Credit Growth and the Financial Crisis: A New Narrative

Stefania Albanesi, University of Pittsburgh
Giacomo De Giorgi, University of Geneva
Jaromir Nosal, Boston College

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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

$\rightarrow$ expansion of subprime credit leading cause for the crisis

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  defaults during financial crisis also concentrated in this segment

→ expansion of subprime credit leading cause for the crisis

- Mechanism:

  mortgage defaults → drop in house prices

  → contraction in credit

  → drop in consumption and employment

  (Lorenzoni & Guerreri 2015, Midrigan & Philippon 2016, Justiniano & al. 2016, Berger & al. 2015, Kaplan, Mittman &Violante 2017, Hedlund & Garriga 2016, etc.)

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  based on large administrative panel of credit report data

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I. Credit growth during boom primarily for mid-high credit score borrowers
   (consistent with Adelino, Shoar & Severino 2015, Ferreira & Guyourko 2015 and Foote, Loewenstein & Willen 2016)

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III. High credit score defaults driven by real estate investors

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  Lessons:

- Critical role of real estate investors in foreclosure crisis

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

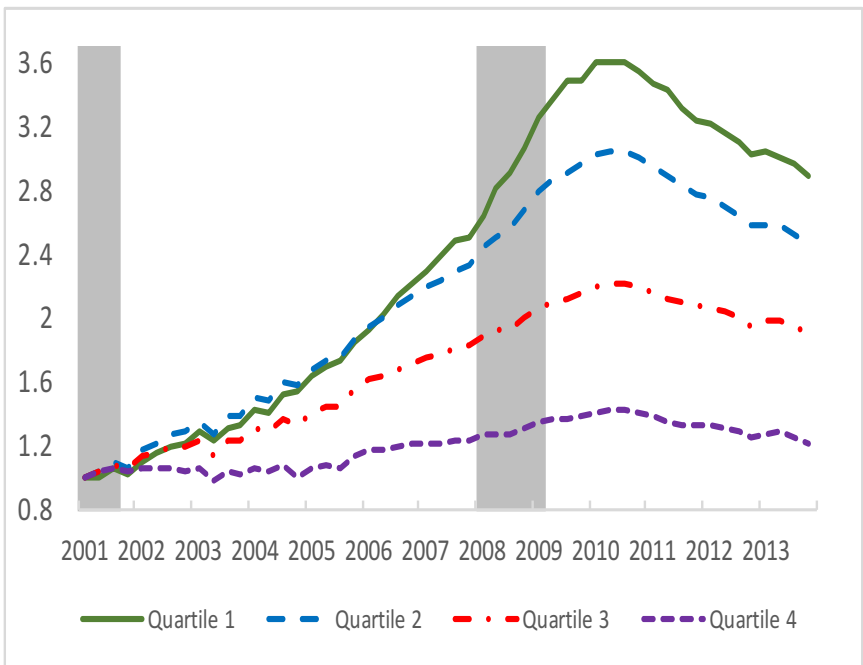
Prevailing Narrative

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

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Individuals by Initial Credit Score

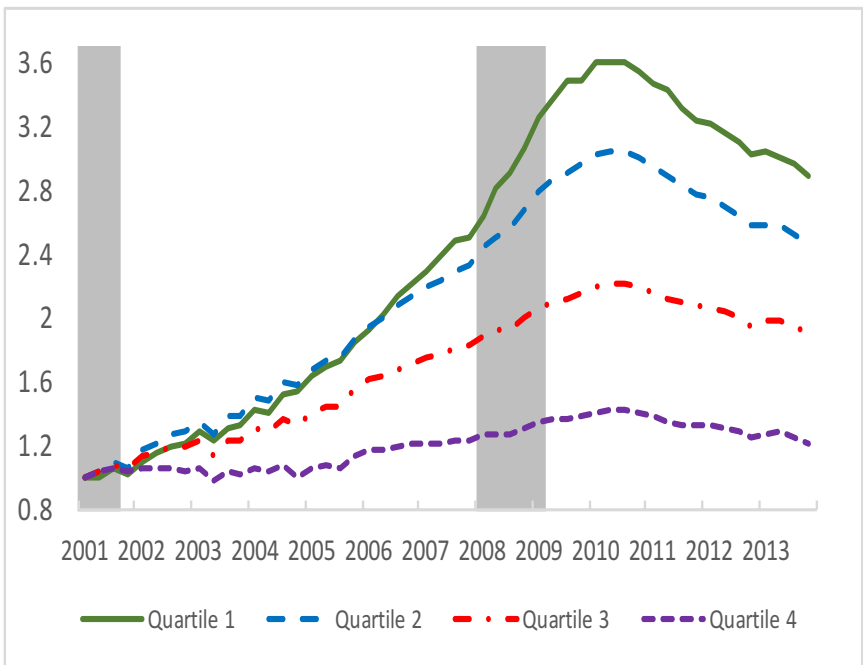


Real per capita real mortgage balances, ratio to 2001Q3. (FRBNY CCP/Equifax Data.)

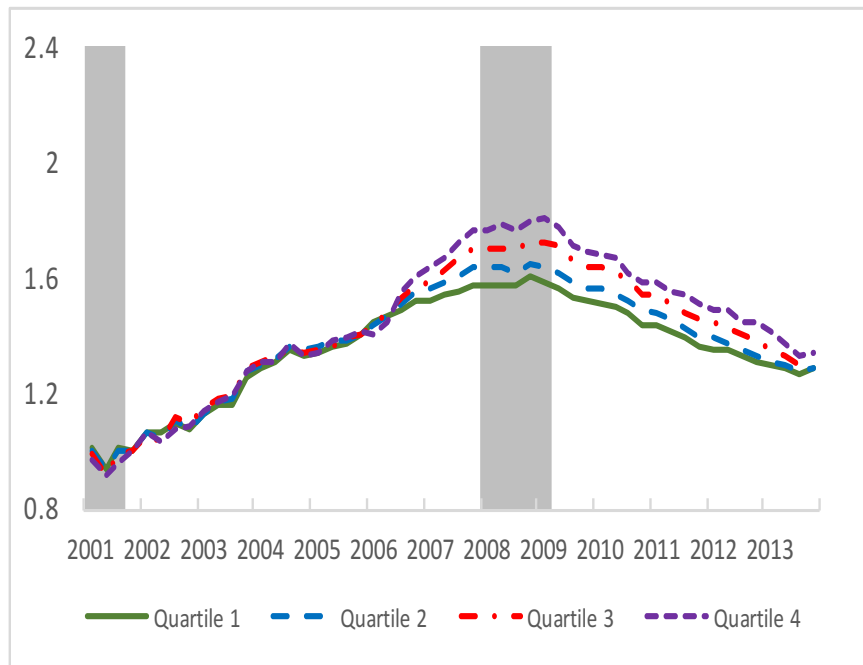
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Individuals by Initial Credit Score



Zip Codes by Initial Subprime Share



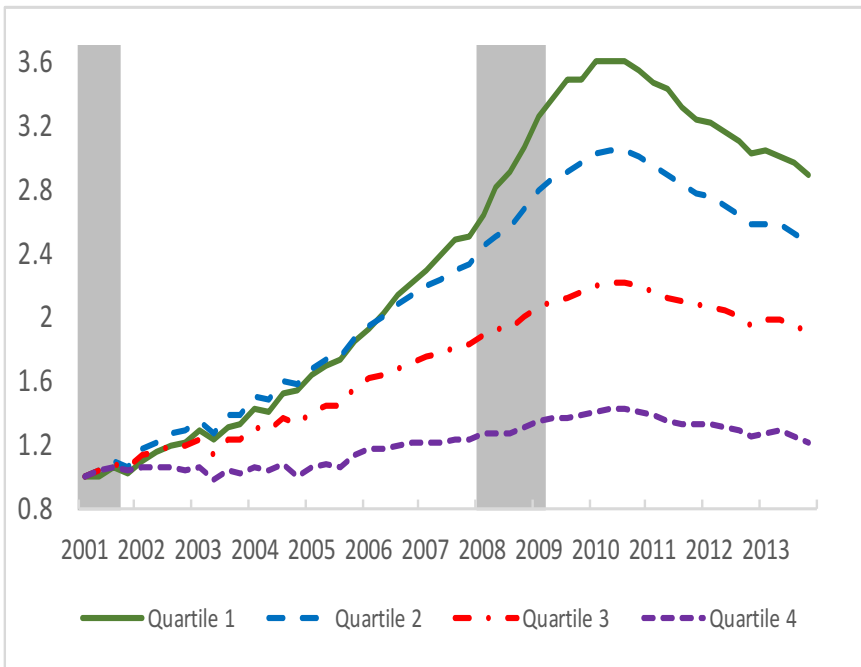
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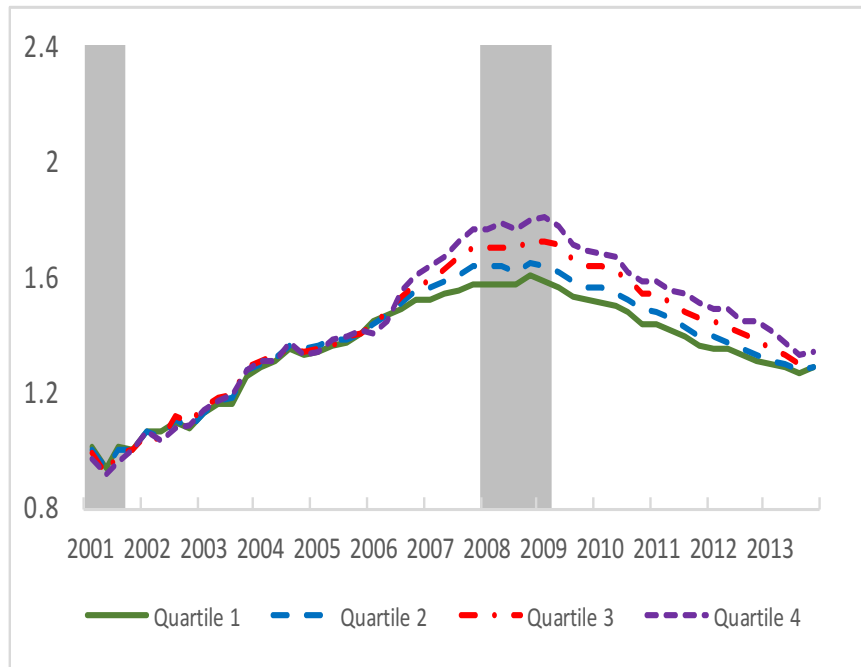
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→ Stronger mortgage debt growth for subprime borrowers

