On bank maturity transformation and the effects of regulatory limits

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Outline

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- Lack of empirical evidence on:
  - the role of MT for bank profitability
  - the effects of prudential regulations limiting MT

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  1. Uses a new measure of maturity transformation
     - based on a full account of the contractual maturity of both assets and liabilities (most of the literature approximates MT with rates differentials, LTD, etc)
     - allows to differentiate between the two risk-dimensions of maturity mismatch: i.e. interest rate and funding risk
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  2. Studies the effects of...
     - a regulatory loosening of...
     - a prudential regulation on maturity transformation
     - The literature so far focused on the effects of tightening and on short-term liquidity related tools à la LCR (Banerjee and Mio (2017), Dujim and Wierts (2016), De Haan and van den End (2013))

Main findings

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- Loosening of a regulatory limit on MT affects banks'
  - balance sheet composition
  - risk exposure
  - no effect on net interest margin

Data

Bank level data from the Italian banks' prudential reports for the period 2001H1 to 2008H1:

$\approx$ 650 banks every period
$\geq$ 80 per cent of banking system assets
$\approx$ 12900 obs every period

Sample description

Definition of maturity transformation

Ratio of weighted assets to weighted liabilities and capital

- Weights depend on the assets' and liabilities' effective residual *contractual* maturity
- Weights are given by the regulation on bank maturity transformation in place in Italy until end-2005

Asset and Liability weightings

Maturity (in years)	Assets	Liabilities
> 5	1	1
$1.5 - 5$	0.5	0.5
< 1.5	0	0.25
Interbank only if > 0.25		0.25

Modelling the effects of regulatory change 1/4

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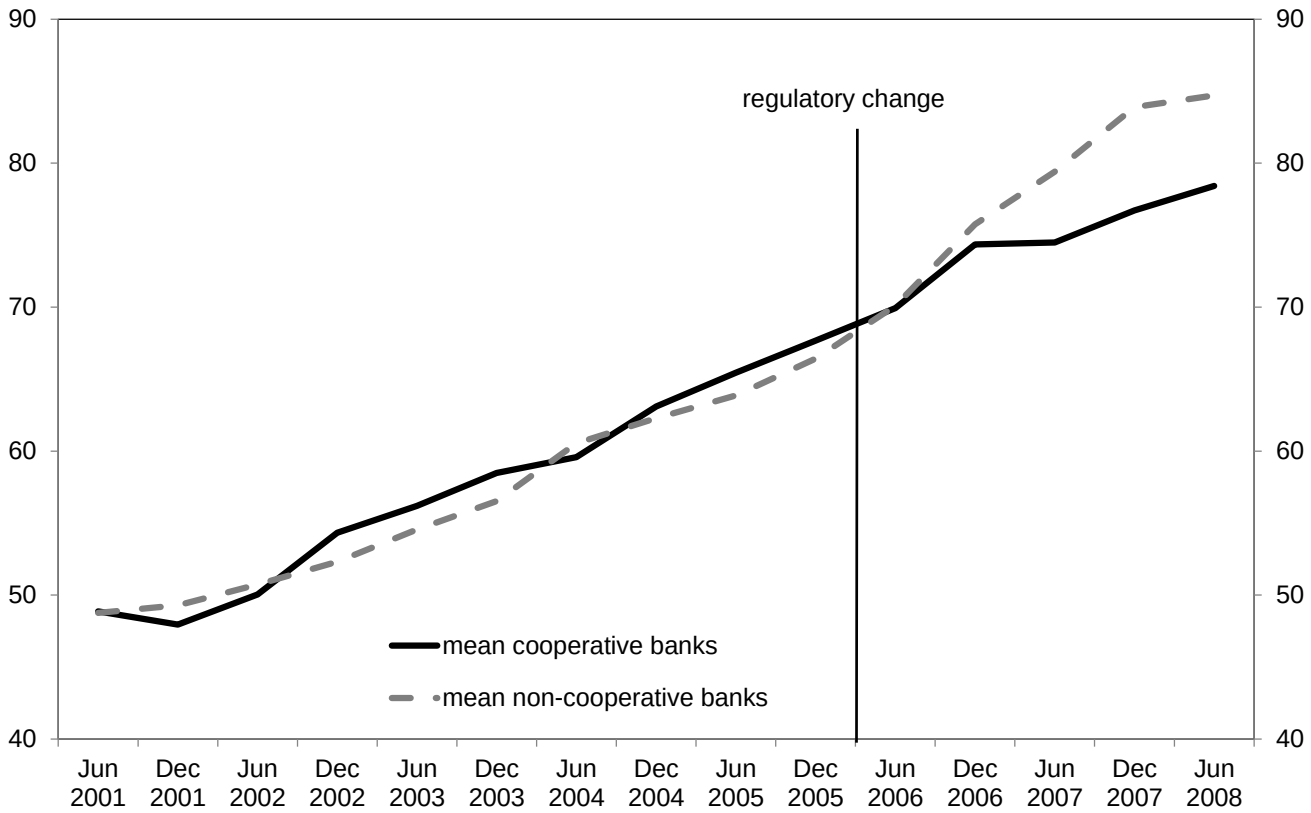
What to do?

