

# Deregulation, Competition and the Race to the Bottom\*

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## Abstract

We exploit the OCC’s preemption of national banks from state laws against predatory lending as a quasi-experiment to study the effect of deregulation and its interaction with competition on the supply of complex mortgages (prepayment penalties, interest-only, and negative amortization). Following the preemption ruling, national banks significantly increased their origination of loans with prepayment penalties and negative amortization features by comparison with lenders not regulated by OCC and lenders in states without predatory lending laws. Further, we highlight a competition channel: in counties where OCC-regulated lenders had larger market shares prior to the preemption, even non-OCC lenders responded by increasing their use of these riskier terms to the extent permitted by the state predatory-lending laws. Overall, our evidence suggests that the deregulation of credit markets triggered a “*race to the bottom*” among distressed financial institutions, working through competition between lenders.

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# 1 Introduction

The financial deregulation of the last two decades has been the subject of heated political and academic debate, insofar as it may have played an important role in creating a permissive lending environment. In fact, critics maintain that regulators incentivized looser underwriting standards in order to encourage the concession of increasingly marginal loans, whereas effective regulation of lending practices could have prevented aggressive lenders from abusing vulnerable borrowers by offering riskier and more complex mortgages.<sup>1</sup> Moreover, it is not clear that this market could regulate itself. On the one hand, market forces and lenders' reputation concerns may discipline banks' behavior, but on the other, fiercer banking competition could induce lenders to "race to the bottom" by originating even riskier loans to preserve their market shares in the short term.

Hence, in this paper we aim to empirically address the following questions: how does financial deregulation affect the credit supply? How does banking competition shape its effects? One of the major difficulties in empirically identifying the effects of deregulation in fueling the increase in mortgage origination is that policy interventions usually affect all lenders at once, making it impossible to distinguish between the direct effects of the policy and other confounding factors affecting mortgage originations, such as changes in demand. This paper overcomes these problems by exploiting the 2004 pre-emption of state laws against predatory lending for lenders regulated by the Office of Comptroller and Currency as an exogenous shock to the competitive landscape. Specifically, this shock expanded the set of loans OCC-regulated lenders were allowed to originate while not altering the set that other lenders were allowed to originate. The pre-emption ruling creates an ideal environment to test for the effects of deregulation by providing us with a clean set of affected banks, i.e.

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<sup>1</sup>President Barack Obama justified the need for a Consumer Financial Protection Agency with the argument that predatory lending by unregulated mortgage brokers was one of the causes of the financial crisis: "Part of what led to this crisis were not just decisions made on Wall Street, but also unsustainable mortgage loans made across the country. While many folks took on more than they knew they could afford, too often folks signed contracts they didn't fully understand offered by lenders who didn't always tell the truth" (White House news release, September 19, 2009, available at [www.whitehouse.gov/the\\_press\\_office/Weekly-Address-President-Obama-Promotes-Tougher-Rules-on-Wall-Street-to-Protect-Consumers](http://www.whitehouse.gov/the_press_office/Weekly-Address-President-Obama-Promotes-Tougher-Rules-on-Wall-Street-to-Protect-Consumers)). .

those regulated by the OCC, and a set of unaffected banks, i.e. those regulated by the state regulators as well as by the Department of Housing and Urban Development (HUD). Thus, we can exploit it to see how lenders respond to deregulation and detect the possible spillover effects on other lenders due to intensified competition.

There is a growing household finance literature on the demand-side determinants of the different loan contracts observed in the data. This literature takes important steps towards understanding what types of borrowers take on different forms of debt, such as adjustable rate mortgages (ARM), fixed rate mortgages (FRM) and interest-only mortgages (IO).<sup>2</sup> Much less is known about the supply side, however. The 2004 deregulation, by affecting different types of originator differentially, offers a unique chance to show that the supply of these mortgages changed significantly in the run-up to the crisis. Moreover, thanks to the granularity of our data the compositional changes in credit supply and demand can be distinguished, by accounting for both observed and unobserved time-varying county heterogeneity through county by month fixed effects.

Our first result derives from differences-in-difference analysis of a sample of loans issued in states with laws against predatory lending (henceforth “APL laws”) to show that the preemption of these laws for OCC regulated lenders led them to change the pool of borrowers receiving credit from national banks. Specifically, we analyze various borrower characteristics at origination: FICO score, loan-to-value (LTV) ratio, second liens, and cash-out refinance mortgages. We compare these characteristics before and after the preemption rule in states that adopted a predatory lending law. We find that after the preemption, borrowers’ FICO scores average 40 points lower, while LTV averages 6% higher. Moreover, the likelihood that the property has a second lien is 4% greater, and the loan is 6% more likely to be a cash-out refinance. These results make it clear that the deregulation in 2004 affected the characteristics of the borrowers they began to serve.

Next, we explore whether the preemption of these APL laws for OCC regulated lenders

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<sup>2</sup>See [Campbell \(2006\)](#) for a survey of this literature. A more detailed discussion of the literature is provided in the next section.

led them to increase loans with more complex terms, such as prepayment penalties, negative amortization, adjustable rate and long prepayment penalty terms. Our most conservative estimate shows that following the preemption ruling OCC-regulated lenders were about 14% more likely than other lenders to make mortgage loans with prepayment penalties. Compared to the unconditional probability of prepayment penalties of about 30% in our sample, this represents an economically significant increase. These prepayment penalties are particularly important, as they are needed to make other features profitable such as negative amortization, teaser rates and balloon payments. To capture any fluctuation in credit demand, our main specification includes county by month fixed effects. Moreover, our results are robust to a triple differences-in-difference specification, which also uses as a control group loans originated in states with no predatory lending laws. That is, this relaxes our identification assumption by requiring that only the difference between OCC and non-OCC lenders is similar across states with and without predatory lending laws. Overall, these findings offer support for the thesis that the deregulation crucially shaped the supply of complex mortgages.

Having established that the deregulation had a direct effect on the supply of riskier mortgages and on the pool of borrowers with access to credit from national banks, we can now examine whether it also had an *indirect* effect on the non-OCC lenders. Intuitively, the deregulation altered the competitive landscape by giving national banks an advantage, as their lending to riskier borrowers was basically unconstrained, while the other financial institutions remained subject to the laws against predatory lending. Hence, we should expect non-OCC lenders to try to defend their market shares by offering mortgages with features that cater to the same pool of borrowers without violating the law, such as interest only mortgages and mortgages with deferred amortization. This effect should be stronger in markets where OCC lenders have a more dominant position.

We test this hypothesis, using the fraction of loan volume originated by OCC lenders in

the pre-period as proxy for their market dominance.<sup>3</sup> We investigate the non-OCC lenders' response by separately considering the response in counties with different levels of competition from OCC lenders. Consistent with the hypothesis, we find that non-OCC lenders do make riskier mortgage loans with features that were not directly restricted by the law. Specifically, we find that after the preemption ruling non-OCC lenders were 7% more likely to grant adjustable-rate mortgages and 4%-5% more likely to grant interest-only and deferred amortization mortgages. Interestingly, these effects were concentrated in counties where OCC lenders had larger market shares and absent in the counties where OCC lenders had little market power. Our results indicate that rather than attenuating the effects of deregulation, competition may have led even the banks that were not directly affected to turn to riskier and more complex mortgages.

Since complex mortgages are characterized by a lack of mortgage amortization which leads to higher LTVs, a greater reliance on refinancing which might turn out to be unfeasible when house prices drop, and are usually held by riskier and less sophisticated households, we might also observe an effect on defaults. We find that after the preemption the mortgages originated by non-OCC lenders were 3.5% more likely to default in more competitive counties, a result concentrated among their complex mortgages. This is evidence for the thesis that the deregulation triggered a race to the bottom in the origination of riskier mortgages, inducing even non-OCC lenders to compete with mortgages with a higher probability of default. The results are robust to several borrower characteristics and to the current loan-to-value ratio in addition to county by time fixed effects.

Finally, we provide additional robustness checks. First, to show that our results are not contaminated by differences in the borrowers' characteristics for the loans originated by OCC and non-OCC lenders we employ a nearest-neighbor matching method to assign to each loan originated by OCC one originated by a non-OCC lender. We use data on quarter of origination, zip code, as well as all the main characteristics at origination, such as FICO

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<sup>3</sup>In a robustness check we also show that similar results hold when we proxy for competition by computing the Herfindahl-Hirschman index using data on deposits from the FDIC.

score, LTV, documentation and size of the loan. We confirm the effect of the preemption rule on OCC lenders on this matched sample as well. Second, for further evidence on the mechanism and as a test of the external validity of our results, we also use the Home Mortgage Disclosure Act (HMDA) dataset for loan applications. We show that after the preemption OCC lenders were 5% more likely to securitize their mortgages, which might explain why they were less concerned about granting riskier mortgages. Moreover, they were also more likely to securitize mortgages with high debt-to-income ratios.

Third, one potential concern about our results on the role of competition and the race to the bottom is that they might be driven by changes in counties with low levels of competition. Instead, we show that in the lowest tercile of counties in terms of market concentration, the results do not hold. Another concern might be that more competitive regions in states that did not adopt predatory lending laws are different from high-competition counties in the states that had such laws. To address this concern, we use a propensity score matching procedure to compare high-competition counties across states that are very similar in terms of a number of observable characteristics. We confirm our results on this matched sample too.

Taken together, our findings indicate two main channels through which mortgage deregulation may work its effects. First, it directly increases OCC-regulated lenders' origination of loans with "predatory" features, particularly prepayment penalties, an effect that can explain about 10 percent of the increase in the use of these features. Second, it induced a response also from the lenders still subject to the regulation in the same markets. The picture suggested is a competition channel that began with the OCC-regulated lenders, worked its way through the local mortgage market, and forced the hand of the non-OCC regulated lenders to alter their own mortgage terms as a competitive response. These results might complement and sheds novel lights on other mechanisms that have been proposed to explain the rise of riskier mortgages such the boom in securitization activity ([Keys et al. \(2010\)](#)).

## 1.1 Related Literature

Our key contribution is to directly estimate the effect of deregulation on the supply of riskier and complex mortgages through both a direct channel, the behavior of the deregulated national banks, and through an indirect one, the response of their non-national competing institutions.

Our paper is directly related to [Amromin et al. \(2013\)](#), who analyze the demand for complex mortgages, namely, what type of borrowers are more prone to take on complex mortgages during the years preceding the crisis. They show that these riskier loans were chosen by prime borrowers with high income levels seeking to purchase expensive houses relative to their incomes. However, these borrowers tend to default more often than borrowers with traditional mortgages with similar characteristics. A few other papers have analyzed the issuance of riskier mortgages during the boom period. [Agarwal et al. \(2014b\)](#) test whether predatory lending was a key element in fueling the subprime crisis by investigating the effect of an anti-predatory pilot program in Chicago on mortgage default rates. Similarly, [Agarwal et al. \(2014a\)](#) explore the effects of mandatory third-party review of mortgage contracts on consumer choice including the terms and demand for mortgage credit. [Gurun et al. \(2013\)](#), instead, show evidence that lenders advertise to steer unsophisticated consumers into bad choices by increasing the salience of the initial interest rate and shroud the reset rate. [Agarwal and Ben-David \(2014\)](#) highlights the role of loan officers' incentives by studying a controlled corporate experiment in which loan officers' compensation structure was altered from fixed salary to volume-based pay, and show that the incentives increased aggressiveness of mortgage origination. We complement these findings by showing how the supply side of the market is shaped by changes in the regulatory environment. We also show that when competition is more intense, the lenders not directly affected by the preemption rule tend to adjust not only the interest rate but also a number of other different mortgage features.

Two recent papers have investigated different policy interventions in the mortgage market. First, we share with [Amromin and Kearns \(2014\)](#) its focus on the effect of policy changes

on the competitive landscape. [Amromin and Kearns \(2014\)](#) explore whether market competitiveness affects mortgage interest rates exploiting the introduction of the Home Affordable Refinancing Program (HARP). Specifically, lenders that currently service loans eligible for refinancing enjoyed substantial advantages over their competitors under HARP. They show a significant increase in mortgage interest rates, about 15 to 20 basis points, precisely at the HARP eligibility threshold. Second, [Agarwal et al. \(2012\)](#) analyze the effect of the Community Reinvestment Act (CRA) on banks' lending activity. They find that adherence to the act led to an increase in lending by banks, in fact, during the six quarters surrounding the CRA exams lending is 5 percent higher, but these loans default more often. We share the focus on the effect of deregulation on the pre-crisis loan origination, however, we exploit loan-level data to study how lenders modified key features of the mortgages they originated to remain competitive. Moreover, we also complement these findings by showing that the poor-performing banks were significantly more likely to take advantage of the deregulation.

After the crisis, a novel literature relating the changes in the mortgage market conditions and the real economy emerged. For instance, in their seminal paper, [Mian and Sufi \(2009\)](#) show that zip codes with a higher fraction of subprime borrowers experienced unprecedented relative growth in mortgage credit and a corresponding increase in delinquencies. Our paper advances this literature by exploiting an exogenous shock supply of credit and the competitive environment, to estimate how the specific contracting features offered by the financial institutions and the approved borrowers' characteristics significantly changed.

Our paper also related to the several studies investigating the changes in lending behavior during the years preceding the crisis. Few studies, such as [Jiang et al. \(2014\)](#), [Agarwal et al. \(2014b\)](#), [Haughwout et al. \(2011\)](#), [Chinco and Mayer \(2014\)](#) and [Barlevy and Fisher \(2010\)](#), have pointed out that weakened lending standards is one of the main causes behind the subprime crisis; while others, such as among others [Rajan et al. \(2010\)](#), [Purnanandam \(2011\)](#), [Nadauld and Sherlund \(2013\)](#) and [Keys et al. \(2010\)](#), have highlighted the failure of ratings models and the rapid expansion of non-agency securitization markets as one of the



main driving factors. We complement these studies by providing evidence that deregulation might have ignited a race to the bottom among lenders in the years preceding the crisis.

We borrow the same identification strategy proposed by [Di Maggio and Kermani \(2014\)](#), based on the introduction of the preemption rule in 2004 by the OCC and the variation across states with and without anti-predatory laws. However, our paper differs both in focus and results. The main results of [Di Maggio and Kermani \(2014\)](#) are about the real effects of an outward shift in the credit supply, specifically, the possibility to induce a boom and bust cycle in economic activity at the county level. Our paper exploits, instead, individual-level data to first show the effect of the preemption rule on the features of mortgages originated after the preemption rule by national banks. We then investigate the response of the non-OCC regulated banks, such as state banks and credit unions, to show how competition might shape the response to deregulation.

Other related papers investigating the effect of deregulation on mortgage origination include [Jayaratne and Strahan \(1996\)](#) and [Favara and Imbs \(2015\)](#). [Jayaratne and Strahan \(1996\)](#) show that per capita growth rates in income and output increased significantly following the relaxation of bank branch restrictions in the United States. We share with [Favara and Imbs \(2015\)](#) the use of a deregulation as quasi-experiment, in fact, [Favara and Imbs \(2015\)](#) exploit the passage of the Interstate Banking and Branching Efficiency Act (IBBEA) in 1994 to show that this deregulation triggered an increase in the demand for housing, that is, that house prices rose because the supply of credit in deregulating states expanded. The main difference with the current paper is that we document an increase in credit supply due to the preemption rule of 2004, which in contrast to the IBBEA targeted subprime lending and riskier borrowers. In other words, the deregulation we consider is expanding the set of contracts that national banks might offer to subprime borrowers and then it is a very different form of deregulation with potentially radically different implications than the one analyzed in the existing literature. <sup>4</sup>

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<sup>4</sup>Other recent papers studying the credit supply include [Greenstone and Mas \(2012\)](#), which investigate the importance of the credit channel for employment by assessing the role of bank lending to small businesses,

Finally, [Piskorski et al. \(2015\)](#) and [Griffin and Maturana \(2015\)](#) have shown that about one out of every ten loans exhibits a form asset quality misrepresentation, such as misreported occupancy status of the borrower and misreported second liens. They also provide evidence that an important fraction of this misrepresentation is driven by financial institutions rather than borrowers. Our results contribute to this debate by showing that deregulation might significantly increase the incentive of the lenders to issue riskier mortgages, especially in highly competitive markets.

The remainder of the paper is organized as follows. Section 2 gives background on the US credit market and regulation. Section 3 provides details on the data sources, while Section 4 illustrate our research design. Section 5 provides the first results on the effect of the deregulation on the mortgage terms and on the composition of borrowers. Section 6 investigates a competition mechanism by which non-OCC lenders also changed their mortgage origination behavior. Finally, Section 7 presents several robustness checks, while Section 8 concludes.

## 2 Regulatory Framework

### 2.1 Mortgage Regulators

In the United States, residential mortgage lenders are regulated by national and local agencies. Specifically, national banks, Federal thrift institutions and their subsidiaries are supervised by the OCC or the Office of Thrift Supervision (OTS). State banks and state-chartered thrift institutions are supervised by either the Federal Reserve System, the Federal Deposit Insurance Corporation (FDIC) or by their chartering state. Credit unions are supervised by the National Credit Union Administration (NCUA), while non-depository mortgage companies are regulated by the Department of Housing and Urban Development (HUD) and the Federal Trade Commission.

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and [Adelino et al. \(2012\)](#) which exploits changes in the conforming loan limit as an instrument to gauge the effect of the availability of cheaper financing on house prices.

