Ditching the Middle Class with Financial Regulation

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Financial Regulation

- Financial regulation aims at guaranteeing stability, transparency and fairness

- New regulations are often implemented in the aftermath of scandals and crises

- The new rules change institutions' incentives in ways that are hard to predict, i.e.

  $\longrightarrow$ they may prove harmful rather than beneficial for the end consumer

- **This paper:** unintended consequences of Dodd-Frank on mortgage lending

The Dodd-Frank Wall Street Reform and Consumer Protection Act

Objectives (among others):

- Prevent predatory lending to subprime borrowers

- Improve borrowing conditions for middle class households

But it also increased the fixed and per-loan costs of originating mortgages:

- Financial institutions shifted their mortgage origination towards larger loans

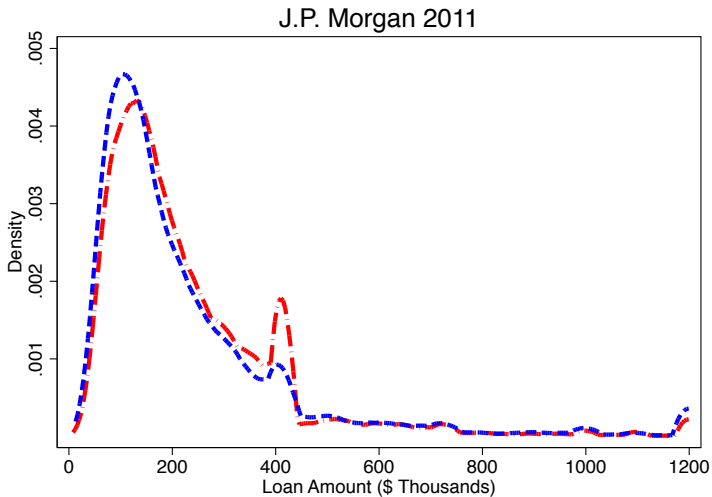- The shift in lending is stronger for larger banks

Overall:

- Lenders reduced credit to middle-class households by 15%

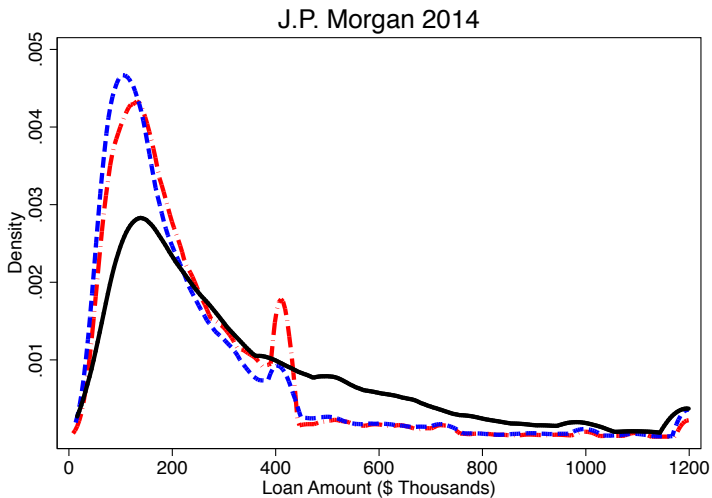- Lenders increased credit to wealthy households by 21%

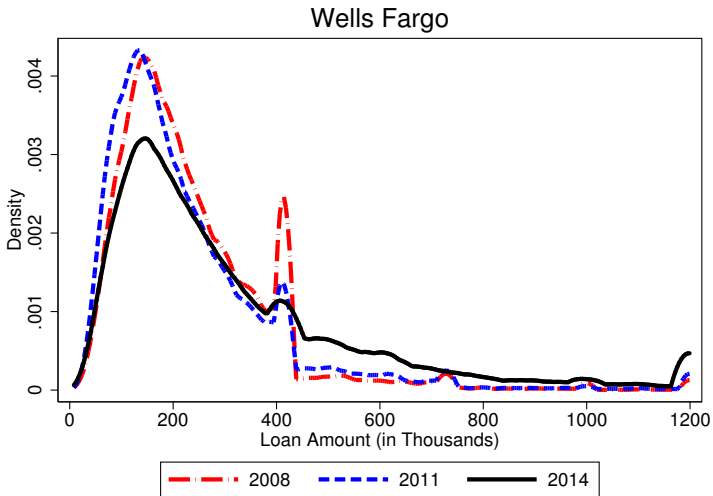## Mortgage Lending of J.P. Morgan: 2008 – 2014

