# Credit Constraints and the Missing Recovery
## What Happened to Housing Production?

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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.

1. Motivation and Introduction

2. Fact 1: The correlation between price growth and construction is weaker post-recession

3. Fact 2: The unit recovery is weak, and there is significant heterogeneity in recovery

4. Fact 3: Disruptions to mortgage composition and availability could explain some of the puzzle

5. Conclusion and Next Steps

## 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
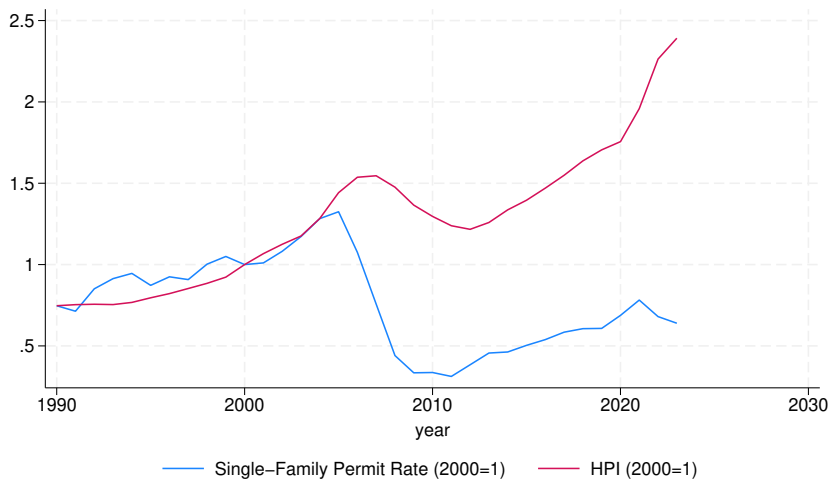


Figure: National Single-Family Permits and HPI (2000=1)

# Prices now increase faster than supply



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

|  | (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.

- 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] and Glaeser and Gyourko (2025). (▸ 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.

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

# 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

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

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

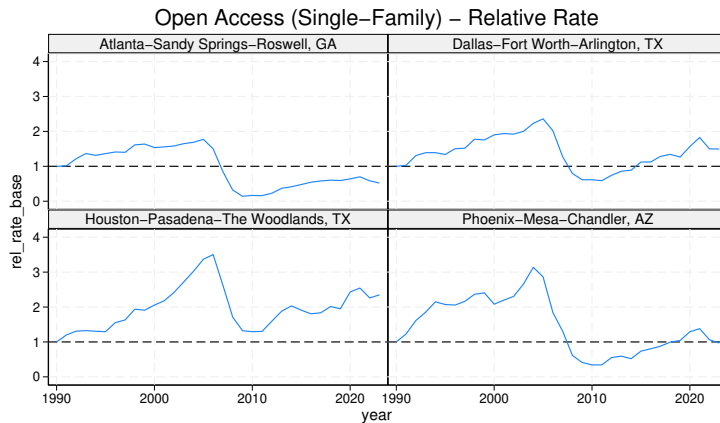Table: CBSA Recovery to 1990s Levels (Unweighted vs. Population-Weighted)

▸ Permit Counts  ▸ Permit Rates Map

Figure: Open Access City Permit Rates

## 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.
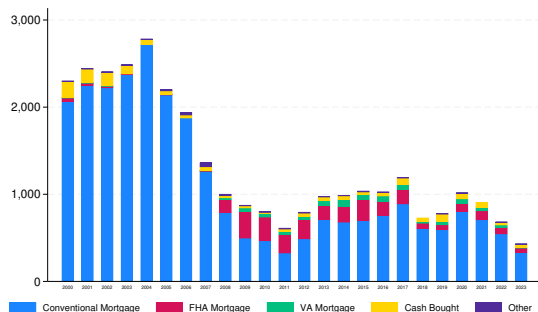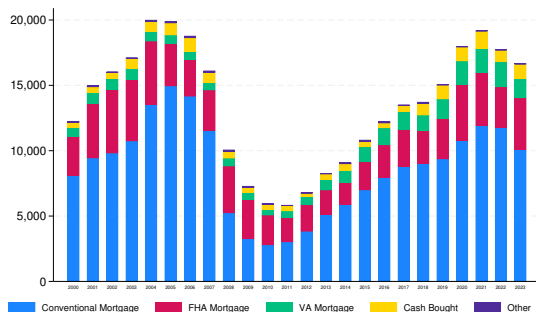
Figure: SF Finance Counts



