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THE CASE OF NEVADA

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Abstract

The state of Nevada passed legislation 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 how the law change affected lenders' decisions to grant mortgages and borrowers' decisions to apply for them and subsequently default. Using unique mortgage loan-level application and performance data, we find evidence that lenders tightened their lending standards for mortgages affected by the new legislation. In particular, lenders reduced approval rates and loan sizes for mortgages after implementation of the law. Borrowers also increased the loan size at application after the law change but the total number of loan applications did not increase. Finally, the law change did not appear to have affected borrowers' default decisions though the power of the test may be limited due to the overall low loan default rates at the time.

Keywords: deficiency judgment, default, foreclosure, approval, interest rate, Nevada

JEL Classifications: G21, K11, R20

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1 Introduction

In the United States, state laws govern residential mortgage defaults and house foreclosure processes. In most states, mortgage loans are recourse loans – that is, lenders can apply the difference between mortgage balance and proceeds from foreclosure sales to delinquent borrowers' other assets or earnings, a process also known as a deficiency judgment.[1] Theory predicts that recourse should deter default since default puts delinquent borrowers' other assets at risk (Ambrose, Buttimer, and Capone 1997, and Corbae and Quintin 2015). Researchers, however, have found mixed empirical evidence. 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 due to the high cost associated with pursuing them (Ambrose and Capone 1996, Leland 2008, and Brueggeman and Fisher 2011).[2] By contrast, Ghent and Kudlyak (2011) find that recourse affects default by lowering borrowers' default sensitivity to negative equity and home value.

In this paper, we show that this debate on the usefulness of deficiency judgments as tools to curb mortgage defaults is incomplete and perhaps even misleading. Both lenders and borrowers respond to changes in regulations. With deficiency judgments, 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 they may 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 more likely to default in states with deficiency judgments may simply reflect the fact that approved borrowers in those states are riskier.

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 legislation that made significant changes to its deficiency judgment law. For homeowners who entered into a mortgage in conjunction with the purchase of a single-family 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 responded to the law change by altering their mortgage approval rates, their approved mortgage loan sizes and their interest rates. We also test whether borrowers changed their mortgage application behavior by applying for more and larger loans. To

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

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

facilitate the comparison with the aforementioned literature, we further 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. To the best of our knowledge, our paper is the first to evaluate the effect of a legislation change in deficiency judgments. Our natural experiment provides variation in deficiency, which allows cleaner identification than the state-level variation in existing recourse laws. This is usually used in the previous literature, however, state recourse laws change only infrequently.

The paper has three main results. First, we uncover evidence that lenders tightened their lending standards by reducing approval rates and loan sizes for those affected after implementation of the law. There is some evidence that lenders also lowered interest rates for approved loans as a result of the improved qualities of the borrowers. Second, we do not find that mortgage applications for purchase loans for one- to four-family owner-occupied homes increased after implementation of the law. But borrowers did apply for larger purchase loans after the law change. Finally, we do not find that borrowers' default behavior responded to the change in the Nevada law in any statistically significant way. What is more, we do not find that the change in recourse law made borrowers' default behavior more sensitive to home equity. The power of the last test, however, may be limited due to the overall low default rates at the time.

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

Until recently, the state of Nevada was a recourse state, since it allowed lenders to sue their borrowers to get a deficiency judgment within six months following foreclosure for all mortgage loans. The amount of the judgment, however, was limited to the lesser of the difference between the total debt and fair market value of the home; or the difference between the total debt and foreclosure sale price.[3] Before awarding a deficiency judgment, the court would hold a hearing to receive evidence from the lender

[3] Nev. Rev. Stat. § 40.459.

and the borrowers concerning the fair market value of the property as of the date of the foreclosure sale. The lender must give the borrower notice of the hearing 15 days prior to the hearing. The court would appoint an appraiser to appraise the property if the lender or borrowers made a request at least 10 days before the hearing date.[4]

The deficiency lawsuit is like a lawsuit to recover an unsecured debt such as credit card debt. If the lender wins the case, the court will issue a judgment ordering the borrowers to pay off the deficiency. If the borrowers ignore this court order, the lender can use the deficiency judgment to place liens on other property that the borrowers own, garnish their wages, or freeze their bank accounts. In the Appendix, we provide information on the actual practice of deficiency judgment in Clark County, Nevada.[5,6] Based on our collected data, the fraction of foreclosed loans that ended up with a deficiency judgment has been declining over time, from 12 percent in 2000 to 0.12 percent in 2013.[7] The sharpest decline occurred in 2007, coinciding with the onset of the mortgage crisis. In contrast, the amount of awarded judgment as a fraction of mortgage outstand- ing has been increasing over time with the median increasing from 9 percent in 2000 to 13 percent in 2013.

Since the mortgage crisis broke out in 2007, Nevada, like with many other states, has begun to implement new laws to mitigate foreclosures. In 2009, eight laws were passed in Nevada alone. Table 1 summarizes the eight laws. As can be seen, almost all laws made foreclosures 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' and tenants' responsibility to maintain the property during the foreclosure sale.

This paper concerns one of 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 if the following four circumstances apply: The real property is a single-family house owned by the debtor; the debtor used the money loaned from the

[4] Nev. Rev. Stat. § 40.457.

[5] Clark County is by far the largest county in Nevada (it contains Las Vegas). Loans in Clark County account for over 75 percent of total mortgages in Nevada between 2000 and 2013. We scraped the website of the Clark County District Court to obtain information on deficiency judgments contained in their case files. Information for the other counties were not easily accessible via the Internet.

[6] We thank Yuan Yuan for her generous help in collecting this information.

[7] Quintin and Yuan (2014) find in their study of foreclosure sales in seven counties in Illinois between mid-2008 and mid-2012 that about 2 percent end up with a deficiency judgment. Over that period, our numbers are smaller. There are several possible reasons for this difference. First, our sample includes both liquidation and realtor-owned mortgages. Using the liquidation sample only raises the probability to about 0.3 percent. Second, deficiency judgment was no longer allowed against purchase mortgages for primary residences made after October 2009. Finally, households in Nevada might have fewer assets than households in Illinois, making deficiency judgment suits not appealing to lenders.

bank to buy the house (as in a typical mortgage); the house was owner occupied; and the loan was never refinanced. What this means is that, for many homeowners who enter into a mortgage in conjunction with a house 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 remain subject to the prior law.[8]

Nevada passed no other laws in 2010 (the 26th Special Session). In the summer of 2011, to combat robo-signing, 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 the judicial foreclosure process more attractive to the banks, which allowed them to sidestep the new robo-signing law and to seek a deficiency judgment at the same time on properties not covered by AB 471.

As historical background, the wide adoption of restrictions on deficiency judgments by states has occurred before during another foreclosure crisis: the Great Depression. Before the Great Depression, there were few restrictions on deficiency judgments. In most states and territories, lenders were free to pursue all the remedies concurrently and successively. By the end of the Great Depression, almost all states had a "fair market value" provision, which prevented lenders from bidding far less than the market value of the property during a foreclosure sale. Many states went further and prohibited deficiency judgments altogether. As a matter of fact, up until recently, virtually all of the restrictions on deficiency judgments dated from the foreclosure crisis of the Great Depression. See Ghent (2012) for a more detailed discussion of the historical origins of the U.S. mortgage laws.

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' nonhousing assets. If the borrower has other assets that can be collected after foreclosure, then the possibility of a deficiency judgment will deter the borrower from becoming seriously delinquent. The more assets the borrower has, the stronger the

[8] 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.

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 movements, the borrower's income, and the cost of defaulting (less access to future credit) will all be factored into borrowers' default decisions. See Ghent and Kudlyak (2011) and Corbae and Quintin (2015) for more discussion.