Individuals by Initial Credit Score



Zip Codes by Initial Subprime Share

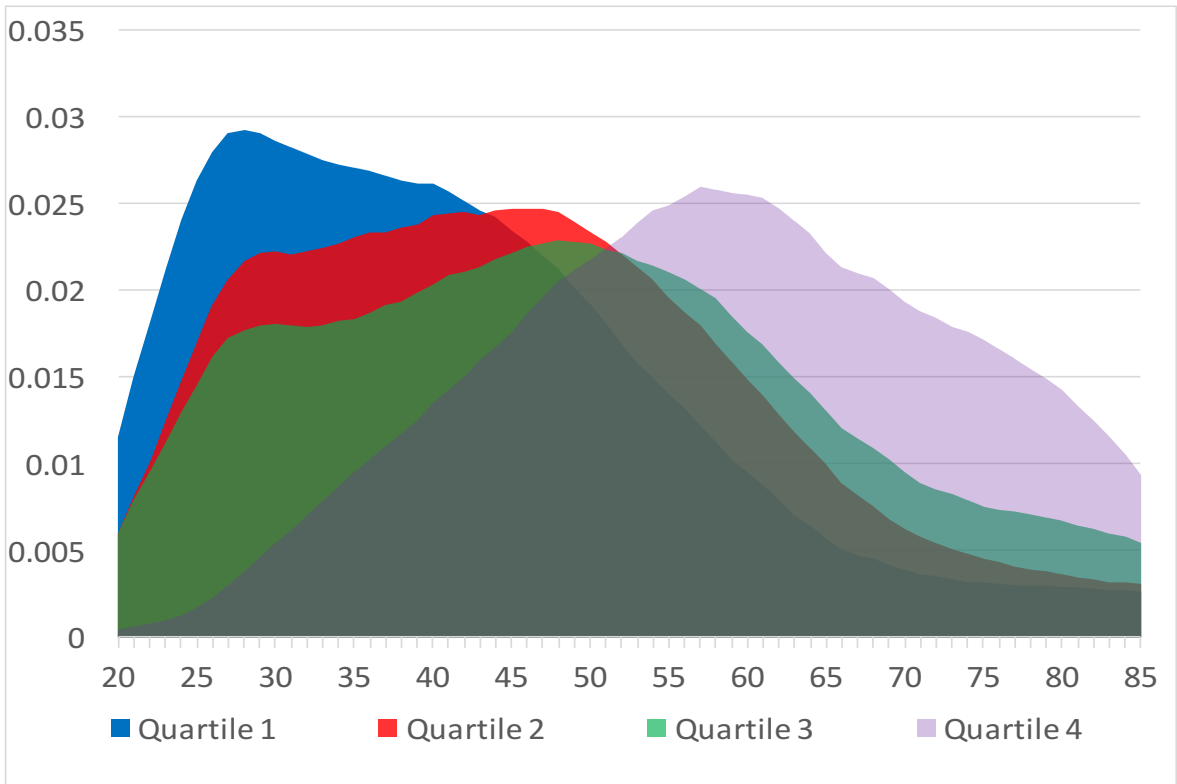


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Problems with Initial Credit Score Ranking

- Low credit score borrowers disproportionately young

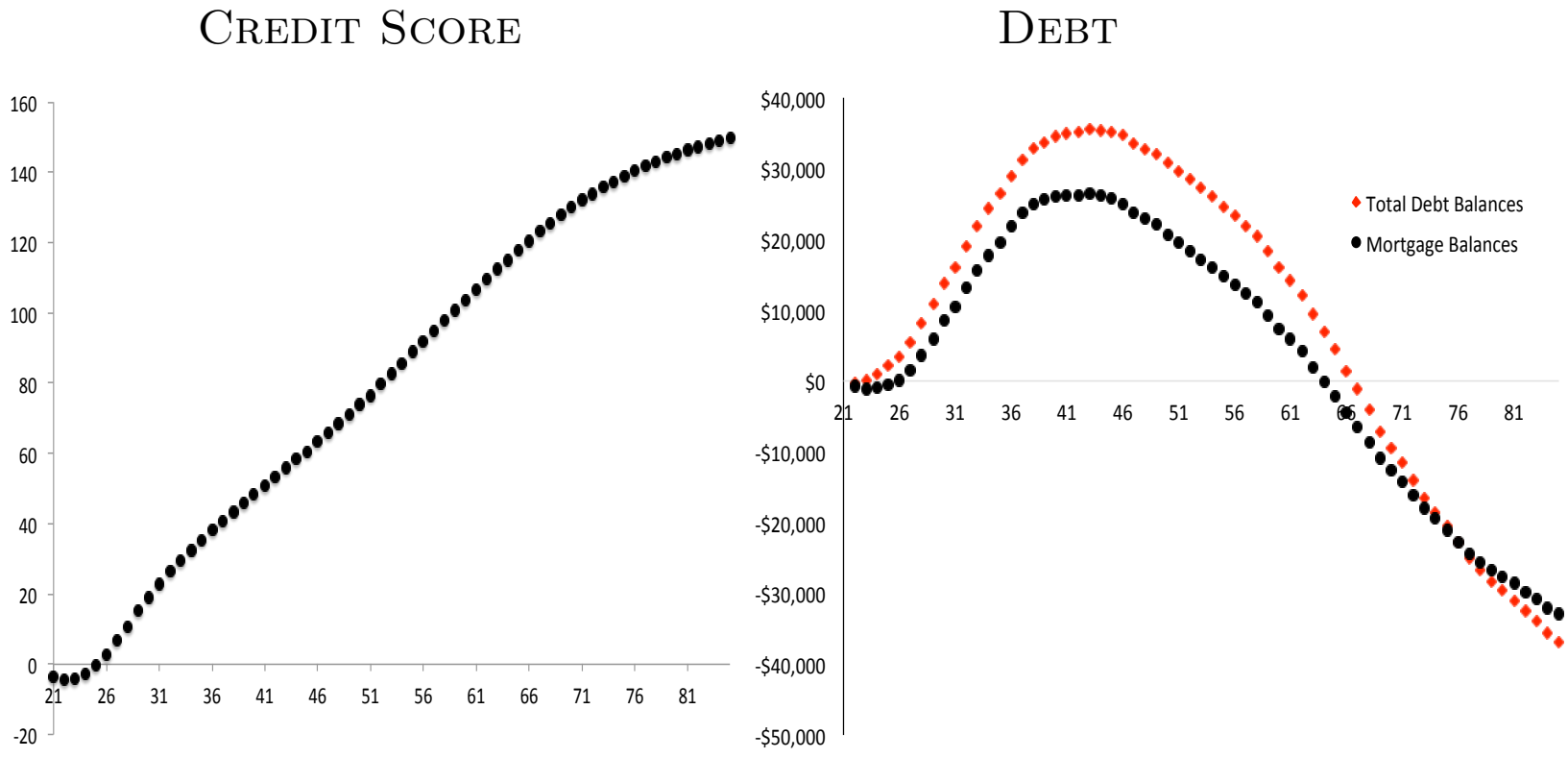
Median Age			
Quartile 1: 39	Quartile 2: 44	Quartile 3: 48	Quartile 4: 58



Age distribution by credit score quartile, 2004-2012 average. (Experian Data.)

Problems with Initial Credit Score Ranking

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



Estimated age effects. (FRBNY CCP/Equifax Data.)

