Consumption Responses to Financial Liberalization: Evidence from Survey Data

Cristina Barcelo (BdE)

Ernesto Villanueva (BdE)

All views and opinions are our own.

Income and Wealth Inequality: Drivers and Consequences,
Gdansk, Poland
September 28 2023

Introduction

- Does financial liberalization help households to bring expected future income resources to smooth consumption? If yes, how?
- The introduction of euro in 1999 increased the possibilities of financing with different kinds of mortgages.
- The permanent income model predicts heterogeneous consumption responses to lifting borrowing constraints
  - Interest rates (R) affect the consumption of "unconstrained" households
  - The consumption of credit rationed households depends on the size and timing of payments (loan maturity, M) .

- THIS PAPER estimates borrowing responses to changes in maturities after the financial liberalization in Spain.
  - Spanish Survey of Household Finances (EFF), 2002-2014.
  - 80% home ownership, usually by taking out mortgages.
  - Wide time and cross-sectional variation in M associated to year of purchase.

What do we do?

- Use a simple life-cycle model to characterize individuals whose consumption is affected by changes in mortgage maturity M.
  - Individuals with high income growth at old ages AND high borrowing rates should react most to M.
- Estimate household responses to credit conditions at purchase
  - Extensions in mortgage maturity affect age groups differently.
  - Longer maturities allow to increase loan liabilities and to reduce loan payments.

Related Literature

- Consumption responses to credit conditions.
  - Leth-Petersen (2009): home equity loans in DK, Besley, Meads and Surico (2009): consumption responses to R spreads, Chen et al (2011), Jappelli and Pistaferri (2011).
- The marginal propensity to consume out of wealth.
  - Mian Rao and Sufi (various), Cocco and Campbell, Disney and Gathergood (2010), Bover (2008), Christelis et al (2020), Guiso et al (2005), Carroll et al (2011)
- Who are the credit constrained?
  - Jappelli (90), Meghir and Weber (96), Attanasio et al (08), Alan et al (2011).
  - De Araujo et al (2016), Tzur-Ilan (2018), Van Bekkum et al (2019), Aguiar, Bils and Boar (2019)
- **Contribution**: Causal response of homeowners' borrowing behaviour to extended loan maturity, identifying credit-constrained households.

Table 1: Evolution of credit conditions in Spain for period 1992-2015

	1992-1998	1999-2004	2005-2015
Fixed Rate Mortgages (%)	24	13	13
Loan-to-Value (median)	0.80	0.90	0.92
Interest rate (%)) (if adjustable)	4.43	3.64	2.91
Maturity at origination	18.5	23.8	29.0
Sample size	939	1,199	668

Source: The 2002-2014 waves of the Spanish Survey of Household Finances (EFF).

A benchmark -Attanasio et al (2008)

- No uncertainty, individuals live for three periods.
  - Separable, isoelastic preferences between the flow of non-durables and housing.
  - Receive income stream, y_1, y_2, y_3, where $y_2 < y_3$
- Heterogeneity in cost of borrowing. Credit constrained can only borrow to purchase a house:
  - Purchase and borrowing in first period only.
  - A set of unconstrained households borrow and save at R ($r_a = r_b$).
  - "Credit constrained" borrow at r_b and save at r_a ($r_a < r_b$)

Consumer decisions

- Consumption of an unconstrained consumer in the first period equals:

$$h_1^u = \kappa(r_b; \eta, \beta, \rho)[y_1 + \frac{y_2}{1+r_b} + \frac{y_3}{(1+r_b)^2}]$$

- The consumption path of (unconstrained) homeowners is unaffected by loan maturity:
$\frac{\partial c_1^u}{\partial M} = 0$, $\frac{\partial h}{\partial M} = 0 \rightarrow \frac{\partial \phi}{\partial M} = 0$ (no gains from maturity extension)

- An unconstrained homeowner, if able to borrow for two periods and unable to save in 2nd (short maturity, superscript S)

$$h^S = \kappa_h^S(r_b; \eta, \beta, \rho)[y_1 + \frac{y_2}{1+r_b}]$$

- If able to borrow for three periods (long maturity, superscript L)

$$h_1^L = \kappa_c^L(r_b; \eta, \beta, \rho)[y_1 + \frac{y_2}{1+r_b} + \frac{y_3}{(1+r_b)^2}] \ .$$

Implications

- The loan to value of (unconstrained) homeowners is unaffected by loan maturity:
  $\frac{\partial \phi}{\partial M} = 0$ (no reaction maturity extension)

- The loan to value of credit constrained consumers is affected by maturity:
  - An extension of mortgage maturity allows accessing to y_3 through:

    Higher LTV ratio at purchase (ϕ): $1 - \phi(M) = \frac{y_1}{h^M} - \frac{(1+r_b)^{\frac{1}{\rho}}}{\eta^{\frac{1}{\rho}}}$

    As $h^L \geq h^S \rightarrow \phi(L) \geq \phi(S)$ (maturity extension increases welfare)
- We identify $\phi(L) - \phi(S) = y_1 \frac{\left(h^L - h^S\right)}{h^S h^L} > 0$

