Regulating Household Leverage

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The views expressed here are those of the authors and do not necessarily reflect those of the Federal Reserve Bank of San Francisco or the Federal Reserve System.
Household Leverage in the U.S. (1990–2016)
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Policy responded along two dimensions

1. Ex-post debt restructuring and payment relief
   Agarwal et al. (2012, 2015), Eberly & Krishnamurthy (2014)
   Mayer et al. (2014), Ganong & Noel (2017)
Household Leverage and the Great Recession

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  2. Ex-ante restrictions on leverage
     
     - Macroprudential regulation
       Farhi & Werning (2015), Korinek & Simsek (2016)
     
     - Consumer financial protection
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Relatively little empirical evidence on the impacts of #2
This Paper

Studies a central U.S. policy intended to reduce household mortgage leverage

The Ability-to-Repay/Qualified Mortgage Rule
- Primary mortgage-related provision of Dodd-Frank Act
- Operates as an implicit tax on certain contract characteristics
- Intended to make high-leverage loans more costly to originate
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The Ability-to-Repay/Qualified Mortgage Rule

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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?
Main Results

- Sharp but small increase in prices
  - Borrowers pay a 10-15bps premium for newly regulated mortgages
    - $1,700–2,600 in extra interest for average affected loan
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- **Large effects on quantities**
  - About 15% of the affected market disappears completely
  - Another 20% take out less-leveraged loans
  - Heterogeneity: agency frictions → larger effects for third-party originators

Bottom line: Careful targeting is important – quantity effects can be very large even when market-priced costs are small and effects on loan performance are limited.
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- **Minimal implications for performance**
  - In most extreme scenario, policy would only ↓ default rate by 0.2pp
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Outline

1. Institutional Background on ATR/QM rule
2. Data and sample construction
3. Research design and results
   - Prices
   - Quantities
   - Performance
4. Conclude
Institutional Background and Data
• 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.”
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.”

- ATR exposes lender to legal liabilities
  - Borrowers can bring lawsuits for violations of ATR
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
ATR and Qualified Mortgages (QM)

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- Originate “Qualified Mortgages”
  - Explicit product features and underwriting standards set by the CFPB
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Law imposes an implicit “tax” on non-QM loans

- If a loan is QM then the loan has ATR “safe harbor”
QM Standards

- QM product features and underwriting rules
  - Debt-to-income (DTI) ratio \( \leq 43\% \)
  - Verified income, assets, and debt
  - No interest-only, balloon, or negative amortization
  - Term \( \leq 30 \) years
  - Points and fees \( \leq 3\% \)

- 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
Research Questions

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?
Data

- CoreLogic Loan-Level Market Analytics (LLMA) Data
  - Loan-level data covering ≅ 60% 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
  - Purchase loan
  - Conventional (non-FHA)
  - 30-year, fixed-rate
  - Owner-occupied
  - Non-missing: FICO, LTV, DTI, rate, appraisal, geography
Research Design and Results
Research Questions

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↓

DEFAULTRATE ON WORST-PERFORMING COHORT BY ONLY 0.2 PP
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## The Effect of Non-QM Status on Interest Rates

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- **Prices**
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    \[ \text{Premium} \approx 10-15 \text{bps} \rightarrow \$13-20K \text{ over 30yr; } \$1.7-2.6K \text{ over 5} \]

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Fraction of Loans by DTI (2013)
Fraction of Loans by DTI (2013–2014)
Constructing the Counterfactual DTI Distribution

- Need to estimate number of jumbo loans at each DTI absent QM:

\[ \text{Counterfactual} \triangleq \hat{n}_{jd}^{\text{post}} \]
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  \[
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- Information available to construct this estimate
  - Post-QM empirical distribution of jumbo and conforming loans:
    \[
    n_{jd}^{post}, n_{cd}^{post}
    \]
  - Pre-QM empirical distribution of jumbo and conforming loans:
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- **Our approach:** Proxy for jumbo market changes using unaffected conforming market
Constructing the Counterfactual DTI Distribution

- **Assumption 1**: Conforming market unaffected ($\hat{\eta}_{cd}^{post} = \eta_{cd}^{post}$)
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

$$\sum_{i=0}^{d} \hat{n}_{ji}^{post} = \sum_{i=0}^{d} n_{ji}^{post} \triangleq N_{jd}^{post}$$
Constructing the Counterfactual DTI Distribution