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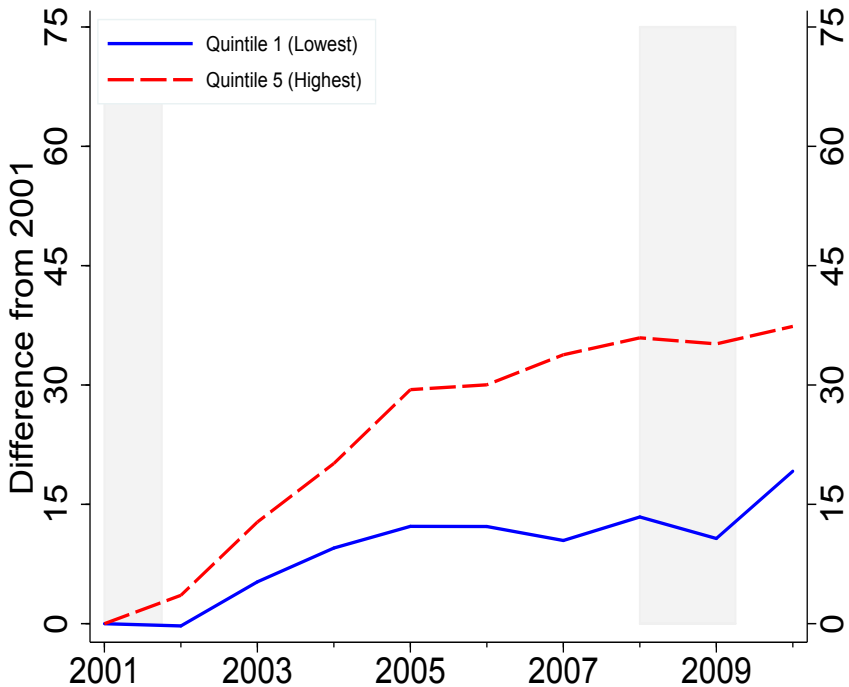
- Life cycle growth of credit scores and debt driven by income growth

Life Cycle Credit Scores, Debt and Income

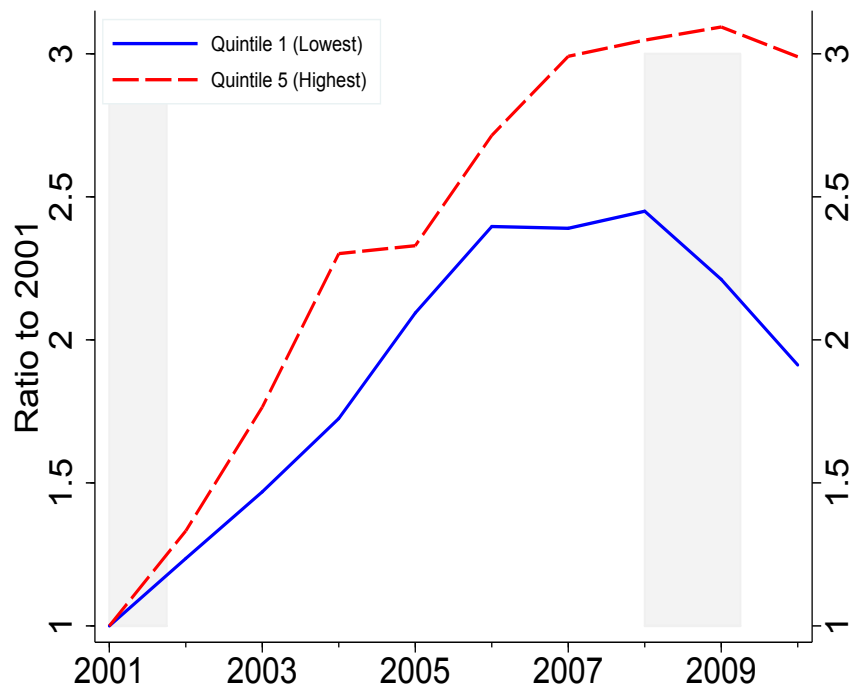
- Credit score and debt growth for young in 1999 rise with 2009 income

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

Per Capita 2001Q3-2007Q4 Real Mortgage Balance Growth

Difference with Quartile 4 Explained by Age Distribution		
Quartile 1	Quartile 2	Quartile 3
25%	20%	14%

Borrowers ranked by 1999 Equifax Risk Score. (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

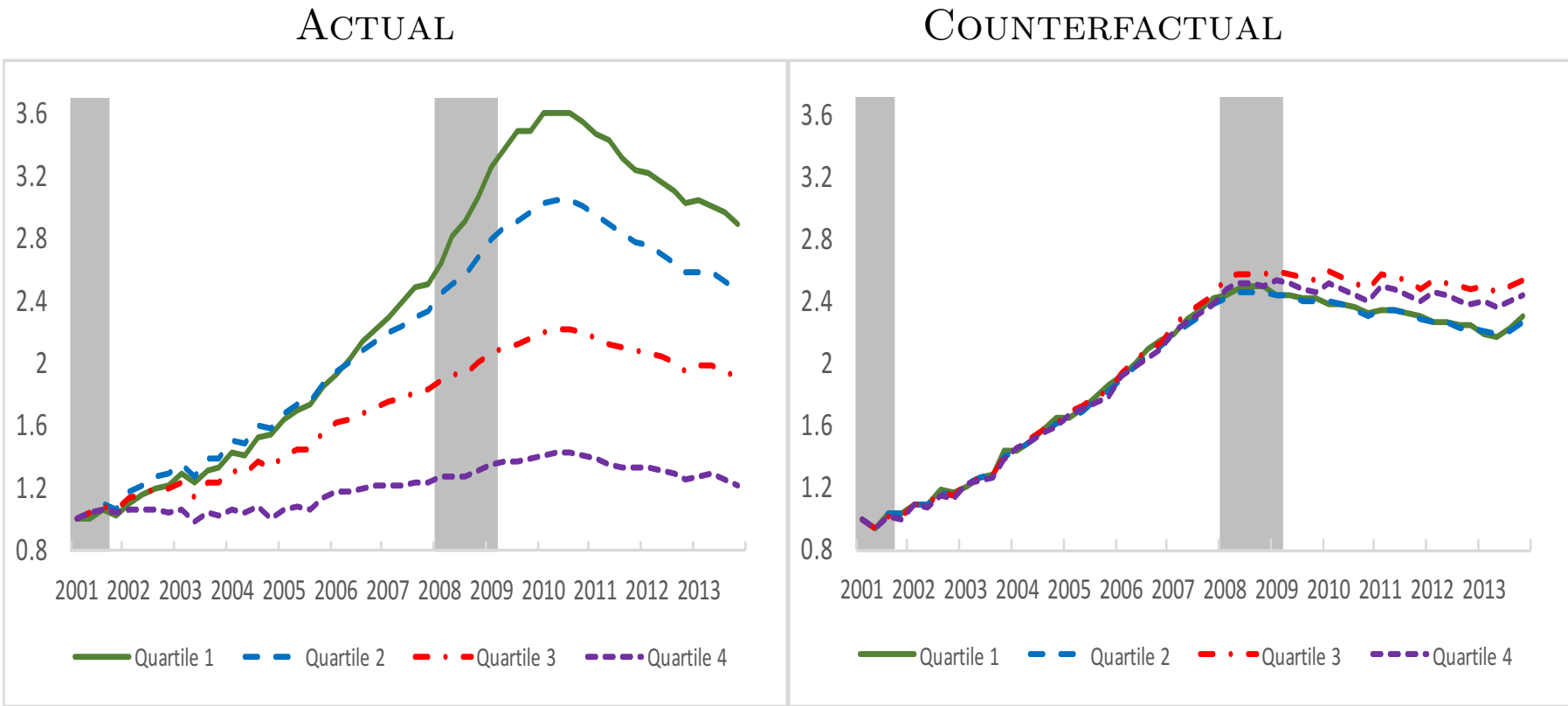
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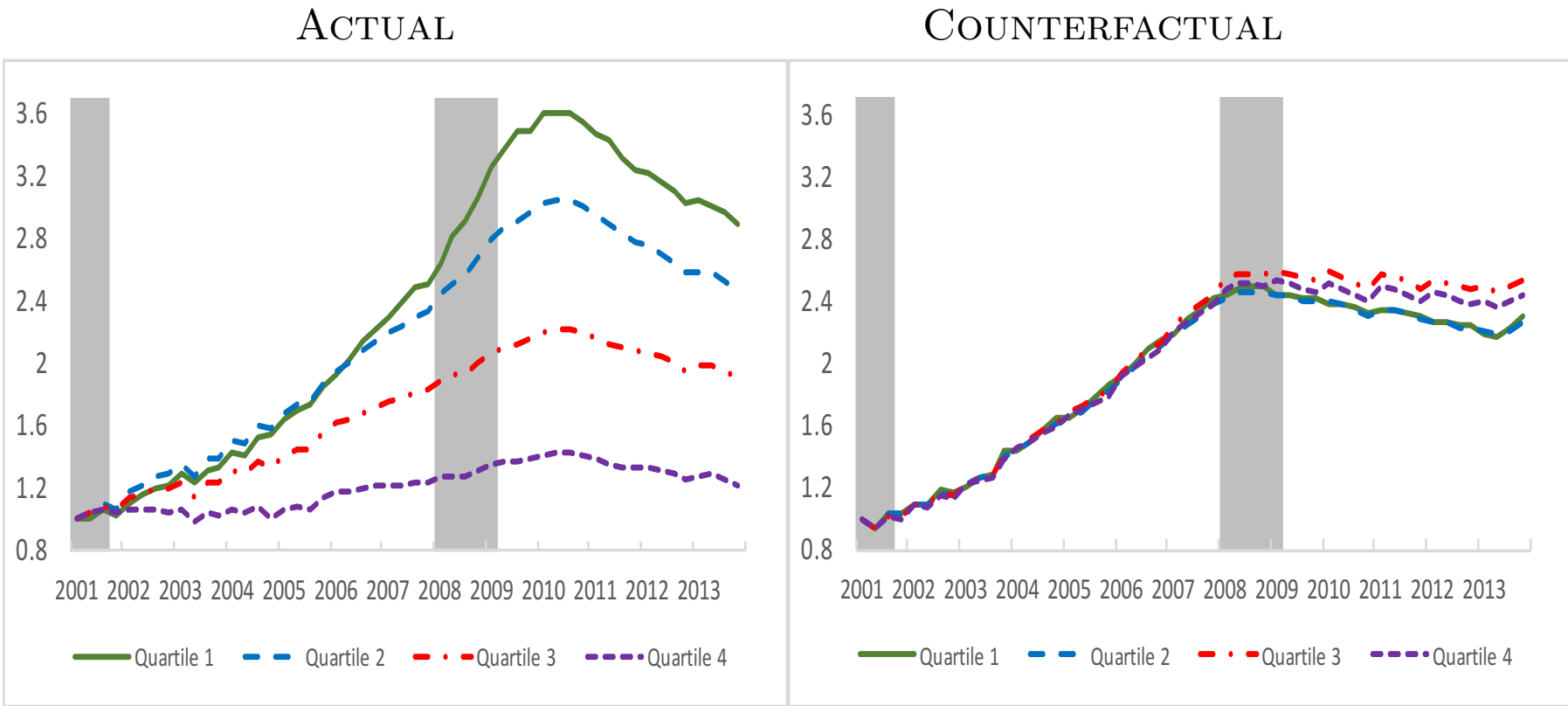