Figure: Dallas Finance Counts

▸▸ National Count    ▸▸ National Share    ▸▸ SF DFW Count    ▸▸ SF DFW Share    ▸▸ SF DFW Comovement
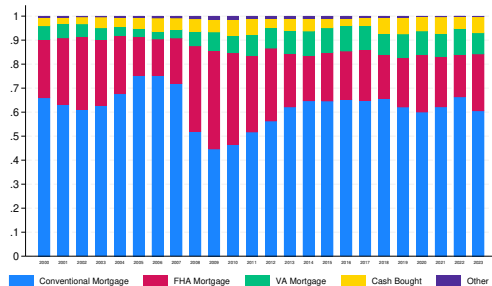
Figure: SF Finance Shares



Figure: Dallas Finance Shares

⤼ National Count   ⤼ National Share   ⤼ SF DFW Count   ⤼ SF DFW Share   ⤼ SF DFW Comovement

FICO Score Distribution Over Time

Figure: National Distribution of FICO Scores

# Higher FHA exposure is associated with more recovery



- Log Rate Ratio (Trimmed) ——— Fitted values

⊷ 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

# 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.

- 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!

AASTVEIT, K. A., B. ALBUQUERQUE, AND A. K. ANUNDSEN (2023): "Changing supply elasticities and regional housing booms," *Journal of Money, Credit and Banking*, 55, 1749–1783.

BAUM-SNOW, N. AND L. HAN (2024): "The Microgeography of Housing Supply," *Journal of Political Economy*, 132, 1897–1946.

DAVIDOFF, T. (2013): "Supply Elasticity and the Housing Cycle of the 2000s," *Real Estate Economics*, 41, 793–813.

DIPASQUALE, D. (1999): "Why Don't We Know More About Housing Supply?" *The Journal of Real Estate Finance and Economics*, 18, 9–23.

GLAESER, E. L. AND J. GYOURKO (2025): "America's Housing Supply Problem: The Closing of the Suburban Frontier?" Working Paper 33876, National Bureau of Economic Research.

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GYOURKO, J., A. SAIZ, AND A. SUMMERS (2008): "A New Measure of the Local Regulatory Environment for Housing Markets: The Wharton Residential Land Use Regulatory Index," *Urban Studies*, 45, 693–729.

LE, T. (2025): "The scarring of the Great Recession on construction labor and housing supply," *Real Estate Economics*, n/a.

LOUIE, S., J. A. MONDRAGON, AND J. WIELAND (2025): "Supply Constraints do not Explain House Price and Quantity Growth Across U.S. Cities," Working Paper 33576, National Bureau of Economic Research.

MAYER, C. J. AND C. SOMERVILLE (2000): "Residential Construction: Using the Urban Growth Model to Estimate Housing Supply," *Journal of Urban Economics*, 48, 85–109.

QUINTERO, L. (2022): "Fewer Players, Fewer Homes: Concentration and the New Dynamics of Housing Supply," Research Paper 18-18, Johns Hopkins Carey Business School, available at SSRN.

SAIZ, A. (2010): "The Geographic Determinants of Housing Supply*," *The Quarterly Journal of Economics*, 125, 1253–1296.

