Policy Uncertainty and Bank Mortgage Credit

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Motivation: Uncertainty and Investment

- Policy uncertainty can affect the behavior of firms through various channels.
  - Industry regulation, monetary and trade policy, taxation, etc.
- Nonfinancial firms cut back investment expenditures when they face policy uncertainty around elections (Julio and Yook 2012; Jens 2017).
  - Irreversibility increases the information value of waiting to invest (Bernanke 1983)
- Banks operate in a heavily regulated industry, likely face more uncertainty than nonfinancial firms when the political landscape changes.
- Their response to the uncertainty may have a riffle effect in the economy.
- Would banks reduce the supply of mortgage credit in the face of policy uncertainty given that many mortgage loans are at least partially irreversible?

Identification Challenges

Identifying the effect of uncertainty on bank lending is empirically challenging.

1. Uncertainties affect all economic agents including households:
   - Demand for credit will likely be lower.
   - Any observable change in bank lending is an equilibrium outcome reflecting both credit supply and demand.

2. Endogeneity: economic downturn itself can generate a great deal of political uncertainty.
   - Establishing a causal relationship requires an exogenous measure of political uncertainty.

Identification Strategy I

Utilize high-frequency, geographically granular loan-level data on bank mortgage credit: Confidential HMDA data

1. Diff-in-diff analysis with state-time fixed effects

2. Exact loan transaction dates allow higher frequency analysis.

3. Location information for each loan enables:
   - State- and county-level analysis:
   - Control for each state's or county's time-varying demand for mortgage credit and other local economic conditions.

Identification Strategy I

3. Exploit that many banks lend outside their home states
   - Policy uncertainty in banks' home state is unlikely to affect home purchase demand in foreign states.
   - Check whether banks' lending to their foreign states changes when they face policy uncertainty in their home state.

4. Do banks with varying characteristics respond to political uncertainty differently?
   - A change in lending behavior will vary with banks' characteristics if it was driven by supply rather than demand for loans.

Identification Strategy II

Use the timing of U.S. gubernatorial elections as a plausibly exogenous measure of variation in policy uncertainty:

1. The election increases policy uncertainty for banks headquartered in the state:
   - Broad based changes in various state policies
     - State taxes, subsidies, budget, procurement, etc.
   - Changes in state level bank regulation and supervision
     - A state's governor has a strong influence over the appointment of the state bank commissioner.
     - Regulatory powers include chartering, rulemaking, supervision, and enforcement.

Identification Strategy II–cont'd

2. The election timing is uncorrelated with other factors that determine economic activity.
   - Predetermined by law $\rightarrow$ orthogonal to the state's economic conditions.
   - Staggered across states $\rightarrow$ net out national business cycle effects.
   - A quasi-natural experiment to identify the link between policy uncertainty and various economic outcomes:
     - International studies: Julio and Yook (2012, 2016)
     - U.S. studies using gubernatorial elections: Gao and Qi (2013), Colak et al. (2017), Jens (2017), and Atanassov, Julio, and Leng (2016)