Since our identification strategy relies on this classification, it is important for us to make sure that lenders are not able to somehow bypass their assigned regulator. Specifically, one potential source of concern is the possibility for lending institutions to shop for the most lenient regulator. However, [Agarwal et al. \(2012\)](#) show that federal regulators are significantly less lenient, downgrading supervisory ratings about twice as frequently as state supervisors, while banks under federal regulators report higher nonperforming loan ratios, more delinquent loans, higher regulatory capital ratios, and lower ROA. Banks accordingly have an incentive to switch from Federal to state supervision, if they are allowed to do so. Hence, even if this was possible, it would bias our results downward. Moreover, [Rosen \(2005\)](#) and [Rezende \(2014\)](#) explores switching in regulatory agencies between 1970 and 2012, and finds that in the early part of the period most of the switches were due to new banking policies, such as the easing of the ban on interstate banking, whereas after the initial period the main reason for switching was merger with a bank chartered at a different level. Further, the banks that switched tended to be small banks with assets of less than \$1 billion and they are not in our sample as we exclude banks with less than one thousand loans in our data. The only exceptions are JP Morgan and HSBC that switched from the state to the national regulator in 2004. To avoid biasing our estimates, we consider JP Morgan and HSBC as national lenders also in the period pre-2004.

These findings corroborate our own identification strategy; moreover, the granularity of our dataset allows us to track the banks that changed regulatory agencies, so that we can address any further concerns related to this issue.

## **2.2 Anti-predatory laws**

This dual banking system generated conflicting regulations when several states passed anti-predatory-lending laws and the OCC issued a preemption rule for national banks. In 1994, Congress had passed the Home Ownership and Equity Protection Act (HOEPA) which imposed substantive restrictions on terms and practices for high-priced mortgages, based either

on APR or on total points and fees. This regulation aimed to redress abusive high charges for refinancing and home equity loans. However, the thresholds for classifying mortgages as predatory or “high cost” were very high, which significantly reduced the applicability of the restrictions; these “high cost” mortgages, in fact, accounted for just 1 percent of subprime residential mortgages; they represented the most abusive sector of the subprime mortgage market (Bostic et al. (2008)).

Many states later adopted stronger anti-predatory regulations than federal law requires. Anti-predatory laws seek to prevent various unfair and deceptive practices, such as steering borrowers into loans with a higher interest rate than they could qualify for, making a loan without considering repayment ability, charging exorbitant fees, or adding abusive subprime early repayment penalties, all of which can increase the risk of foreclosure significantly.<sup>5</sup> The first comprehensive state APL law was that of North Carolina in 1999, which was targeted at the subprime mortgage market. As of January 2007, 20 states and the District of Columbia had APL laws in effect.

Potentially, APLs may have different kinds of effects on mortgage market outcomes. On the one hand, the laws might ration credit and raise the price of subprime loans. On the other, they might serve to allay consumer fears about dishonest lenders and ensure that creditors internalize the cost of any negative externalities from predatory loans, which could increase the demand for credit.

There is strong recent evidence that anti-predatory laws had an important role in the subprime market. Ding et al. (2012), for instance, find that they are associated with a 43% reduction in early repayment penalties and a significant decrease in adjustable-rate mortgages; they are also correlated with a significant reduction in the riskier borrowers’ probability of default. In subprime regions (those with a higher fraction of borrowers with FICO scores below 680) these effects are even stronger.

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<sup>5</sup>Agarwal and Evanoff (2013) provide evidence of unscrupulous behavior by lenders – such as predatory lending – during the housing boom of the 2000s. They show that lenders steered higher-quality borrowers to affiliates that provided subprime-like loans, with APR between 40 and 60 basis points higher.

Using 2004 HMDA data, [Ho and Pennington-Cross \(2006\)](#) find that subprime loans originated in states with laws against predatory lending had lower APRs than in unregulated states. [Ho and Pennington-Cross \(2008\)](#) provide additional evidence, focusing on border counties of adjacent states with and without APL to control for labor and housing market characteristics. Using a legal index, they examine the effect of APLs on the probability of subprime applications, originations, and rejections. They find that stronger regulatory restrictions reduced the likelihood of origination and application. Similarly, [Ellehausen et al. \(2006\)](#), using a proprietary database of subprime loans originated by eight large lenders from 1999 to 2004, find that the presence of a law was associated with fewer subprime originations. More recently, [Agarwal et al. \(2014b\)](#) estimate the effect on mortgage default rates of a pilot anti-predatory policy in Chicago that required “low-credit-quality” applicants and applicants for “risky” mortgages to submit their loan offers from state-licensed lenders for third-party review by HUD-certified financial counselors. This policy significantly affected both the origination rates and the characteristics of risky mortgages.<sup>6</sup>

We follow this literature employing the measure constructed by [Ding et al. \(2012\)](#), which considers only the states that passed anti-predatory laws that were not just small-scale home ownership and equity protection acts implemented to prevent local regulation.

## 2.3 Preemption Rule

On January 7, 2004 the OCC adopted sweeping regulations preempting, with regard to national banks, a broad range of state laws that sought to regulate the “terms of credit.” The measure preempted laws that regulate loan terms, lending and deposit relationships or require a state license to lend. The final rule also provided for preemption when the law would “obstruct, impair, or condition a national bank’s exercise of its lending, deposit-taking, or other powers granted to it under federal law”, either directly or through subsidiaries. The new regulations effectively barred the application of all state laws to national banks, except

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<sup>6</sup>For a theoretical model of predatory lending see [Bond et al. \(2009\)](#).

where (i) Congress has expressly incorporated state-law standards in federal statutes or (ii) particular state laws have only an “incidental” effect on national banks. The OCC has said that state laws will be deemed to have a permissible “incidental” effect only if they are part of “the legal infrastructure that makes it practicable” for national banks to conduct their federally-authorized activities and “do not regulate the manner or content of the business of banking authorized for national banks,” such as contracts, torts, criminal law, the right to collect debts, property acquisition and transfer, taxation, and zoning.<sup>7</sup>

Specifically, the OCC preempted all regulations pertaining the terms of credit, including repayment schedules, interest rates, amortization, payments due, minimum payments, loan-to-value ratios, the aggregate amount that may be lent with real property as security or term to maturity, including the circumstances under which a loan may be called due and payable after a certain time or upon a specified external event.

This means that starting in 2004 the subprime mortgage market in states with anti-predatory laws was no longer a level playing field: national banks were significantly less constrained by APLs in providing credit to riskier borrowers.

### 3 Data

We collected data from a number of different sources. The primary source of our data is the ABSNet Loan Database. This database covers almost 90% of the private-label Residential Mortgage Backed Securitization issuances and provides data on the underlying loans, as well

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<sup>7</sup>For instance, New Century mentioned in its 2004 10-K filing the following: “Several states and cities are considering or have passed laws, regulations or ordinances aimed at curbing predatory lending practices. In general, these proposals involve lowering the existing federal HEPA thresholds for defining a “high-cost” loan, and establishing enhanced protections and remedies for borrowers who receive such loans. [...] Because of enhanced risk and for reputational reasons, many whole loan buyers elect not to purchase any loan labeled as a “high cost” loan under any local, state or federal law or regulation. This would effectively preclude us from continuing to originate loans that fit within the newly defined thresholds. [...] Moreover, some of our competitors who are, or are owned by, national banks or federally chartered thrifts may not be subject to these laws and may, therefore, be able to capture market share from us and other lenders. For example, the Office of the Comptroller of the Currency issued regulations effective January 7, 2004 that preempt state and local laws that seek to regulate mortgage lending practices by national banks.” (available at <http://www.sec.gov/Archives/edgar/data/1287286/000119312505052506/d10k.htm> pag. 45).

as, data on key borrowers' characteristics. The main advantage of this dataset over the other standard datasets used in the literature, such as LPS and Blackbox, is the possibility to identify the mortgage originator, which is key to our identification. In fact, this allows us to use a classification of the lenders into those who were regulated by federal agencies (henceforth "OCC Lenders") and all other lenders (henceforth "Non-OCC Lenders").<sup>8</sup> We consider all first-lien mortgages originated in the pre-period, January 2002 to January 2004, and in the post-period, February 2004 to December 2005, with a final sample including close to 7 million individual loans.

Another main advantage of this fine-grained data is the possibility to observe all the specific features of these loans at the origination date. For instance, the first part of our analysis will exploit this by analyzing how the national banks changed the presence of prepayment penalties, length of the prepayment penalty term, balloon payment, negative amortization, and interest rates in response to the preemption rule. We shall show that the ability to impose prepayment penalties enabled lenders to issue more complex mortgages such as those with negative amortization or balloon payments, and those that were interest only or had adjustable rates. One shortcoming of the data, however, is that we do not observe the loan fees and points so as to classify loans into those that were "high cost". Additionally, we do not observe the amount or size of the prepayment penalty.

Table 1A and Table 1B display summary statistics for our sample of loans. There are about 7 million loans with 3.6 million loans in our sample that were originated in states that had APL laws in place. Panel A focuses on the covariates that we use in our specification, while Panel B focuses on the mortgage features at origination. Table 1A shows the statistics for the period before the preemption rule (2001-2004), while those for the post-period February 2004-December 2006 are presented in Table 1B. As our sample comes from private label securitization, which were the way in which a large quantity of subprime and non-conforming loans were securitized, we have an average FICO score of 687 for OCC lenders

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<sup>8</sup>This classification has been graciously provided to us by Nancy Wallace and the Fisher Center for Real Estate and Urban Economics at the Haas School of Business.

in the pre-period and slightly smaller for other financial institutions. It slightly decreases during the post period, probably reflecting the general deterioration of lending standards. The average LTV is 72% for OCC lenders and about 76% on average for the non-OCC in the pre-period. While it remained stable for non-OCC lenders, it increased to 75.8% for OCC lenders. We also show that about 7% of the loans have a second lien in the pre-period which increases to 14% for OCC-originated loans. Finally, about 40% of the loans have low or no documentation, while about 15% exhibit private mortgage insurance. Unconditionally, 29% of the loans in our sample have a prepayment penalty, a variable that will constitute a key focus of the analysis. 64% of the loans have ARMs while 17% are interest only loans.

To provide further results on the expansion of credit by OCC lenders after the preemption, and also to show the external validity to our results, we collect data on the new mortgage loans originated every year through the Home Mortgage Disclosure Act (HMDA) dataset for loan applications. This dataset records the final status (i.e. denied, approved or originated), reason for borrowing (i.e. home purchase, refinancing or home improvement), if the loan has been sold to another party (i.e. if it has been securitized), and other characteristics such as the loan amount, race, sex, income, and home ownership status. This allows us to investigate if also the approval rates of OCC lenders have been affected by the preemption or the decision to securitize a mortgage has been influenced by the preemption rule.

## 4 Research Design

By lifting the existing laws against predatory lending, the preemption rule might have induced the OCC lenders to cater to riskier borrowers. This is for at least three reasons. First, one of the most common features of the APL laws is the need for the originators to lend based on the borrowers' repayment ability. Hence, the preemption might have induced national banks to lend to borrowers hoping for an increasing future income stream or a sharp house appreciation. Second, the preemption also makes easier for the lenders to securitize



their loans, because as mentioned above credit rating agencies are more willing to support deals that do not risk to violate APL laws. Third, by allowing OCC lenders to make more complex mortgages, lending to riskier and less sophisticated borrowers might now become more profitable, i.e. by shrouding additional fees. We then test the following hypothesis:

**Hypothesis I:** After the preemption rule, OCC lenders attracted riskier borrowers.

Our identification strategy is designed to exploit the preemption rule as a shock to the OCC lenders' ability to give credit to riskier borrowers. We do so using both a difference-in-difference approach, as well as a triple difference-in-difference approach. There are advantages to both approaches. For instance, by comparing loans originated by OCC and non-OCC lenders in states that eventually adopted an APL law, before and after the preemption rule, we avoid any confounding factor coming from states that never adopted an APL law. Formally, the differences-in-difference specification we consider is as follows:

$$\begin{aligned} Characteristics_{i,c,t} = & \beta_0 + \beta_1 \cdot Post_t \cdot OCC_i + & (DD) \\ & + \beta_2 \cdot OCC \cdot APL_{g,t} + \beta_3 \cdot OCC_i + \beta_4 \cdot X_{i,t} + \eta_{c,t} + \epsilon_{i,c,t} \end{aligned}$$

where  $Characteristics_{i,c,t}$  are borrowers' attributes at origination,  $OCC_i$  is an indicator for whether the lender originating loan  $i$  was regulated by the OCC;  $APL_{g,t}$  is an indicator for whether the state  $g$  has adopted an APL law at time  $t$  and  $Post_t$  is an indicator equal to 1 after the preemption rule.<sup>9</sup>

We include several controls  $X_{i,t}$  aim to capture heterogeneity across different mortgages: the log of the appraised value, a low or no documentation indicator, an indicator for the type of loan (i.e. ARMs, FRMs, etc...), and an indicator for the presence of private mortgage insurance. We also include linear and squared agency time trends, which capture the possibility that banks regulated by different regulatory agencies were on different trends.

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<sup>9</sup>The main effect  $APL$  is captured by the county by time fixed effects.

However, if the pool of borrowers significantly change after the preemption, then the features of the mortgages offered might change as well. Specifically, [Mayer et al. \(2013\)](#) provides a dynamic lending model with costly default in which riskier loans are more likely to exhibit prepayment penalties in equilibrium. The reason is that banks find optimal to use prepayment penalties to make it more costly for the higher-quality borrowers to refinance as soon as their creditworthiness has improved. This theory suggests the following empirical hypothesis:

**Hypothesis II** Controlling for borrowers’ characteristics, loans made by OCC lenders are more likely to have prepayment penalties.

We test this hypothesis by estimating the following differences-in-difference specification:

$$\begin{aligned} \text{Loan Features}_{i,c,t} = & \beta_0 + \beta_1 \cdot \text{Post}_t \cdot \text{OCC}_i + \\ & + \beta_2 \cdot \text{OCC} \cdot \text{APL}_{g,t} + \beta_3 \cdot \text{OCC}_i + \beta_4 \cdot X_{i,t} + \eta_{c,t} + \epsilon_{i,c,t} \end{aligned}$$

where  $\text{Loan Features}_{i,c,t}$  are mortgages characteristics,  $\text{OCC}_i$  is an indicator for whether the lender originating loan  $i$  was regulated by the OCC;  $\text{APL}_{g,t}$  is an indicator for whether the state  $g$  has adopted an APL law at time  $t$  and  $\text{Post}_t$  is an indicator equal to 1 after the preemption rule. In addition to the controls mentioned in the previous (DD) specification, we also control for the the LTV ratio, the FICO score, an indicator for the presence of second liens, and an indicator for loan purposes (i.e. cash out refinance, rate refinance or other).

An outstanding concern may be that we may not be accounting for time-varying unobserved heterogeneity at the county level. For instance, unobserved fluctuations in the local credit demand might drive changes in the origination of these mortgages by OCC lenders. In order to put these concerns to rest, we also include county by month fixed effects  $\eta_{c,t}$ . These allow us to capture any other unobserved shock at the county-month level that might influence our estimates. For instance, any differential trend in local house prices is captured

by these fixed effects.  $\beta_1$  is the coefficient of interest as it estimates:

$$[\bar{Y}_{OCC,Post}^{APL} - \bar{Y}_{OCC,pre}^{APL}] - [\bar{Y}_{Non-OCC,Post}^{APL} - \bar{Y}_{Non-OCC,Pre}^{APL}],$$

that is, it compares the difference between outcomes by OCC lenders before and after the preemption to the same difference for non-OCC lenders. This methodology effectively exploits only within county variation and has the advantage of showing that our effects are really driven by the treatment group, i.e. OCC lenders in states with APL laws. The underlying identifying assumption is that OCC and non-OCC lenders would have been on parallel trends in absence of the preemption rule.

The triple differences-in-difference methodology uses as a control set not only the loans made by lenders subject to a different regulator (non-OCC), but also those loans made in states where the pre-emption should not have had any effect as no APL laws were in place. In other words, we can relax the identifying assumption, in this approach we are basically assuming that the difference between OCC and non-OCC lenders' origination behavior in states with and without APL would have been the same in absence of the preemption ruling. Formally, we use the following specification:

$$Y_{i,c,t} = \beta_0 + \beta_1 \cdot Post_t \cdot OCC_i \cdot APL_{g,t} + \beta_2 \cdot Post_t \cdot OCC_i + \beta_3 \cdot OCC_i \cdot APL_{g,t} + (\text{DDD}) \\ \beta_4 \cdot Post_t \cdot APL_{g,t} + \beta_5 \cdot Post_t + \beta_6 \cdot OCC_i + \beta_7 \cdot APL_{g,t} + \beta_8 \cdot X_{i,t} + \eta_{c,t} + \epsilon_{i,c,t}$$

where  $APL_{g,t}$  indicates whether state  $g$  had a anti-predatory lending law in effect at time  $t$ , the month of origination of the loan. We define  $APL_{g,t}$  to be equivalent to the *ineffect* variable of [Ding et al. \(2012\)](#). The coefficient of interest is  $\beta_1$ . It estimates:

$$\left( [\bar{Y}_{OCC,Post}^{APL} - \bar{Y}_{OCC,pre}^{APL}] - [\bar{Y}_{Non-OCC,Post}^{APL} - \bar{Y}_{Non-OCC,Pre}^{APL}] \right) \\ - \\ \left( [\bar{Y}_{OCC,Post}^{Non-APL} - \bar{Y}_{OCC,pre}^{Non-APL}] - [\bar{Y}_{Non-OCC,Post}^{Non-APL} - \bar{Y}_{Non-OCC,Pre}^{Non-APL}] \right),$$

which effectively compares loans originated by OCC to non-OCC lenders across states with and without APL around the preemption rule. We shall show that with both approaches the results are broadly consistent, which reassures us that we are able to capture the effect of the deregulation rather than preexisting trends or confounding factors.

