Credit Constraints and the Missing Recovery

What Happened to Housing Production?

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Outline

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Motivation

- Housing is expensive. House prices and valuations have at least doubled from 2010-2025.
- At the same time, the supply response has been remarkably muted.
- The typical response in this literature has been to point to land-use regulation and other constraints (Saiz, 2010) (Aastveit et al., 2023)
- There are issues with this approach: :
  - Davidoff (2013) notes demand contamination.
  - Louie, Mondragon, and Wieland (2025) finds that the most commonly-used supply elasticities explain nothing differential about the response to a demand shock.
- **Last presentation:** Discuss the business of home-building and some market-firm facts.
- **This presentation:** Document production shifts and discuss consumer credit constraints and financing disruptions.

Abridged Literature Review

- **Housing Supply:** Thinking about housing supply (Dipasquale, 1999), working in house price changes (Mayer and Somerville, 2000), land constraints (Saiz, 2010), regulatory barriers (Gyourko, Saiz, and Summers, 2008) (Gyourko, Hartley, and Krimmel, 2021), more detailed examination (Baum-Snow and Han, 2024), and the closing of the frontier (Glaeser and Gyourko, 2025),
- **What's Different:** Competition (Quintero, 2022), lower elasticities and regulation (Aastveit et al., 2023), and labor supply(Le, 2025)
- **Issues with elasticities:** Contaminated with demand (Davidoff, 2013) and elasticities do not measure differences (Louie, Mondragon, and Wieland, 2025)
- **This presentation:** Think about effects of disruption to financing and credit constraints on construction quantities.

Outline

Fact 1 Overview

- I use data from the FHFA CBSA Home Price Index, the US Census Building Permits Survey, and the SEER Cancer Population data.
  - Using the BPS and SEER data, I construct two measures, the total number of single-family permits, and the permits rate, which is the number of single-family permits per thousand people in a CBSA.
  - I construct house price percentage changes at the CBSA level using the FHFA's CBSA delineations.[1]
- I compute percent changes in house prices and compare them with the aggregate national times series. These two series should comove.
  - Note: This is not a formal elasticity, but there should be some comovement.
- I now show some plots that are consistent with the notion that during the housing crash there was a decoupling of price growth and construction.
- I also run a formal test[2] where I find that in the post-crash period, the relationship between the two is weaker. I cluster errors by CBSA and include CBSA fixed effects.

[1] I plan to adjust this to be from the county level aggregated up weighted by population to make my measures more comparable.

[2] Nothing causal here, just thinking about correlations.

Prices fell less and rebounded more than production in aggregate

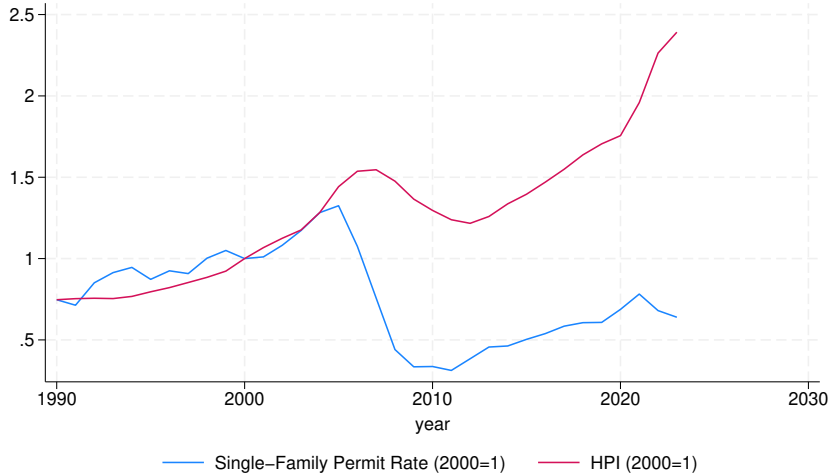


Figure: National Single-Family Permits and HPI (2000=1)

Prices now increase faster than supply

Figure: National Single-Family Permit Rate (Units/Thousand People) and % Change in HPI

The cross-sectional correlation between supply and price changes is lower post-recession

	(1)	(2)
	rel_sf_permits_rate	rel_sf_permits_rate
hpi_change	4.366***	
	(16.55)	
1.post_crashc.hpi_change	-2.283***	
	(-4.96)	
lag_hpi_change		4.432***
		(13.86)
1.post_crashc.lag_hpi_change		-2.488***
		(-5.05)
N	28060	27205
R^2	0.488	0.494

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table: Regression of relative single-family permits on HPI with period-varying coefficients