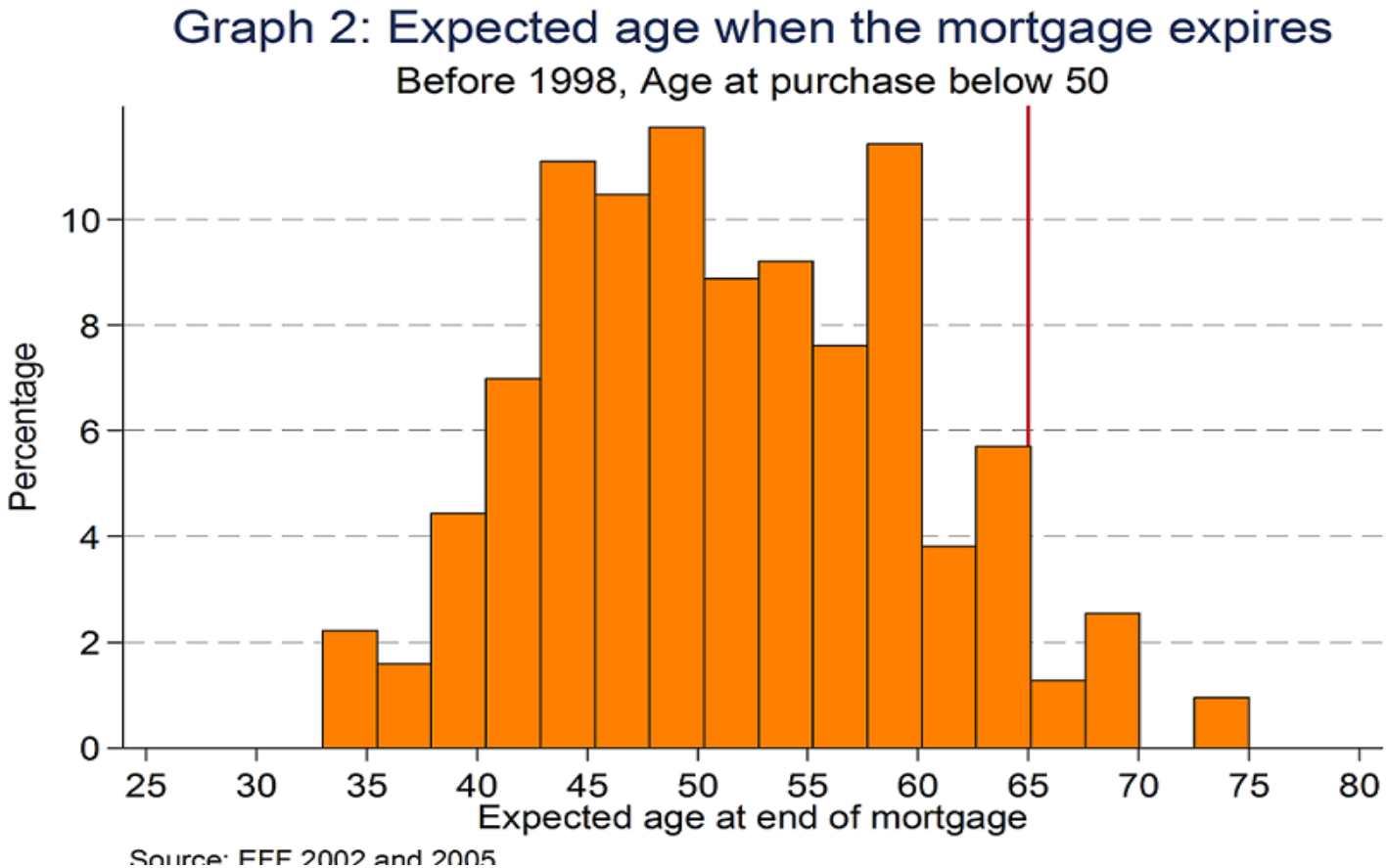
Data

- **2002-2014 waves of the triennial Spanish Survey of Household Finances (EFF)**
  - Information about household's assets, debt, income and consumption.
- Similar to US Survey of Consumer Finances (SCF).
- We use a sample of "recent" homeowners who purchased house of residence using a mortgage after 1992 (2,821 observations):
  - Original **maturity** of loan.
  - Loan-to-value ratio at purchase
  - Loan payments at the year of the survey interview.

