

Low Interest Rates and the Distribution of Household Debt

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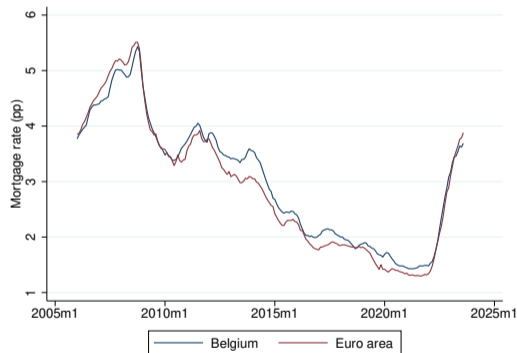
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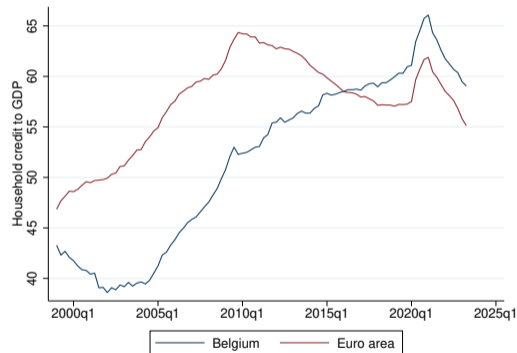
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Mortgage rates and household debt in the Euro Area and Belgium

Mortgage rates

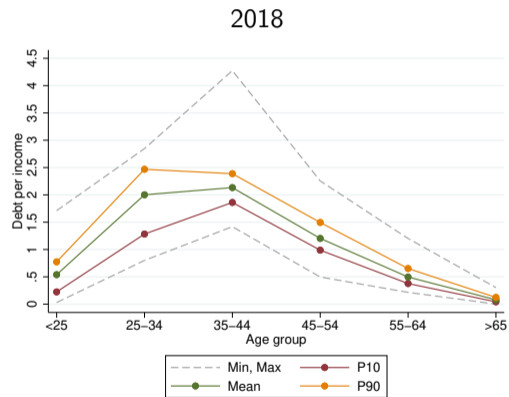
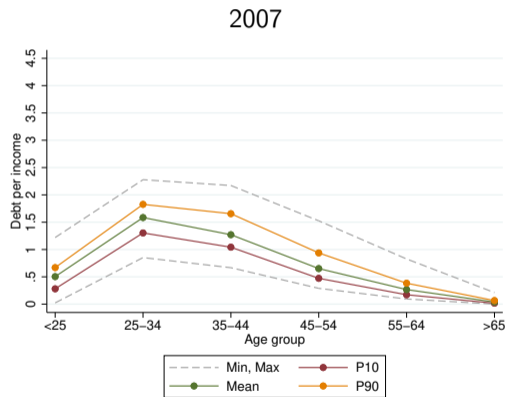


Household debt to GDP



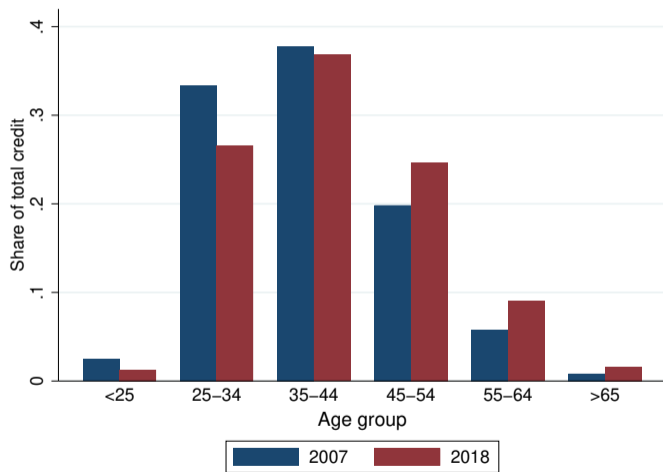
Source: ECB

Mortgage debt to annual income across municipalities



Source: NBB KCP, Finance Ministry.