- Banks divided on the basis of their legal status: cooperative vs non-cooperative banks
- Hp: cooperatives de facto not constrained by the regulation
  - mutual nature, subject to legal constraints that limit scope for growth and diversification (e.g. credit to be granted mainly to shareholders, 70 per cent of profits to be retained, limited the geographical area of competence, shareholders resident in the same area, etc)

Modelling the effects of regulatory change 2/4

Average maturity transformation by bank type 1.pdf



Modelling the effects of regulatory change 3/4

Average MT growth rate

- Before regulatory change:
  - Cooperatives 3.5
  - Non-cooperatives 3.3
- After regulatory change:
  - Cooperatives 3.0
  - Non-cooperatives 5.0

Bank legal status instrument for treatment (constrained, i.e. non-cooperative banks) and control (unconstrained, i.e. cooperative banks) groups

Modelling the effects of regulatory change 4/4

Effect of maturity transformation regulation on net interest margin, balance sheet and risk

$$Y_{i,t} = \alpha + \beta_1 pol_t + \beta_2 con_i + \beta_3 pol_t con_i + \beta_4 size_{i,t} + \sum_{j=1}^{n} \beta_j X_{j,t} + \epsilon_{i,t} \quad (1)$$

pol is a dummy = 1 after the regulatory change (as of 2006H1)
con is a dummy = 1 for the treated non-cooperative banks

Estimation with fixed effects and robust clustered standard errors

Results - Effects of regulatory change on balance sheet composition by maturity and asset type

VARIABLES	LT assets	Mortgages	LT liabilities
Policy	-0.052**	0.018	0.094***
	(0.026)	(0.027)	(0.022)
Policy*constrained	0.001	0.021***	-0.005***
	(0.003)	(0.004)	(0.002)
Size	0.001	-0.004	0.007**
	(0.006)	(0.010)	(0.003)
HH index	0.114***	0.073***	-0.067***
	(0.020)	(0.022)	(0.016)
Constant	-0.129	0.174	-0.000
	(0.108)	(0.175)	(0.063)
Observations	10058	9921	10058
R^2	0.662	0.608	0.030
Bank and time FE	YES	YES	YES

- Significant recomposition of assets and liabilities after the policy change
- On the asset side, mortgage lending higher for constrained banks
- On the liability side, constrained banks increased LT liaiblities

Results - Effects of regulatory change on balance sheet composition by interest rate

VARIABLES	LT assets - fixed rate	LT liabilities - fixed rate
Policy	-86.436***	-237.466***
	(8.325)	(73.928)
Policy*constrained	3.985***	4.008
	(1.045)	(4.161)
Size	-3.007	-15.768**
	(2.555)	(6.948)
HH index	57.962***	171.263***
	(6.514)	(55.572)
Constant	-22.755	83.326
	(45.905)	(163.193)
Observations	9425	3203
R^2	0.152	0.038
Bank and Time FE	YES	YES

- Recomposition of LT assets for constrained banks, with higher share of assets at fixed-rate
- No effect on LT liabilities

Results - Effects of regulatory change on risk exposure

VARIABLES	Credit risk - average RW	Credit risk - NPLs	IR risk	Risk aversion
Policy	35.177***	-2.606***	-28.911***	-6.915
	(13.524)	(0.628)	(5.935)	(7.650)
Policy*constrained	-3.056***	0.099	2.517***	1.074*
	(0.774)	(0.099)	(0.948)	(0.571)
size	-2.122	-0.350	-0.523	-13.418***
	(1.437)	(0.226)	(0.674)	(2.374)
HH index	-20.250**	1.809***	23.177***	6.856
	(10.151)	(0.499)	(4.508)	(6.162)
Constant	143.587***	6.188	-28.262**	261.973***
	(33.192)	(4.081)	(13.756)	(43.909)
Observations	10058	9768	10058	10058
R^2	0.116	0.014	0.071	0.150
Bank and time FE	YES	YES	YES	YES

- Change in risk exposure for the constrained banks: credit risk ↓ interest rate risk ↑ risk aversion ↑
- Results consistent with recomposition of A&L by maturity and IR:
  - Credit risk ↓ and risk aversion ↑ coherent with ↑ mortgages (carry lower RW than other asset classes)
  - ↑ IR risk consistent with ↑ in fixed-rate LT assets, relative to the fixed-rate LT liablities, which ceteris paribus entails a higher duration gap

