CREDIT GROWTH AND THE FINANCIAL CRISIS: A NEW NARRATIVE

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Introduction

- Prevailing narrative about the financial crisis:

  credit growth during boom concentrated in subprime segment
  defaults during financial crisis also concentrated in this segment

→ expansion of subprime credit leading cause for the crisis
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- Our contribution: study consumer debt and delinquency in 1999-2013
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- Findings:

  I. Credit growth during boom primarily for mid-high credit score borrowers
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  II. Larger rise in defaults for mid-high credit score borrowers during crisis
  
  III. High credit score defaults driven by real estate investors
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  III. High credit score defaults driven by real estate investors

- Lessons:
  
  Reassessment of role of subprime credit

  Critical role of real estate investors in foreclosure crisis
Outline

- Data
- Critique of approach in previous literature
  → role of lifecycle
- Our findings
- Role of real estate investors
- Macroeconomic implications
  → problems with geographically aggregated data
**Data**

- **FRBNY Consumer Credit Panel/Equifax Data**
  
  1% of all individuals with an Equifax credit report
  (2.5 mil borrowers per quarter)
  
  quarterly, 1999:Q1-2013:Q4

- **Information**
  
  all consumer debt except pay day loans
  delinquent behavior
  public record items
  credit score, age, ZIP code
  matched to payroll data for 2009
Prevailing Narrative

- Initial credit score used to assess borrower quality
  (Mian & Sufi 2009 and 2017)
**Prevailing Narrative**

- Initial credit score used to assess borrower quality
  (Mian & Sufi 2009 and 2017)

→ Stronger mortgage debt growth for *subprime borrowers*

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**Individuals by Initial Credit Score**

Real per capita real mortgage balances, ratio to 2001. (FRBNY CCP/Equifax Data.)
Problem with Initial Credit Score Ranking

- Low credit score borrowers disproportionately **young**

<table>
<thead>
<tr>
<th>Quartile 1: 39</th>
<th>Quartile 2: 44</th>
<th>Quartile 3: 48</th>
<th>Quartile 4: 58</th>
</tr>
</thead>
</table>

Age distribution by credit score quartile, 2004-2012 average. (Experian Data.)
Problem with Initial Credit Score Ranking

- Low credit score borrowers disproportionately young
- Young experience life cycle debt and credit score growth →

Credit Score Age Effects

(FRBNY CCP/Equifax Data.)
Problem with Initial Credit Score Ranking

- Low credit score borrowers disproportionately young
- Young experience life cycle debt and credit score growth → Initial credit score lower than at time of borrowing

Current Score as Ratio to 2001

By 1999 Equifax Risk Score Quartile. (FRBNY CCP/Equifax Data.)
Problem with Initial Credit Score Ranking

- Low credit score borrowers disproportionately young

- Young experience life cycle debt and credit score growth $\rightarrow$

  Initial credit score lower than at time of borrowing

  Young borrowers experience future debt growth due to life cycle demand

$\rightarrow$ Life cycle growth of credit scores and debt driven by income growth
Life Cycle Credit Scores, Debt and Income

- Credit score and debt growth for young in 1999 rise with 2009 income

25-34 Year Olds in 1999 by Income Quintile in 2009

Credit Score

Mortgage Balances

Difference with 2001 (credit score) and ratio to 2001 (mortgage balances).

(FRBNY CCP/Equifax Data.)
Life Cycle and Borrowing by Initial Credit Score

I. Removing differences in age distribution

(FRBNY CCP/Equifax Data.)
Life Cycle and Borrowing by Initial Credit Score

I. Removing differences in age distribution

→ Differences in debt growth across initial credit scores attenuated

Per Capita 2001Q3-2007Q4 Real Mortgage Balance Growth

<table>
<thead>
<tr>
<th>Quartile 1</th>
<th>Quartile 2</th>
<th>Quartile 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td>20%</td>
<td>14%</td>
</tr>
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</table>

Borrowers ranked by 1999 Equifax Risk Score. (FRBNY CCP/Equifax Data.)
II. Removing life cycle effects

Real per capita mortgage balances by 1999 Equifax Risk Score, ratio to 2001. Life cycle effects removed by assigning to each 1999 age bin balances of borrowers in that age bin in current quarter. (FRBNY CCP/Equifax Data.)
Life Cycle and Borrowing by Initial Credit Score

II. Removing life cycle effects

→ Differences in debt growth by initial credit score mostly eliminated

Real per capita mortgage balances by 1999 Equifax Risk Score, ratio to 2001. Life cycle effects removed by assigning to each 1999 age bin balances of borrowers in that age bin in current quarter. (FRBNY CCP/Equifax Data.)
Credit Scores, Debt and Defaults

