US Mortgage Regulation and Market Structure*

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Abstract

I study the impact of state anti-predatory lending (APL) laws on the expansion of riskier loans. Banks were supplying low quality mortgages to risky borrowers via predatory practices, such as refinancing with higher fees, lending without regard for the ability to repay and inflating property values above the market price. In response to predatory lending practices, states began implementing APL laws between 1999 to 2006. However, this legislation was partially offset when the Office of the Comptroller Currency (OCC) exempted national banks from APL laws in 2004. I use the 2004 federal preemption rule, as an exogenous shock to assess the causal impact of APL laws on the mortgage market via national banks. I find that after the federal preemption rule, higher growing national banks increase loan origination by 10% relative to state banks. National banks increase the private share by 1.8% and the growth in marginal GSE by 3% in states with tougher APL laws. State banks that face APL laws charge mortgage rate by 25 bps more relative to national banks. Based on these facts, I develop a structural model of the US banking sector. Borrowers choose between national and state banks. Banks compete for mortgage loans and state banks in APL states charge higher mortgage rate while national banks charge lower rate. I use the model to analyze how mortgage loan originations and the rates differ when (i) all banks face the APL laws (ii) only national banks face the APL laws and (iii) no banks face the APL laws.

Keywords: anti-predatory lending law; mortgage securitization

JEL Codes: G21, G28, K23

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1 Introduction

Banks were engaged in predatory lending practices–refinance with higher fees, inflate property values above the market price, lend without regard for the ability to repay–on subprime mortgage borrowers. Starting 1999, a number of states implemented anti-predatory lending (APL) laws. APL laws restrict banks to prey on low-income and elderly borrowers by requiring verification of borrowers' repayment ability and having limits on fees, rates and prepayment penalties. However, APL laws failed to prevent the subprime mortgage crisis as the Office of the Comptroller Currency exempted national banks from APL laws in 2004.

In this paper, I ask: what are the effects of APL laws on mortgage loan originations and securitization? One of the major difficulties in empirically identifying the effect of deregulation on mortgage loan originations and securitizations is that most federal policy interventions affect all lenders at once. I overcome this problem by using the OCC preemption rule–when the OCC exempted national banks in 2004, while non-OCC lenders (state banks, credit unions, non-depository mortgage companies) are covered by APL laws–as an exogenous shock. The OCC preemption rule targets riskier borrowers and predatory mortgage lending. This preemption rule creates an environment to test the effects of partial deregulation by distinguishing between affected and unaffected lenders, thereby allowing us to evaluate the direct effects of the policy on mortgage originations and securitizations.

My panel dataset merges data at the regulator-metropolitan statistical area (MSA) level from years 2002 to 2006. I use private and marginal GSE loans (loans where credit score is below 620) from the Home Mortgage Disclosure Act (HMDA) and Freddie Mac and Fannie Mae, bank deposit from Summary of Deposits, the passage of APL laws from Ho and Pennington-Cross (2006) and APL laws indices from Bostic, Engel, McCoy, Pennington-Cross, and Wachter (2008).

I use the OCC preemption rule as the credit shock, where national banks are the key drivers in lending to riskier borrowers. I analyze the mortgage market in APL and non-APL states before and after the OCC preemption rule by exploiting heterogenous presence of national banks and regional variation in the strength of APL intensities and APL state adoption. This approach controls for national trends affecting OCC lenders and sorting by banks across states in response to prior APL laws. I find that after the preemption rule, higher growing national banks increase loan origination by 10% relative to non-OCC lenders. National banks increase the private share by 1.8% and the growth in marginal GSE by 3% in states with tougher APL laws.

Outline The outline of the rest of the paper is as follows. Section 2 describes state anti-predatory lending laws and discusses the literature. Section 3 describes the market structure. Section 4 discusses the data sources and Section 5 illustrates empirical methodology and reports results. Section 6 concludes. List of tables and figures is shown in Appendix.

2 Background

2.1 State Anti-predatory Lending Laws

In 1994, the U.S. Congress enacted an anti-predatory lending statute, the Home Ownership Equity Protection Act (HOEPA). Predatory lending involves practices such as charging borrowers high fees, arranging borrowers to refinance where they would pay a higher amount in later years, making a loan without considering the borrower's paying ability or adding subprime prepayment penalties that increase the risk of foreclosure (Ding, Quercia, Reid, and White, 2012). HOEPA applies to all residential mortgage lenders and brokers. It regulates high-cost loans based on annual percentage rate or when total points and fees exceed eight percent of the total loan amount or $400 whichever is greater. It covers less than five percent of subprime residential mortgages and imposes a number of restrictions within these loans. However, lenders learned to avoid the high-cost loan provisions easily.

As a result, many states implemented their own APL laws based on HOEPA. Implementation and regulation of APL laws vary across states, time, and intensities. By January 1, 2007 only six states did not legislate any APL laws. APL laws target high-cost loans; according to HMDA, 37.4% of all loans were high cost loans in 2004, 35.8% in 2005 and 40.9% in 2006. In 2004, the OCC exempted national banks from APL laws. Since the OCC depends on fees from their regulated entities, it was aware that if it did not grant preemption to national banks then they would switch their charter from the OCC to the Office of Thrift Supervision. The Office of Thrift Supervision preempted thrift institutions from APL laws in 1996. Thus, only state-chartered depository institutions and independent mortgage lenders (non-OCC lenders) are regulated by state APL laws.

2.2 Related Literature

When North Carolina implemented the first new APL law in 1999, a literature soon emerged analyzing the impact of APL laws on mortgage loan applications, originations and rejections.[1] This literature studies whether APL laws were effective in restraining risky mortgage lending. It uses the HMDA dataset and estimates the effect of APL passage laws on mortgage loan applications, originations and rejections by using probit, logit and differences-in-differences methodologies at the state level. It finds decrease in loan originations and rejections, but mixed results on loan applications.

The following papers contribute to this literature by creating indices that measure the strength of APL laws. Ho and Pennington-Cross (2006) created APL laws indices in terms of coverage and restriction, while Bostic et al. (2008) updated the index with enforcement mechanism. However, they find different results. In states with broader APL *coverage* of loans, Ho and Pennington-Cross (2006) find that borrowers apply more for loans and banks originate more loans with no change in loan rejection. On the contrary, borrowers apply less for loans and banks reject less often in Bostic et al. (2008)'s results. In states with stricter APL *restrictions* rules, both of them find that banks originate fewer loans, but find different results for loan rejections.