## 5 OCC Response to the Preemption Rule

In this section, we focus on the effect of the deregulation on the OCC lenders' mortgage origination before and after the preemption.

### 5.1 Borrowers' Quality and the Supply of Complex Mortgage

We start by presenting our main results on the change in the pool of borrowers that obtain credit from OCC lenders and the features of the mortgages originated after the enactment of the preemption rule. Specifically, our set of outcome variables  $Y_{i,c,t}$  is the credit score, the LTV, the presence of a second lien or an indicator which captures if the mortgage is a cash out refinance. These features should capture the quality of the borrowers' at origination, as they can proxy for his credit-worthiness, his equity in the house, and overall his risk to default. If the preemption rule has dampened the lenders' concerns about the borrowers' ability to repay their mortgages, we should observe a significant change along these dimensions after 2004.

We test this hypothesis in Table 2. Column 1 shows that individuals borrowing by OCC lenders exhibit lower FICO scores by about 41 points after the preemption. Column 2 and 3 provides evidence that OCC were also willing to lend to borrowers with less equity in their homes, as the average combined LTV increased by 6% after the preemption and the probability to have a second lien was 4 percentage points higher. Finally, these borrowers were also 6% more likely to get a cash-out refinance. In all of these specifications, we include county by month fixed effects to absorb any time-varying unobserved heterogeneity at the

county level. Overall, these results suggest that the pool of borrowers obtaining credit from OCC lenders changed significantly after the preemption rule.

Next, we test if the features of the mortgages originated by OCC lenders to these riskier borrowers after the preemption also changed significantly. In Table 3 our dependent variables  $Y_{i,c,t}$  include an indicator of whether the loan had a prepayment penalty, the length of the prepayment term (e.g. the borrower is subject to prepayment penalties if he repays the mortgage within the first two years from origination), whether the prepayment penalty term of the loan would have been in violation of existing APL laws<sup>10</sup>, as well as, whether the loan is an adjustable rate mortgage, whether the loan had deferred amortization features as defined by APL laws (i.e. negative amortization or balloon features), and whether the loan features an interest-only period. Prepayment penalties is the most important feature, because it is the mortgage feature whose use is consistently restricted by all APL laws. Moreover, as argued by Mayer et al. (2013), riskier loans tend to exhibit prepayment penalties, because otherwise the high-quality borrowers would refinance as soon as their creditworthiness has improved.<sup>11</sup>

Table 3 presents the results. The results in Column 1 shows that an OCC lender in an APL state was about 15% more likely to make a loan with a prepayment penalty relative to a non-OCC lender following the pre-emption. This compares to an unconditional mean of the presence of prepayment penalties of 31.6%. This result suggests that the pre-emption led to an economically important increase in the presence of this loan feature. Additionally, as shown in Column 2, they also made prepayment penalty terms 4 months longer relative to non-OCC lenders (unconditional mean of 8 months). Moreover, OCC lenders were 10% more likely to originate loans that would have been in violation of the existing APL law (Column 3), originated 11% more ARMs (Column 4) and made 4.2% more deferred amortization loans (Column 5). Column 6 shows that OCC lenders were 5% less likely to originate interest-only

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<sup>10</sup>For this purpose we use the Bostic et al. (2008) classification of prepayment penalty term related APL laws. See Table 2 of Bostic et al. (2008) .

<sup>11</sup>This idea is related to an empirical prepayment literature which observed path dependence of prepayment (see, for instance, Richard and Roll (1989)).

mortgages. This is not a surprise as loans featuring interest-only repayment terms were not prohibited by the APL laws.

Finally, in light of the results we shall show in the next section a discussion of the potential bias of our estimates is granted. Since the preemption rule also affects non-OCC lenders, in principle our estimates might be upward or downward biased. The first case occurs when there is business stealing, that is, when OCC lenders are able to attract risky borrowers that otherwise would have obtained credit by non-OCC lenders. If as a result of business stealing non-OCC borrowers become relatively safer borrowers then the frequency of complex features for mortgages originated by non-OCC lenders will decline, which in a DD framework will show as an upward bias in the causal effect of deregulation on the supply of complex mortgages. The second case, instead, occurs when also the non-OCC lenders start issuing more complex mortgages after the deregulation, then the differential effect that we estimate is smaller than the real effect of the preemption on the OCC lenders and our estimates would then be downward biased. There are two results that corroborates this second case. First, we shall show that *controlling for borrowers' characteristics* (especially, FICO score and LTV) non-OCC lenders also react to the preemption rule by making loans with riskier features such as IO, ARMs and deferred amortization. This means that even controlling for the potential selection of riskier borrowers towards OCC lenders, we observe that non-OCC lenders are actually making more complex loans. Second, if we compare the results in Panel A with those in Panel B of Table 3, we observe that the results are larger when we do not control for borrowers' characteristics which is consistent with this interpretation that controlling for borrowers' characteristics help us controlling for the "business stealing" effect. Overall, this evidence indicates that our estimates might be downwardly biased.

## 5.2 Triple Differences Estimation

The results in Tables 2 and 3 have identified an exogenous change in the loan contracts issued in states with APL laws, induced by the pre-emption ruling via the channel of the expanded

choice set of OCC lenders relative to non-OCC lenders. One potential concern with that estimation methodology is that we are assuming that OCC and non-OCC lenders would have been on parallel trends in absence of the preemption. However, there might be other shocks in the early 2000s that might differentially affect the two types of lenders. For instance, a change in monetary policy might have a larger effect on smaller banks than on larger banks due to the absence of an internal capital markets. Then, we can relax this assumption by including as an additional control group the difference between OCC and non-OCC lenders in the states without APL laws. This is helpful in addressing the previous concern, because to invalidate the triple differences-in-difference any confounding factor should differentially affect not only different type of lenders, but it should also be correlated with the presence of laws against predatory lending. This approach is then very helpful in controlling for unobserved time-varying heterogeneity that might predict a differential behavior between the treatment and the control after 2004.

Results appear in Tables 4 and 5. Table 4 analyze the borrowers' characteristics and it shows that the credit score decreases by about 10 points, the combined LTV increases by 4%, while the probability of the mortgage being a cash out refinancing increases by about 8%. Table 5, instead, investigates the results for the mortgages features. The two main mortgage features that OCC lenders can now exploit to take advantage of the preemption are the term length and the presence of prepayment penalties. The magnitude of the effect on the origination of loans with prepayment penalties is mitigated, but remains statistically significant and economically significant. Then, even in this case we can confirm the hypothesis that OCC lenders expanded their supply of mortgages featuring prepayment penalties after the preemption rule.

### **5.3 Matching**

To further alleviate concerns about differences between the national banks and other mortgage originators, we can follow a different approach and match loans originated by OCC

with loans originated by non-OCC lenders. This can help addressing the concern that there might be a non-linear relationship between borrower characteristics (as well as zipcode and quarter of origination) and the outcome variables across different type of lenders that our differences-in-difference methodology is not able to control for. Specifically, we employ the nearest-neighbor matching method. We constructed 50 points buckets for the FICO score, 10% buckets for the loan-to-value ratio and \$50k buckets for the loan size. We then match with replacement each loan originated by OCC lenders based on ZIP code, quarter of origination, documentation, FICO bucket, LTV bucket and size bucket. If there is more than one match, we then find within each bucket the closest loan and pick the one that minimize the distance along all the different dimensions. This approach allows us to find the closest possible match for each OCC loan among non-OCC loans and control in the most conservative way for all the relevant characteristics.

Table 6 reports the results based on this matched sample, where the dependent variable is already the difference between the OCC and the non-OCC outcomes, then the coefficient of interest is the interaction between our Post indicator and our APL indicator. The results are extremely similar to the ones presented in the previous section, that is, OCC lenders are 18% more likely to originate loans with prepayment penalties and they exhibit significantly longer prepayment terms. We can also check for the absence of any pre-trends in Figure 2 and 3 which plots our coefficient of interest over time. It shows that there is no effect in the quarters before the preemption rule, that is, OCC lenders' mortgages are not statistically different from the one of non-OCC lenders as the loans that they originate exhibit similar features. However, after the preemption rule both the presence of prepayment penalties and the terms of these penalties increases significantly. The effect is also quite persistent over time.

Overall these results have identified an exogenous component to the change in the pool of borrowers and in the loan contract features from the pre-period to the post-period.



## 6 Competition and the Non-OCC Lenders' Response

We now consider whether the preemption also had an *indirect* effect on the non-OCC lenders. The pre-emption created an un-level playing field whereby the non-OCC regulated lenders still had to adhere to the state APL laws. On the one hand, non-OCC lenders may have responded to the change in the competitive landscape by specializing in serving less risky borrowers. In other words, the preemption rule might have increased market segmentation, especially in regions where OCC have a dominant position, which reduced the non-OCC lenders' incentives to compete for the same borrowers. On the other hand, non-OCC lender could increase the origination of loans with prepayment penalties, changed the prepayment penalty terms up to the level allowed by the state laws, or could originate more complex loans, such as IO and ARMs, that were not directly governed by the APL laws, but were still riskier in nature. Moreover, non-OCC lenders might be more prone to do so to protect their market share in an environment where OCC lenders have a more dominant position. Then, the reaction of non-OCC lenders to the deregulation is an empirical question. We test the following hypothesis:

**Hypothesis I:** In more competitive mortgage markets, Non-OCC lenders increase their issuance of riskier mortgages along non-regulated dimensions.

As a proxy for the competitiveness of the local mortgage market, we construct the *Fraction OCC*, which is the fraction of loans (by volume) originated by OCC lenders in 2003. Intuitively, if national banks capture a higher market share, then non-OCC lenders might be even more adversely affected by the preemption ruling, because OCC lenders might take advantage of their position to issue these mortgages and capture an even higher market share. Before analyzing the non-OCC lenders origination behavior, we first report in Table 7 the coefficient estimates of cross-sectional regressions relating the presence of national banks to several county characteristics. The fraction of loans originated by national banks is correlated with several important characteristics of the county. For instance, less popu-

lated counties (Column 2) and those with more elastic housing supply (Column 3) and less intense securitization activity (Column 5) are also regions with a higher fraction of loans originated by national banks. However, these correlations do not differ significantly in states with and without anti-predatory laws, as shown by the lack of significance of the coefficient on the interaction  $Fraction\ OCC \times APL_{g,2004}$ . In other words, the correlation between fraction of OCC and county characteristics does not vary by whether the state adopted an anti-predatory law or not. This reassures us that fraction of OCC does not proxy for other characteristics of the mortgage market that might drive loan origination. The only exception is the elasticity of housing supply. We address potential heterogeneity concerns in different ways. First of all, we exploit within county and month variation. Second, we show that our results are robust to different measures of competition. Third, in section 7 we follow a matching procedure to reduce at minimum the differences between counties with high and low fraction of OCC activity.

Table 8 tests the effect of competition on non-OCC lending behavior. Panel A shows that in counties in APL states where OCC lenders capture a larger market share, non-OCC lenders respond by issuing mortgages with features that were not directly restricted by the APL laws. Specifically, we find that non-OCC lenders issue significantly more adjustable-rate mortgages and mortgages featuring deferred amortization after the preemption ruling. As hypothesized, these effects are mainly concentrated in counties where OCC lenders have a higher level of market share. In fact, Panel B and C show that whereas the results are broadly not present in the counties where OCC lenders have little market power (Panel C), they become large and significant in the counties where the measure of OCC activity is in the top two terciles (Panel B). The effects are statistically and economically significant. Specifically, we find that non-OCC lenders originate 5% more interest-only mortgages, 6% more adjustable-rate mortgages and 6% more mortgages with deferred amortization features. Interestingly, there is no significant effect on the prepayment penalties and the term length, which are the terms governed by the APL. This is important because this also confirms that

non-OCC lenders are a good control group for the response of OCC lenders as they do not react along the same dimensions as the treatment group.

To further check that the issuance of complex mortgages by non-OCC regulated banks in highly competitive counties is not driven by differential trends among the counties, Figures 4-6 graph the time-series coefficients of the following regressions:

$$Y_{i,t} = \lambda_i + \eta_t + \sum_{\tau \neq t_0} \beta_{1\tau} APL_{2004} \mathbf{1}_{(\tau=t)} + \Gamma X_{i,t} + \varepsilon_{i,t},$$

where  $Y$  is a vector including our dependent variables capturing the mortgages' features.  $\mathbf{1}_{(\tau=t)}$  is a dummy variable equal to 1 for quarter  $t$ , and  $X_{i,t}$  contains all the other main borrower controls. We have normalized the coefficient  $\beta_{1,2003q3}$  – the quarter preceding the preemption rule – to zero. Note that  $APL_{2004}$  is time-invariant and equals one for the states that passed an APL by 2004 and zero otherwise. To keep the sample constant over time, we have excluded the states that implemented an APL after 2004 (i.e. Wisconsin, Rhode Island and Indiana). We have restricted attention to counties with a presence of OCC lenders in the top two terciles.

These event studies highlight two main points. First, that in the pre-period there was no difference in the issuance behavior of non-OCC lenders among counties in states with and without APLs. In other words, the treatment group (counties in APL states) and the control group (counties in non APL states) were on parallel trends in the pre-period. Second, Figures 4-6 show the dynamics of the effects: the coefficients become significantly positive right after the implementation of the preemption rule, which further reassures us that there are no confounding effects that coincide with the preemption rule.

These results point out that rather than attenuating the effects of deregulation, competition might induce also the mortgage originators not directly affected by the preemption to compete by issuing riskier and more complex mortgages. This might have significant consequences on the borrowers' delinquency behavior.

**Hypothesis II:** These complex mortgages by non-OCC are also more likely to default in highly competitive markets.

In Table 9 we test this hypothesis and find that the complex mortgages originated after the preemption rule in states with APL laws were 5% more likely to default in counties with a higher presence of national banks. We do not find similar effects when we restrict attention to counties where national banks do not have a dominant position, which further suggests that competition is driving these results. Overall, these results show that the higher local credit market competition steered non-OCC lenders towards the origination of riskier mortgages, which were also significantly more likely to default. Then, the adverse effects of the deregulation were amplified rather than attenuated by the competition among different type of lending institutions.

## 7 Further Evidence and Robustness

### 7.1 Matching Estimator

Of course, mortgage market competition is not randomly assigned, so it is difficult to ascribe causality to the results presented in 6. We attempt to address endogeneity concerns in a variety of ways. First, in the previous section we have shown that our results are robust to a battery of controls including county and time fixed effects, and detailed mortgage characteristics. Moreover, we control for the interaction of *Post* and *APL* with these characteristics. Thus, our results show that market competition increases the likelihood that non-OCC issue riskier mortgages after the preemption rule in APL states even after considering the possibility that this sensitivity can vary with the aforementioned characteristics.

Nonetheless, one may still be concerned that our controls only absorb linear effects of observable characteristics and that highly competitive counties in APL states are different from highly competitive counties in non-APL states. Therefore, we use a propensity score

matching procedure to ensure that the counties exhibiting different levels of market competition are similar on observable dimensions. We restrict attention to counties with the fraction of OCC lending activity being in the top two terciles of the distribution and estimate the probability that a county has an APL based on observable characteristics. Specifically, we match on unemployment rate, fraction of households with FICO scores below 620 and below 680, average debt to income ratio, the log of median income, the fraction of employed individuals, the fraction of homeownership, fraction of households with college and high school degrees all measured in 2000. We then match each high-competition county in APL states to the county with high competition in non-APL states that has the most similar propensity score and run our baseline specifications in the matched sample. Table 10A and 10B report these results both for the mortgage features and defaults. We find that even on this matched sample non-OCC lenders were significantly more likely to issue ARMs as well as riskier mortgages exhibiting interest-only and deferred amortization in highly competitive markets. Moreover, as shown in Table 10B these mortgages were also significantly more likely to default.

As a further robustness check we want to make sure that our results are not driven by heterogeneous boom and bust patterns in house prices. For instance, regions that experienced more severe housing crush might also be the regions in which competition among lenders was more intense during the boom and then defaults are more likely during the bust years. To account for this possibility, we then compute for each zip code the house price change between 2006 and 2008 and we divide zip codes in deciles of house price movements. Then, we re-run our specification for both the mortgage origination and the defaults by controlling for zip code bucket interacted with quarter fixed effects. This means that we are controlling for time-varying heterogeneity at the zip code level and find very similar results (Column 1 of Table 10 Panel B). To be even more restrictive, we differentiate among different type of mortgages based on the buckets of FICO score, LTV, loan type and size and allow for heterogeneous trends for these different loan groups within zip codes. Even in this case

we find similar results (Column 2 of Table 10 Panel B). This reassures us that the effect of competition is not confounded by other unobserved local heterogeneity.

## 7.2 A Different Proxy for Competition

To provide evidence that our results do not crucially hinge upon the proxy we used for competition, we also compute the Hirschman-Herfindahl Index (HHI) of concentration calculated as the sum of squared market shares, where market shares are based on branch-level deposit data from the FDIC’s Summary of Deposits dataset, which has been used extensively in the literature.<sup>12</sup> In the Appendix we report the results on both the issuance of riskier mortgages and defaults using this alternative measure. Even in this case all of our results are robust and both statistically and economically significant. We find that in less concentrated regions in APL states, after 2004 non-OCC lenders significantly increased the issuance of riskier mortgages, which were also more likely to become delinquent in the subsequent years. Both the fraction of mortgages issued by OCC lenders in the pre-period and the HHI of deposit concentration are imperfect proxies for the level of local competition. However, they capture some of the variation in local competition among financial institutions which is what is key for our analysis.

