Credit-Induced Boom and Bust

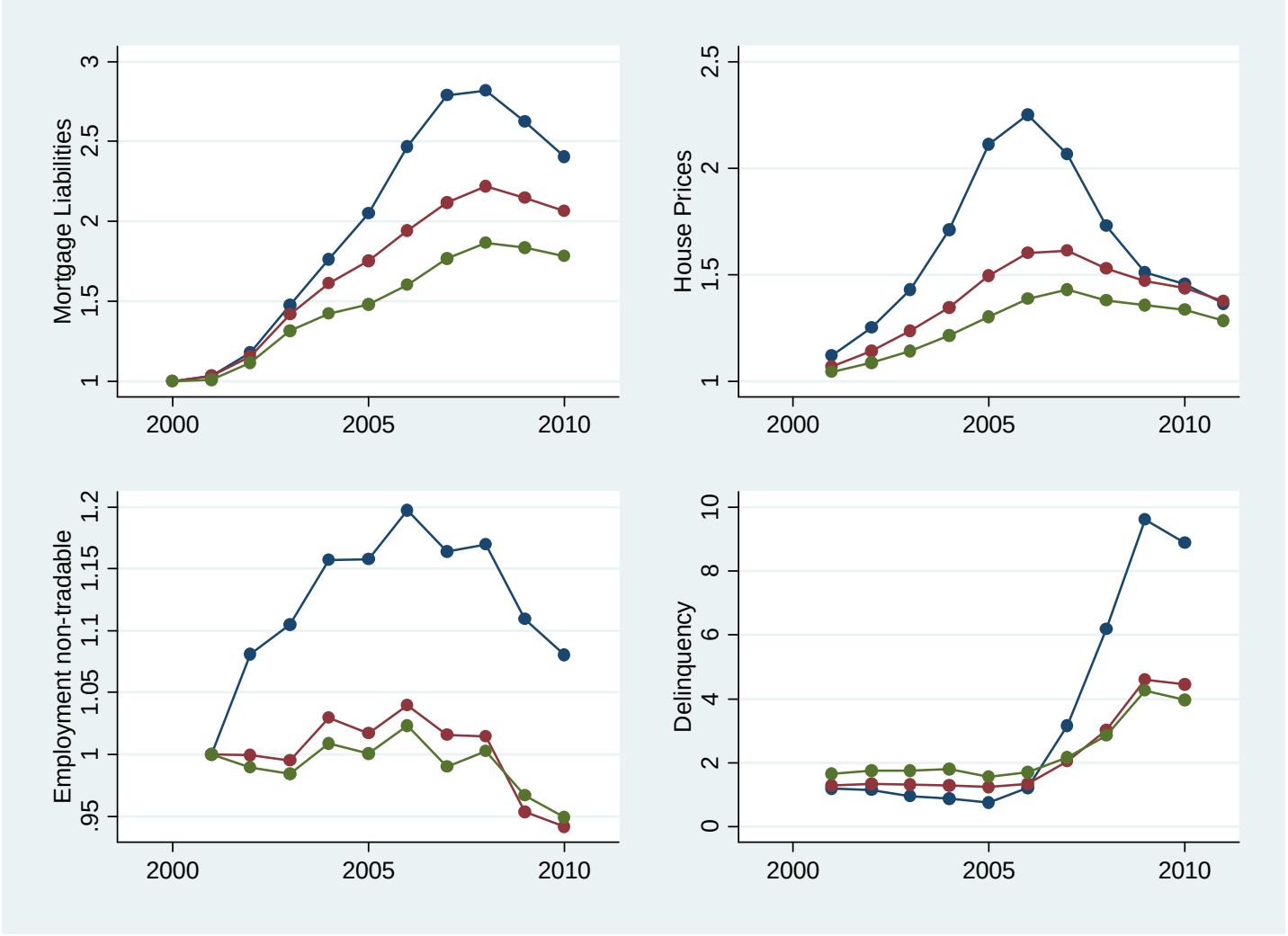
Marco Di Maggio (Columbia) and Amir Kermani (UC Berkeley)

CFPB Research Conference
May, 2015

Motivation

- The Great Recession was preceded by a large expansion of credit and followed by a collapse in housing prices, employment, and consumption.
- The US flow of funds: stock of household mortgage liabilities more than doubled from 2000 to 2006, increasing by 5.7 trillion dollars.
- The employment decline was greater than that of any recession of recent decades, peaking at 10% in Oct .09.
- Regions that accumulated more debt during this period experienced a larger boom in house prices and consumption which was followed by a larger bust in subsequent years.

Households' Liabilities, House Prices and Employment



Research Question

- How much of the boom and the bust in the real economy were due to an outward shift in the credit supply?
- Specifically, due to lending to riskier borrowers?

Challenges:

- Identifying the causal effect of credit is challenging:
  - Counties that experience higher growth are going to increase their consumption and drive house prices up, but are also going to have higher demand for credit.
  - As a result, house price and employment increases will be strongly correlated with the supply of credit, even if credit has no direct effect on house prices and consumption.

Identification Strategy

- We take advantage of important changes to banking regulation in the U.S. during the early 2000s.
- Starting in 1999 several states adopted anti-predatory laws (APL): several restrictions such as requiring verification of borrowers repayment ability, limits on fees, rates and prepayment penalties.
  - Most importantly, many states included purchase loans to APL.
- In 2004 the OCC enacted a preemption rule, which barred the application of state anti-predatory laws to national banks.
  - National banks and subsidiaries became exempt from APL laws and state enforcement.
- We employ this as a positive shock to credit supply in counties with higher fraction of national banks and in states with local APL.

Main Results

1. **Credit Supply**: if we compare counties in the top versus the bottom decile of presence of national banks in states with anti-predatory laws the OCC preemption resulted in:
   - 18% increase in annual loan issuance in years 2004-2006.
   - Followed by a similar decline in years 2007-2010.
2. **House Prices:** using this as an instrument for the supply of credit, we find that a 10% increase in annual loans origination is associated with a 3% increase in annual house price growth rate or a total of 10% increase in house prices from 2004-2006.
3. **Employment:** a 10% increase in loan origination leads to a 2-3% increase in employment in the non-tradable sectors.
4. **Delinquencies:** a 15% decrease in delinquencies during the boom period, and 30% more delinquencies during the Great Recession.
5. **Heterogeneous Effects**: The Boom-Bust pattern is more pronounced in Subprime regions, regions with less affordable housing, and regions with less elastic supply of housing.
6. **Robust to several alternative hypothesis.**

Our Contribution

Growing literature on the role played by credit supply during the crisis

Most of the existing literature investigates how an underlying increase in the credit supply propagates through the economy by using static regional variations, such as the elasticity of housing supply developed by Saiz (2010).

In contrast,

- We provide an instrument aimed to directly capture an outward shift in the credit supply, which allows us to investigate how lending to riskier borrowers affects real economic activity, controlling for regional differences.
- Our paper shows its effect on the boom and bust cycle experienced in several sectors of the economy.

