Homeownership rates of young households in Germany

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Disclaimer
The author’s views do not necessarily reflect those of the Deutsche Bundesbank or its staff.
Motivation

Stylized Facts about homeownership in Germany

- Homeownership rate in Germany the lowest in the Euro Area (HFCS - Wave 2 - 2014)
  - In Germany 44% of households own their main residence
  - Euro Area average: 60%

- On average households main residence account for 60% of the value of real assets (HFCS)

- Low ownership rate one of the reason behind the relatively low median net wealth in Germany

- Since reunification homeownership rate increased from 38% to 47% in 2015 (GSOEP)
Stylized Facts about homeownership in Germany

Own calculation based on GSOEP v32 and Jorda-Schularick-Taylor Database
Motivation

Potential reasons explaining declining homeownership rate of young households

- Individuals enter the labor market increasingly with higher age
- Increasing uncertainty for young professionals
- Credit constraint due to a delayed start of capital accumulation
- Strong price increases for real estate since 2010 (e.g. in +25% in Germany between 2010 and 2015)
- Peaks in urban areas (e.g. in +65% in A-Cites between 2010 and 2015)
  - Young people increasingly live in urban regions
Affordability Analysis
Affordability Model

Assumption: Price may not exceed a household’s maximum affordability

\[ A_{i,c,t} = 1 \text{ if } MA_{i,t} \geq P_{i,c,t} \]
\[ = 0 \text{ otherwise} \] \hspace{1cm} (1)

Maximum Affordability, \( MA_{i,t} \)
- Financial assets, \( FA_{i,t} \)
- Max. credit volume, \( K_{i,t}^{\text{max}} \)
\[ \Rightarrow MA_{i,t} = FA_{i,t} + K_{i,t}^{\text{max}} \]

Purchase price, \( P_{i,c,t} \)
- Av. price per m\(^2\), \( p_{c,t} \)
- Size of the residence \( S_{i,t} \)
- Transaction costs, \( \theta_{c,t} \)
\[ \Rightarrow P_{i,c,t} = p_{c,t} \times S_{i,t} \times (1 + \theta_{c,t}) \]
Affordability Model

Maximum credit volume is subject to an *income constraint* and a *wealth constraint* (e.g. Albacete & Lindner, 2017)

**Wealth constraint**
- Financial assets, \( FA_{i,t} \)
- Max. loan-to-value, \( LTV \)

\[ K_{i,t}^{max} = \frac{FA_{i,t}}{1-LTV} \times LTV \]

**Income constraint**
- Disposable income, \( I_{i,t} \)
- Debt service-income ratio, \( \kappa \)
- Mortgage interest rate, \( r \)
- Time to repay the mortgage, \( \eta_{i,t} = 65 - \text{age}_{i,t} \)

\[ K_{i,t}^{max} = \kappa I_{i,t} \frac{1-(1+r)^{-\eta_{i,t}}}{r} \]

The lower value is binding

\[ K_{i,t}^{max} = \min\left\{ \frac{FA_{i,t}}{1-LTV} \times LTV; \kappa I_{i,t} \frac{1-(1+r)^{-\eta_{i,t}}}{r} \right\} \]
Affordability Model

\[ p_{c,t} \leq \frac{FA_{i,t}}{1-LTV} \min \left\{ \frac{FA_{i,t}}{1-LTV} \frac{LTV}{\kappa l_{i,t}} \right\} \]

Options to react to a price increase affecting affordability

- Adjustment of credit conditions, \( \kappa, LTV, r \), or \( \eta \)
- Reduction of size of dwelling, \( S_{i,t} \)
- Postpone decision to buy a house
Affordability Model

\[ p_{c,t} \leq \frac{FA_{i,t}}{1 - LTV} \times LTV; \kappa I_{i,t} \times \frac{1 - (1+r)^{-n_{i,t}}}{r} \]
\[ S_{i,c} \times (1 + \theta_{c,t}) \]  

(3)

Options to react to a price increase affecting affordability

- Adjustment of credit conditions, \( \kappa \), \( LTV \), \( r \), or \( \eta \)
- Reduction of size of dwelling, \( S_{i,t} \)
- Postpone decision to buy a house

Empirical evidence based on GSOEP

- Purchase decision affected by prices, financial endowment, marital status and number of children  
  Cox Regression
- Size of dwelling influenced by price development, and financial situation  
  OLS Regression
Application of affordability model with a focus on LTV
Affordability analysis using PHF waves 1 and 2

Share of tenant households with reference person aged 30-39 able to afford a 90-m² dwelling in the region of residence.

