The Cost of Distorted Advice in the Mortgage Market

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December 2017

Financial Advice

Households rely heavily on advice from financial intermediaries

Survey evidence: 80% of households in Germany; 91% in UK; 73% in US

Potential for biased recommendations

1. Limited information
2. Limited sophistication

Two big research questions:

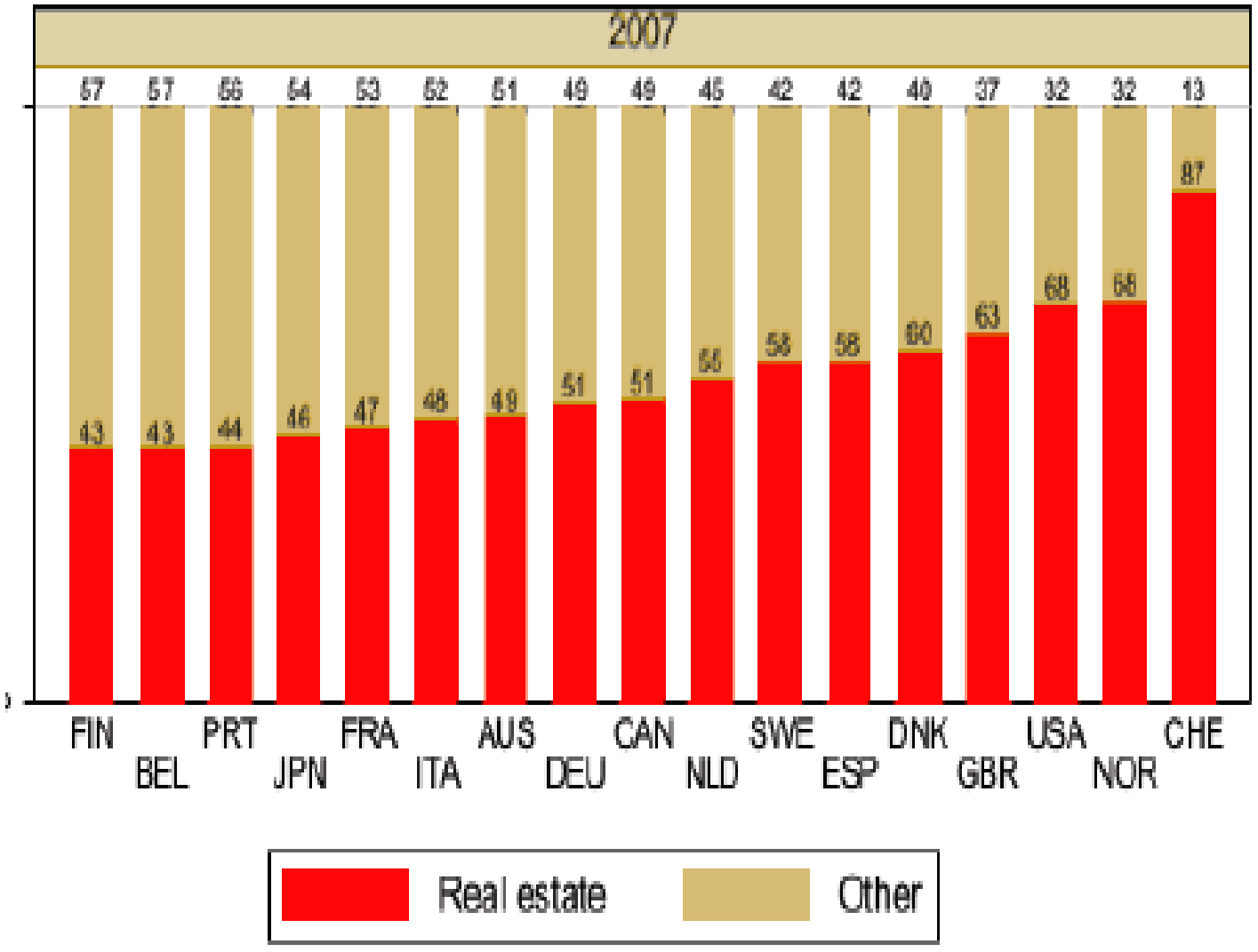
1. How to identify existence of biased advice?
   If present, is it quantitatively important?
2. What is its welfare cost?
   Which policies can best reduce it?

Two dimensions

- Address *both* questions using two complementary approaches:
  1. A reduced form approach to identify existence
  2. A structural estimation approach to assess welfare and alternative policies

- Look at mortgage choice, look at Italy. Draw on:
  - Foà, Gambacorta, Guiso and Mistrulli (on 1)
  - Guiso, Pozzi, Tsoy, Gambacorta, Mistrulli (on 2)

Temptation to Bias and its Cost May Be Large



Why the Italian mortgage market?

- Two mortgage types: More
  - Adjustable rate mortgage (ARM)
  - Fixed rate mortgage (FRM)
- Advice provided by banks Evidence
- Banks trade-off: FRMs expose to interest rate risk Others
- Banks' risk management tools:
  - pricing; More
  - distorted advice;
  - other instruments More

Related literature

- **Expert advice in financial markets: Empirics**

  [Anagol et al. (2017); Egan (2015); Egan et al. (2015); Foà et al. (2016); Foester et al. (2017); Hackethal et al. (2012); Ru and Schoar (2015); Woodward and Hall (2012)]

- **Structural models of financial markets**

  [Allen et al. (2016); Crawford et al. (2015); Einav et al. (2012); Hortacsu et al. (forthcoming); Hortacsu and Kastl (2012)]

- **Expert advice in financial markets: Theory**

  [Gennaioli et al. (2015); Inderst and Ottaviani (2012); Kartik (2007); Ottaviani and Squintani (2007)]

Outline

- Reduced form empirical strategy
- Data
- Reduced form evidence
- Structural model and identification
- Structural estimates
- Welfare evaluation & Counterfactual

Reduced Form Tests: Approaches

- **Current approaches:**
- Compare performance of advised vs unadvised
  - Selection bias
- Randomized field experiments
  - External validity + long term customers
- Require to **observe advice**
  - Unsolicited

Our Test Strategy

- Under no advice, prices summarize supply effects on choice
- Under advice, banks identity and incentives matter
- Goal: disentangle the price channel and the advice channel

Features:

- no need to observe advice once we observe customer choices, prices and banks supply factors (incentives)
- identifying assumptions needed

Data

Desc. Stats

Bank of Italy datasets

- Credit Registry: all loans $\geq$ 75K
- Data on interest rate charged on loans (175 banks)

Data for reduced form

- Microdata on 2 mln mortgages 25 and 30 years 2004-2010
- Contract info: Amount borrowed, rate and type
- Borrower info: age, gender, nationality, province, cohabitation, proximity to bank
- Lender info: identifier $\Rightarrow$ balance sheet information

Data for structural analysis

- Universe of 25 and 30 years mortgages 2005-2008
- Aggregate info (by bank-quarter-province): Num ARM and average rate; Num FRM and average rate
- Lender info: as above + Market share in deposit market

Mortgage choice

- Households (sophisticated and unsophisticated)
  - Get a mortgage (choose *FRM* vs *ARM*)
  - Risk: income, inflation, real rate
  - ϕ: FRM-ARM spread
  - Q: distribution of risk aversion