Outline

1. Our Contribution
2. **Regulatory Framework**
3. Data and Research Design
4. Main Results
5. Heterogeneous Effects
6. Robustness Checks
7. Conclusion

Regulatory Framework

- In the U. S. national banks are supervised by the OCC.
- Federal thrifts by the OTS.
- Independent mortgage companies by HUD
- State banks and thrifts chartered at the state level are supervised by either the Federal Reserve System (FRS) or the Federal Deposit Insurance Corporation (FDIC) or by their chartering state.
- Credit unions by the National Credit Union administration (NCUA).

Anti-predatory laws

- In 1994, Home Ownership and Equity Protection Act (HOEPA):
  - restrictions on lending terms and practices for mortgages with high prices, based on either the APR or the total points and fees imposed.
  - However, high cost mortgages only accounted for one percent of residential mortgages.
  - It only covered refinance loans.
- Many states adopted stronger anti-predatory lending regulations than federal law requires. The first law was passed in 1999 by North Carolina.
- As of January 2007, 20 states and the District of Columbia had anti-predatory laws in effect.
- We focus on the ones that were not replication of Federal Anti-Predatory law.

Do APLs Matter?

- Ding et al. (2012): APLs associated with a 43% reduction in prepayment penalties; 40% decrease in ARMs; significant reduction in likelihood to default. Stronger for subprime regions.
- Ho and Pennington-Cross (2006): subprime loans originated in APL states had lower APRs than in unregulated states.
- Keys et al. (2010): employ the APL as an instrument for the ease of securitization.
- Evidence from Rating Agencies: they require credit enhancement, "to the extent that potential violations of APL reduce the funds available to repay RMBS investors, the likelihood of such violations and the probable severity of the penalties must be included in Moody's overall assessment".

Preemption Rule

- On January 7, 2004 the OCC preempted a broad range of state laws attempting to regulate the "terms of credit" from applying to national banks' activities.
- Specifically, the OCC preempted all regulations pertaining the following:
  - Loan-to-value ratios;
  - The terms of credit: repayment of principal and interest, amortization, balance, payments due, minimum payments, or term to maturity of the loan;
  - The aggregate amount of funds that may be loans upon the security of real property;
  - Access to, and use of, credit reports;
  - Disclosure and advertising;
  - Processing, origination, servicing, sale or purchase of, or investment or participation in, mortgages;
  - Rates of interest on mortgage loans;

New Century 2004 10-K Filing

"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."

New Century 2004 10-K Filing

"Several states and cities are considering or have passed laws, regulations or ordinances aimed at curbing predatory lending practices.

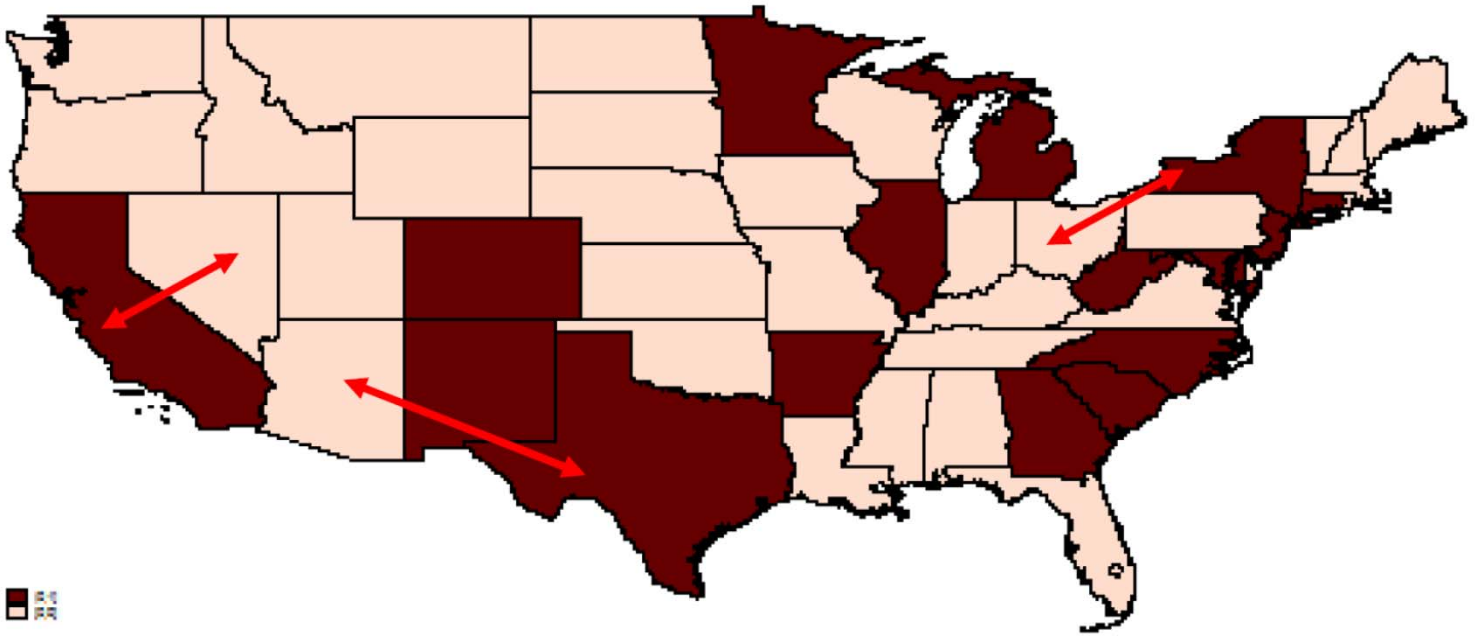
In general, these proposals involve lowering the existing federal HEPA thresholds for defining a high-cost loan, and establishing enhanced protections and remedies for borrowers who receive such loans. [...] Because of enhanced risk and for reputational reasons, many whole loan buyers elect not to purchase 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."

Data

- "Home Mortgage Disclosure Act" (HMDA) data set from 1999 through 2011: flow of new mortgage loans originated every year.
    - It records each applicant's final status (denied/approved/originated), purpose of borrowing (home purchase/refinancing/home improvement), loan amount, race, sex, income, and home ownership status.
- We obtain data on the fraction of loans securitized from Blackbox Logic.
- The New York Fed Consumer Credit Panel: county level information on loan amounts, mortgage delinquency rates and the fraction of households with FICO scores below 620.
- County Business Pattern: employment data (non tradable sectors).
- Our county--level house price data from 1999 to 2011 come from Zillow.com
- We also add county--level data on demographics, income, and business statistics through the Census.
- Anti-Predatory measure from White, Reid, Ding and Quercia (2011)