There is still no consensus on the impact of APL laws on the mortgage market, partly due to the use of different measures and methodologies. The papers cited above focus on loan originations, but it is vital to understand that APL laws target high-cost loans, which have interest rates three or more percentage points higher than the Treasury rate. Since APL laws target riskier loans, looking at overall loan originations may miss the true effects. According to Loan Performance, 51% of all loans were subprime loans by 2002 (Quercia et al., 2003) and Federal Reserve report that 25% of all mortgages were subprime loans by 2005 (Avery et al., 2006). Hence, I proxy risky loans with securitization

[1] Bostic et al. (2008), Elliehausen and Staten (2004), Ernst et al. (2002), Harvey and Nigro (2003), Harvey and Nigro (2004), Ho and Pennington-Cross (2005), Ho and Pennington-Cross (2006), Ho and Pennington-Cross (2007), Quercia et al. (2003) and Di Maggio and Kermani (2017).

because financial institutions tend to securitize low quality mortgages. Indeed, Keys et al. (2012) report that the securitization of subprime lending went up from less than 50% in 2001 to over 80% by 2006.

I use triple-difference strategy that is also employed in Di Maggio and Kermani (2017), but this paper differs in both focus and results. Di Maggio and Kermani (2017) focus on loan issuance, housing price, employment in non-tradable sector and loan delinquency from a change to credit supply. They find the OCC preemption rule increases loan issuance by 11% to 15% and 10% increase in loan origination increases house prices by 3.3 percentage point during the boom period and increases employment in non-tradable sectors by 2%.

However, Di Maggio and Kermani (2017) have four limitations. First, they use only passage of APL laws and choose states with APL laws that is built on HOEPA, thus leaving 9 other states with APL laws. I incorporate all states with APL laws and exploit the variation in the strength of APL intensities. Second, they analyze APL adoption dates on home purchase loans. However, APL laws target subprime mortgage market and analyzing the impact of APL laws on securitized and unsecuritized mortgage loans would be a better measure. In addition, they include fraction of subprime borrowers in each county as a control variable, but it is affected by the APL laws thus leading to a simultaneity problem. In my paper, I analyze the effects of APL laws on subprime mortgage loans and total loan originations defined as the sum of securitized and unsecuritized mortgage loans.

Third, they use weighted-least squares regression with weights equal to the population of each county. If APL laws tend to have larger effects in more populous states, then WLS estimation that places greater weight on more populous states will tend to estimate larger effects than OLS does. Using the inverse of population would reflect the information in the observation, because an observation with small error variance has a large weight since it contains relative more information than an observation with large error variance. However, Di Maggio and Kermani (2017) use county population as a weight rather than the inverse of the population. But, both OLS and WLS are inconsistent for the population average effect and neither strictly dominates the other. Thus, I report OLS, OLS with robust standard errors and WLS results in table 5 and compare their standard errors. OLS standard errors are smaller than WLS standard error. Since, the Home Mortgage Disclosure Act is a representative data that is based on the location of the house purchased, there is no need to use WLS.

Fourth, they do not incorporate bank size information. Large lenders such as Wells Fargo, JP Morgan Chase, Bank of America and US Bancorp were heavily involved in high risky lending. I incorporate bank deposit and asset for robustness check to confirm my results. From figure 1, we can see that national banks (OCC lenders) have higher deposit to asset ratio than state banks (non-OCC lenders).

3 Market Structure

To provide the underpinnings for the empirical work, this section reviews how APL laws affect households, lenders and securitizers' decisions. Figure 2 shows the market structure: households purchase mortgage loans either from OCC lenders (national banks) or non-OCC lenders (state banks, credit unions and non-depository mortgage companies) that are regulated by APL laws. Lenders can hold or sell mortgage loans to either government-sponsored enterprise (GSE) or private securitizers.

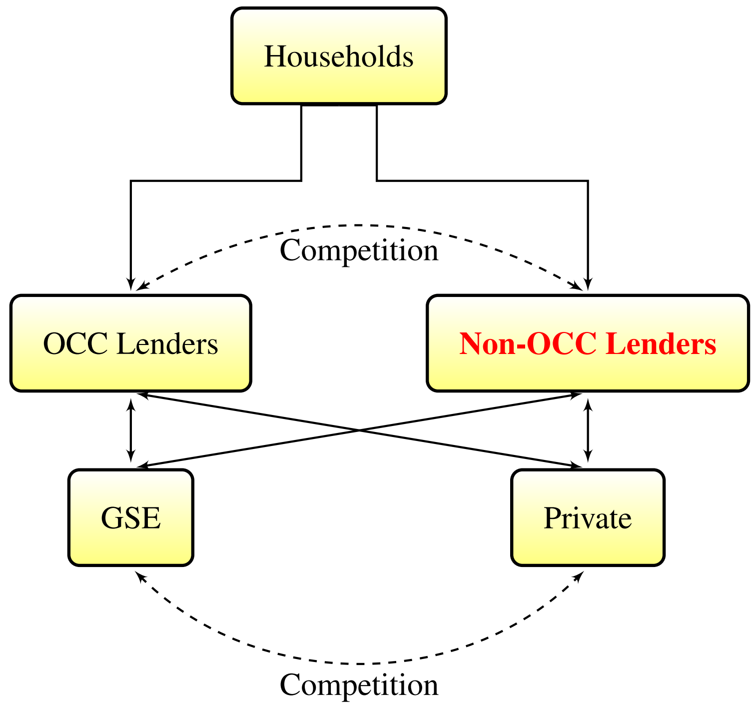


Fig 2. Market Structure. *Notes:* OCC lenders consist of national chartered commercial banks that were exempted from APL laws by regulator, Office of Comptroller Currency (OCC), in 2004, while non-OCC lenders consist of state banks, credit unions and non-depository mortgage companies that are not preempted from APL laws. GSE is a government-sponsored enterprise that composes of Fannie Mae and Freddie Mac. GSE is required to purchase low risky loans, while private securitizers buy riskier loans. GSE securities are insulated from default risk, while private securitizers must price both the risk of default and risk of early prepayment.

Households differ in their search costs. One with lower search cost would shop around and choose any bank that offers the lowest interest rate, while a household with higher search cost would most likely take mortgage loans from a pre-existing relationship through savings or deposit account. APL laws allow households to sort loans from predatory loans. The press, government reports and local nonprofit agencies have informed the public about the presence of predatory lending but regulatory agencies found some evidence that some subprime borrowers, particularly elderly or poorly educated households, were unable to sort predatory loans (Ho and Pennington-Cross, 2006).

3.1 Hypotheses

The type of market structure (i.e., perfect competition or monopoly) financial institutions operate under will determine their mortgage pricing. Non-OCC lenders can transfer the cost imposed by APL laws to borrowers or bear the cost on their own. If they transfer the cost to borrowers, it would be cheaper to purchase from OCC lenders and OCC lenders' loan originations would increase. If non-OCC lenders bear the cost on their own, borrowers are likely to take out loans from non-OCC lenders due to reduced legal uncertainty. It would be ideal for researchers to observe mortgage pricing or interest rates at each lender to confirm the hypothesis. I test this hypothesis by estimating loan origination on APL laws.