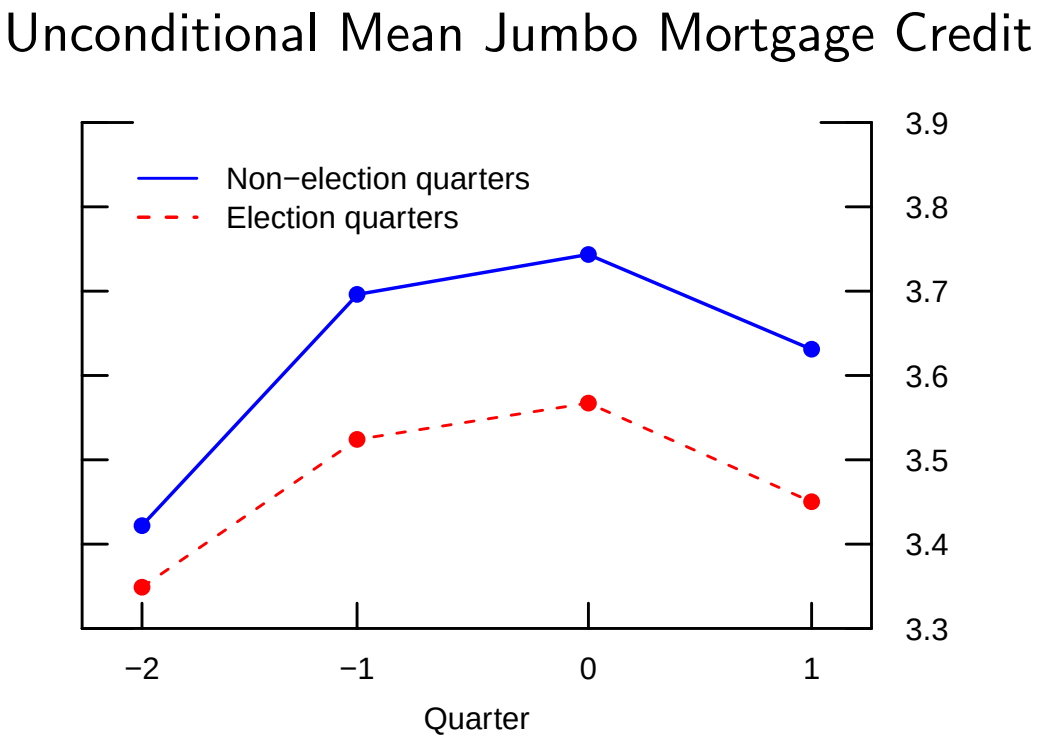
Investment and Irreversibility

We focus on relatively more irreversible loans:

1. Loans that banks obtain to hold in their balance sheets
   - It is difficult to sell seasoned loans, making them a relatively irreversible investment.
     - Loans can become delinquent while in banks' possession.
     - Even well-performing loans have to meet various requirements to be sold as seasoned loans to Fannie Mae and Freddie Mac.

2. Jumbo (non-conforming) loans
   - Cannot be purchased or securitized by GSEs.
   - Less liquid than conforming loans, thus more irreversible.

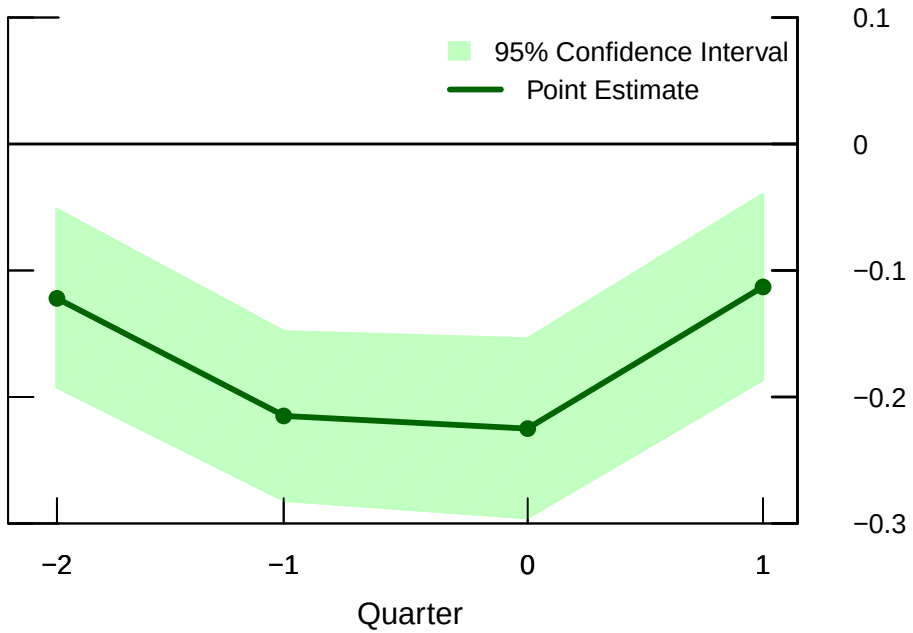
Summary of results



- Unconditional mean jumbo mortgage volume is lower for banks facing elections in their home states.
- The gap widens as we move closer to the election quarter.