Outline

The aggregate recovery was weak

- The 2000 home production was 1,140,562 units in the matched sample, and the 2019 home production was 831,189 units ($\sim$ 73% recovery)
- However, there is considerable heterogeneity in recovery.
- I perform a basic counterfactual exercise where I calculate the counterfactual aggregate production of total single-family homes under two recovery scenarios (the recoveries of the San Francisco (SF) and Dallas-Fort Worth (DFW) CBSAs):
  - **San Francisco Unit Recovery:** 521355.92. The production rate would be 63% of its 2019 level, and there would be 309,833 fewer units in production.
  - **DFW Unit Recovery:** 1102994.7. The production rate would be 132.7% of its 2019 levels, and there would be 271,805 more units in production.

Fact 2 Overview

- Following Fact 1, I use the permits rate, that is, the number of single-family permits issued divided by the population (in thousands).
- I show the distribution of permit rates. Permit Rate Table Time Series
- I then define a housing market recovery in the following extremely generous way: if a CBSA recovered to the minimal level of permits or permit rate achieved during the 1990s, I classify that as a housing recovery.[3] Open Counts
- I then show that half of CBSAs recovered to 1990s levels of production, while less than 40% recovered to the populated-adjusted permits rate.

[3] There may indeed be a recovery in total units, but the permit rate may not recover. See Atlanta in Open Permit Rates and Glaeser and Gyourko (2025).

Construction was shocked, with differing levels of recovery

	Mean	10th percentile	25th percentile	50th percentile	75th percentile	90th percentile
year						
1990	3.798568	.813061	1.721744	2.925627	4.581305	7.339949
2000	4.520265	1.534439	2.405842	3.722185	5.568744	8.512223
2003	5.475946	1.867351	2.812054	4.490542	6.973798	9.929019
2010	1.769174	.5672746	.9423307	1.440657	2.195749	3.324123
2019	2.823025	.7768357	1.238107	2.163182	3.655227	5.669736

Table: Single-Family Permit Rates (Permits per Thousand People)

Time Series

40% of CBSAs recovered to 1990s production rate, and only 30% of people live in recovered CBSAs

	Mean
year	
2000	1
2005	.9542203
2010	.248927
2015	.3018598
2019	.3991416

	Mean
year	
2000	1
2005	.9677053
2010	.1307623
2015	.1876838
2019	.2917714

Table: CBSA Recovery to 1990s Levels (Unweighted vs. Population-Weighted)

Permit Counts Permit Rates Map

Even in the large, unconstrained CBSAs, some places failed to recover

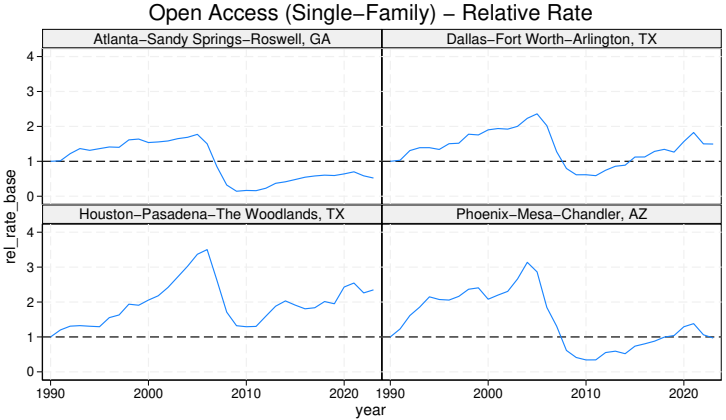


Figure: Open Access City Permit Rates

⏭ Open Counts ⏭ Open Permit Rates ⏭ Closed Counts ⏭ Closed Permit Rates ⏭ Fed Cities Counts ⏭ Fed Cities Rates

Outline

Fact 3 Methodology

- I merge the CoreLogic Owner Transfer with the CoreLogic Mortgage data for newly constructed homes to construct a (hopefully) representative sample of homes in the United States.
- I compare SF and DFW in terms of financing quantities and shares.
- Changing tactics, I then use the CoreLogic Loan-Level Mortgage Analytics (LLMA) data to measure the FICO scores on newly-originated mortgages. I construct distributions for each CBSA.
- I then take the log ratio of the permit rate in 2019 and the permit rate in 2000, and the log ratio of the 25th percentile of the FICO distribution in 2019 and 2000. This will hopefully reflect the margin of tightening. I also take the log of the 2000 FHA share.
- I then make scatter plots that show that higher FHA share is positively associated with recovery, and more FICO tightening is negatively associated with recovery.