Real per capita mortgage balances by 1999 Equifax Risk Score, ratio to 2001Q3. Counterfactual assigns to each 1999 age bin balances of borrowers in that age bin in each subsequent quarter. (FRBNY CCP/Equifax Data.)

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 2001Q3. Counterfactual assigns to each 1999 age bin balances of borrowers in that age bin in each subsequent quarter. (FRBNY CCP/Equifax Data.)

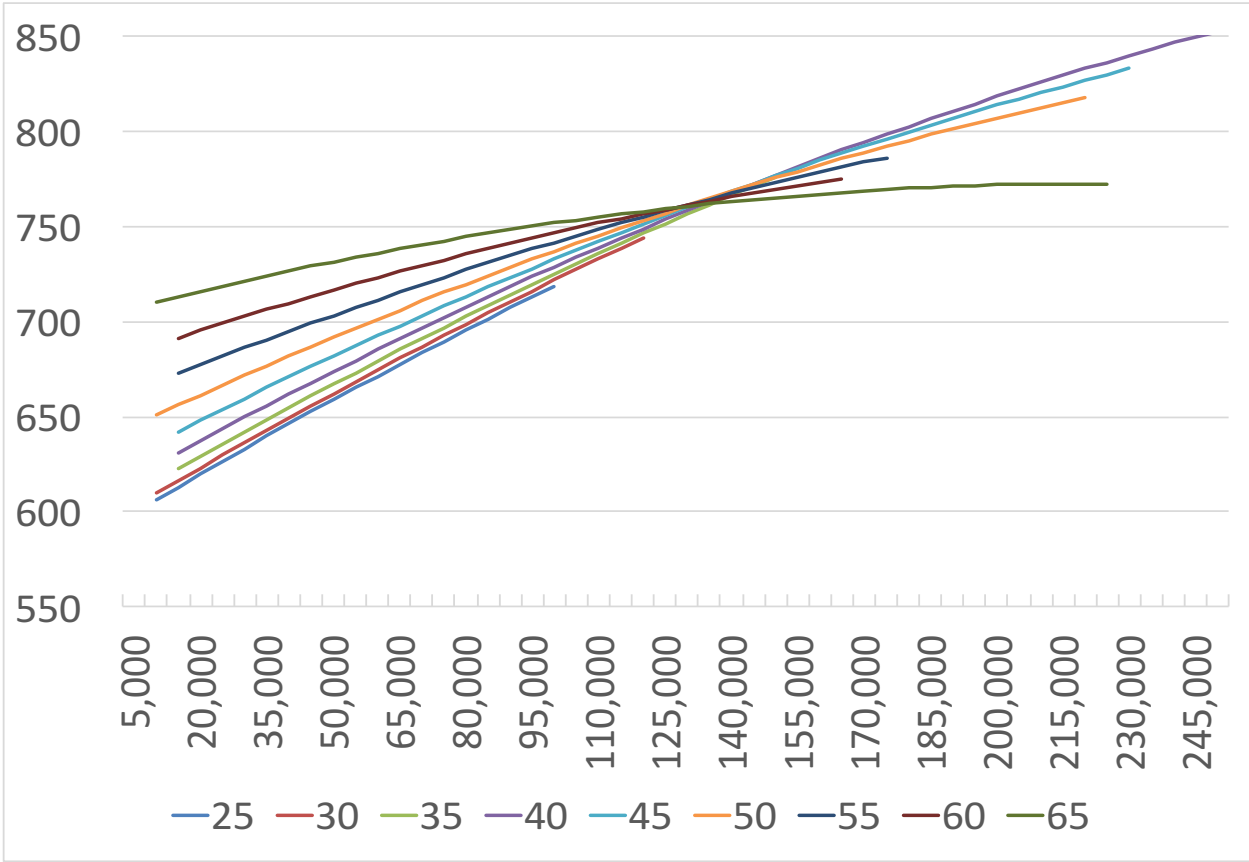
Credit Scores, Debt and Defaults

- Alternative to initial credit score? RECENT CREDIT SCORE

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→ 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

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Regression Specification

Dependent variable:

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Explanatory variables:

1 quarter lagged credit score quartile
lagged change in credit score (4-8 quarter change)
time effects, age effects
time and age effects interacted with 1 quarter lagged credit score

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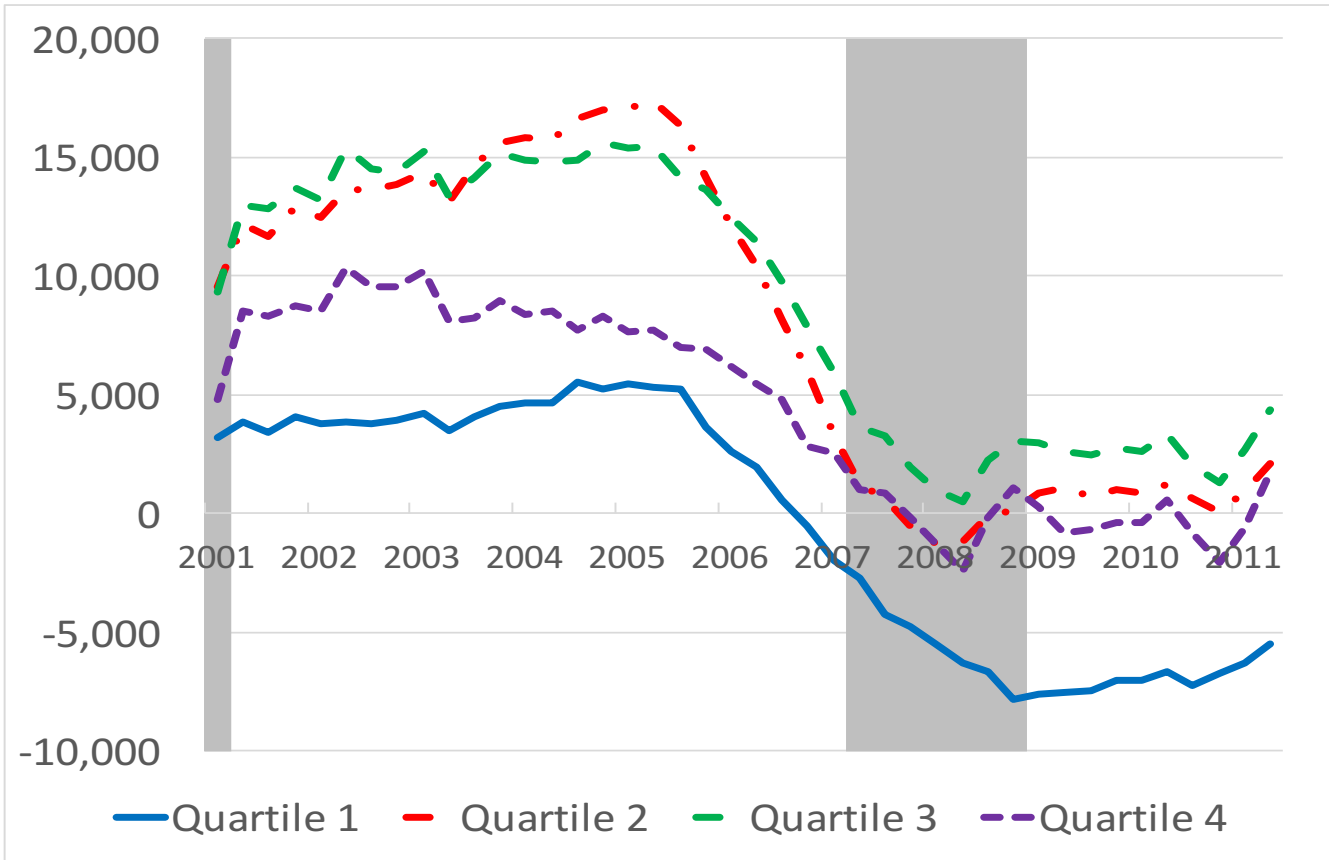
- Findings:

Strongest growth in debt and defaults for mid-high credit score borrowers

Debt by Recent Credit Score: Mortgage Balances

- Growth strongest for quartiles 2-3 during boom

Predicted 8 quarter ahead change in mortgage balances

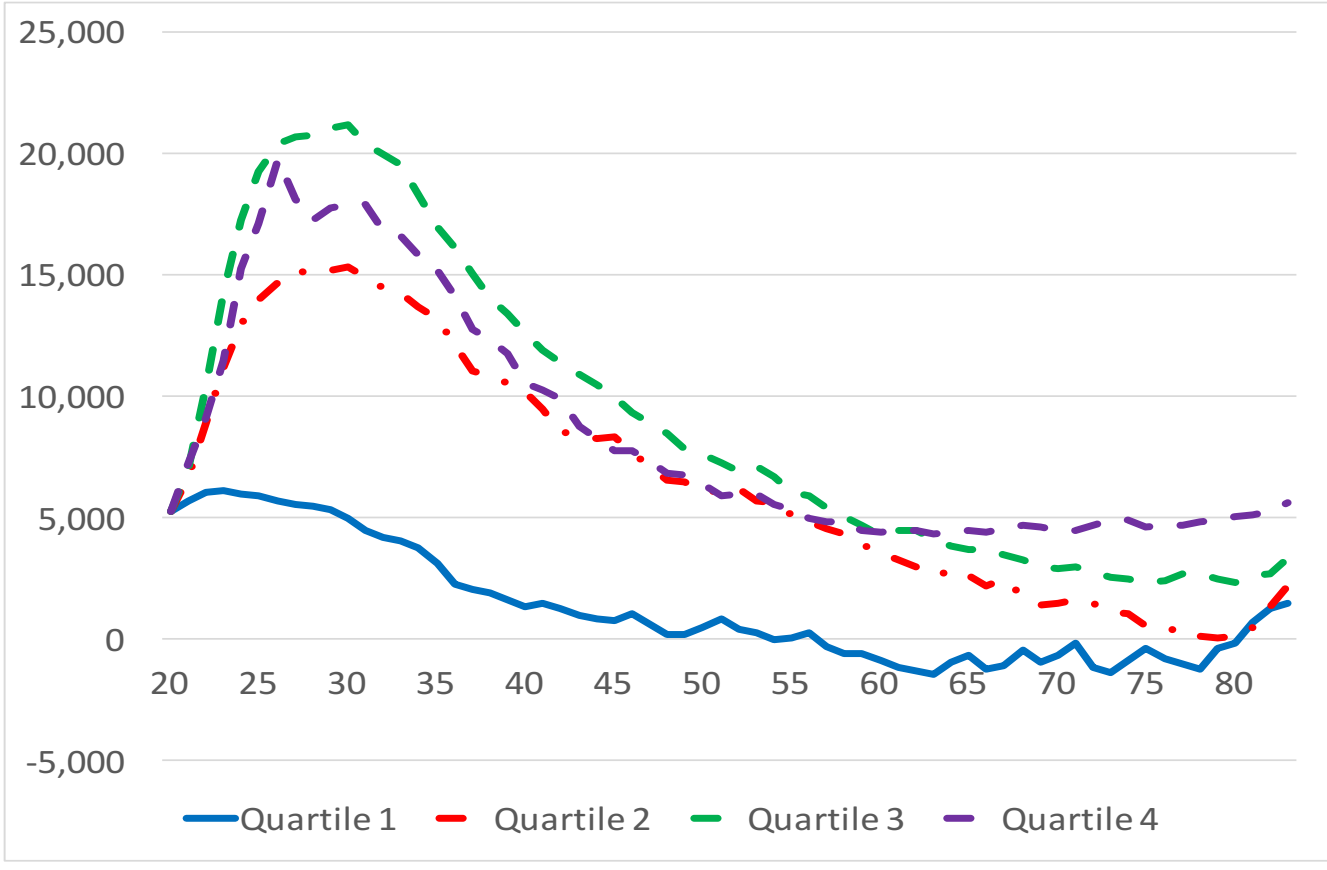


Age adjusted, by 1Q lagged Equifax Risk Score quartile, USD. (FRBNY CCP/Equifax Data.)

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

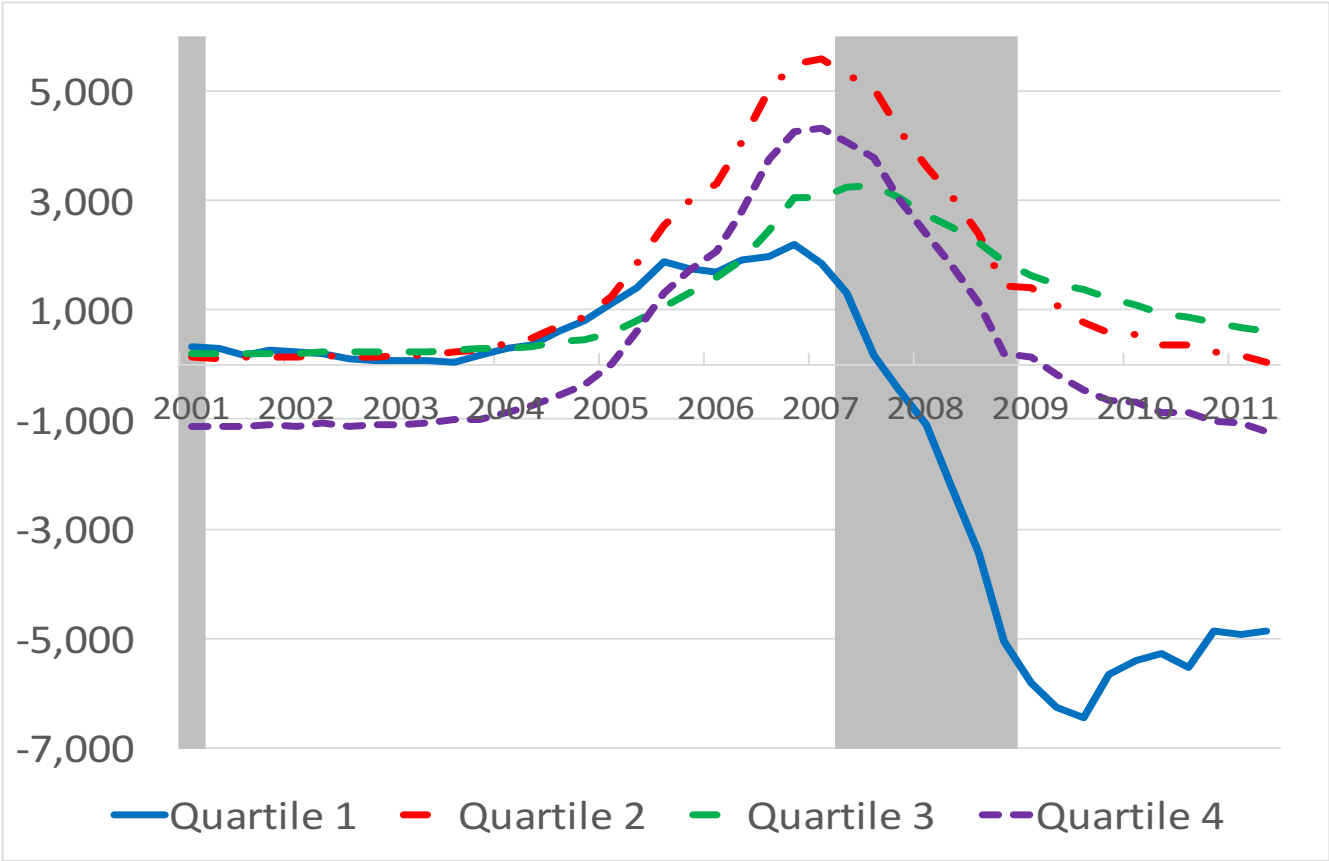


By 1Q lagged Equifax Risk Score quartile, USD. (FRBNY CCP/Equifax Data.)