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

On the basis of this theory, we seek to test several hypotheses. First, are lenders less willing to lend, will they lend a smaller amount, or will they lend at higher rates to primary single-family purchase mortgage loans after the law's implementation (October 1, 2009)? Second, do borrowers apply for more and/or larger primary single-family purchase mortgage loans after October 1, 2009? Finally, are primary single-family mortgage loans made after October 1, 2009, more likely to become delinquent and be foreclosed than primary single-family loans made before that date or primary single-family refinance loans?

3 Data and Empirical Methodologies

3.1 Data and Data Sampling

We use two main data sets. The first set is collected as foreseen by the Home Mortgage Disclosure Act (HMDA), which covers almost all U.S. mortgage applications as well as originations. It records each applicant's final status (denied/approved/originated), the purpose of borrowing (home purchase/refinancing/home improvement), occupancy type (primary residence/second or investment homes), loan amount, race, sex, income, and lenders' institutional categories.[9]

The second data source, LPS Applied Analytics, Inc., provides information from homeowners' mortgage applications concerning their financial situation, characteristics

[9]Only lenders not doing business in a metropolitan statistical area (e.g., small community banks) are exempt from reporting to HMDA.

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 about two-thirds of installment-type loans in the residential mortgage servicing market for the post-2005 period we are analyzing.

Both data sets are then merged with county-level monthly unemployment rates obtained from the Bureau of Labor Statistics and a monthly zip-code-level House Price Index (HPI) available from CoreLogic, Inc. When the zip-code-level HPI is not available due to low transaction volume, we substitute a county-level HPI. When the county-level HPI is not available either, we use the Nevada state HPI.

We use HMDA data to examine lenders' mortgage loan approval and loan size decisions and to detect changes in mortgage applications for affected mortgages after implementation of the new deficiency judgment law. For our benchmark, we restrict the sample to first-lien purchase or refinanced mortgages made in Nevada and collateralized by one-to-four-unit primary residence at around October 2009 –six months before and after the law change.[10] We then delete those applications that were withdrawn without an approval decision or were closed for incompleteness. We also delete loans insured by the Federal Housing Administration (FHA), U.S. Department of Veterans Affairs (VA), and Farmers Home Administration (FmHA) from the sample because deficiency judgments are prohibited on FHA loans and strongly discouraged on VA loans. We also delete mortgages that are owned or guaranteed by Fannie Mae or Freddie Mac due to the likely effect of the Home Affordable Refinance Program (HARP).[11] Finally, we drop mortgage loans for manufacturing housing as in Ghent and Kudlyak (2011).

We use LPS to analyze lenders' approved mortgage loan size and interest rate decisions, borrowers' default behavior, and lenders' foreclosure decisions. It must be noted that the analysis is conditional on loans already made. We focus on first-lien purchase or refinanced mortgages for single-family primary residences made in Nevada around October 2009 and follow the performance of these loans until the end of 2012. As with the HMDA data, we delete from the sample those loans insured by the government, including FHA, VA, and FmHA.

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

[11] HARP is the federal mortgage refinancing program that was first implemented in early 2009. It allows underwater homeowners with loans that are owned or guaranteed by Fannie Mae or Freddie Mac to refinance without paying for private mortgage insurance. Even though the program was implemented before the Nevada recourse law took effect, it took a while to ramp up and potentially could have a bigger impact on mortgage markets in the post-October 2009 period. We thank an anonymous referee for making this point.

3.2 Empirical Methodologies

We use various regression techniques to study the impact of Nevada's law change on lenders as well as borrowers. As mentioned earlier, decisions about mortgage loan application approval and approved mortgage loan size come from HMDA data. For the hypothesis regarding borrowers' mortgage application decisions, which also use HMDA data, we study changes in loan size at the individual application level. We also aggregate the data to the county level and by purpose of the loan — that is, whether the loan is for purchase or refinance. We measure borrowers' default behavior by examining whether they first became 60 and 90 days or more delinquent, as well as lenders' foreclosure decisions as reported by LPS. Approved loan sizes as well as mortgage interest rates also come from LPS.

Our identification comes from the interaction of two terms: whether the loan is a purchase loan and whether the loan is made after October 1, 2009. Given the rich information contained in the data, we will conduct robustness analysis using other information such as primary versus investment loans, and conventional versus nonconventional 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, race, and income of the applicant, whether the applicant has a cosigner for the mortgage, whether the property belongs to an area with 30 percent or more minorities, the range of median income in the census tract, and whether the lender is a commercial bank or its subsidiary, an independent mortgage bank, a thrift, or a credit union. When we aggregate the data to test for trends in mortgage applications, 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, X_{it} includes borrowers' credit (FICO) score at origination and mortgage loan contract information such as loan age, loan-to-value ratio and mortgage interest rate at origination, whether the loan has full documentation, whether the loan has a fixed interest rate, whether the loan is a jumbo loan, whether the loan is a balloon loan, whether the loan is an interest-only loan, and whether the loan was sold to private investors.[12] For both data, we further control for county and month fixed effects and separate linear time trends for each county. Finally, we cluster standard errors at the

[12] We observe virtually no subprime loans during our sample period.

county level when using HMDA data and the loan level when using LPS data.

We use ordinary least squares (OLS) when the dependent variable y_{it} is continuous and Probit regression when the dependent variable is binary. When testing for approved mortgage loan sizes using HMDA, we use Tobit analysis because the data are censored as rejected loans effectively have a zero loan amount. Unfortunately, LPS does not include any rejected loans. For interest rate and mortgage size analysis, we thus use OLS for approved loans.

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 responded 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 to capture lending standards: mortgage approval rates, approved mortgage loan sizes, and interest rates of approved loans. As discussed earlier, we use HMDA data for the analysis of approval rates and mortgage loan sizes and LPS data for the tests on approved loan sizes and 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 22,172 applications for first-lien mortgages collateralized by one- to four-family primary residences with no government guarantees. The overall mortgage approval rate is 55 percent. Of the 22,172 applications, 69 percent are for refinance. About 14 percent of the applications are affected by the change in deficiency judgments (i.e., are purchase loan applications made after October 1, 2009). Roughly 28 percent of the applications are filed by females. About 75 percent of the applicants are white, 2.5 percent are black, 9.5 percent list race other than white or black, and 13 percent do not report race. Nearly 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 \$112,000 and the median income at \$80,000. The average loan amount is \$235,000, and the median is \$185,000. About 3.1 percent of the applicants live in areas where over 30

percent of the residents are minorities. Over half the applicants come from census tracts whose median family income is 120 percent or more of the MSA area median family income in which the tracts are located (upper income census tracts). Census tracts with less than 50 percent their corresponding MSA area median income have virtually no mortgage applications (low income census tracts).[13] The majority of the applications are filed at commercial banks (57 percent) followed by independent mortgage banks (25 percent), thrifts (11 percent), and credit unions (5 percent). Unemployment rates are high in all counties of Nevada; both the mean and the median are over 12 percent. House prices declined for most of the state during that period.

Table 3 reports summary statistics for the LPS static sample. Between April 2009 and March 2010, 7,053 mortgage loans were first-lien purchase mortgages made for single-family primary residence without government guarantees. Note that this number is smaller than the 12,170 approved mortgage loans calculated from HMDA. This is because we delete from the LPS sample mortgages for two-to-four-family residence, information that is not available in HMDA. We also delete from the sample loans that do not report their occupancy type, purpose (purchase, refinance, home improvement, etc.), or property type (single family, multifamily, etc.). Finally, LPS has a smaller coverage than HMDA, as mentioned earlier in the data description.

Of the 7,053 mortgages, 65 percent are for refinances. This number is somewhat lower than the 69 percent at application. About 15 percent of the mortgages are affected by the law change, and 7 percent of them have private mortgage insurance. The average mortgage loan amount is $202,000, smaller than those reported at application contained in HMDA. The average property value is about $318,000. The resulting loan-to-value ratio averages 69 percent with a median of 73 percent. The mean interest rate at origination is 4.96 percent. The majority of the mortgages (over 97 percent) have fixed rates. The mean credit score at origination is 698, and the median is 767.[14] About 53 percent of the mortgages have full documentation. A mere 2 percent are jumbo mortgages, another 2 percent are interest-only loans, about 0.1 percent are balloon loans, and 27 percent are sold to private investors.