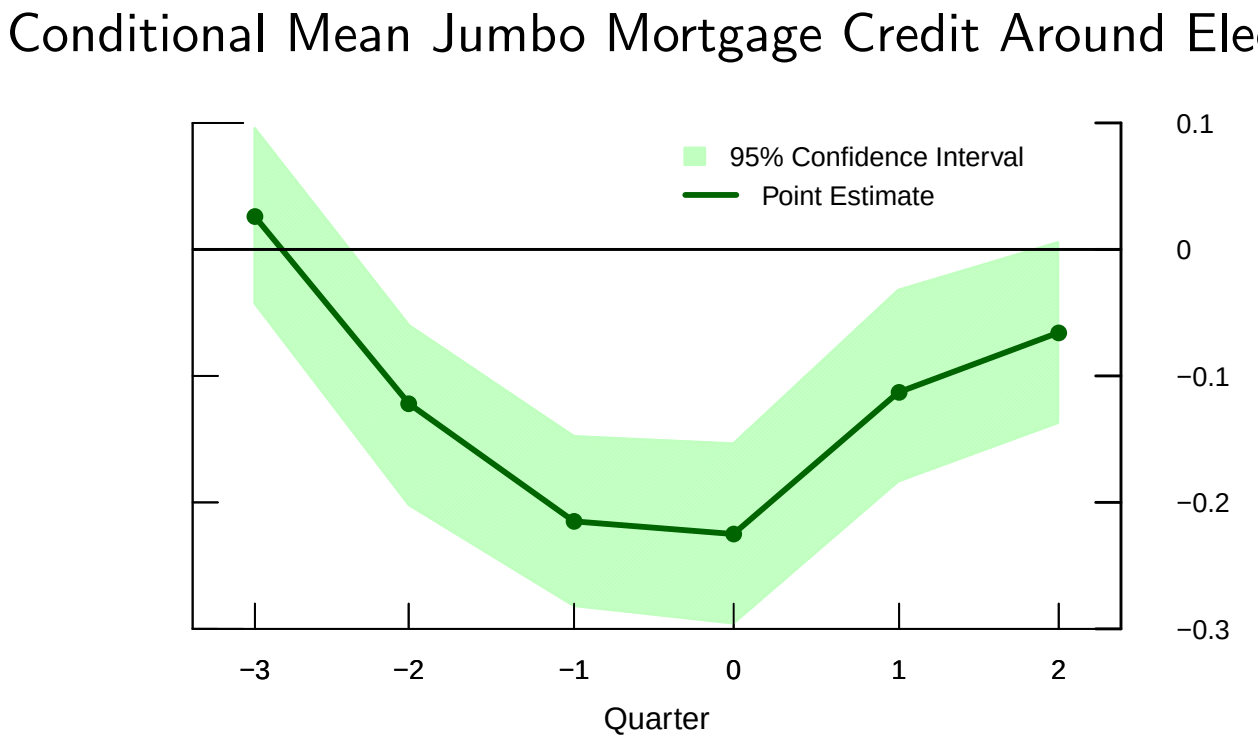
Summary of results

Conditional Mean Jumbo Mortgage Credit Around Elections



- Banks reduce jumbo mortgage credit supply in the quarters before elections:
  - 13% to 25% reduction in volume in baseline regressions.
  - Reduce lending in both banks' home state and foreign states.