Defaults by Recent Credit Score: Balances

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

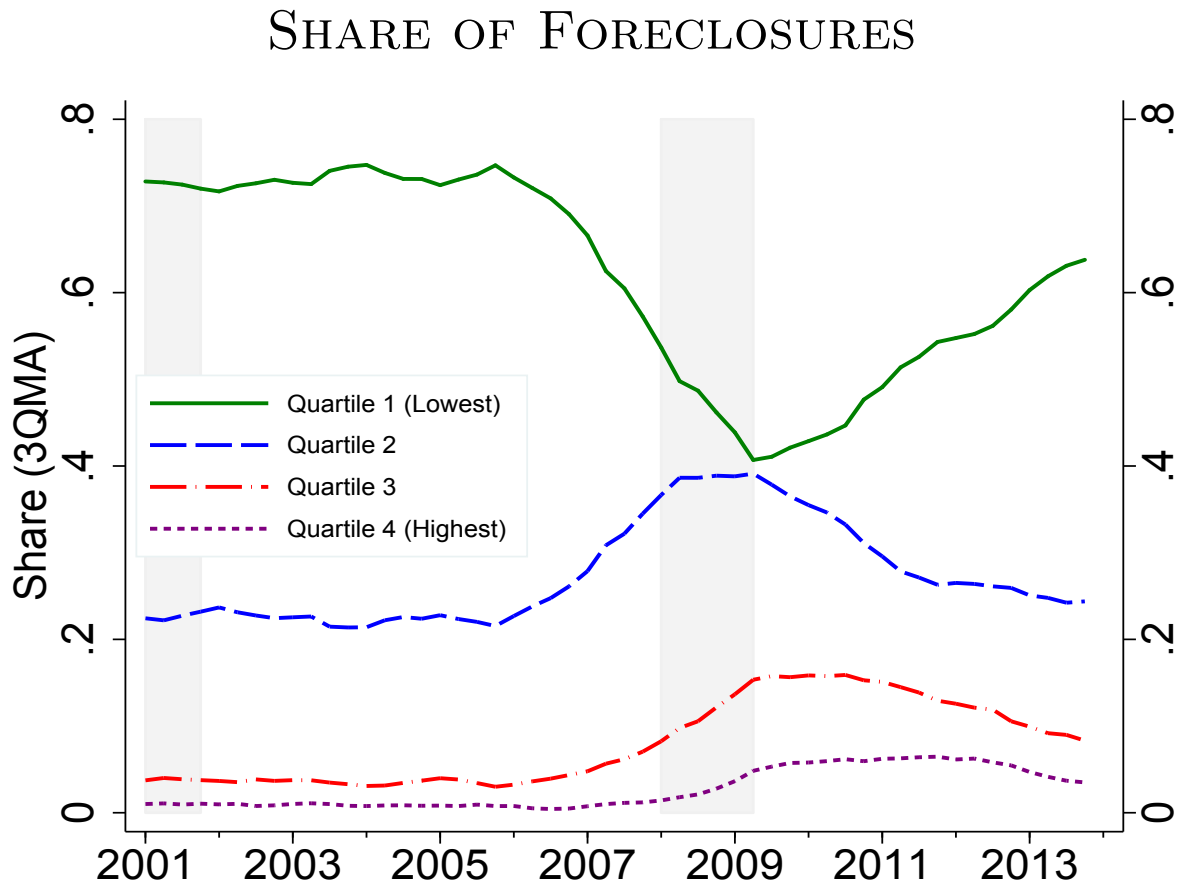
Predicted 8 quarter ahead change in delinquent mortgage balances



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



Share of new foreclosures 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 $\rightarrow$ borrowers with 2 or more first mortgages

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Fraction of Investors				
	Quartile 1	Quartile 2	Quartile 3	Quartile 4
2001Q3-2004Q3 mean	0.063	0.103	0.110	0.107

Investor Share of Mortgage Balances				
	Quartile 1	Quartile 2	Quartile 3	Quartile 4
2001Q3-2004Q3 mean	0.123	0.196	0.212	0.226

By 8 quarter lagged Equifax Risk Score. (FRBNY CCP/Equifax Data.)

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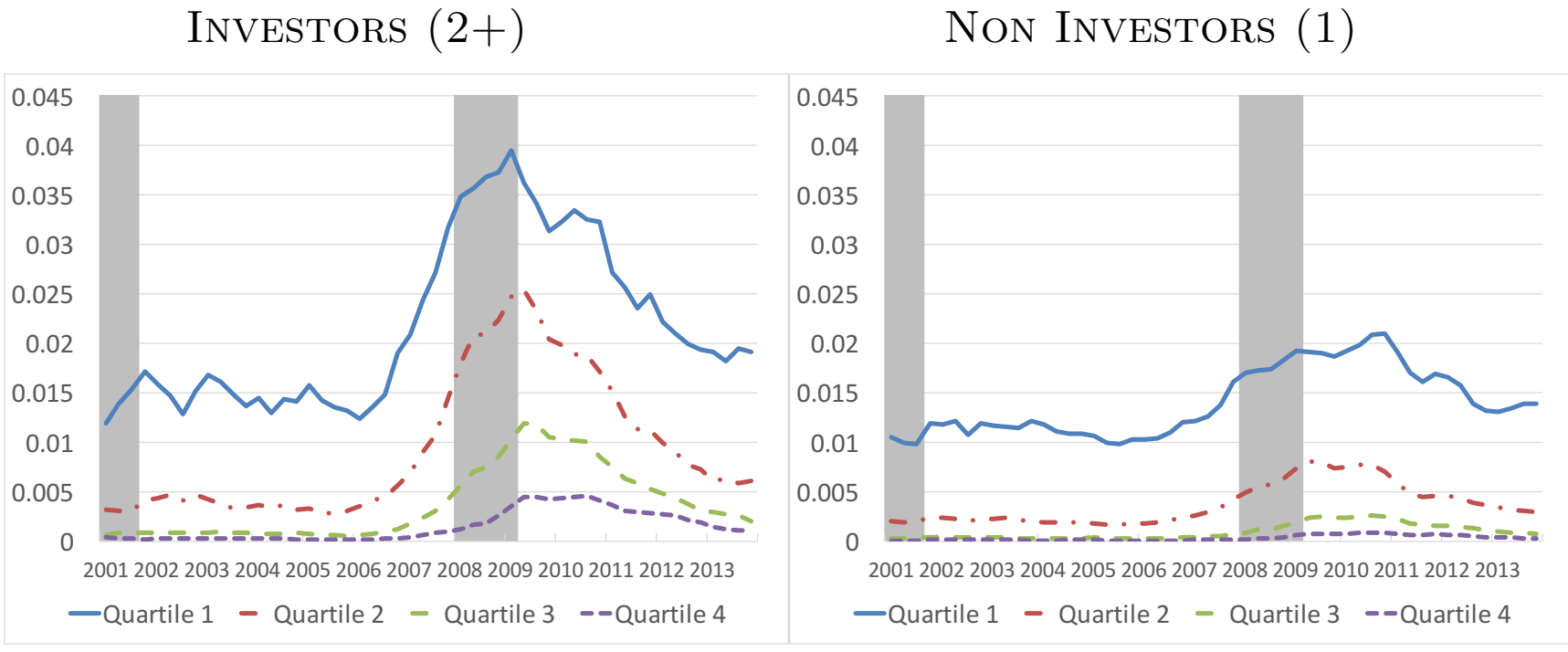
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2007Q4 peak	0.082	0.156	0.162	0.142
Investor Share of Mortgage Balances				
	Quartile 1	Quartile 2	Quartile 3	Quartile 4
2001Q3-2004Q3 mean	0.123	0.196	0.212	0.226
2007Q4 peak	0.183	0.333	0.350	0.317