J.P. Morgan 2008

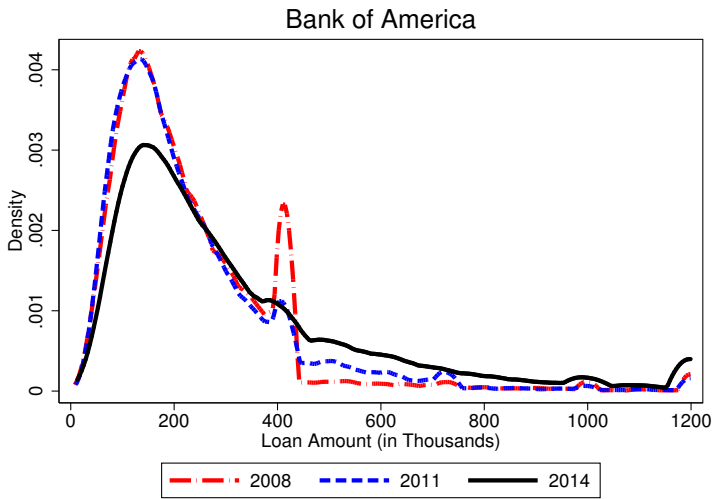## Mortgage Lending of J.P. Morgan: 2008 – 2014

Mortgage Lending of J.P. Morgan: 2008 – 2014

Mortgage Lending of Wells Fargo: 2008 – 2014

Wells Fargo

Mortgage Lending of Bank of America: 2008 – 2014

Bank of America

Mortgage Lending of Large and Small Banks: 2008 – 2014
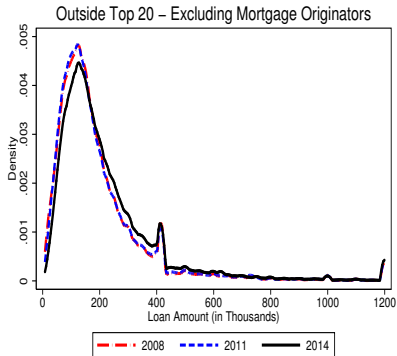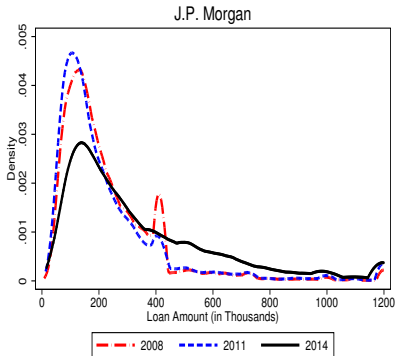
Change in mortgage origination by lender size: 2008 – 2014
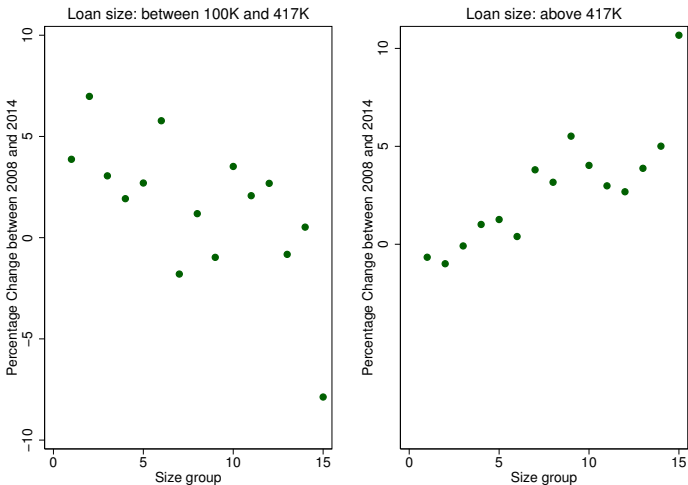
The change in lending is (almost) monotonic in originator size

Change in Lending by Small and Large Lenders

- Change in lending before and after Dodd-Frank by loan size

- These results control for determinants of demand such as income and race
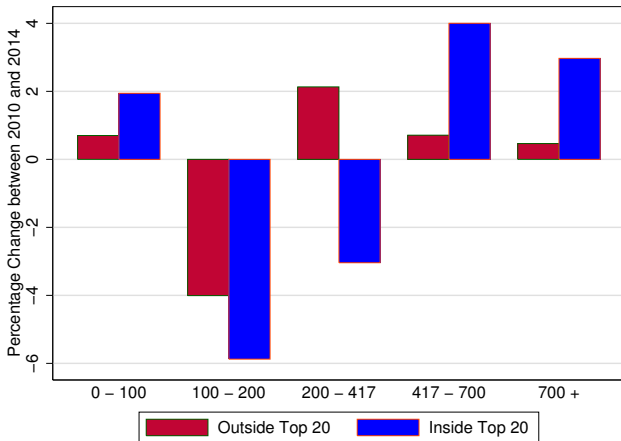
Our Interpretation