Summary of results



Summary of results–cont'd

- Reduction in bank lending is more pronounced when uncertainty about the election outcome is higher:
  - Close elections.
  - Elections where incumbent governors are term-limited.
- Results hold controlling for demand.
  - State-time fixed effects in all regressions.
  - Results hold at the county level.
  - Banks reduce lending in their foreign states as well.
  - Variation across banks:
    - State-chartered banks are more sensitive to policy uncertainty than are national banks.
    - More risky banks tend to cut lending more, likely because they are more vulnerable to increased policy uncertainty.
- Additional tests

Related literature

- Policy uncertainty and housing markets
  - Canes-Wrone and Park (2014): home prices and home sales decline in the year leading up to gubernatorial elections.
- Policy uncertainty and financial institutions' credit supply
  - Gissler, Oldfather, and Ruffino (2016)
  - Bordo et al (2016), Alessandri and Bottero (2017), Berger et al (2018)
    - Bank credit growth is negatively related to EPU index.
    - Baker, Bloom, and Davis (2016): "identifying a causal relation between the EPU index and economic activities is difficult because policy responds to economic conditions and is likely to be forward looking."
  - Kim (2017): syndicated loan rates and uncertainty
- Role of multi-market banks in the cross-market spillover of shocks
  - Peek and Rosengren (1997, 2000), Berrospide, Black, and Keaton (2016), Schnabl (2012)

Data

Mortgage lending information: Confidential HMDA.

- Loan level data for commercial banks' mortgage lending between 1990 and 2014 at daily frequency
- Data cleaning is similar to previous literature
  - Home purchase loans for owner-occupied houses only
  - Exclude mortgages subsidized by FHA, VA, and other gov't programs
  - Exclude very small and very large loans
- Aggregate the volume and number of loans originated and loans held (not sold within the same calendar year) at the bank-state-quarter level
- Include a bank for a 4-year election cycle if it has originated and held loans in 3 out of 4 quarters in the pre-election year

Bank balance sheet information: merger adjusted Call Reports

- Variables: Size, core deposits, return on equity, home mortgages

Data-Gubernatorial Elections

- Primary source: CQ Press Voting and Elections Collection.
- 323 elections across 48 states between 1990 and 2014.
- Include election outcome, vote percentages, and whether the incumbent governor faces a term-limit.

Election variables	N	$I = 1$	Mean	Median	Std. Dev.
Vote Margin (%)	323		15.84	12.67	13.40
Close ($VM < 5\%$)	323	83	0.26	0	0.44
Wide ($VM > 15\%$)	323	137	0.42	0	0.49
Term limit	323	80	0.25	0	0.43
New governor	323	172	0.53	1	0.50

Methodology

Baseline specification:

$$Y_{i,s,t} = \alpha_{i,s} + \alpha_{s,t} + \sum_{k=-2}^{1} \beta_k \text{Elect}_{i,h,t+k} + X'\theta + \varepsilon_{i,s,t}.$$

- Diff-in-diff estimation.
  - Exploit the difference in the bank lending behavior between election quarters and non-election quarters as well as the differences across banks headquartered in different states and facing elections in different years.
- $Y_{i,s,t}$: bank i's mortgage lending in state s in quarter t.
- $Elect_{i,h,t+k}$ (k = -2, -1, 0, 1), are set to one if bank i's home state h holds a gubernatorial election in quarter $t-k$, and zero otherwise.
- $Elect_t$: the quarter right before an election, from September to November.
- Control variables (X) are lagged by one quarter.

Bank-level Analysis

	(1) log(1+Volume held)	(2) log(1+Number held)	(3) Volume held/lag(assets)
$Elect_{t-2}$	-0.078	-0.035*	-0.006
	[0.080]	[0.021]	[0.011]
$Elect_{t-1}$	-0.265***	-0.061***	-0.023**
	[0.080]	[0.021]	[0.011]
$Elect_t$	-0.445***	-0.109***	-0.034***
	[0.080]	[0.021]	[0.011]
$Elect_{t+1}$	-0.564***	-0.129***	-0.041***
	[0.080]	[0.021]	[0.011]
Size	0.787***	0.428***	-0.119***
	[0.040]	[0.010]	[0.006]
Home mortgages	3.273***	1.728***	0.534***
	[0.252]	[0.066]	[0.035]
Core deposits	-0.608***	-0.197***	-0.137***
	[0.219]	[0.057]	[0.031]
Return on equity	2.109***	0.553***	-0.366***
	[0.697]	[0.182]	[0.098]
Bank Fixed Effects	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
Observations	49,597	49,597	49,365
R^2	0.470	0.747	0.469