Lenders:

- *Transfer the lending cost*: Non-OCC lenders that face APL laws can transfer the cost to borrowers which would increase the price of loans. Thus, borrowers take mortgage loans from OCC lenders.
- *Swallow the lending cost*: Non-OCC lenders can bear the costs imposed by APL laws. Since APL laws reduced legal uncertainty, borrowers are fearless to take loans from non-OCC lenders.

GSE and private securitizers maximize profits for stock holders, but GSE is constrained to purchase good quality loans. Securitizers observe borrower characters before purchasing loans. If GSE concerns about the public then it may prefer lending to less-risky borrowers. If GSE focuses on retaining its market share then GSE would securitize loans to riskier borrowers. Thus, race to the bottom competition happens between GSE and private securitizers. I test this hypothesis by estimating loan securitization on APL laws.

Securitizers:

- *Tiebout sorting*: Securitizers may choose OCC or non-OCC lenders depending on different set of borrowers. Choosing a particular lender would affect securitizer's portfolio. According to the Tiebout model, lenders offer securitizers with different risks in terms of credit score, loan-to-value (LTV) and debt-to-income (DTI). Securitizers choose the package that most closely fits their objectives. For example, if GSE concerns about public it may prefer lenders with less-risky borrowers while private securitizers that want to maximize profits may prefer high-risky borrowers.
- *Race to the bottom*: If GSE solely concentrates on retaining its market share, then GSE and private securitizers will compete for lenders. A race to the bottom competition happens at the expense of the public interest. Banks would take excessive risks by providing low quality loans to riskier borrowers as securitizers buy huge amounts of loans. This is not in the public interest because it increases the risk of bank failures, and hence the expected payments to insured depositors by the FDIC.

4 Data

In this section, I provide an overview of the different datasets used in this paper. Annual panel dataset at the MSA-level is built from a variety of public sources. I use MSA level data because social and economic integration are much more accurate than state-level data. My principal datasets include the Home Mortgage Disclosure Act (HMDA), Fannie Mae, Freddie Mac, the Bureau of Economic Analysis and American Community Survey. I collect house price data from FHFA, population data from Bureau of Economic Analysis, employment rate and income from American Consumer Survey and housing supply elasticity from Saiz (2010). For robustness check, I perform the same exercise by constructing an annual panel dataset at the bank-MSA level. I incorporate bank size information from Statistics on Depository Institutions.

HMDA provides number and volume of loan originations and securitization for banks that are regulated by different agencies in the location of the purchased property. It is a disclosure report that is publicly available and used widely by academic and policy research. A lender does not have to report to HMDA, unless it has an office in a MSA or have less than $30 million in assets. Banks are subject to pecuniary penalties if they do not report. There are two limitations in the HMDA dataset. It does not have any information on borrower characteristics and reportings on rural areas are low. To capture more information on geographic risk, I collapse loans at MSA level. For example, if there are two financial institutions in Abilene, Texas that are regulated by OCC say $3 billion and $6 billion then I say it is $9 billion in Abilene, Texas. The loan amount in HMDA reports the dollar amount granted or requested in thousands. That is, banks report a $95,000 loan as 95 and do not report any loans of less than $500.

From the loan securitization part, GSE is not allowed to purchase risky loans, while private securitizers can buy any loans. In order to retain its market share, GSE competed with private securitizers, which resulted in the deterioration of underwriting standards.To confirm this, I use credit score information from the Fannie Mae and Freddie Mac datasets and construct marginal GSE loans where credit score is below 620. Fannie Mae and Freddie Mac provide information on loan acquisition and origination at the quarterly frequency, respectively.

In this study, I also use two different measures of state APL laws: (i) passage of APL laws from Ho and Pennington-Cross (2005) and (ii) law intensities from Bostic et al. (2008). Bostic et al. (2008) create indices for years from 2004 to 2005 through legal expertise. Legal measures that are equivalent to HOEPA get a score of 0, whereas higher scores indicate heavier regulation. APL laws are measured in terms of *coverage*, *restrictions* and *enforcement* indices. APL indices are standardized.

4.1 Summary Statistics

I concentrate on the period from 2002 to 2006 for symmetrical analysis before and after the 2004 OCC preemption rule. Table 6 reports the percentage of financial institutions from my working sample. Since there is no public data on credit union and non-depository mortgage companies, I only include state-chartered banks that are regulated by Federal Reserve Board and Federal Deposit Insurance Corporation. This leaves me with 45% of non-OCC lenders. OCC lenders compose of less than 10%, while state-chartered banks that are regulated by Federal Deposit Insurance Corporation take larger presence.

Table 7 shows summary statistics of annual growth at bank-MSA level and table 8 reports it at regulatory-MSA level. In the bank-MSA level, OCC lenders have higher growth in private securitization than non-OCC lenders. In the regulator-MSA level, both types of lenders have similar pattern except for private securitization. OCC lenders have positive growth, while non-OCC lenders have negative growth in private securitization.

Table 1: Percentage of Financial Institutions at Bank-MSA Level

Year	**National banks**	**State banks** (45%)	
	OCC	FRB	FDIC
2002	9	15.6	75.4
2003	9.4	15.9	74.8
2004	7	16.2	76.8
2005	7	15	78
2006	7	16.5	76.5

Notes: FRB for Federal Reserve Board and FDIC stands for Federal Deposit Insurance Corporation.

Table 2: Annual Growth at Bank-MSA Level: 2002-2006

			State banks			
Variable	**Mean**	**S. D.**	**P25**	**P50**	**P75**	**Obs**
GSE Secur.	-8.8	27	-25.8	-9.4	2.9	674
Private Secur.	.74	6.1	0	0	0	10
Total Loan Orig.	-4.2	16.6	-14.1	-4.1	4.1	1287
Asset	2.38	4.75	.82	1.87	3.18	1258
Deposit	2.33	4.79	.72	1.74	3.3	1258
			National banks			
Variable	**Mean**	**S. D.**	**P25**	**P50**	**P75**	**Obs**
GSE Secur.	-9.1	27.2	-26.3	-10.5	5.5	49
Private Secur.	4.1	33.1	-26.8	0	39	3
Total Loan Orig.	-3.6	18.8	-14	-5	7.1	104
Asset	2.58	3.78	.76	1.86	3.54	99
Deposit	2.57	3.85	.65	1.97	3.65	99

Table 3: Annual Growth at Regulatory-MSA Level: 2002-2006

	State banks					
Variable	**Mean**	**S. D.**	**P25**	**P50**	**P75**	**Obs**
GSE Secur.	-4.5	27.3	-21.4	-6.9	9.9	683
Private Secur.	-.86	36.5	-43.3	0	31.3	199
Marginal GSE Secur.	1.9	13.9	-6.2	2.8	10.5	908
Total Loan Orig.	-2.6	17.1	-11	-2.1	6.8	754
	National banks					
Variable	**Mean**	**S. D.**	**P25**	**P50**	**P75**	**Obs**
GSE Secur.	-4.7	31.2	-28.4	-4.5	11.4	216
Private Secur.	1.1	37.5	-35.2	0	44.5	44
Marginal GSE Secur.	1.8	13.3	-6.8	3.1	10.6	445
Total Loan Orig.	-3.5	20.6	-15.3	-2.8	8.5	333

5 Empirical Methodology

In this section, I discuss the implication of APL laws on loan originations and securitizations by using a panel fixed-effect model. Then, I consider a difference-in-difference model and lastly, I move to the central estimation strategy using a difference-in-difference-in-difference (DDD) model. Standard errors are clustered at MSA level in all three models.