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

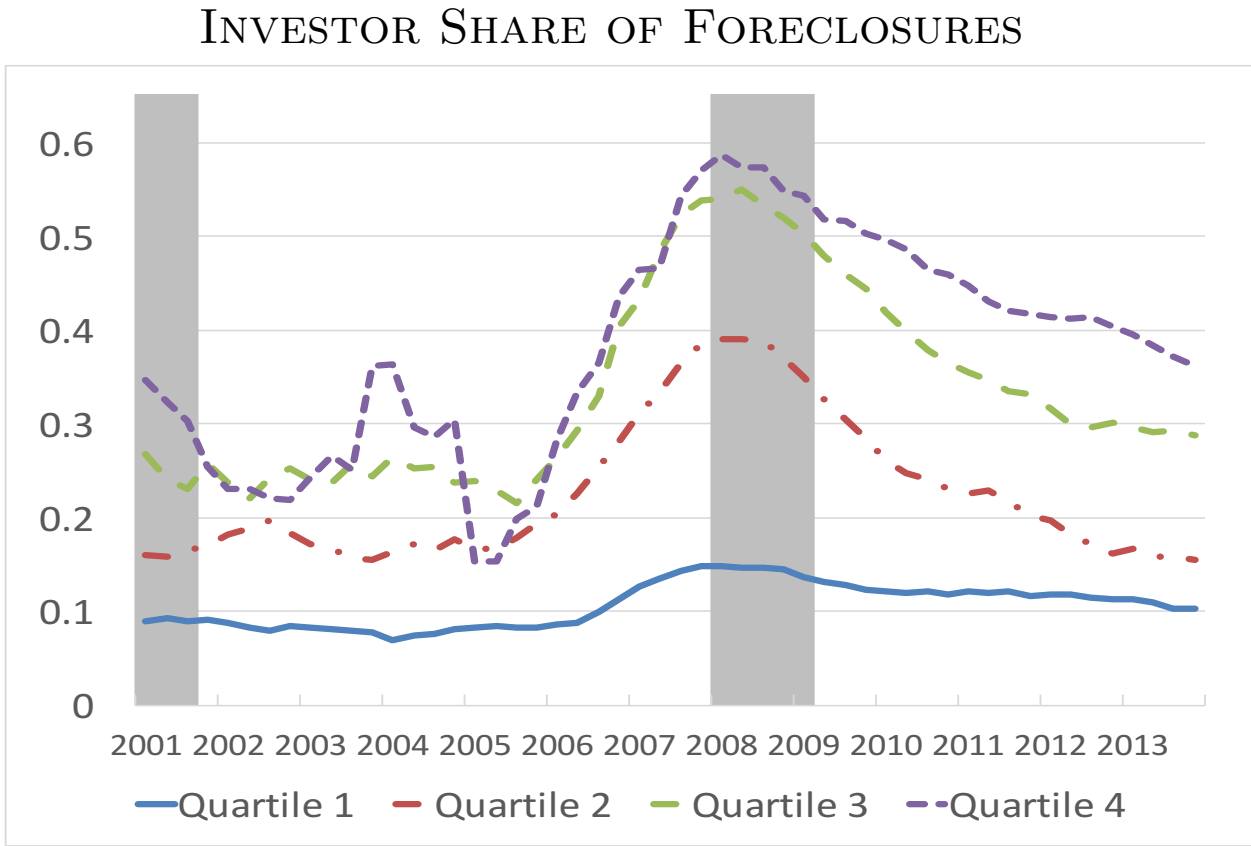


Foreclosure rate by 8 quarter lagged Equifax Risk Score, 3QMA.
(FRBNY CCP/Equifax Data.)

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



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

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- Causal link identified from geographical variation

  (zip code, MSA, county, state)

  (Mian & Sufi 2014, Mian, Rao & Sufi 2013, Kehoe, Midrigan & Pastorino 2014, Mian, Sufi & Trebbi 2014, Midrigan & Philippon 2016, Justiniano, Primiceri & Tambalotti 2016, Guren, Nakamura, Steinsson 2017 etc)

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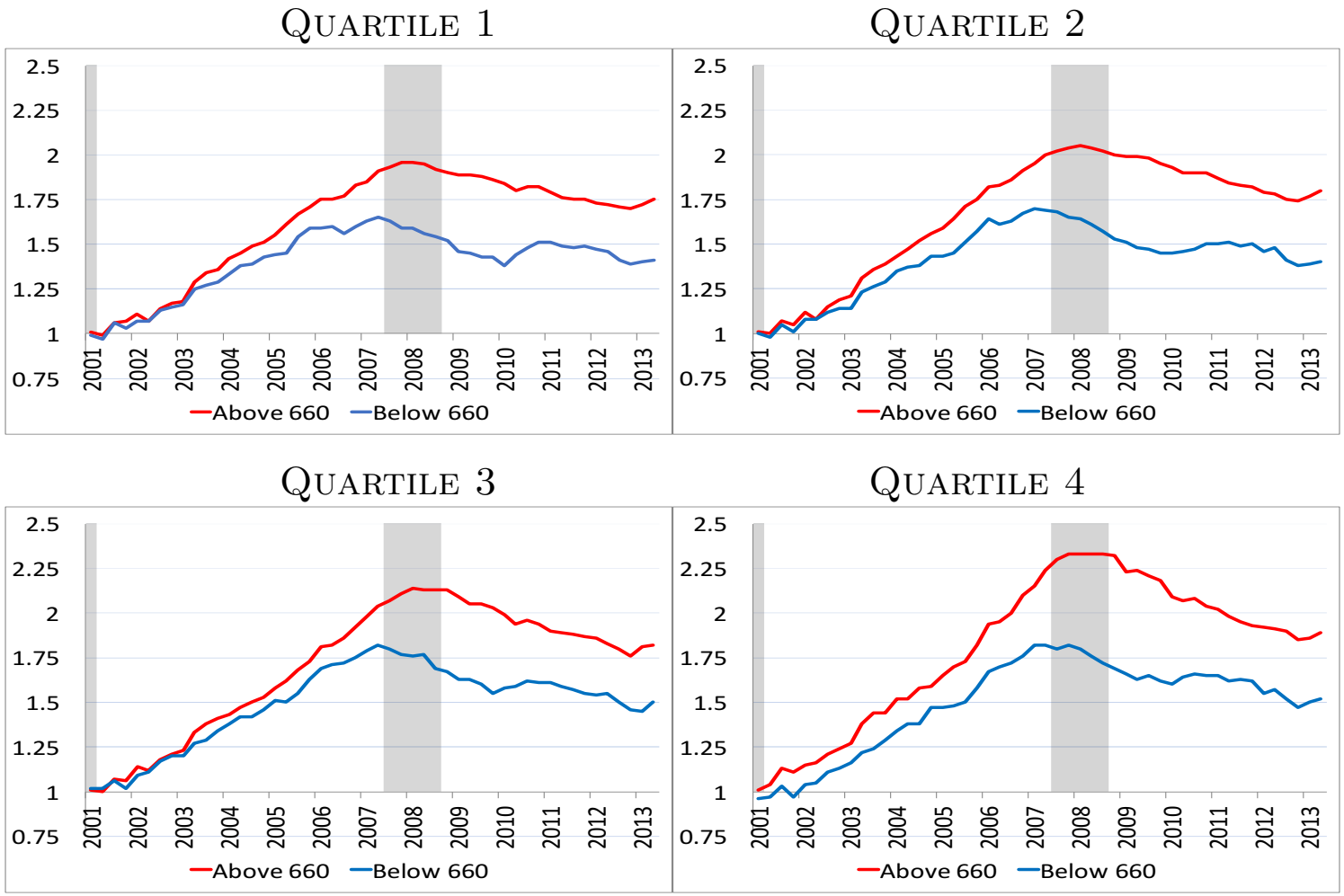
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$\rightarrow$ New findings challenge causal mechanism

Growth in Mortgage Balances By Zip Code

- Strongest growth for prime borrowers in all zip codes



Real per capita mortgage balance growth by fraction of subprime borrowers in 2001. Ratio to 2001. (FRBNY CCP/Equifax Data.)

Zip Code Variation: Role of Age Distribution

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

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

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
2001 subprime share	19%	32%	44%	60%
median age	50	49	48	46
	Fraction in each age bin			
	Quartile 1	Quartile 2	Quartile 3	Quartile 4
20-34	0.22	0.25	0.28	0.30
35-54	0.42	0.41	0.41	0.41
55-85	0.38	0.34	0.32	0.30

By fraction of subprime in 2001. 2001Q1-2013Q4 averages.
(FRBNY CCP/Equifax Data.)

Zip Code Variation: Role of Age Distribution

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→ Quartile 4-Quartile 1 difference mostly explained by age distribution

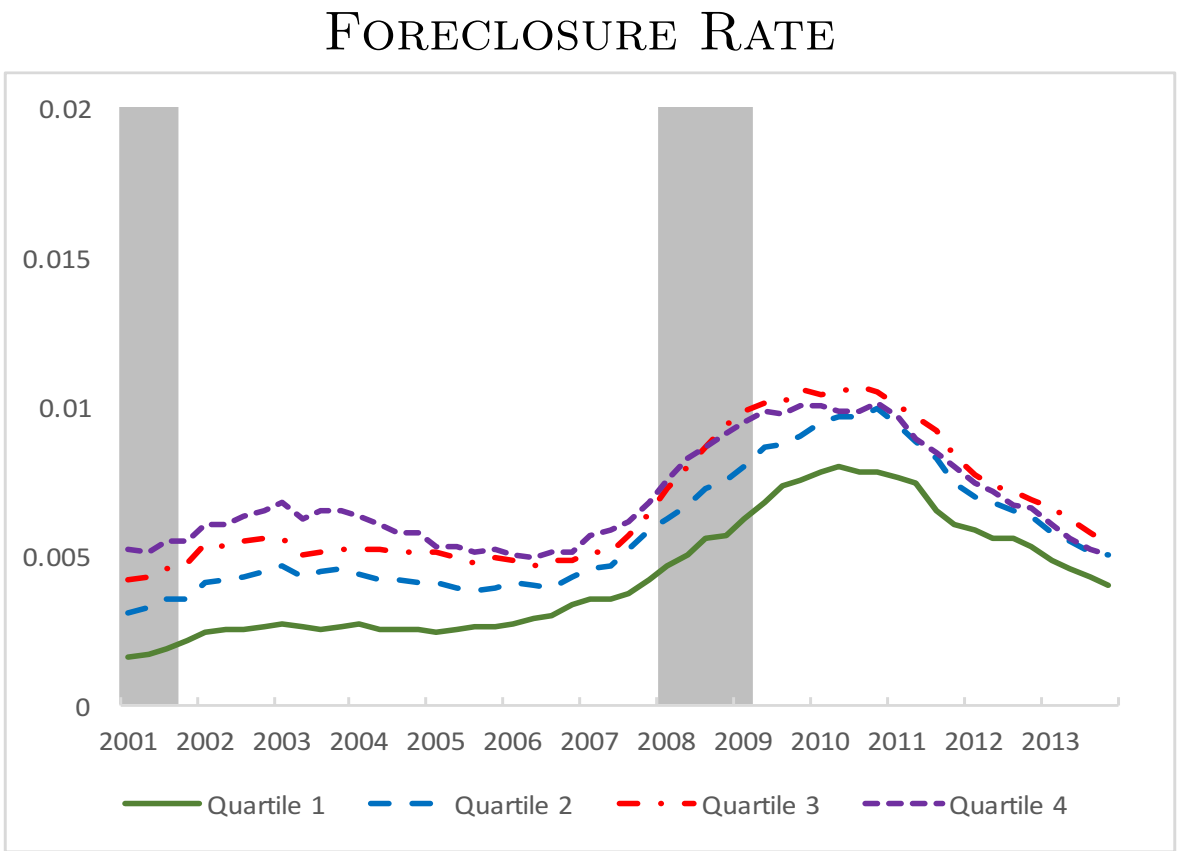
2001Q1-2007Q4 Real Per Capita Mortgage Balance Growth