Bank/State-level Analysis: Baseline Results

Variables	(1) log(1+Volume held)	(2) log(1+Number held)	(3) Volume held/lag(assets)
$Elect_{t-2}$	-0.122***	-0.047***	-0.007***
	[0.036]	[0.008]	[0.001]
$Elect_{t-1}$	-0.215***	-0.042***	-0.009***
	[0.034]	[0.008]	[0.001]
$Elect_{t}$	-0.225***	-0.062***	-0.006***
	[0.036]	[0.008]	[0.001]
$Elect_{t+1}$	-0.113***	-0.043***	-0.009***
	[0.037]	[0.008]	[0.001]
Size	0.550***	0.242***	-0.025***
	[0.044]	[0.015]	[0.002]
Home mortgages	2.876***	0.902***	0.048***
	[0.228]	[0.077]	[0.013]
Core deposits	0.355	0.193***	0.032***
	[0.236]	[0.073]	[0.008]
Return on equity	-0.259	-0.134	-0.049**
	[0.413]	[0.117]	[0.022]
Bank-State Fixed Effects	Yes	Yes	Yes
State-Time Fixed Effects	Yes	Yes	Yes
Observations	207,535	207,535	206,544
R^2	0.574	0.677	0.585

Baseline results: Interpretation

- Overall, the results have two important implications:

- Policy uncertainty matters for banks' mortgage lending decisions.
  - Policy uncertainty has a real effect on housing markets through the financial intermediaries.

- The coefficients reflect reduction in lending in both banks' home states and foreign states.
  - Policy uncertainty in one state has a spill-over effect to other states through financial institutions serving multiple states.

Close and Term Limited Elections

Are the results driven by the uncertainty generated by elections?

- Test whether the effect is higher when there is higher degree of uncertainty:

$$Y_{i,s,t} = \alpha_{i,s} + \alpha_{s,t} + \sum_{k=-2}^{1} \beta_k \text{Elect}_{i,h,t+k} + \sum_{k=-2}^{1} \gamma_k \text{Elect}_{i,h,t+k} \cdot Z_{i,h,t} + X'\theta + \varepsilon_{i,s,t},$$

where Z captures the degree of electorial uncertainty:

  - Close election dummy: vote margin less than 5 %
  - Wide margin dummy: vote margin greater than 15 %
  - Dummy variable indicating whether an incumbent governor faces a term limit

Close and Term Limited Elections

Variables	Close	Wide margin	Term limited
$Elect_{t-2}$	-0.122***	-0.122***	-0.060
	[0.037]	[0.041]	[0.041]
$Elect_{t-1}$	-0.190***	-0.256***	-0.104***
	[0.036]	[0.038]	[0.040]
$Elect_{t}$	-0.221***	-0.268***	-0.142***
	[0.038]	[0.040]	[0.042]
$Elect_{t+1}$	-0.082**	-0.182***	-0.052
	[0.040]	[0.043]	[0.043]
$Elect_{t-2} \times Close$	-0.002		
	[0.059]		
$Elect_{t-1} \times Close$	-0.107*		
	[0.059]		
$Elect_{t} \times Close$	-0.017		
	[0.061]		
$Elect_{t+1} \times Close$	-0.131*		
	[0.071]		
$Elect_{t-2} \times Wide$		0.000	
		[0.052]	
$Elect_{t-1} \times Wide$		0.105**	
		[0.050]	
$Elect_{t} \times Wide$		0.113**	
		[0.054]	
$Elect_{t+1} \times Wide$		0.182***	
		[0.059]	
$Elect_{t-2} \times Term\ Limited$			-0.180***
			[0.058]
$Elect_{t-1} \times Term\ Limited$			-0.317***
			[0.058]
$Elect_{t} \times Term\ Limited$			-0.236***
			[0.060]
$Elect_{t+1} \times Term\ Limited$			-0.176***
			[0.063]