- Spread rule (Koijen et al. 2009)

$$\phi > \frac{\gamma H}{2}(\sigma_\varepsilon^2 - \sigma_\pi^2)$$

- Unsophisticated follow advice by the bank

Main equation

- Our test involves estimating:

$$x_{ijt} = \beta_1 \phi_{ijt} + \beta_2 z_{ijt} + \beta_3 B_{it} + f_i + f_t + \varepsilon_{ijt}$$

  - $x_{ijt} = 1$ if FRM
  - The coefficient of interest is β_3
  - f_i banks fixed characteristics
  - f_t take care of aggregate factors

  - Identification assumption: $Cov(\varepsilon, B|\phi, z, f_i, f_t) = 0$
    - individual heterogeneity is uncorrelated with time varying bank supply factors

Identification strategy

Quarter 1
Mortgage choice

Bond premium = 100bp

FRM-ARM spread = 100bp

Say household chooses FRM

Compare with:

Quarter 2
Mortgage choice by **same** borrower from **same** bank

Bond premium = 200bp

FRM-ARM spread unchanged (or controlled for)

If household chooses ARM⇒

Evidence of distorted advice

Supply Shifters

- **Bank bond spread** $\Rightarrow$ relative advantage in ARM
- **Securitization activity** $\Rightarrow$ relative advantage in FRM (Fuster & Vickery, 2014)
- **Deposit to total funding** $\Rightarrow$ relative advantage in FRM (Berlin & Mester, 1999; Ivashina & Scharfstein, 2010)

Reduced Form Results

Dependent variable =1 if borrower chooses FRM	I Baseline	II Bond spread always observed	III Nonlinear LTFP	IV Banks operating in all provinces
LTFP	-0.0623***	-0.0625***	-0.0524***	-0.0703***
$LTFP^2$			-0.0020	
$LTFP^3$			0.0002	
Bank bond spread	-0.0678***	-0.0633***	-0.0700***	-0.0737***
Securitization activity	0.0006***	0.0006***	0.0007***	0.0008***
Deposit ratio (%)	0.0016*	0.0022**	0.0016*	0.0022*
Bank f.e.	yes	yes	yes	yes
Region-time f.e.	yes	yes	yes	yes
Borrower characteristics	yes	yes	yes	yes

"Dynamic" Sorting?

Explanatory variables	Mortgage size (log)	Italian	Cohabitation	Age	Female
Bank bond spread	0.0005	-0.0079	0.0034	-0.1227	-0.0020
	(0.0052)	(0.0056)	(0.0024)	(0.0862)	(0.0014)
Securitization activity	0.0079	-0.0016	-0.0058	-0.2730	0.0035
	(0.0136)	(0.0014)	(0.0068)	(0.4104)	(0.0031)
Deposit ratio (%)	0.0003	-0.0002	-0.0001	-0.0014	-0.0000
	(0.0004)	(0.0005)	(0.0003)	(0.0128)	(0.0001)
Bank f.e.	yes	yes	yes	yes	yes
Region-time f.e.	yes	yes	yes	yes	yes
F-test joint significance (p-value)	0.4020	0.9166	0.8890	0.7853	0.2684

Time-varying bank supply factors uncorrelated with customers observable characteristics

Yet, Individual Characteristics Affect Contract Choice

Variable	Coeff
Mortgage size (log)	-0.044***
	(0.007)
Joint Mortgage	0.006*
	(0.003)
Italian	0.065***
	(0.009)
Cohabitation	0.004***
	(0.002)
Age (in years)	-0.0001
	(0.0002)
Female	0.012***
	(0.002)
Bank, time , province FE	yes

Effect of Sophistication

Dependent variable is the probability that the borrower chooses a FRM	(a) Sophisticated borrowers from provinces top 5% in education	(b) Unsophisticated borrowers from provinces bottom 5% in education	Difference $\|b-a\|$ $H_0 : \|b-a\| > 0$
Long term financial premium (LTFP) (1)	-0.0691*** (0.0065)	-0.0601*** (0.0083)	0.009 (0.011)
Bank bond spread (2)	-0.0504*** (0.0131)	-0.0878*** (0.0109)	0.037** (0.017)
Securitization activity (3)	-0.0016 (0.0299)	0.0897*** (0.0260)	0.091** (0.040)
Deposit ratio (%) (4)	-0.0009 (0.0013)	0.0023* (0.0013)	0.003** (0.002)
Bank f.e.	yes	yes	
Regin-time f.e.	yes	yes	
Borrowers' characteristics	yes	yes	

Summary of reduced form

- Supplier shocks affect mortgage choice even after prices are controlled for
- Consistent with biased advice
- Sign of coefficients reflects incentives
- Quantitatively important. 1 sd QoQ increase in:
  - bond spread $\Rightarrow +3.4$ pp in Pr(ARM)
  - entry in sec mkts $\Rightarrow -$ 3.3 pp in Pr(ARM)
  - Deposits/Funding $\Rightarrow -0.3\%$ in Pr(ARM)
- Sophistication reinforces results

Questions

Evidence raises new questions:

1. Can Financial Advice be valuable even when distorted?
2. What is the cost of the distortion for consumers?
3. Who bears the cost if not all the consumers are naive? Can some actually gain?

Structural model

- Model
  - Households
  - Banks
- Identification
- Estimates
- Counterfactuals

Model: Households

- Born in bank i (home bank) with prob. p_i
- Choose bank and type of mortgage (ARM vs FRM)
- Households heterogeneity:
  - sophisticated (frac. $1-\mu$) vs naive (μ);
    [captures people who are susceptible to advice]
  - un-attached (frac. ψ) vs attached ($1-\psi$) to *home bank*;
    [captures market frictions]
  - Optimal cutoff on FRM-ARM spread $\delta \sim N(\mu_\delta, \sigma_\delta)$
    [risk aversion, mortgage size, beliefs on volatility of rates and inflation, expectations on nominal interest rates]

Model: Household behavior

	Un-attached (frac. ψ)	Attached (frac. $1-\psi$)
Sophisticated (frac. $1-\mu$)	• best market rates • "Spread rule"	• rates at home bank • "Spread rule"
Naive (frac. μ)	• best fixed rate ["Money doctors" (Gennaioli et al. 2015)] Data • recommended mortgage type	• rates at home bank • recommended mortgage type

"Spread rule" (ex. Koijen et al. 2015). ARM iff:

$$\nu_r + H\gamma(\sigma_\varepsilon^2 - \sigma_\pi^2) \equiv \delta \leq \phi_{ht} \equiv \text{FRM-ARM spread}$$

Model: Banks

Bank managers maximize:

$$\underbrace{\Big[\overbrace{s_{it}^{a}(1-x_{it})}^{\text{profits on ARM}}+\overbrace{s_{it}^{f}x_{it}}^{\text{profits on FRM}}-\overbrace{\lambda(x_{it}-\theta_{it})^{2}}^{\text{cost of deviating from ideal frac. of FRM}}\Big]}_{\text{net profit margin}}\times\underbrace{m_{it}}_{\text{customer base}}\times\underbrace{e^{-\beta r_{it}^{f}}}_{\text{penalty for high rates}}$$