4.1.2 Results

Approval Rate and Loan Size Figures 1 and 2 chart the raw data for mortgage approval rates and approved average mortgage loan sizes, respectively, at levels between

[13] About 38 percent come from census tracts whose median family income is 80 to 120 percent of the corresponding MSA median family income (middle income census tracts), and the remaining applicants come from census tracts that have a median family income 50 to 80 percent of the MSA or non-MSA area median family income where the tracts are located (moderate income census tracts)

[14] The FICO score ranges between 350 and 850.

January 2007 and December 2011 and as deviations from their respective October 2009 values between April 2009 and March 2010, which is six months before and six months after the law change. The left panel of Figure 1 indicates that loan approval rates for purchase and refinance loans followed a similar time trend except that the approval rates for refinance loans fluctuated more than the approval rates for purchase loans. The right panel of Figure 1 shows that after October 2009, the approval rates for purchase loans zigzagged but had more significant falls than rises. By contrast, the approval rates for refinance loans had more significant rises than falls.

Turning to approved mortgage loan sizes, the left panel of Figure 2 plots the time trend of approved loan sizes in thousands of dollars, and the right panel plots deviations in thousands of dollars from October 2009 between April 2009 and March 2010. As can be seen, leading to October 2009, the approved mortgage loan sizes fell for purchase mortgages. Although the approved mortgage loan sizes also fell initially for refinance loans, they recovered somewhat by October 2009. After that, the approved mortgage loan sizes stabilized for both types of loans. As deviations from their respective October 2009 levels, the approved mortgage loan sizes again had overall more significant rises than falls for refinance loans than purchase loans.

We conduct two regression analyses using HMDA and report the results in Table 4. The first is a Probit analysis in which the dependent variable takes the value of 1 if the loan is approved and zero if the loan is declined. The second is a Tobit analysis where the dependent variable is the actual loan amount for approved loans and zero for rejected loans. According to our analyses, the key variable, one- to four-family purchase loans made after October 2009 contributes negatively and statistically significantly to lenders' approval rates as well as mortgage loan sizes upon approval. In particular, a one- to four-family mortgage purchase loan made after October 2009 has an approval rate that is 6.44 percentage points lower than that of a similar loan made earlier or a single-family refinance loan, that is, it is 11.74 (=(6.44/54.85)*100) percent less likely to be approved. The approved loan size is $30,000 less, or 12.77 (=(30/235)*100) percent smaller than loans not affected by the change in the law.

In terms of the other control variables, for approval rates, everything else the same, a refinance mortgage loan is about 25 percentage points less likely to be approved. This result likely 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 after house prices have declined, and lenders tightened their lending standards after the crisis. As expected, a high income increases the probability of being approved, while a large loan amount reduces the probability of being approved. Specifically, a $1,000 increase in income raises the approval rate by about 1.6 basis points, while a $1,000 increase in

loan amount reduces the approval rate by about 1.7 basis points. Note that living in minority areas substantially lowers the approval rates by about 12 percentage points. Additionally, living in areas with lower census tract median income relative to the MSA or non-MSA area median family income also substantially reduces loan approval rates. Furthermore, being nonwhite or not reporting race reduces approval rates by between 6 and 10 percentage points.[15] Having no cosigner also reduces the approval rate by 6 percentage points. Finally, compared with specialized mortgage banks, commercial banks and thrifts are less likely to approve mortgage applications, while credit unions are more likely to do so.

In terms of loan sizes, refinance loans are on average $130,000 smaller. Applicants with higher incomes borrow more; a $1,000 increase in income corresponds to a $390 increase in loan sizes. Borrowers living in minority areas get smaller loans ($90,000 less), 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.

Approved Mortgage Loan Size and Interest Rate To further investigate whether lenders lend smaller loans or lend at higher interest rates to borrowers affected by the change in the deficiency law, we turn to LPS data, which contain much richer information on mortgage loan characteristics and borrower credit worthiness as summarized by FICO scores than the HMDA data. The information in LPS, however, is for approved loans only, and the data thus limit our ability to control for this survival bias.

We first chart the overall time trend of loan sizes on the left panel of Figure 3. Deviations in loan sizes from their October 2009 level are depicted on the right panel of Figure 3 over a shorter time horizon. Similarly, we chart the time trend of interest rates at levels on the left panel of Figure 4 and deviations from their October 2009 value on the right panel. The figures clearly indicate a downward trend in both loan sizes and mortgage interest rates. While the former may reflect falling property value and tightened lending standards, the latter stems from loose monetary policies at the time that lowered all interest rates including mortgage rates. In terms of deviations, the approved loan sizes appear to deviate more from their October 2009 level both before and after the law change for purchase loans than for refinance loans. The interest rate

[15] These findings pertain to the literature on discrimination in mortgage lending. Ladd (1998) reviews earlier studies that provide evidence of disparate treatment of minorities in terms of loan denial rates, loan default rates, and the possibility of geographic redlining. Apgar and Calder (2005) document the new form of discrimination in the increase in high-cost, inappropriate, or predatory mortgage loans in low-income and minority neighborhoods during the housing booms of the late 1990s to early 2000s.

deviations for purchase loans track those for refinance loans fairly well.

Table 5 reports our regression analyses. We include zip code dummies to control for geographical differences. Due to our limited sample size, however, we include separate time trends for each county instead of each zip code. According to our analyses, purchase loans made after the reform are about $9,300 smaller than loans not affected by the law. This estimate is much smaller than the previous estimate from HMDA when we control for selection bias with our Tobit regression. For other control variables, interest-only loans have much larger sizes, $33,000 larger. Loans with private mortgage insurances are larger by $42,000. A higher property value is also associated with larger mortgages. In particular, a $1,000 increase in property value raises the loan amount by $350. Interestingly, borrowers with higher FICO scores tend to have smaller loans, although a 100-point increase in a FICO score only decreases the mortgages by $8,000. Borrowers with full document, jumbo loans, or high interest rates at origination also borrow more. Finally, loans that are sold to private investors are smaller by over $7,000.

Regarding interest rates, those affected by the law actually have slightly lower interest rates (by about 4 basis points), but the estimate is barely significant at the 10 percent significance level. This result is possible given that lenders have already tightened their lending standards in the other dimensions, approval rates and loan sizes. Put differently, the extended mortgages that are affected by the law change may have higher quality and thus require smaller interest rates than those not affected by the law change. For the other control variables, mortgage rates for refinance loans are, on average, about 12 basis points lower. An increase of 10 percentage points in the mortgage loan-to-value ratio raises the interest rate by about 4 basis points. An increase of 100 in FICO score, on the other hand, reduces the interest rate by 17 basis points. Loans sold to private investors have somewhat higher interest rates (8 basis points). Jumbo loans have much higher interest rates (61 basis points). Finally, borrowers in areas with high local unemployment 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 three additional analyses. First, we extend our sample to include loans made between October 2008 and September 2010, one year before and one year after the deficiency law change. Second, we include investment loans for single-family housing to our sample to serve as an additional control group that is not affected by the law change. Third, we add loans on single family primary residence that are guaranteed by government agencies. These loans are also not affected by changes in the deficiency judgment law. The results are

reported in Table 6.

Extending the benchmark sample to include loans made one year before October 2009 and one year after strengthens our results. Now, the lenders are 8 percentage points or 15 (8/54) percent more likely to reject a single family purchase loan made after the law change, and the loan size is on average $47,000 or 20 (47000/238000) percent smaller. Including loan applications for investment properties does not change the benchmark results much. After October 1, 2009, lenders reduce their approval rates of primary single-family mortgage loans by 6.3 percentage points or 11 (6.3/53) percent, and, once approved, the loan sizes are $26,000 or 12 percent smaller. When we add government-guaranteed loans for single-family primary residence, the reductions in approval rates and approved mortgage loan size become 14 percentage points and $19,000, respectively. In percentage terms, these numbers correspond to a reduction of approval rates by 19 (=14/73) percent and loan sizes by 9.7 (19,000/196000) percent. Note that by including more control groups, the fraction of purchase loans affected by the deficiency law change necessarily falls, especially when government-guaranteed loans are included.