Supply vs Demand for Mortgage Credit

1. Economic Conditions Across States
2. County-Level Analysis
3. Mortgage Credit in Home States vs. Foreign States
4. Bank Characteristics
   - State vs. National Banks
   - Risk-taking behavior

1: Economic Conditions Across States

	Equal-Weighted Across States/Years		Sample-Weighted Averages	
	Election Years	Nonelection Years	Election Years	Nonelection Years
Real GDP Growth (%)				
Mean	2.74	2.35	2.30	2.86
S.D.	[2.82]	[2.92]	[2.80]	[2.58]
Unemployement Rate (%)				
Mean	5.69	5.76	5.69	5.66
S.D.	[1.86]	[1.88]	[1.80]	[1.83]

- If general economic conditions are systematically worse in election years, they can depress the local housing market and the demand for mortgage credit.
- The patterns are similar across election years and non-election years, when looking at both equal weighted and sample weighted averages.

2: Bank/County-Level Analysis

	(1) log(1+Volume held)	(2) log(1+Number held)	(3) Volume held/lag(assets)
$Elect_{t-2}$	-0.086***	-0.017***	-0.001***
	[0.007]	[0.001]	[0.000]
$Elect_{t-1}$	-0.050***	-0.010***	-0.001***
	[0.007]	[0.001]	[0.000]
$Elect_{t}$	-0.068***	-0.015***	-0.000***
	[0.008]	[0.001]	[0.000]
$Elect_{t+1}$	-0.071***	-0.016***	-0.001***
	[0.008]	[0.001]	[0.000]
	[0.093]	[0.018]	[0.001]
Bank-level controls	Yes	Yes	Yes
Bank-County Fixed Effects	Yes	Yes	Yes
County-Time Fixed Effects	Yes	Yes	Yes
Observations	2,268,856	2,268,856	2,263,395
R^2	0.533	0.612	0.561

3: Mortgage Credit in Home vs. Foreign States

- Compare loans extended in banks' home states and those in their foreign states.
- If the results are solely driven by a decline in demand, the reduction in loans should be concentrated in banks' home states.
- Explicitly capture the change in foreign states by interacting quarterly election dummies with a home state dummy.
  - Home state dummy is equal to one if the lending takes place in a bank's home state.

3: Mortgage Credit in Home vs. Foreign States

Variables	(1) log(1+Volume held)	(2) log(1+Number held)	(3) Volume held/lag(assets)
$Elect_{t-2}$	-0.146***	-0.059***	-0.006***
	[0.037]	[0.008]	[0.001]
$Elect_{t-1}$	-0.215***	-0.054***	-0.010***
	[0.035]	[0.008]	[0.001]
$Elect_t$	-0.124***	-0.043***	-0.000
	[0.037]	[0.009]	[0.001]
$Elect_{t+1}$	0.085**	0.003	0.005***
	[0.039]	[0.009]	[0.001]
$Elect_{t-2} \times$ *Home state*	0.163**	0.076***	-0.003
	[0.063]	[0.014]	[0.004]
$Elect_{t-1} \times$ *Home state*	0.020	0.074***	0.011***
	[0.062]	[0.015]	[0.004]
$Elect_t \times$ *Home state*	-0.576***	-0.108***	-0.036***
	[0.067]	[0.016]	[0.004]
$Elect_{t+1} \times$ *Home state*	-1.105***	-0.261***	-0.078***
	[0.073]	[0.016]	[0.004]
Bank-level controls	Yes	Yes	Yes
Bank-State Fixed Effects	Yes	Yes	Yes
State-Time Fixed Effects	Yes	Yes	Yes
Observations	207,535	207,535	206,544
R^2	0.575	0.678	0.587

4: Bank Characteristics (1): State vs. National Banks

Do state banks respond more strongly to uncertainty surrounding elections?