Change in the distribution of credit across age groups



Source: NBB KCP

Research questions

- What is the sensitivity of household borrowing to changes in the interest rate?
- How does this sensitivity change in the presence of credit constrained borrowers?
- Why:
 - Financial stability and pro-cyclical consumption (Mian, Sufi and Verner, 2017)
 - Aggregate implications of current estimates are unclear (De Fusco et al. 2017, Martins and Villanueva 2006, Fuster and Zafar 2021)
 - Relevant for inequality (Greenwald et al. 2021) and monetary policy transmission with heterogeneous agents (Auclert 2019, Kaplan et al. 2018).

Literature

- Micro: Interest rate elasticity of mortgage debt - identification strategies
 - De Fusco et. al. (2020), Best et. al. (2020), Martins and Villanueva (2006); Bhutta and Ringo (2020), Fuster (2021).
 - DiMaggio (2017), Fuster and Willen (2017), Cloyne et. al. (2019)
- Macro: Low interest rates and implications for households, inequality and the financial system
 - Jorda, Taylor and Schularick (2015), Mian et.al. (2017)
 - Gomez and Guin-Bonenfant (2020), Greenwald et. al (2020), Mian et.al (2020), Adelino et.al (2020)
 - Kaplan et.al (2018), Auclert (2019)
- Monetary policy transmission and impact on bank credit supply
 - Wang (2022), Benetton et.al. (2021), Gyongyosi et.al. (2021)
 - Kwaja and Mian (2008), Dejonghe et al. (2020)
- Role of credit frictions in household borrowing and macroprudential policies
 - Attanasio et.al. (2008), Defusco et.al (2020), Peydro et al. (2020)

Overview

This paper

- Model of distribution of household debt with credit constraints and endogenous house prices
- Use data on the universe of mortgage loans in Belgium to document credit allocation and lending standards since 2006
- Estimate rate sensitivity with identification based on bank exposures to foreign countries

Results

- A fall in interest rates leads to more borrowing by wealthier, middle-aged households
- Shift in the debt distribution to borrowers aged over 45 years old amid stable lending standards.
- 1% fall in interest rates is associated with a 7% growth in household debt.

Overview

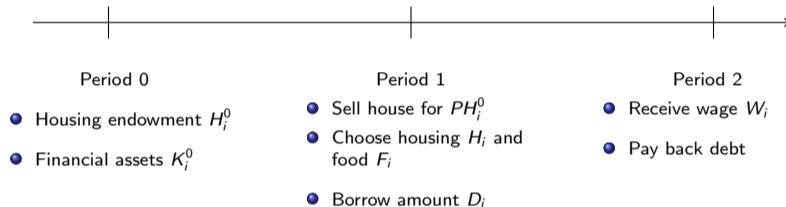
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Endowment and timing



- Stein (1995): household i chooses housing H_i and food F_i to maximize $U_i = \alpha \ln H_i + (1 - \alpha) \ln F_i$
- Receive housing H_i^0 and assets K_i^0 in period 0 but wage W_i in period 2 \rightarrow borrow in period 1
- $\partial H_i^0 / \partial i > 0$, $\partial K_i^0 / \partial i > 0$ and $\partial W_i / \partial i < 0$: index i can be interpreted as age

Borrowing constraints and market clearing

- Budget constraint \rightarrow Debt-Service-to-Income limit ρ

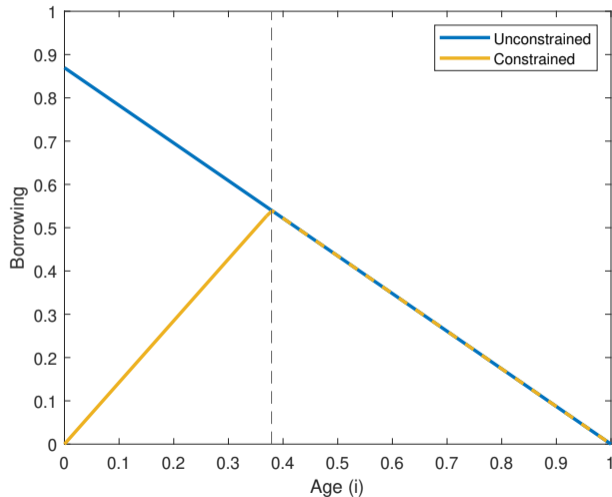
$$(1 + r)(F_i + H_i P - H_i^0 P - K_i^0) \leq \rho W_i.$$