Approved Mortgage Size and Interest Rate For mortgage interest rates, we conduct four robustness tests: 1) extending the sample by including loans made one year before and one year after the deficiency law change, 2) including investment properties, 3) including multifamily properties, and 4) excluding loans with private mortgage insurance. The results are presented in Table 7. As can be seen, the change in the deficiency law continues to have a significant and negative effect on approved loan sizes in three of the four robustness tests, when a longer period is used, when we include multifamily properties, and when we exclude loans with private mortgage insurance, and the magnitudes vary within a narrow range of $7,400 to $9,300. The effects of the law change on mortgage interest rates are significant in two of the robustness analyses, including multifamily properties and excluding loans with private mortgage insurance. The magnitudes, at 5 basis points, are 1 basis point larger than that in the benchmark.

4.2 Mortgage Application

In this subsection, we investigate mortgage applicants' behavior. Theory predicts that those affected by the deficiency law change should postpone their application for mortgages until after the law change and apply for larger loans then. Using the HMDA loan-level data, we examine whether changes in the deficiency law had an effect on loan size at application. Then to study how the total number of applications are affected by the law change, we aggregate by month the total number of mortgage applications made

for single-family primary residence purchase loans and refinance loans for each county.[16] Figure 5 charts the average loan size at application at levels on the left panel and as deviations from their respective October 2009 value in the right panel. Figure 6 charts the total number of applications over time and as deviations from their respective October 2009 value for purchase and refinance loans, respectively.

According to the left panel of Figure 5, the average loan size at application has been declining since 2007 for both purchase loans and refinance loans but more sharply for purchase loans initially and then less sharply starting in mid-2009. This can also be seen in the right panel of Figure 5, where the average loan size continued to increase after October 2009 before falling in January 2010 for purchase loans. For refinance loans, the average loan size continued to decline after October 2009 before climbing in January 2010 to recover some of the declines. According to Figure 6, the total number of applications for purchase loans had a slight decline between 2007 and 2011, while the total number of applications for refinance loans had a much more dramatic decline, especially early in the sample period. As deviations from their October 2009 levels, however, the purchase loan applications seem to have more of a decline after October 2009 than the refinance loan applications.

In our regression analyses, we use OLS to test for the individual loan size at application. The control variables are the same as those in the benchmark. For the aggregate loan demand, we regress the number of loan applications on whether the loans are for purchase or refinance, lagged local unemployment rates, lagged local house price growth rates, average local income, whether minority households are more than 30 percent of the population in the area where the property is located, and a time trend and its square.[17] The regression results are reported in Tables 8 and 9. We see from table 8 that purchase loan application is slightly larger after the law change, by $7,000 or 0.4 percent. In terms of other variables, applications for refinance loans tend to have larger sizes, income also contributes positively to loan sizes at application. By contrast, living in areas with over 30 percent minorities, being nonwhite, female, or having no cosigners all lead to smaller loan sizes at application. In terms of lending institutions, applications at commercial banks and thrifts have larger loans than those at mortgage banks, while those at credit unions have smaller loans. From Table 9, we observe that the law change does not affect total loan applications. Interestingly, MSAs with smaller average income have more applications. Similarly, MSAs with over 30 percent minorities also have more applications. County dummies are important determinants of total mortgage applications.

[16] Although the data contain census tract information, many census tracts had none or very few applications at times.

[17] We can no longer afford separate time trends given the much smaller sample size.

Robustness Analysis We conduct three additional robustness tests with respect to individual loan sizes at application: 1) examining loan applications made one year before and one year after October 2009, 2) including investment properties in the control group, and 3) including nonconventional single-family loans for primary residence. The results are in Table 10. The significant positive demand effect from the deficiency law change turned negative when we extend the sample period to one year before and after the law change. However, the effects are further strengthened when we include investment loans or government-guaranteed loans. For the aggregate loan demand, the insignificant benchmark result remains robust to including investment loans or government guaranteed loans. We omit the results here.

4.3 Mortgage Default and House Foreclosure

This subsection seeks to test whether single-family home borrowers who were granted loans after October 1, 2009, are more likely to default. We define defaults to be the first time that the loan becomes 60 days delinquent, 90 days delinquent, or enters the foreclosure process.

4.3.1 Descriptive Statistics

We use LPS for the default and foreclosure analysis. We focus on first-lien mortgage loans for single-family primary residences that are not guaranteed by the government and are 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. These are the same loans that we studied for the effects of the law change on originated loan sizes and interest rates. We follow these loans from the time of their origination to the first time they become 60 days or 90 days delinquent, enter into foreclosure, or reach the end of the sample period (December 2012).

Table 11 reports the summary statistics for the 60+ delinquency sample, in which we delete loan observations after they first become 60 days delinquent. In total, we have 256,654 observations. The 60-day delinquency rate is 0.09 percent at the monthly frequency, or a little over 1 percent at the annual frequency. Given that we focus on loans originated between April 2009 and March 2010, it is not surprising that the loan delinquency rates are low as lenders have tightened lending standards after the crisis. This low delinquency rate likely weakens the power of our tests.[18] About 65 percent of the loans are refinance loans, 7 percent have private mortgage insurance, and 14 percent are purchase loans made after October 1, 2009, and are thus affected by the deficiency

[18] We thank an anonymous referee for pointing this out.

law change. The average loan age is 20 months, and the median is 24 months. The mean mortgage loan-to-value ratio is 69 percent with a median of 73 percent. The interest rate averages about 5 percent. The average credit score (FICO) is 699, and the median is 767, on the high end of the FICO score range of 300 and 850. Slightly over half of the loans have full documentation, a small 2 percent are jumbo loans, less than 2 percent are of adjustable rates, another 2 percent are interest-only loans, 0.08 percent are balloon loans, and 6 percent are sold to private investors. The monthly unemployment rate averages 13 percent. The monthly real house price growth rate averages about 0.49 percent with large variances. The sample statistics for the 90+ day delinquency and foreclosure sample are very similar except that the 90-day delinquency rate averages 0.08 percent monthly for the 90+ day delinquency sample, and the foreclosure rate is 0.05 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 the foreclosure process.

4.3.2 Results

As discussed in the empirical methodologies section, we run Probit regressions with the dependent variable being the binary variable that takes the value of 1 if the loan becomes delinquent or enters into foreclosure and zero otherwise. We cluster standard errors at the loan level. Table 12 reports our regression results, including marginal effects of each explanatory variable and the associated standard errors. Following Ghent and Kudlyak (2011), we also study the different effect of the law change on loans that are close to having negative equity. To do that, we interact the dummy variable that indicates whether the loan is a purchase loan made after October 2009 with a dummy variable that indicates whether the updated mortgage loan-to-value ratio exceeds 100 percent. We obtain the current loan-to-value ratio by updating the appraisal value of the house at origination with the zip code house price growth rates and then dividing the current mortgage balance by the updated property value.