Consider the panel fixed-effect model:

$$Y_{mt} = \alpha_m + \eta_t + \beta_1 APL_{st} + \Gamma X_{mt} + \epsilon_{mt} \tag{1}$$

where Y_{mt} includes loan originations and private and marginal GSE securitizations, APL_{st} indicates dummy variable of when states implemented APL laws or APL indices. X_{mt} includes control variables such as population, average income, employment rate and housing supply elasticity.

The panel fixed-effect model estimates the total change in mortgage market from APL laws. However, it does not provide any clear information on how regulated lenders respond relative to deregulated ones after the OCC preemption rule. In addition, the passage and the strictness of APL laws can be endogenously related to state development. To incorporate the OCC preemption rule into the model, I consider the differences-in-differences model:

$$Y_{mt} = \alpha_m + \eta_t + \beta_1 APL_{st} + \beta_2 Post_{2004} + \beta_3 APL_{st} \times Post_{2004} + \Gamma X_{mt} + \epsilon_{mt} \quad (2)$$

where Y_{mt} captures loan originations and private and marginal GSE securitizations, APL_{st} indicates dummy variable of when states implemented APL laws or APL indices, $Post_{2004}$ captures the passage of the OCC preemption rule and control variables include population, average income, housing supply elasticity and employment rate.

Although the OCC preemption rule is exogenous to state developments, non-APL states (control group) may be affected by the OCC preemption rule via spillover effects from OCC lenders (which are national banks with branches in multiple states). DDD controls for different trends for OCC and non-OCC combined with sorting across states based on prior APL laws and different state-level trends for APL vs. non-APL states. To solve these issues, I use triple-differences:

$$\begin{aligned} Y_{mtr} = \alpha_m + \eta_t + \beta_1 OCC_r + \beta_2 APL_{st} + \beta_3 OCC_r \times Post_{2004} \\ + \beta_4 APL_{st} \times OCC_r + \beta_5 APL_{st} \times Post_{2004} \\ + \beta_6 APL_{st} \times Post_{2004} \times OCC_r + \epsilon_{mt} \end{aligned} \quad (3)$$

where Y_{mtr} is loan originations and private and marginal GSE securitizations in MSA m and time t fixed effects for years from 2002 to 2006 by regulator r. APL_{st} is either an indicator for the passage of APL laws or indices. States with no APL laws are coded zero in the indices and indices are a cross-sectional measure in 2004. Time dummy $Post_{2004}$ is one if after preemption rule year 2004 and zero otherwise and OCC_r indicates dummy variable if regulated by OCC.

β_1 represents the differences between OCC and non-OCC lenders in non-APL states before preemption, β_2 represents the differences between APL states and non-APL states, which captures the APL effect on mortgage performance before preemption. β_3 to β_5 capture the effects of different interactions on mortgage performance. β_6 shows the preemption effect on mortgage securitization by capturing the change in mortgage performance of OCC originations in APL states after OCC preemption. If OCC lenders in APL states start to lend less, it means that previously they were swallowing costs, but if they start to lend more, it means that they were passing on the costs. The main interested variable is β_6:

$$\begin{aligned} \hat{\beta}_6 = (y^{Post}_{APL,OCC} - y^{Pre}_{APL,OCC}) - (y^{Post}_{Non-APL,OCC} - y^{Pre}_{Non-APL,OCC}) \\ -(y^{Post}_{APL,Non-OCC} - y^{Pre}_{APL,Non-OCC}) - (y^{Post}_{Non-APL,Non-OCC} - y^{Pre}_{Non-APL,Non-OCC}) \end{aligned} \tag{4}$$

Analysis of OCC lenders before and after the legislative change will assess the impact of APL laws on the mortgage market. However, other macro effects are confounded. One useful approach is to compare OCC lenders in APL states to OCC lenders in non-APL states. But, the gap between this comparison would capture other non-APL factors that vary by state. Comparing unaffected group, non-OCC lenders in APL states to non-OCC lenders in non-APL states would capture non-APL factors that affect mortgage market prospects. Taking differences between these two comparisons should give the effect of APL laws on the mortgage market. This controls for changes in lending across states and changes in lending of all banks in APL states.

The DDD estimates the effect of the OCC preemption rule provided that there is no other omitted variable that leads to higher growth of OCC vs. non-OCC lending in APL states relative to non-APL states. This would be violated if in APL states, lawmakers responded to the preemption rule by changing state regulation of non-OCC lenders.

Since (3) does not account for compositional effect, I use market share of national banks in 2003 as a MSA exposure to the OCC preemption rule.

$$\begin{aligned} Y_{mtr} = \alpha_m + \eta_t + \beta_1 OCC_{2003} + \beta_2 APL_{st} + \beta_3 OCC_{2003} \times Post_{2004} \\ + \beta_4 APL_{st} \times OCC_{2003} + \beta_5 APL_{st} \times Post_{2004} \\ + \beta_6 APL_{st} \times Post_{2004} \times OCC_{2003} + \epsilon_{mt} \end{aligned} \tag{5}$$

where OCC_{2003} is the market share of national banks relative to the total lending in each MSA. This controls for ex ante differential incentives of lenders in different states to supply credit in MSA with high market share of OCC lenders.

5.1 Results

Through employing these methodologies, I find the following results. In table 9, panel fixed-effect model shows that one standard deviation increase in coverage, restrictions and enforcement measures decreases GSE growth by 85%, 38% and 23%. APL indicator has no significant effects. Panel fixed-effect model shows that APL laws decrease GSE securitization. If policymakers pursue this analysis, they would implement APL laws because these rules limit predatory loans. However, it is vital to understand that the adoption of APL laws are endogenous to state developments.

Table 10 presents results from restrictions and enforcement rules on difference-in-difference strategy. Restrictions and enforcement measures increase loan origination by 114% and 124% after the preemption rule. Even though federal preemption rule is exogenous to state development, there is a local spillover effect. Since national banks have branches in other states, there is a possibility that national banks could divert their loan originations in non-APL states.

