Competition and the pass-through of unconventional monetary policy: evidence from TLTROs

M. Benetton[1] D. Fantino[2]

[1]London School of Economics and Political Science

[2]Bank of Italy

Boston Policy Workshop, 07/09/2017

Outline

1. Introduction
   - Introduction
   - Aim of the paper
   - Previous literature
2. Institutional setting of TLTROs
3. Empirical strategy
   - Data
   - Empirical model
4. Results
   - Effects of targeted monetary policy
   - Competition and transmission mechanism
   - Heterogeneous effects
5. Conclusions

Introduction

- During financial crisis, central banks implemented unprecedented measures to avoid perturbations in monetary policy transmission mechanism.
- Eurosystem implemented, among other measures:
  - ✓ fixed-rate full-allotment mode for refinancing operations since 2008;
  - ✓ Longer Term Refinancing Operations (LTROs) in 2009-2012;
  - ✓ Targeted Longer Term Refinancing Operations (TLTROs) in 2014-currently.
- Aims:
  - ✓ providing a certain source of funding to banks;
  - ✓ reducing rollover risk coming from mismatch in duration of assets and liabilities;
  - ✓ sustaining lending to real economy (TLTROs).

Aim of the paper

- To evaluate impact of 1st and 2nd TLTRO on pass-through to credit interest rates charged to Italian firms.
  - ✓ Transaction level (bank-firm) term loans data.
  - ✓ Difference-in-differences model.
- Role of local level bank competition.
  - ✓ Province level Herfindal indexes.
- Heterogeneity of effects: firm characteristics.
  - ✓ Size and credit rating.

Previous literature: transmission mechanism to loan prices

- Theoretical models with active financial sector (Adrian and Song Shin (2010), Gertler and Kiyotaki (2010), Brunnermeyer and Sannikov (2014));
- DSGE models (Gerali et al. (2010), Gertler and Karadi (2011));
- empirical models controlling for unobservable demand factors (Khwaja and Mian (2008), Schnabl (2012), Gambacorta and Mistrulli (2014), Albertazzi et al. (2014), Jiménez et al. (2012, 2014));
- empirical applications to unconventional monetary policy (Drechsler et al. (2016), Acharya et al. (2015), Carpinelli and Crosignani (2015), García-Posada and Marchetti (2015)).

Previous literature: competition and monetary policy

- Industrial organization approach to the banking sector (Freixas and Rochet (2008), Rochet (2009));
- competition and pass-through of shocks (Berger and Hannan (1989), Neumark and Sharper (1992), De Graeve et al. (2007));
- relation between competition and monetary policy (Scharfstein and Sunderam (2014), Drechsler et al. (2016b));
- lending relationship for access to credit and its local nature (Berger and Udell (1995), De Mitri et al. (2010), Bolton et al. (2013), Guiso et al. (2004), Paravisini (2008)).

Institutional setting of TLTROs

- Eight operations, announced on June 5th 2014, one each quarter since September 2014; further four operations, announced in March 2016, started in the following June.
- Explicitly targeting lending to real economy.
- May participate individual banks or groups.
- Collateral rules same as for standard operations.
- Interest rate same as MRO, +10 b.p. in 1st and 2nd operation.
- Paid back in September 2018, but there are prepayment options and mandatory repayment rule.

Institutional setting of TLTROs

- Borrowing limit for together 1st and 2nd TLTRO:

$$q_1^b + q_2^b \leq 0.07 \times OL^b_{April2014}.$$

- Bank cannot borrow more than 7% of its outstanding amount of eligible loans to NFCs and HH on April 30th 2014.
- Eligible loans exclude loans to households for house purchases, to emphasize channelling into productive investments.
- Borrowing limit for other TLTROs depends on net lending since May 2014 up to two months before operation (endogenous).

Data

- Four main sources of data:
  - ✓ Italian Credit register, individual monthly data on borrowers with exposure >30000 euros from Italian intermediaries; we use interest rates on term loans;
  - ✓ Supervisory reports from Bank of Italy; quarterly data about banking group structure, distribution of branches, balance sheets;
  - ✓ Italian firms annual balance sheets from Cerved: geographical location, credit rating, size, economic sector of activity of firms;
  - ✓ confidential data about participation and amounts lent to Italian banking groups after each TLTRO.
- Final dataset: quarterly balanced panel of banking group-firm relationships between 2014q1 and 2015q2.

Data: Descriptive statistics

	Obs	Mean	Std. Dev.	Min	Median	Max
Panel A: Transaction level variables (term loans; 1st quarter 2014-2nd quarter 2015)						
Interest rate including expenditures (stocks; %)	671951	4.06	1.96	0.49	3.85	12.10
Interest rate without expenditures (stocks; %)	671951	4.05	1.95	0.49	3.85	11.83
Interest rate including expenditures (flows; %)	58098	4.85	2.30	0.50	4.56	14.31
Panel B: Herfindal indexes (credit amount; 1st quarter 2014)						
Province level	103	0.17	0.06	0.09	0.16	0.36
Province and sector level	2873	0.33	0.21	0.06	0.27	1.00
Province and rating level (rating 1-6)	103	0.17	0.06	0.08	0.16	0.36
Province and rating level (rating 7-9)	103	0.18	0.08	0.09	0.16	0.48
Panel C: I-II TLTRO variables						
Amount borrowed (million euros)	78	670.0	1843	5	85.72	12500
Log of amount borrowed	78	18.79	1.54	15.42	18.27	23.25
Additional amount borrowed (million euros)	43	542.7	1167	5	123	5495
Log of additional amount borrowed	43	18.83	1.55	15.42	18.63	22.43
Borrowing limit (million euros)	104	560.3	1635	16.11	83.49	12500
Log of borrowing limit	104	18.49	2.32	16.59	18.24	23.25
Panel D: Banking group variables (1st quarter 2014)						
Assets (million euros)	104	30188.97	101274.05	458.14	2973.13	777911.50
Loans over assets ratio (%)	104	54.07	11.64	8.21	55.75	74.86
Bad loans over loans ratio (%)	104	9.33	5.44	0.09	8.75	27.57
Government bonds over assets ratio (%)	104	18.26	8.86	1.09	18.25	43.30
Capital ratio (%)	104	15.48	9.24	0.25	13.86	94.89
Panel E: Firm variables (2013)						
Assets (thousand euros; by firm)	73174	3954	30079	1	589	2548199
Assets (thousand euros; by relationship)	113246	7240	40646	1	949	2548199

