | 2383.972 | -5.6564** | 2.8601 |
| lagged house price growth rate | -45.5819 | 127.337 | -9200.426 | 31453.61 | 3.6573 | 37.737 |
| time trend | -69.86* | 41.23 | -15942.68 | 10183.51 | -4.3822 | 12.218 |
| time trend squared | 0.9478 | 0.6239 | 215.5841 | 154.11 | 0.0657 | 0.1849 |
| county dummies included | yes | | yes | | yes | |
| Adjusted R-squared | 0.8363 | | 0.8115 | | 0.7103 | |
| number of observations | 325 | | 325 | | 325 | |

Note. * indicates statistical significance at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

Table 9. Mortgage Applications – Robustness Analysis (HMDA)

| | # loan applications | | loan amount ($1000) | | Average loan size | |
|---|---|---|---|---|---|---|
| sample | coefficient | s.e. | coefficient | s.e. | coefficient | s.e. |
| loan application: 200810 – 201009 | 7.0772 | 14.7954 | 2125.01 | 3614.89 | 2.6299 | 5.1689 |
| include investment properties | 16.6061 | 23.6911 | 4372.19 | 5715.32 | -0.0193 | 8.4571 |
| conventional vs nonconventional purchase loans | -11.0204 | 42.7198 | -1291.89 | 6380.23 | -2.2505 | 5.6399 |

Note. * indicates statistical significance at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

Table 10. Sample Summary Statistics (Dynamic LPS)

| variable | mean | median | standard deviation |
|---|---|---|---|
| 60 days mortgage delinquency sample | | | |
| 60 day mortgage delinquency rate | 0.00085 | 0 | 0.0292 |
| refi mortgage* | 0.6343 | 1 | 0.4816 |
| loans affected by the law change* | 0.0864 | 0 | 0.2809 |
| age of the loan (months) | 20.8970 | 24 | 11.6881 |
| mortgage loan-to-value ratio at origination | 67.8118 | 72.5500 | 17.9809 |
| current interest rate | 4.9599 | 4.8750 | 0.4639 |
| FICO at origination | 659 | 763 | 262 |
| full document* | 0.5254 | 1 | 0.4994 |
| jumbo loan* | 0.0193 | 0 | 0.1373 |
| loan sold to private investor* | 0.0294 | 0 | 0.1688 |
| adjustable-rate mortgage* | 0.0168 | 0 | 0.1283 |
| lagged local unemployment rate | 12.8817 | 13.1000 | 1.7947 |
| lagged local house price growth rate | 0.0049 | -0.0044 | 0.1386 |
| Total number of observations | 352,534 | | |

Note. Purchase loans for owner-occupied housing originated between April 2009 and March 2010 excluding October 2009 and followed until the loan first becomes 60 days delinquent or the end of the sample period, December 2012. These loans are not government guaranteed and with no private mortgage insurance. *indicates dummy variables.

Table 11. Mortgage Default and Foreclosure Start – Benchmark
(loans originated between 200904 to 201004)

| | 60 days delinquent | | 90 days delinquent | | Foreclosure start | |
|---|---|---|---|---|---|---|
| variable | marginal effs | s.e. | marginal effs | s.e. | marginal effs | s.e. |
| purchase loans made after reform | 4.64e-05 | 1.15-04 | 6.14e-05 | 1.44-04 | 2.45e-05 | 7.29e-05 |
| refi loans | 2.35e-04*** | 4.67e-05 | 3.12e-04*** | 5.77e-05 | 1.24e-04*** | 2.69e-05 |
| loan age (months) | 7.45e-05*** | 1.66e-05 | 6.35e-05*** | 1.89e-05 | 3.09e-05*** | 6.23e-06 |
| loan age squared | -1.14e-06*** | 3.00e-07 | -8.49e-07*** | 3.40e-07 | -4.65e-07*** | 1.24e-07 |
| ltv ratio at orig. | 1.17e-05*** | 1.37e-06 | 1.58e-05*** | 1.72e-06 | 6.34e-06*** | 9.46e-07 |
| FICO score at origination | -3.96e-06*** | 4.70e-07 | -3.57e-06*** | 5.20e-07 | -1.07e-06*** | 2.49e-07 |
| current interest rate | 1.94e-04*** | 4.04e-05 | 2.38e-04*** | 4.84e-05 | 7.71e-05*** | 2.24e-05 |
| full document | 1.23e-04** | 4.67e-05 | 1.44e-04** | 5.62e-05 | 3.60e-05 | 2.36e-05 |
| private investor | 4.21e-05 | 1.20e-04 | -1.11e-04 | 8.79e-05 | -4.07e-05 | 3.75e-05 |
| jumbo mortgage | -2.29e-04 | 6.40e-05 | | | | |
| adjustable rate mortgage | 5.47e-04*** | 3.60e-04 | 8.34e-04*** | 5.00e-04 | 5.28e-04*** | 3.08e-04 |
| lagged mon. unemp. rate | -4.48e-06 | 3.12e-05 | 2.77e-05 | 3.09e-05 | 2.96e-05*** | 1.04e-05 |
| lagged hpi growth rate | -4.78e-05 | 1.27e-04 | 7.39e-05 | 1.56e-04 | 1.07e-05 | 7.27e-05 |
| county fixed effects | yes | | yes | | yes | |
| time fixed effects | yes | | yes | | yes | |
| county time trends | yes | | yes | | yes | |
| Pseudo R-squared | 0.1004 | | 0.1118 | | 0.1290 | |
| number of observations | 352,534 | | 353,837 | | 354,793 | |

Note. * indicates statistical significance at 10 percent level, ** at 5 percent level, and *** at 1 percent level. Dummies for interest only and balloon loans predict 90 days delinquency perfectly and are not included in the regression. The dummy for jumbo loans predicts foreclosure probability perfectly and are not included in the 90 days delinquency and the foreclosure regressions.