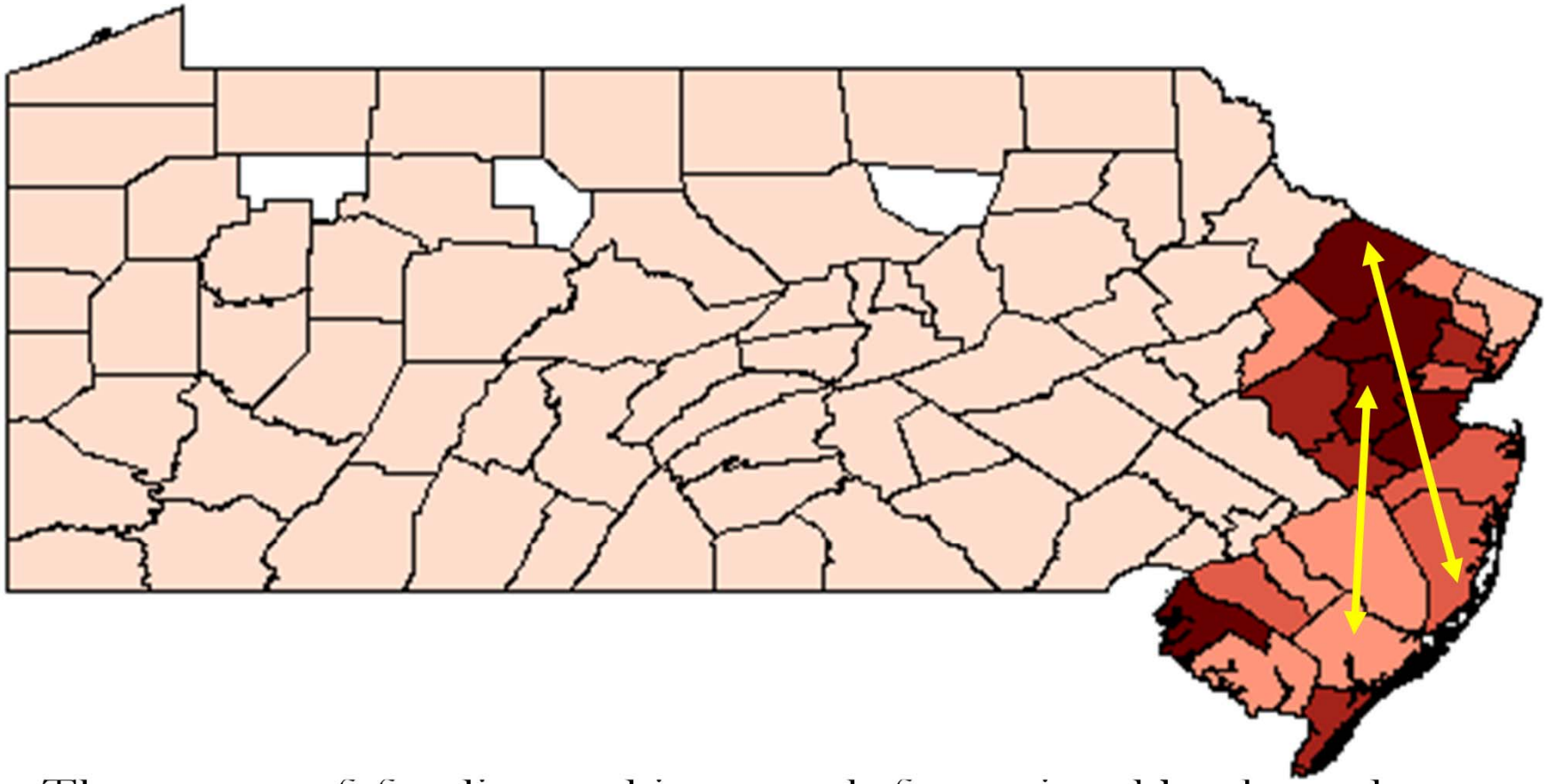
Research Design

Research Design (1)



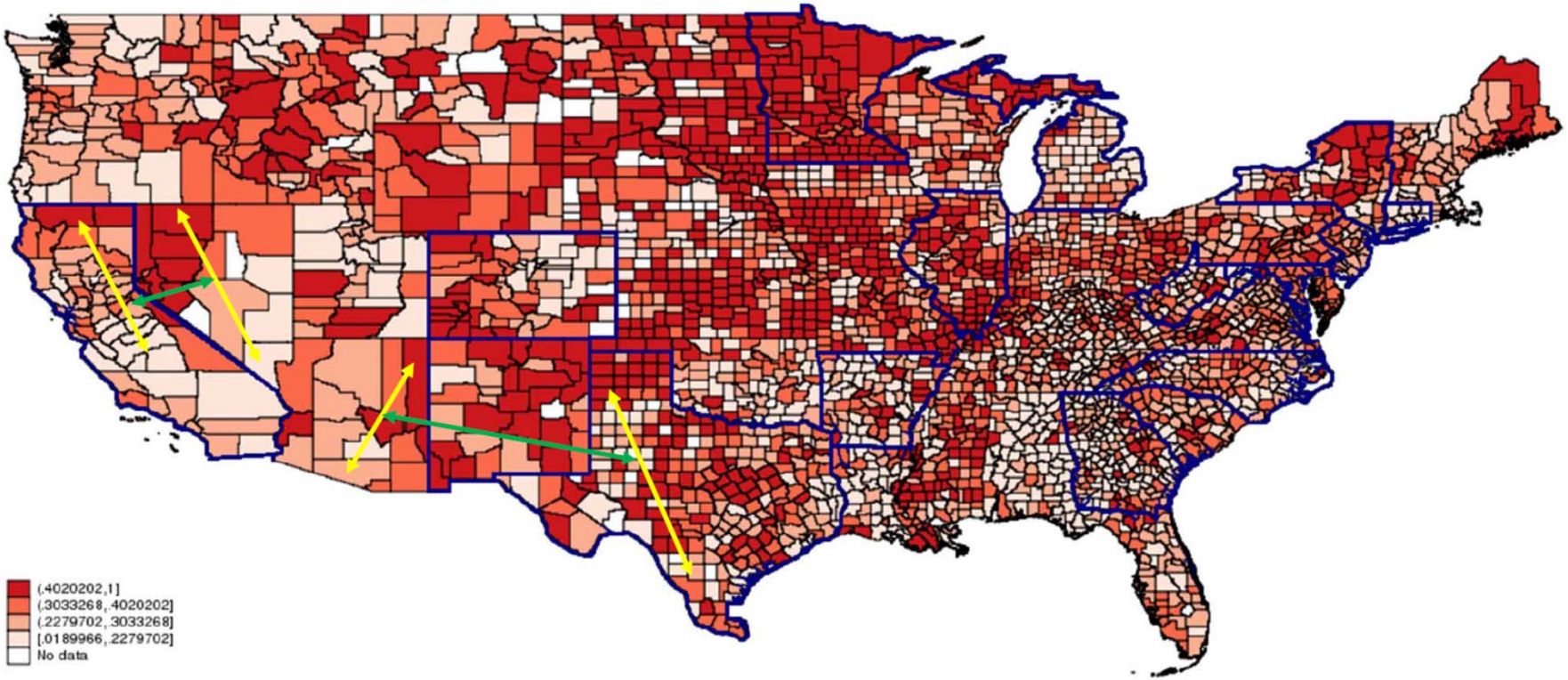
The introduction of APL might be correlated with other policies or with unobserved characteristics of the local mortgage market.