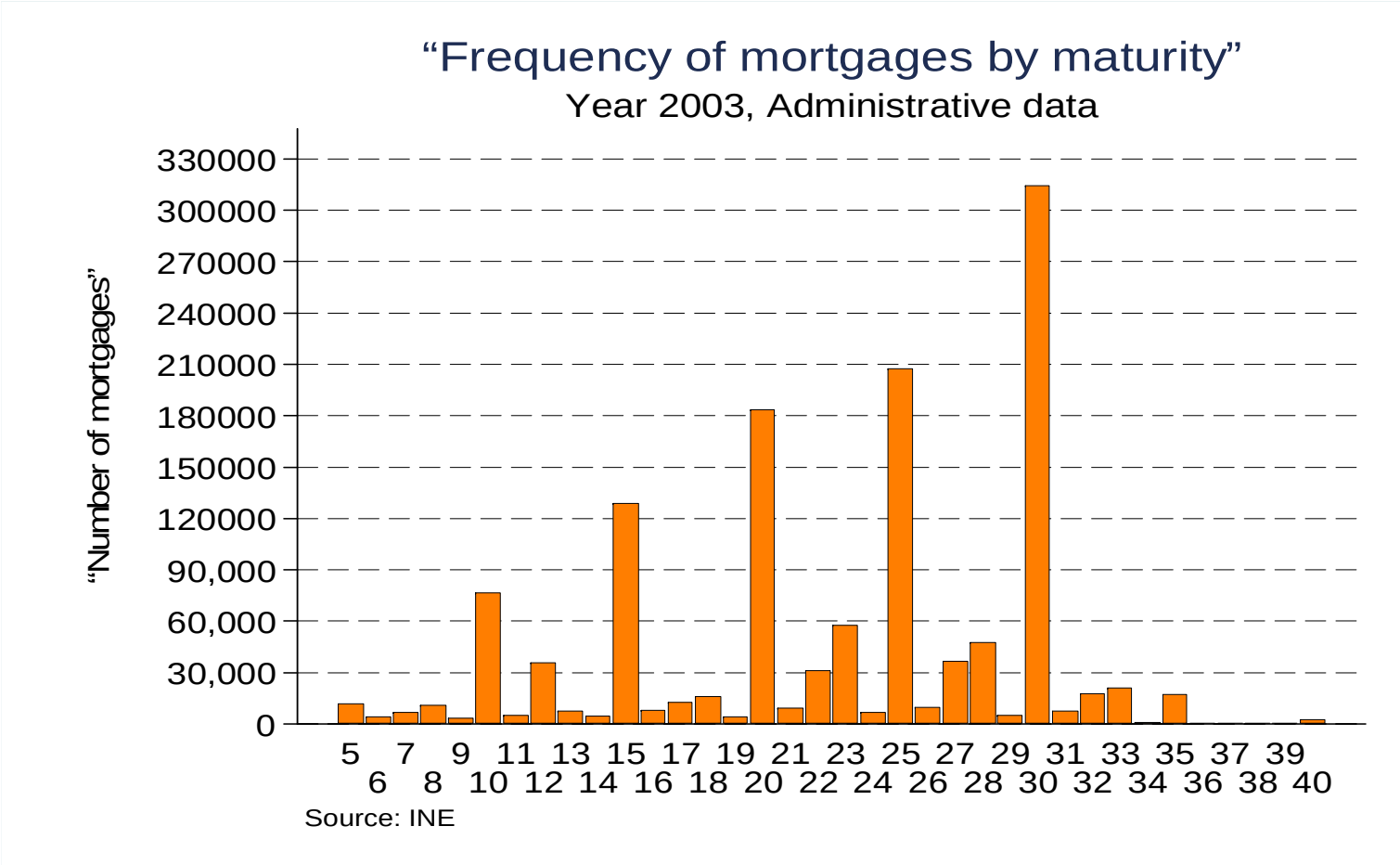
Empirical strategy: endogeneity

- Estimate responses of Loan-to-Value and loan payments to changes in maturity.
- OLS estimates are biased: self-selection of customers of loans and screening from banks, among others.
- Use discontinuities in bank policy functions as instruments for mortgage maturity:
  1. Banks reluctant to mortgages still repaying after the age of 65.
  2. Banks usually offers maturities as multiple of 5 years

  $\rightarrow$ Instrument for maturity: "distance to the age of 65 at the time of purchase, rounded by the minimum number being multiple of 5 years".
- Instrument should work mainly for purchases after 1999, when maturities longer than 20 were usually granted.


Graph 2: Expected age when the mortgage expires
Before 1998, Age at purchase below 50
Percentage
0
2
4
6
8
10
25
30
35
40
45
50
55
60
65
70
75
80
Expected age at end of mortgage
Source: EFF 2002 and 2005

Back


"Frequency of mortgages by maturity"
Year 2003, Administrative data
"Number of mortgages"
330000
300000
270000
240000
210000
180000
150000
120000
90,000
60,000
30,000
0
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Source: INE

Back

Differences-in-differences estimates

$$\begin{aligned} Y_i &= \beta_0 + \beta_1 1(X_i \geq X_0) + \beta_2 f(X_i) + \beta_3 D_{99,i} + \\ &\quad \beta_4 1(X_i \geq X_0) \cdot D_{99,i} + \beta_5 g(X_i) \cdot D_{99,i} + \varepsilon_i \end{aligned}$$

i : households; β : model parameters; X_i : distance in years until age of 65; X_0: cut-off of distance (20 years, 25 and 30 years according to maturity length);
$D_{99,i}$: indicator of year of purchase after 1999; ε_i : error term;

Y_i =indicators of whether maturities (M) are:

1. below 20 years: $M_i \leq 20$
2. over 25 years: $M_i \geq 25$
3. over 30 years: $M_i \geq 30$

Figure 1: Differences-in-differences estimates of the proportion of maturities under 20 years according to the cut-off of the distance of 20 years until retirement

