

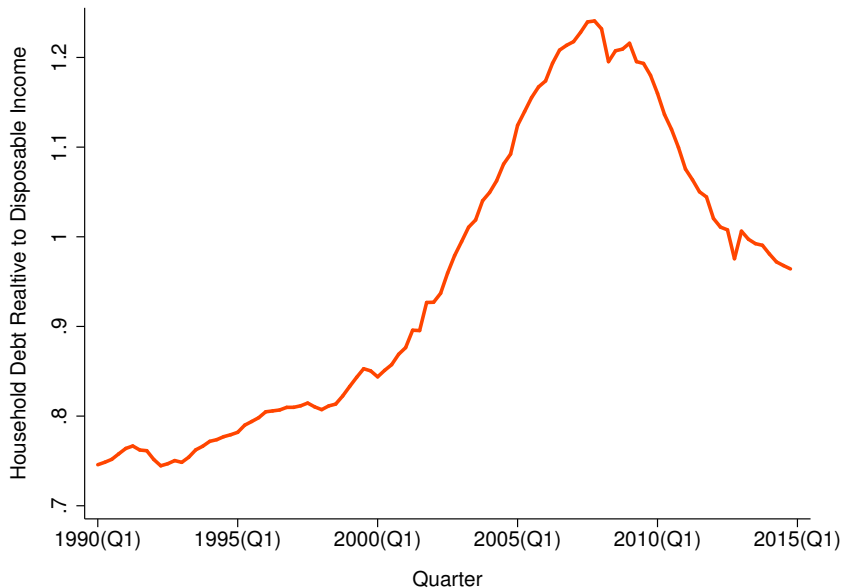
Regulating Household Leverage

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Household Leverage in the U.S. (1990–2015)



Household Leverage and the Great Recession

- **Empirics and theory suggest that this was not a sideshow**

[Mian & Sufi (2011, 2014), Mian, Rao, & Sufi (2013)

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2. Forward-looking leverage curtailment

- Macroprudential regulation

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- Consumer financial protection

[Campbell et al (2011), Agarwal et al (2015b), Campbell (2016)]

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- **Relatively little empirical evidence on the impacts of #2**

Use loan-level data to study the impact of a central U.S. policy intended to reduce household leverage in the mortgage market

The Ability-to-Repay/Qualified Mortgage Rule

- Dodd-Frank rule making high-leverage loans more costly to originate

Research Questions:

- How did this affect the price of credit?
- How did this affect the quantity of credit?
 - *Extensive margin*: Did it result in the loss of loans?
 - *Intensive margin*: Did it reduce household leverage at the loan level?
- What are the implications for mortgage market performance?

Bottom Line Results

1. **Sharp but modest effect on prices**
2. **Sizable effect on quantities**
3. **Minimal implications for performance**

Institutional Background and Data

Ability-to-Repay Rule (ATR)

- Issued: January 1, 2013; Effective: January 10, 2014
- Mandated by Dodd-Frank and implemented by CFPB

“A creditor shall not make a loan that is a covered transaction unless the creditor makes a reasonable good faith determination at or before consummation that the consumer will have a reasonable ability to repay the loan according to its terms.”

- Compliance with ATR requires lenders to *either*
 - Make “reasonable good faith” evaluation of borrower’s ATR
 - Must consider and verify 8 specific underwriting criteria
 - No explicit guidance on what constitutes “consideration”
 - No explicit limits on product features
 - Originate “Qualified Mortgages”
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- Compliance with ATR requires lenders to *either*
 - Make “reasonable good faith” evaluation of borrower’s ATR
 - Originate **“Qualified Mortgages”**
- Compliance with ATR provides legal protection
 - Borrowers can bring lawsuits for violations of ATR
 - If a loan is QM then the loan has ATR “safe harbor”

- QM product features and underwriting rules
 - No interest-only, balloon, or negative amortization
 - Term ≤ 30 years
 - Points and fees $\leq 3\%$
 - Verified income, assets, and debt
 - **Debt-to-income (DTI) ratio $\leq 43\%$**
- QM “Patch”
 - **GSE loans not required to meet DTI limit**
 - Implication: non-QM \approx Jumbo loans with DTI > 43 + other stuff
 - Expires in 2021 or when GSEs exit conservatorship

Has ATR/QM affected credit **prices**, **quantities**, or **performance**?

- **Prices**

- Do lenders charge a premium for non-QM loans?

- **Quantities**

- How does the DTI limit affect the allocation of credit?