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

- **Assumption 3**: Parallel trends in ratios

$$
\frac{\hat{n}_{jd}^{post}}{N_{jd}^{post}} = \frac{n_{jd}^{pre}}{N_{jd}^{pre}} + \left( \frac{n_{cd}^{post}}{N_{cd}^{post}} - \frac{n_{cd}^{pre}}{N_{cd}^{pre}} \right) \triangleq \hat{n}_{jd}^{post}
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- **Counterfactual**: $\hat{n}_{jd}^{post} = \hat{n}_{jd}^{post} \times N_{jd}^{post}$
Proof of Concept: Placebo Policy Year 2013

Number of Loans

Back-End DTI

Empirical

Counterfactual

Number of Loans

0 500 1000 1500

0 10 20 30 40 50
The Effect of QM on Quantity of Credit: Actual Policy Year 2014

\[ B/N = 0.208 \]
\[ (M-B)/N = 0.154 \]
A Brief Comment on Sausage Making

- In the first draft we submitted, this was all we had to say about quantities
- The result is interesting, but somewhat unsatisfying
- Why is there such a large quantity effect?
A Brief Comment on Sausage Making

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Referee #1

_In my mind, the most interesting result of the paper is that quantities decline by so much, in particular on the extensive margin. I agree with your statement that this has important implications for the implementation of macro-prudential policies like the one that is studied directly. As such, the reasons for this decline in quantity need to be explored much more systematically._
A Brief Comment on Sausage Making

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Referee #2

"The quantification of the negative effect of the reform on quantities in the first part of the paper might be interesting for the legislator - but without additional discussion - it is not clear what we learn from an academic point of view."
A Brief Comment on Sausage Making

- In the first draft we submitted, this was all we had to say about quantities
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Referee #3

*Gave us a free pass on this (sort of)*
A Brief Comment on Sausage Making

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Referee #4

"It would be very interesting if the authors could explore also heterogeneity across banks: which banks pulled out from the market the most?...This will be important in shaping the policy implications of the paper."
A Brief Comment on Sausage Making

- In the first draft we submitted, this was all we had to say about quantities
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Editor’s Letter

"You need to investigate reasons for the large quantity effect...It is not enough to say that the reduction in the number of loans reflects credit rationing. You need to outline a mechanism, because the same mechanism may be helpful in thinking about the impact of other forms of regulation. I am not necessarily asking you to write down a model. But you need to find the economic mechanism generating the quantity effect."
What Explains the Large Quantity Effect?

- Unintended by the regulator

  “the Bureau believes that the ability to repay requirements and the accompanying potential litigation costs will create, at most, relatively small price increases for mortgage loans. These small price increases, in turn, are not likely to result in the denial of credit to more than a relatively small number of borrowers [...]” (CFPB, 2013)

- Difficult to reconcile with a frictionless view of credit markets

- Why do some lenders exit the market entirely instead of pricing the added legal risk?
Agency Conflicts as a Potentially Important Market Friction

Recall: Compliance with ATR requires lenders to *either*

1. Make “reasonable good faith” determination of borrower’s ATR
2. Originate Qualified Mortgages
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Costs of complying under Option 1. vary with lender business model
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Costs of complying under Option 1. vary with lender business model

- Vertically integrated lenders
  - Perform documentation and underwriting in-house
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- Fragmented lenders
  - Perform documentation and underwriting through brokers/correspondents
  - Buy non-QM loans from third-party originators
  - Exposed to ATR liability, but outsource compliance to third-parties
Agency Conflicts as a Potentially Important Market Friction

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Hypothesis

- Agency costs $\rightarrow$ non-QM lending unprofitable at fragmented lenders
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- **Quantities**
  - How does the DTI limit affect the allocation of credit?
    \[ \text{Intensive margin: } \rightarrow \approx 20\% \text{ of market shifted to lower DTI} \]
    \[ \text{Extensive margin: } \rightarrow \approx 15\% \text{ of market lost} \]
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- **Performance**
  - Given DTI effects, what are the implications for mortgage default?
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Would QM Have Helped to Avoid the Mortgage Crisis?