The variable we are most interested in, single-family mortgage loans made after October 2009, is not significant in the 60+ delinquency and foreclosure analyses and barely significant in the 90+ delinquency analysis. Furthermore, borrowers who have negative home equities are not any more affected by the law change than other borrowers. Among the control variables, refinance loans are more likely to default, potentially reflecting the lower lending standards when these loans were first made as purchase loans and the deteriorating housing market conditions since the loans were made. The older the mortgage loan is, the more likely it becomes 60 days, 90 days delinquent, or enters into foreclosure, although the speed of the increase declines with age. As expected, mortgage loans with

high mortgage loan-to-value ratios, interest-only loans, and loans with adjustable rates are more likely to become delinquent or enter foreclosure, while high FICO scores at origination reduce default as well as foreclosure probability. Current interest rate also contributes positively to default and foreclosure probabilities. County- and time-fixed effects are included in all three regressions. As mentioned earlier in our data description, our sample period is a period that mortgage default and foreclosure rates have come done significantly due to lenders tightening lending standards. This potentially reduced the power of our test.[19]

4.3.3 Robustness

We extend the sample to include loans made one year before and one year after October 2009, to include multifamily loans, to include nonconventional loans, or to exclude loans with private insurance. In all the analyses, the key coefficient, single-family purchase mortgage loans made after October 2009, as well as its interaction term with the dummy term that indicates whether the current loan-to-value ratio exceeds 100 percent, remain statistically insignificant. We do not report the results here.

5 Conclusion

This paper studies whether the change in deficiency judgments that affected only purchase mortgages made on single-family primary residences after October 2009 in the state of Nevada had affected mortgage borrowers'default behavior, lenders'foreclosure and lending decisions, and 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. The paper finds evidence that lenders have tightened their lending standards by reducing loan approval rates and loan sizes though there exists some evidence that the mortgage interest rates for approved loans also declined slightly. It further reveals that there were no delays in mortgage applications from households, but there is some, albeit weak, evidence that borrowers increased the size of their loans at application after the law change. Finally, the paper does not find any significant change in affected borrowers'mortgage default decisions and lenders' foreclosuredecisions. Having said that, this last test may be weakened by the fact that mortgage default rates had declined to very low levels by 2009.

[19] We thank an anonymous referee for bringing up this point.

Overall, the paper casts a cautionary note on using deficiency judgments as a deterrence for mortgage default or mortgage foreclosure and calls for comprehensive analysis of law changes on both loan supply and demand. Further policy research requires more structural analysis, which we pursue in a separate project.[20]

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

Appendix

We collect information on deficiency judgment cases for Clark County, Nevada.[21] We first obtain a list of lender names from the Home Mortgage Disclosure Act (HMDA) for the years 2000 to 2011. In total, we have 460 lenders, including prominent names such as Bank of America, Bank One, Chase Manattan Bank, Citibank, Countrywide Home Loans, GMAC Bank, Merrill Lynch Credit Corporation, and Wells Fargo. There are also many local smaller lenders. We built a Python web scraper that automates the proceedure below to collect data from the court website. The web scraper is publicly available on github at `https://github.com/floswald/scraper`. The search proceeds as follows:

1. Go to the Clark County court records at `https://www.clarkcountycourts.us/Anonymous/default.aspx`

2. Select "District Civil/Criminal Records."

3. In the next page, select "party" underthe "Search By:" dropdownbox. In the box with "Party Information:," select "Business," under "*Business Name," enter the lender names that we obtained from HMDA as described above. In the box with "Case Status," we choose "All," for "Date Filed:," we search for cases filed after 2000 but before 2014. Click "search."

4. In the resulting page, we pick all cases that have "Breach of Contract" under "Type/Status."

5. For each "Breach of Contract," clickthe case number to access the court files.

6. For each case of type Breach of Contract, check whether the court ruling is one of "DEFAULT JUDGMENT","DFLT JDGMT","DFLT JMNT","JUDGMENT PLUS INTEREST","DEFAULT JUDGMENT PLUS INTEREST","DEFAULT JUDG + INT","DEFAULT JUDGMT + INT","JUDGMENT PLUS LEGAL INTEREST","DEFAULT JMNT + INTEREST","DFLT JMNT+LEGAL","DFLT JDGMT+INTEREST". Information on amount awarded, attorney cost, etc. are collected from this page.

7. The resulting dataset is available upon request from the authors.

   Separately, we obtain from LPS Applied Analytics the number as well as mortgage balances of mortgage loans in the county that are either realtor owned, in

[21] We thank Yuan Yuan for generously providing us with the information and technique to collecting this information.

foreclosure, or liquidated. Table A1 reports the frequency of deficiency judgments calculated as the ratio of total deficiency cases as a fraction of total loans in foreclosure and mean and median amount awarded as a fraction of mean and median mortgages at the time of foreclosure.

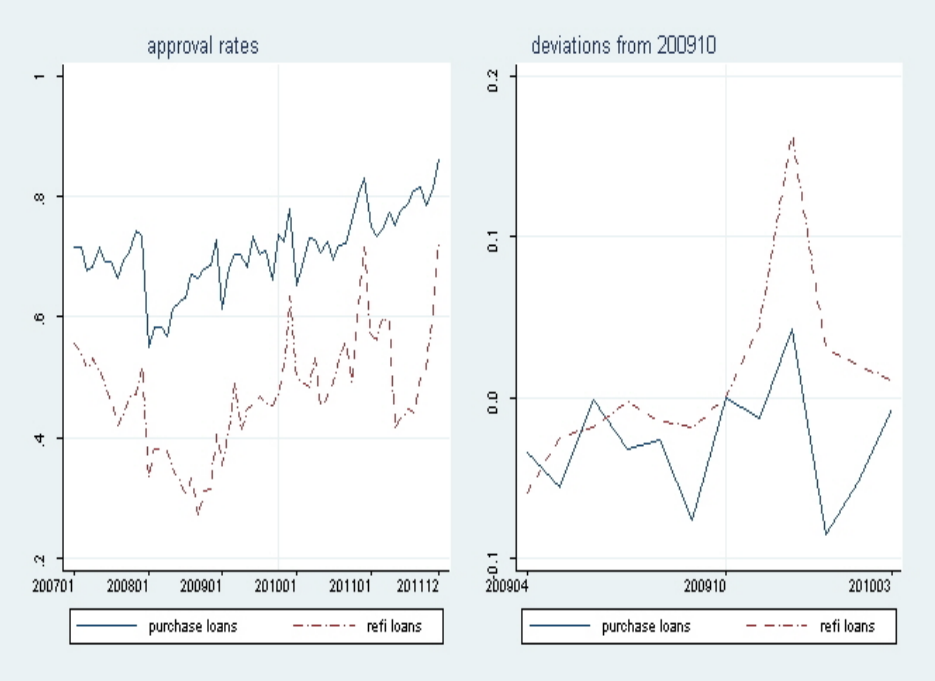

Figure 1. Average Mortgage Approval Rates (Source: HMDA. We restrict mortgages to first-lien conventional loans that are not sold to GSEs and that are for one- to four-family primary residences.)

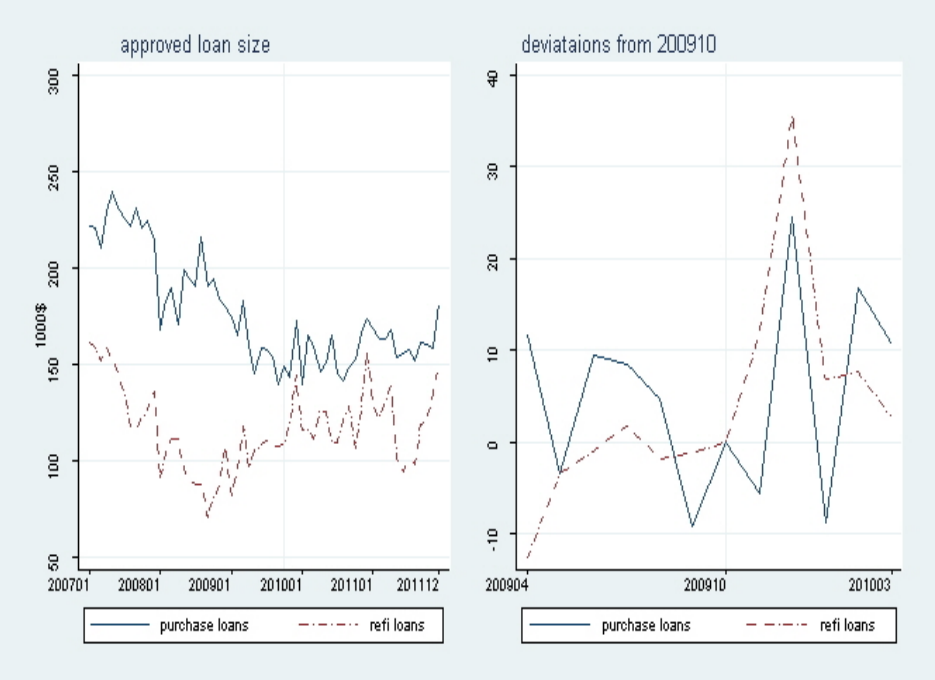

Figure 2. Average Approved Mortgage Loan Size (Source: HMDA. We restrict mortgages to first-lien conventional loans not sold to GSEs and that are for one- to four-family primary residences. The loan size for rejected loans is recorded as zero.)