- Alternative to initial credit score? recent credit score
Credit Scores, Debt and Defaults

- Alternative to initial credit score? RECENT CREDIT SCORE
  → Strongly positively related to income, given age

Predicted relation between credit score and total labor income by age in 2009.
(FRBNY CCP/Equifax Data.)
Debt and Defaults by Recent Credit Score

- Analysis from lender’s perspective
Debt and Defaults by Recent Credit Score

- Analysis from lender’s perspective

Regression Specification

Dependent variable:

future change in balances (4-12 quarter ahead)
Debt and Defaults by Recent Credit Score

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Regression Specification

Dependent variable:
  future change in balances (4-12 quarter ahead)

Explanatory variables:
  1 quarter lagged credit score quartile

Findings:
Strongest growth in debt and defaults for mid-high credit score borrowers (consistent with Adelino, Shoar & Severino 2015, Ferreira & Guyourko 2015 and Foote, Loewenstein & Willen 2016)
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time effects, age effects
time and age effects interacted with 1 quarter lagged credit score

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Debt by Recent Credit Score: Mortgage Balances

- Growth strongest for quartiles 2-3 during boom

Predicted 8 quarter ahead change in mortgage balances

Age adjusted, by 1Q lagged Equifax Risk Score quartile, USD. (FRBNY CCP/Equifax Data.)
Debt by Recent Credit Score: Mortgage Balances

- Sizable estimated age effects only for quartiles 2-4

Age effects for 8 quarter ahead change in mortgage balances

By 1Q lagged Equifax Risk Score quartile, USD. (FRBNY CCP/Equifax Data.)
Credit Growth by Credit Score: More Evidence

- No growth in new originations for quartile 1

By 8Q lagged Equifax Risk Score quartile. Quartile cutoffs: 615, 720, 791, 840. (FRBNY CCP/Equifax Data.)
Credit Growth by Credit Score: More Evidence

- No growth in new originations for quartile 1
- No growth in fraction with first mortgages for quartile 1

(FRBNY CCP/Equifax Data.)
Defaults by Recent Credit Score: Balances

- Delinquent mortgage balances grow most for quartiles 2-4 during crisis

Predicted 8 quarter ahead change in delinquent mortgage balances

Age adjusted, 90+ day delinquent, by 1Q lagged Equifax Risk Score quartile, USD.
(FRBNY CCP/Equifax Data.)
Defaults by Recent Credit Score

- Quartile 1 share of foreclosures drops during crisis

Foreclosures in the last 4 quarters by 8 quarter lagged Equifax Risk Score quartile.
(FRBNY CCP/Equifax Data)
Explaining High Credit Score Defaults

- Why did borrowers with 'good credit' default during crisis?

  Rise in investors → borrowers with 2 or more first mortgages
Explaining High Credit Score Defaults

- Why did borrowers with 'good credit' default during crisis?

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<tr>
<td>2001Q3-2004Q3 mean</td>
<td>0.063</td>
<td>0.103</td>
<td>0.110</td>
<td>0.107</td>
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<th>Investor Share of Mortgage Balances</th>
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By 8 quarter lagged Equifax Risk Score. (FRBNY CCP/Equifax Data.)
**Explaining High Credit Score Defaults**

- Why did borrowers with ‘good credit’ default during crisis?

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<td>0.107</td>
</tr>
<tr>
<td>2007Q4 peak</td>
<td>0.082</td>
<td>0.156</td>
<td>0.162</td>
<td>0.142</td>
</tr>
</tbody>
</table>

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<td>Quartile 2</td>
<td>Quartile 3</td>
<td>Quartile 4</td>
</tr>
<tr>
<td>2001Q3-2004Q3 mean</td>
<td>0.123</td>
<td>0.196</td>
<td>0.212</td>
<td>0.226</td>
</tr>
<tr>
<td>2007Q4 peak</td>
<td>0.183</td>
<td>0.333</td>
<td>0.350</td>
<td>0.317</td>
</tr>
</tbody>
</table>

By 8 quarter lagged Equifax Risk Score. (FRBNY CCP/Equifax Data.)
High Credit Score Defaults: Role of Investors

- Rise in foreclosure rate more pronounced for investors

Foreclosure rate by 8 quarter lagged Equifax Risk Score, 3QMA. (FRBNY CCP/Equifax Data.)
**High Credit Score Defaults: Role of Investors**

- Rise in foreclosure rate *more pronounced for investors*

→ Rise in investor share of defaults for high credit score borrowers

*Investor Share of Foreclosures*

By quartile of the 8 quarter lagged Equifax Risk Score, 3QMA. (FRBNY CCP/Equifax Data.)
Macroeconomic Implications