San Francisco and Dallas have different pre-crisis funding structures and different recoveries

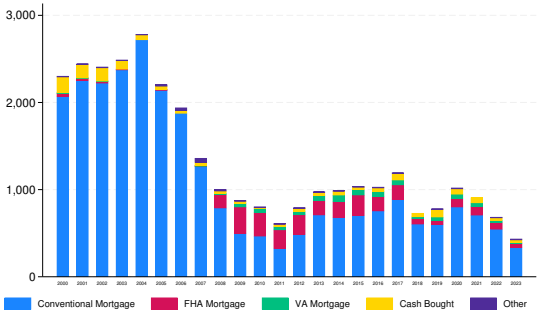


Figure: SF Finance Counts

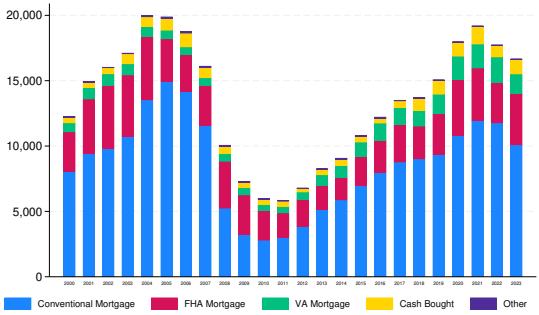


Figure: Dallas Finance Counts

⏩ National Count ⏩ National Share ⏩ SF DFW Count ⏩ SF DFW Share ⏩ SF DFW Comovement

Dallas had less funding structure disruption and had a higher pre-crisis FHA share

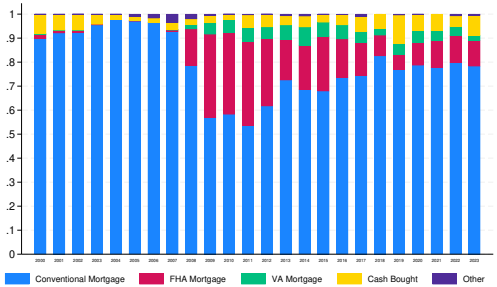


Figure: SF Finance Shares

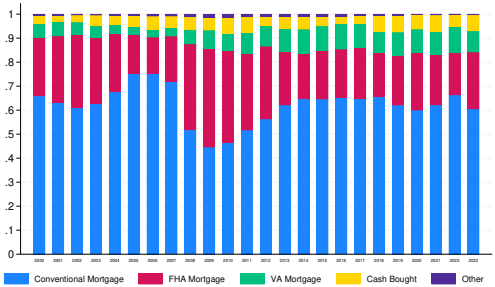


Figure: Dallas Finance Shares

⏭ National Count ⏭ National Share ⏭ SF DFW Count ⏭ SF DFW Share ⏭ SF DFW Comovement

Mortgage availability tightened after the Great Recession, particularly at the bottom

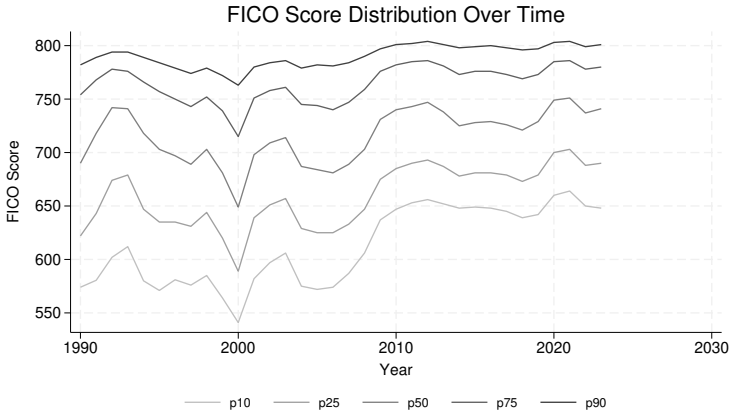
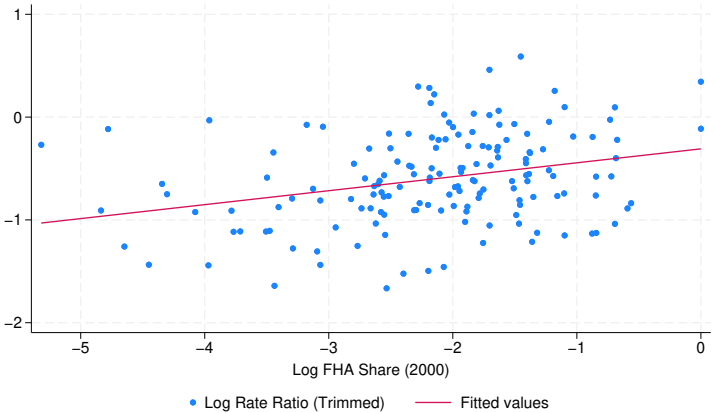


