Macroprudential Policy and Household Leverage Evidence from Administrative Household-Level Data

Sjoerd van Bekkum    Erasmus University Rotterdam
Marc Gabarro          University of Mannheim
Rustom M. Irani       University of Illinois & CEPR
José-Luis Peydró      Imperial, UPF-CREI-BGSE-ICREA & CEPR

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Household leverage cycles

1. **U.S. household leverage growth**
   - 1980s: household debt-to-GDP ~50%
   - 2008: ~100%
   - 2018: ~75%

2. **Negative consequences of “excessive” debt**
   - Household-level
     - Consumption and property maintenance
     - Default
     - Labor supply and mobility
     - Entrepreneurship and innovation
   - Aggregate effects
     - Drop in consumer spending, employment, and investment
     - Impairment of bank balance sheets
     - Longer and deeper recession, slower recovery
Policy responses aim to reduce household debt

1 **Ex post**: “bailout” bad debt in bad state of world
   ▶ HAMP, HARP, Countrywide settlement, etc.
   ▶ Benefits and costs?
     ☑ Reverses negative consequences
     ☑ Strategic default among healthy borrowers
     ☑ Lower credit supplied to vulnerable borrowers going forward

2 **Ex ante**: “macroprudential” policies in good state
   ▶ Lender-based: e.g., countercyclical capital buffers
     ☑ Reduce credit supply to households and firms
     ☑ “Leakages” may render ineffective
   ▶ Borrower-based: e.g., PTI, DTI, and/or LTV limits
     - Great in theory, very common in practice
     - Limited empirical evidence on effectiveness
Increasing share of countries regulating household leverage

Source: Cerutti et al. (2018)

- LTV regulation popular, but limited evidence on success
Key empirical evidence on macroprudential policies

1. Lender-based macroprudential policies can be effective
   - e.g., Jimenez et al. (2017), Basten and Koch (2019)

2. However, lender-based policies may suffer from “leakages”
   - e.g., Kim et al. (2018), Aiyar et al. (2014)

3. Cross-country evidence on borrower-based policies mixed
   - e.g., Cerutti et al. (2017)

4. Micro-level evidence primarily focused on lender responses
   - e.g., Acharya et al. (2019), DeFusco et al. (2019)

What do we do? Micro-evidence on how households respond to a borrower-based macroprudential policy (leverage restriction)
This paper

Our objectives

1. Household finance response to macroprudential lending limit
2. Household financial distress and homeownership dynamics

Setting: Dutch households facing new mortgage LTV limit in 2011
- Highly relevant: levered households, boom-bust cycle in prices
- Amazing data: all HH balance sheets and housing transactions
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Household leverage in the Netherlands

Household leverage before 2011

1. High LTVs at-origination, often >>120
   - Demand: high transaction costs and unlimited MID
   - Supply: full recourse, gov’t guarantees, securitized

2. Highly-leveraged households
   - 2010: 120% HH debt-to-GDP (vs 99% peak in US in ‘08:Q1)

3. Ugly recession
   - 2008-2013:
     - House prices fell 20%
     - # underwater households increased from 5 to 30%
Household leverage in the Netherlands

2011 introduction of mortgage LTV limit

1. Maximum LTV ratio at-origination set to 106%
   - Announced 3/21/2011 and implemented 8/1/2011
   - Ratcheted down 1%pt per year to 100% by 2018

2. No “leakages”: all domestic/foreign banks and nonbanks must comply

3. Some exceptions for borrowers (“soft limit”)
   - Movers: allowed to roll negative equity
   - Stayers: if refinancing
   - Minimize by focus on first-time homebuyers
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Administrative data on universe of households
Link Statistics Netherlands (tax data) and Land Registry (housing transactions)

- Labor income
- Interest expense
- Mortgage payment

**Income statement (income tax)**

**Balance sheet (wealth tax)**
- Assets
- Bank accounts
- Debt
- Mortgage debt
- Housing wealth
- Net worth (equity)

**Housing transaction records**
- Homeownership
- Sales price
- Timing

- We focus on non-self-employed first-time homebuyers
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» We focus on non-self-employed first-time homebuyers
Key outcomes (mostly imputed from tax returns)

1. Mortgage debt choices
   - *Mortgage Amount, Home Value, LTV, Mortgage Payment, Interest Expense*

2. Household leverage
   - *Mortgage Payment/Income, Mortgage Debt/Income, and Total Debt/Income*

3. Household liquidity
   - *Liquid Assets*

- Things we are collecting...
  - Characteristics of home; borrower financials at time of purchase; family demographics at time of purchase; cash gifts
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LTV adjustments: dramatic shift in time-series
LTV adjustments: bunching at threshold
Measuring household-level effects of LTV limit

- Main challenge
  1. We have a repeated cross-section of first-time homebuyers
  2. No obvious counterfactual (everyone’s affected)

- Simple before-versus-after comparison in a narrow window around shock requires that
  1. Borrowers and/or lenders do not anticipate policy
  2. No confounding macroeconomic events

- We build a counterfactual
  - Control for kitchen sink of observables via OLS
  - Or via matching estimators
  - [Instrument for purchase decision using family variables]
Measuring household-level effects of LTV limit

August 2010  No limit  August 2011  Max LTV limit  August 2012
Measuring household-level effects of LTV limit

- We refine this approach to control for potential time effects

- DiD based on $LTV > 106$
  - “Affected” households can’t choose $LTV > 106$ in after period
  - Latent choice is unobservable
  - Identify them based on predicted $LTV$
  - Prediction based on unconstrained choices in the before period