- Heterogenous in cost-efficient fraction of FRMs: $\theta_{it} \sim TN$

  Drives banks' incentives in setting rates and provide advice

- Compete setting FRM spread over interest rate swap: s_{it}^{f}

  More

- Distort choices of naive through advice

  Recommend "Take ARM" to fraction $1-\omega_i$ of their customers

Identification

"Demand" parameters

- % of un-attached (ψ) $\rightsquigarrow$ % taking mortgage outside home bank (SHIW)
- % of naive (μ) $\rightsquigarrow$ Behavior naive vs. sophisticated
- Optimal cutoff ($\mu_\delta, \sigma_\delta$) $\rightsquigarrow$ Variation in FRM-ARM spread
- Estimation by maximum likelihood Details

"Supply "parameters

- We want to recover: θ_{it}'s, β and λ
- Exploit 2 sets of FOCs: advice; FRM-ARM spread Details
- Need stationarity of demand to identify θ_{it}'s Evidence

Parameter estimates

Demand		*Supply*	
Parameter	Estimate	Parameter	Estimate
μ (frac. of naive)	0.48 [0.46;0.49]	λ (cost param.)	2.5 [2.36;13.15]
ψ (frac. of un-attached)	0.0884 [0.0879;0.0891]	β (high spread penalty)	0.46 [0.38;0.52]
μ_δ (cutoff distrib. - mean)	-0.68 [-0.88;-0.56]		
σ_δ (cutoff distrib. - stdev)	0.9 [0.81;1.01]		

Imply that banks distort choice for 48% of the customers

Fin. literacy | Rates distribution | Robustness

Evidence of distorted advice

$$\theta_{bt} = a_b + b * \text{Bond spread}_{bt} + \tau_t + e_{bt}$$

	All sample	Deposit/ Liabilities < 75 pctile	Deposit/ Liabilities < 50 pctile	Deposit/ Liabilities < 25 pctile
Bank bond spread	-0.042^{*}	-0.069^{**}	-0.078^{**}	-0.089
	(0.025)	(0.028)	(0.033)	(0.055)
Obs.	762	521	386	202

Distribution of θ

Counterfactual exercises

- Welfare measure: Average change in certainty equivalent of mortgage payment per capita per year
- **Limiting distorted advice**
  - Bank can manipulate only half of their naive customers (e.g. tighter regulation monitoring, fiduciary standards)
- **Undistorted advice**
  - Banks provide advice in the best interest of the customers $\rightarrow$ Everybody follows the "spread rule"
- **Financial literacy campaign**
  - Policy reducing the fraction of naive. Ex., $\mu \downarrow$ to 24%

Counterfactual results

	Limiting Advice	Undistorted Advice	Financial Literacy
All	-998	661	304
(% of repayment)	(17%)	(7.8%)	(3.6%)
Sophisticated	-590	-295	-314
Naive	-1,444	1,705	980

$$\begin{cases} 1{,}845 & N \Rightarrow S \\ 117 & N \Rightarrow N \end{cases}$$

Note: Welfare effects are expressed in *Euros per household per year*.
Yearly repayment for 125,000 euros mortgage at 4%: 8,550 euros.

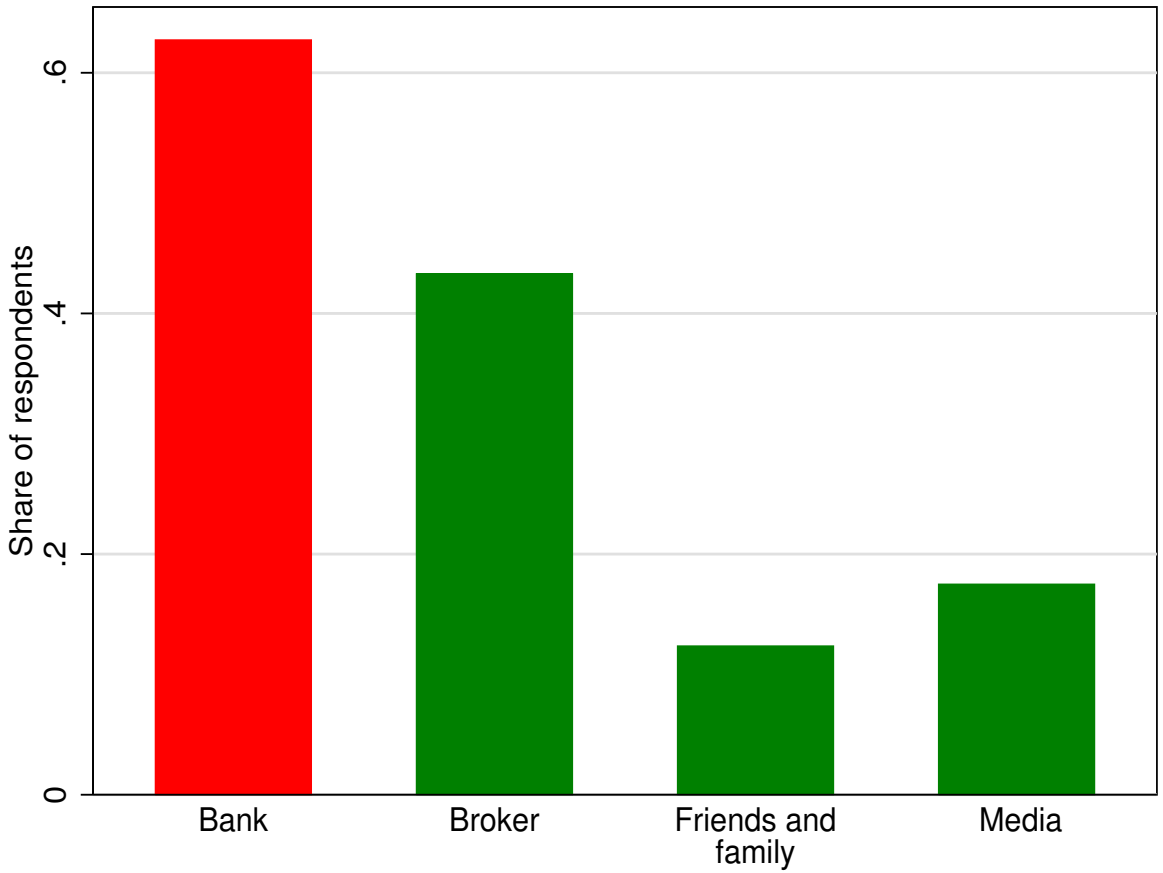
Conclusions

- Model of mortgage market with naive households receiving advice from self-interested banks
- Exploit detailed administrative data + institutional features of the Italian mortgage market to:
  1. **Assess relevance of advice distortion**
     - Large fraction of naive households
     - Novel evidence of advice distortion
  2. **Quantify impact on households welfare**
     - Effects are sizeable
     - Educating the population leads to gains but not for all
     - Banning advice reduces welfare for everybody
  3. **Establish that effects are heterogenous**
     - Financial education and undistorted advice policies exposed to non trivial political economy problem

Backup slides

Sources of advice

From which of the following sources do you obtain often or very often information on financial choices ?