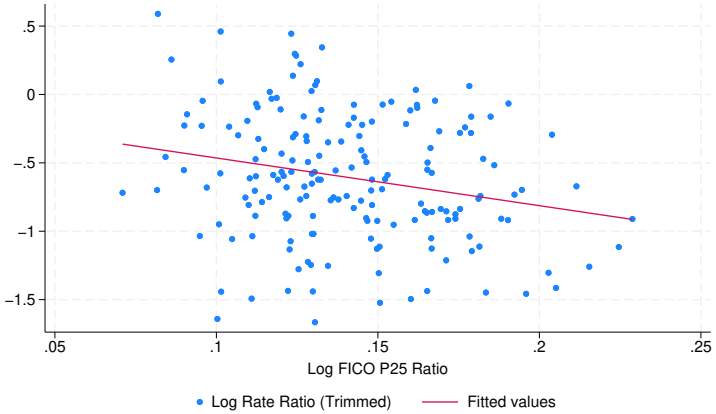
Figure: Distribution of FICO Scores at Mortgage Origination

Higher FHA exposure is associated with more recovery



FHA Exposure and Recovery Ratio (Trimmed) | FHA Exposure and Recovery Ratio (Untrimmed) | CoreLogic Sample Regressions

More exposure to tighter FICO is associated with less recovery



⏭ FICO Tightening (CL Trimmed) ⏭ FICO Tightening (Trimmed) ⏭ FICO Tightening (CL Untrimmed) ⏭ FICO Tightening (Untrimmed)

⏭ Rate Ratio Summary Table ⏭ FICO Sample Regressions ⏭ CoreLogic Sample Regressions

Outline

Conclusion:

- Housing prices and production no longer comove as strongly.
- The housing market broadly underperformed and failed to recover on both a total unit and permit rate basis.
- A disruption to credit availability could explain some of this, and a higher FHA exposure pre-crisis is associated with better outcomes, while more tightening is associated with worse outcomes.

Next Steps

- Meaningful:
  - Replicate Aastveit et al. (2023)'s work but for CBSAs to get better elasticity estimates.
  - Determine if credit constraints are associated with lower elasticities.
- Technical:
  - Construct CPI from county-level (having issues matching some CBSAs).

. . . plus anything you think I should do.

Thank you!

References I

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Outline

Construction was shocked, with differing levels of recovery

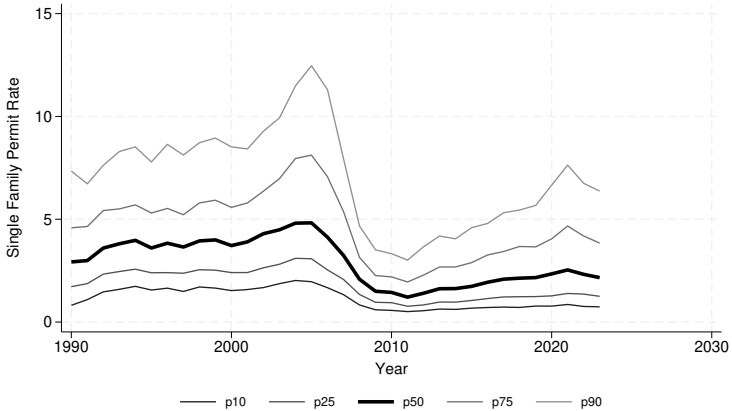

Figure: Percentiles of Single-Family Permit Rate (Permits/Thousand People)

Back to Permits Table

Visualizing the Problem (Permits Rate)

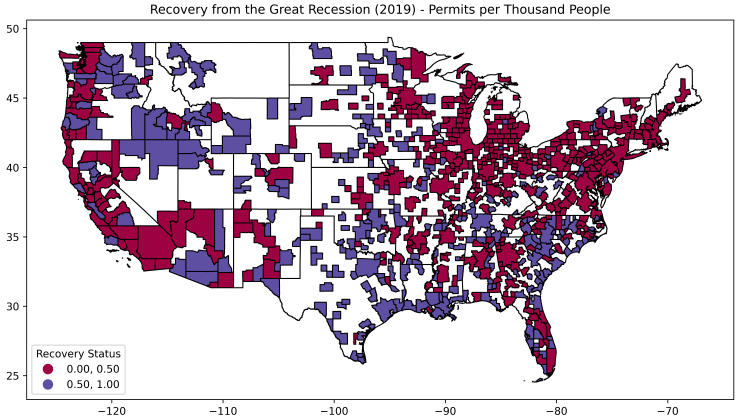

Figure: Map of CBSAs with indicator if recovered to 1990s production permits rate