## 7.3 Securitization Activity

Now we can provide evidence addressing the following question: why does national banks’ lending behavior become more aggressive? One potential reason is that the preemption has significantly affected their ability to securitize these loans. In fact, there is evidence that the anti-predatory laws had a significant impact on the banks’ incentives for securitization. The reason is that the market might impose tighter constraints on the issuers of these loans who might have been in violation of state APL laws. Specifically, in the words of the credit rating agencies: “To the extent that potential violations of APLs reduce the funds available to repay

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<sup>12</sup>See, for instance, [Cetorelli and Strahan \(2006\)](#) and [Scharfstein and Sunderam \(2013\)](#).

RMBS investors, the likelihood of such violations and the probable severity of the penalties must be included in Moody’s overall assessment”.<sup>13</sup> Interestingly, the effect of the APL laws on securitization has been recently employed by [Keys et al. \(2010\)](#) as an instrument for the lenders’ securitization activity and its effect on their screening decisions. Consistently with the credit rating concerns’, they find that the incentives to screen the borrowers significantly increased during a period of strict enforcement of anti-predatory lending laws.

We test this hypothesis in Table 11, which reports results from the estimation of a linear probability model relating the lenders’ decision to securitize with the preemption ruling. We find that OCC lenders became 5% more likely to securitize, even after controlling for the borrower’s characteristics at origination and county by month fixed effects. This suggests that the outward shift in the supply of complex mortgages after the preemption was also due to the increased possibility of these lenders, and not the other non-OCC ones, to securitize these riskier mortgages without incurring in the requirement of credit enhancement from credit rating agencies. Table 12 shows that OCC lenders are even more likely to securitize a loan after the preemption rule when the loan’s debt to income ratio, as calculated in HMDA, is in the top tercile of the distribution. These results highlight that one potential reason why the preemption rule significantly affected the OCC lenders’ behavior is by increasing the possibility to securitize these riskier loans APL states without incurring in any credit enhancement request by the credit rating agencies.

## 7.4 Interest Rates

Mortgage features are usually bundled together, for instance, to make the most profitable features more attractive to borrowers or to shroud some features of the contract. One particular effect we can analyze is what is the effect of the inclusion of prepayment penalties on the interest rate at origination. For instance, we might expect that if OCC lenders require larger prepayment penalties, they might bundle them with lower interest rates. One challenge in

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<sup>13</sup> Available at <http://www.iffr.com/Article/2026825/Predatory-lending-and-RMBS-securitizations-in-the-US.html>.

estimating this effect is the need to take care of the heterogeneity among different contracts. To address this issue, we construct six different loan groups, depending on the combination between three main features: adjustable rate, interest-only and deferred amortization.

Table 13 reports the results. Column (1) presents the estimates controlling for agency linear and square trends, as well as, for loan group by county and month fixed effect. This means that we can control for time-varying unobserved heterogeneity across different type of mortgage contracts within a county. We find that after the preemption rule, the mortgages originated by OCC lenders exhibiting prepayment penalties featured on average 23 basis points lower interest rates. In Column 2 we also control for several borrower characteristics and their interaction with the loan groups. This allows us to control for the effect of the LTV, for instance, which can be different depending on the loan characteristics. The results are almost unchanged, as we find that the interest rate is 26 basis points lower for those mortgages featuring prepayment penalties.

## 8 Conclusion

In this paper, we use the pre-emption of state anti-predatory lending laws for banks regulated by the OCC - as a quasi-experiment to test for the effect of deregulation on the supply of complex mortgages. This was a shock which expanded the set of loans OCC-regulated lenders were allowed to make while leaving unchanged the set of non-OCC regulated lenders. This deregulation allows us to take advantage of two different sources of variation. First, we exploit the heterogeneity among banks OCC and non-OCC regulated mortgage originators before and after the preemption rule. Second, we can also augment this approach by exploiting the fact that the preemption only affected a subset of the states in the U.S. namely those that adopted an APL law.

We have three main results. We show that the supply of loans with prepayment penalties significantly increased in response to the deregulation. Prepayment penalties enable the



profitable use by the lenders of features such as interest only or negative amortization. Additionally, while some states with APLs did not fully restrict prepayment penalties, they did curb the length of the prepayment penalty term and we can show that this increased significantly after the preemption rule. We also find that the quality of the borrowers having access to credit by OCC significantly deteriorates. These results confirm our hypothesis that the supply of complex mortgages increased in response to the deregulation.

Finally, we explore how local mortgage market competition between lenders regulated by different agencies may have had perverse effects. We show that in highly competitive counties, those where OCC lenders had a higher market share, non-OCC lenders became more aggressive in the origination of loans with interest-only payments, deferred amortization and ARMs, that is, features not directly controlled by the state APL laws. Moreover, these mortgages were significantly more likely to default. This is even more striking because these non-OCC regulated lenders were not directly affected by the pre-emption ruling, then their response was mainly an attempt to maintain their position in the market. Our evidence is suggestive of a competition channel that ignited a “*race to the bottom*” and induced a potentially adverse response even from those lenders who continued to fall under the regulation.

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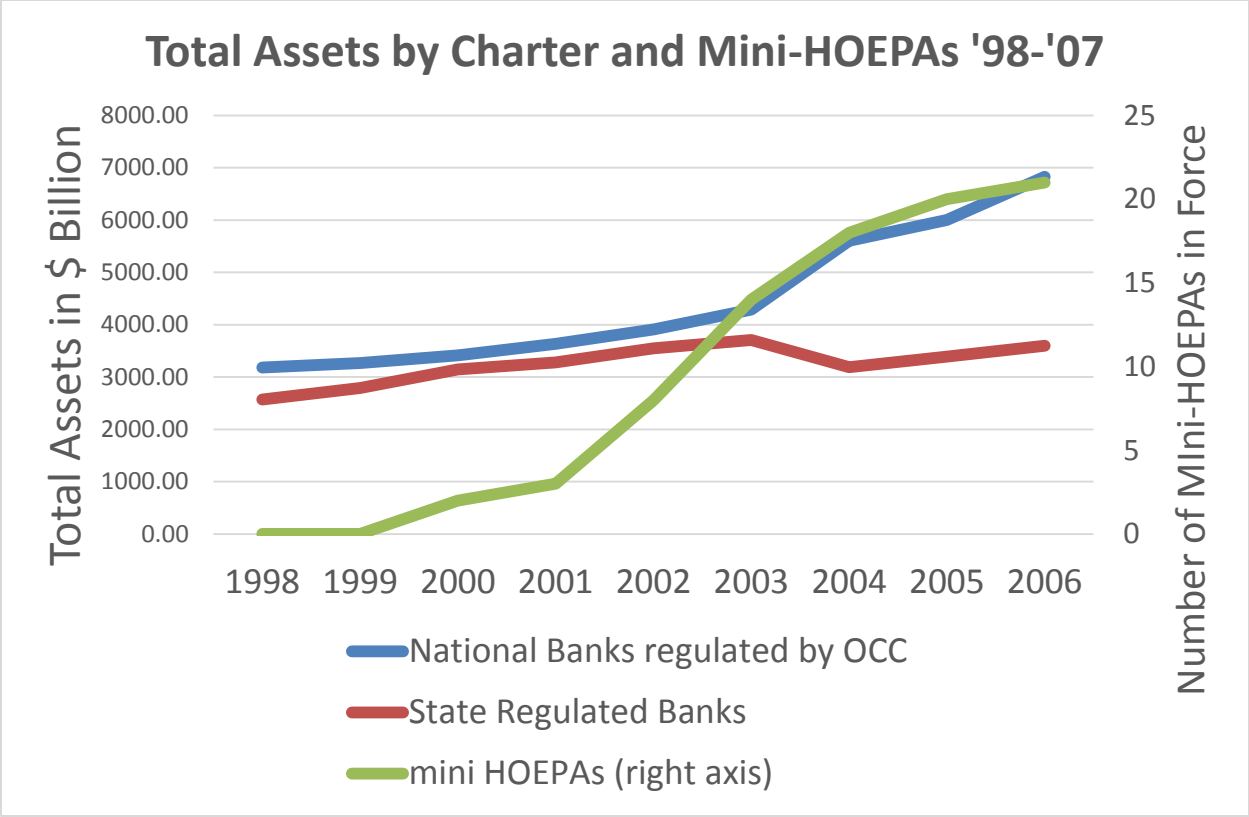
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**Figure 1**

The figure depicts the total assets that OCC and state regulators supervise over time in relation with the introduction of the state laws against predatory lending.

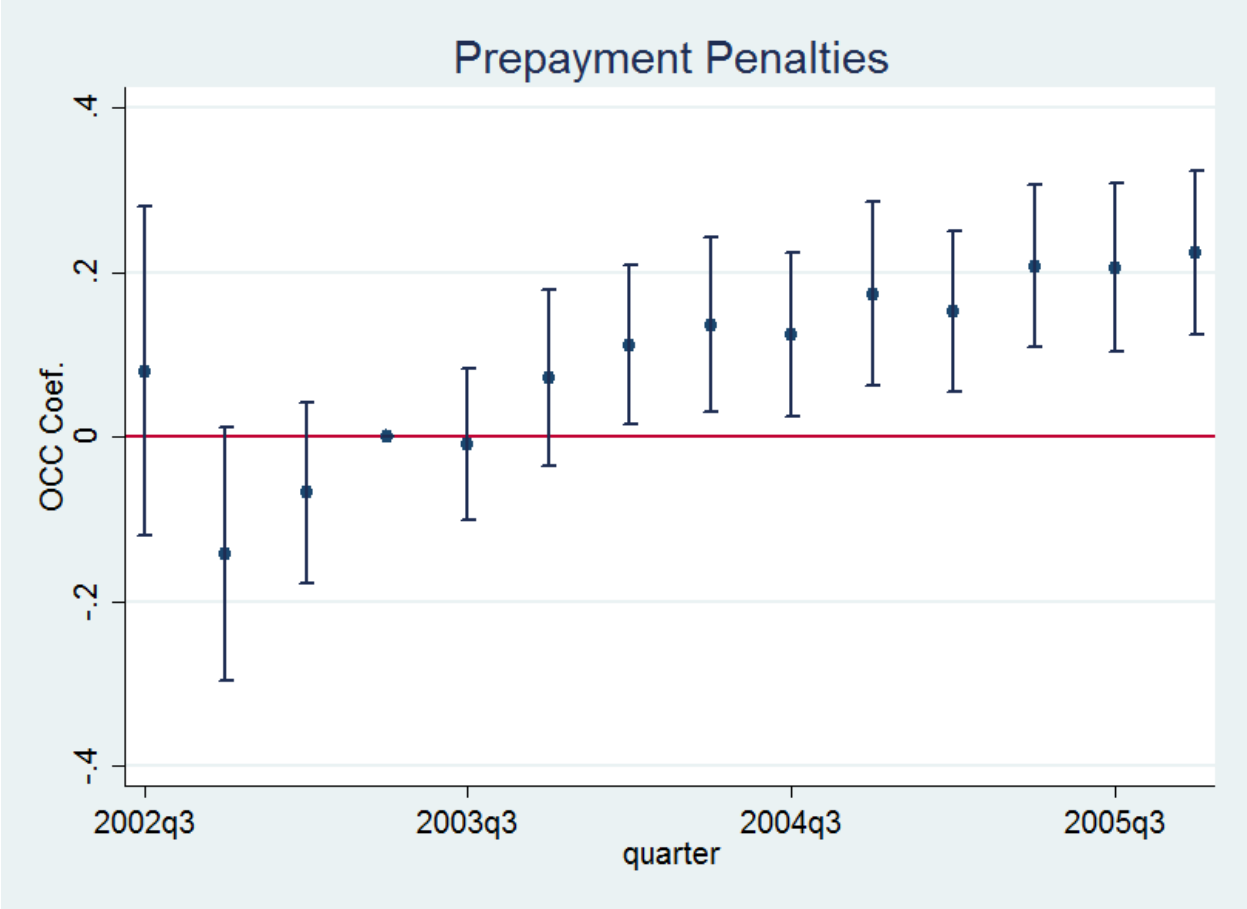


Figure 2

The figure plots the interaction coefficient of the OCC indicator with quarterly dummies relating the preemption of national banks to the issuance of mortgages with prepayment penalties.

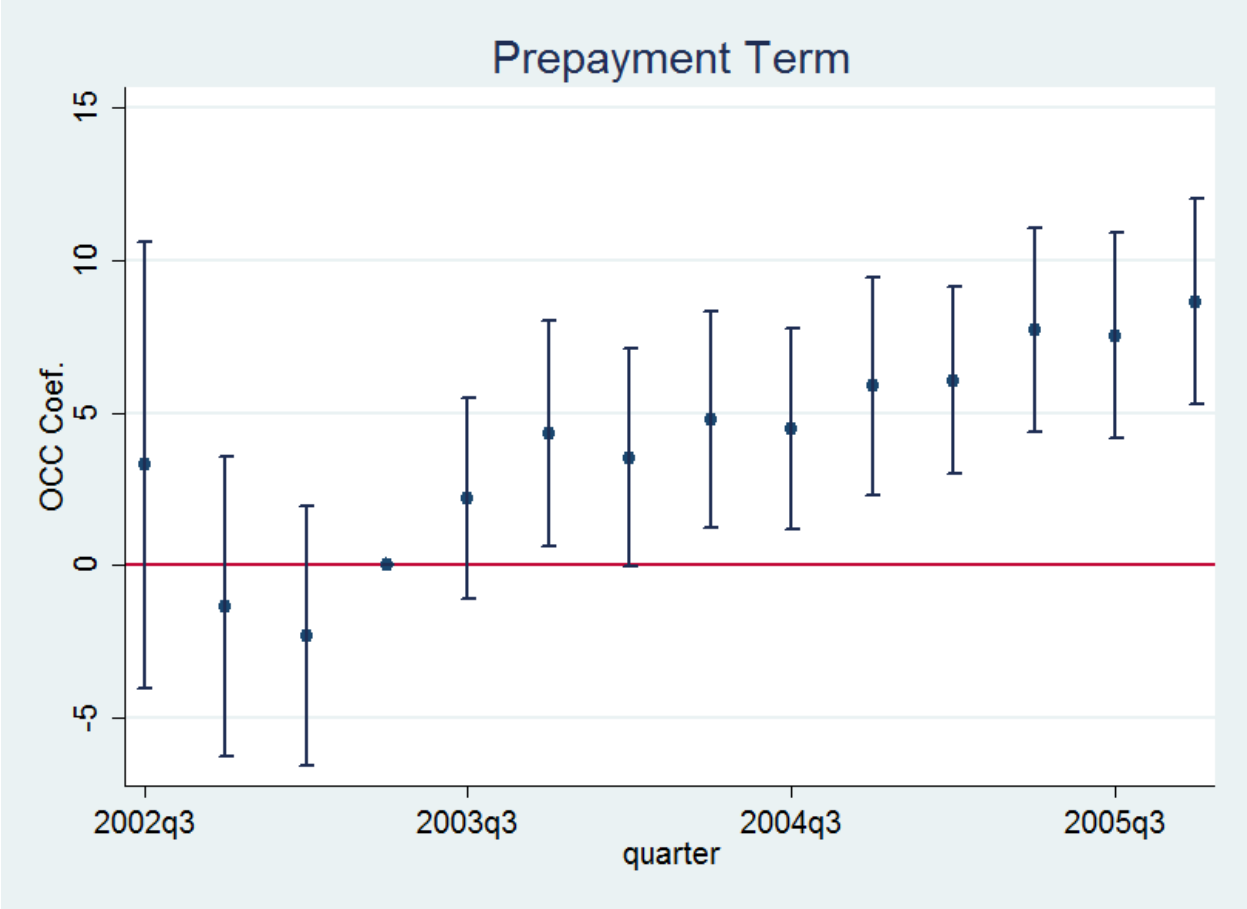


Figure 3

The figure plots the interaction coefficient of the OCC indicator with quarterly dummies relating the preemption of national banks to the issuance of mortgages with longer prepayment penalties terms.