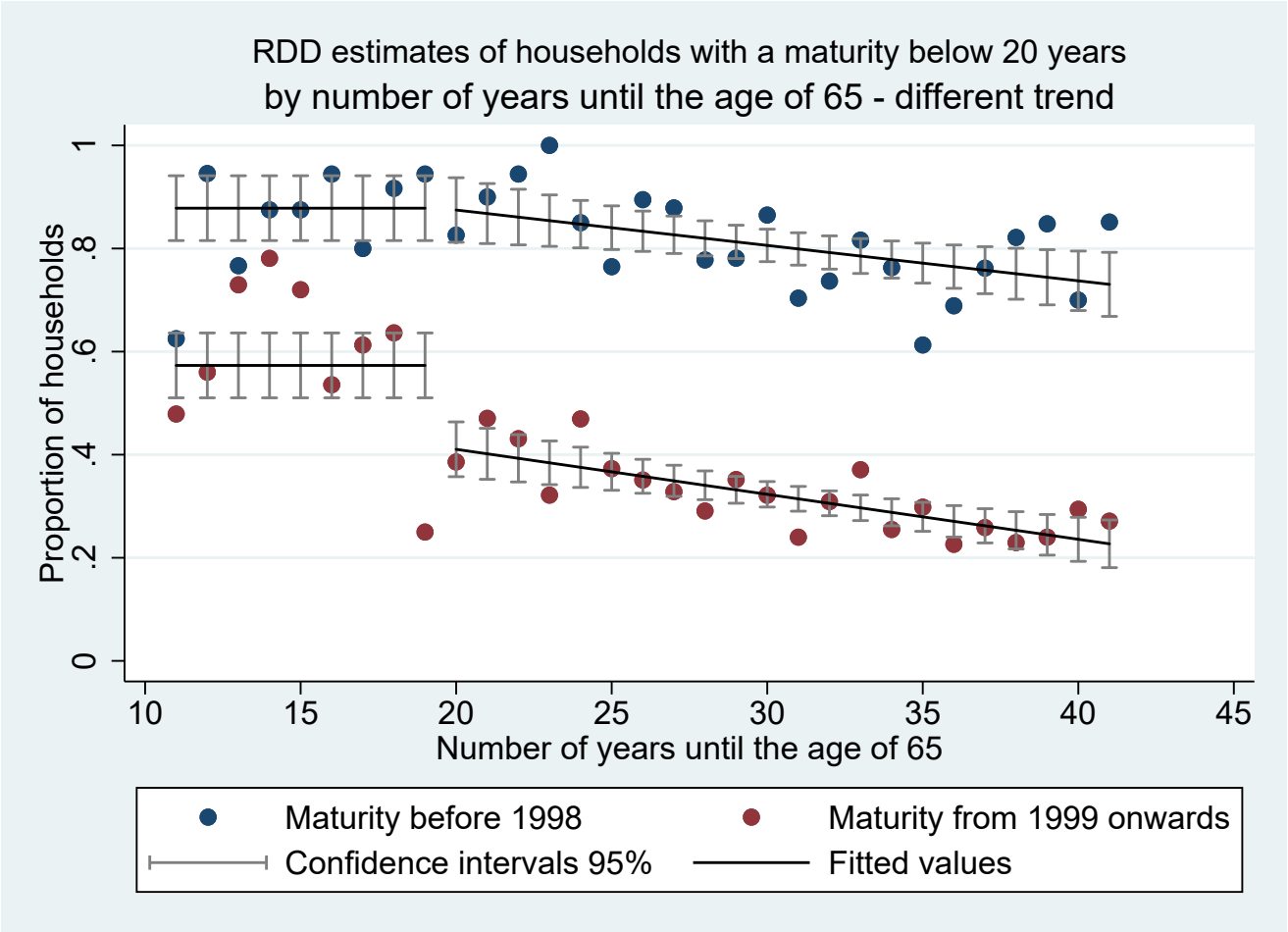
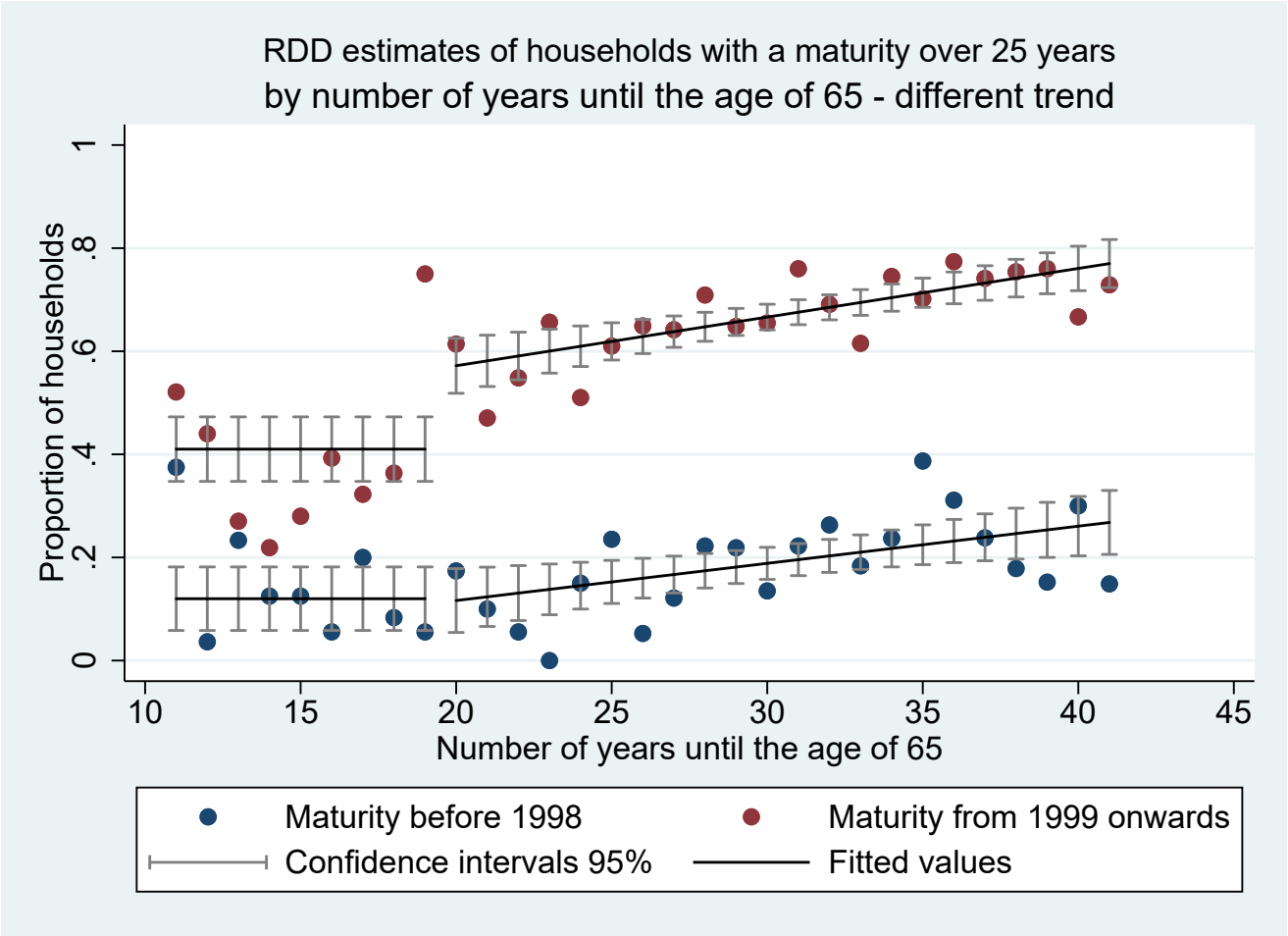