# Construction was shocked, with differing levels of recovery
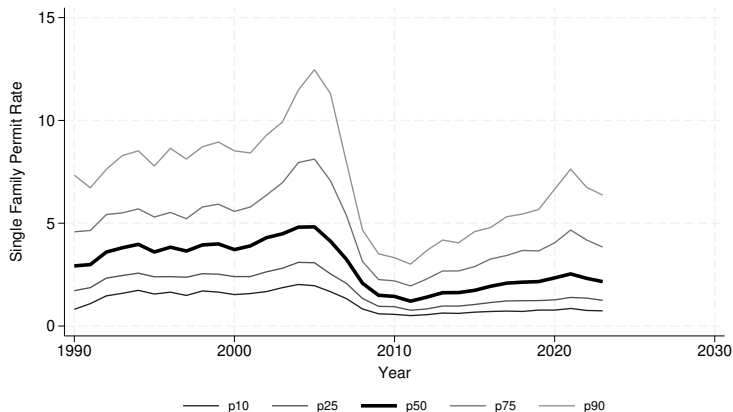


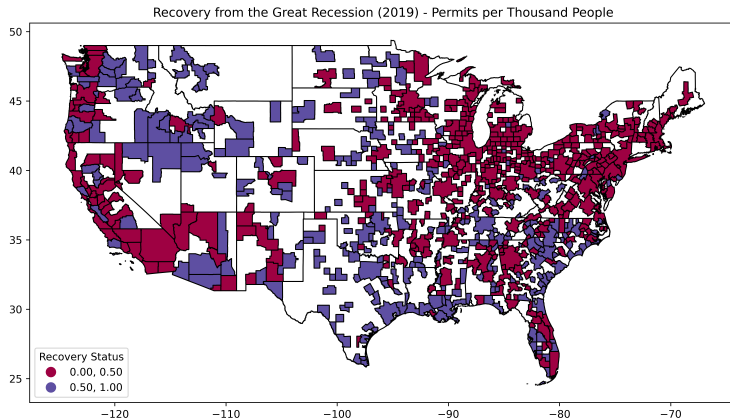Figure: Percentiles of Single-Family Permit Rate (Permits/Thousand People)

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

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

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

| year | Mean |
|------|------|
| 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
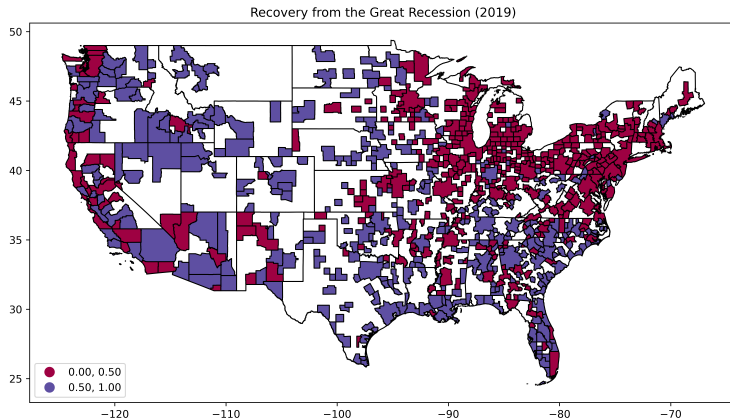
Figure: Map of CBSAs with indicator if recovered to 1990s level of construction
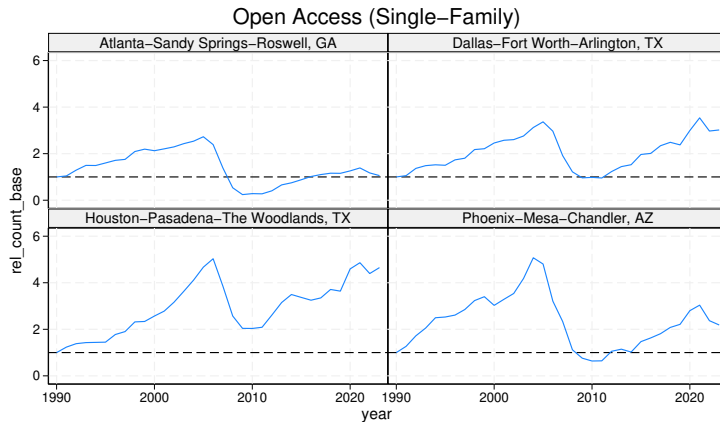
Figure: Open Access City Permits