- Aggregate consequences of growth in subprime lending
  
  Mortgage defaults $\rightarrow$ drop in house prices  
  $\quad$ $\rightarrow$ contraction in credit for high MPC households  
  $\quad$ $\rightarrow$ drop in consumption and employment  
  $\rightarrow$ larger mortgage boom associated with more severe recession
**Macroeconomic Implications**

- Aggregate consequences of growth in subprime lending

  Mortgage defaults $\rightarrow$ drop in house prices
  $\rightarrow$ contraction in credit for high MPC households
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  $\rightarrow$ larger mortgage boom associated with more severe recession

- Causal link identified from geographical variation

  (zip code, MSA, county, state)

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$\rightarrow$ larger mortgage boom associated with more severe recession

- Causal link identified from geographical variation

  (zip code, MSA, county, state)


$\rightarrow$ New findings challenge causal mechanism
Growth in Mortgage Balances By Zip Code

- Stronger debt growth in zip codes with high fraction of subprime borrowers
  (Mian & Sufi 2009)

**Growth in Mortgage Balances By Zip Code**

- Stronger debt growth in zip codes with high fraction of subprime borrowers (Mian&Sufi 2009)

→ Strongest growth **for prime borrowers** in all zip codes

Zip Code Variation: Role of Age Distribution

- Highest debt growth in high subprime zip codes for all borrowers
**Zip Code Variation: Role of Age Distribution**

- Highest debt growth in high subprime zip codes for all borrowers
- More young borrowers in high subprime zip codes

<table>
<thead>
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<th>2001 subprime share</th>
<th>Quartile 1</th>
<th>Quartile 2</th>
<th>Quartile 3</th>
<th>Quartile 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001 subprime share</td>
<td>19%</td>
<td>32%</td>
<td>44%</td>
<td>60%</td>
</tr>
<tr>
<td>Fraction in each age bin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-34</td>
<td>0.22</td>
<td>0.25</td>
<td>0.28</td>
<td>0.30</td>
</tr>
<tr>
<td>35-54</td>
<td>0.42</td>
<td>0.41</td>
<td>0.41</td>
<td>0.41</td>
</tr>
<tr>
<td>55-85</td>
<td>0.38</td>
<td>0.34</td>
<td>0.32</td>
<td>0.30</td>
</tr>
</tbody>
</table>

By fraction of subprime in 2001. 2001Q1-2013Q4 averages. (FRBNY CCP/Equifax Data.)
ZIP CODE VARIATION: ROLE OF AGE DISTRIBUTION

- Highest debt growth in high subprime zip codes for all borrowers
- More young borrowers in high subprime zip codes
→ Quartile 4-Quartile 1 difference mostly explained by age distribution

2001Q1-2007Q4 REAL PER CAPITA MORTGAGE BALANCE GROWTH

<table>
<thead>
<tr>
<th>Quartile 2</th>
<th>Quartile 3</th>
<th>Quartile 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>44%</td>
<td>43%</td>
<td>84%</td>
</tr>
</tbody>
</table>

Difference relative to Quartile 1 explained by age distribution

By fraction of subprime in 2001. (FRBNY/CCP Equifax Data.)
Defaults By Zip Code

- Similar rise in foreclosure rates during crisis

By fraction of subprime in 2001. (FRBNY CCP/Equifax Data.)
**Defaults By Zip Code**

- Similar rise in foreclosure rates during crisis
- Large rise in prime share of defaults in all zip codes during crisis
  → Higher default rates for prime borrowers in high subprime zip codes

**Prime Share of Foreclosures**

By fraction of subprime in 2001. (FRBNY CCP/Equifax Data.)
Defaults By Zip Code: Role of Investors

- Larger rise in investors for prime borrowers, similar across zip codes
- More subprime investors in low subprime zip codes

Fraction with 2+ first mortgages by fraction of subprime borrowers in 2001.
Prime status based on 8Q lagged credit score. (FRBNY CCP/Equifax Data.)
Defaults By Zip Code: Role of Investors

- Stronger rise in foreclosures for prime investors in high subprime zip codes

### Prime Borrowers

<table>
<thead>
<tr>
<th>no. first mortgages</th>
<th>Quartile 1</th>
<th>Quartile 2</th>
<th>Quartile 3</th>
<th>Quartile 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>86%</td>
<td>85%</td>
<td>97%</td>
<td>104%</td>
</tr>
<tr>
<td>3</td>
<td>94%</td>
<td>104%</td>
<td>117%</td>
<td>118%</td>
</tr>
<tr>
<td>4+</td>
<td>102%</td>
<td>122%</td>
<td>133%</td>
<td>125%</td>
</tr>
</tbody>
</table>