Dodd-Frank reduced the profitability of small loans, compared to large loans

But large banks had more flexibility in changing their lending for (at least) four reasons:

1. Large banks operate in multiple businesses

2. Large banks can keep jumbo loans on their books

3. More cross-selling opportunities to wealthy customers for large banks

4. Large banks operate in several counties

Alternative Explanations We Rule Out

- Risk-Management provisions in Dodd-Frank

  Bank risk does not correlate with changes in lending

- Wealth polarization after the financial crisis

  Similar results for counties that experience more and less polarization

- Pre-crisis stock of loans to middle-class

  Results stronger in counties with lower stock of loans to the middle class

- Collapse of the private-label securitization

  Large banks did not securitize more: the market was frozen from 2008 onwards

Data

HMDA data for the years 2007– 2014:

- Universe of loan applications to banks with more than $\approx$ \$40 millions in assets

- Approval and denial information

- Purpose and type of loan

- Characteristics of the applicant and the lender

  $\longrightarrow$ only include home-occupied new purchases secured by a first lien

Zillow data:

- House prices and foreclosures at the ZIP code level

American Community Survey (ACS) data:

- Income and mortgage distribution at the county level

Summary Statistics

Panel A. Approved Loans

	Obs.	Mean	St.dev.	5th	25th	50th	75th	95th
Loan Amount ($000)	13,532,723	228.2	162.2	65.0	124.0	186.0	285.0	518.0
Applicant Income ($000)	13,532,723	95.0	121.8	28.0	47.0	71.0	109.0	225.0
Black	13,532,723	.070	.255	0	0	0	0	1
Asian	13,532,723	.070	.253	0	0	0	0	1
Latino	13,532,723	.095	.293	0	0	0	0	1
Median House Price ($000)	13,532,723	219.1	199.6	101.4	132.6	184.1	264.0	459.5
Share Foreclosed (%)	10,516,574	.079	.085	.004	.023	.052	.103	.268

Summary Statistics

| | **Panel B. Rejected Loans** | | | | | | | |
	Obs.	Mean	St.dev.	5th	25th	50th	75th	95th
Loan Amount ($000)	5,983,994	225.3	182.1	45.0	106.0	176.0	290.0	563.0
Applicant Income ($000)	5,983,994	92.8	151.8	23.0	42.0	65.0	104.0	231.0
Black	5,983,994	.121	.326	0	0	0	0	1
Asian	5,983,994	.078	.269	0	0	0	0	1
Latino	5,983,994	.141	.348	0	0	0	0	1
Median House Price ($000)	5,983,994	229.1	127.0	99.1	134.2	187.6	297.9	497.6
Share Foreclosed (%)	4,475,810	8.583	9.035	.409	2.302	5.738	11.362	29.119

Empirical Strategy

Tests that change in lending is driven by supply side:

- Change in loan amount in different loan-size categories – intensive margin

- Change in number of loans in different loan-size categories – extensive margin

- Change in lending standards in different loan-size categories

Loan size categories:

$0K – $100K	$100K-$200K	$200K-$417K	$417K-$700K	$700K+
	⇓	⇓	⇑	⇑

Empirical Strategy

- We exploit variation in household's exposure to large banks

- The higher the fraction of local lending by large banks, the higher the exposure

- We compare origination across counties that are otherwise similar
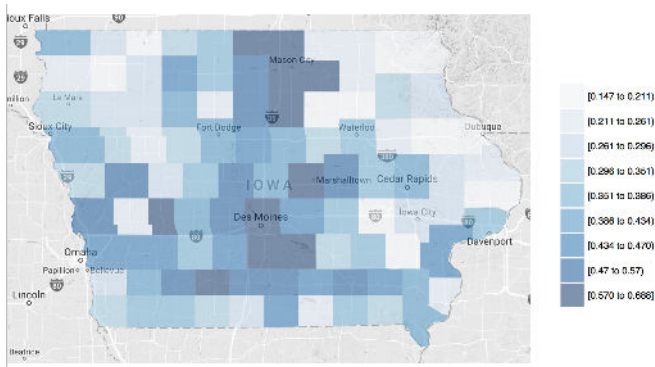
Percent Originations by Top 20 Institutions across Iowan Counties