Figure: Closed Access City Permits
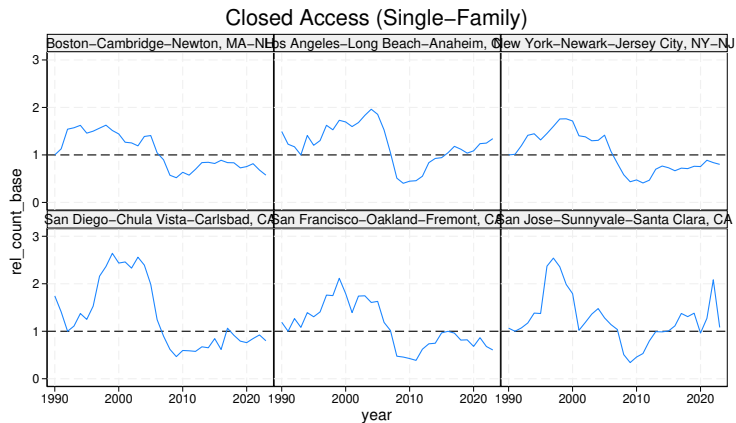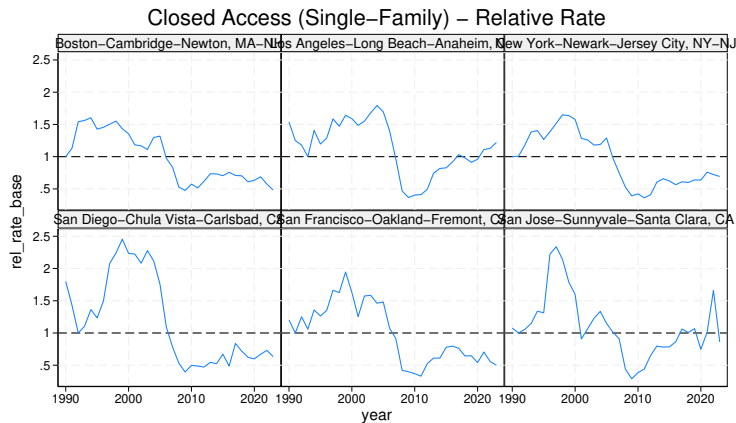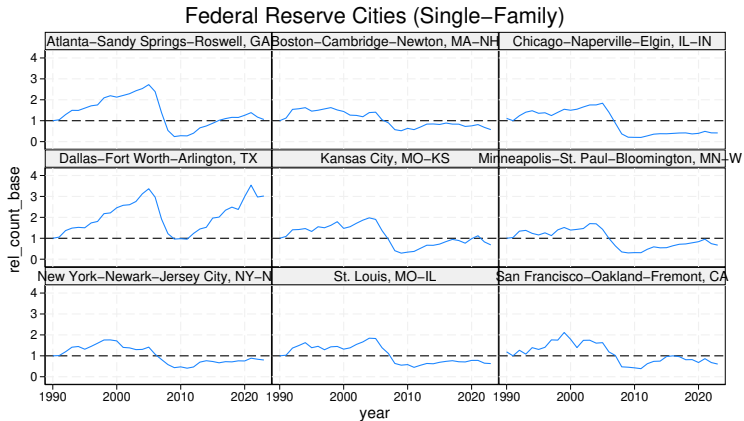
▸▸ Open Counts    ▸▸ Open Permit Rates    ▸▸ Closed Counts    ▸▸ Closed Permit Rates    ▸▸ Fed Cities Counts    ▸▸ Fed Cities Rates

Figure: Closed Access City Permit Rates

⤷ Open Counts    ⤷ Open Permit Rates    ⤷ Closed Counts    ⤷ Closed Permit Rates    ⤷ Fed Cities Counts    ⤷ Fed Cities Rates

Figure: Federal Reserve Cities Permits
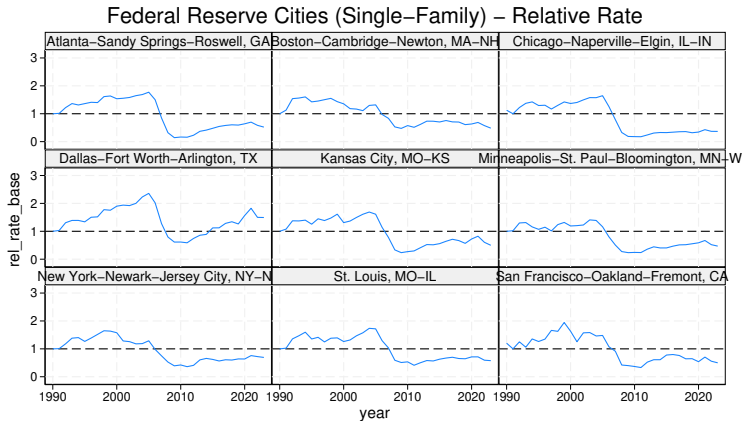
Figure: Federal Reserve Cities Permit Counts