Intensive margin: shifts from high- to low-DTIs

Extensive margin: loss of high-DTI loans

- **Performance**

- Given DTI effects, what are the implications for mortgage default?

- CoreLogic Loan-Level Market Analytics (LLMA) Data
 - Loan-level data covering $\approx 80\%$ of all active first mortgages
 - Provided by majority of top-20 loan servicers
 - Origination characteristics (FICO, LTV, DTI, property type)
 - Contract terms (rate, term, product type)
 - Monthly performance information over the life of the loan
- Sample restrictions
 - Originated January, 2010 – December, 2015
 - Purchase loan
 - Conventional (non-FHA)
 - 30-year, fixed-rate
 - Owner-occupied
 - Non-missing: FICO, LTV, DTI, rate, appraisal, geography

Research Design and Results

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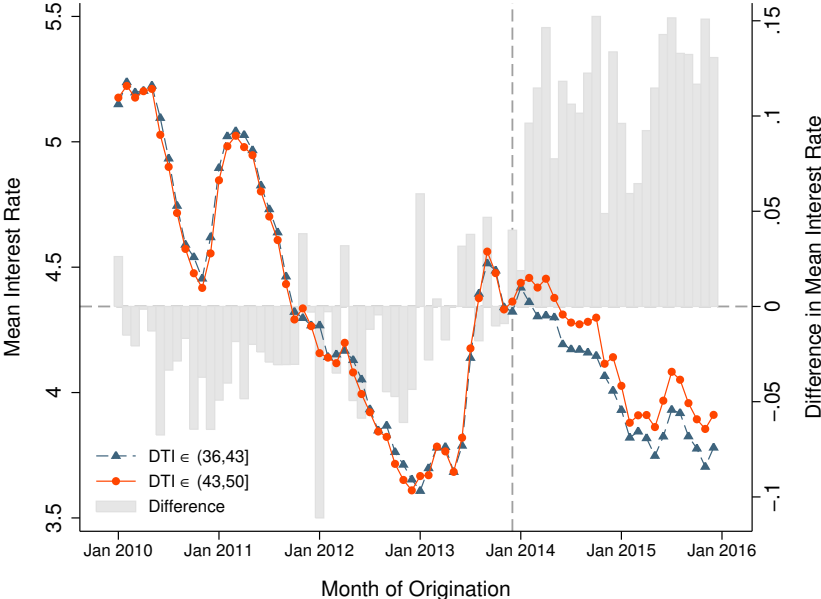
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Mean Interest Rates by DTI and Month of Origination



Research Design: Difference in Differences

- Compare high/low DTI jumbo loans, pre/post QM

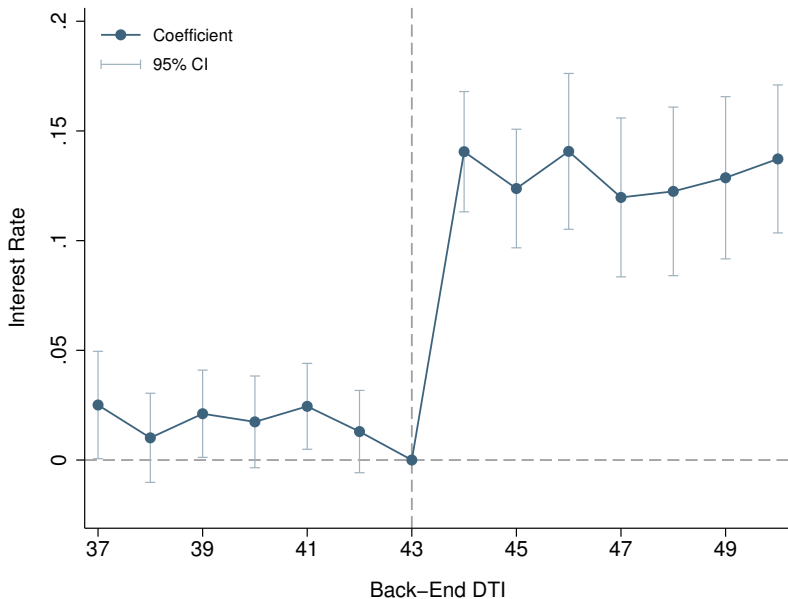
$$r_{it} = \alpha + \delta_t + X_{it}'\gamma + \beta_0 \cdot \mathbb{1}[DTI_i > 43] + \beta_1 \cdot \mathbb{1}[DTI_i > 43] \times Post_t + \epsilon_{it}$$