To provide information on regulated and deregulated lenders' activities, tables 11, 12 and 13 show results on log of loan originations, private share and growth in marginal GSE from triple differences. Columns (1) and (2) control for MSA and year fixed effects, columns (3) and (4) control for MSA$\times$OCC and year fixed effects and columns (5) and (6) control for OCC$\times$year and MSA fixed effects.

After the preemption rule, OCC lenders in states with tougher coverage rule decreases log of loan origination by 0.3 relative to non-OCC lenders. Table 12 shows that OCC lenders increase private share by 1.8% in stricter restrictions rule and table 13 presents that OCC lenders increase the growth in marginal GSE by 3.2% and 4.7% in states with tougher coverage and enforcement rules. The federal preemption rule increases the growth of marginal GSE and private share for OCC lenders relative to non-OCC lenders. When OCC lenders are deregulated, they are more likely to take risks and thus sell their loans on the secondary mortgage market.

To account for compositional effect, I control for market share of OCC lenders in each MSA prior to the preemption rule. The results indicate that higher market share of OCC lenders in APL states resulted in larger increases in securitization. Table 15 shows that higher loan origination share resulted in GSE growth by 0.27%. APL states with stricter coverage rule and higher growth in GSE or private securitization resulted in more private securitization by 0.2%.

Table 4: Triple difference

	Loan Amt	Loan Vol	Private Amt Share	Private Vol Share	GSE Amt Share	Mortgage rate
	(1)	(2)	(3)	(4)	(5)	(6)
Coverage×National×Post	-0.21	-0.24	0.26	0.17	3.79**	-0.0982*
	(0.16)	(0.17)	(0.57)	(0.34)	(1.64)	(0.0459)
R^2	0.88	0.87	0.67	0.66	0.34	0.676
N	1556	1556	1556	1556	1353	10432
Restrictions×National×Post	-0.44*	-0.48*	2.61*	2.36*	3.5	-0.0926***
	(0.24)	(0.25)	(1.32)	(1.22)	(2.64)	(0.0282)
R^2	0.88	0.87	0.67	0.66	0.34	0.677
N	1556	1556	1556	1556	1353	10432
Enforcement×National×Post	-0.44**	-0.45*	1.54	1.28	4.89**	-0.258***
	(0.22)	(0.23)	(1.58)	(1.43)	(2.24)	(0.0696)
R^2	0.88	0.87	0.67	0.66	0.34	0.677
N	1556	1556	1556	1556	1353	10432
Controls	Yes	Yes	Yes	Yes	Yes	Yes
MSAxNational FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 4 shows that after 2004 national banks in stricter (coverage) MSA tend to have more GSE amount share by 3.79. What do these numbers mean? stricter (restrictions) have more private securitization but fewer loan originations. stricter (enforcement) have fewer loan originations but more GSE securitizations.

5.2 Robustness Tests

The baseline results withstand a wide set of robustness tests. First, to rule out reverse causality I include the growth of a bank asset (size) and deposit information (lending capacity) to the set of control variables. Banks with strong loan demand open or purchase new branches to fund loan growth. Large banks with more capital could take higher risks since they are not financially constrained. Taking bank deposit or asset as a control variable, Table 14 shows that national banks with higher growth in asset or deposit increase loan originations by 10%.

Second, I add MSA$\times$OCC fixed effect. This captures shocks that affect only a subset of lenders in each MSA. This removes the possibility that OCC lenders may always grow faster than non-OCC lenders within the same MSA. For instance, some banks may advertise more in specific areas or exploit their geographical locations, thus increasing their mortgage growth. Table 11 presents that log of loan origination decreases by 0.4 in states with stricter restrictions or enforcement rules. Table 12 shows that OCC lenders increase private share by 2.6% more than non-OCC lenders in states with tougher restrictions rule and table 13 shows that OCC lenders increase growth in marginal GSE by 3.8% and 4.9% in states with stricter coverage and enforcement rules. Similar pattern holds when controlling for OCC$\times$year and year fixed effects. OCC$\times$year fixed effect captures time-varying unobserved heterogeneity for lenders.

6 Conclusion

It is vital to understand how regulatory institutional change can have heterogenous effects on banking activities. Studying regulations on banking can help us understand the origin of crisis and avoid it in the future. In this paper, I use the OCC preemption rule, when the OCC regulator exempted national banks in 2004, as a quasi-natural experiment to study the impact of APL laws on loan originations and securitization. The purpose of this analysis is to assess the impact of APL laws on banks by decomposing lenders into regulated vs. deregulated types and to study their activities.

I find that after the preemption rule, OCC lenders decrease loan origination but higher growing national banks increase loan origination by 10% relative to non-OCC lenders. OCC lenders increase the private share by 1.8% and the growth in marginal GSE by 3 to 4% in states with tougher APL rules. Higher growing OCC lenders offer cheaper loans than non-OCC lenders, while non-OCC lenders outcompete small growing national banks. When OCC lenders are deregulated, they take more risks and sell their loans on the secondary mortgage market.

Tougher predatory lending laws have not reduced subprime lending and non-OCC lenders felt the impact of the law to a greater degree than OCC lenders. This paper is empirical and results are derived from reduced-form analysis. As a result, I cannot assess whether individual states with unique laws or all banks facing the same APL law would create more chaos in the secondary mortgage market. For future work, modelling heterogenous financial institutions with regional variation in the state law would help answer the welfare cost analysis.