⟩⟩ Open Counts    ⟩⟩ Open Permit Rates    ⟩⟩ Closed Counts    ⟩⟩ Closed Permit Rates    ⟩⟩ Fed Cities Counts    ⟩⟩ Fed Cities Rates
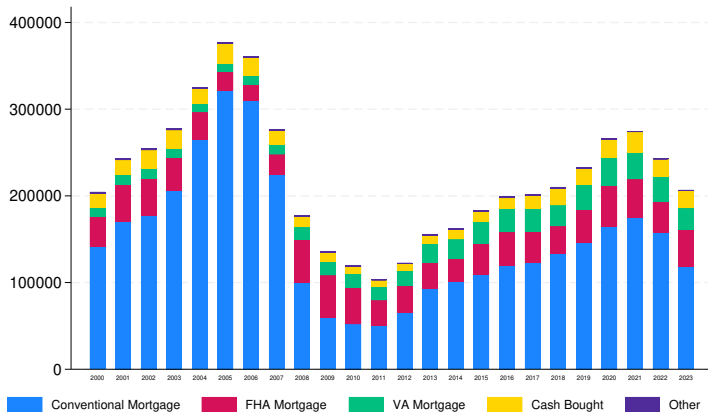
Figure: National Finance Counts (CoreLogic)
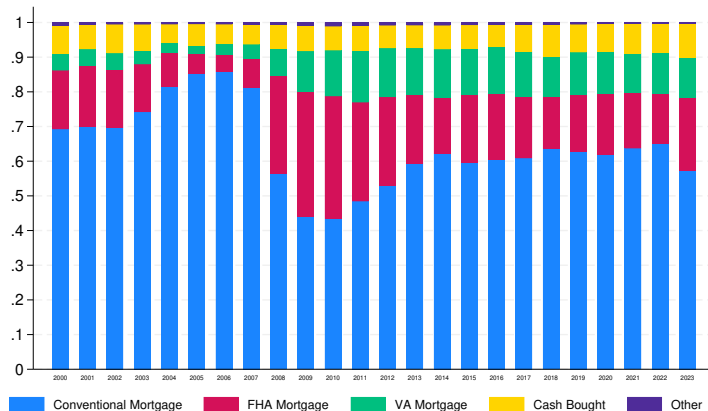
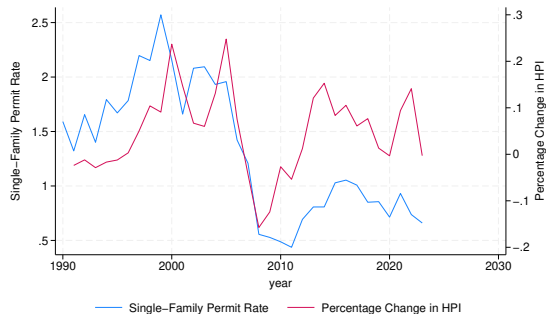Figure: National Finance Shares (CoreLogic)

