Borrower Characteristics and Credit Supply Expansion in the U.S. Residential Mortgage Market, Evidence from 2010 to 2015

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The Landscape: What are borrowers like in this period?

Greater levels of income result in higher approval rates, all else equal. Income is more closely associate with origination measures over the six-year period. Income growth is leads to higher approval rates, causal estimates.

Conclusion.
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Conclusion.
Higher Approval Rates and Demand

Source: HMDA
What are borrowers in 2015 like?

Have a higher income.
Demand marginally more debt for given income level.
Have slightly lower credit scores.
Otherwise have largely similar characteristics as in 2010.
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- Have a higher income.
- Demand marginally more debt for given income level.
- Have slightly lower credit scores.
- Otherwise have largely similar characteristics as in 2010.
Applicant income relative to median income of ZIP code

Source: HMDA, IRS
Number of applicants per Income Quintile

Source: HMDA, IRS
Credit Quality in Fannie/Freddie Mortgages

Source: Fannie Mae, Freddie Mac
More debt in low credit score zip codes

Source: HMDA, Fannie Mae, Freddie Mac
Higher income growth in lower credit score regions

Source: HMDA, IRS, Fannie Mae, Freddie Mac
Tract-level panel setup

\[ Q_{i,t} = \beta \ln(y)_{i,t,j} + \gamma CLTV_{i,t} + \rho FICO_{i,t} + \phi DTI_{i,t} + FE_t + FE_{\text{county}} + \epsilon_{i,t} \]  

(1)

Where:

- \( Q \): Approval rate
- \( y_j \): Median Income - IRS or Applicant Income
- \( CLTV \): Median Combined Loan-to-Value ratio
- \( FICO \): Median FICO (Credit) Score
- \( DTI \): Median Debt-to-Income Ratio (Percentage Points)
- \( FE_t \): Year Fixed Effects
- \( FE_{\text{county}} \): County Fixed Effects
## Cross-Sectional tract level panel

<table>
<thead>
<tr>
<th></th>
<th>Applicant Income</th>
<th>Median Taxable Income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Applicant Income</td>
<td>9.927***</td>
<td>10.320***</td>
</tr>
<tr>
<td></td>
<td>(0.056)</td>
<td>(0.055)</td>
</tr>
<tr>
<td>Median Taxable Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLTV</td>
<td>0.191***</td>
<td>0.744***</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>FICO</td>
<td>0.154***</td>
<td>0.433***</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>DTI</td>
<td>−0.017</td>
<td>−0.582***</td>
</tr>
<tr>
<td></td>
<td>(0.035)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>County Fixed effects?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>N</td>
<td>432,440</td>
<td>432,440</td>
</tr>
<tr>
<td>R²</td>
<td>0.282</td>
<td>0.126</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.277</td>
<td>0.126</td>
</tr>
<tr>
<td>Residual Std. Error</td>
<td>13.539 (df = 429316)</td>
<td>14.889 (df = 432430)</td>
</tr>
</tbody>
</table>

**Notes:**
- *****Significant at the 1 percent level.
- **Significant at the 5 percent level.
- *Significant at the 10 percent level.
The closer association of income to mortgage origination