- $\mathbb{1}[DTI_i > 43]$: dummy for whether DTI exceeds QM threshold
 - $Post_t$: dummy for whether month t is after QM implementation
 - X_{it} : loan/property characteristics
 - δ_t : month of origination FEs
- Identifying assumption: parallel trends above and below cutoff
 - Sample restriction: jumbo loans with $DTI \in (36, 50]$
 - Results robust to triple difference using conforming loans

The Effect of Non-QM Status on Interest Rates

	(1)	(2)	(3)	(4)
DTI > 43	-0.018*** (0.005)	-0.017*** (0.004)	-0.004 (0.004)	-0.004 (0.004)
DTI > 43 × Post	0.131*** (0.007)	0.141*** (0.008)	0.119*** (0.007)	0.113*** (0.007)
Month FEs	X	X	X	X
County FEs		X	X	X
FICO × LTV Bin FEs			X	X
Property Type FEs				X
Implied %Δ	2.9%	3.2%	2.7%	2.5%
R-Squared	0.70	0.72	0.75	0.75
Number of Observations	62,748	62,748	62,748	62,748

The Effect of Non-QM Status on Interest Rates by DTI



Research Questions

Has ATR/QM affected credit **prices**, **quantities**, or **performance**?

- **Prices**

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Premium \approx 10–15bps \rightarrow \$13–20K over 30yr; \$1.7–2.6K over 5

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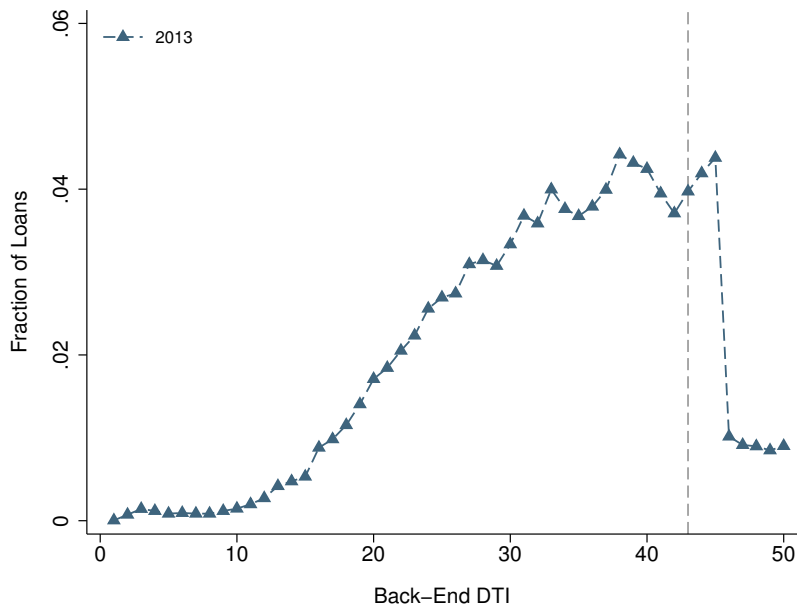
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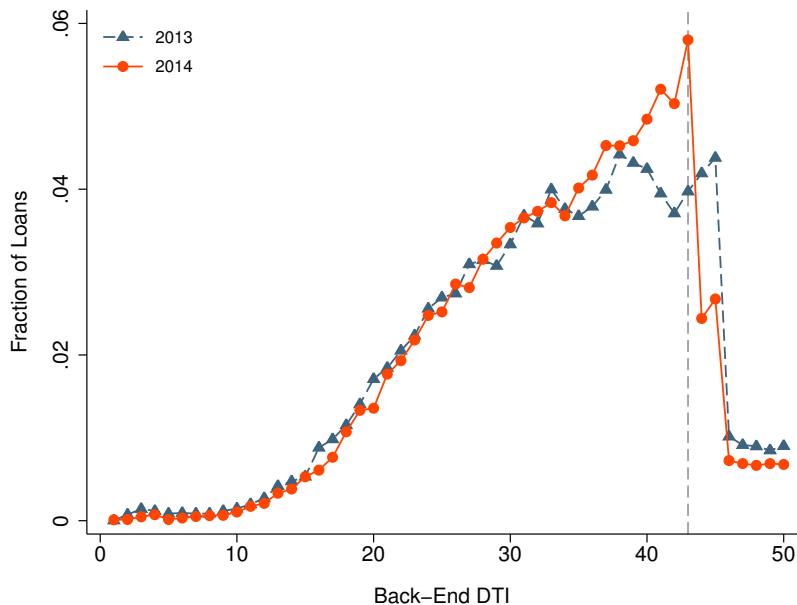
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Fraction of Loans by DTI (2013)