Research Design (2)

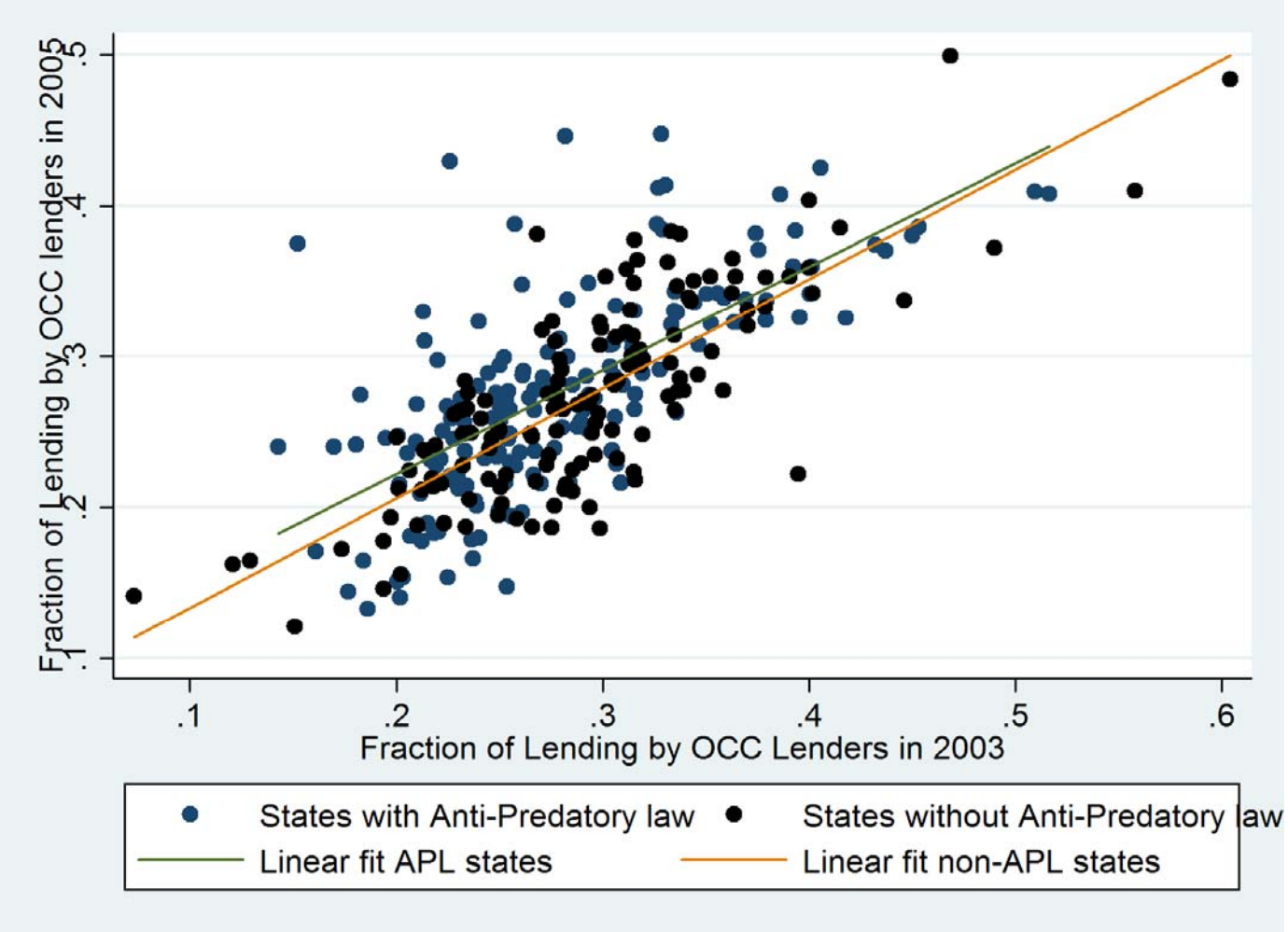


The source of funding and its growth for national banks and independent mortgage lenders were significantly different.

Research Design (3)



Presence of National Banks Over Time



Main Results

Summary Statistics

		States without Anti-Predatory Law		States with Anti-Predatory Law		Diff-in-Diff	
		Below Median	Above Median	Below Median	Above Median		
	Fraction of OCC lenders in 2003	0.219	0.349	0.230	0.345	-0.015	
	Elasticity of housing supply	-1.568	-2.083	-1.575	-1.775	0.315	
	Log Population in 2003	10.58	10.66	10.70	10.73	-0.050	
	Log Median Income in 2003	12.51	12.09	13.26	12.60	-0.240	
Change from 2003-2005	Median Income	0.0727	0.0549	0.103	0.0835	-0.002	
	Population	0.0306	0.0220	0.0212	0.0171	0.005	
	Fraction of Loans Securitized	0.204	0.162	0.238	0.194	-0.002	
	Loan amounts	0.710	0.443	0.455	0.428	0.240	***
	House prices	0.450	0.250	0.359	0.289	0.130	*
	Employment in non-tradables	0.0725	0.0471	0.0508	0.0441	0.019	*
Change from 2008-2010	Median Income	-0.00495	-0.0108	-0.00595	-0.00928	0.003	
	Population	0.00583	0.00728	0.00583	0.00724	0.000	
	Loan amounts	-0.265	-0.202	-0.179	-0.210	-0.094	***
	House prices	-0.170	-0.0744	-0.112	-0.0929	-0.077	**
	Employment in non-tradables	-0.0567	-0.0409	-0.0403	-0.0481	-0.024	**
Change from 2001-2003 (Pre-trends)	Median Income	0.0302	0.0257	0.0146	0.00803	-0.002	
	Population	0.00803	0.0102	0.0178	0.0150	-0.005	
	Loan amounts	0.379	0.280	0.372	0.286	0.013	
	House prices	0.207	0.154	0.275	0.150	-0.072	
	Employment in non-tradables	0.0450	0.0196	0.0454	0.0138	-0.006	