Source: "Large bank" 's customers survey

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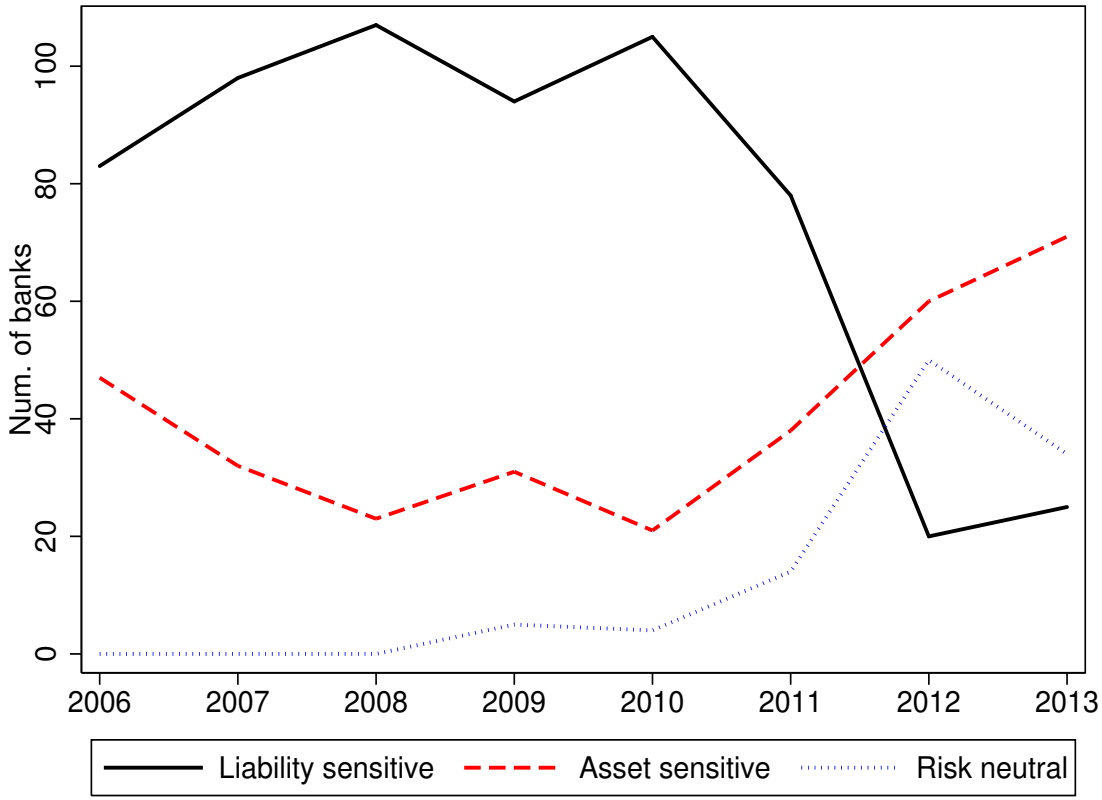
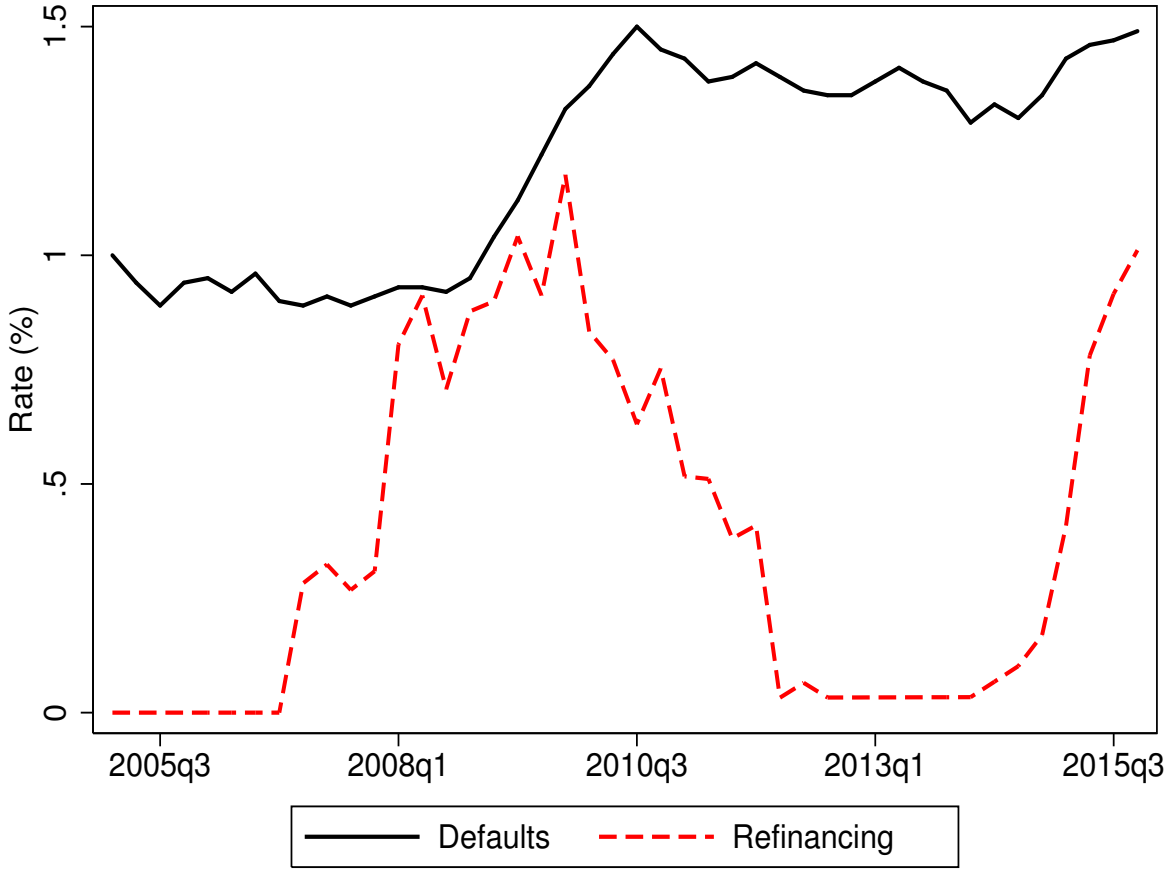
Evidence of incomplete hedging



Source: Our elaboration on Cerrone et al. (JFS,2017)

- Esposito et al. (JB&F, 2015): In 2008 on average positive interest risk exposure equal to 3.1% of regulatory capital Back