Results - Effect of regulatory change on net interest margin

VARIABLES	Net interest margin
L.nim_ratio	0.012
	(0.068)
L2.nim_ratio	0.124***
	(0.030)
Maturity transformation	0.002***
	(0.000)
Interest rate risk	0.001
	(0.001)
Credit risk	0.003***
	(0.001)
Risk aversion	0.004***
	(0.001)
Operational costs	0.464***
	(0.090)
...	...
Policy	0.279
	(0.183)
Policy*constrained	-0.015
	(0.015)
R^2	0.311
Bank and Time FE	YES

- Contrary to expectation and despite the increase in average maturity transformation, no material effect on net interest margin.
- No effect as well on both its components (i.e. income and expense, not shown)
  - Possibly due to increased competition and lower margins
  - Possible effects on other income components (e.g. fee and commission)

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- No effect on NIM
- Impact on banks' balance sheet composition
  - increase in mortgage lending
  - reduction in long-term liabilities
  - increase in long-term assets at fixed rate
- Increase in interest rate risk and decrease in credit risk

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Policy implications

- NSFR likely to benefit financial stability
- If used as macroprudential tool, consider possible asymmetric effects of tightening and loosening
- Careful assessement of the financial and (real?) consequences

Thank you

Sample description

	Date																		
	1999H1	1999H2	2000H1	2000H2	2001H1	2001H2	2002H1	2002H2	2003H1	2003H2	2004H1	2004H2	2005H1	2005H2	2006H1	2006H2	2007H1	2007H2	2008H1
n. of banks																			
total	696	705	712	723	718	704	701	682	675	667	658	660	662	661	659	655	653	652	651
of which:																			
parent/consolidating banks	64	59	59	60	60	59	59	63	65	65	65	65	67	68	68	67	66	62	62
subsidiaries	93	104	119	122	124	120	125	117	114	115	113	117	117	115	115	113	113	114	120
individual banks	539	542	534	541	534	525	517	502	496	487	480	478	478	478	476	475	474	476	469
memo:																			
of which cooperative banks	472	473	473	472	463	444	439	427	420	415	412	407	406	404	402	402	402	401	398
asset size (percentage)																			
share ot total banking system	77.4	79.6	81.0	81.1	80.3	86.5	87.0	82.8	83.0	83.7	82.0	82.5	81.3	81.6	81.5	80.0	73.7	80.3	80.2
share of GDP	105.5	107.8	112.7	114.0	112.3	120.0	120.8	120.4	120.8	123.1	121.0	123.2	127.1	129.9	132.5	137.2	137.7	150.1	156.5

This table describes the sample, by semester, in terms of share of total banking system assets and share of GDP, as well as its composition by consolidation status (i.e. individual/solo banks, parent/consolidating banks, and subsidiaries of banking groups – and by institutional status (i.e. cooperative and commercial banks).

Back

Model 1: Net interest margin and Maturity transformation

Standard specification augmented by MT

$$NIM_{i,t} = \alpha + \sum_{b=1}^{2} \beta_b NIM_{i,t-b} + \sum_{j=1}^{n} \beta_j X_{i,j,t} + \sum_{k=1}^{m} \beta_k X_{k,t} + \epsilon_{i,t} \quad (2)$$

with $\epsilon_{i,t} = \nu_i + \mu_{i,t}$

estimated alternatively with

- bank-fixed effects with robust clustered standard errors
- System GMM (2 step estimator with forward orthogonal deviation transformation by Arellano and Bover (1995), instruments for all bank specific regressors)

Estimation period: 1999H1-2005H2

Results - Net interest margin and maturity transformation

VARIABLES	FE	FE	System GMM
L.nim_ratio		-0.038	0.077
		(0.066)	(0.168)
L2.nim_ratio		0.111***	0.215***
		(0.033)	(0.048)
Maturity transformation	0.003***	0.003***	0.005***
	(0.001)	(0.001)	(0.002)
Interest rate risk	-0.001	-0.001	0.002
	(0.001)	(0.001)	(0.004)
Credit risk	0.002**	0.003***	0.004***
	(0.001)	(0.001)	(0.001)
Risk aversion	0.001	0.005***	0.001
	(0.001)	(0.001)	(0.002)
Operational costs	0.324***	0.483***	-0.065
	(0.063)	(0.089)	(0.126)
...	...	...	...
Constant	2.165***	0.853**	0.000
	(0.354)	(0.368)	(0.000)
R^2	0.235	0.353	
Bank and Time FE	YES	YES	

- MT, credit risk and operational costs significant with the expected signs sub (1) and (2)
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Robustness

Results robust to

- Possible collinearity between interest rate risk and maturity transformation
- Alternative parameter specification of System GMM
- Alternative definition of maturity transformation
- Parallel trends hp for constrained and unconstrained banks (pre-policy change period)