⏩ Permit Rates ⏩ Permit Levels Map ⏩ Permits

Permits have only recovered to 1990s levels in half of CBSAs

	Mean
year	
2000	1
2005	.9643367
2010	.3166904
2015	.4136947
2019	.5007133

	Mean
year	
2000	1
2005	.9859921
2010	.1687563
2015	.317602
2019	.4625192

Table: CBSA Recovery to 1990s Levels (Unweighted and Population-Weighted)

⏩ Permit Rates ⏩ Permit Levels Map

Visualizing the Problem (Overall Permits)

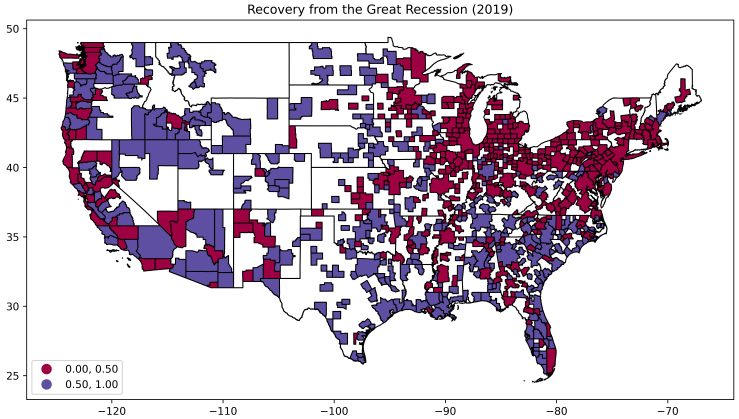

Figure: Map of CBSAs with indicator if recovered to 1990s level of construction

Permits

Open Access Permits

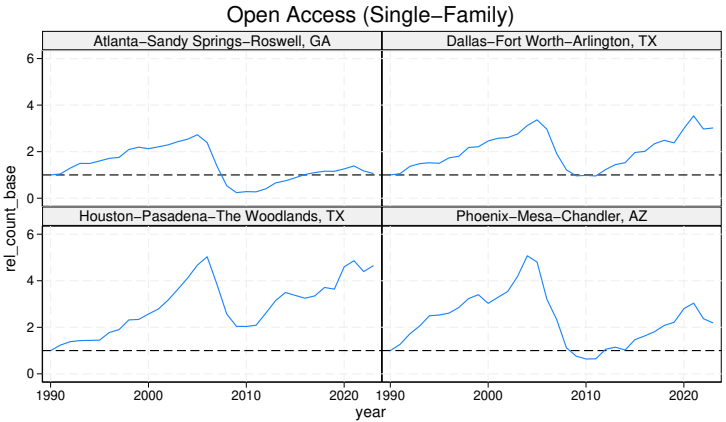

Figure: Open Access City Permits

⏭ Open Counts ⏭ Open Permit Rates ⏭ Closed Counts ⏭ Closed Permit Rates ⏭ Fed Cities Counts ⏭ Fed Cities Rates