Figure 2: Differences-in-differences estimates of the proportion of mortgages with a maturity over 25 years



The treatment is the cut-off of 20 years until the age of 65 and a linear trend on distance in years until age of 65.

First-stage estimates (FS)

$$Y_i = \beta_0 + \beta_1 1(X_i \geq 20) + \beta_2 1(X_i \geq 20) \cdot D_{99,i} + \beta_3 \cdot D_{99,i} + \beta_4 W_i + v_i$$

Y_i: different lengths of maturities ($\leq$20, $\geq$ 25 and $\geq$ 30 years);

$D_{99,i}$: post 1999 dummy; β: model parameters; v_i : error term; X_i: number of years until the age of 65;

W_i: vector of covariates:

Family head's gender, household size, children's age, more than two adult household members, marital status, education level, polynomials on family head's age and logarithm of previous household total income, kind of financial institution, fixed effects of calendar years and years of purchase.

β_2: parameter of interest after 1999.

- In further specifications of the FS equation we consider additional thresholds of the age at purchase as instruments, $X_i \geq 25$ and $X_i \geq 30$.

Table 2: Impact of the distance in years until the age of 65 on maturity of mortgages for the purchase of the owner-occupied house.

Estimation method: First-stage estimates by OLS				
Dependent variable:	Loan maturity	Indicator of the length of mortgages (in years):		
		Maturity≤20	Maturity≥25	Maturity≥30
(Dist. to 65≥20)·Post99	**2.086**			
	(.743)* **			
Distance to 65≥20	0.174			
	(.499)			
Post99	-0.481			
	(.954)			
Intercept	17.118			
	(.702)***			
F-test	7.88			
Sample size	2821			

Source: The 2002-2014 waves of the Spanish Survey of Household Finances(EFF). Other covariates included: Family head's sex, household size, children's age, more than two adult household members, marital status, education level, polynomials on family head's age and logarithm of previous household total income, kind of financial institution, fixed effects of calendar years and years of purchase. Standard errors robust to heteroscedasticity and arbitrary correlation within age of purchase and combined across 5 implicates.

Table 2: Impact of the distance in years until the age of 65 on maturity of mortgages for the purchase of the owner-occupied house.

Estimation method: First-stage estimates by OLS				
Dependent variable:	Loan maturity	Indicator of the length of mortgages (in years):		
		Maturity≤20	Maturity≥25	Maturity≥30
(Dist. to 65≥20)·Post99	**2.086**	**-0.180**		
	(.743)* **	**(.059)*** **		
Distance to 65≥20	0.174	0.028		
	(.499)	(0.034)		
Post99	-0.481	0.055		
	(.954)	(.072)		
Intercept	17.118	0.788		
	(.702)***	(.055)***		
F-test	7.88	9.45		
Sample size	2821	2821		

Source: The 2002-2014 waves of the Spanish Survey of Household Finances(EFF). Other covariates included: Family head's sex, household size, children's age, more than two adult household members, marital status, education level, polynomials on family head's age and logarithm of previous household total income, kind of financial institution, fixed effects of calendar years and years of purchase. Standard errors robust to heteroscedasticity and arbitrary correlation within age of purchase and combined across 5 implicates.

Thresholds at 25 and 30

Table 2: Impact of the distance in years until the age of 65 on maturity of mortgages for the purchase of the owner-occupied house.

Estimation method: First-stage estimates by OLS				
Dependent variable:	Loan maturity	Indicator of the length of mortgages (in years):		
		Maturity≤20	Maturity≥25	Maturity≥30
(Dist. to 65≥20)·Post99	**2.086**	**-0.180**	**0.193**	
	(.743)* **	**(.059)*** **	**(.059)*** **	
Distance to 65≥20	0.174	0.028	-0.046	
	(.499)	(0.034)	(.034)	
Post99	-0.481	0.055	-0.052	
	(.954)	(.072)	(.070)	
Intercept	17.118	0.788	0.214	
	(.702)***	(.055)***	(.053)***	
F-test	7.88	9.45	10.61	
Sample size	2821	2821	2821	

Source: The 2002-2014 waves of the Spanish Survey of Household Finances(EFF). Other covariates included: Family head's sex, household size, children's age, more than two adult household members, marital status, education level, polynomials on family head's age and logarithm of previous household total income, kind of financial institution, fixed effects of calendar years and years of purchase. Standard errors robust to heteroscedasticity and arbitrary correlation within age of purchase and combined across 5 implicates.