- Answering this requires knowing
  1. How QM would have affected the pre-crisis DTI distribution
     - 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?
Default Probability Relative to DTI = 38%

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<th>Back-End DTI</th>
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<td>50</td>
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DTI and Five-year Default Rate (Pre-Policy Loan Cohorts)
Counterfactual Effect of QM on Default Rate

2007 Cohort

Percentage Point Change in Aggregate Default Rate

Years Since Origination

Estimate

95% CI
Research Questions

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

• Prices
  • Do lenders charge a premium for non-QM loans?
    \[\text{Premium} \approx 10\text{--}15b\text{ps} \implies \$13\text{--}20\text{K over 30yr}; \$1.7\text{--}2.6\text{K over 5}\]

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• Performance
  • Given DTI effects, what are the implications for mortgage default?
    \[\downarrow \text{default rate on worst-performing cohort by only 0.2pp}\]
Conclusion

Bottom Line

• New evidence on credit market responses to DTI restrictions
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- New evidence on credit market responses to DTI restrictions
- Prices respond moderately, quantities move by a lot
  - Identifying credit market frictions and understanding how they interact with policy choices is crucial input into the design of ex ante restrictions on household leverage
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Bottom Line

- New evidence on credit market responses to DTI restrictions
- Prices respond moderately, quantities move by a lot
  - Identifying credit market frictions and understanding how they interact with policy choices is crucial input into the design of *ex ante* restrictions on household leverage
- Only moderate performance improvements in extreme scenarios
  - Important to target the “right” measure of leverage
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**Bottom Line**

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- Prices respond moderately, quantities move by a lot
  - Identifying credit market frictions and understanding how they interact with policy choices is crucial input into the design of *ex ante* restrictions on household leverage
- Only moderate performance improvements in extreme scenarios
  - Important to target the “right” measure of leverage

**Limitations/Opportunities for Future Research**

- Aggregate implications of DTI restrictions for house prices, consumption etc.
- Distributional/welfare effects of *ex-ante* restrictions on leverage
- Unintended/spillover effects in other credit markets
Thanks!
Missing Debt-to-Income Ratios by Month of Origination

![Graph showing the fraction of loans with missing DTI by month of origination for conforming and jumbo loans. The graph displays data from January 2010 to January 2016.](image-url)
Substitution Into the Conforming Market

2013

\[\text{DTI} \in (38, 43]\]

Empirical

Counterfactual

Excess Mass: 6.70 (1.01)

Fraction of Loans

Loan Amount

-200000 -100000 0 100000 200000

2014

\[\text{DTI} \in (43, 50]\]

Empirical

Counterfactual

Excess Mass: 5.60 (0.76)

Fraction of Loans

Loan Amount

-200000 -100000 0 100000 200000

Excess Mass: 6.32 (1.10)

Excess Mass: 5.18 (0.72)
Parallel Trends test for Quantity Analysis
Substitution to Adjustable-Rate Mortgages

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<th>FRMs Only</th>
<th>FRMs and ARMs Combined</th>
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<tr>
<td>$\hat{B}/\hat{N}_{44+}^{post}$</td>
<td>0.208***</td>
<td>0.333***</td>
<td>0.665***</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.032)</td>
<td>(0.123)</td>
</tr>
<tr>
<td>$(\hat{M} - \hat{B})/\hat{N}_{44+}^{post}$</td>
<td>0.154***</td>
<td>0.101**</td>
<td>-0.056</td>
</tr>
<tr>
<td></td>
<td>(0.041)</td>
<td>(0.039)</td>
<td>(0.146)</td>
</tr>
<tr>
<td>Bootstrap Replications</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>418,105</td>
<td>454,360</td>
<td>36,255</td>
</tr>
</tbody>
</table>
## Performance Results by Documentation Status

<table>
<thead>
<tr>
<th>Documentation Status</th>
<th>All Loans</th>
<th>Full Documentation</th>
<th>Low Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>DTI ≤ 38</td>
<td>-0.0706***</td>
<td>-0.0709***</td>
<td>-0.0695***</td>
</tr>
<tr>
<td></td>
<td>(0.0038)</td>
<td>(0.0052)</td>
<td>(0.0061)</td>
</tr>
<tr>
<td>DTI &gt; 43</td>
<td>0.0320***</td>
<td>0.0384***</td>
<td>0.0227***</td>
</tr>
<tr>
<td></td>
<td>(0.0044)</td>
<td>(0.0056)</td>
<td>(0.0069)</td>
</tr>
<tr>
<td>Implied Aggregate Effect</td>
<td>-0.0022***</td>
<td>-0.0025***</td>
<td>-0.0018***</td>
</tr>
<tr>
<td></td>
<td>(0.0004)</td>
<td>(0.0004)</td>
<td>(0.0004)</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>91,493</td>
<td>58,748</td>
<td>30,415</td>
</tr>
</tbody>
</table>