Closed Access Permits

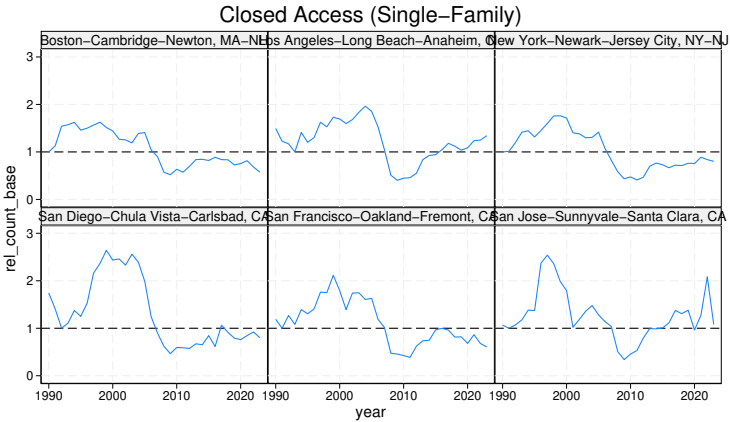

Figure: Closed Access City Permits

Closed Access Permits Rate

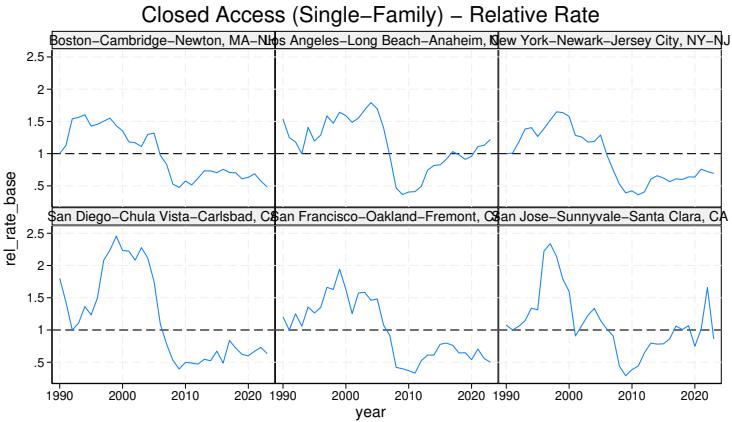

Figure: Closed Access City Permit Rates

Fed Cities Counts (ex. DC, Cleveland, Richmond)

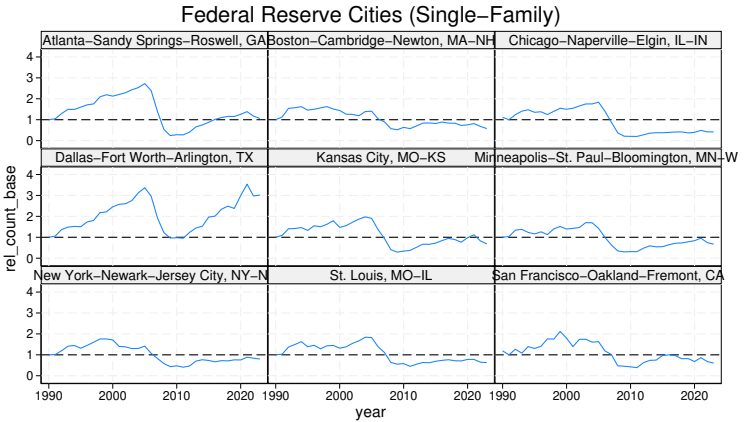

Figure: Federal Reserve Cities Permits

Fed Cities Permit Rates (ex. DC, Cleveland, Richmond)

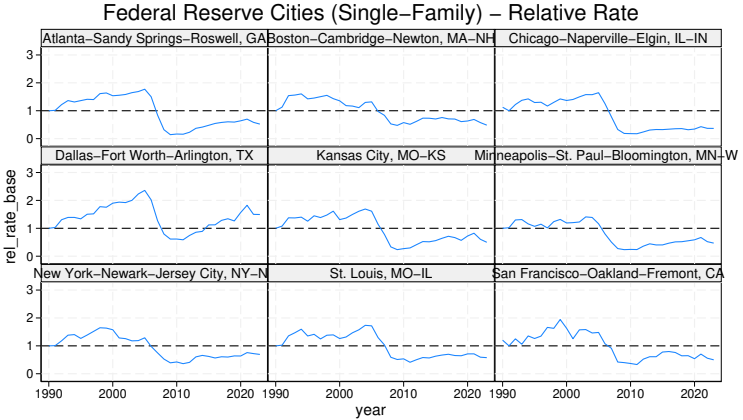

Figure: Federal Reserve Cities Permit Counts

Outline

National Counts

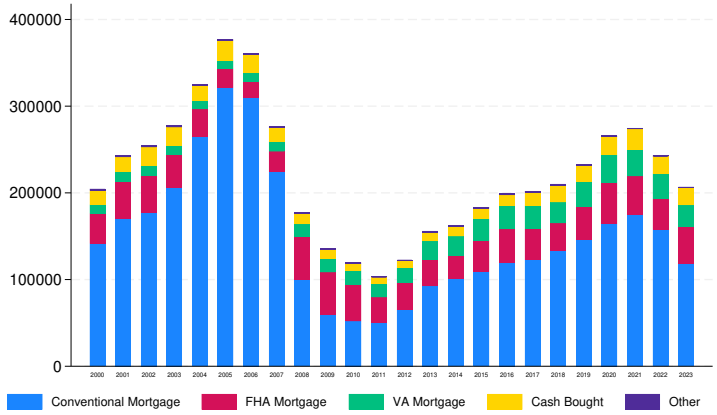

Figure: National Finance Counts (CoreLogic)

⏭ National Count ⏭ National Share ⏭ SF DFW Count ⏭ SF DFW Share ⏭ SF DFW Comovement