A Appendix

A.1 Figures

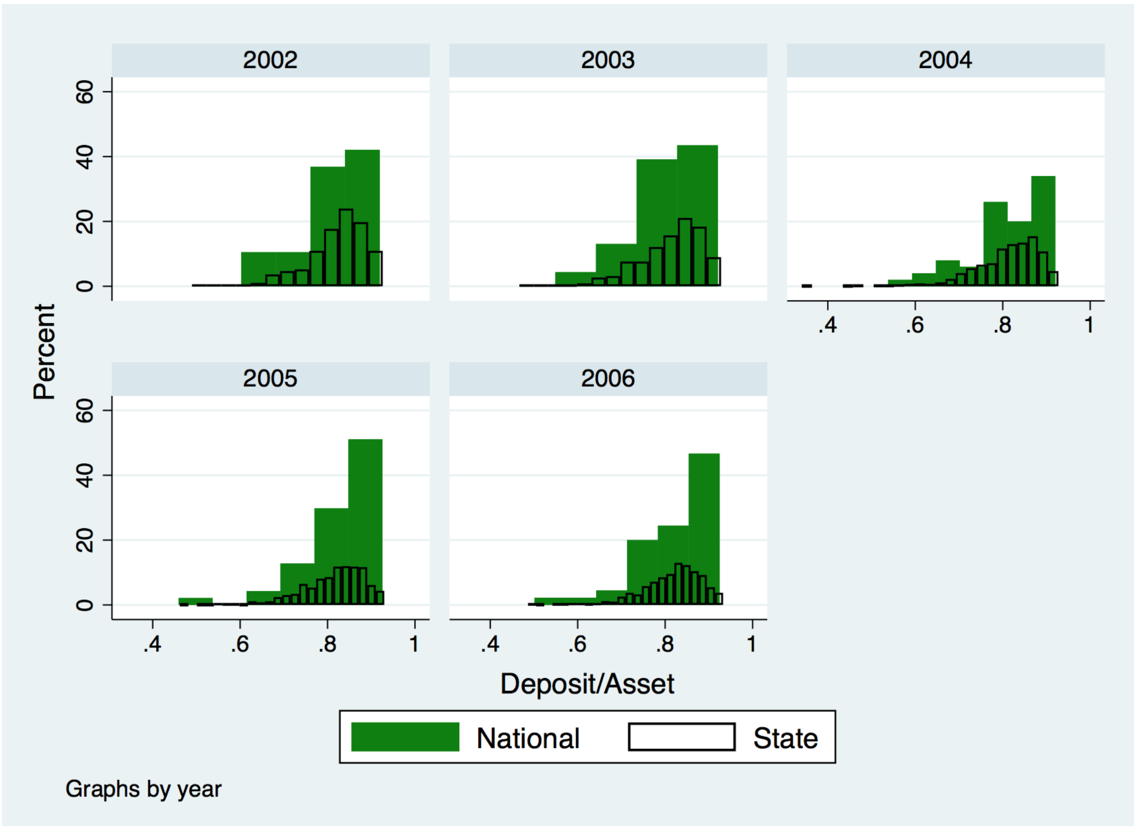
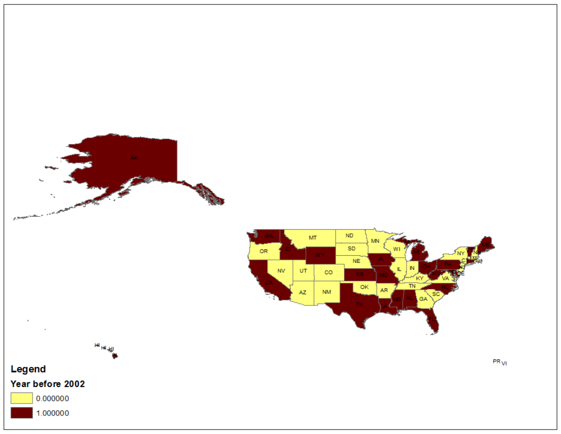
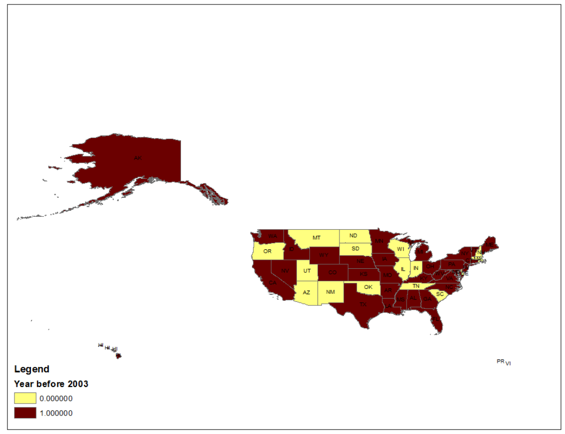


Figure 1: Deposit to asset ratio

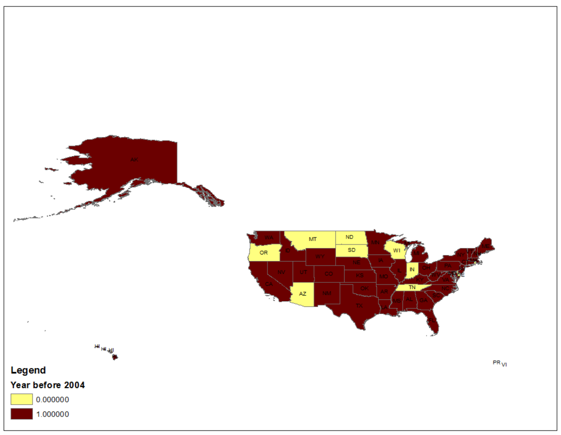
(a) Year before 2002



(b) Year before 2003



(c) Year before 2004



(d) Year before 2007

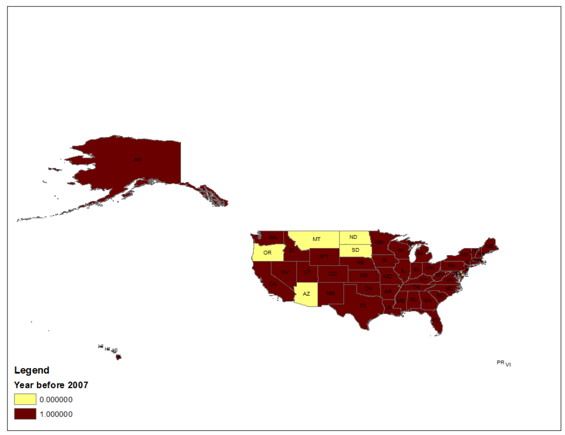
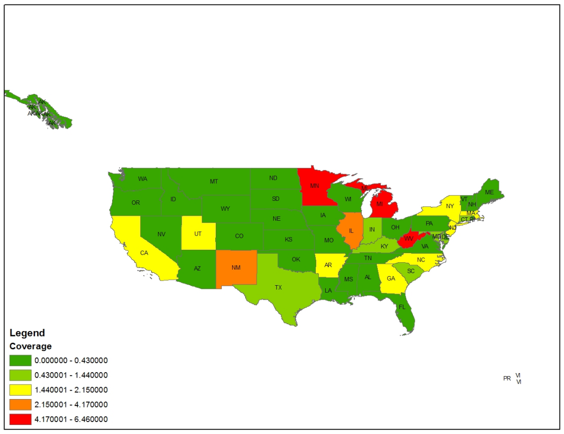
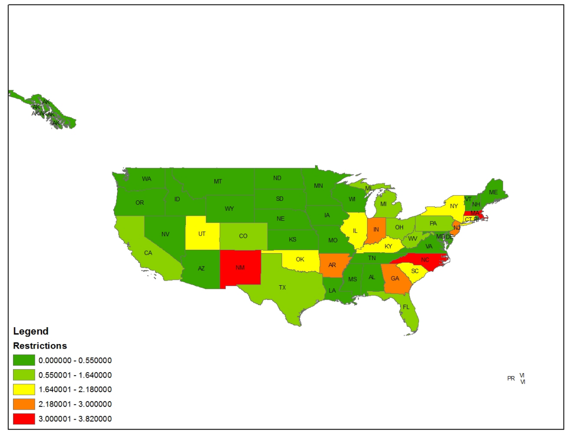


Fig 3. APL Laws Implementation. *Notes:* 14 states had older APL laws that were in effect and adopted before 2000. 29 states and DC implemented APL laws after 2000. 25 states legislated APL laws between 2002 and 2004 and 6 states did not legislate any APL laws.