Table 12. Mortgage Default and Foreclosure Start - Robustness Analysis

| | 60 days delinquent | | 90 days delinquent | | Foreclosure start | |
|---|---|---|---|---|---|---|
| sample | marginal effs | s.e. | marginal effs | s.e. | marginal effs | s.e. |
| originated: 200810-201009 | 6.54-e05 | 1.50e-04 | -2.14e-06 | 8.56e-05 | -1.88e-06 | 3.10e-05 |
| mortgage ltv above 90 | 2.53e-04 | 4.54e-04 | -1.30e-04 | 6.76e-05 | 5.00e-05 | 3.30e-04 |
| above median house value | 4.59e-04 | 4.56e-04 | 1.66e-04 | 3.07e-04 | 1.43e-05 | 4.81e-05 |

Note. * indicates statistical significance at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

References


1. Adelino, M., K. Gerardi, and P. S. Willen. 2009. "Why Don't Lenders Renegotiate More Home Mortgages? Redefaults, Self-cures, and Securitization." Working Paper 09-4, Federal Reserve Bank of Boston.

2. Ambrose, B. W., R. J. Buttimer Jr., and C. A. Capone. 1997. "Pricing Mortgage Default and Foreclosure Delay." *Journal of Money, Credit, and Banking* 29. pp. 314–25.

3. Ambrose, B. W., C. A. Capone, and Y. Deng. 2001. "Optimal Put Exercise: An Empirical Examination of Conditions for Mortgage Foreclosure." *Journal of Real Estate Finance and Economics* 23, pp. 213–34.

4. Bajari, P., C. S. Chu, and M. Park (2008). "An Empirical Model of Subprime Mortgage Default from 2000 to 2007," NBER Working Papers 14625. National Bureau of Economic Research, Inc.

5. Bajari, P., C. S. Chu, D. Nekipelov, and M. Park. 2013. "A Dynamic Model of Subprime Mortgage Default: Estimation and Policy Implications." NBER Working Papers 18850. National Bureau of Economic Research, Inc.

6. Berkowitz, J., and R. Hynes. 1999. "Bankruptcy Exemptions and the Market for Mortgage Loans." *Journal of Law and Economics* 42(2), pp. 809-830.

7. Bhutta, N., J. Dokko, and H. Shan. 2010. "The Depth of Negative Equity and Mortgage Default Decisions." Finance and Economics Discussion Series Working Paper 2010–35, Federal Reserve Board of Governors.

8. Brueggeman, W. B., and J. D. Fisher. 2011. *Real Estate Finance and Investments.* 14th Ed. New York: McGraw-Hill Irwin.

9. Ciochetti, Brian A. 1997. "Loss Characteristics of Commercial Mortgage Foreclosure." *Real Estate Finance* 14(1), pp. 53-69.

10. Clauretie, T. M. 1987. "The Impact of Interstate Foreclosure Cost Differences and the Value of Mortgages on Default Rates." *American Real Estate and Urban Economics Association Journal* 15, pp.152–67.

11. Clauretie, T.M., and T. Herzog. 1990. "The Effect of State Foreclosure Laws on Loan Losses: Evidence from the Mortgage Insurance Industry." *Journal of Money, Banking, and Finance* 22(2), pp. 221-233.

12. Corbae, D., and E. Quintin. 2010. "Mortgage Innovation and the Foreclosure Boom." Working Paper, University of Texas at Austin.

13. Demyanyk Y. and O. van Hemert. 2011. "Understanding the Subprime Mortgage Crisis." *Review of Financial Studies* 24(6), pp. 1848-1880.

14. Elul, R., N. S. Souleles, S. Chomsisengphet, D. Glennon, and R. Hunt. 2011. "What 'Triggers' Mortgage Default?" *American Economic Review* 100 (2), pp. 490-94

15. Feldstein, Martin. 2008. "How to Help People Whose Home Values Are Under Water?" *Wall Street Journal* Opinion, November 18.

16. Foote, C. L., K. S. Gerardi, P. S. Willen. 2008. "Negative Equity and Foreclosure: Theory and Evidence," Public Policy Discussion Paper 08-3, Federal Reserve Bank of Boston.

17. Gerardi, K. S., A. H. Shapiro, and P. S. Willen. 2007. "Subprime outcomes: risky mortgages, homeownership experiences, and foreclosures." Working Papers 07-15, Federal Reserve Bank of Boston.

18. Ghent, Andra C., and M. Kudlyak. 2011. "Recourse and Residential Mortgage Default: Evidence from US States." *Review of Financial Studies* 24(9), pp. 3139-3186.

19. Guiso, L., P. Sapienza, and L. Zingales. 2013. "The Determinants of Attitudes Toward Strategic Default on Mortgages." *Journal of Finance* 68(4), pp. 1473-1515.

20. Leland, J. 2008. "Facing Default, Some Walk Out on New Homes." *New York Times*, February 29.

21. Lin, E,Y., and M. White. 2001. "Bankruptcy and the Market for Mortgage and Home Improvement Loans." *Journal of Urban Economics* 50(1), pp. 138-162.