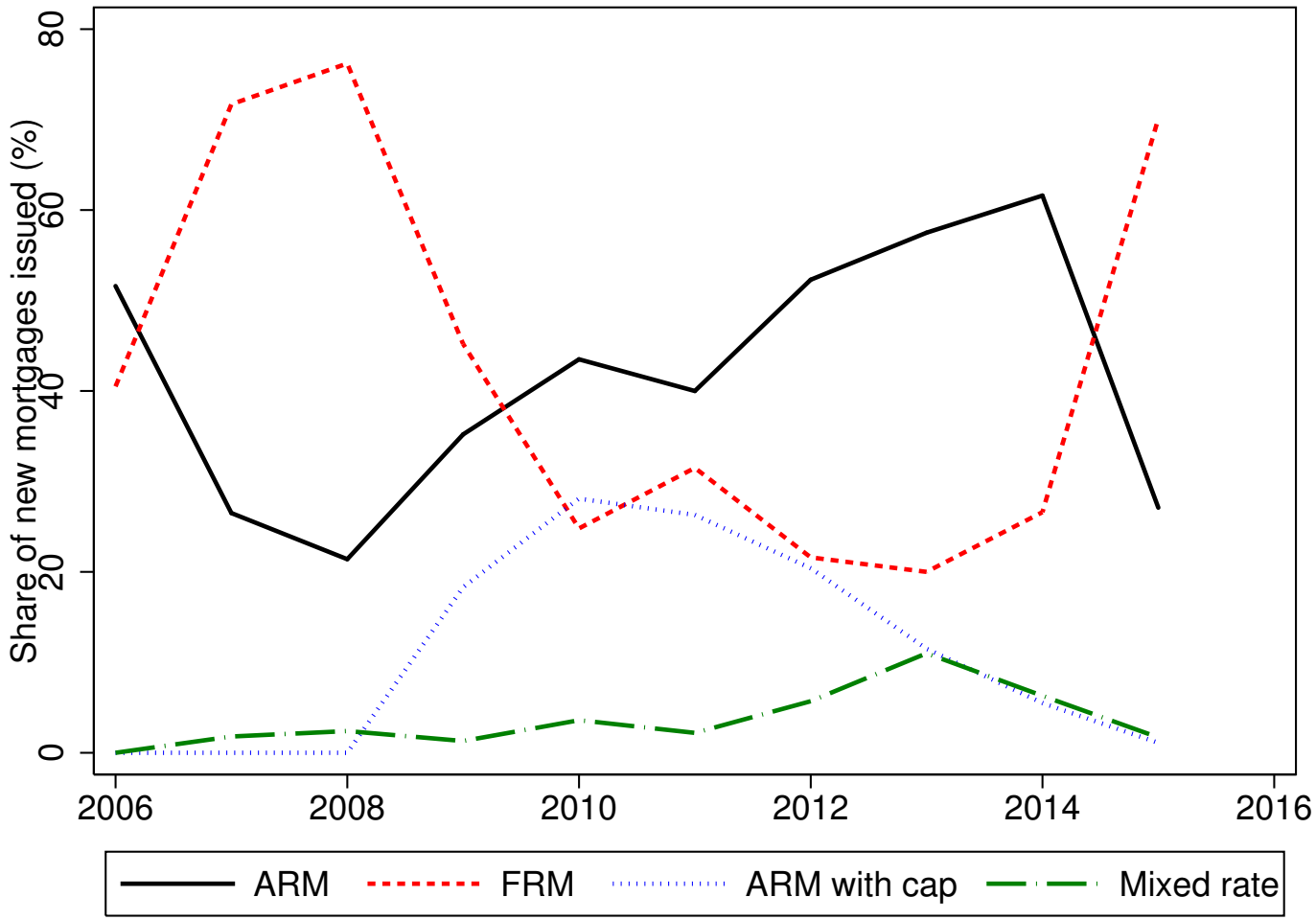
Default and refinancing



Bersani Law (April 2007)

- Cap to prepayment fees at 1.90% (0 for new mortgages) vs. $>$ 3% before reform Back

ARM vs FRM market share



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Mortgage pricing

	% borrowing at posted rate	Discount (bps)|Discount>0		
		25 pctile	*50 pctile*	*75 pctile*
Mortgages issued in the same quarter	56	16	38	76
Allen et al. (2016)	25	50	75	95

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FRM vs ARM for naive households

Question in SHIW on inflation risk

Suppose you have 1,000 euros in an account that yields a 1% interest rate and carries no fees. If inflation is going to be 2%, do you think that in one year time you will be able to afford the same goods that you can buy today with the balance of your account? 1) Yes; 2) No, I will be able to buy less; 3) No, I will be able to buy more; 4) I do not know.

	Sophisticated answ=2	*Naive answ=1 or 3*	*Clueless answ=4*
ARM (%)	0.63	0.53	0.5
FRM (%)	0.37	0.47	0.5

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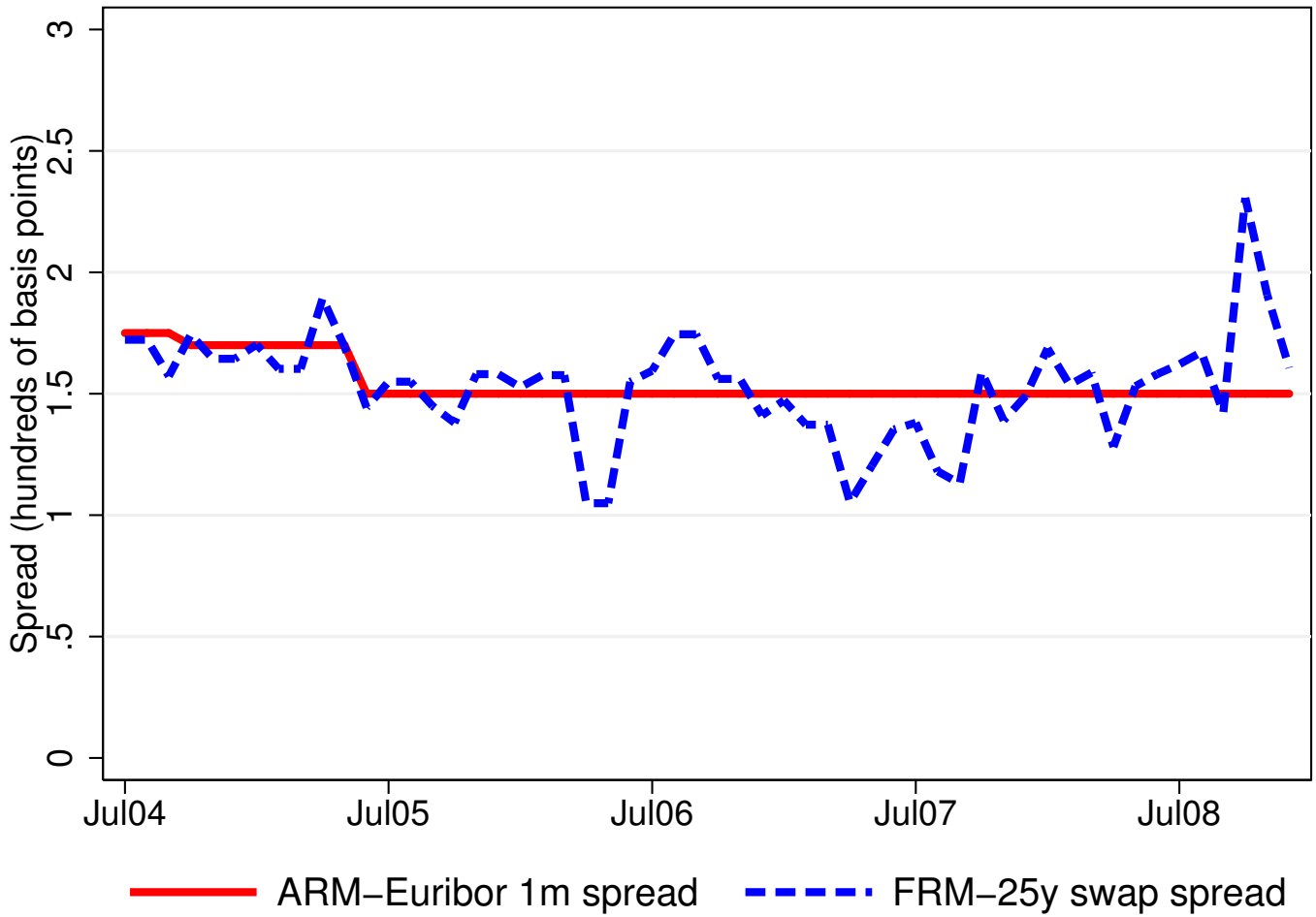
Patterns of spread setting