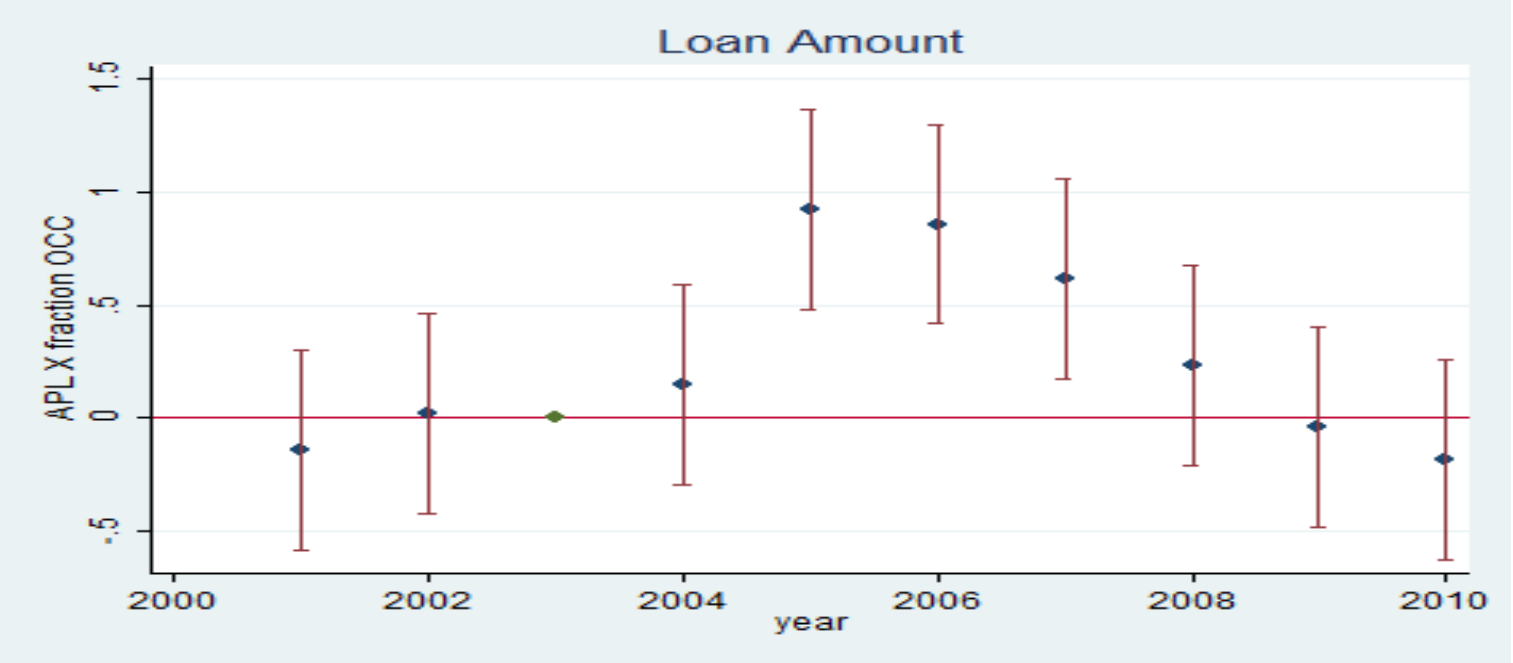
Loan Amounts by Agency

	Log of loan amount	*Log (Loan Amounts / Loan Amounts in 2000)*	
APL x Post x OCC	0.09***	0.11***	0.11***
	(0.03)	(0.03)	(0.03)
County-Agency Fixed Effects	Yes		
Year Fixed Effects	Yes	Yes	
County Fixed Effects		Yes	
County-Year Fixed Effetcs			Yes

Outward Shift in Supply of Credit

	Log of Loan amount				
	Full Sample		*Counties with Elasticity and FICO Measure*		
APL X Post X Fraction OCC	0.449***	0.472***	0.949***	0.915***	0.717***
	(0.133)	(0.120)	(0.223)	(0.189)	(0.182)
Log(Median Income)		1.552***	1.725***	1.731***	1.431***
		(0.142)	(0.157)	(0.143)	(0.156)
Log(Population)		1.191***	1.196***	1.180***	1.293***
		(0.156)	(0.184)	(0.174)	(0.164)
Fraction Subprime X Post				0.804***	1.017***
				(0.112)	(0.112)
Elasticity X Post					-0.0658***
					(0.00867)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
County Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	21,564	15,533	5,348	5,348	5,348
R-squared	0.020	0.147	0.233	0.233	0.267
Number of counties	3,085	2,219	764	764	764

Boom and Bust: Credit Supply



$$\log(Loan\ Amount) = \lambda_i + \eta_t + \beta_{1t} APL_{2004} \times d_t + \beta_{2t} Frac_{2003} \times d_t + X_{i,t}\gamma + \varepsilon_{it}$$

APL X Fraction OCC	0.890***	0.728***	-1.016***	-0.852***
	(0.214)	(0.197)	(0.349)	(0.314)
Fraction of Subprime	0.568***	0.728***	-0.566***	-0.820***
	(0.0948)	(0.0980)	(0.168)	(0.185)
Elasticity		-0.0521***		0.0669***
		(0.00802)		(0.0149)

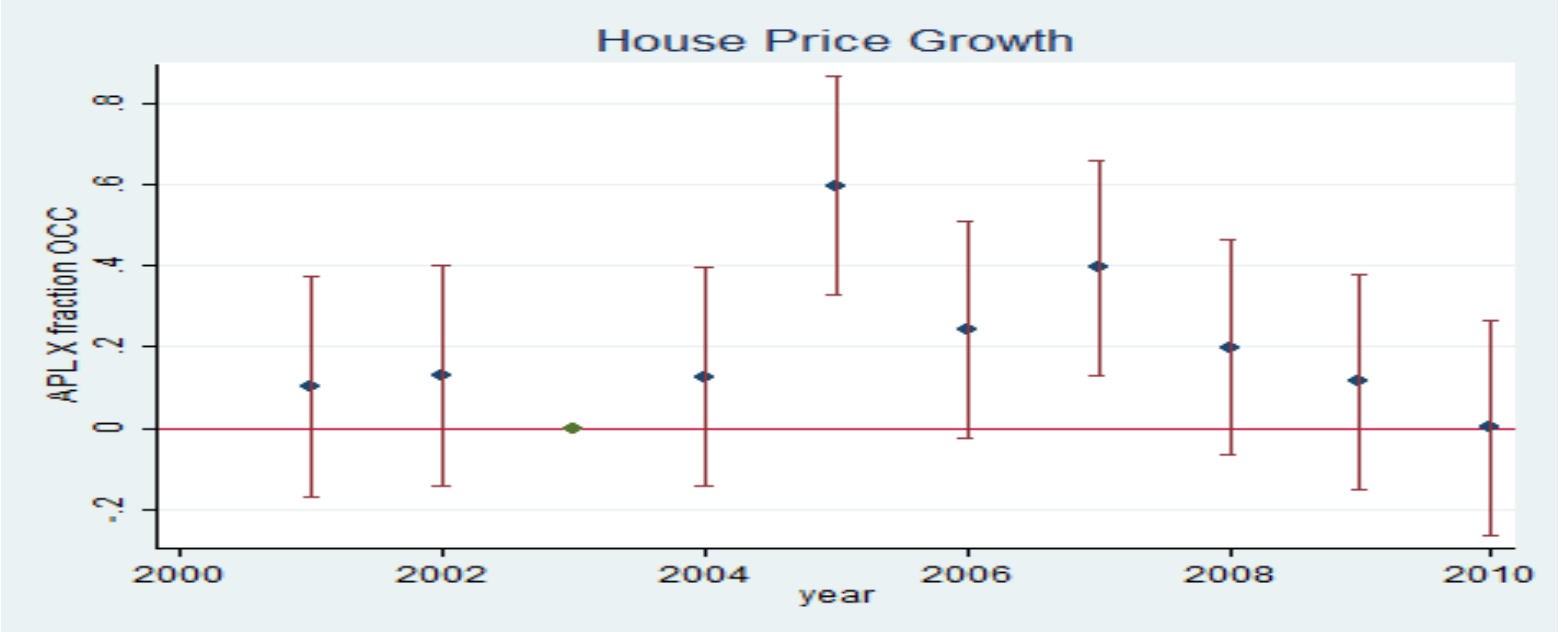
Economic Magnitude

- We start by noticing that the fraction of loans originated by OCC lenders varies from 0.43 in the top decile to 0.18 in the bottom one, i.e. a difference of about 0.25.
- Hence, the counties in the top decile of presence of national banks in APL states showed on average 11%-24% higher annual loan issuance after the preemption than those in the bottom decile.
- Bust: counties in the top decile of presence of national banks in APL states showed 21% lower annual loan issuance after the preemption than those in the bottom decile.