- Debt-service to income ratio: 0.33
- Mortgage rates (Bundesbank): 3.8% in 2010 and 2.7% in 2014

Quelle: PHF und Bulwiengesa
LTV and Mortgage Rates

Positive correlation between LTV and mortgage rate

- Banks bear higher risks with higher LTV ratios (see e.g. Qi & Yang, 2009)
- Maximum observed LTV raises the probability of a real estate boom by capturing relaxed lending standards (Cerutti et al., 2017)
- European bank survey provides evidence that an increase of a LTV ratio from 50% to 95% leads to a higher mortgage rate of up to 60 basis points (Drudi et al, 2009)
### Data: PHF 2014

- Sample consists of household serving a mortgage for HMR
- Sample restricted to mortgages with LTV ratio of 50%-120%
- HMR purchased up to 15 years prior survey
- Investigation at the household level as well as for single credits
- Only mortgages with main purpose to purchase HMR
- Household level: Mortgage rate calculated as weighted average of mortgage rates with respect to credits' original value
- Credit level: Only credits accounting for at least 30% of original credit volume
- Sample Size: 260 households and 326 credits
- Regressions and variance estimation based on five imputations and 1,000 replicate weights
LTV and Mortgage Rates in Germany - Estimation

\[ i_{hh,t} = \sum_{c=1}^{C} w_{c,0} \times i_{c,t} = \alpha + \beta \times LTV + \gamma \times X + \epsilon_{hh,t} \]

Measurement of LTV: PHF 2014

LTV: Sum of the original values of the issued mortgages is divided by the purchasing price

1. Linear term of LTV
2. Two categories with a LTV ratio of 80% as threshold
3. Four categories with 60%, 80%, and 100% as thresholds

Covariates

- Fixed interest rate
- Credit volume (log values)
- Individual characteristics (age, gender, education)
- Year of purchase/credit origination
### LTV and Mortgage Rates in Germany - Results PHF 2014

#### Dependent Variable: Mortgage Rate

<table>
<thead>
<tr>
<th>LTV (linear)</th>
<th>Household</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.017*</td>
<td></td>
<td>0.017**</td>
</tr>
<tr>
<td>LTV: [60%-80%)</td>
<td>0.030</td>
<td>-0.053</td>
</tr>
<tr>
<td>LTV: [80%-100%)</td>
<td>0.613**</td>
<td>0.474**</td>
</tr>
<tr>
<td>LTV: 100% plus</td>
<td>0.815</td>
<td>0.770*</td>
</tr>
<tr>
<td>LTV: 80% plus</td>
<td>0.669**</td>
<td>0.616***</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fixed interest rates</th>
<th>mortgage rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.691**</td>
<td>0.598*</td>
</tr>
<tr>
<td>ln(credit volume)</td>
<td></td>
</tr>
<tr>
<td>-0.243</td>
<td>-0.220</td>
</tr>
<tr>
<td></td>
<td>0.159</td>
</tr>
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<td></td>
<td>0.180</td>
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<table>
<thead>
<tr>
<th>Observations</th>
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<th>259</th>
<th>259</th>
<th>326</th>
<th>326</th>
<th>326</th>
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</table>

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. Dummies for individual characteristics (age, gender, education) and year of purchase included.

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### Findings

- Increased risk for bank (high LTV) is reflected in higher mortgage rates
- LTV ratio ↑ 10 percentage pts ⇒ mortgage rate ↑ 17 basis pts
- Mortgages with a LTV ratio above 80% ⇒ mortgage rate ↑ 60 basis pts
- Fixed rates coincide with higher mortgage rates
Affordability analysis - PHF 2014 including estimation results

If borrowers account for increased risks via mark-ups, LTV cap becomes less efficient.
Summary & Outlook
Summary and Outlook

Major Finding

- Several reasons for declining homeownership/delayed purchase decision of young households
- Many young households are credit constraint
- Improved borrowing conditions offset by increased real estate prices
- Introduction of LTV cap could affect affordability of young tenant households
- Macroprudential instrument would be efficient under relaxed lending behavior

Outlook

- Quantifying the effects of declining homeownership/delayed purchase decision of young households in Germany
- Assessing long-run consequences on financial stability
Appendix
Regional Distribution of households since 1991

Share of households living in corresponding type of region
household's reference person aged 30 to 39

Own calculation based on GSOEP v32
Labor Market in Germany

Share of individuals working full-time per cohort in % for the period 1984 to 2015

Share of full-time employees with a permanent contract for the period 1984 to 2015

Own calculation based on SOEP v32
Stylized Facts about homeownership in Germany

Homeownership rate in %

- Outright - 30 to 39 years
- Outright - Whole Population
- Mortgage - 30 to 39 years
- Mortgage - Whole Population

Own calculation based on SOEP v32
Affordability analysis using PHF waves 1 and 2

Share of tenant households with reference person aged 30-39 able to afford a 90-m$^2$ dwelling in the region of residence.