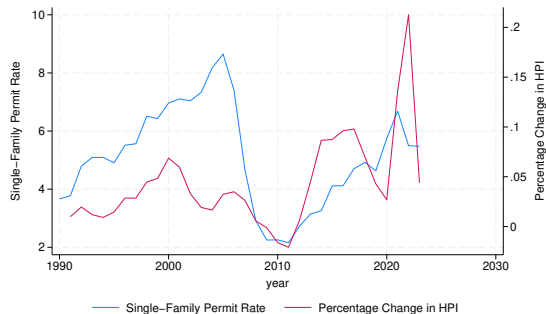Figure: SF Permit Rate and % HPI Change



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)
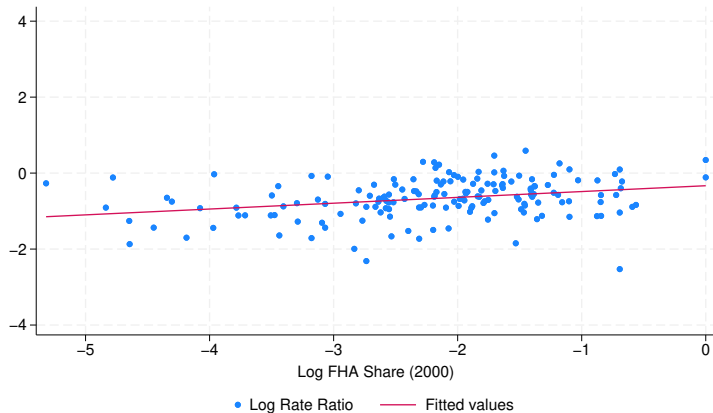


Figure: Log Recovery Ratio and Log FHA Share in 2000 (Untrimmed)

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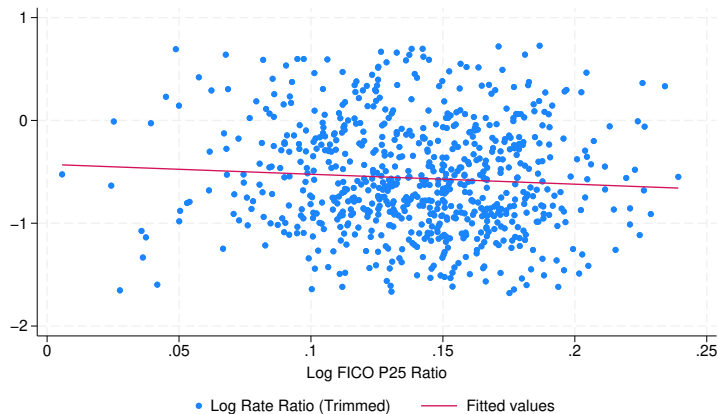


Figure: FICO Tightening (Trimmed)

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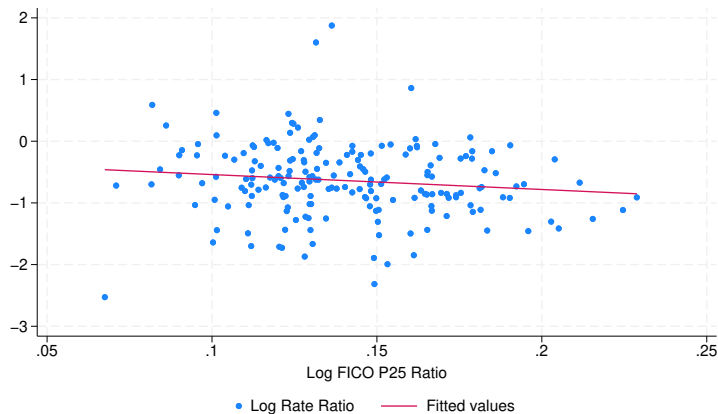


Figure: FICO Tightening (CL Trimmed)
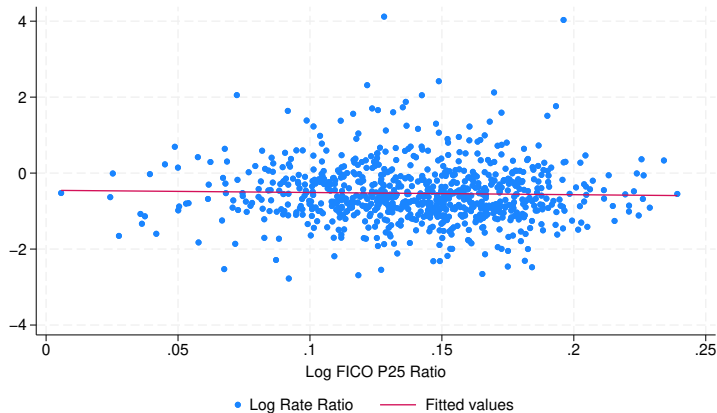
Figure: FICO Tightening (Untrimmed)

# 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 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

|  | (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