Impact on House Prices

	Full Sample		*Counties with Elasticity Measure*		
					IV
APL X Post X Fraction OCC	0.247***	0.215***	0.273***	0.236***	0.333***
	(0.0547)	(0.0484)	(0.0643)	(0.0617)	(0.109)
Fraction of Subprime X Post			0.193***	0.233***	-0.185
			(0.0370)	(0.0378)	(0.146)
Elasticity X Post				-0.0124***	0.0150
				(0.00312)	(0.00997)
Log(Median Income)		0.200***	0.239***	0.190***	-0.0852
		(0.0443)	(0.0510)	(0.0517)	(0.0900)
Log(Population)		0.219**	0.162	0.220*	-0.0458
		(0.111)	(0.129)	(0.115)	(0.176)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
County Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	6,244	5,322	3,258	3,258	3,258
R-squared	0.063	0.077	0.113	0.128	0.160
Number of counties	892	887	543	543	543

Boom and Bust: House Prices

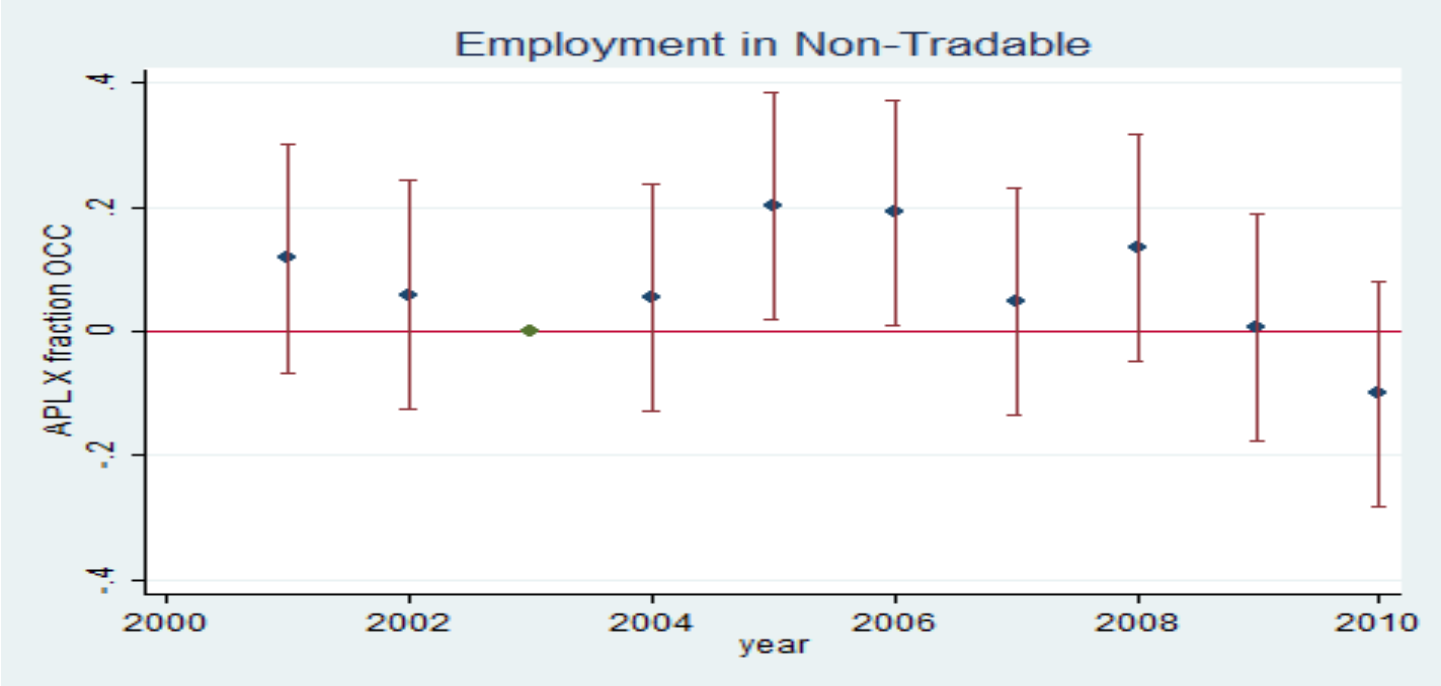


APL X Fraction OCC	0.563***	0.348*	-0.650***	-0.518***
	(0.208)	(0.191)	(0.198)	(0.182)
Fraction of Subprime	0.0431	0.221***	-0.110	-0.252***
	(0.0753)	(0.0795)	(0.0799)	(0.0772)
Elasticity		-0.0568***		0.0415***
		(0.00891)		(0.00531)

Impact on Employment in Non-tradable Sector

	Full Sample		*Counties with Elasticity Measure*		
					IV
APL X Post X Fraction OCC	0.207***	0.161***	0.179**	0.152**	0.220**
	(0.0698)	(0.0596)	(0.0707)	(0.0714)	(0.0987)
Fraction of Subprime X Post			0.101***	0.128***	-0.110
			(0.0352)	(0.0393)	(0.115)
Elasticity X Post				-0.008***	0.00619
				(0.00298)	(0.00718)
Log(Median Income)		0.287***	0.310***	0.273***	-0.0384
		(0.0443)	(0.0488)	(0.0470)	(0.145)
Log(Population)		0.893***	0.954***	0.965***	0.668***
		(0.0741)	(0.0814)	(0.0815)	(0.164)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
County Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	5,362	5,362	3,693	3,693	3,693
R-squared	0.014	0.226	0.287	0.291	0.150
Number of counties	790	790	537	537	537

Boom and Bust: Employment



APL X Fraction OCC	0.176**	0.159**	-0.241**	-0.220**
	(0.0750)	(0.0752)	(0.0989)	(0.103)
Fraction of Subprime	0.0828***	0.0976***	0.0620	0.0392
	(0.0307)	(0.0321)	(0.0425)	(0.0475)
Elasticity		-0.00470*		0.00657**
		(0.00276)		(0.00323)