Fraction of Loans by DTI (2013–2014)



Constructing the Counterfactual DTI Distribution

- **Assumption 1:** Conforming market unaffected ($\hat{n}_{cd}^{post} = n_{cd}^{post}$)
- Assumption 2: Total jumbo volume only affected at high-DTIs

$$\sum_{i=0}^{\underline{d}} \hat{n}_{ji}^{post} = \sum_{i=0}^{\underline{d}} n_{ji}^{post} \triangleq N_{j\underline{d}}^{post}$$

- Assumption 3: Parallel trends in ratios

$$\frac{\hat{n}_{jd}^{post}}{N_{j\underline{d}}^{post}} = \frac{n_{jd}^{pre}}{N_{j\underline{d}}^{pre}} + \left(\frac{n_{cd}^{post}}{N_{c\underline{d}}^{post}} - \frac{n_{cd}^{pre}}{N_{c\underline{d}}^{pre}} \right) \triangleq \hat{\pi}_{jd}^{post}$$

- Counterfactual: $\hat{n}_{jd}^{post} = \hat{\pi}_{jd}^{post} \times N_{j\underline{d}}^{post}$

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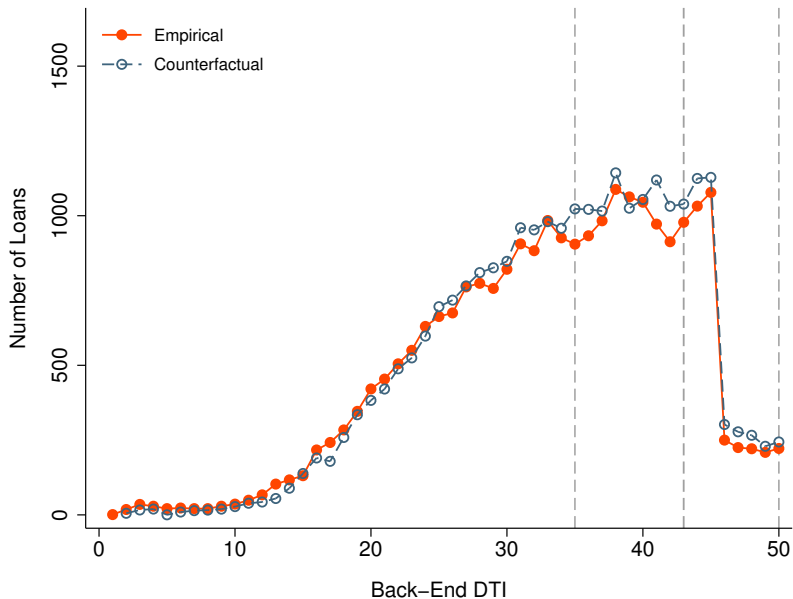
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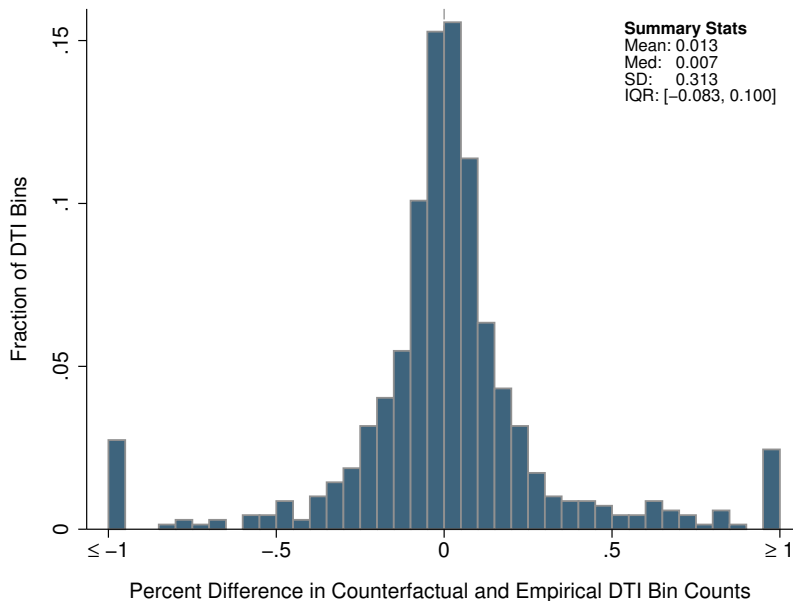
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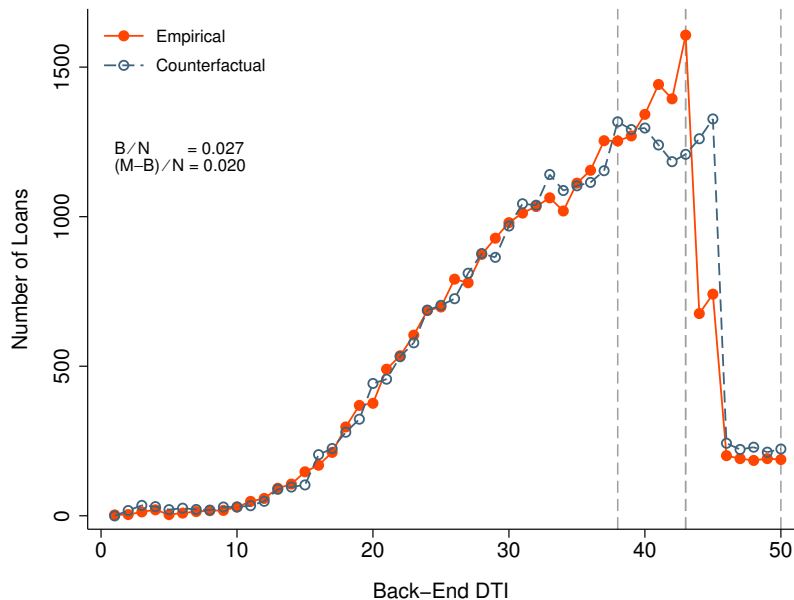
Proof of Concept: Placebo Policy Year 2013