Figure 3. Average Approved Mortgage Loan Sizes (Source: LPS. We restrict mortgages to first-lien conventional loans or loans with private insurance that for single-family primary residences.)

Figure 4. Average Mortgage Interest Rates for Approved Mortgage Loans (Source: LPS. We restrict mortgages to first-lien conventional loans or loans with private insurance that are for single-family primary residence.)

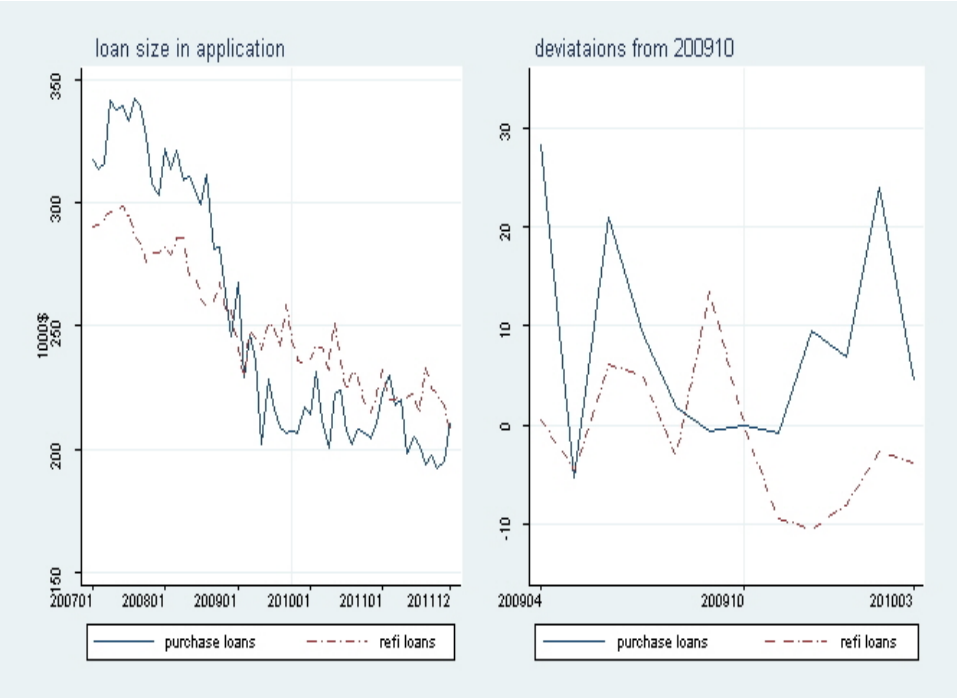

Figure 5. Average Loan Size at Application (Source: HMDA. We restrict mortgages to first-lien conventional loans that are not sold to GSEs and that are for one- to four-family residences.)

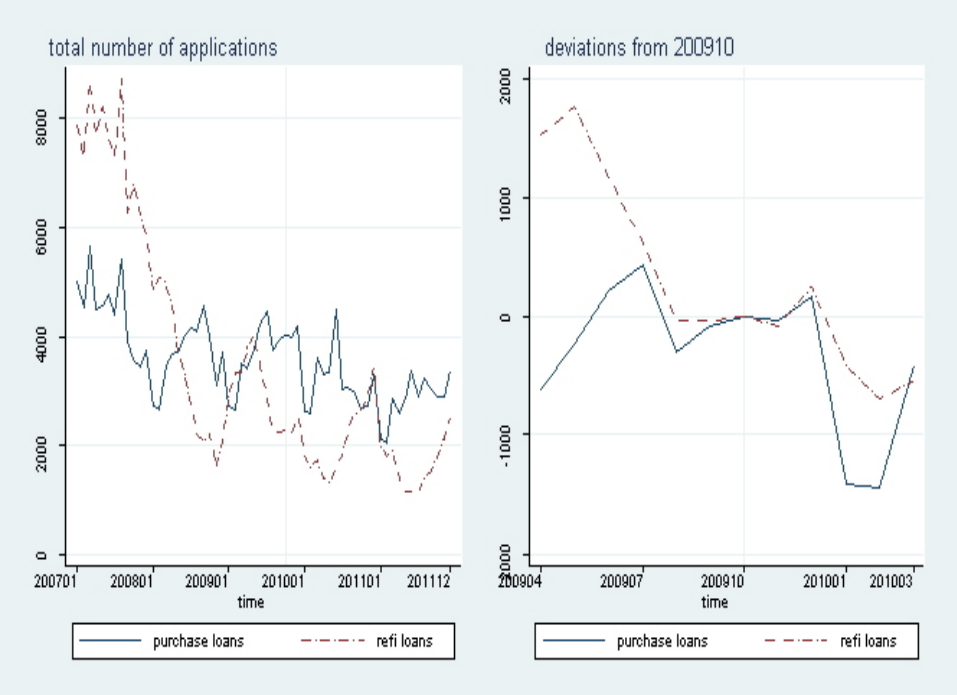

Figure 6. Total Mortgage Applications (Source: HMDA. We restrict mortgages to first-lien conventional loans that are not sold to the GSEs and that are for one-to-four family primary residences.)

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	Provides that a deficiency in a payment on a mortgage, deed of trust, or other encumbrance may be cured under certain circumstances before foreclosure. Provides that a court shall not award a deficiency judgment on the foreclosure of a mortgage or deed of trust under certain circumstances.
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 are 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 $1,000 fine 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 the copy of the promissory 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*	0.5485	1	0.4977
refinanced mortgage loans*	0.6945	1	0.4606
purchased loans made after law change*	0.1449	0	0.3520
female*	0.2797	0	0.4489
gender unknown*	0.0763	0	0.2655
race: black*	0.0251	0	0.1564
race: non-white and non-black*	0.0948	0	0.2929
race: unknown*	0.1252	0	0.3309
no cosigner*	0.4931	0	0.5000
income ($ thousands)	112	80	231
loan amount ($ thousands)	235	185	240
living in area with 30% or more minorities*	0.0308	0	0.1728
low income census tract*	0.0023	0	0.0484
moderate income census tract*	0.0510	0	0.2200
middle income census tract*	0.3823	0	0.4860
upper income census tract*	0.5643	1	0.4959
lender: commercial banks and their subsidiaries*	0.5714	1	0.4949
lender: independent mortgage banks*	0.2533	0	0.4349
lender: thrifts*	0.1121	0	0.3155
lender: credit unions*	0.0548	0	0.2276
lagged local unemployment rate (%)	12.1372	12.4000	1.5958
lagged net local house price growth rate	-0.0090	-0.0071	0.0185
Total number of observations	22,172		

Note: The data contain all *Applications* including those that will be later rejected for conventional first-lien purchase or refinance loans for owner-occupied one- to four-unit primary residence submitted between April 2009 and March 2010.

2. * indicates dummy variables.