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Descriptive statistics

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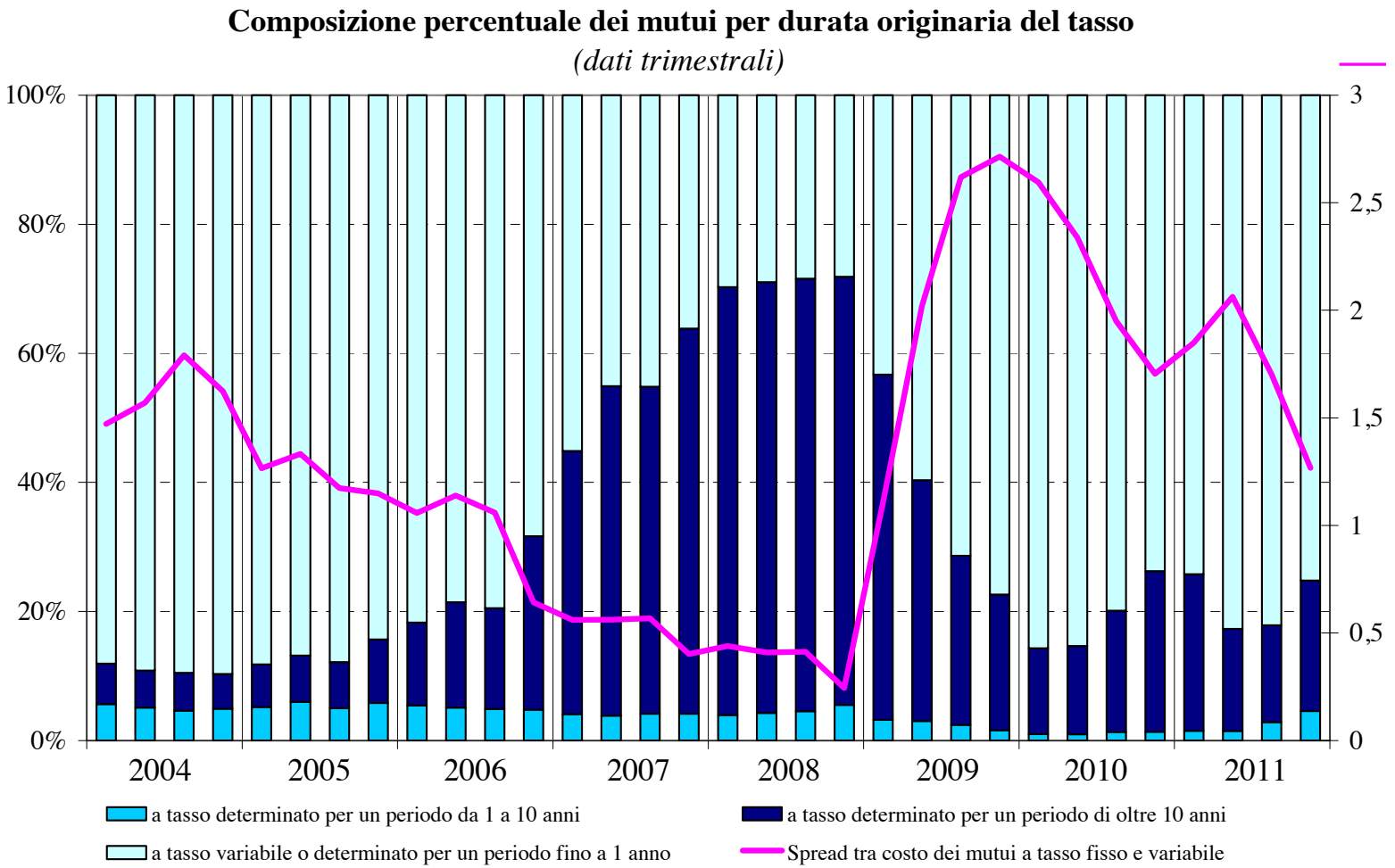
Variable	*Obs.*	*Mean*	*Std.dev.*	*25th pctile*	*50th pctile*	*75th pctile*
Branch level variables						
FRM-ARM Spread	13,747	0.54	0.63	0.23	0.54	0.84
FRM rate	13,747	5.47	0.62	5.17	5.58	5.91
ARM rate	13,747	4.63	0.87	3.80	4.66	5.36
FRM rate - 25 yrs swap	13,747	1.16	0.47	0.99	1.16	1.32
ARM rate - Euribor 1m	13,747	1.29	0.50	1.13	1.38	1.54
Num. mortgages	13,747	47.41	95.09	8	20	48
% of mortgage market	13,747	0.10	0.09	0.03	0.06	0.13
% of FRM issued	13,747	0.37	0.34	0.03	0.27	0.67
Bank level variables						
Total assets (TA)	268	39,495	45,098	11,737	17,169	57,768
Deposits/TA	268	0.46	0.11	0.38	0.45	0.53
Bank bond spread	280	0.27	0.52	-0.07	0.28	0.64
Market variables						
Num. banks in the mkt.	1,350	10.18	1.98	9	10	11

Spread fluctuations in Italy

Fig. 12



Source: Felici et al., 2015

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Estimation: "Demand"

Likelihood function:

$$
\begin{aligned}
\ell_{ijt} \quad = \quad & (1-\psi)p_{ijt} + \psi\mu\mathbb{1}\{r^f_{ijt} = \underline{r}^f_{jt}\} + \\
& \psi(1-\mu)\mathbb{1}\{r^f_{ijt} = \underline{r}^f_{jt}\}\left(1 - \Phi\left(\frac{1}{\sigma_\delta}(\underline{r}^f_{jt} - \underline{s}^a_{jt} - r^{eurbr}_t - \mu_\delta)\right)\right) + \\
& \psi(1-\mu)\mathbb{1}\{s^a_{ijt} = \underline{s}^a_{jt}\}\Phi\left(\frac{1}{\sigma_\delta}(\underline{r}^f_{jt} - \underline{s}^a_{jt} - r^{eurbr}_t - \mu_\delta)\right) +
\end{aligned}
$$

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Estimation: "Supply"

1. Optimal advice eq. [+ distrib. assumption] $\rightsquigarrow$ Get θ_{it}
2. Minimize deviations bw data and model predictions