Table 2: Impact of the distance in years until the age of 65 on maturity of mortgages for the purchase of the owner-occupied house.

Estimation method: First-stage estimates by OLS				
Dependent variable:	Loan maturity	Indicator of the length of mortgages (in years):		
		Maturity≤20	Maturity≥25	Maturity≥30
(Dist. to 65≥20)·Post99	**2.086**	**-0.180**	**0.193**	**0.176**
	(.743)* **	**(.059)*** **	**(.059)*** **	**(.031)*** **
Distance to 65≥20	0.174	0.028	-0.046	-0.073
	(.499)	(0.034)	(.034)	(.028)***
Post99	-0.481	0.055	-0.052	-0.105
	(.954)	(.072)	(.070)	(.039)***
Intercept	17.118	0.788	0.214	0.078
	(.702)***	(.055)***	(.053)***	(.040)*
F-test	7.88	9.45	10.61	31.68
Sample size	2821	2821	2821	2821

Source: The 2002-2014 waves of the Spanish Survey of Household Finances(EFF). Other covariates included: Family head's sex, household size, children's age, more than two adult household members, marital status, education level, polynomials on family head's age and logarithm of previous household total income, kind of financial institution, fixed effects of calendar years and years of purchase. Standard errors robust to heteroscedasticity and arbitrary correlation within age of purchase and combined across 5 implicates.

Thresholds at 25 and 30

Impact on household borrowing behaviour

- Longer maturities after financial liberalization allow to finance consumption by two channels:

  (1) Higher loan-to-value (LTV) ratio at purchase (collateralize income late in life).

  (2) Reducing the size of the installment.

- Estimate intention-to-treat equations of the loan-to-value at purchase (LTV) and the ratio of current loan payments to income ($\frac{b}{Y}$):

$$LTV_i = \delta_0 + \delta_1 1\left(X_i \geq 20\right) + \delta_2 1\left(X_i \geq 20\right) \cdot D_{99,i} + \delta_3 D_{99,i} + \delta_4 W_i + u_i$$

$$\left(\frac{b}{Y}\right)_i = \gamma_0 + \gamma_1 1\left(X_i \geq 20\right) + \gamma_2 1\left(X_i \geq 20\right) \cdot D_{99,i} + \gamma_3 D_{99,i} + \gamma_4 W_i + v_i$$

Table 3: Impact of the maturity rule according to the distance to the age of 65 on the initial capital of mortgages by homeowners aged 25-64.

Estimation method: Intention-to-treat estimates by OLS Sample: Mortgages for the purchase of the owner-occupied house of homeowners				
Dependent variable:	Loan-to-value ratio at purchase (LTV)	Indicator of whether: LTV>0.80	LTV≥0.90	LTV≥1
(Dist. to 65≥20)·Post99	1.203	**0.158**	**0.120**	0.072
	(1.127)	**(0.046)*** **	**(0.045)*** **	(0.043)
Distance to 65≥20	-0.577	-0.115	-0.086	-0.066
	(0.646)	(0.065)*	(0.058)	(0.051)
Post99	-0.867	-0.079	-0.064	-0.003
	(0.887)	(0.049)	(0.041)	(0.038)
Intercept	1.160	0.517	0.357	0.275
	(0.52)**	(0.085)***	(0.068)***	(0.067)***
Sample size	2821	2821	2821	2821

Source: EFF2002-EFF2014. The remaining covariates are identical to Table 3. Other covariates included: Family head's sex, household size, children's age, more than two adult household members, marital status, education level, polynomials on family head's age and logarithm of previous household total income, kind of financial institution, fixed effects of calendar years and years of purchase. Standard errors robust to heteroscedasticity and arbitrary correlation within age of purchase and combined across 5 implicates.

Interpretation of the results (i)

- From the theoretical model, credit constraints alter Loan-To-Value responses to M
  1. Credit-unconstrained consumers: $\phi(L) - \phi(S) = 0$
  2. Credit-constrained consumers: $\phi(L) - \phi(S) = y_1 \frac{\left(h^L - h^S\right)}{h^S h^L} > 0$

- At the discontinuity at 20 years from retirement (45 years of age) the probability of being granted a mortgage with more than 20 years maturity increases by (18%)

- At the same discontinuity 20 years from retirement, the probability of holding LTV over 80% increases by 15.8% $\Longrightarrow$
  $\Longrightarrow$ The share of credit-constrained households is 88% ($\frac{15.8}{18} \cdot 100$).

Table 4: Impact of the maturity rule according to the distance to the age of 65 on access to credit and financial knowledge.