(e) Coverage



(f) Restrictions



(g) Enforcement

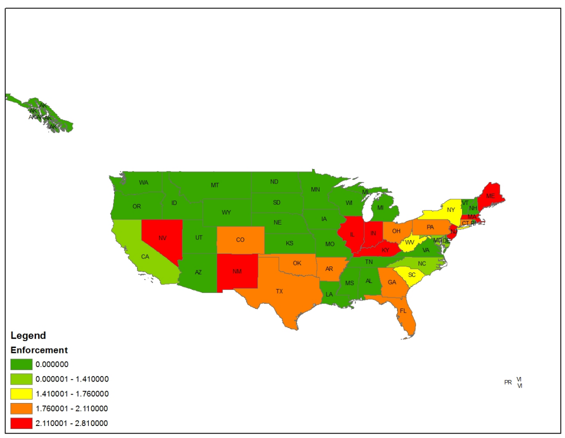


Fig 4. APL Laws Indices. *Notes:* The strictness of indices increase with the point. Coverage index measures the type of loans that are covered by the law, restrictions index shows limits on prepayment penalties, requirements for credit counselling and borrowers' access to the courts. Enforcement rule indicates potential liability of mortgage purchasers for wrongdoing by originators.

A.2 Tables

Table 5: Replication of Di Maggio and Kermani (2017)

	OLS	OLS, robust	WLS, robust
	(1)	(2)	(3)
APL	-0.056**	-0.056**	-0.030
	(0.03)	(0.03)	(0.03)
OCC	-0.088	-0.088	0.128*
	(0.06)	(0.06)	(0.07)
APL$\times$OCC	-0.001	-0.001	-0.204**
	(0.08)	(0.08)	(0.09)
APL$\times$OCC$\times$Post	-0.055	-0.055	0.144
	(0.10)	(0.10)	(0.12)
APL$\times$Post	0.030	0.030	0.034
	(0.05)	(0.05)	(0.05)
OCC$\times$Post	0.050	0.050	-0.112
	(0.08)	(0.08)	(0.09)
R^2	0.158	0.158	0.112
N	105288	105288	105288
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Table 6: Percentage of Financial Institutions at Bank-MSA Level

Year	**OCC Lenders**	**Non-OCC Lenders** (45%)	
	OCC	FRB	FDIC
2002	9	15.6	75.4
2003	9.4	15.9	74.8
2004	7	16.2	76.8
2005	7	15	78
2006	7	16.5	76.5

Notes: FRB for Federal Reserve Board and FDIC stands for Federal Deposit Insurance Corporation.

Table 7: Annual Growth at Bank-MSA Level: 2002-2006

			Non-OCC Lenders			
Variable	**Mean**	**S. D.**	**Pctile 25**	**Median**	**Pctile 75**	**Obs**
GSE Secur.	-8.8	27	-25.8	-9.4	2.9	674
Private Secur.	.74	6.1	0	0	0	10
Total Loan Orig.	-4.2	16.6	-14.1	-4.1	4.1	1287
Asset	2.38	4.75	.82	1.87	3.18	1258
Deposit	2.33	4.79	.72	1.74	3.3	1258
			OCC Lenders			
Variable	**Mean**	**S. D.**	**Pctile 25**	**Median**	**Pctile 75**	**Obs**
GSE Secur.	-9.1	27.2	-26.3	-10.5	5.5	49
Private Secur.	4.1	33.1	-26.8	0	39	3
Total Loan Orig.	-3.6	18.8	-14	-5	7.1	104
Asset	2.58	3.78	.76	1.86	3.54	99
Deposit	2.57	3.85	.65	1.97	3.65	99

Table 8: Annual Growth at Regulatory-MSA Level: 2002-2006

	Non-OCC Lenders					
Variable	**Mean**	**S. D.**	**Pctile 25**	**Median**	**Pctile 75**	**Obs**
GSE Secur.	-4.5	27.3	-21.4	-6.9	9.9	683
Private Secur.	-.86	36.5	-43.3	0	31.3	199
Marginal GSE Secur.	1.9	13.9	-6.2	2.8	10.5	908
Total Loan Orig.	-2.6	17.1	-11	-2.1	6.8	754
	OCC Lenders					
Variable	**Mean**	**S. D.**	**Pctile 25**	**Median**	**Pctile 75**	**Obs**
GSE Secur.	-4.7	31.2	-28.4	-4.5	11.4	216
Private Secur.	1.1	37.5	-35.2	0	44.5	44
Marginal GSE Secur.	1.8	13.3	-6.8	3.1	10.6	445
Total Loan Orig.	-3.5	20.6	-15.3	-2.8	8.5	333

Table 9: Panel Fixed-Effect: Growth

	GSE Amt	GSE Vol	Private Amt	Private Vol	Total Loan Amt	Total Loan Vol
	(1)	(2)	(3)	(4)	(5)	(6)
APL	1.286	1.037	0.402	1.283	1.701	1.319
	(3.81)	(3.86)	(7.31)	(8.43)	(1.76)	(1.84)
R^2	0.566	0.570	0.538	0.517	0.519	0.517
N	2728	2728	175	175	5791	5791
Coverage	-84.079*	-90.462**	-61.381	9.731	-12.338	-19.390
	(43.63)	(44.47)	(131.65)	(163.46)	(50.81)	(74.41)
R^2	0.566	0.570	0.538	0.517	0.518	0.517
N	2728	2728	175	175	5791	5791
Restrictions	-38.382*	-41.295**	-28.020	4.442	-5.632	-8.851
	(19.92)	(20.30)	(60.10)	(74.62)	(23.19)	(33.97)
R^2	0.566	0.570	0.538	0.517	0.518	0.517
N	2728	2728	175	175	5791	5791
Enforcement	-23.324*	-25.094**	-17.027	2.699	-3.423	-5.379
	(12.10)	(12.34)	(36.52)	(45.34)	(14.09)	(20.64)
R^2	0.566	0.570	0.538	0.517	0.518	0.517
N	2728	2728	175	175	5791	5791
Controls	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The sample includes years from 2002 to 2006. Standard errors are in parentheses and are clustered by MSA *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 1 percent level.