Percentage of Lending by Large Originators – Variation Across Counties
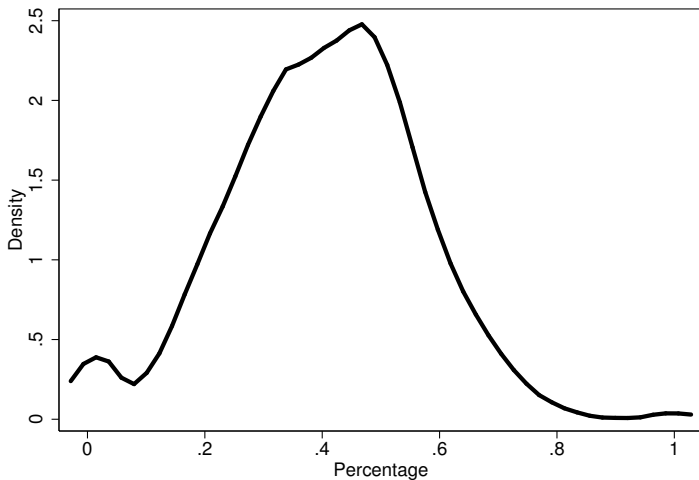
kernel = epanechnikov, bandwidth = 0.0285

Empirical Strategy

Baseline strategy

- Exploit variation in percentage of lending by Top 20 US originators

- Exploit variation within counties and over time – before and after Dodd-Frank

Instrumental variable strategy

- Instrument percentage of lending by Top 20 US originators with pre-crisis variation

- Use 2007 percentages, because not affected by the crisis

Propensity score matching

- Match counties on observables, including geographic location

- Compare similar counties with different exposures to large originators

Baseline Regression

$$Log(LoanAmount)_{i,k,t} = \alpha + \beta \; Top20\_Share_{k,t} \times DoddFrank_t + \gamma \; Top20\_Share_{k,t}$$
$$+ \; X'_{i,k,t}\delta + D'_{k,t}\phi + \eta_k + \eta_t + \epsilon_{i,k,t},$$

For county k and year t,

- $Log(LoanAmount)_{i,k,t}$: log amount of mortgage i

- $Top20\_Share_{k,t}$: percentage of loans generated by top 20 mortgage originators

- $DoddFrank_t$: dummy equal to 1 for the years after 2010

- $X'_{i,k,t}$: individual-level characteristics – Income, Black, Asian, Latino

- $D'_{k,t}$: county-level characteristics – median house price, racial composition

- η_k, η_t: county- and year-effects

Baseline Regression

Estimate baseline specification across groups of different loan sizes

	Below \$100K	**\$100K-\$200K**	**\$200K-\$417K**	**\$417K-\$700K**	**Above \$700K**
Top20× Dodd-Frank	-0.022 (0.144)	-0.022*** (0.000)	-0.012* (0.094)	0.043*** (0.000)	0.241*** (0.000)
Top20	-0.021 (0.199)	0.012 (0.117)	-0.003 (0.762)	-0.032** (0.012)	-0.094*** (0.009)
Log(Income)	0.098*** (0.000)	0.151*** (0.000)	0.214*** (0.000)	0.110*** (0.000)	0.159*** (0.000)
House Price	0.029 (0.211)	0.162*** (0.000)	0.121*** (0.000)	0.027** (0.041)	0.137*** (0.000)
Individual Ch.	✓	✓	✓	✓	✓
County Ch.	✓	✓	✓	✓	✓
Year F.E.	✓	✓	✓	✓	✓
County F.E.	✓	✓	✓	✓	✓
Observations	1,729,513	4,463,568	4,094,783	845,591	222,922
Adjusted R^2	0.061	0.170	0.286	0.190	0.286

Robustness of Baseline Regression Results

Extensive margin:

- Similar results when we run the analysis at the Zip-Code level

Robustness exercises:

- Use Top 5 or Top 100 lender dummies

- Use the other quantiles of the house price distribution

- Include interactions between the Dodd-Frank dummy and the control variables

- Include state-year fixed-effects

- Focus on sand-states, i.e., California, Nevada, Florida and Arizona

- Exclude non-bank lenders

- Include zip-code level yearly foreclosures

- Local concentration of banking unrelated to our measure
  (Sharfstein & Sunderam, 2016)

Using Other Thresholds for Top Lenders

We use different thresholds to define Top banks.

Results should be similar if the effect is monotonic in the size of the lender.