Table 3. Sample Summary Statistics: LPS (Static)

Variable	Mean	Median	Standard Deviation
refinance mortgage loans*	0.6480	1	0.4776
purchase loans made after the law change*	0.1464	0	0.3535
loans with private mortgage insurance*	0.0727	0	0.2596
loan origination amount (1000$)	202	163	184
property appraisal value (1000$)	318	244	360
current interest rate (%)	4.9591	4.8750	0.4553
mortgage loan-to-value ratio at origination (%)	68.7334	73.1650	19.0320
FICO at origination	698	767	212
full document*	0.5328	1	0.4990
jumbo loan*	0.0227	0	0.1489
interest-only loans*	0.0162	0	0.1261
balloon loans*	0.0009	0	0.0292
loan sold to private investor*	0.2709	0	0.4444
adjustable-rate mortgage*	0.0169	0	0.1288
lagged local unemployment rate	12.1291	12.1000	1.7609
lagged gross local real house price growth rate	-0.0027	-0.0083	0.1152
Total number of mortgage loans	7,053		

Note: Conventional and first-lien purchase or refinance loans for owner-occupied single-family housing originated between April 2009 and March 2010. * indicates dummy variables.

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

	Mortgage approval (Probit, Marginal Effect)		Mortgage Loan Size Tobit (All Loans)	
Variable	Marginal Effs.	S.E.	Coeffi cient	s.e.
purchase loans made after reform	-0.0644***	0.0074	-30.2297***	3.4433
refinance loan	-0.2466***	0.0092	-130.7403***	5.2631
income at origination ($ thousands)	1.55e-04***	3.24e-05	0.3903***	0.0122
loan amount ($ thousands)	-1.67e-04***	2.71e-05		
MSA with over 30% minorities	-0.1210***	0.0069	-90.2843***	9.2510
being black	-0.0940***	0.0087	-58.6469***	4.6814
race other than white and black	-0.0637***	0.0040	-31.3501***	2.5362
race unknown	-0.1041***	0.0175	-51.9376***	10.0252
female	-0.0008	0.0040	-15.7719***	2.3724
gender unknown	0.0943***	0.0081	67.9716***	10.2207
no cosigner	-0.0583***	0.0074	-43.2069***	3.7081
moderate income census tract	0.0070	0.0156	-13.7064*	6..6464
middle income census tract	0.0764***	0.0184	23.7139***	5.9917
upper income census tract	0.1421***	0.0136	83.5801***	4.8296
lender: commercial bank	-0.2545***	0.0204	-109.8904***	6.1880
lender: thrift	-0.1041***	0.0174	-16.1560***	3.7726
lender: credit union	0.0891**	0.0414	18.4217	12.4407
lagged monthly unemployment rate	0.0164	0.0111	3.4389	6.4531
lagged HPI growth rate	0.2467	0.3482	149.2562	180.3215
linear county time trends	yes		yes	
county fixed effects	yes		yes	
monthly fixed effects	yes		yes	
Pseudo R-squared	0.1089		0.0219	
number of observations	22,172		22,172	

Note: 1. For approval rates, the dependent variable is a dummy variable indicating whether the loan. is approved. The mean of the approval rate = 0.5485. For mortgage loan size, the dependent variable takes the value of zero for loans not approved. The average approved loan size is $227,000, and the median is $175,000.

2. * indicates statistical signifi cant coeffi cients at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

Table 5. Mortgage Lending: Approved Interest Rate and Loan Size: Benchmark (LPS)

	Loan Size at Orig. (1000$)		Interest Rate at Orig. (%)	
Variable	Coeffi cient	S.E.	Coeffi cient	S.E.
purchase loan made after reform	-9.2709**	4.4038	-0.0402*	0.0205
interest only	33.0409*	18.6517	-0.0671	0.1152
balloon loans	-80.8275	71.1861	-0.1240	0.1125
loans with private mortgage insurance	42.0125***	2.8666	-0.0274	0.0184
refinance loan	-12.1931***	3.9988	-0.1193***	0.0143
property appraisal value (1000$)	0.3495***	0.0519		
mortgage LTV ratio (%)			0.0038***	0.0003
FICO score at origination	-0.0813***	0.0219	-0.0017***	0.0002
full document	16.7473***	2.3340	0.0025	0.0194
loan sold to private investors	-7.8484***	2.5260	0.0773***	0.0131
jumbo mortgage	305.5514***	47.8906	0.6149***	0.0544
adjustable-rate mortgage	21.5198	13.6629	-0.0283	0.1066
interest rate at origination (%)	13.1336***	5.0994		
lagged monthly unemployment rate	0.1637	2.8423	0.0424***	0.0122
lagged real HPI growth rate	0.8157	6.7513	0.0238	0.0398
linear county time trend	yes		yes	
zip code fixed effects	yes		yes	
month fixed effects	yes		yes	
R-squared	0.8019		0.2271	
number of observations	7,053		7,053	

Note: 1. For loan size, the dependent variable is loan amount at origination in thousands, which has a mean of $202,000. For mortgage rate, the dependent variable is interest rate at origination with a mean of 4.96 percent.

2. * indicates statistical significance for the coefficient at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

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

	Loan Approval Rate Coeffi cient	S.E.	Loan Size ($) Coeffi cient	S.E.
Loans Originated: 200810 to 201009	-0.0823***	0.0078	-47.5925***	4.0520
control group: add investment loans for single family primary residence	-0.0626***	0.0047	-26.0457***	1.7057
control group: add nonconventional loans for single family primary residence	-0.1419***	0.0051	-18.9078***	1.7440

Note: 1. The specifications follow those in table 4. In the first experiment, we study loans made over a longer period, one year before and after the law change. The fraction of the affected loans is 14 percent, the approval rate averages 54 percent, and the loan size averages $238,000. In the second experiment, we include investment loans for single-family primary residences to the benchmark. Now 11 percent of the loans are affected, the approval rate averages 56 percent, and the loan size averages $216,000. In the third experiment, we add government guaranteed loans to the benchmark. Six percent of the loans are affected by the law, the approval rate averages 73 percent and the loan size averages $196,000.
2.* indicates statistical significance at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

Table 7. Mortgage Lending: Approved Loan Size and Interest Rate – Robustness Analysis (LPS)

Sample	Loan Sizes (1000$)		Mortgage Rate (%)	
	Coeffi cient	S.E.	Coeffi cient	S.E.
loans originated: 200810 to 201009	-7.3779**	3.3717	0.0153	0.0164
includes investment properties	-5.1281	3.4635	-0.0235	0.0173
includes multifamily properties	–9.3199**	4.4061	-0.0507**	0.0202
loans without private mortgage insurance	-8.5274**	4.6500	-0.0503**	0.0215

Note: 1. The specifi cations follow those in Table 5. The fi rst experiment studies loans made over a longer sample, the affected loans accounted for 16 percent of total loans. The loan size averages $204,889, and the interest rate averages 5.05 percent. The second experiment adds investment properties to the benchmark, the affected loans accounted for 11 percent of the sample. The loan size averages $188,936, and the interest rate averages 5.04 percent. The third experiment adds multifamily loans to the benchmark, the affected loans accounted for 14 percent of the sample.
The average loan size is $197,293 and the average interest rate is 4.97 percent. The fourth experiment excludes from the benchmark loans with private insurance, the affected loans is about 13 percent of the sample. The average loan size is $201,488, and the average interest rate is 4.9517 percent.
2. * indicates statistical significance at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

Table 8. Mortgage Applications: Loan Size (HMDA)

Variable	Coeffi cient	S.E.
purchase loan applications submitted after reform	7.1186*	3.8425
refinance loan	13.3857***	1.9072
income at origination ($ thousands)	0.5304***	0.0354
MSA with over 30% minorities	-51.9726***	8.1282
being black	-6.2600*	3.3329
race other than white and black	-7.4796***	1.9694
race unknown	1.6765	1.7039
female	-26.1835***	1.1206
gender unknown	19.0595	12.1589
no cosigner	-18.8487***	2.0128
moderate income census tract	-42.6887	26.4640
middle income census tract	-24.0682	26.7522
upper income census tract	23.0666	32.7435
lender: commercial bank	19.0595***	4.2752
lender: thrift	35.5600***	2.5400
lender: credit union	-23.1593***	1.9067
lagged monthly unemployment rate	3.4389	6.4531
lagged HPI growth rate	149.2562	180.3215
linear county time trends	yes	
county fixed effects	yes	
monthly fixed effects	yes	
Pseudo R-squared	0.3263	
number of observations	22,172	