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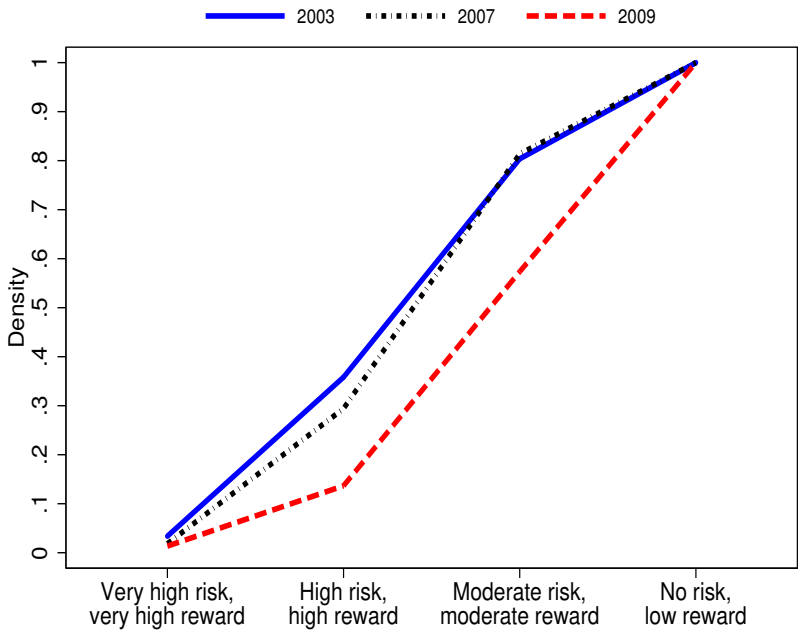
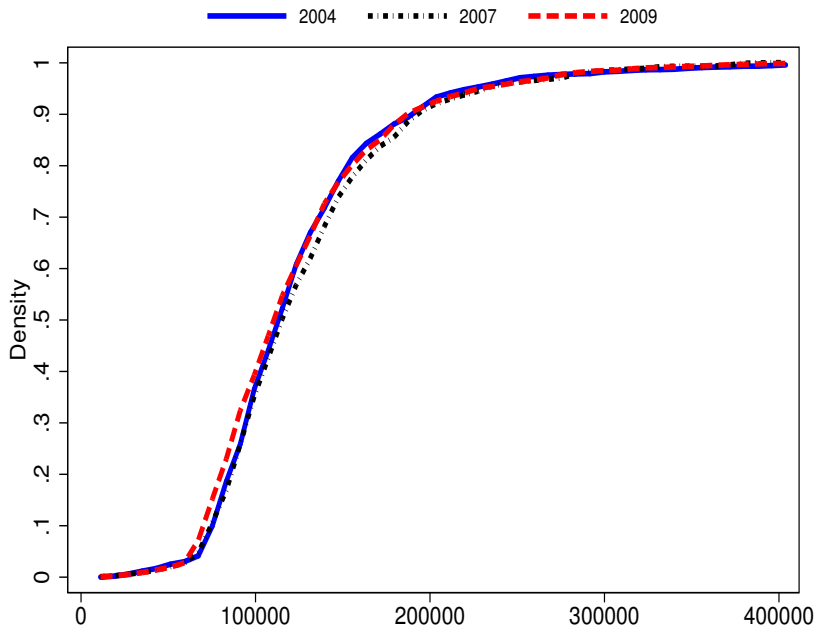
Stationarity of demand

Risk aversion



Source: Large bank 's customers survey

Mortgage size



Source: Credit registry microdata

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Evidence of (lack of) financial sophistication

Over 50% of the interviewed is unable to read a bank statement

Banca Nazionale del Risparmio
Estratto al 31/05/2006
del conto C/C N. 678 987654 321

You receive your account balance from the bank; can you tell how much money is available at the end of May?

DATA	VALUTA	N. OPERAZIONE	DESCRIZIONE DELLE OPERAZIONI	MOVIMENTI DARE	MOVIMENTI AVERE
***	***	***	SALDO COME DA COMUNICAZIONE DEL 05/05/2006		320
01/05/2006	30/04/2006	1007	ADDEBITO R.I.D. 06054542 RAPPORTO N. 06054 UTENZE TELEFONICA SPA, PERIODO 01/03/2006 - 30/04/2006	65	
02/05/2006	01/05/2006	1008	PRELEVAMENTO BANCOMAT CARTA N. 10	100	
27/05/2006	28/05/2006	1010	ACCREDITO STIPENDIO		1.100
28/05/2006	27/05/2006	1011	VOSTRO ASSEGNO N. 3036 VOSTRA DISPOSIZIONE A FAVORE DEL SIG. PAOLO ROSSI	187	
29/05/2006	28/05/2006	1012	CAUSALE: AFFITTO APRILE	800	
29/05/2006	28/05/2006	1013	ADDEBITO SPESE OPERAZIONE N. 1012	1	
31/05/2006	30/05/2006	1014	PAGOBANCOMAT ADDEBITO CARTA N. 10. ESEGUITO IL 28/05/2006 FARMACIA DELLA SALUTE,	88	
31/05/2006	30/05/2006	1015	ACCREDITO RIMBORSO RETTA ASILO NIDO.		100
***	***	***	SALDO FINALE DOPO LE SOPRAELENCATE SCRITTURE		279

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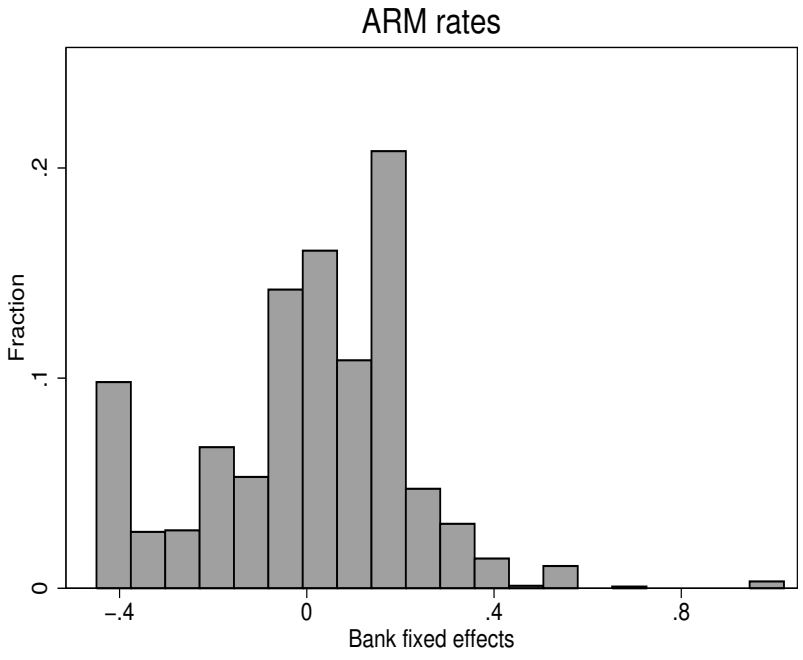
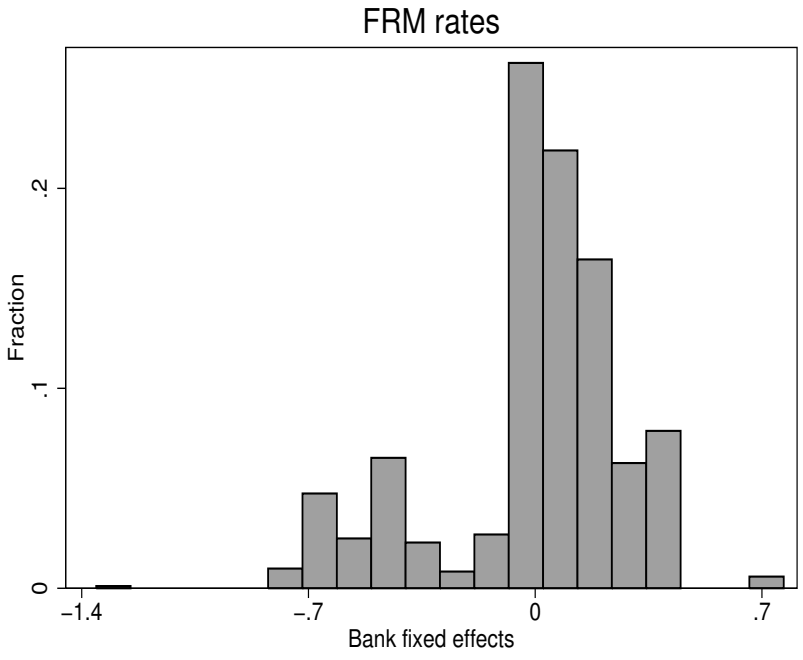
Dispersion in rates