Top 5 and Top 100 Lenders

Panel A. Top 5	Below \$100K	\$100K-\$200K	\$200K-\$417K	\$417K-\$700K	Above \$700K
Top 5 × Dodd-Frank	0.019	-0.042***	-0.041***	0.054***	0.316***
	(0.460)	(0.000)	(0.000)	(0.000)	(0.000)
Year and County F. E.	✓	✓	✓	✓	✓
Observations	1,729,513	4,463,568	4,094,783	845,591	222,922
Adjusted R^2	0.061	0.170	0.286	0.190	0.288

Panel B. Top 100	Below \$100K	\$100K-\$200K	\$200K-\$417K	\$417K-\$700K	Above \$700K
Top 100 × Dodd-Frank	-0.012	-0.025***	0.000	0.026**	0.218***
	(0.312)	(0.000)	(0.940)	(0.029)	(0.000)
Year and County F. E.	✓	✓	✓	✓	✓
Observations	1,729,513	4,463,568	4,094,783	845,591	222,922
Adjusted R^2	0.061	0.170	0.286	0.190	0.285

Demand for Loans 1

We use alternative ways to control directly for the demand for housing

Below, we control for the full distribution of house prices in the county, as opposed to the median

Quantiles House Prices	Below \$100K	\$100K-\$200K	\$200K-\$417K	\$417K-\$700K	Above \$700K
Top 20×Dodd-Frank	-0.027*	-0.017***	-0.015**	0.031***	0.214***
	(0.065)	(0.006)	(0.045)	(0.007)	(0.000)
Year and County F. E.	✓	✓	✓	✓	✓
Observations	1,729,513	4,463,568	4,094,783	845,591	222,922
Adjusted R^2	0.061	0.170	0.286	0.191	0.287

Demand for Loans 2

We use alternative ways to control directly for the demand for housing

Below, we allow for a full set of interactions of the demographic controls with the Dodd-Frank dummy

This allows for systematic changes in county demographics before and after Dodd-Frank

All Interactions	**Below $100K**	**$100K-$200K**	**$200K-$417K**	**$417K-$700K**	**Above $700K**
Top 20×Dodd-Frank	-0.021	-0.013**	-0.004	0.048***	0.095***
	(0.171)	(0.037)	(0.635)	(0.000)	(0.000)
Year and County F. E.	✓	✓	✓	✓	✓
Observations	1,729,513	4,463,568	4,094,783	845,591	222,922
Adjusted R^2	0.061	0.170	0.286	0.192	0.290

Local Economic Shocks

Local economic shocks might drive the results.

Below, we add a full set of state×year fixed effects to address this point

Local shocks	Below $100K	$100K-$200K	$200K-$417K	$417K-$700K	Above $700K
Top 20×Dodd-Frank	0.014	-0.022***	-0.002	0.115***	0.261***
	(0.445)	(0.001)	(0.788)	(0.000)	(0.000)
State*Year and County F. E.	✓	✓	✓	✓	✓
Observations	1,729,513	4,463,568	4,094,783	845,591	222,922
Adjusted R^2	0.063	0.171	0.287	0.193	0.291

Concentration Local Lending Markets

In concentrated lending markets, rates react less to monetary policy interventions (Scharfstein and Sunderam, 2016).

We verify our measure of Top 20 bank penetration is unrelated to market concentration

Concentration Lending	Below $100K	$100K-$200K	$200K-$417K	$417K-$700K	Above $700K
Top 20×Dodd-Frank	-0.019	-0.025***	-0.018**	0.040***	0.150***
	(0.209)	(0.000)	(0.013)	(0.002)	(0.000)
Top 4 Mkt share×Dodd-Frank	-0.015	0.032***	-0.003	0.021	0.161***
	(0.314)	(0.000)	(0.676)	(0.246)	(0.000)
Year and County F. E.	✓	✓	✓	✓	✓
Observations	976,130	2,214,717	1,959,778	471,795	175,286
Adjusted R^2	0.065	0.160	0.271	0.171	0.275

Mortgage Originators

Mortgage Originators have no other businesses, and often lend online.

We verify our results are similar if we exclude Mortgage Originators

Exclude non-bank lenders	Below $100K	$100K-$200K	$200K-$417K	$417K-$700K	Above $700K
Top 20 × Dodd-Frank	-0.029*	-0.033***	-0.023***	0.048***	0.255***
	(0.087)	(0.000)	(0.005)	(0.000)	(0.000)
Year and County F. E.	✓	✓	✓	✓	✓
Observations	976,130	2,214,717	1,959,778	471,795	175,286
Adjusted R^2	0.065	0.160	0.271	0.171	0.275

Change in Risk Borrower Pool

Our observables might not capture fully a change in the underlying risk of the pool of borrowers.