- Loan-to-value \rightarrow downpayment constraint $0 \leq \gamma \leq 1$

$$\gamma(H_i P + F_i) \leq H_i^0 P.$$

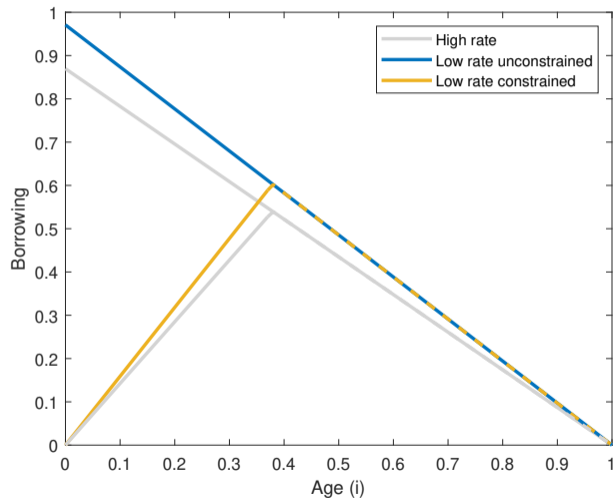
- Moral hazard problem (Holmstrom and Tirole 2012)
- Regulatory / market leverage constraint (Brunnermeier and Pedersen 2009)
- Housing market clearing: $1 = \int_0^1 H_i di.$

Equilibrium



- First-best: Younger households borrow most, to transfer future income (blue line)
- Second-best: two regimes.
 - 1 Households above age threshold are unconstrained
 - 2 Down payment constraint binds below threshold
- Constrained households are unable to transfer resources from period 2 to 1

Comparative statics



- A fall in interest rate has two implications
 - 1 Cheaper to transfer resources
 - 2 Rise in house prices which relaxes the down payment constraint
- Households at the extremes are however less affected
 - Oldest households have less resources to transfer
 - Youngest have little wealth to use as collateral
- → A fall in interest rates increases debt most for “middle aged” households

Data

- Household credit registry, Kredit Centrale Particulieren (NBB KCP) (2006-2019)
- Income data at municipality \times age group level (Finance Ministry)
- House prices data at municipality level (Statbel)
- MFI Interest Rates data (NBB MIR)
- Prets Hypothecaires Leningen data (NBB PHL)
- Financial accounts and Schema A (bank balance sheet) (NBB)

The Belgian Household Credit Registry

- Universe of household borrowing in Belgium from 2006
 - All loans outstanding to (anonymized) individuals in Belgium at each year-end
 - Includes consumer credit, defaults
- Data at the loan-borrower-municipality-issuer level
- We focus on mortgage loans
- For each loan, the data includes the loan size D_0 , the issuance date T_0 and maturity M + monthly payments
- Unique overview of bank lending to households in Belgium
- We use municipality and bank of borrower to merge credit with other datasets

Empirical specification

- In the model, when DSTI constraint is not binding, borrowing by households D_{it} is

$$\begin{cases} D_{it} = \frac{W_{it}}{1+r} & \text{if } i \in \{\text{Unconstrained}\} \\ D_{it} = \frac{H_i^0 P(r)}{\gamma} & \text{if } i \in \{\text{Constrained}\} \end{cases}$$

- Estimate separately for unconstrained (all) and constrained (first-time) borrowers:

$$\log D_{it} = \alpha_0 + \alpha_1 r_{it} + X_{it} + \epsilon_{it},$$

where

- D_{it} is the outstanding debt of borrower i in year t
- r_{it} : interest rate faced by the borrower
- X_{it} : borrower and year controls (housing wealth H_i^0 , income W_i , borrower and time fixed effects)
- ϵ_{it} : unobserved characteristics

Identification

$$\log D_{it} = \alpha_0 + \alpha_1 r_{it} + X_{it} + \epsilon_{it},$$

Challenge: ensure that the variation in r_{it} is independent of borrower and local economic characteristics