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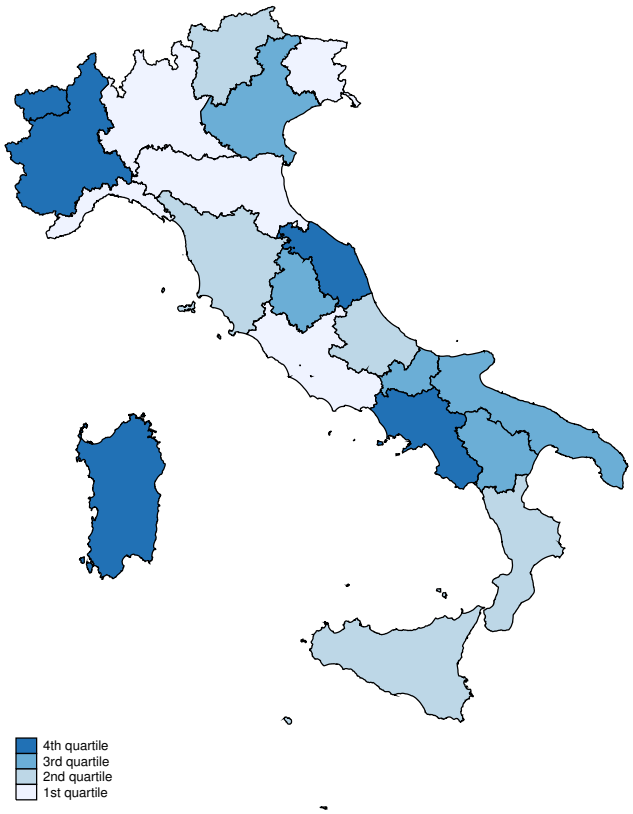
Heterogeneity in demand parameters

$$\mu_k = \frac{exp(a_0 + a_1 \text{Education}_k)}{(1 + exp(a_0 + a_1 \text{Education}_k))}$$

$$\psi_k = \frac{exp(b_0 + b_1 \text{RelLength}_k)}{(1 + exp(b_0 + b_1 \text{RelLength}_k))}$$

$\hat{a_1} < 0,\ \hat{b_1} < 0$

Heterogeneity in share of naive households



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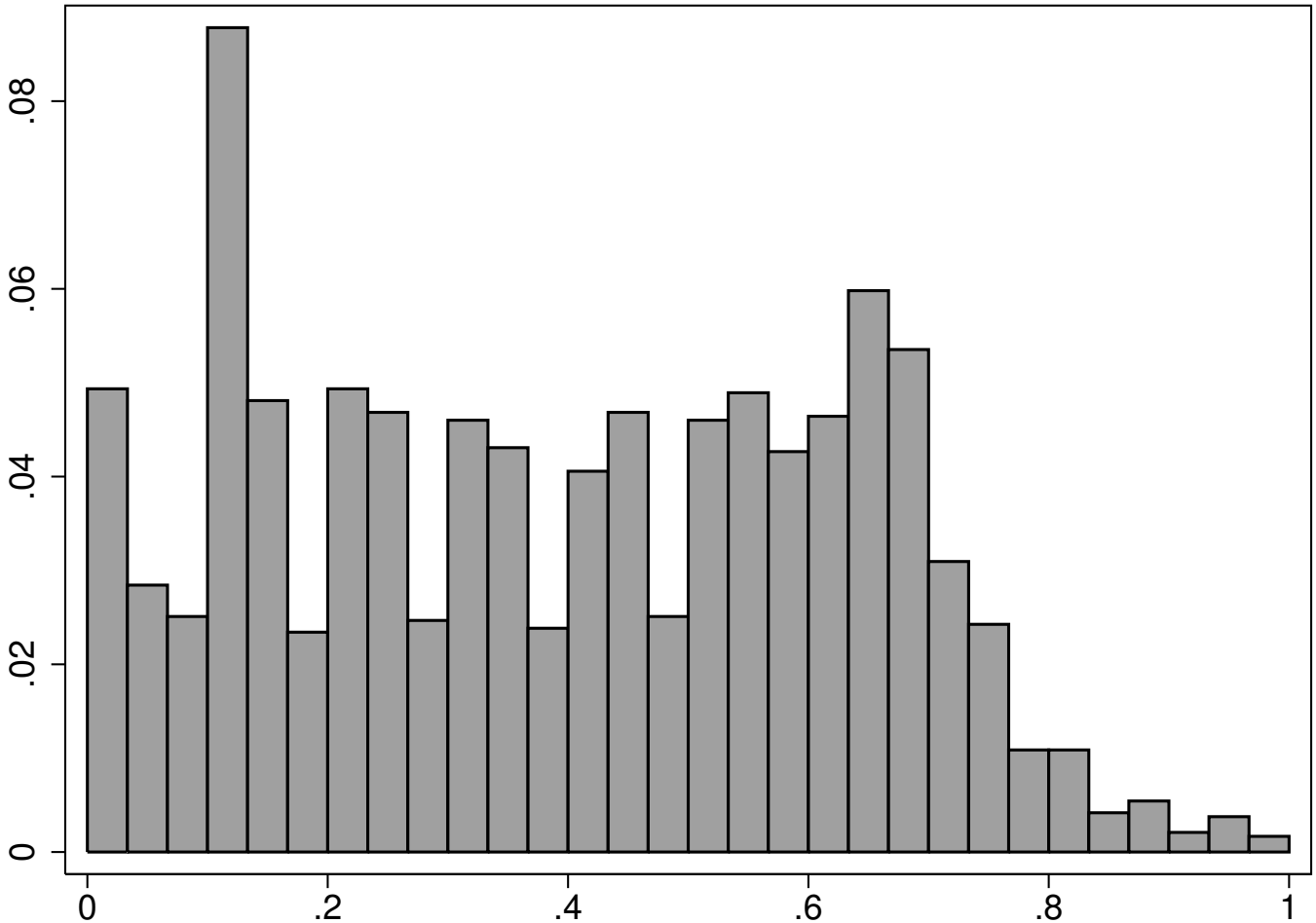
Distribution of θ_{it}



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