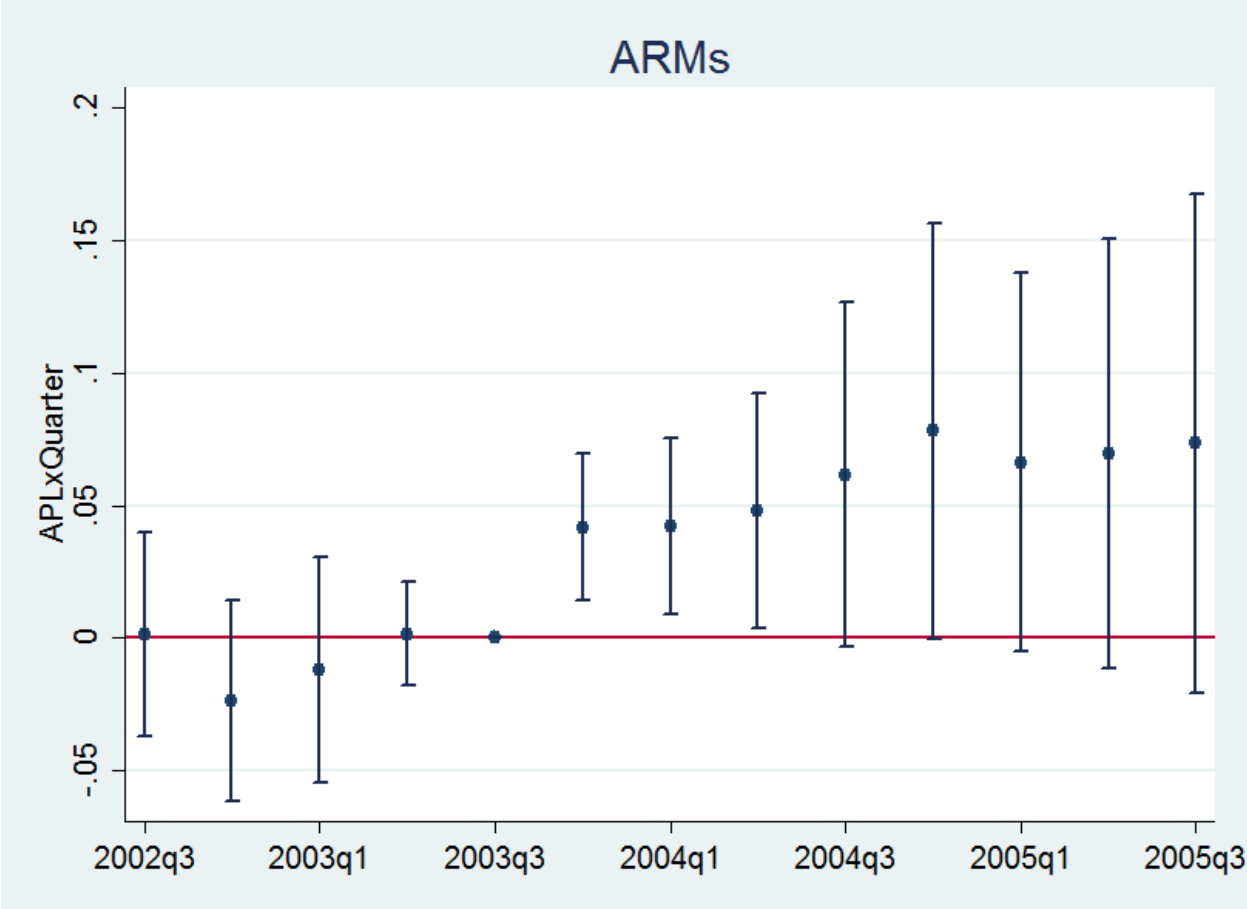


Figure 4

The figure plots the interaction coefficient of the APL indicator with quarterly dummies relating the preemption of national banks to the issuance of ARM's by non-OCC regulated banks in highly competitive counties.

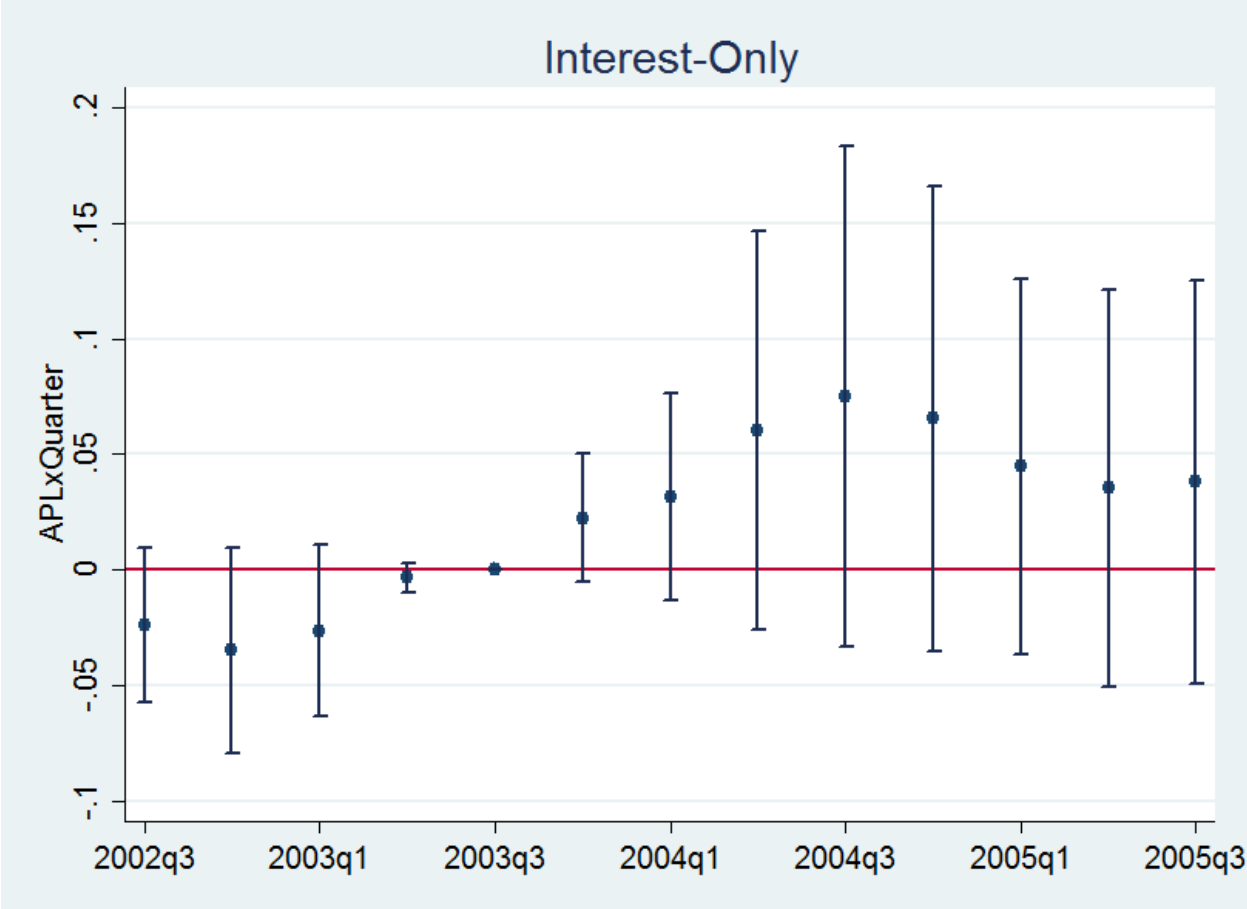


Figure 5

The figure plots the interaction coefficient of the APL indicator with quarterly dummies relating the preemption of national banks to the issuance of interest-only by non-OCC regulated banks in highly competitive counties.

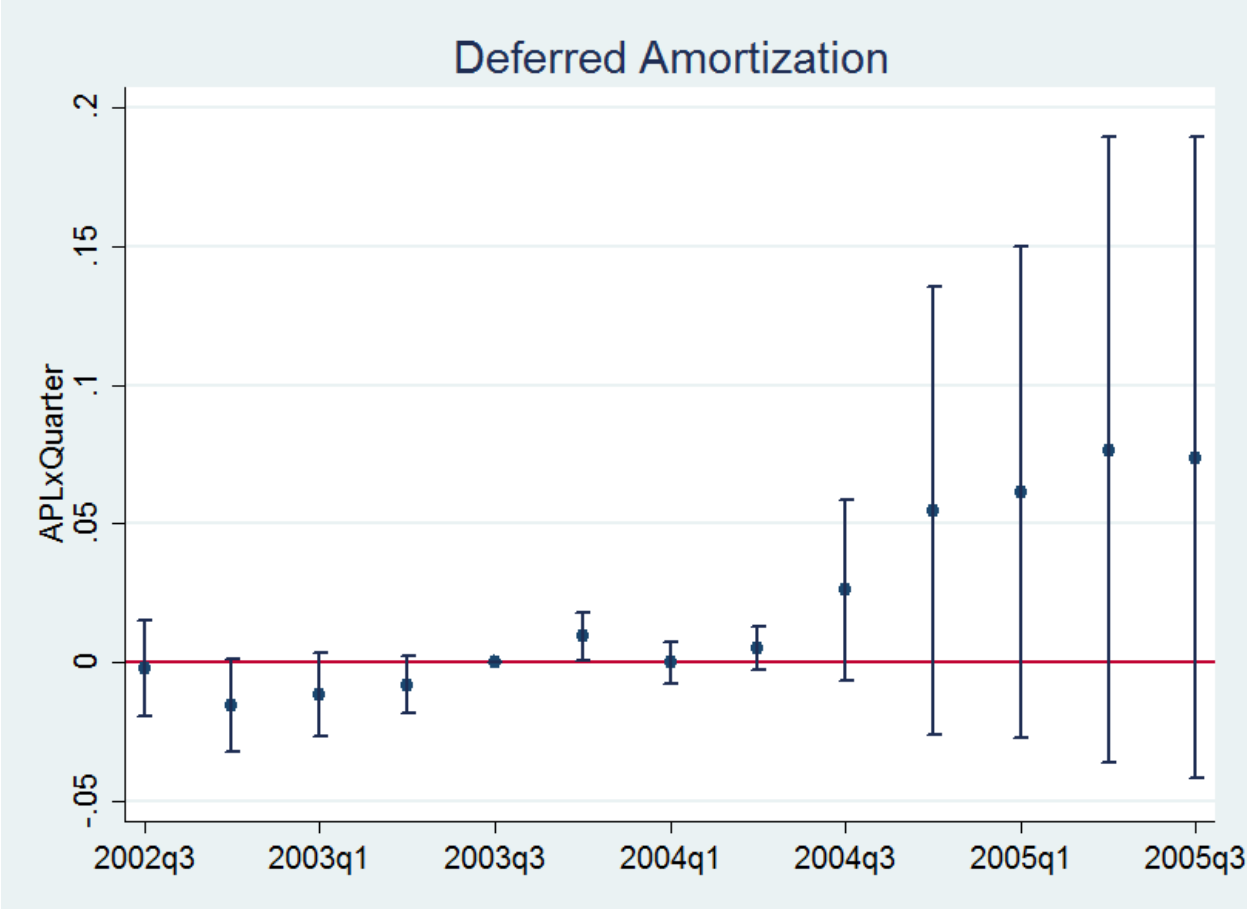


Figure 6

The figure plots the interaction coefficient of the APL indicator with quarterly dummies relating the preemption of national banks to the issuance of mortgages with deferred amortization by non-OCC regulated banks in highly competitive counties.

**Table 1A****Summary Statistics Loan Level (January 2001 to January 2004)**

The table below presents Summary Statistics by Regulatory Agency of Lender for Loans that were originated between and including January 2001 and January 2004. OCC refers to loans originated by national banks who were regulated by the OCC. Non-OCC includes all state chartered banks and state chartered savings and loans institutions as well as mortgage companies, funding companies and credit unions. Credit Score, LTV Ratio and Appraised Value have been winsorized at the 1st and 99th percentile. Second Lien Present is an indicator variable for whether the property had a second lien at the time of origination. PMI is an indicator variable equal to one if the mortgage had private mortgage insurance. Prepayment Penalty Term Violation is an indicator variable capturing whether a loan issued was in violation of the maximum prepayment penalty term length stipulated in the APL as classified by Bostic et al. (2009). Prepayment Penalty, Interest Only and ARM are indicator variables equal to 1 if the mortgage had each of these features respectively. Deferred Amortization is an indicator variable equal to one if the mortgage had a negative amortization or a balloon payment feature.

|  | <i>States with APL Laws by Feb 2004</i> |           |                |           | <i>States without APL Laws by Feb 2004</i> |            |                |            |
|--|---|-----------|----------------|-----------|--|------------|----------------|------------|
|  | <i>OCC</i>                              |           | <i>Non-OCC</i> |           | <i>OCC</i>                                 |            | <i>Non-OCC</i> |            |
|  | <i>Mean</i>                             | <i>SD</i> | <i>Mean</i>    | <i>SD</i> | <i>Mean</i>                                | <i>SD</i>  | <i>Mean</i>    | <i>SD</i>  |
| <b>Panel A: Covariates</b>             |   |           |                |           |  |            |                |            |
| CreditScore                            | 686.875                                 | 77.632    | 637.305        | 70.406    | 672.037                                    | 76.971     | 630.697        | 67.892     |
| LTV Ratio                              | 0.721                                   | 0.194     | 0.792          | 0.141     | 0.794                                      | 0.163      | 0.820          | 0.133      |
| Appraised Value                        | 266642                                  | 236584    | 246102         | 180121    | 157455.649                                 | 134844.042 | 165060.516     | 127394.611 |
| Second Lien Present                    | 0.075                                   | 0.263     | 0.081          | 0.272     | 0.051                                      | 0.221      | 0.073          | 0.260      |
| Low or No Doc                          | 0.484                                   | 0.500     | 0.347          | 0.476     | 0.378                                      | 0.485      | 0.286          | 0.452      |
| PMI                                    | 0.146                                   | 0.353     | 0.121          | 0.326     | 0.148                                      | 0.355      | 0.148          | 0.355      |
| <b>Panel B: Loan Contract Features</b> |   |           |                |           |  |            |                |            |
| Prepayment Penalty                     | 0.177                                   | 0.382     | 0.275          | 0.447     | 0.332                                      | 0.471      | 0.367          | 0.482      |
| Prepayment Penalty Term Violation      | 0.120                                   | 0.325     | 0.167          | 0.373     | -  | -          | -              | -          |
| Deferred Amortization                  | 0.019                                   | 0.136     | 0.016          | 0.124     | 0.024                                      | 0.154      | 0.018          | 0.131      |
| Interest Only Loan                     | 0.013                                   | 0.113     | 0.036          | 0.187     | 0.003                                      | 0.056      | 0.016          | 0.126      |
| ARM Loan                               | 0.224                                   | 0.417     | 0.549          | 0.498     | 0.222                                      | 0.416      | 0.536          | 0.499      |
| Observations                           | 75112                                   |           | 990193         |           | 66151                                      |            | 773020         |            |

**Table 1B****Summary Statistics Loan Level (February 2004 to December 2006)**

The table below presents Summary Statistics by Regulatory Agency of Lender for Loans that were originated between and including February 2004 and December 2006 in those states that had implemented APL laws by February 2004. OCC refers to loans originated by national banks who were regulated by the OCC. OTS indicates Federal Reserve Banks regulated by the Office of Thrift Supervision. Non-OCC/OTS includes all state chartered banks and state chartered savings and loans institutions as well as mortgage companies, funding companies and credit unions. Credit Score, LTV Ratio and Appraised Value have been winsorized at the 1st and 99th percentile. Second Lien Present is an indicator variable for whether the property had a second lien at the time of origination. PMI is an indicator variable equal to one if the mortgage had private mortgage insurance. Prepayment Penalty Term Violation is an indicator variable capturing whether a loan issued was in violation of the maximum prepayment penalty term length as classified by Bostic et al. (2009). Prepayment Penalty, Interest Only and ARM are indicator variables equal to 1 if the mortgage had each of these features respectively. Deferred Amortization is an indicator variable equal to one if the mortgage had a negative amortization or a balloon payment feature.

|  | <i>States with APL Laws by Feb 2004</i> |           |                |           | <i>States without APL Laws by Feb 2004</i> |            |                |            |
|--|---|-----------|----------------|-----------|--|------------|----------------|------------|
|  | <i>OCC</i>                              |           | <i>Non-OCC</i> |           | <i>OCC</i>                                 |            | <i>Non-OCC</i> |            |
|  | <i>Mean</i>                             | <i>SD</i> | <i>Mean</i>    | <i>SD</i> | <i>Mean</i>                                | <i>SD</i>  | <i>Mean</i>    | <i>SD</i>  |
| <b>Panel A: Covariates</b>             |   |           |                |           |  |            |                |            |
| CreditScore                            | 674.048                                 | 70.165    | 652.977        | 68.824    | 667.689                                    | 69.999     | 647.095        | 69.293     |
| LTV Ratio                              | 0.758                                   | 0.150     | 0.781          | 0.127     | 0.787                                      | 0.133      | 0.803          | 0.121      |
| Appraised Value                        | 327011                                  | 256682    | 342702         | 235484    | 234336.584                                 | 188550.835 | 240955.555     | 176497.628 |
| Second Lien Present                    | 0.138                                   | 0.345     | 0.225          | 0.418     | 0.113                                      | 0.316      | 0.211          | 0.408      |
| Low or No Doc                          | 0.412                                   | 0.492     | 0.451          | 0.498     | 0.391                                      | 0.488      | 0.386          | 0.487      |
| PMI                                    | 0.193                                   | 0.395     | 0.039          | 0.194     | 0.199                                      | 0.399      | 0.046          | 0.208      |
| <b>Panel B: Loan Contract Features</b> |   |           |                |           |  |            |                |            |
| Prepayment Penalty                     | 0.263                                   | 0.440     | 0.332          | 0.471     | 0.375                                      | 0.484      | 0.431          | 0.495      |
| Prepayment Penalty Term Violation      | 0.156                                   | 0.363     | 0.201          | 0.401     | -  | -          | -              | -          |
| Deferred Amortization                  | 0.046                                   | 0.210     | 0.175          | 0.380     | 0.052                                      | 0.223      | 0.143          | 0.350      |
| Interest Only Loan                     | 0.198                                   | 0.398     | 0.250          | 0.433     | 0.163                                      | 0.369      | 0.200          | 0.400      |
| ARM Loan                               | 0.500                                   | 0.500     | 0.724          | 0.447     | 0.506                                      | 0.500      | 0.687          | 0.464      |
| Observations                           | 307082                                  |           | 2956710        |           | 301487                                     |            | 2345248        |            |