2005Q4-2007Q4 change in foreclosure rate

<table>
<thead>
<tr>
<th>no. first mortgages</th>
<th>Quartile 1</th>
<th>Quartile 2</th>
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<tbody>
<tr>
<td>2</td>
<td>0.023</td>
<td>0.027</td>
<td>0.045</td>
<td>0.053</td>
</tr>
<tr>
<td>3</td>
<td>0.040</td>
<td>0.063</td>
<td>0.087</td>
<td>0.115</td>
</tr>
<tr>
<td>4+</td>
<td>0.076</td>
<td>0.096</td>
<td>0.123</td>
<td>0.151</td>
</tr>
</tbody>
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Zip code level investor activity for prime borrowers by fraction of subprime in 2001. (FRBNY CCP/Equifax Data.)
Zip Code Variation: Role of Demographics

- Why did high subprime zip codes experience more severe recession?
Zip Code Variation: Role of Demographics

- Why did high subprime zip codes experience more severe recession?
  Young, low education, high minority share

### Zip Code Level Indicators

<table>
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<tbody>
<tr>
<td>Associate+ degree (2012)</td>
<td>45%</td>
<td>31%</td>
<td>23%</td>
<td>17%</td>
</tr>
<tr>
<td>Percent white</td>
<td>93%</td>
<td>90%</td>
<td>83%</td>
<td>63%</td>
</tr>
<tr>
<td>Percent black</td>
<td>1.7%</td>
<td>3.6%</td>
<td>7.6%</td>
<td>24.6%</td>
</tr>
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By fraction of subprime in 2001.
(FRBNY CCP/Equifax Data, IPUMS, IRS, ACS.)
**Zip Code Variation: Role of Demographics**

- Why did high subprime zip codes experience more severe recession?
  
  Young, low education, high minority share

  High unemployment, low income

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<tbody>
<tr>
<td>Average UR 2001-2007</td>
<td>4.94%</td>
<td>5.19%</td>
<td>5.38%</td>
<td>5.72%</td>
</tr>
<tr>
<td>Average PDI 2001-2007</td>
<td>$41k</td>
<td>$30k</td>
<td>$26k</td>
<td>$21k</td>
</tr>
</tbody>
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By fraction of subprime in 2001. PDI in 2012 USD.
(FRBNY CCP/Equifax Data, IPUMS, IRS, ACS.)
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- Why did high subprime zip codes experience more severe recession?
  Young, low education, high minority share
  High unemployment, low income
  High population density & inequality

<table>
<thead>
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<tr>
<td>Pop per sq mile</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>1,214</td>
</tr>
<tr>
<td>Mean Income ≥ $200K</td>
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By fraction of subprime in 2001.
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- Why did high subprime zip codes experience more severe recession?
  - Young, low education, high minority share
  - High unemployment, low income
  - High population density & inequality
  - More pronounced swing in housing values

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<tbody>
<tr>
<td>HPI Growth 2001-2007</td>
<td>29%</td>
<td>37%</td>
<td>42%</td>
<td>47%</td>
</tr>
<tr>
<td>HPI Growth 2007-2010</td>
<td>-21%</td>
<td>-30%</td>
<td>-27%</td>
<td>-36%</td>
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→ Prevalence of business cycle sensitive, high MPC populations
  ⇒ stronger impact of recession on employment and consumption
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→ Prevalence of business cycle sensitive, high MPC populations
  \[\implies\] stronger impact of recession on employment and consumption

→ Prevalence of urban areas
  \[\implies\] accentuated house price cycle
  gentrification (Guerrieri et al. 2013)
  international capital inflows
Conclusions

I. Reassessment of role of subprime credit

II. Important role of real estate investors for foreclosure crisis
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I. Reassessment of role of subprime credit

II. Important role of real estate investors for foreclosure crisis
   - drivers of investor activity? (Albanesi 2018)
   - alternative default risk indicators? (Albanesi & Vamossy 2018)

III. Geographical variation
   - larger rise in debt and defaults for prime borrowers everywhere
   - more severe recession in high subprime areas linked to demographics
     Why stronger housing cycle and investor activity in high subprime areas?
     - preference for urban locations (Gyourko, Mayer & Sinai 2012, Couture & Handbury 2017)
     - labor market factors (Ferreira & Gyourko 2012, Liebersohn 2017)
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   - alternative default risk indicators? (Albanesi & Vamossy 2018)

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