- State-chartered banks can be more sensitive:
  - They are supervised both by state and federal regulators
  - A state's governor has a strong influence over the appointment of the head of the state banking regulator (Saiz and Semenov 2014).
  - State regulators can implement identical rules differently than federal regulators (Agarwal et al 2014).
- The effect may also be limited:
  - Changes in a state's political landscape are broad-based and not limited to bank regulation (state taxes, subsidies, budget, and procurement).
  - Legislation has strengthened the authority of federal regulators relative to that of state regulators over time (Leverty and Grace, 2016).

4: Bank Characteristics (2): Risk-Taking Behavior

Does banks' risk-taking behavior affect their sensitivity to policy uncertainty?

- Risky banks would react more if they are likely more vulnerable to changes in policy regimes.
  - Banks' risk-taking behavior is associated with the probability of their survival, especially during crises.
- They may react less if risk taking tendency is persistent over time.
- Construct "high risk" dummy variables based on measures of risk-taking:
  - z-score: $$\frac{\overline{ROA}_{i,t} \times \frac{\textit{total equity}_{i,t}}{\textit{total assets}_{i,t}}}{sd(ROA_{i,t})}$$
  - equity ratio: ratio of total equity to total assets
  - credit risk: ratio of risk-weighted assets to total assets

4: Bank Characteristics and Policy Uncertainty

Variables	(1) State banks	(2) Z-score	(3) Equity ratio	(4) Credit risk
$Elect_{t-2}$	-0.120***	-0.066	-0.082**	-0.012
	[0.041]	[0.041]	[0.039]	[0.045]
$Elect_{t-1}$	-0.164***	-0.211***	-0.178***	-0.159***
	[0.039]	[0.040]	[0.038]	[0.041]
$Elect_{t}$	-0.134***	-0.216***	-0.208***	-0.179***
	[0.041]	[0.040]	[0.040]	[0.043]
$Elect_{t+1}$	-0.072	-0.151***	-0.101**	-0.143***
	[0.044]	[0.043]	[0.043]	[0.045]
$Elect_{t-2} \times$ *State bank*	-0.001			
	[0.046]			
$Elect_{t-1} \times$ *State bank*	-0.115**			
	[0.045]			
$Elect_{t} \times$ *State bank*	-0.204***			
	[0.048]			
$Elect_{t+1} \times$ *State bank*	-0.091*			
	[0.053]			
$Elect_{t-2} \times$ *High risk*		-0.142***	-0.104**	-0.192***
		[0.053]	[0.050]	[0.047]
$Elect_{t-1} \times$ *High risk*		0.001	-0.115**	-0.099**
		[0.052]	[0.048]	[0.045]
$Elect_{t} \times$ *High risk*		-0.025	-0.054	-0.070
		[0.052]	[0.051]	[0.047]
$Elect_{t+1} \times$ *High risk*		0.100*	-0.039	0.087*
		[0.055]	[0.055]	[0.053]

Additional Tests

1. Jumbo Loan Origination

2. Conforming Loans

3. Robustness Tests
   - Pseudo Elections
   - Excluding states coinciding with presidential elections
   - Excluding large states

Bank/State-level Analysis: Jumbo Origination

Variables	(1) log(1+Volume originated)	(2) log(1+Number originated)	(3) Volume originated/lag(assets)
$Elect_{t-2}$	-0.079**	-0.031***	-0.010***
	[0.036]	[0.008]	[0.002]
$Elect_{t-1}$	-0.106***	-0.031***	-0.011***
	[0.036]	[0.008]	[0.002]
$Elect_{t}$	-0.110***	-0.041***	-0.007***
	[0.035]	[0.008]	[0.002]
$Elect_{t+1}$	-0.019	-0.017**	-0.010***
	[0.036]	[0.008]	[0.002]
Bank-level controls	Yes	Yes	Yes
Bank-State Fixed Effects	Yes	Yes	Yes
State-Time Fixed Effects	Yes	Yes	Yes
Observations	207,535	207,535	206,544
R-squared	0.606	0.725	0.644