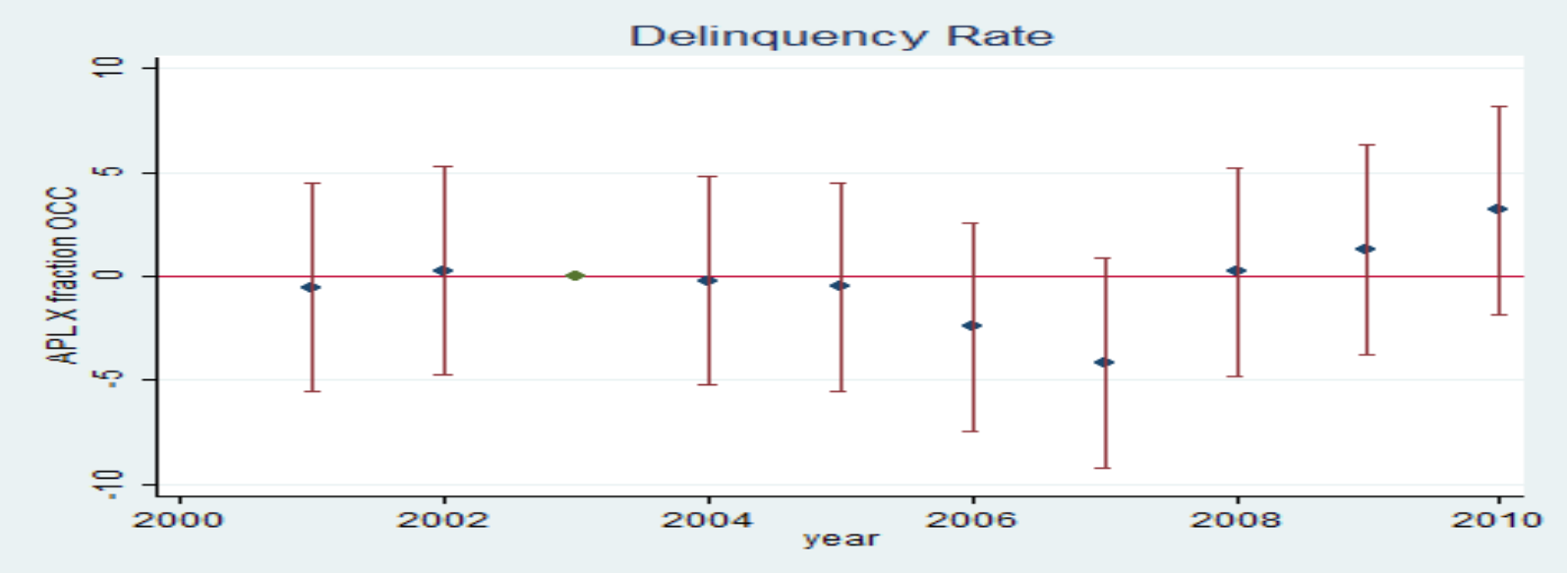
Economic Magnitude

- House Prices: A 10% increase in loan origination, through a local general equilibrium effect, leads to a 3.3% increase in house prices growth rate, which resulted in a total increase of 10% in house prices during the 2004-2006 period.
- Employment: Our IV estimates suggest that a 10% increase in loan origination leads to a 2% increase in employment in the non-tradable sectors.

Impact on Delinquencies

	Full Sample		*Counties with Elasticity Measure*		***IV***
APL X Post X Fraction OCC	-0.874***	-0.869***	-1.830***	-1.580***	-2.202***
	(0.328)	(0.309)	(0.442)	(0.435)	(0.613)
Fraction of Subprime X Post			-0.843***	-1.113***	1.128
			(0.304)	(0.322)	(0.691)
Elasticity X Post				0.0834***	-0.0616
				(0.0221)	(0.0468)
Log(Median Income)		-1.930***	-2.316***	-1.935***	1.216
		(0.325)	(0.372)	(0.421)	(0.904)
Log(Population)		-0.827*	-0.865*	-1.008**	1.839**
		(0.435)	(0.515)	(0.503)	(0.921)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
County Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	15,533	15,533	5,348	5,348	5,348
R-squared	0.007	0.022	0.074	0.086	-0.090
Number of counties	2,219	2,219	764	764	764

Boom and Bust: Delinquencies



APL X Fraction OCC	-1.874***	-1.788***	7.838**	5.757*
	(0.498)	(0.501)	(3.795)	(3.355)
Fraction of Subprime	-1.085***	-1.171***	2.625*	5.412***
	(0.234)	(0.252)	(1.373)	(1.418)
Elasticity		0.0278		-0.819***
		(0.0193)		(0.108)

Economic Magnitude

- The effect is also economically substantial: the increase in annual loan issuance resulted in a .4% reduction in delinquencies during the 2004-2006 period, which is a 30% decrease compared to the 1.3% delinquency rate of 2003.
- The delinquency rate increased by 1.5% between 2008 and 2010, which is a thirty percent increase with respect to the 4.8% delinquency rate in 2008.

Heterogeneous Treatment Effect

Heterogeneous Treatment Effect

	Change in Loan Amount in 2003-2005	*Change in Loan Amount in 2007-2009*	*Change in House Prices in 2003-2005*	*Change in House Prices in 2008-2010*	*Change in Employment in Non-Tradable Sector in 2003-2005*	*Change in Employment in Non-Tradable Sector in 2008-2010*	*Change in Delinquency Rates in 2003-2005*	*Change in Delinquency Rates in 2008-2010*
Subprime County X APL X Fraction OCC	1.342***	-1.78***	0.566*	-1.15***	0.288**	-0.355*	-2.062*	16.98***
	(0.361)	(0.676)	(0.314)	(0.316)	(0.136)	(0.205)	(1.083)	(6.366)
Prime County X APL X Fraction OCC	0.325	-0.284	0.181	-0.142	0.0762	-0.163	-1.322**	-0.249
	(0.240)	(0.307)	(0.226)	(0.144)	(0.0903)	(0.105)	(0.540)	(3.199)
Inelastic County X APL X Fraction OCC	1.471**	-3.330**	0.985	-1.43***	0.277	-0.556*	-0.162	25.01*
	(0.663)	(1.562)	(0.598)	(0.388)	(0.212)	(0.305)	(1.561)	(12.77)
Elastic County X APL X Fraction OCC	0.717***	-0.564**	0.323*	-0.309	0.191**	-0.146*	-2.03***	4.309
	(0.245)	(0.263)	(0.187)	(0.228)	(0.0878)	(0.0815)	(0.554)	(3.113)

Robustness Checks/Further Evidence

1. Diff-in-Diff
2. Securitization
3. State Borders
4. CRA Lending
5. BHC Agency
6. Loan-Level Evidence

Robustness VIa: Loan-Level Evidence High-Cost Mortgages

	1	2	3
	Log of loan amount	*Log (Loan Amounts / Loan Amounts in 2004)*	
APL X OCC	0.39***	0.17***	0.17***
	(0.07)	(0.05)	(0.05)
APL	-0.13*	-0.10*	
	(0.07)	(0.06)	
Year Fixed Effects	Yes	Yes	
County Fixed Effects		Yes	
Agency Fixed Effects		Yes	Yes
County-Agency Fixed Effects	Yes		
County-Year Fixed Effetcs			Yes
Observations	85,328	51,312	51,312
R-squared	0.91	0.48	0.53

Robustness VIb: Loan-Level Evidence High DTI Mortgages

	(1)	(2)	(3)
	Log of loan amount	*Log (Loan Amounts / Loan Amounts in 2000)*	
APL X OCC X Post	0.09**	0.18***	0.18***
	(0.04)	(0.05)	(0.06)
County-Agency Fixed Effects	Yes		
Year Fixed Effects	Yes	Yes	
County Fixed Effects		Yes	
County-Year Fixed Effetcs			Yes
Observations	73,700	99,976	99,976
R-squared	0.96	0.37	0.51

Aggregate Impact

- How much of the increase in house prices can be attributed to a direct effect of an outward shift in the credit supply?
- We can integrate our estimated effect to compute the economy wide magnitude of our results.
- Compute the ratio between "Fraction OCC x APL" in the loan amount and in the house prices estimations.
- For each county, we compute the increase in loan amount minus the 10% decile.
- That increase in loan amount times the ratio gives the effect on house prices and then take the average across counties.
- For boom of 2003 to 2005: our channel explains 52% of boom in house prices
- For bust of 2008 to 2010: our channel explains 67% of decline in house prices
- Similarly for employment and delinquency rates.
- If consider only the increase in subprime lending, it explains about 20%-25% of boom and bust of house prices.
- Similarly, if we consider only the APL states

Conclusion

- A change in banking regulation with differential effects on APL states versus the ones without, and on counties with a different presence of national banks provides us with a novel identification strategy to investigate the role of the supply of credit on the boom and bust cycle.