For the subsample of zip codes for which we observe it, we add the share of foreclosed property each year

Foreclosures	Below $100K	$100K-$200K	$200K-$417K	$417K-$700K	Above $700K
Top 20 × Dodd-Frank	-0.038**	-0.021***	-0.029***	0.040***	0.263***
	(0.023)	(0.006)	(0.000)	(0.000)	(0.000)
Year and County F.E.	✓	✓	✓	✓	✓
Observations	1,169,782	3,368,168	3,398,971	758,441	196,416
Adjusted R^2	0.055	0.169	0.292	0.197	0.298

Rejected Loans

Take ($Income/LoanAmount$) as a proxy for how strict lending standards are

$$Log(Income/LoanAmount)_{i,k,t} = \alpha + \beta Top20\_Share_{k,t} \times DoddFrank_t + \gamma Top20\_Share_{k,t}$$
$$+ X'_{i,k,t}\delta + D'_{k,t}\phi + \eta_k + \eta_t + \epsilon_{i,k,t},$$

For county k and year t,

- $Log(Income/LoanAmount)_{i,k,t}$: log income-to-loan ratio of mortgage i

- $Top20\_Share_{k,t}$: percentage of loans generated by top 20 mortgage originators

- $DoddFrank_t$: dummy equal to 1 for the years after 2010

- $X'_{i,k,t}$: individual-level characteristics – Income, Black, Asian, Latino

- $D'_{k,t}$: county-level characteristics – median house price, racial composition

- η_k, η_t: county- and year-effects

Rejected Loans

Estimate specification across groups of different loan sizes

	Below $100K	**$100K-$200K**	**$200K-$417K**	**$417K-$700K**	**Above $700K**
Top20× Dodd-Frank	0.010 (0.647)	0.030*** (0.000)	0.030*** (0.006)	-0.046*** (0.000)	-0.229*** (0.000)
Top20	0.000 (0.992)	-0.011 (0.207)	-0.016 (0.194)	0.009 (0.555)	0.093*** (0.003)
Log(Income)	0.875*** (0.000)	0.892*** (0.000)	0.839*** (0.000)	0.919*** (0.000)	0.879*** (0.000)
House Price	0.120*** (0.000)	-0.141*** (0.000)	-0.105*** (0.000)	-0.042*** (0.001)	-0.119*** (0.000)
Individual Ch.	✓	✓	✓	✓	✓
County Ch.	✓	✓	✓	✓	✓
Year F.E.	✓	✓	✓	✓	✓
County F.E.	✓	✓	✓	✓	✓
Observations	1,133,521	1,676,520	1,521,463	359,659	116,519
Adjusted R^2	0.540	0.859	0.844	0.918	0.926

Empirical Strategy

Baseline strategy

- Exploit variation in percentage of lending by Top 20 US originators

- Exploit variation across counties and over time – before and after Dodd-Frank

Instrumental variable strategy

- Instrument percentage of lending by Top 20 US originators with pre-crisis variation

- Use 2007 percentages, because not affected by the crisis

Propensity score matching

- Match counties on observables, including geographic location

- Compare similar counties with different exposures to large originators

Instrumental Variable Estimation

- Use 2007 percentage of Top20 lenders as an instrument for subsequent years

- Rationale: unaffected by changes in the supply of lending after the crisis
  (Agarwal, Amromin, Ben-David, Chomsisengphet, Piskorski, and Seru, forthcoming)

First and second stage:

$$Top20\_Share_{k,t} * DoddFrank_t = \alpha + \gamma \, Top20\_Share_{k,2007} \times DoddFrank_t$$
$$+ X'_{i,k,t}\delta + D'_{k,t}\phi + \eta_k + \eta_t + \epsilon_{i,k,t},$$

$$Log(LoanAmount)_{i,k,t} = \alpha + \beta \, \overbrace{Top20\_Share_{k,t} \times DoddFrank_t}$$
$$+ X'_{i,k,t}\delta + D'_{k,t}\phi + \eta_k + \eta_t + \epsilon_{i,k,t},$$

Relevance and Exclusion Restriction

Relevance:

- Kleibergen-Paap F-Statistic greater than 100 in all specifications

Exclusion restriction:

- Share of large banks in 2007 affects loan amount only through its effect on the share of large banks in the following years