National Shares

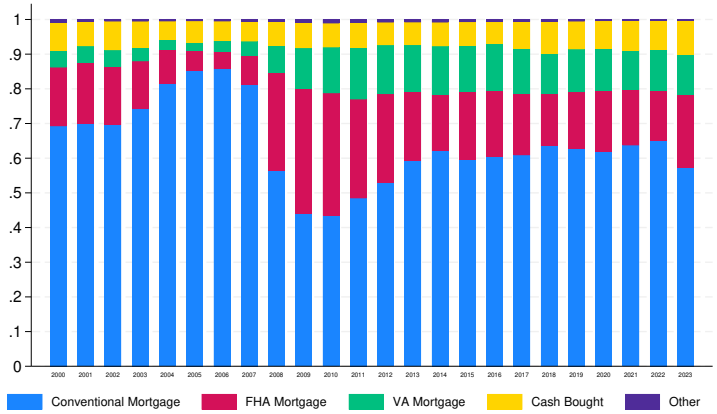

Figure: National Finance Shares (CoreLogic)

⏭ National Count ⏭ National Share ⏭ SF DFW Count ⏭ SF DFW Share ⏭ SF DFW Comovement

SF and DFW Comovements

Figure: SF Permit Rate and % HPI Change

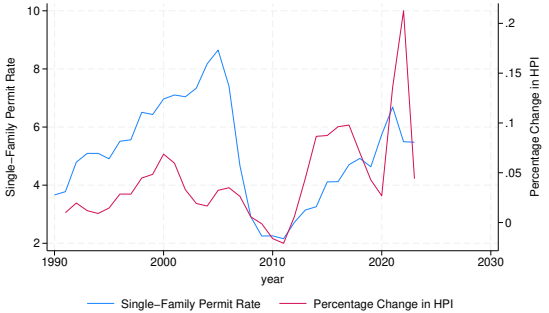

Figure: Dallas Permit Rate and % HPI Change

⏩ SF DFW Count ⏩ SF DFW Share ⏩ SF DFW Comovement ⏩ CoreLogic Sample Regressions

Higher FHA exposure is associated with more recovery (Untrimmed)

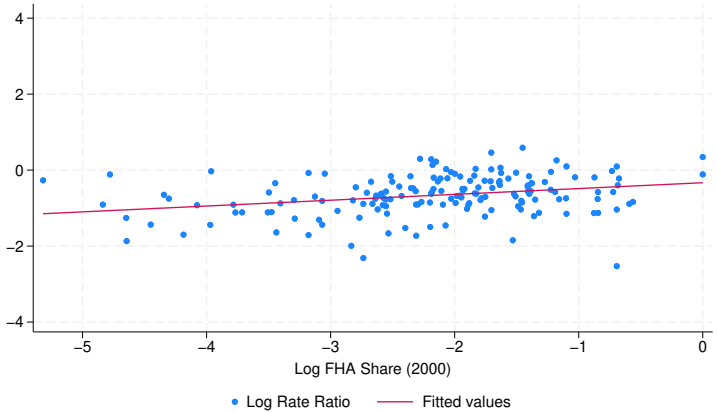

Figure: Log Recovery Ratio and Log FHA Share in 2000 (Untrimmed)

⏭ FHA Exposure and Recovery Ratio (Trimmed) ⏭ FHA Exposure and Recovery Ratio (Untrimmed) ⏭ CoreLogic Sample Regressions

More exposure to tighter FICO limits predicts less recovery in the trimmed sample

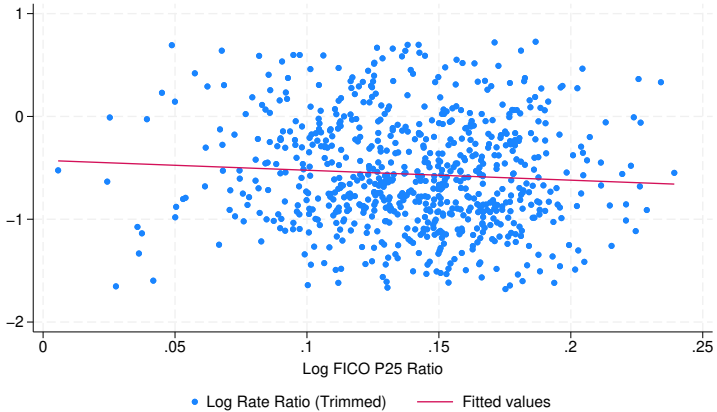

Figure: FICO Tightening (Trimmed)

⏭ FICO Tightening (CL Trimmed) ⏭ Rate Ratio Summary Table ⏭ FICO Sample Regressions ⏭ CoreLogic Sample Regressions

More exposure to tighter FICO limits predicts less recovery in the CoreLogic sample without trimming