**Table 2****Effect of Pre-Emption Rulng on Borrower Quality (Diff in Diff)**

The table reports coefficient estimates from a linear probability model relating various borrower characteristics to the pre-emption ruling of national banks. The sample includes loans made in states which had implemented APL laws by 2004. The dependent variables are as follows: Column 1: Borrower's FICO score, Column 2: combined LTV ratio at origination, Column 3: Indicator variable for whether the property had a second lien at the time of origination, Column 4: Indicator variable for whether the mortgage was a Cash Out Refinance. OCC is an indicator for whether the mortgage was originated by an OCC regulated lender. APL is a time varying indicator variable for whether the state in which the loan was originated had an APL law in place at time of origination. Post is an indicator variable equal to 1 for months after January 2004. Asterisks denote significance levels (\*\*\*=1%, \*\*=5%, \*=10%).

|                    | (1)<br><i>Credit Score</i> | (2)<br><i>CLTV</i>   | (3)<br><i>Second Lien</i> | (4)<br><i>Cash Out</i> |
|--------------------|----------------------------|----------------------|---------------------------|------------------------|
| OCC x Post         | -40.990***<br>(1.357)      | 0.063***<br>(0.005)  | 0.040***<br>(0.005)       | 0.061***<br>(0.010)    |
| OCC X APL          | 15.648***<br>(4.238)       | -0.062***<br>(0.013) | 0.020***<br>(0.005)       | -0.062***<br>(0.016)   |
| OCC                | -10.159***<br>(3.453)      | 0.024***<br>(0.008)  | -0.062***<br>(0.005)      | -0.420***<br>(0.014)   |
| Observations       | 4,175,298                  | 4,315,707            | 4,315,707                 | 4,315,707              |
| R-squared          | 0.120                      | 0.109                | 0.079                     | 0.062                  |
| County by Month FE | Yes                        | Yes                  | Yes                       | Yes                    |
| Mean of Dep Var    | 651.5                      | 0.806                | 0.183                     | 0.450                  |

**Table 3****Effect of Pre-Emption Ruling on Loan Features (Diff in Diff)**

The table reports coefficient estimates from a linear probability model relating the presence of various mortgage terms to the pre-emption ruling of national banks. The sample contains loans made in those states that implemented APL laws before February 2004. The dependent variables are as follows: Column 1: an indicator variable for whether the loan has a prepayment penalty; Column 2: indicator variable capturing whether a loan originated was in violation of the maximum prepayment penalty term length of the APL law as classified by Bostic et al. (2009); Column 3: length of the prepayment penalty term, with 0 if there is no prepayment penalty; Column 4: indicator variable for whether a loan has an ARM feature; Column 5: indicator variable for whether a loan has either negative amortization or a balloon feature. Column 6: Indicator variable for whether a mortgage had an interest only feature. OCC is an indicator for whether the mortgage was originated by an OCC regulated lender. APL is a time varying indicator variable for whether the state in which the loan was originated had an APL law in place at time of origination. Post is an indicator variable equal to 1 for months after January 2004. All columns include the following controls: the LTV ratio at origination, the Log of appraised value at origination, the borrower's FICO score, an indicator for the presence of second liens, a low or no documentation indicator, an indicator for loan purpose (i.e. cash out refinance, rate refinance or other), and an indicator for the presence of PMI. Asterisks denote significance levels (\*\*\*=1%, \*\*=5%, \*=10%).

|  | (1)                  | (2)                   | (3)                  | (4)                  | (5)                    | (6)                  |
|--|----------------------|-----------------------|----------------------|----------------------|------------------------|----------------------|
|  | <i>Prepay Pen</i>    | <i>Term Violation</i> | <i>Term Length</i>   | <i>ARM</i>           | <i>Deferred Amort.</i> | <i>IO</i>            |
| <b>Panel A: With Borrower Controls</b> |                      |                       |                      |                      |                        |                      |
| OCC x Post                             | 0.142***<br>(0.018)  | 0.104***<br>(0.016)   | 4.169***<br>(0.540)  | 0.114***<br>(0.011)  | 0.042***<br>(0.004)    | -0.052***<br>(0.008) |
| OCC X APL                              | -0.172***<br>(0.024) | -0.112***<br>(0.016)  | -4.494***<br>(0.659) | -0.077***<br>(0.014) | -0.014***<br>(0.003)   | -0.036***<br>(0.006) |
| OCC                                    | 0.148***<br>(0.018)  | 0.090***<br>(0.016)   | 3.436***<br>(0.595)  | -0.108***<br>(0.016) | 0.063***<br>(0.011)    | -0.017*<br>(0.010)   |
| Observations                           | 4,177,118            | 3,988,453             | 3,974,483            | 4,177,118            | 4,177,118              | 4,177,118            |
| R-squared                              | 0.179                | 0.213                 | 0.176                | 0.191                | 0.226                  | 0.216                |
| County by Month FE                     | Yes                  | Yes                   | Yes                  | Yes                  | Yes                    | Yes                  |
| Borrower Controls                      | Yes                  | Yes                   | Yes                  | Yes                  | Yes                    | Yes                  |
| Mean of Dep Var                        | 0.316                | 0.193                 | 8.113                | 0.660                | 0.126                  | 0.195                |
| <b>Panel B: No Borrower Controls</b>   |                      |                       |                      |                      |                        |                      |
| OCC x Post                             | 0.169***<br>(0.017)  | 0.125***<br>(0.018)   | 4.926***<br>(0.545)  | 0.212***<br>(0.013)  | 0.006**<br>(0.003)     | -0.057***<br>(0.007) |
| OCC X APL                              | -0.140***<br>(0.024) | -0.089***<br>(0.015)  | -3.470***<br>(0.649) | -0.104***<br>(0.019) | 0.006*<br>(0.004)      | -0.033***<br>(0.007) |
| OCC                                    | -0.133***<br>(0.020) | -0.107***<br>(0.017)  | -4.934***<br>(0.710) | 0.005<br>(0.020)     | 0.015**<br>(0.007)     | 0.022**<br>(0.010)   |
| Observations                           | 4,329,097            | 4,124,261             | 4,108,900            | 4,329,097            | 4,329,097              | 4,329,097            |
| R-squared                              | 0.137                | 0.182                 | 0.140                | 0.122                | 0.210                  | 0.154                |
| County by Month FE                     | Yes                  | Yes                   | Yes                  | Yes                  | Yes                    | Yes                  |
| Borrower Controls                      | No                   | No                    | No                   | No                   | No                     | No                   |
| Mean of Dep Var                        | 0.311                | 0.188                 | 7.899                | 0.660                | 0.126                  | 0.193                |

**Table 4****Effect of Pre-Emption Ruling on Borrower Quality (Diff in Diff in Diff)**

The table reports coefficient estimates from a linear probability model relating various borrower characteristics to the pre-emption ruling of national banks. The sample includes loans made in states which with and without APL laws in place. The dependent variables are as follows: Column 1: Borrower's FICO score, Column 2: combined LTV ratio at origination, Column 3: Indicator variable for whether the property had a second lien at the time of origination, Column 4: Indicator variable for whether the mortgage was a Cash Out Refinance. OCC is an indicator for whether the mortgage was originated by an OCC regulated lender. APL is a time varying indicator variable for whether the state in which the loan was originated had an APL law in place at time of origination. Post is an indicator variable equal to 1 for months after January 2004. Standard Errors are clustered at the county level. Asterisks denote significance levels (\*\*\*=1%, \*\*=5%, \*=10%).

|                    | (1)<br><i>Credit Score</i> | (2)<br><i>CLTV</i>   | (3)<br><i>Second Lien</i> | (4)<br><i>Cash Out</i> |
|--------------------|----------------------------|----------------------|---------------------------|------------------------|
| Post x APL x OCC   | -7.977**<br>(3.193)        | 0.044***<br>(0.009)  | -0.007<br>(0.006)         | 0.077***<br>(0.012)    |
| OCC x Post         | -37.022***<br>(1.828)      | 0.029***<br>(0.004)  | 0.032***<br>(0.006)       | -0.020**<br>(0.008)    |
| OCC X APL          | 8.203**<br>(3.387)         | -0.053***<br>(0.013) | 0.018***<br>(0.004)       | -0.056***<br>(0.011)   |
| OCC                | -16.300***<br>(2.104)      | 0.043***<br>(0.005)  | -0.068***<br>(0.004)      | -0.404***<br>(0.010)   |
| Observations       | 7,554,275                  | 7,793,625            | 7,793,625                 | 7,793,625              |
| R-squared          | 0.118                      | 0.109                | 0.081                     | 0.063                  |
| County by Month FE | Yes                        | Yes                  | Yes                       | Yes                    |
| Borrower Controls  | 649.0                      | 0.817                | 0.177                     | 0.444                  |
| Mean of Dep Var    | 9.740                      | 0.361                | 0.646                     | 0.117                  |

**Table 5****Effect of Pre-Emption Ruling on Loan Features (Diff in Diff in Diff)**

The table reports coefficient estimates from a linear probability model relating the presence of various mortgage terms to the pre-emption ruling of national banks. The sample contains loans made in those states with and without APL laws. The dependent variables are as follows: Column 1: an indicator variable for whether the loan has a prepayment penalty; Column 2: length of the prepayment penalty term, with 0 if there is no prepayment penalty; Column 3: indicator variable for whether a loan has an ARM feature; Column 4: indicator variable for whether a loan has either negative amortization or a balloon feature. Column 5: Indicator variable for whether a mortgage had an interest only feature. OCC is an indicator for whether the mortgage was originated by an OCC regulated lender. APL is a time varying indicator variable for whether the state in which the loan was originated had an APL law in place at time of origination. Post is an indicator variable equal to 1 for months after January 2004. All columns include the following controls: the LTV ratio at origination, the Log of appraised value at origination, the borrower's FICO score, an indicator for the presence of second liens, a low or no documentation indicator, an indicator for loan purpose (i.e. cash out refinance, rate refinance or other), and an indicator for the presence of PMI. Asterisks denote significance levels (\*\*\*=1%, \*\*=5%, \*=10%).

|  | (1)                  | (2)                  | (3)                  | (4)                    | (5)                  |
|--|----------------------|----------------------|----------------------|------------------------|----------------------|
|  | <i>Prepay Pen</i>    | <i>Term Length</i>   | <i>ARM</i>           | <i>Deferred Amort.</i> | <i>IO</i>            |
| <b>Panel A: All Counties</b>           |                      |                      |                      |                        |                      |
| Post x APL x OCC                       | 0.150***<br>(0.016)  | 4.634***<br>(0.438)  | 0.010<br>(0.010)     | -0.010<br>(0.008)      | 0.020**<br>(0.009)   |
| OCC x Post                             | 0.024*<br>(0.013)    | 0.666<br>(0.476)     | 0.107***<br>(0.007)  | 0.040***<br>(0.006)    | -0.050***<br>(0.008) |
| OCC X APL                              | -0.102***<br>(0.024) | -2.686***<br>(0.622) | -0.034***<br>(0.008) | -0.010***<br>(0.003)   | -0.031***<br>(0.005) |
| OCC                                    | 0.149***<br>(0.015)  | -7.886***<br>(0.138) | -0.130***<br>(0.012) | 0.042***<br>(0.008)    | -0.014**<br>(0.006)  |
| Observations                           | 7,555,361            | 7,169,712            | 7,555,361            | 7,555,361              | 7,555,361            |
| R-squared                              | 0.177                | 0.177                | 0.188                | 0.207                  | 0.213                |
| County by Month FE                     | Yes                  | Yes                  | Yes                  | Yes                    | Yes                  |
| Borrower Controls                      | Yes                  | Yes                  | Yes                  | Yes                    | Yes                  |
| Mean of Dep Var                        | 0.361                | 9.740                | 0.646                | 0.117                  | 0.176                |
| <b>Panel B: Counties on the Border</b> |                      |                      |                      |                        |                      |
| Post x APL x OCC                       | 0.150***<br>(0.022)  | 5.078***<br>(0.643)  | -0.009<br>(0.016)    | -0.007<br>(0.015)      | -0.007<br>(0.015)    |
| OCC x Post                             | -0.003<br>(0.019)    | -0.565<br>(0.735)    | 0.114***<br>(0.011)  | 0.039***<br>(0.009)    | 0.039***<br>(0.009)  |
| OCC X APL                              | -0.105***<br>(0.028) | -3.115***<br>(0.718) | -0.017<br>(0.016)    | -0.006<br>(0.004)      | -0.006<br>(0.004)    |
| OCC                                    | 0.139***<br>(0.027)  | 3.152***<br>(0.890)  | -0.137***<br>(0.018) | 0.046***<br>(0.014)    | 0.046***<br>(0.014)  |
| APL                                    | -0.029**<br>(0.012)  | -0.599<br>(0.437)    | 0.019*<br>(0.010)    | 0.002<br>(0.006)       | 0.002<br>(0.006)     |
| Observations                           | 2,422,382            | 2,311,157            | 2,422,382            | 2,422,382              | 2,422,382            |
| R-squared                              | 0.181                | 0.184                | 0.181                | 0.191                  | 0.191                |
| Border County Pair by Month FE         | Yes                  | Yes                  | Yes                  | Yes                    | Yes                  |
| Borrower Controls                      | Yes                  | Yes                  | Yes                  | Yes                    | Yes                  |
| Mean of Dep Var                        | 0.330                | 8.705                | 0.649                | 0.111                  | 0.111                |



**Table 6****Effect of Pre-Emption Ruling on Loan Features (Diff in Diff in Diff)**

The table reports coefficient estimates from a linear probability model relating the presence of various mortgage terms to the pre-emption ruling of national banks. The sample contains loans made in those states with and without APL laws. We employ the nearest-neighbor matching method to match each loan originated by OCC-regulated lender to a loan originated by a non-OCC lender. We constructed 50-points buckets for the FICO score, 10% buckets for the loan-to-value ratio and \$50k buckets for the loan size. We then match with replacement each loan originated by OCC lenders based on ZIP code, quarter of origination, documentation, FICO bucket, LTV bucket and size bucket. The dependent variables are as follows: Column 1: an indicator variable for whether the loan has a prepayment penalty; Column 2: length of the prepayment penalty term, with 0 if there is no prepayment penalty; Column 3: indicator variable for whether a loan has an ARM feature; Column 4: indicator variable for whether a loan has either negative amortization or a balloon feature. Column 5: Indicator variable for whether a mortgage had an interest only feature. OCC is an indicator for whether the mortgage was originated by an OCC regulated lender. APL is a time varying indicator variable for whether the state in which the loan was originated had an APL law in place at time of origination. Post is an indicator variable equal to 1 for months after January 2004. Asterisks denote significance levels (\*\*\*=1%, \*\*=5%, \*=10%).

|              | (1)<br><i>Prepay Pen</i> | (2)<br><i>Term Length</i> | (3)<br><i>ARM</i> | (4)<br><i>Deferred Amort.</i> | (5)<br><i>IO</i>  |
|--------------|--------------------------|---------------------------|-------------------|-------------------------------|-------------------|
| Post x APL   | 0.180***<br>(0.056)      | 5.646***<br>(1.807)       | -0.006<br>(0.021) | -0.019<br>(0.014)             | 0.025<br>(0.016)  |
| APL          | -0.133***<br>(0.050)     | -3.781**<br>(1.710)       | -0.006<br>(0.018) | -0.005<br>(0.004)             | -0.013<br>(0.013) |
| Observations | 108,592                  | 97,717                    | 108,592           | 108,592                       | 108,592           |
| R-squared    | 0.057                    | 0.074                     | 0.009             | 0.029                         | 0.013             |
| Month FE     | Yes                      | Yes                       | Yes               | Yes                           | Yes               |

**Table 7****Examining the Competition Measure (Fraction OCC in 2003)**

The table reports coefficient estimates of weighted cross-sectional regressions relating the county level covariates to our measure of competition- the fraction OCC lending in each county between, and including, 2001 and 2003 in the ABSNet sample. The dependent variables are as follows. Column 1: Fraction of Subprime is estimated from HMDA as the fraction of originations to borrowers with FICO Score below 680; Column 2: The log of the County Population as at 2003; Column 3: A measure of elasticity of housing supply provided by Saiz (2010); Column 4: Fraction Securitized, estimated by dividing the number of loans in the BlackBox data on private securitizations by the total number of loans for each county in HMDA as at 2003; Column 5: Log of the County's Median Income. "APL in 2004" is equal to 1 if the state has an anti-predatory-lending law in place by 2004 and zero otherwise. High OCC Share is an indicator variable equal to 1 if the county's fraction of lending by OCC lenders was in the top two terciles of the distribution of this measure. All regressions are weighted by the number of loans in ABSNet for each county between 2001 and 2003. Standard errors are clustered at the county level. Asterisks denote significance levels (\*\*=1%, \*\*\*=5%, \*=10%).

|                              | (1)<br><i>Fraction of Subprime</i> | (2)<br><i>Ln(Population)</i> | (3)<br><i>Elasticity</i> | (4)<br><i>Fraction Securitized</i> | (5)<br><i>Ln(Median Income)</i> |
|------------------------------|------------------------------------|------------------------------|--------------------------|------------------------------------|---------------------------------|
| APL in 2004 x High OCC Share | 0.026<br>(0.022)                   | -0.296<br>(0.405)            | -0.326<br>(0.211)        | 0.002<br>(0.024)                   | -0.035<br>(0.044)               |
| APL in 2004                  | -0.009<br>(0.016)                  | 0.743**<br>(0.363)           | 0.040<br>(0.157)         | 0.059***<br>(0.019)                | 0.081**<br>(0.033)              |
| High OCC Share               | -0.014<br>(0.014)                  | -0.744***<br>(0.212)         | 1.033***<br>(0.120)      | -0.038***<br>(0.007)               | -0.024<br>(0.027)               |
| Constant                     | 0.453***<br>(0.012)                | 12.709***<br>(0.190)         | 1.309***<br>(0.078)      | 0.133***<br>(0.007)                | 10.659***<br>(0.022)            |
| Observations                 | 2,665                              | 2,167                        | 768                      | 2,117                              | 2,167                           |
| R-squared                    | 0.005                              | 0.143                        | 0.185                    | 0.156                              | 0.032                           |