Estimation method: Intention-to-treat estimates by OLS			
Sample: Mortgages for the purchase of the owner-occupied house of homeowners aged between 25 and 64			
Dependent variable:	Granted lower amount than requested	Financial knowledge	
		Lusardi-Mitchell Big 3 (0-1)	Interest rate compounding
	(1)	(2)	(3)
(Dist. to 65≥20)·Post99	**0.030**		
	(0.013)		
Distance to 65≥20	0.002	-0.022	0.139
	(0.018)	(0.046)	(0.081)
Intercept		0.72	0.60
		(0.09)	(0.147)
Sample size	2821	1582	1582

Source: EFF2002-EFF2014(column1) The remaining covariates are identical to Table 3. Other covariates included: Family head's sex, household size, children's age, more than two adult household members, marital status, education level, polynomials on family head's age and logarithm of previous household total income, kind of financial institution, fixed effects of calendar years and years of purchase. Columns 2 and 3: ECF(2017):Survey of Financial Competences Standard errors robust to heteroscedasticity and arbitrary correlation within age of purchase and combined across 5 implicates.

Conclusions

- Use household survey with detailed information on mortgage terms to investigate borrowing responses to maturity among mortgaged homeowners.
- An increase in loan liabilities due to longer maturities is informative about the share of credit-constrained households.
- The availability of longer maturities after 1999 has brought:
  1. A rise in liabilities among households aged under 45, an increase of 16% and 12% in the proportion of households with LTV higher than 80% and 90%, respectively.
  2. A great heterogeneity in the response of loan payments:
     (i) A reduction of 10% in the proportion of individuals aged under 45 at purchase who devote more than 30% of their income to repay the mortgage.
     (ii) An increase of 5% in the fragility of the youngest households (aged under 35 at purchase), more than 40% of their income used to repay loans.

Thank you for your attention!

Table 5: Impact of maturity on mortgage liabilities for the purchase of the owner-occupied house.

Sample: Homeowners aged between 25 and 64 with outstanding mortgages.				
Method: Ordinary Least Squares Estimates (OLS)				
Dependent variable:	Loan-to-value ratio	Indicator of whether:		
Panel A: Maturity as continuous	at purchase (LTV)	LTV>0.80	LTV≥0.90	LTV≥1
1. Maturity, linear (diff from 15)	0.046	0.023	0.023	0.020
	(0.024)**	(0.003)***	(0.003)***	(0.003)***
2. Maturity·Post99	-0.028	-0.001	-0.005	-0.006
	(0.02)	(0.003)	(0.003)*	(0.003)**
Panel B: Maturity as discrete				
1. (Maturity≥30 years)·Post99	-0.111	0.043	-0.016	-0.070
	(0.226)	(0.074)	(0.078)	(0.079)
2. (Maturity≥25 years)·Post99	0.655	0.002	0.015	0.009
	(0.671)	(0.06)	(0.062)	(0.061)
3. (Maturity≥20 years)·Post99	-0.668	0.028	-0.072	-0.056
	(0.651)	(0.051)	(0.047)	(0.044)
4. Maturity≥30 years	0.190	0.041	0.101	0.157
	(0.209)	(0.068)	(0.072)	(0.074)**
5. Maturity≥25 years	-0.730	0.149	0.138	0.112
	(0.768)	(0.051)***	(0.053)***	(0.052)**
6. Maturity≥20 years	1.172	0.167	0.161	0.123
	(0.971)	(0.038)***	(0.035)***	(0.033)***

1. Source: Pooled 2002-2014 EFF waves. Sample of 2821 homeowners aged 25-64 who obtained a mortgage between 1991 and 2015. One observation per household, the 95% observations is 15 years after purchase.

Back

Table 6: Impact of the distance in years until the age of 65 on maturity of mortgages for the purchase of the owner-occupied house.

Estimation method: First-stage estimates by OLS				
Dependent variable:	Loan maturity	Indicator of the length of mortgages (in years):		
		Maturity≤20	Maturity≥25	Maturity≥30
(Dist. to 65≥30)·Post99	**1.219**	-0.035	0.031	**0.072**
	(0.562)**	(0.034)	(0.039)	**(0.025)*****
(Dist. to 65≥25)·Post99	-0.847	0.017	0.015	0.030
	(0.551)	(0.038)	(0.042)	(0.03)
(Dist. to 65≥20)·Post99	**2.097**	**-0.180**	**0.169**	**0.107**
	(0.841)**	**(0.069)*****	**(0.07)****	**(0.039)*****
Distance to 65≥30	-0.839	0.013	-0.008	-0.047
	(0.468)*	(0.035)	(0.037)	(0.027)*
Distance to 65≥25	1.395	-0.074	0.051	0.007
	(0.451)***	(0.033)**	(0.036)	(0.021)
Distance to 65≥20	-0.104	0.044	-0.046	-0.039
	(0.433)	(0.033)	(0.034)	(0.024)
F-test	4.00	3.47	3.97	14.08
Sample size	2821	2821	2821	2821

Source: The 2002-2014 waves of the Spanish Survey of Household Finances(EFF). Other covariates included: Family head's sex, household size, children's age, more than two adult household members, marital status, education level, polynomials on family head's age and logarithm of previous household total income, kind of financial institution, fixed effects of calendar years and years of purchase. Standard errors robust to heteroscedasticity and arbitrary correlation within age of purchase and combined across 5 implicates.

Back

Table 6: Impact of the maturity rule according to the distance to the age of 65 on the homeowners' loan payments.