Distribution of Counterfactual Errors: 2000-2013



The Effect of QM on Quantity of Credit



Research Questions

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- **Prices**

- Do lenders charge a premium for non-QM loans?

Premium \approx 10–15bps \rightarrow \$13–20K over 30yr; \$1.7–2.6K over 5

- **Quantities**

- How does the DTI limit affect the allocation of credit?

*Intensive margin: $\rightarrow \approx$ **2.7% of market shifted to lower DTI***

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Would QM Have Helped to Avoid the Mortgage Crisis?

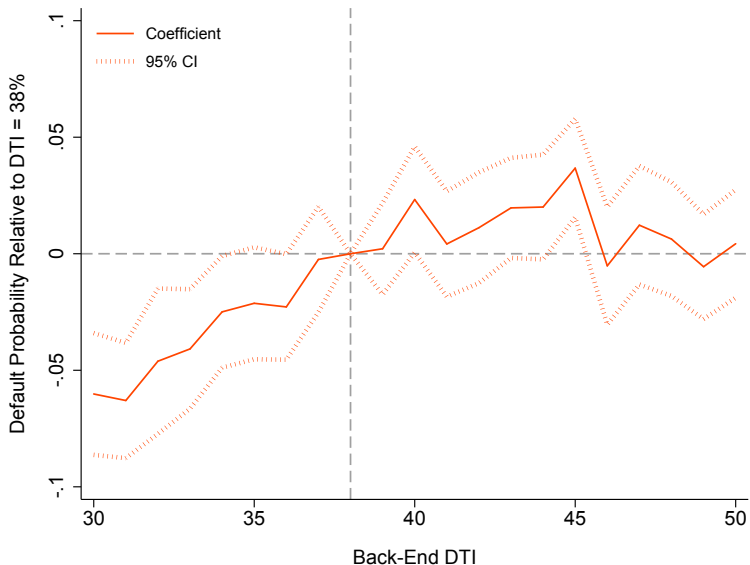
- **Answering this requires knowing**
 1. How QM would have affected distribution of DTIs during the crisis
 - Extrapolate our estimates to pre-crisis loan cohorts
 2. The relationship between DTI and mortgage performance
 - Estimate historical relationship using performance data
 - Origination cohorts 2005–2008
- **Given 1 & 2, how much lower would default rates have been?**