**Table 8**

**Competition and Loan Features Unmatched Sample (Non-OCC Lenders)**

The table below reports coefficient estimates of regressions relating the pre-emption of state anti-predatory lending laws for national banks and features of mortgages originated. The sample contains loans originated in states with and without APL laws. We further restrict the sample to loans made by non-OCC lenders. The dependent variables are as follows: Column 1: Indicator variable for whether a mortgage had an interest only feature; Column 2: indicator variable for whether a loan has an ARM feature; Column 3: indicator variable for whether a loan has either negative amortization or a balloon feature; Column 4: length of the prepayment penalty term, with 0 if there is no prepayment penalty; Column 5: an indicator variable for whether the loan has a prepayment penalty. We divide our sample of mortgages into terciles depending on the share of OCC lending in the county of origination between 2001 and 2003 based on the ABSNet Sample. High Share is an indicator variable equal to one if the loan was originated in a county in the top two terciles of the distribution of this measure. APL is a time varying indicator variable for whether the state in which the loan was originated had an APL law in place at time of origination. Post is an indicator variable equal to 1 for months after January 2004. Panel B performs the regression only on the sample of loans with High Share=1. Panel C performs the regression for loans with High Share=0. All columns include the following controls: the LTV ratio at origination, the Log of appraised value at origination, the borrower's FICO score, an indicator for the presence of second liens, a low or no documentation indicator, an indicator for loan purpose (i.e. cash out refinance, rate refinance or other), and an indicator for the presence of PMI. Standard errors are clustered at the county level. Asterisks denote significance levels (\*\*\*=1%, \*\*=5%, \*=10%).

|                                | (1)                | (2)                  | (3)                    | (4)                  | (5)                  |
|--------------------------------|--------------------|----------------------|------------------------|----------------------|----------------------|
|                                | <i>IO</i>          | <i>ARM</i>           | <i>Deferred Amort.</i> | <i>Term Length</i>   | <i>Prepay Pen.</i>   |
| <b>Panel A</b>                 |                    |                      |                        |                      |                      |
| Post x APL x High Share        | 0.043<br>(0.030)   | 0.093***<br>(0.029)  | 0.070***<br>(0.025)    | 0.776<br>(0.662)     | 0.030*<br>(0.018)    |
| APL x High Share               | -0.005<br>(0.022)  | -0.027<br>(0.017)    | -0.023<br>(0.018)      | 0.323<br>(0.644)     | 0.022<br>(0.017)     |
| Post x High Share              | -0.014<br>(0.019)  | -0.040**<br>(0.020)  | -0.041**<br>(0.017)    | -0.181<br>(0.496)    | -0.015<br>(0.015)    |
| Post x APL                     | 0.004<br>(0.023)   | -0.034<br>(0.024)    | -0.007<br>(0.018)      | 0.037<br>(0.485)     | -0.013<br>(0.013)    |
| APL                            | -0.003<br>(0.020)  | -0.014<br>(0.013)    | -0.021<br>(0.016)      | -3.346***<br>(0.556) | -0.118***<br>(0.015) |
| Observations                   | 6,807,318          | 6,807,318            | 6,807,318              | 6,453,551            | 6,807,318            |
| R-squared                      | 0.186              | 0.136                | 0.176                  | 0.142                | 0.144                |
| County FE                      | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Quarter FE                     | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Borrower Controls              | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Mean of Dep Var                | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| <b>Panel B: High OCC Share</b> |                    |                      |                        |                      |                      |
| Post x APL                     | 0.047**<br>(0.020) | 0.059***<br>(0.016)  | 0.063***<br>(0.016)    | 0.829*<br>(0.448)    | 0.018<br>(0.011)     |
| APL                            | -0.009<br>(0.009)  | -0.041***<br>(0.010) | -0.044***<br>(0.008)   | -3.051***<br>(0.317) | -0.097***<br>(0.008) |
| Post                           | 0.019<br>(0.013)   | 0.014<br>(0.013)     | -0.028**<br>(0.013)    | 0.692**<br>(0.341)   | 0.004<br>(0.011)     |
| Observations                   | 4,485,174          | 4,485,174            | 4,485,174              | 4,247,944            | 4,485,174            |
| R-squared                      | 0.194              | 0.141                | 0.178                  | 0.132                | 0.139                |
| County FE                      | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Quarter FE                     | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Borrower Controls              | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Mean of Dep Var                | 0.188              | 0.661                | 0.127                  | 10.23                | 0.375                |
| <b>Panel C: Low OCC Share</b>  |                    |                      |                        |                      |                      |
| Post x APL                     | 0.004<br>(0.023)   | -0.034<br>(0.024)    | -0.007<br>(0.018)      | 0.023<br>(0.484)     | -0.013<br>(0.013)    |
| APL                            | -0.003<br>(0.020)  | -0.015<br>(0.013)    | -0.022<br>(0.016)      | -3.365***<br>(0.549) | -0.119***<br>(0.014) |
| Post                           | 0.033**<br>(0.014) | 0.055***<br>(0.015)  | 0.014<br>(0.012)       | 0.901**<br>(0.366)   | 0.019*<br>(0.010)    |
| Observations                   | 2,322,143          | 2,322,143            | 2,322,143              | 2,205,606            | 2,322,143            |
| R-squared                      | 0.169              | 0.126                | 0.173                  | 0.161                | 0.154                |
| County FE                      | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Quarter FE                     | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Borrower Controls              | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Mean of Dep Var                | 0.162              | 0.679                | 0.120                  | 9.327                | 0.351                |

**Table 9****Competition and Mortgage Delinquency Unmatched Sample**

The table below reports coefficient estimates of regressions relating the pre-emption of state anti-predatory lending laws for national banks and the probability of serious delinquency. The sample contains loans originated in states with and without APL laws. We further restrict the sample to loans made by non-OCC regulated lenders. The dependent variable in each regression is an indicator variable equal to one if the mortgage became 90+ days delinquent at any point in its history prior to December 2009. We divide our sample of mortgages into terciles depending on the share of OCC lending in the county of origination between 2001 and 2003 based on the ABSNet Sample. High Share is an indicator variable equal to one if the loan was originated in a county in the top two terciles of the distribution of this measure. APL is a time varying indicator variable for whether the state in which the loan was originated had an APL law in place at time of origination. Post is an indicator variable equal to 1 for months after January 2004. In Panel B, Complex is an indicator variable for whether the mortgage has an IO or Deferred Amortization feature. Column (1) considers the sample of loans in the lowest tercile of the Fraction of OCC lending measure. Column (2) considers the sample of loans in the highest two terciles. All columns include the following controls: updated LTV as at December 2009 (we estimate a new LTV based on an updated property value using a zip code level House Price Index, and under the assumption that the loan survived until December 2009), the Log of appraised value at origination, the borrower's FICO score, an indicator for the presence of second liens, a low or no documentation indicator, an indicator for loan purpose (i.e. cash out refinance, rate refinance or other), and an indicator for the presence of PMI. Standard errors are clustered at the county level Asterisks denote significance levels (\*\*\*=1%, \*\*=5%, \*=10%).

|                      | <i>Non-OCC Sample</i> |                      |
|----------------------|-----------------------|----------------------|
|                      | (1)                   | (2)                  |
|                      | Low Share             | High Share           |
| Complex x APL x Post | 0.034<br>(0.025)      | 0.050***<br>(0.017)  |
| Complex x APL        | -0.030**<br>(0.014)   | -0.038***<br>(0.010) |
| Complex x Post       | 0.008<br>(0.012)      | 0.017<br>(0.011)     |
| Post x APL           | 0.017<br>(0.014)      | 0.019**<br>(0.007)   |
| APL                  | -0.006<br>(0.012)     | -0.014**<br>(0.007)  |
| Complex              | 0.027***<br>(0.006)   | 0.020***<br>(0.005)  |
| Observations         | 1,868,358             | 3,528,219            |
| R-Square             | 0.171                 | 0.165                |
| County FE            | Yes                   | Yes                  |
| Quarter FE           | Yes                   | Yes                  |
| Borrower Controls    | Yes                   | Yes                  |
| Mean of Dep Var      | 0.289                 | 0.265                |

**Table 10A****Competition and Loan Features Matched Sample (Non-OCC Lenders)**

The table below reports coefficient estimates of weighted regressions relating the pre-emption of state anti-predatory lending laws for national banks and features of mortgages originated. The sample contains loans originated in states with and without APL laws. We match counties without APL laws to counties with APL laws using a propensity score matching procedure. We match counties based on key observables such as unemployment rate, fraction subprime, median income, average debt to income, home ownership rate and college and high school graduation rate. We further restrict the sample to loans made by non-OCC lenders. The dependent variables are as follows: Column 1: Indicator variable for whether a mortgage had an interest only feature; Column 2: indicator variable for whether a loan has an ARM feature; Column3: indicator variable for whether a loan has either negative amortization or a balloon feature; Column 4: length of the prepayment penalty term, with 0 if there is no prepayment penalty; Column 5: an indicator variable for whether the loan has a prepayment penalty. We divide our sample of mortgages into terciles depending on the share of OCC lending in the county of origination between 2001 and 2003 based on the ABSNet Sample. High Share is an indicator variable equal to one if the loan was originated in a county in the top two terciles of the distribution of this measure. APL is a time varying indicator variable for whether the state in which the loan was originated had an APL law in place at time of origination. Post is an indicator variable equal to 1 for months after January 2004. Panel B performs the regression only on the sample of loans with High Share=1. Panel C performs the regression for loans with High Share=0. All columns include the following controls: the LTV ratio at origination, the Log of appraised value at origination, the borrower's FICO score, an indicator for the presence of second liens, a low or no documentation indicator, an indicator for loan purpose (i.e. cash out refinance, rate refinance or other), and an indicator for the presence of PMI. Standard errors are clustered at the county level. Asterisks denote significance levels (\*\*\*=1%, \*\*=5%, \*=10%).

|  | (1)                | (2)                  | (3)                    | (4)                  | (5)                  |
|--|--------------------|----------------------|------------------------|----------------------|----------------------|
|  | <i>IO</i>          | <i>ARM</i>           | <i>Deferred Amort.</i> | <i>Term Length</i>   | <i>Prepay Pen.</i>   |
| <b><u>Panel A: High OCC Share Matched Sample</u></b> |                    |                      |                        |                      |                      |
| Post x APL   | 0.045**<br>(0.021) | 0.055***<br>(0.017)  | 0.061***<br>(0.017)    | 0.752<br>(0.458)     | 0.016<br>(0.012)     |
| APL  | 0.003<br>(0.010)   | -0.027***<br>(0.010) | -0.034***<br>(0.009)   | -2.991***<br>(0.323) | -0.097***<br>(0.009) |
| Observations   | 4,387,591          | 4,387,591            | 4,387,591              | 4,155,783            | 4,387,591            |
| R-squared  | 0.192              | 0.166                | 0.185                  | 0.134                | 0.145                |
| County FE  | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Quarter FE   | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Borrower Controls                                    | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Mean of Dep Var                                      | 0.192              | 0.664                | 0.129                  | 9.887                | 0.365                |
| <b><u>Panel B: Low OCC Share Matched Sample</u></b>  |                    |                      |                        |                      |                      |
| Post x APL   | 0.003<br>(0.023)   | -0.036<br>(0.025)    | -0.009<br>(0.018)      | -0.064<br>(0.477)    | -0.017<br>(0.013)    |
| APL  | -0.003<br>(0.020)  | -0.017<br>(0.014)    | -0.021<br>(0.016)      | -3.404***<br>(0.555) | -0.120***<br>(0.015) |
| Observations   | 2,309,470          | 2,309,470            | 2,309,470              | 2,193,608            | 2,309,470            |
| R-squared  | 0.169              | 0.151                | 0.175                  | 0.165                | 0.158                |
| County FE  | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Quarter FE   | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Borrower Controls                                    | Yes                | Yes                  | Yes                    | Yes                  | Yes                  |
| Mean of Dep Var                                      | 0.162              | 0.680                | 0.120                  | 8.975                | 0.341                |

**Table 10B****Competition and Mortgage Delinquency Matched Sample (Non-OCC Lenders)**

The table below reports coefficient estimates of regressions relating the pre-emption of state anti-predatory lending laws for national banks and the probability of serious delinquency. The sample contains loans originated in states with and without APL laws. We further restrict the sample to loans made by non-OCC lenders. We match counties without APL laws to counties with APL laws using a propensity score matching procedure. We match counties based on key observables such as unemployment rate, fraction subprime, median income, average debt to income, home ownership rate and college and high school graduation rate. We further restrict the sample to loans made by non-OCC regulated lenders. The dependent variable in each regression is an indicator variable equal to one if the mortgage became 90+ days delinquent at any point in its history prior to December 2009. We divide our sample of mortgages into terciles depending on the share of OCC lending in the county of origination between 2001 and 2003 based on the ABSNet Sample. High Share is an indicator variable equal to one if the loan was originated in a county in the top two terciles of the distribution of this measure. APL is a time varying indicator variable for whether the state in which the loan was originated had an APL law in place at time of origination. Post is an indicator variable equal to 1 for months after January 2004. In Panel B, Complex is an indicator variable for whether the mortgage has an IO or Deferred Amortization feature. Column (1) considers the sample of loans in the lowest tercile of the Fraction of OCC lending measure. Column (2) considers the sample of loans in the highest two terciles. All columns include the following controls: updated LTV as at December 2009 (we estimate a new LTV based on an updated property value using a zip code level House Price Index, and under the assumption that the loan survived until December 2009), the Log of appraised value at origination, the borrower's FICO score, an indicator for the presence of second liens, a low or no documentation indicator, an indicator for loan purpose (i.e. cash out refinance, rate refinance or other), and an indicator for the presence of PMI. In Panel B we compute for each zip code the house price change between 2006 and 2008 and we divide zip codes in deciles of house price movements. In Column 1 we control for zip code bucket interacted with quarter fixed effects. In Column 2, we differentiate among different type of mortgages based on the buckets of FICO score, LTV, loan type and size and allow for heterogeneous trends for these different loan groups within zip codes. Standard errors are clustered at the county level. Asterisks denote significance levels (\*\*=1%, \*\*\*=5%, \*=10%).

*Panel A*

|                      | <i>Non-OCC Sample</i>   |                          |
|----------------------|-------------------------|--------------------------|
|                      | (1)<br><i>Low Share</i> | (2)<br><i>High Share</i> |
| Complex x APL x Post | 0.037<br>(0.026)        | 0.053***<br>(0.018)      |
| Complex x APL        | -0.031**<br>(0.015)     | -0.037***<br>(0.009)     |
| Complex x Post       | 0.006<br>(0.013)        | 0.011<br>(0.013)         |
| Post x APL           | 0.015<br>(0.014)        | 0.017**<br>(0.007)       |
| APL                  | -0.007<br>(0.012)       | -0.009<br>(0.007)        |
| Complex              | 0.026***<br>(0.006)     | 0.021***<br>(0.005)      |
| Observations         | 1,864,736               | 3,460,002                |
| R-Square             | 0.169                   | 0.162                    |
| County FE            | Yes                     | Yes                      |
| Quarter FE           | Yes                     | Yes                      |
| Borrower Controls    | Yes                     | Yes                      |
| Mean of Dep Var      | 0.288                   | 0.264                    |

*Panel B*

|                                   | (1)<br><i>90+ Days<br/>High Share</i> | (2)<br><i>90+ Days<br/>High Share</i> |
|-----------------------------------|---------------------------------------|---------------------------------------|
| Complex x APL x Post              | 0.048***<br>(0.012)                   | 0.031***<br>(0.010)                   |
| Complex                           | 0.018***<br>(0.005)                   | 0.016***<br>(0.005)                   |
| Observations                      | 3,525,504                             | 3,525,504                             |
| R-Square                          | 0.165                                 | 0.208                                 |
| Zip Code Group by Quarter FE      | Yes                                   | No                                    |
| Zip Code-Loan Group by Quarter FE | No                                    | Yes                                   |
| Borrower Controls                 | Yes                                   | Yes                                   |

**Table 11****Increase in Private Securitization by OCC Lenders**

The model estimates the effect of the pre-emption on the probability that an originated loan was sold to an entity other than the GSEs. The regression sample is conventional originated (HMDA action code=1) loans in HMDA between and including 2001 to 2006. Columns 1 and 2 consider a the subset of loans originated in those states that had APL laws in place by year 2004. The dependent variable is an indicator variable equal to one if the loan is recorded as being sold to an entity other than a GSE (HMDA purchase code>4). OCC is an indicator variable equal to 1 whenever the lender in HMDA is regulated by the OCC. APL is an indicator for whether the state in which the loan was originated had an APL in place at the year of origination. Post is an indicator variable equal to 1 for all years 2004 and beyond. Control variables include dummy variables for race, occupancy status, loan purpose and property type. Standard errors are clustered at the county level. Asterisks denote significance levels (\*\*\*=1%, \*\*=5%, \*=10%).