  (inertia in the supply structure of lending at the county level)

- If include endogenous regressor and instrument, only instrument significant

- Observables across counties with low and high share of large banks are balanced

Validity of the Instrument: Balancing of Variables

	Quantile Large Banks in 2007				
	1	2	3	4	St. Dev.
Growth Loan Amount 2007-2010 (<$100k)	0.018	0.014	0.029	0.046	0.175
Growth Loan Amount 2007-2010 ($100k-$200k)	0.009	0.003	0.006	-0.007	0.074
Growth Loan Amount 2007-2010 ($200k-$417k)	-0.011	-0.008	-0.009	-0.025	0.096
Growth Loan Amount 2007-2010 ($417k-$700k)	-0.044	-0.039	-0.052	-0.045	0.109
Growth Loan Amount 2007-2010 (>$700k)	-0.015	-0.014	-0.006	-0.015	0.140
Avg. Black county	0.044	0.047	0.048	0.052	0.139
Avg. Asian county	0.005	0.007	0.014	0.022	0.076
Avg. Latino county	0.122	0.036	0.054	0.069	0.154
Share Foreclosed Properties	0.004	0.005	0.004	0.007	0.010
Share Middle-Class Households 2007	0.388	0.378	0.370	0.369	0.041
Share Middle-Class Households with a Mortgage 2007	0.535	0.520	0.500	0.475	0.086
Share County Income from Stock Dividends 2007	0.060	0.066	0.067	0.072	0.026
Share Workforce in Public Administration 2007	0.085	0.085	0.083	0.084	0.033

Second Stage Results – Approved Loans

	Below $100K	$100K-$200K	$200K-$417K	$417K-$700K	Above $700K
Top 20× Dodd-Frank	0.008 (0.749)	-0.044*** (0.000)	-0.026** (0.041)	0.036*** (0.002)	0.338*** (0.000)
Log(Income)	0.098*** (0.000)	0.151*** (0.000)	0.214*** (0.000)	0.110*** (0.000)	0.159*** (0.000)
House Price	0.030 (0.198)	0.161*** (0.000)	0.121*** (0.000)	0.031** (0.017)	0.149*** (0.000)
Individual Ch.	✓	✓	✓	✓	✓
County Ch.	✓	✓	✓	✓	✓
Year F.E.	✓	✓	✓	✓	✓
County F.E.	✓	✓	✓	✓	✓
Observations	1,729,513	4,463,568	4,094,783	845,591	222,922
KP F-Stat	475.7	453.0	417.9	149.5	101.6

Second Stage Results – Rejected Loans

	Below $100K	$100K-$200K	$200K-$417K	$417K-$700K	Above $700K
Top 20× Dodd-Frank	0.041 (0.038)	0.040*** (0.013)	0.051*** (0.018)	-0.045*** (0.016)	-0.327*** (0.037)
Log(Income)	0.875*** (0.004)	0.892*** (0.001)	0.839*** (0.002)	0.919*** (0.003)	0.879*** (0.004)
House Price	0.121*** (0.033)	-0.140*** (0.010)	-0.104*** (0.010)	-0.043*** (0.012)	-0.129*** (0.027)
Individual Ch.	✓	✓	✓	✓	✓
County Ch.	✓	✓	✓	✓	✓
Year F.E.	✓	✓	✓	✓	✓
County F.E.	✓	✓	✓	✓	✓
Observations	1,133,521	1,676,520	1,521,463	359,659	116,519
KP F-Stat	496.9	420.8	341.2	145.9	114.39

Empirical Strategy

Baseline strategy

- Exploit variation in percentage of lending by Top 20 US originators

- Exploit variation across counties and over time – before and after Dodd-Frank

Instrumental variable strategy

- Instrument percentage of lending by Top 20 US originators with pre-crisis variation

- Use 2007 percentages, because not affected by the crisis

Propensity score matching

- Match counties on observables, including geographic location

- Compare similar counties with different exposures to large originators

Matching Procedure

- Match nearest neighbor county-years based on observables (propensity score)

- Rationale: similar counties are likely to face similar demand shocks
  (Scharfstein and Sunderam (2016))

- Estimate at county-year level:

$$Pr\left(\textit{Top Quartile}_{k,t}|X_{k,t}\right) = \frac{exp\left(X'_{k,t}\,\beta\right)}{1 + exp\left(X'_{k,t}\,\beta\right)},$$

where:

- *Top Quartile*$_{k,t}$: equals 1 if the county-year is in the top quartile by Top 20 banks