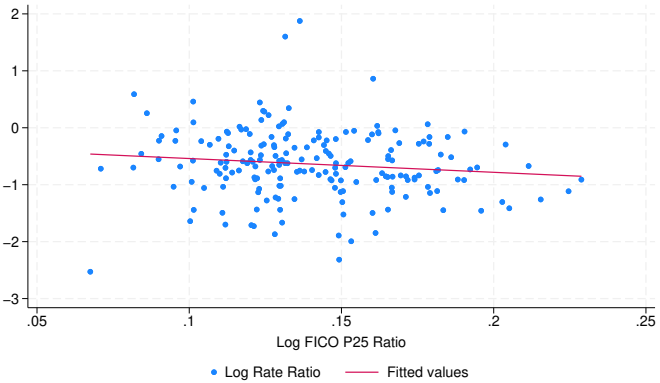

Figure: FICO Tightening (CL Untrimmed)

FICO Tightening (CL Trimmed) Rate Ratio Summary Table

More exposure to tighter FICO limits predicts little in the full sample without trimming

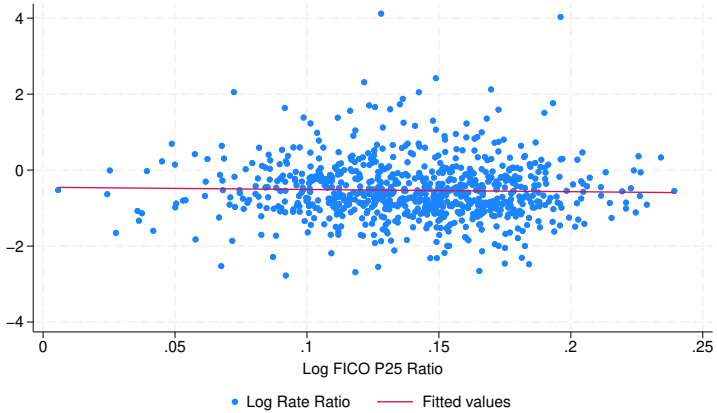

Figure: FICO Tightening (Untrimmed)

FICO Tightening (CL Trimmed) | Rate Ratio Summary Table

Rate Ratio Summary Table

Variable	Sample	Mean	Median (p50)	Std. Dev.	Observations (N)	Population	SamplePopShare
FullSample	Full Sample	-0.537	-0.625	0.788	852	287,915	0.996
CoreLogicSample	CoreLogic Sample	-0.644	-0.662	0.587	202	225,020	0.779
FICOSample	FICO Sample	-0.534	-0.622	0.778	803	280,746	0.971
WinsorSample	Winsorized Sample	-0.567	-0.625	0.527	768	280,210	0.970
CLWinsorSample	Winsorized CoreLogic Sample	-0.614	-0.631	0.456	190	221,993	0.768

⏩ FICO Tightening (CL Trimmed) ⏩ FICO Tightening (Trimmed) ⏩ FICO Tightening (CL Untrimmed) ⏩ FICO Tightening (Untrimmed)
⏩ Rate Ratio Summary Table ⏩ FICO Sample Regressions ⏩ CoreLogic Sample Regressions

FICO Sample Regressions

	(1)	(2)	(3)
	rate_ratio_tr	rate_ratio_tr	rate_ratio_tr
fico_p25_diff	-0.996*		-1.063*
	(-1.77)		(-1.90)
diff_2009_2007		0.694***	0.709***
		(3.64)	(3.75)
_cons	-0.423***	-0.531***	-0.381***
	(-5.18)	(-23.80)	(-4.62)
N	720	720	720
R^2	0.005	0.016	0.021

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

FICO Tightening (Trimmed) | FICO Tightening (Untrimmed) | Rate Ratio Summary Table | CoreLogic Sample Regressions

CoreLogic Sample Regressions

	(1)	(2)	(3)	(4)
	rate_ratio_tr	rate_ratio_tr	rate_ratio_tr	rate_ratio_tr
fico_p25_diff	-3.265***			-2.847**
	(-2.66)			(-2.14)
log_fha_share		0.137***		0.120***
		(3.24)		(2.65)
diff_2009_2007			0.0499	0.159
			(0.19)	(0.55)
_cons	-0.128	-0.298***	-0.582***	0.0901
	(-0.69)	(-3.18)	(-10.19)	(0.45)
N	149	149	149	149
R^2	0.046	0.084	0.000	0.114

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

FICO Tightening (CL Trimmed) | FICO Tightening (CL Untrimmed) | Rate Ratio Summary Table | FICO Sample Regressions