|                   | (1)                  | (2)                  | (3)                  | (3)                  |
|-------------------|----------------------|----------------------|----------------------|----------------------|
|                   | <i>DD</i>            | <i>DD</i>            | <i>DDD</i>           | <i>DDD</i>           |
| OCC x Post x APL  |                      |                      | 0.051***<br>(0.007)  | 0.057***<br>(0.007)  |
| OCC x Post        | 0.055***<br>(0.006)  | 0.018**<br>(0.008)   | 0.014***<br>(0.004)  | -0.011*<br>(0.006)   |
| OCC x APL         | -0.064***<br>(0.006) | -0.102***<br>(0.009) | -0.060***<br>(0.006) | -0.058***<br>(0.007) |
| OCC               |                      |                      | -0.215***<br>(0.005) | -0.218***<br>(0.004) |
| Observations      | 36,055,095           | 36,055,095           | 76,376,527           | 76,376,527           |
| R-squared         | 0.131                | 0.234                | 0.129                | 0.228                |
| County by Year FE | Yes                  | Yes                  | Yes                  | Yes                  |
| Agency Trends     | No                   | Yes                  | No                   | Yes                  |
| Borrower Controls | Yes                  | Yes                  | Yes                  | Yes                  |
| Mean of Dep Var   | 0.416                | 0.416                | 0.387                | 0.387                |



**Table 12****Increase in Private Securitization by OCC Lenders**

The model estimates the effect of the pre-emption on the probability that an originated loan was sold to an entity other than the GSEs. The regression sample is conventional originated (HMDA action code=1) loans in HMDA between and including 2001 to 2006. The sample only includes loans in states that had APL laws in place by 2004. The dependent variable is an indicator variable equal to one if the loan is recorded as being sold to an entity other than a GSE (HMDA purchase code>4). High DTI is an indicator variable equal to one if the borrower's DTI ratio is in the top tercile of the distribution. OCC is an indicator variable equal to 1 whenever the lender in HMDA is regulated by the OCC. APL is an indicator for whether the state in which the loan was originated had an APL in place at the year of origination. Post is an indicator variable equal to 1 for all years 2004 and beyond. Control variables include dummy variables for race, occupancy status, loan purpose and property type. Standard errors are clustered at the county level. Asterisks denote significance levels (\*\*=1%, \*\*\*=5%, \*=10%).

|                       | (1)<br><i>DD</i>     | (2)<br><i>DD</i>     |
|-----------------------|----------------------|----------------------|
| OCC x Post x High DTI | 0.051***<br>(0.005)  | 0.057***<br>(0.006)  |
| OCC x Post            | 0.039***<br>(0.006)  | -0.001<br>(0.008)    |
| OCC x APL x High DTI  | -0.041***<br>(0.007) | -0.050***<br>(0.007) |
| OCC x APL             | -0.045***<br>(0.005) | -0.079***<br>(0.007) |
| OCC x High DTI        | -0.017***<br>(0.006) | 0.008**<br>(0.004)   |
| OCC                   | -0.208***<br>(0.005) | -0.461***<br>(0.010) |
| APL x High DTI        | 0.038***<br>(0.002)  | 0.037***<br>(0.003)  |
| Post x High DTI       | -0.014***<br>(0.003) | -0.014***<br>(0.004) |
| High DTI              | 0.019***<br>(0.003)  | 0.005**<br>(0.002)   |
| Observations          | 38,042,779           | 38,042,779           |
| R-squared             | 0.145                | 0.245                |
| County by Year FE     | Yes                  | Yes                  |
| Agency Trends         | No                   | Yes                  |
| Borrower Controls     | Yes                  | Yes                  |
| Mean of Dep Var       | 0.404                | 0.404                |

**Table 13****Interest Rates and Prepayment Penalties**

The model estimates the effect of the pre-emption on the interest rate of the loans originated by OCC that feature prepayment penalties. The sample contains loans made in those states that implemented APL laws before February 2004 as collected by ABSnet. The dependent variable is the interest rate at origination. Prepayment Penalties is an indicator variable equal to one if the mortgage exhibits these penalties. OCC is an indicator variable equal to 1 whenever the lender in HMDA is regulated by the OCC. APL is an indicator for whether the state in which the loan was originated had an APL in place at the year of origination. Post is an indicator variable equal to 1 for all years 2004 and beyond. Control variables include dummy variables for LTV, loan size, PMI, occupancy status, loan purpose, presence of second liens, documentation level and property type. Standard errors are clustered at the county level. We also include the interaction between these variables and the loan types. Asterisks denote significance levels (\*\*\*=1%, \*\*=5%, \*=10%).

|                                   | (1)                   | (2)                   |
|-----------------------------------|-----------------------|-----------------------|
| OCC x Post x Prepayment Penalties | -0.230***<br>(0.0380) | -0.257***<br>(0.0449) |
| OCC x Prepayment Penalties        | 0.607***<br>(0.0365)  | 0.555***<br>(0.0316)  |
| Post x Prepayment Penalties       | 0.0108<br>(0.0176)    | -0.00938<br>(0.0191)  |
| APL x Prepayment Penalties        | -0.00998<br>(0.0200)  | -0.0476**<br>(0.0203) |
| Prepayment Penalties              | 0.0153<br>(0.0225)    | -0.00407<br>(0.0183)  |
| OCC x Post                        | 0.122***<br>(0.0405)  | 0.0897***<br>(0.0337) |
| OCC                               | -0.358***<br>(0.0546) | -0.301***<br>(0.0518) |
| OCC x APL                         | -0.130***<br>(0.0482) | -0.0800<br>(0.0506)   |
| County by Year by Loan Type FE    | Yes                   | Yes                   |
| Agency Trends                     | Yes                   | Yes                   |
| Borrower Controls                 | No                    | Yes                   |
| Observations                      | 4,123,638             | 3,972,676             |
| R-squared                         | 0.665                 | 0.724                 |

**Table A1****Examining the Competition Measure (HHI based on Deposits 2003)**

The table reports coefficient estimates of weighted cross-sectional regressions relating the county level covariates to our measure of competition- a Herfindahl Hirschman Index at the county level based on the Summary of Deposits from the FDIC. The dependent variables are as follows. Column 1: Fraction of Subprime is estimated from HMDA as the fraction of originations to borrowers with FICO Score below 680; Column 2: The log of the County Population as at 2003; Column 3: A measure of elasticity of housing supply provided by Saiz (2010); Column 4: Fraction Securitized, estimated by dividing the number of loans in the BlackBox data on private securitizations by the total number of loans for each county in HMDA as at 2003; Column 5: Log of the County's Median Income. "APL in 2004" is equal to 1 if the state has an anti-predatory-lending law in place by 2004 and zero otherwise. Low HHI Share is an indicator variable equal to 1 if the county's HHI index was in the bottom two terciles of this measure (i.e. in less concentrated, more competitive areas). The regressions are weighted by county population as of 2003. Standard errors are clustered at the county level. Asterisks denote significance levels (\*\*=1%, \*\*\*=5%, \*=10%).

|                       | (1)<br><i>Fraction of Subprime</i> | (2)<br><i>Ln(Population)</i> | (3)<br><i>Elasticity</i> | (4)<br><i>Fraction Securitized</i> | (5)<br><i>Ln(Median Income)</i> |
|-----------------------|------------------------------------|------------------------------|--------------------------|------------------------------------|---------------------------------|
| APL in 2004 x Low HHI | -0.010<br>(0.019)                  | 0.354<br>(0.580)             | -1.205*<br>(0.621)       | 0.061***<br>(0.021)                | 0.064<br>(0.064)                |
| APL in 2004           | 0.024<br>(0.016)                   | 0.351<br>(0.527)             | 0.939<br>(0.605)         | 0.006<br>(0.016)                   | 0.005<br>(0.061)                |
| Low HHI               | -0.047***<br>(0.013)               | 1.635***<br>(0.382)          | -0.131<br>(0.508)        | 0.002<br>(0.011)                   | 0.114**<br>(0.045)              |
| Constant              | 0.486***<br>(0.011)                | 10.712***<br>(0.366)         | 2.016***<br>(0.502)      | 0.108***<br>(0.010)                | 10.535***<br>(0.043)            |
| Observations          | 2,217                              | 2,217                        | 769                      | 2,160                              | 2,217                           |
| R-squared             | 0.018                              | 0.116                        | 0.034                    | 0.126                              | 0.039                           |

**Table A2**

**HHI Measure and Loan Features (Non-OCC Lenders)**

The table below reports coefficient estimates regressions relating the pre-emption of state anti-predatory lending laws for national banks and features of mortgages originated. The sample contains loans originated in states with and without APL laws. We further restrict the sample to loans made by non-OCC lenders. For panels B and C, we match counties without APL laws to counties with APL laws using a propensity score matching procedure. We match counties based on key observables such as unemployment rate, fraction subprime, median income, average debt to income, home ownership rate and college and high school graduation rate. The dependent variables are as follows: Column 1: Indicator variable for whether a mortgage had an interest only feature; Column 2: indicator variable for whether a loan has an ARM feature; Column3: indicator variable for whether a loan has either negative amortization or a balloon feature; Column 4: length of the prepayment penalty term, with 0 if there is no prepayment penalty; Column 5: an indicator variable for whether the loan has a prepayment penalty. We divide our sample of mortgages into terciles depending on the county HHI measure based on the summary of deposits from the FDIC. Low HHI is an indicator variable equal to one if the loan was originated in a county in the bottom two terciles of the distribution of this measure. APL is a time varying indicator variable for whether the state in which the loan was originated had an APL law in place at time of origination. Post is an indicator variable equal to 1 for months after January 2004. Panel B performs the regression only on the sample of loans with Low HHI=1. Panel C performs the regression for loans with Low HHI=0. All columns include the following controls: the LTV ratio at origination, the Log of appraised value at origination, the borrower's FICO score, an indicator for the presence of second liens, a low or no documentation indicator, an indicator for loan purpose (i.e. cash out refinance, rate refinance or other), and an indicator for the presence of PMI. Standard errors are clustered at the county level. Asterisks denote significance levels (\*\*\*=1%, \*\*=5%, \*=10%).

|   | (1)                 | (2)                  | (3)                    | (4)                  | (5)                  |
|---|---------------------|----------------------|------------------------|----------------------|----------------------|
|   | <i>IO</i>           | <i>ARM</i>           | <i>Deferred Amort.</i> | <i>Term Length</i>   | <i>Prepay Pen.</i>   |
| <b>Panel A: Triple Difference in Difference</b> |                     |                      |                        |                      |                      |
| Post x APL x Low HHI                            | 0.076***<br>(0.029) | 0.052**<br>(0.022)   | 0.065***<br>(0.020)    | 1.406***<br>(0.532)  | 0.028*<br>(0.016)    |
| APL x Low HHI                                   | -0.020<br>(0.018)   | -0.054***<br>(0.013) | -0.051***<br>(0.015)   | -0.870<br>(0.566)    | -0.044**<br>(0.018)  |
| Post x Low HHI                                  | -0.028*<br>(0.016)  | -0.032**<br>(0.016)  | -0.049***<br>(0.014)   | -1.164***<br>(0.393) | -0.033***<br>(0.012) |
| Post x APL                                      | -0.021<br>(0.025)   | -0.013<br>(0.013)    | -0.009<br>(0.014)      | -0.428<br>(0.336)    | -0.013<br>(0.011)    |
| Post  | 0.040***<br>(0.010) | 0.048***<br>(0.007)  | 0.018***<br>(0.006)    | 1.483***<br>(0.174)  | 0.030***<br>(0.006)  |
| APL   | 0.000<br>(0.013)    | -0.000<br>(0.008)    | -0.005<br>(0.009)      | -2.696***<br>(0.356) | -0.078***<br>(0.013) |
| Observations                                    | 6,819,594           | 6,819,594            | 6,819,594              | 6,465,449            | 6,819,594            |
| R-squared                                       | 0.187               | 0.137                | 0.179                  | 0.142                | 0.144                |
| County FE                                       | Yes                 | Yes                  | Yes                    | Yes                  | Yes                  |
| Quarter FE                                      | Yes                 | Yes                  | Yes                    | Yes                  | Yes                  |
| Borrower Controls                               | Yes                 | Yes                  | Yes                    | Yes                  | Yes                  |
| Mean of Dep Var                                 | 0.179               | 0.667                | 0.124                  | 9.923                | 0.367                |
| <b>Panel B: Low HHI (High Competition)</b>      |                     |                      |                        |                      |                      |
| Post x APL                                      | 0.052***<br>(0.020) | 0.035<br>(0.023)     | 0.054***<br>(0.016)    | 0.890**<br>(0.445)   | 0.012<br>(0.013)     |
| APL   | -0.022<br>(0.015)   | -0.051***<br>(0.013) | -0.053***<br>(0.013)   | -3.532***<br>(0.490) | -0.121***<br>(0.013) |
| Post  | 0.006<br>(0.018)    | 0.014<br>(0.020)     | -0.037**<br>(0.015)    | 0.054<br>(0.413)     | -0.009<br>(0.014)    |
| Observations                                    | 4,506,007           | 4,506,007            | 4,506,007              | 4,255,356            | 4,506,007            |
| R-squared                                       | 0.182               | 0.133                | 0.198                  | 0.148                | 0.151                |
| County FE                                       | Yes                 | Yes                  | Yes                    | Yes                  | Yes                  |
| Quarter FE                                      | Yes                 | Yes                  | Yes                    | Yes                  | Yes                  |
| Borrower Controls                               | Yes                 | Yes                  | Yes                    | Yes                  | Yes                  |
| Mean of Dep Var                                 | 0.207               | 0.686                | 0.147                  | 9.282                | 0.355                |
| <b>Panel C: High HHI (Low Competition)</b>      |                     |                      |                        |                      |                      |
| Post x APL                                      | -0.018<br>(0.027)   | -0.011<br>(0.013)    | -0.009<br>(0.015)      | -0.359<br>(0.354)    | -0.012<br>(0.011)    |
| APL   | 0.005<br>(0.015)    | -0.001<br>(0.008)    | -0.004<br>(0.010)      | -2.806***<br>(0.358) | -0.081***<br>(0.014) |
| Post  | 0.041***<br>(0.012) | 0.047***<br>(0.008)  | 0.019***<br>(0.007)    | 1.460***<br>(0.196)  | 0.031***<br>(0.007)  |
| Observations                                    | 2,145,116           | 2,145,116            | 2,145,116              | 2,050,725            | 2,145,116            |
| R-squared                                       | 0.187               | 0.150                | 0.131                  | 0.138                | 0.141                |
| County FE                                       | Yes                 | Yes                  | Yes                    | Yes                  | Yes                  |
| Quarter FE                                      | Yes                 | Yes                  | Yes                    | Yes                  | Yes                  |
| Borrower Controls                               | Yes                 | Yes                  | Yes                    | Yes                  | Yes                  |
| Mean of Dep Var                                 | 0.138               | 0.639                | 0.0887                 | 10.07                | 0.361                |

**Table A3****HHI and Mortgage Delinquency (Non-OCC Lenders)**

The table below reports coefficient estimates of regressions relating the pre-emption of state anti-predatory lending laws for national banks and the probability of serious delinquency. The sample contains loans originated in states with and without APL laws. We further restrict the sample to loans made by non-OCC lenders. For panels B and C, we match counties without APL laws to counties with APL laws using a propensity score matching procedure. We match counties based on key observables such as unemployment rate, fraction subprime, median income, average debt to income, home ownership rate and college and high school graduation rate. The dependent variable in each regression is an indicator variable equal to one if the mortgage became 90+ days delinquent at any point in its history prior to December 2009. We divide our sample of mortgages into terciles depending on the county HHI measure based on the summary of deposits from the FDIC. Low HHI is an indicator variable equal to one if the loan was originated in a county in the bottom two terciles of the distribution of this measure. APL is a time varying indicator variable for whether the state in which the loan was originated had an APL law in place at time of origination. Post is an indicator variable equal to 1 for months after January 2004. In Panel B, Complex is an indicator variable for whether the mortgage has an IO or Deferred Amortization feature. Column (1) considers the sample of loans in the highest tercile (least competitive) of the HHI measure. Column (2) considers the sample of loans in the bottom two terciles. All columns include the following controls updated LTV as at December 2009 (we estimate a new LTV based on an updated property value using a zip code level House Price Index, and under the assumption that the loan survived until December 2009), the Log of appraised value at origination, the borrower's FICO score, an indicator for the presence of second liens, a low or no documentation indicator, an indicator for loan purpose (i.e. cash out refinance, rate refinance or other), and an indicator for the presence of PMI. Standard errors are clustered at the county level. Asterisks denote significance levels (\*\*\*=1%, \*\*=5%, \*=10%).

|                      | <i>Non-OCC Sample</i>  |                       |
|----------------------|------------------------|-----------------------|
|                      | (1)<br><i>High HHI</i> | (2)<br><i>Low HHI</i> |
| Complex x APL x Post | -0.001<br>(0.025)      | 0.053***<br>(0.017)   |
| Complex x APL        | 0.005<br>(0.013)       | -0.046***<br>(0.008)  |
| Complex x Post       | 0.013<br>(0.010)       | 0.010<br>(0.014)      |
| Post x APL           | 0.027*<br>(0.014)      | 0.009<br>(0.007)      |
| APL                  | 0.010<br>(0.014)       | -0.004<br>(0.006)     |
| Complex              | 0.020***<br>(0.007)    | 0.024***<br>(0.005)   |
| Observations         | 3,822,657              | 1,452,885             |
| R-Square             | 0.185                  | 0.132                 |
| County FE            | Yes                    | Yes                   |
| Quarter FE           | Yes                    | Yes                   |
| Borrower Controls    | Yes                    | Yes                   |
| Mean of Dep Var      | 0.266                  | 0.283                 |