- Compute local interest rate r_{mt} using bank market shares ω_{bm} and bank-level rates r_{bt} :

$$r_{mt} = \sum_b \omega_{bm} r_{bt}$$

Market shares

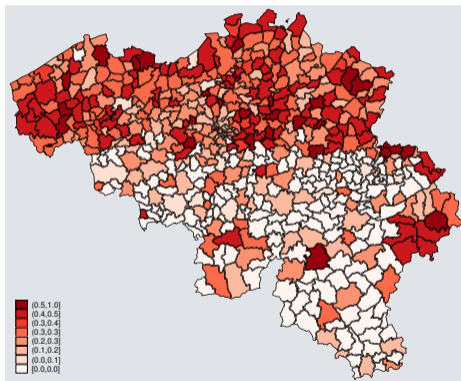
- Use instrument Z_{mt} : local impact of foreign growth shock Foreign Exp.
 - Depends on bank foreign exposures e_{bf} and foreign growth shock g_{ft} weighted by bank exposure e_{bf}

$$Z_{mt} = \sum_b \omega_{bm} \times \sum_{f=1}^F e_{bf} g_{ft}$$

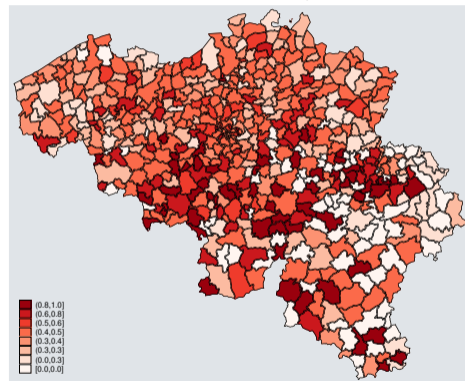
First stage

Market share of two banks in Belgium

Branch market share, Bank A

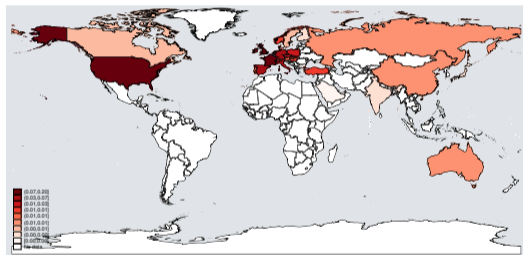


Branch market share, Bank B

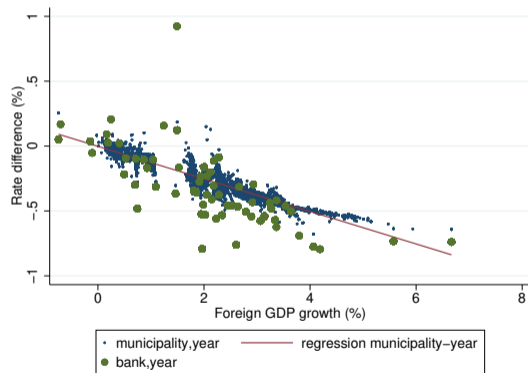


The market share is computed as the number of branches of a bank relative to total branches in a municipality. Source: Banque Carrefour des Entreprises. [back](#)

International exposures of Belgian banks and First stage relationship between interest rates and foreign GDP



International exposures are computed as the share of foreign exposures out of total foreign exposures. Source: NBB Schema A.



Second stage: Municipality level

	Debt			
	OLS (1)	IV (2)	IV (3)	IV (4)
Interest rate	-9.776*** (0.778)	-9.856*** (1.821)	-8.983*** (1.797)	-8.839*** (1.877)
Mean income	1.204*** (0.050)	1.257*** (0.063)	1.283*** (0.065)	1.223*** (0.062)
Population	0.959*** (0.004)	0.971*** (0.003)	0.975*** (0.003)	0.960*** (0.005)
Property price	0.069*** (0.010)		0.100*** (0.024)	0.081*** (0.027)
Market concentration	-1.241*** (0.153)			-1.242*** (0.156)
Observations	6,144	6,144	6,144	6,144
Region × Year	Yes	Yes	Yes	Yes
R ²	0.981	0.978	0.978	0.980

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- Estimate the impact of the interest rate using municipality-level data
- We perform IV specification on credit to all borrowers
- A 1% fall in interest rates is associated with a 9% increase in household indebtedness