Note: 1. The average loan size at application is $235,000. About 14 percent of the applications are affected by the law change. The data sample is from April 2009 to March 2010.
2. * indicates statistical signifi cant coeffi cients at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

Table 9. Aggregate Mortgage Applications: Benchmark (HMDA)

	Total Number of Loan Applications	
Variable	Coeffi cient	S.E.
purchase loans made after reform	36.6785	41.0508
refinance loans	-32.4582	32.2295
average income of the MSA	-1.3219***	0.5112
MSA with over 30% minorities	6513.2120***	1574.0430
lagged unemployment rate	-17.0437	17.3360
lagged house price growth rate	-0.2413	153.5131
time trend	-19.9158	102.4525
time trend squared	0.1363	1.1369
county dummies included	yes	
Adjusted R-squared	0.8869	
number of observations	364	

Note: 1. The dependent variable is total loan applications for fi rst-lien conventional loans on single-family primary residence by month and county. The mean is 206. The data sample is from January 2007 to December 2011.

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

Table 10. Mortgage Demand: Loan Size at Application – Robustness Analysis (HMDA)

	Loan Size (1000$)	
	Coeffi cient	S.E.
Loans Originated: 200810 to 201009 -1.9281*		0.8856
control group: add investment loans for single family primary residence	11.2653***	4.7164
control group: add nonconventional loans for single family primary residence	21.6552***	1.3633

Note: 1. The specifi cations follow those in Table 8. The fi rst experiment studies loans submitted over a longer period, the fraction of affected loans is 14 percent, and the loan size averages $238,000 at application. The second experiment adds to the benchmark investment loans for single-family primary residence, 11 percent of the loans are affected, and the loan size at application averages $216,000. The third experiment adds to the benchmark government guaranteed loans, 5 percent of the loans are now affected by the law change, and the loan size at application averages $196,000.
2.* indicates statistical significance at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

Table 11. Sample Summary Statistics (Dynamic LPS: 60 Days Delinq. Sample)

Variable	Mean	Median	Standard Deviation
60 days mortgage delinquency sample			
60-day mortgage delinquency rate (monthly)*	0.00093	0	0.0304
refi mortgage*	0.6489	1	0.4773
with private insurance*	0.0720	0	0.2584
loans affected by the law change*	0.1355	0	0.3423
age of the loan (months)	20.4490	24	11.7937
mortgage loan-to-value ratio at origination	68.8071	73.2400	18.8015
current interest rate	4.9599	4.9435	0.4455
FICO at origination	699	767	210
full document*	0.5329	1	0.4989
jumbo loan*	0.0197	0	0.1391
interest-only loan*	0.0153	0	0.1226
balloon loan*	0.0008	0	0.0289
loan sold to private investor*	0.0613	0	0.2390
adjustable-rate mortgage*	0.0144	0	0.1193
lagged local unemployment rate	12.8719	13.1000	1.8291
lagged local house price growth rate	0.0049	-0.0044	0.1386
Total number of observations	256,654		
90 days delinq rate (monthly)	0.00076		
foreclosure rate (monthly)	0.00050		

Note: 1. We focus on conventional first-lien mortgage for owner-occupied primary housing originated between April 2009 and March 2010 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.

2. The 90 days delinquency rate is calculated for the 90 days delinquent sample, i.e., loans are deleted after they become 90 days delinquent. The foreclosure rate is calculated likewise

3. *indicates dummy variables.

Table 12. Mortgage Default and Foreclosure Start: Benchmark
(Loans Originated Between 200904 and 201003 Followed Until Delinquency or December 2012)

	60 Days Delinquent		90 Days Delinquent		Foreclosure Start
Variable	Marginal Effs.	S.E.	Marginal Effs.	S.E.	Marginal Effs.
purchase loans made after reform	1.23e-04	2.37-04	1.83e-04*	1.46e-04	4.62e-04
affected loan x current LTV over 100 percent	2.08e-04	3.91e-04	-7.27e-05	2.51e-05	-2.09e-04
refinance loans	2.02e-04**	1.06e-05	8.07e-05***	3.58e-05	2.40e-04**
loan age (months)	7.57e-05***	2.58e-05	1.21e-05***	5.40e-06	5.69e-05***
loan age squared	-1.41-06***	4.57e-07	-2.21e-07***	1.03e-07	-1.39e-06***
current LTV ratio	5.27e-06***	1.85e-06	4.81e-06***	7.10e-07	5.91e-06***
FICO score at origination	-4.63e-06***	5.73e-07	-9.61e-07***	2.28e-07	-2.41e-06***
current interest rate	3.52e-04***	7.04e-05	1.02e-04***	2.20e-05	2.90e-04***
full document	9.85e-05	7.77e-05	3.40e-05	2.06e-05	1.08e-04
private investor	3.53e-04	4.45e-04	-1.50e-05	4.79e-05	-7.93e-05
jumbo mortgage	-3.49e-04	7.98e-04	-7.32e-05	1.43e-05	-2.11e-04
interest-only mortgage	9.80e-04*	8.44e-04	3.56e-04***	2.40e-04	6.61e-04*
adjustable-rate mortgage	6.57e-04*	5.60e-04	2.65e-04***	2.16e-04	6.22e-04*
lagged mon. unemp. rate	7.20e-05***	2.47e-05	-6.30e-06	2.29e-05	2.54e-05
lagged HPI growth rate	3.86e-05	1.74e-04	2.27e-06	5.22e-05	-1.94e-04
county fixed effects	yes		yes		yes
month fixed effects	yes		yes		yes
county time trends	yes		yes		yes
Pseudo R-squared	0.1100		0.1270		0.1068
number of observations	256,654		257,425		258,047

Note: 1. In the Probit analysis, the dependent variable is a dummy variable that indicates whether the loan in is 60 days delinquent, 90 days delinquent, or in foreclosure, respectively.
2. The dummy variables for jumbo loans and balloon loans predict delinquency and foreclosure probabilities and are dropped in the regression analysis.
3. * indicates statistical significance at 10 percent level, ** at 5 percent level, and *** at 1 percent level.

Table A1. Deficiency Judgments in Clark County, Nevada, Between 2000 and 2013

Year	Mortgage Loans in Foreclosure Sales		Mortgages Loans with Deficiency Judgments	
	Number	Median Balance ($)	Number	Median Awarded Judgments ($)
2000	881	111,477	174 (12%)	10,471 (0.4%)
2001	651	114,788	132 (13%)	9,649 (8.4%)
2002	700	118,679	96 (10%)	10,853 (9.1%)
2003	663	115,828	99 (10%)	9,491 (8.2%)
2004	586	104,729	91 (9%)	10,034 (9.6%)
2005	1330	169,782	72 (3%)	12,577 (7.4%)
2006	3891	237,125	111 (2%)	13,444 (5.7%)
2007	13670	251,674	83 (0.4%)	15,602 (6.2%)
2008	35680	241,692	32 (0.39%)	20,145 (8.3%)
2009	51831	235,015	69 (0.06%)	17,854 (7.6%)
2010	37167	220,986	67 (0.19%)	32,016 (14.5%)
2011	23694	219,907	28 (0.12%)	42,867 (19.5%)
2012	12332	208,913	13 (0.10%)	16,111 (7.7%)
2013	5915	203,341	6 (0.11%)	26,369 (14.7%)

Note: The sample for mortgage loans in foreclosure sales is from LPS Applied Analytics. We keep mortgages that are real estate owned, in liquidation, or in foreclosure sales. The sample for deficiency judgments is collected from the country court as described in the Appendix. The numbers in parentheses are deficiency judgments as a share of total mortgages that are real estate owned, in liquidation, or in foreclosure sales.

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