- $X_{k,t}$: denotes county-year observables that include:

  - Population, median income, homeownership, race composition, state fixed-effects

- Keep only counties in the top and bottom quartiles by shares of large banks

- Match treated and control counties based on propensity scores

- Keep only individuals in matched counties

Matched Sample Results

	Below $100K	**$100K-$200K**	**$200K-$417K**	**$417K-$700K**	**Above $700K**
Treated × Dodd-Frank	-0.055* (0.059)	0.007 (0.641)	-0.106*** (0.004)	0.121*** (0.000)	0.168** (0.028)
Treated	0.042 (0.175)	-0.031** (0.035)	0.096*** (0.004)	-0.042 (0.314)	-0.262*** (0.000)
Log(Income)	0.115*** (0.000)	0.158*** (0.000)	0.196*** (0.000)	0.073*** (0.000)	0.131*** (0.000)
House Price	0.108*** (0.001)	0.146*** (0.000)	0.039* (0.068)	-0.113** (0.014)	0.067 (0.366)
Individual Ch.	✓	✓	✓	✓	✓
County Ch.	✓	✓	✓	✓	✓
Year F.E.	✓	✓	✓	✓	✓
County F.E.	✓	✓	✓	✓	✓
Observations	278,348	589,758	416,738	64,104	17,460
Adjusted R^2	0.066	0.173	0.262	0.127	0.228

Alternative Explanations We Rule Out

- Risk-Management provisions in Dodd-Frank

  Bank risk does not correlate with changes in lending

- Wealth polarization after the financial crisis

  Similar results for counties that experience more and less polarization

- Pre-crisis stock of loans to middle-class

  Results stronger in counties with lower stock of loans to the middle class

- Collapse of the private-label securitization

  Large banks did not securitize more: the market was frozen from 2008 onwards

Alternative Explanations We Rule Out

- Risk-Management provisions in Dodd-Frank

  Bank risk does not correlate with changes in lending
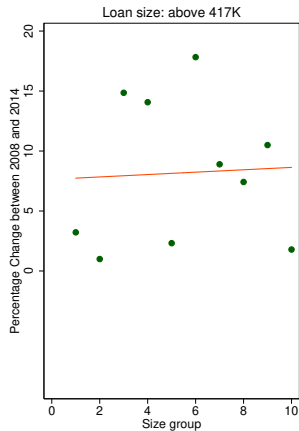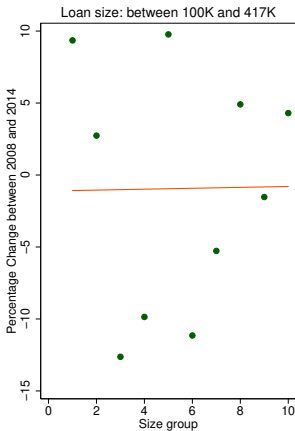
Alternative Explanations We Rule Out

- Wealth polarization after the financial crisis

- Higher share Middle-class households in 2007, more polarization

	Below $100K	$100K-$200K	$200K-$417K	$417K-$700K	Above $700K
Panel A. Share Middle-Class Households in 2007					
Bottom Third Counties					
Top20×Dodd-Frank	-0.019 (0.733)	-0.013 (0.500)	-0.044** (0.010)	0.048*** (0.005)	0.231*** (0.000)
Top Third Counties					
Top20×Dodd-Frank	-0.014 (0.567)	-0.018 (0.277)	-0.010 (0.388)	0.022 (0.336)	-0.102** (0.015)

Alternative Explanations We Rule Out

- Pre-crisis stock of loans to middle-class

  Results stronger in counties with lower stock of loans to the middle class

	Below \$100K	**\$100K-\$200K**	**\$200K-\$417K**	**\$417K-\$700K**	**Above \$700K**
Panel B. Share Middle-Class Households with Mortgages in 2007					
Bottom Third Counties					
Top20×Dodd-Frank	-0.044	-0.058**	-0.034**	0.045**	0.208***
	(0.237)	(0.039)	(0.021)	(0.023)	(0.000)
Top Third Counties					
Top20×Dodd-Frank	-0.034	-0.013	-0.016	0.046	0.043
	(0.153)	(0.444)	(0.530)	(0.186)	(0.606)

Conclusions

We document:

- a substantial redistribution of mortgage lending from mid-loan amounts to high loan amounts

- that the redistribution is more pronounced for larger mortgage originators

Our interpretation:

- Dodd-Frank increased the per-loan costs of originating mortgages

- large banks could react more to this regulatory shock