Table 10: APL on Log of Loans and Securitizations

	GSE Amt	GSE Vol	Private Amt	Private Vol	Total Loan Amt	Total Loan Vol
	(1)	(2)	(3)	(4)	(5)	(6)
Restrictions	-1.710***	-3.338***	2.064	1.743	-3.580***	-3.574***
	(0.48)	(0.53)	(2.03)	(2.03)	(0.47)	(0.49)
Post	-0.663*	-0.706*	-0.460	-0.304	-0.493***	-0.506**
	(0.37)	(0.40)	(1.88)	(2.22)	(0.19)	(0.20)
Res$\times$Post	0.067	0.064	0.102	0.165	0.114**	0.101*
	(0.09)	(0.09)	(0.17)	(0.20)	(0.05)	(0.06)
R^2	0.906	0.910	0.932	0.934	0.855	0.863
N	4422	4422	445	445	11274	11274
Enforcement	-1.123***	-2.105***	1.232	1.011	-2.212***	-2.198***
	(0.31)	(0.34)	(1.22)	(1.23)	(0.29)	(0.30)
Post	-0.729**	-0.765*	-0.439	-0.304	-0.518***	-0.523***
	(0.37)	(0.40)	(1.88)	(2.25)	(0.19)	(0.20)
Enf$\times$Post	0.121	0.112	0.057	0.114	0.124**	0.103*
	(0.10)	(0.10)	(0.17)	(0.19)	(0.05)	(0.06)
R^2	0.906	0.910	0.932	0.934	0.855	0.863
N	4422	4422	445	445	11274	11274
Controls	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The sample includes years from 2002 to 2006. Standard errors are in parentheses and are clustered by MSA *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 1 percent level.

Table 11: DDD: Log of Loan Amount

	(Amt)	(Vol)	(Amt)	(Vol)	(Amt)	(Vol)
	(1)	(2)	(3)	(4)	(5)	(6)
Coverage×OCC×Post	-0.3*	-0.34**	-0.21	-0.24	-0.3*	-0.34**
	(0.16)	(0.17)	(0.16)	(0.17)	(0.16)	(0.17)
R^2	0.7	0.7	0.88	0.87	0.7	0.69
N	1556	1556	1556	1556	1556	1556
Restrictions×OCC×Post	-0.17	-0.23	-0.44*	-0.48*	-0.17	-0.23
	(0.25)	(0.26)	(0.24)	(0.25)	(0.25)	(0.26)
R^2	0.7	0.7	0.88	0.87	0.7	0.7
N	1556	1556	1556	1556	1556	1556
Enforcement×OCC×Post	-0.2	-0.2	-0.44**	-0.45*	-0.2	-0.2
	(0.22)	(0.23)	(0.22)	(0.23)	(0.22)	(0.23)
R^2	0.7	0.7	0.88	0.87	0.7	0.7
N	1556	1556	1556	1556	1556	1556
Controls	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes			Yes	Yes
MSAxOCC FE			Yes	Yes		
OCCxYear FE					Yes	Yes
Year FE	Yes	Yes	Yes	Yes		

Notes: The sample includes years from 2002 to 2006. Standard errors are in parentheses and are clustered by MSA *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 1 percent level.

Table 12: DDD: Private Share

	(Amt) (1)	(Vol) (2)	(Amt) (3)	(Vol) (4)	(Amt) (5)	(Vol) (6)
Coverage×OCC×Post	1.2	1.12	0.26	0.17	1.2	1.1
	(1.33)	(1.31)	(0.57)	(0.34)	(1.33)	(1.31)
R^2	0.6	0.58	0.67	0.66	0.6	0.58
N	1556	1556	1556	1556	1556	1556
Restrictions×OCC×Post	1.77**	1.44*	2.61*	2.36*	1.77**	1.43*
	(0.79)	(0.74)	(1.32)	(1.22)	(0.79)	(0.75)
R^2	0.58	0.57	0.67	0.66	0.6	0.58
N	1556	1556	1556	1556	1556	1556
Enforcement×OCC×Post	0.9	0.5	1.54	1.28	0.9	0.5
	(0.93)	(0.82)	(1.58)	(1.43)	(0.93)	(0.82)
R^2	0.58	0.57	0.67	0.66	0.58	0.58
N	1556	1556	1556	1556	1556	1556
Controls	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes			Yes	Yes
MSAxOCC FE			Yes	Yes		
OCCxYear FE					Yes	Yes
Year FE	Yes	Yes	Yes	Yes		

Notes: The sample includes years from 2002 to 2006. Standard errors are in parentheses and are clustered by MSA *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 1 percent level.

Table 13: DDD: Growth in Marginal GSE

	(1)	(2)	(3)
Coverage×OCC×Post	3.2**	3.79**	3.2 **
	(1.44)	(1.64)	(1.44)
R^2	0.3	0.34	0.3
N	1353	1353	1353
Restrictions×OCC×Post	2.9	3.5	3.02
	(2.13)	(2.64)	(2.12)
R^2	0.29	0.34	0.3
N	1353	1353	1353
Enforcement×OCC×Post	4.7**	4.89**	4.7**
	(1.93)	(2.24)	(1.93)
R^2	0.29	0.34	0.3
N	1353	1353	1353
Controls	Yes	Yes	Yes
MSA FE	Yes		Yes
MSAxOCC FE		Yes	
OCCxYear FE			Yes
Year FE	Yes	Yes	

Notes: The sample includes years from 2002 to 2006. Standard errors are in parentheses and are clustered by MSA *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 1 percent level.

Table 14: Triple Differences at Bank-MSA Level

	Log of loan amount		Log of GSE Loans	
	(1)	(2)	(3)	(4)
Res×National×Post	-0.38	-0.38	-0.29	-0.29
	(0.32)	(0.32)	(0.47)	(0.47)
Res×Growth in Deposit	0.01*		0.02	
	(0.01)		(0.02)	
Res×Growth in Asset		0.01*		0.02
		(0.01)		(0.02)
R^2	0.94	0.94	0.95	0.95
N	1362	1362	613	613
Enf×National×Post	-0.47*	-0.47*	-0.37	-0.37
	(0.24)	(0.24)	(0.29)	(0.28)
Enf×Growth in Deposit	0.01*		0.01	
	(0.01)		(0.02)	
Enf×Growth in Asset		0.01*		0.01
		(0.01)		(0.02)
R^2	0.94	0.94	0.95	0.95
N	1362	1362	613	613
Controls	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table 15: MSA Exposure to Preemption Rule

	(1)	(2)	(3)
	GSE Growth Amt	Private Growth Amt	Ln(Private Amt)
APL×Post×Loan	0.265*		
	(0.15)		
Coverage×Post×GSE		0.192**	
		(0.10)	
Coverage×Post×Private			0.056**
			(0.03)
R^2	0.280	0.444	0.756
N	735	201	212
Controls	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

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