<table>
<thead>
<tr>
<th></th>
<th>Approval Rate</th>
<th>Median Loan Size</th>
<th>Loans Originated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Ln IRS Income</td>
<td>2.671***</td>
<td>2.435***</td>
<td>−0.174</td>
</tr>
<tr>
<td></td>
<td>(0.046)</td>
<td>(0.048)</td>
<td>(0.319)</td>
</tr>
<tr>
<td>Ln IRS Income × 2011</td>
<td>1.001***</td>
<td>0.979***</td>
<td>−0.769*</td>
</tr>
<tr>
<td></td>
<td>(0.062)</td>
<td>(0.069)</td>
<td>(0.431)</td>
</tr>
<tr>
<td>Ln IRS Income × 2012</td>
<td>1.648***</td>
<td>1.676***</td>
<td>−0.165</td>
</tr>
<tr>
<td></td>
<td>(0.066)</td>
<td>(0.073)</td>
<td>(0.460)</td>
</tr>
<tr>
<td>Ln IRS Income × 2013</td>
<td>1.360***</td>
<td>1.379***</td>
<td>4.259***</td>
</tr>
<tr>
<td></td>
<td>(0.065)</td>
<td>(0.072)</td>
<td>(0.452)</td>
</tr>
<tr>
<td>Ln IRS Income × 2014</td>
<td>1.464***</td>
<td>1.485***</td>
<td>7.865***</td>
</tr>
<tr>
<td></td>
<td>(0.065)</td>
<td>(0.072)</td>
<td>(0.452)</td>
</tr>
<tr>
<td>Ln IRS Income × 2015</td>
<td>1.200***</td>
<td>1.195***</td>
<td>11.560***</td>
</tr>
<tr>
<td></td>
<td>(0.065)</td>
<td>(0.072)</td>
<td>(0.455)</td>
</tr>
<tr>
<td>Constant</td>
<td>39.908***</td>
<td></td>
<td>−118.630***</td>
</tr>
<tr>
<td></td>
<td>(0.506)</td>
<td></td>
<td>(4.427)</td>
</tr>
<tr>
<td>County Fixed effects?</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>432,405</td>
<td>432,405</td>
<td>432,405</td>
</tr>
<tr>
<td>R²</td>
<td>0.263</td>
<td>0.068</td>
<td>0.542</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.258</td>
<td>0.068</td>
<td>0.539</td>
</tr>
<tr>
<td>Residual Std. Error</td>
<td>13.718 (df = 429280)</td>
<td>15.370 (df = 432393)</td>
<td>95.953 (df = 429280)</td>
</tr>
</tbody>
</table>

Notes:

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*Significant at the 10 percent level.
The impact of income growth within a county and ZIP Code

Column 1:

\[ Q_i = \beta \ln(y_i) + \gamma FICO + FE_{county} + \epsilon_i \]  \hspace{1cm} (2)

Column 2:

\[ Q_i = \beta \ln(y_i) + FE_{FICOquintile} + \epsilon_i \]  \hspace{1cm} (3)
The Bartik Instrument

Instrument median taxable income across counties using a Bartik Instrument.

\[ \tilde{y}_{lt} = Z'_{i,t} G_t \]  \hspace{1cm} (4)

where

\( Z'_{i,l,t} \): Employment share of industry i in county l at time t-1

\( G_{i,t} \): Growth in number of payroll employees in industry i over period t-1 to t.
## Bartik Instrument Results

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ln IRS Income</td>
<td>3.464***</td>
<td>12.107***</td>
<td>12.107***</td>
</tr>
<tr>
<td></td>
<td>(0.070)</td>
<td>(0.468)</td>
<td>(0.468)</td>
</tr>
<tr>
<td>FICO</td>
<td>0.409***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>County Fixed effects?</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>FICO Score Quintile Fixed effects?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year Fixed effects?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>18,449</td>
<td>18,449</td>
<td>18,449</td>
</tr>
<tr>
<td>R²</td>
<td>0.193</td>
<td>0.128</td>
<td>0.128</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.193</td>
<td>0.128</td>
<td>0.128</td>
</tr>
<tr>
<td>F Statistic</td>
<td>2,199.058***</td>
<td>−6,694.030 (df = 1; 18442)</td>
<td>−6,694.030 (df = 1; 18442)</td>
</tr>
</tbody>
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Within a county: 10% Increase in Income $\rightarrow$ 0.33% increase in approval rate.

Within a FICO Quintile: 10% Increase in Income $\rightarrow$ 1.15% increase in approval rate.
What’s Different?
Worse than national average:
Income: 0.8 x WV median
Hampshire, West Virginia

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Better than national average:
Hampshire, West Virginia

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Worse than national average:
Income: $0.8 \times$ WV median
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Better than national average:
Jobs and income growth: $15\%$
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What’s Different?
Worse than national average:
Income: 0.8 x WV median
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Better than national average:
Jobs and income growth: 15%
Home ownership rate change: 6 x national average
Hampshire, West Virginia

What’s Different?
Worse than national average:
Income: 0.8 x WV median
Delinquency: 1.7 x national average

Better than national average:
Jobs and income growth: 15%
Home ownership rate change: 6 x national average
Job growth of major industry 4.8 x national average
Appendix 1

Total Debt Balance

Source: FRB NY Consumer Credit Panel/Equifax
Appendix 2

Source: FRBY Consumer Credit Panel

Total Balance by Delinquency Status

Source: FRBNY Consumer Credit Panel/Equifax
Appendix 3

Total Debt Balance

Source: FRBNY Consumer Credit Panel

Source: FRBY Consumer Credit Panel