Alternative Sample: Conforming Loans

Variables	(1) log(1 + Volume held)	(2) log(1 + Number held)	(3) Volume held/lag(assets)
$Elect_{t-2}$	-0.092***	-0.066***	-0.010***
	[0.022]	[0.008]	[0.001]
$Elect_{t-1}$	-0.113***	-0.065***	-0.012***
	[0.021]	[0.008]	[0.001]
$Elect_{t}$	-0.157***	-0.092***	-0.009***
	[0.023]	[0.009]	[0.001]
$Elect_{t+1}$	-0.123***	-0.067***	-0.011***
	[0.023]	[0.009]	[0.001]
Bank-level controls	Yes	Yes	Yes
Bank-State Fixed Effects	Yes	Yes	Yes
State-Time Fixed Effects	Yes	Yes	Yes
Observations	450,597	450,597	448,893
R^2	0.614	0.697	0.576

Robustness Checks

Variables	(1) Pseudo-election dates	(2) Excluding states coinciding with pres. elections	(3) Excluding large states
$Elect_{t-2}$	0.025	-0.140**	-0.124***
	[0.030]	[0.064]	[0.037]
$Elect_{t-1}$	0.111***	-0.268***	-0.205***
	[0.029]	[0.061]	[0.035]
$Elect_t$	0.031	-0.313***	-0.227***
	[0.029]	[0.062]	[0.038]
$Elect_{t+1}$	0.010	-0.150**	-0.121***
	[0.029]	[0.067]	[0.038]
Bank-level controls	Yes	Yes	Yes
Bank-State Fixed Effects	Yes	Yes	Yes
State-Time Fixed Effects	Yes	Yes	Yes
Observations	207,535	170,536	184,842
R^2	0.574	0.570	0.565

* Large states are California, Florida, and New York

Conclusion

- Banks reduce mortgage credit supply in the quarters before their home state holds a gubernatorial election.
- Policy uncertainty matters for banks' mortgage lending decisions.
- Policy uncertainty in one state has a spill-over effect to other states through financial institutions serving multiple states.
- Policy uncertainty has a real effect on housing markets through the financial intermediaries.

Summary Statistics

	N	Mean	Median	Std. Dev.
Loan Variables				
Volume of jumbo loans held$_{i,t}$ (unit: \$M)	49,597	11.14	1.04	45.92
Number of jumbo loans held$_{i,t}$	49,597	17.26	2	68.64
Volume of jumbo loans held$_{i,t}$/Total assets$_{i,t-4}$ (%)	49,366	0.28	0.11	0.49
Volume of jumbo loans originated$_{i,t}$ (unit: \$M)	49,597	14.82	1.28	61.15
Number of jumbo loans originated$_{i,t}$	49,597	24.88	2	101.05
Volume of jumbo loans originated$_{i,t}$/Total assets$_{i,t-4}$ (%)	49,366	0.37	0.13	0.71
Other Variables				
Total assets$_{i,t-1}$ (unit: \$B)	49,597	6.84	0.88	22.33
Core deposits$_{i,t-1}$	49,597	0.69	0.71	0.13
ROE$_{i,t-1}$	49,597	0.03	0.03	0.02
Home mortgages$_{i,t}$	49,597	0.21	0.19	0.11
State bank$_i$	49,597	0.59	1.00	0.49
Z-score$_{i,t-4}$	48,200	196.00	153.46	165.92
Equity ratio$_{i,t-4}$	49,366	0.09	0.08	0.03
Credit risk$_{i,t-4}$	48,914	0.69	0.70	0.12
Elect$_t$	49,597	0.24	0	0.43