- Debt-service to income ratio: 0.33
- Mortgage rates (Bundesbank): 3.8% in 2010 and 2.7% in 2014
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## Cox-Regression estimating the hazard rate of house purchase

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Price-Income-Ratio</td>
<td>-0.170*** (0.023)</td>
<td>-0.210*** (0.029)</td>
<td>-0.101*** (0.039)</td>
<td>-1.399*** (0.189)</td>
<td>-1.611*** (0.224)</td>
<td>-0.930*** (0.352)</td>
</tr>
<tr>
<td>log(sqm-price$_c$,t)</td>
<td>1.154*** (0.104)</td>
<td>1.237*** (0.126)</td>
<td>1.007*** (0.192)</td>
<td>1.164*** (0.104)</td>
<td>1.242*** (0.126)</td>
<td>1.011*** (0.191)</td>
</tr>
<tr>
<td>log(income)</td>
<td>0.065*** (0.015)</td>
<td>0.056*** (0.017)</td>
<td>0.081*** (0.029)</td>
<td>0.066*** (0.015)</td>
<td>0.057*** (0.017)</td>
<td>0.081*** (0.029)</td>
</tr>
<tr>
<td>log(Fin.Assets)</td>
<td>15,028</td>
<td>9,533</td>
<td>5,495</td>
<td>15,028</td>
<td>9,533</td>
<td>5,495</td>
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<tr>
<td>Log-Likelihood</td>
<td>-3,629.8</td>
<td>-2,595.3</td>
<td>-812.1</td>
<td>-3,631.5</td>
<td>-2,598.7</td>
<td>-812.1</td>
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### OLS Regressions on Size of purchased real estate

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>log(m² p.c.)</th>
<th>log(m²)</th>
<th>m²</th>
<th>log(m² p.c.)</th>
<th>log(m²)</th>
<th>m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(sqm-price_{c,t})</td>
<td>-0.170***</td>
<td>-0.171***</td>
<td>-25.89***</td>
<td>-0.021***</td>
<td>-0.021***</td>
<td>-3.018***</td>
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<tr>
<td></td>
<td>(0.063)</td>
<td>(0.063)</td>
<td>(7.978)</td>
<td>(0.007)</td>
<td>(0.007)</td>
<td>(0.930)</td>
</tr>
<tr>
<td>Price-Income-Ratio</td>
<td>-0.021***</td>
<td>-0.021***</td>
<td>-3.018***</td>
<td>0.524***</td>
<td>0.524***</td>
<td>83.08***</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.007)</td>
<td>(0.930)</td>
<td>(0.192)</td>
<td>(0.192)</td>
<td>(24.23)</td>
</tr>
<tr>
<td>Equivailized HH-Size</td>
<td>0.513***</td>
<td>81.25***</td>
<td>0.524***</td>
<td>0.524***</td>
<td>83.08***</td>
<td>83.08***</td>
</tr>
<tr>
<td></td>
<td>(0.193)</td>
<td>(24.24)</td>
<td>(0.192)</td>
<td>(0.192)</td>
<td>(24.23)</td>
<td>(24.23)</td>
</tr>
<tr>
<td>log(income)</td>
<td>0.319***</td>
<td>36.033***</td>
<td>0.318***</td>
<td>0.318***</td>
<td>35.853***</td>
<td>35.853***</td>
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<tr>
<td></td>
<td>(0.036)</td>
<td>(4.523)</td>
<td>(0.036)</td>
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<td>(4.520)</td>
<td>(4.520)</td>
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<tr>
<td>log(Fin.Assets)</td>
<td>0.010**</td>
<td>1.026*</td>
<td>0.010**</td>
<td>1.037*</td>
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<tr>
<td></td>
<td>(0.005)</td>
<td>(0.567)</td>
<td>(0.004)</td>
<td>(0.005)</td>
<td>(0.567)</td>
<td>(0.567)</td>
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<td>R²</td>
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<td>0.309</td>
<td>0.308</td>
<td>0.268</td>
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