Difference relative to Quartile 1 explained by age distribution		
Quartile 2	Quartile 3	Quartile 4
0.44	0.43	0.84

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

Defaults By Zip Code

- Level differences in foreclosure rates, similar rise during crisis

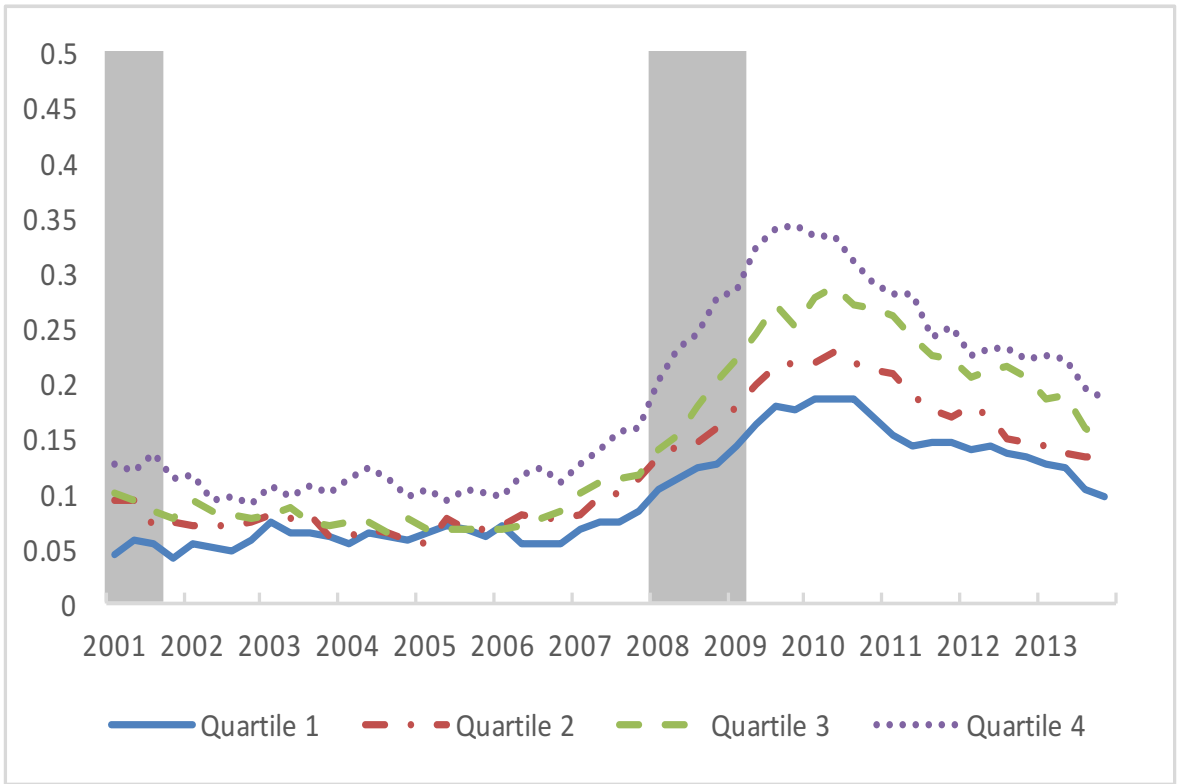


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Prime Share of Foreclosures



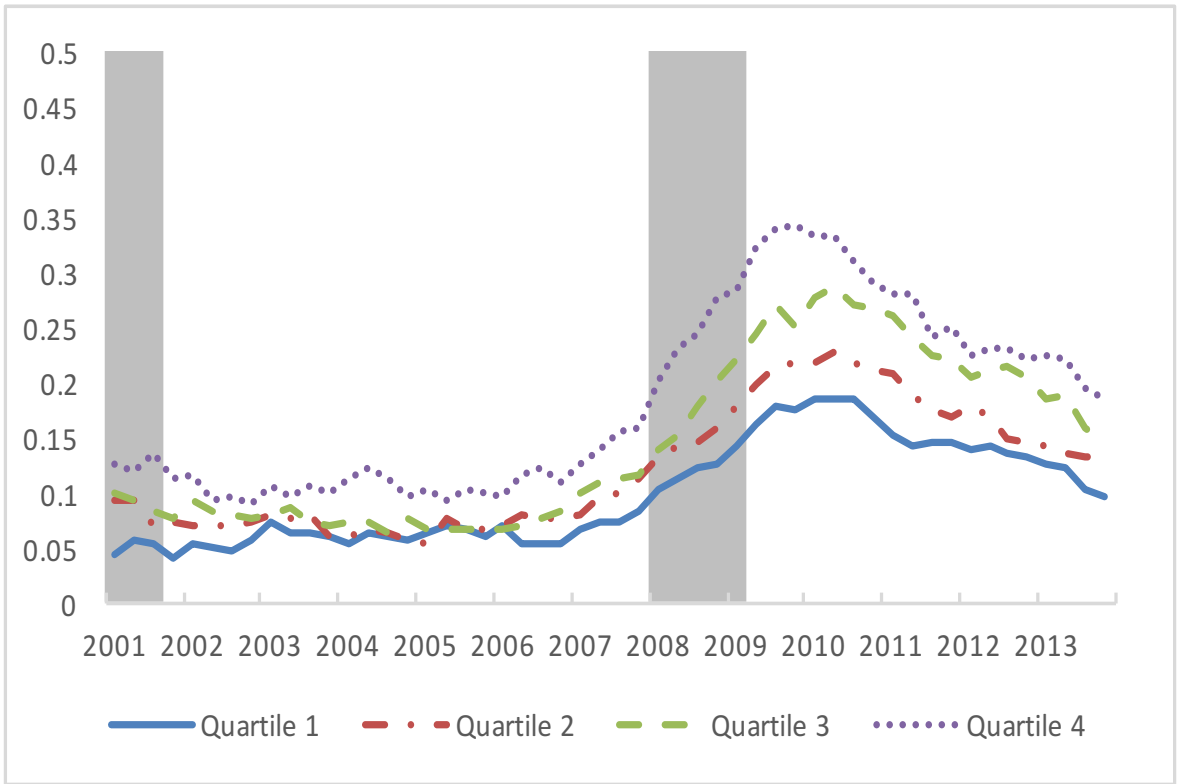
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→ Higher default rates for prime borrowers in high subprime zip codes

Prime Share of Foreclosures



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

Defaults By Zip Code: Role of Investors

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

Prime Borrowers

	2001Q3-2007Q4 net mortgage balance growth			
no. first mortgages	Quartile 1	Quartile 2	Quartile 3	Quartile 4
2	86%	85%	97%	104%
3	94%	104%	117%	118%
4+	102%	122%	133%	125%

	2005Q4-2007Q4 change in foreclosure rate			
no. first mortgages	Quartile 1	Quartile 2	Quartile 3	Quartile 4
2	0.023	0.027	0.045	0.053
3	0.040	0.063	0.087	0.115
4+	0.076	0.096	0.123	0.151

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?

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  Young, low education, high minority share

Zip Code Level Indicators

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Associate+ degree (2012)	45%	31%	23%	17%
Percent white	93%	90%	83%	63%
Percent black	1.7%	3.6%	7.6%	24.6%

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 inequality

Zip Code Level Indicators

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Average UR 2001-2007	4.94%	5.19%	5.38%	5.72%
Average PDI 2001-2007	$41k	$30k	$26k	$21k
$\frac{\text{Mean Income} \geq \$200K}{\text{Mean Income}}$ (2006-11)	6.4	7.9	9.4	11.8

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  High unemployment, low income, high inequality

  Higher population density, more pronounced housing cycle

Zip Code Level Indicators

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Pop per sq mile	1,214	1,380	1,386	2,322
HPI Growth 2001-2007	29%	37%	42%	47%
HPI Growth 2007-2010	-21%	-30%	-27%	-36%

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$\rightarrow$ Prevalence of business cycle sensitive populations, urban areas

Conclusions

I. Reassessment of role of subprime credit

II. Important role of real estate investors for foreclosure crisis

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   - more severe recession in high subprime areas linked to demographics

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II. Important role of real estate investors for foreclosure crisis
   - drivers of investor activity?
   - alternative default risk indicators?

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   - stronger 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, gentrification
   - labor market factors

     rise in initial local income (Ferreira and Gyourko 2012)
     concentration of growing industries (Liebersohn 2017)