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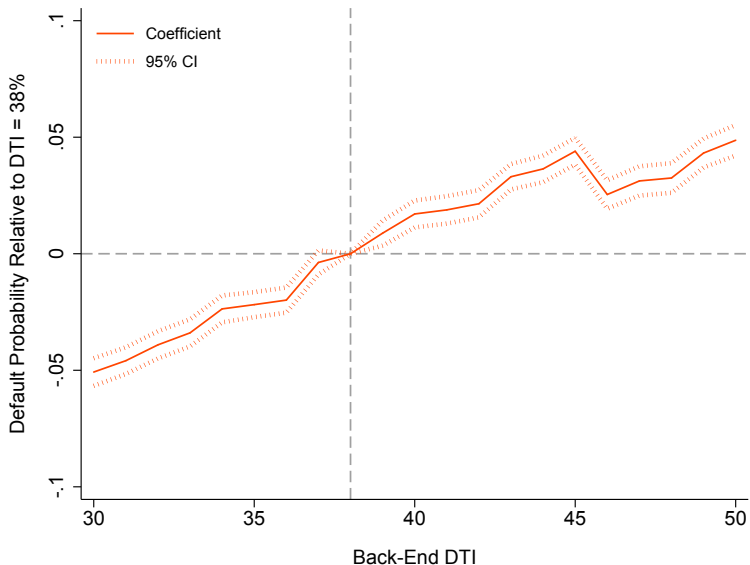
DTI and Five-year Default Rate: Jumbo Only

$$d_{it} = \alpha_c + \delta_t + \beta_d \cdot \mathbb{1}[DTI_i = d] + \mathbf{X}_i' \gamma + \epsilon_{it}$$



DTI and Five-year Default Rate: Jumbo + Conforming

$$d_{it} = \alpha_c + \delta_t + \beta_d \cdot \mathbb{1}[DTI_i = d] + \mathbf{X}_i' \gamma + \epsilon_{it}$$



Estimating Implied Effect of QM on Aggregate Default Rate

- Assume policy applied to entire market
- Group loans into DTI bins consistent with bunching analysis
 - High: $DTI > 43$
 - Med: $DTI \in (38, 43]$
 - Low: $DTI \leq 38$
- Estimate relative 1–5 year default rates by cohort

$$d_{it} = \alpha_c + \delta_t + \beta_L \cdot \mathbb{1}[DTI_i \leq 38] + \beta_H \cdot \mathbb{1}[DTI_i > 43] + X_i \gamma + \epsilon_{it}$$

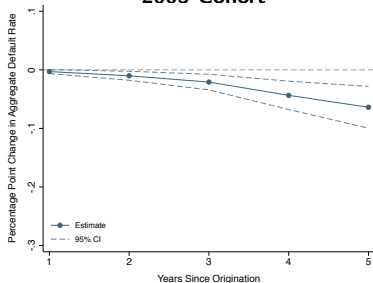
- Implied reduction in cohort-level default rate

$$\Delta \text{DefaultRate} = (\beta_H - \beta_L)(\hat{\delta}_H - \delta_H) - \beta_L(\hat{\delta}_M - \delta_M),$$

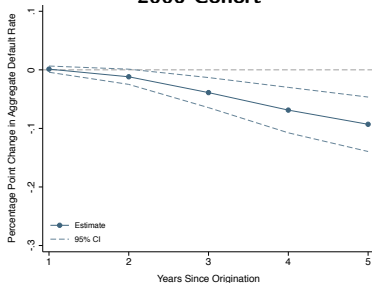
where $\hat{\delta}_i, \delta_i$ denote share of loans in bin i with and without QM

Counterfactual Effect of QM on Cohort Default Rates

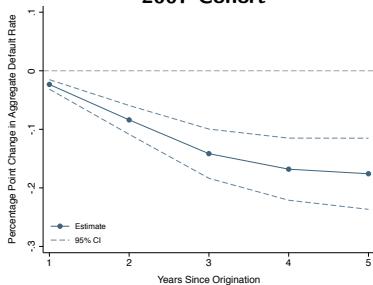
2005 Cohort



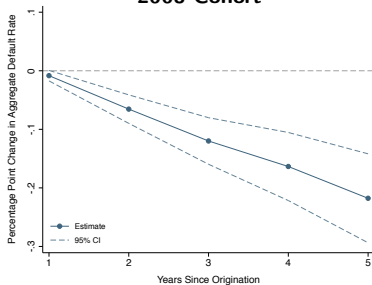
2006 Cohort



2007 Cohort



2008 Cohort



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\downarrow default rate on worst-performing cohort by only 0.2pp

Bottom Line

- Prices and quantities respond sharply
- Only moderate performance improvements in extreme scenarios
- Suggests that regulating household leverage is costly

Possible Next Steps

- Decompose shift in DTI distribution
 - Reductions in loan size?
 - Higher borrower incomes?
- Understand how different kinds of lenders are responding
 - Which lenders charge a premium?
 - Which lenders drop out of non-QM market?

Thanks!