Second stage: Borrower level - All borrowers

	Debt			
	OLS (1)	IV (2)	IV (3)	IV (4)
Interest rate	0.034 (0.340)	-6.616* (3.521)	-7.372** (3.478)	-7.366** (3.478)
Population	-0.048*** (0.000)	-0.048*** (0.001)	-0.048*** (0.000)	-0.048*** (0.000)
Mean income	0.155*** (0.003)	0.155*** (0.003)	0.154*** (0.003)	0.154*** (0.003)
Market concentration	0.108*** (0.014)	0.080*** (0.023)	0.072*** (0.022)	0.071*** (0.022)
Population age	0.008*** (0.000)	0.008*** (0.000)	0.008*** (0.000)	0.008*** (0.000)
Property price	-0.014*** (0.002)		-0.012*** (0.002)	-0.012*** (0.002)
Borrower age	-0.374*** (0.006)			-0.374*** (0.006)
Observations	16,088,898	16,088,898	16,088,898	16,088,898
Age Group × Year	Yes	Yes	Yes	Yes
Borrower	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- We then estimate the specification at the borrower-level
- Results are consistent with municipality level
- Stable to municipality-level controls

Second stage: Borrower level - First-time borrowers

	Debt			
	OLS (1)	IV (2)	IV (3)	IV (4)
Interest rate	8.726*** (1.339)	-12.398*** (3.578)	-12.097*** (3.577)	-10.928*** (3.582)
Mean income	0.628*** (0.006)	0.639*** (0.005)	0.638*** (0.005)	0.626*** (0.006)
Market concentration	-1.331*** (0.029)	-1.382*** (0.032)	-1.384*** (0.032)	-1.421*** (0.032)
Borrower age	-0.004*** (0.000)		-0.004*** (0.000)	-0.004*** (0.000)
Property price	-0.064*** (0.004)			-0.062*** (0.004)
Observations	738,529	738,529	738,529	738,529
Age Group \times Year	Yes	Yes	Yes	Yes
Region \times Year	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- Finally, we focus specifically on first time borrowers
- Magnitudes are larger
- Given that first-time borrowers are only 5% of borrowers in a given year, non-first-time nevertheless drive credit growth

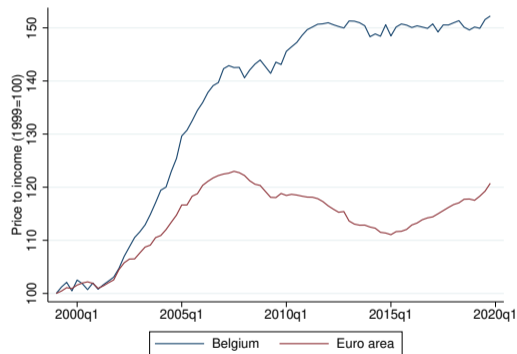
Conclusion and policy implications

Conclusion

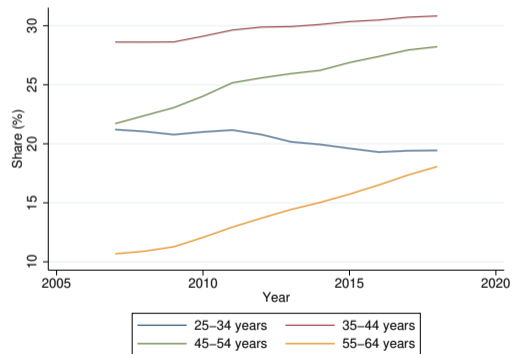
- What is the interest rate elasticity of household borrowing? What distributional implications with credit constraints?
- Model: middle aged, unconstrained households borrow most
- Stylized facts are consistent with the model
- IV: low interest rates are associated with higher household borrowing

Price-to-Income and Distribution of Borrowers

Price -to-income



Share of Borrowers by age



Source: ECB Quarterly Sector Accounts , OECD Housing Prices, NBB

Overview of Mortgage Credit Registry

Characteristic	Year		
	2007	2013	2018
<i>All borrowers</i>			
Borrower count	1,574,737	1,731,767	1,858,961
Age average	39	40	41
Loans per borrower	2	2	2
Amount per borrower	77,607	102,020	126,701
<i>First-time borrowers</i>			
Borrower count	98,182	64,556	74,932
Age average	34	33	33
Loans per borrower	1	1	1
Amount per borrower	135,258	162,696	203,865