- Credit expansion (especially to riskier borrowers) may induce a boom-bust cycle in the real economy.

- **Time inconsistency of financial regulation: short-term consequences can be very different from long-term ones.**

Robustness I: Diff-in-Diff

	(1)	(2)	(3)	(4)
	Log of Loan amount	*House Prices Growth*	*Employment in the Non-Tradable Sector*	*Delinquency Rates*
Post X Fraction OCC	0.519***	0.146**	0.128**	-0.978**
	(0.138)	(0.0620)	(0.0614)	(0.398)
County-Level Controls	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
County Fixed Effect	Yes	Yes	Yes	Yes
Observations	2,359	1,820	1,719	2,359
R-squared	0.507	0.128	0.434	0.131
Number of Counties	337	260	252	337

Robustness II : Securitization

	Change in Loan Amount in 2003-2005	*Change in Loan Amount in 2007-2009*	*Change in House Prices in 2003-2005*	*Change in House Prices in 2008-2010*	*Change in Employment in Non-Tradable Sector in 2003-2005*	*Change in Employment in Non-Tradable Sector in 2008-2010*	*Change in Delinquency Rates in 2003-2005*	*Change in Delinquency Rates in 2008-2010*
APL X Fraction OCC	0.821***	-0.998***	0.525**	-0.561***	0.175**	-0.210**	-1.979***	6.652**
	(0.207)	(0.349)	(0.240)	(0.199)	(0.0744)	(0.0969)	(0.536)	(2.998)
Securitization boom between 2003-2005	0.954***		0.427		0.122***		-0.199	
	(0.129)		(0.348)		(0.0335)		(0.307)	
Securitization boom between 2002-2006		-0.514**		-0.802***		-0.106***		9.663***
		(0.256)		(0.108)		(0.0367)		(1.560)

Robustness III: State Borders

- Looking at Census-Tracts within 10-15 miles from state-borders

	Change in Loan Amount in 2003-2005	*Change in House Prices in 2003-2005*	*Change in Loan Amount in 2007-2009*	*Change in House Prices in 2008-2010*
APL X Fraction OCC	0.290***	0.232***	-0.265**	-0.0516**
	(0.0994)	(0.0444)	(0.116)	(0.0248)
State Fixed Effect	Yes	Yes	Yes	Yes
State-Border Fixed Effect	Yes	Yes	Yes	Yes

Robustness IV: CRA Lending

	Change in CRA Lending in 2003-2005	Change in CRA Lending in 2007-2009	*Change in House Prices in 2003-2005*	*Change in House Prices in 2008-2010*	*Change in Employment in Non-Tradable Sector in 2003-2005*	*Change in Employment in Non-Tradable Sector in 2008-2010*	*Change in Delinquency Rates in 2003-2005*	*Change in Delinquency Rates in 2008-2010*
APL X Fraction OCC	-1.242***	-0.242	0.510*	-0.537**	0.154**	-0.204*	-1.812***	5.099
	(0.288)	(0.272)	(0.266)	(0.261)	(0.0786)	(0.107)	(0.563)	(3.212)
Change in CRA lending			-0.0381	0.0956**	-0.0166*	0.0251	0.167**	-3.520***
			(0.0393)	(0.0422)	(0.00953)	(0.0163)	(0.0710)	(0.492)

Robustness V: Bank-Holding Company

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Change in Loan Amount in 2003-2005	*Change in Loan Amount in 2007-2009*	*Change in House Prices in 2003-2005*	*Change in House Prices in 2008-2010*	*Change in Employment in Non-Tradable Sector in 2003-2005*	*Change in Employment in Non-Tradable Sector in 2008-2010*	*Change in Delinquency Rates in 2003-2005*	*Change in Delinquency Rates in 2008-2010*
APL X Fraction OCC	0.820***	-1.001***	0.523**	-0.565***	0.174**	-0.209**	-2.002***	6.701**
	(0.207)	(0.350)	(0.239)	(0.199)	(0.0741)	(0.0969)	(0.536)	(2.998)
APL	-0.356***	0.335***	-0.227***	0.202***	-0.0625***	0.0648**	0.765***	-2.804***
	(0.0661)	(0.119)	(0.0721)	(0.0642)	(0.0215)	(0.0305)	(0.168)	(1.006)
Fraction OCC	-0.510***	1.127***	-0.269	0.418***	-0.0762	0.0158	1.611***	-7.948***
	(0.149)	(0.231)	(0.181)	(0.153)	(0.0579)	(0.0526)	(0.371)	(2.048)
Change in Median Income	1.240***	1.056***	1.824***	0.273	0.0874	0.165	-1.518***	-1.936
	(0.173)	(0.317)	(0.516)	(0.181)	(0.0563)	(0.118)	(0.433)	(2.437)
Change in Population	1.785***	1.125*	1.094***	0.351	0.919***	0.258	-1.251**	-17.42***
	(0.250)	(0.575)	(0.250)	(0.518)	(0.0949)	(0.215)	(0.605)	(5.636)
Elasticity	-0.00492	0.0206	-0.0327**	-0.0180**	0.00154	0.00225	-0.00767	-0.201**
	(0.00773)	(0.0163)	(0.0136)	(0.00713)	(0.00287)	(0.00289)	(0.0198)	(0.0806)
Securitization boom between 2003-2005	0.954***		0.427		0.122***		-0.199	
	(0.129)		(0.348)		(0.0335)		(0.306)	
Securitization boom between 2002-2006		-0.514**		-0.802***		-0.106***		9.660***
		(0.256)		(0.108)		(0.0367)		(1.558)
Observations	769	769	459	478	532	538	769	769
R-squared	0.478	0.250	0.535	0.478	0.246	0.066	0.118	0.463

Other Robustness Checks

- Only APL States
- JP Morgan Chase/Countrywide
- Outliers: Arizona and Nevada

Aggregate Impact

- How much of the increase in house prices can be attributed to a direct effect of an outward shift in the credit supply?
- We can integrate our estimated effect to compute the economy wide magnitude of our results.
- Compute the ratio between "Fraction OCC x APL" in the loan amount and in the house prices estimations.
- For each county, we compute the increase in loan amount minus the 10% decile.
- That increase in loan amount times the ratio gives the effect on house prices and then take the average across counties.
- For boom of 2003 to 2005: our channel explains 52% of boom in house prices
- For bust of 2008 to 2010: our channel explains 67% of decline in house prices
- Similarly for employment and delinquency rates.
- If consider only the increase in subprime lending, it explains about 20%-25% of boom and bust of house prices.
- Similarly, if we consider only the APL states

Conclusion

- A change in banking regulation with differential effects on APL states versus the ones without, and on counties with a different presence of national banks provides us with a novel identification strategy to investigate the role of the supply of credit on the boom and bust cycle.

- Credit expansion (especially to riskier borrowers) may induce a boom-bust cycle in the real economy.

- **Time inconsistency of financial regulation: short-term consequences can be very different from long-term ones.**