Estimation method: Intention-to-treat estimates by OLS			
Sample: Mortgages for the purchase of the owner-occupied house of homeowners aged between 25 and 64			
Dependent variable:	Mortgage payments over income ($\frac{b}{Y}$)	Indicator of whether payments over income:	
		$\frac{b}{Y} \geq 0.30$	$\frac{b}{Y} \geq 0.40$
	(1)	(2)	(3)
(Dist. to 65≥30)·Post99	**0.023**	0.023	**0.051**
	(0.013)*	(0.032)	**(0.018)*****
(Dist. to 65≥25)·Post99	0.005	0.059	-0.030
	(0.016)	(0.043)	(0.035)
(Dist. to 65≥20)·Post99	-0.023	**-0.110**	-0.046
	(0.018)	**(0.043)*****	(0.036)
Distance to 65≥30	-0.014	-0.022	-0.028
	(0.011)	(0.026)	(0.019)
Distance to 65≥25	0.008	-0.054	0.016
	(0.016)	(0.04)	(0.024)
Distance to 65≥20	0.012	0.084	0.046
	(0.018)	(0.036)**	(0.025)*
Sample size	2821	2821	2821

Source: EFF2002-EFF2014. The remaining covariates are identical to Table 3. Other covariates included: Family head's sex, household size, children's age, more than two adult household members, marital status, education level, polynomials on family head's age and logarithm of previous household total income, kind of financial institution, fixed effects of calendar years and years of purchase. Standard errors robust to heteroscedasticity and arbitrary correlation within age of purchase and combined across 5 implicates.

Figure 3: Manipulation tests of the anticipation of the purchase of homeownership to access longer mortgage maturities (McCrary (2008))

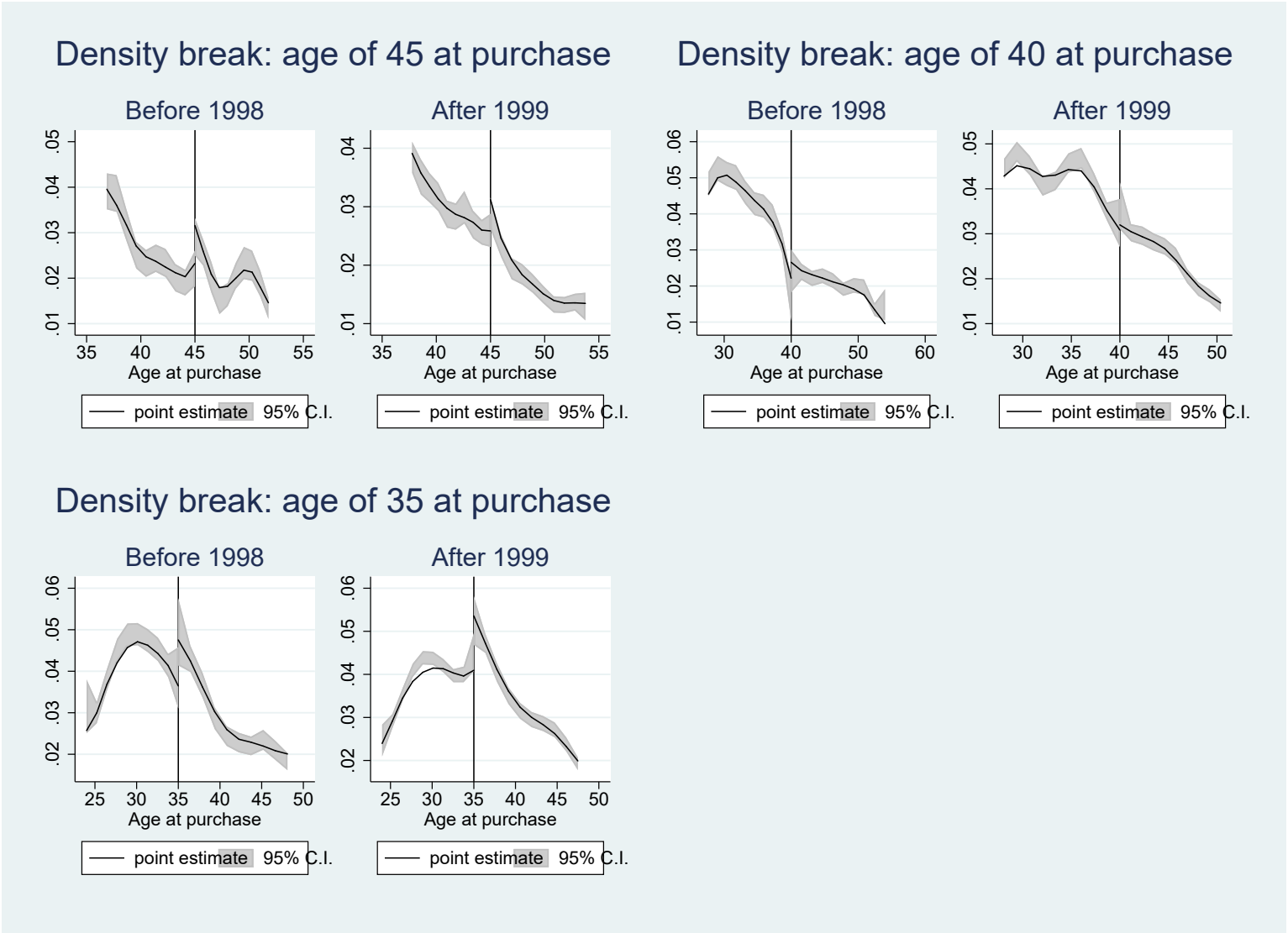


Figure 4: Histogram of the age at the time of purchase broken down by subperiods 1992-1998 and 1999-2015.