- How do we do prediction?
  - Predict $LTV$ or $1_{LTV > 106}$
  - Old dog: kitchen sink approach via OLS
  - [New tricks: machine learning via LASSO/random forest]
Measuring household-level effects of LTV limit

\[ \text{LTV} < 106 \]
\[ \text{LTV} > 106 \]

August 2010
August 2011
August 2012

\[ \overline{\text{LTV}} \] = prediction based on unconstrained choices in the before period
### Mortgage borrowing outcomes

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>(LTV)</th>
<th>(\log(\text{Mortgage Amount}))</th>
<th>(\log(\text{Home Value}))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[1]</td>
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<td>[3]</td>
</tr>
<tr>
<td>(After \times d(LTV &gt; 106))</td>
<td>(-0.064^{***})</td>
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<td>(0.002)</td>
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<td>(R^2)</td>
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<td>0.70</td>
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1. **6.4%pt drop in LTV among affected households**

2. **Distributional consequences?**
   - Differences by \(Income_t\), \(Liquid \text{ Assets}_{t-1}\), and \(Wealth_{t-1}\)
   - Rich: constraint does bind (e.g., due to MID)
   - Poor: effect at least 20% larger
Mortgage borrowing outcomes

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1. Borrow 4.2%pt less, but do not buy cheaper homes

2. Interpretation?
   - Borrow ~€9k less to buy house costing an additional ~€4k
   - Funding gap ~€13k
# Household debt and liquidity dynamics

<table>
<thead>
<tr>
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1. Mortgage debt servicing costs decline
Household debt and liquidity dynamics

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1. Mortgage debt servicing costs decline
2. Household leverage declines lockstep with mortgage leverage
   ▶ No “leakages” to “unregulated” debt (i.e., personal loans)
### Household debt and liquidity dynamics

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1. Mortgage debt servicing costs decline
2. Household leverage declines lockstep with mortgage leverage
   - No “leakages” to “unregulated” debt (i.e., personal loans)
3. Tradeoff? Households consume liquidity (~25% at median)
This paper

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Setting: Dutch households facing new mortgage LTV limit in 2011
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- Amazing data: all HH balance sheets and housing transactions
Two consequences for households

1. **Household financial distress:**
   - Lower household leverage and debt servicing costs
   - Higher upfront cost of buying $\rightarrow$ consume liquidity buffer
   $\rightarrow$ heightened risk of payment difficulties in short run

   ∴ We examine loan repayment performance

2. **Financial exclusion:**
   - Benefits of LTV limit *conditional on buying home*
   - Higher downpayment may impede ownership among poor

   ∴ We examine extensive margin decision to buy a first home
#1 Household financial distress

1. Conceptual issues
   - Loans are full recourse and government guaranteed
     - Mortgage foreclosure very unlikely
     - Focus instead on loan repayment performance
   - Distress due to excessive mortgage debt can have severe consequences for households (e.g., consumption)

2. Data and measurement
   - Loan-level data source from van Bekkum et al. (2018)
     - Monthly performance of large chunk of mortgage market
     - Cannot be linked to tax data (no wealth data)
   - Payment Arrears = 1 if missed a loan payment
#1 Poor households less likely to exhibit financial distress

<table>
<thead>
<tr>
<th>Sample:</th>
<th>All</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{After} \times \mathbb{1}(\text{LTV} &gt; 106)$</td>
<td>-0.023*** (0.007)</td>
<td>-0.026** (0.010)</td>
<td>-0.014 (0.009)</td>
</tr>
<tr>
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<tr>
<td>$N$</td>
<td>77,751</td>
<td>38,493</td>
<td>39,258</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.01</td>
<td>0.02</td>
<td>0.01</td>
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- 2.3%pt decline in arrears (baseline: 3.3%)
#2 Extensive margin transition into homeownership

- Goal: measure how LTV limit affects $\Pr(\text{Buy} \mid \text{Rent})$ for observationally similar households

- Revert to main data set and universe of renters
  - Identify renters pre-policy
  - Identify renters post-policy
  - Measure transition rate before-versus-after

- Modify DiD design
  - Predict LTV for renting population
  - Measure transition rate for affected-versus-unaffected
#2 Poor households less likely to get on property ladder

<table>
<thead>
<tr>
<th>Dependent variable: <em>Homeowner</em></th>
<th>Income&lt;sub&gt;t&lt;/sub&gt;</th>
<th>Wealth&lt;sub&gt;t−1&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household finance variable:</td>
<td></td>
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<tr>
<td>Sample:</td>
<td>All</td>
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<tr>
<td></td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>N</td>
<td>1,965,072</td>
<td>982,468</td>
</tr>
<tr>
<td>R&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.03</td>
<td>0.02</td>
</tr>
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</table>

- Low wealth households: 19.4%pt reduction in transition rate
Summary

- **Households respond to the LTV limit by reducing:**
  1. Mortgage debt
  2. Overall leverage (no “leakages” to unregulated debt)
  3. Liquidity
  4. Mortgage defaults
  5. Transition rate into homeownership

- **Further potential implications for households:**
  1. Does lower leverage improve resilience to negative shocks?
     - We already looked at this unconditionally
     - Default and consumption response to income/wealth loss
     - This really is the bigger question
  2. Private wealth accumulation and inequality
  3. Durable goods consumption at time of purchase
  4. Role of institutional buyers (“buy-to-let”)