	Percentage distribution	
Classes:	1-6	7-9
Credit rating (by firm)	73%	27%
Credit rating (by relationship)	74%	26%

Empirical model

- Difference-in-differences model; two main challenges:
  - ✓ unobserved demand and supply factors correlated with policy
  - $\Rightarrow$ firm, time and banking group fixed effects;
  - ✓ selection bias in treatment $\Rightarrow$ IV (borrowing limit).
- Interaction of policy variable with predetermined Herfindal index to isolate competition effects.
- Time-varying coefficients to observe dynamics.
- Errors clustered by firm and by banking group and time.
- Final equation:

$$Y_{bfmt} = \gamma_f + \gamma_t + \gamma_b + \alpha_t \times \widehat{TLTRO}_{bt} + \beta_t \times \widehat{TLTRO}_{bt} \times HI_m + \varepsilon_{bfmt}.$$

Effects of targeted monetary policy

	OLS		IV	
TLTRO specification:	(1) Dummy	(2) Log	(3) Dummy	(4) Log
TLTRO x				
t=2014q4	0.024	0.001	-0.049	-0.0018
	(0.034)	(0.0016)	(0.13)	(0.0043)
t=2015q1	-0.011	-0.0011	-0.39**	-0.014**
	(0.039)	(0.0019)	(0.17)	(0.0056)
t=2015q2	-0.02	-0.0014	-0.36*	-0.013**
	(0.044)	(0.0021)	(0.2)	(0.0066)
N	655146	655146	655146	655146
$R2$	0.73	0.73	0.73	0.73

Effects of targeted monetary policy

- Two specifications: one using participation dummy, one using log of additional borrowed amount by bank in the 1st and 2nd TLTRO.
- OLS results not significant.
- IV results show that policy reduced credit rates charged by treated banks between 25 and 40 basis points.
- Effect begins one period after second round of policy, in 2015q1.

Competition and transmission mechanism

	HI credit		HI sector	
TLTRO	(1)	(2)	(3)	(4)
specification:	Dummy	Log	Dummy	Log
TLTRO x				
t=2014q4	-0.13	-0.0054	-0.082	-0.0033
	(0.15)	(0.0052)	(0.13)	(0.0043)
t=2015q1	-0.44**	-0.017***	-0.44**	-0.016***
	(0.18)	(0.0057)	(0.17)	(0.0056)
t=2015q2	-0.48**	-0.018***	-0.42**	-0.016**
	(0.19)	(0.0062)	(0.2)	(0.0068)
TLTRO x HI x				
t=2014q4	0.49	0.023	0.15***	0.0070***
	(0.31)	(0.014)	(0.047)	(0.0021)
t=2015q1	0.32	0.014	0.20***	0.0094***
	(0.26)	(0.012)	(0.053)	(0.0022)
t=2015q2	0.70**	0.033**	0.28***	0.013***
	(0.29)	(0.013)	(0.055)	(0.0026)
N	655146	655146	655146	655146
R2	0.73	0.73	0.73	0.73

Competition and transmission mechanism

- Two versions of Herfindal index, with different market boundaries: province or province-sector.
- Average effects of policy to interest rates of treated banks are substantially same as in table without HI.
- Indirect effect of competition one quarter after direct effect of policy, probably due to adjustments following reactions of other competitors.
- One standard deviation increase in concentration reduces effect of policy by:
  - ✓ 4 basis points (11%-16% of overall effect) when segmenting by province;
  - ✓ 5-6 basis points (18%-23% of overall effect) when segmenting by both province and sector.

Robustness checks

- Results robust to several robustness checks:
  - ✓ banking group time-varying characteristics and participation to following TLTROs (3rd-4th);
  - ✓ stronger fixed effects structure: by banking group and by firm and time (jointly);
  - ✓ raw TLTRO borrowed amount instead of additional ones;
  - ✓ interest rates excluding expenditures;
  - ✓ credit flows instead of credit stocks.

Heterogeneous effects

	Credit rating				Firm size			
	Best		Worst		Small		Big	
TLTRO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
specification:	Dummy	Log	Dummy	Log	Dummy	Log	Dummy	Log
TLTRO x								
t=2014q4	-0.19	-0.0079	0.045	0.0016	-0.13	-0.0056	-0.13	-0.0054
	(0.16)	(0.0057)	(0.12)	(0.0042)	(0.16)	(0.0055)	(0.14)	(0.0049)
t=2015q1	-0.48***	-0.018***	-0.31*	-0.011**	-0.58***	-0.022***	-0.36**	-0.013**
	(0.18)	(0.0061)	(0.17)	(0.0053)	(0.20)	(0.0065)	(0.16)	(0.0054)
t=2015q2	-0.56***	-0.022***	-0.23	-0.0081	-0.58***	-0.022***	-0.40**	-0.016***
	(0.20)	(0.0066)	(0.18)	(0.0059)	(0.21)	(0.0070)	(0.17)	(0.0057)
TLTRO x HI x								
t=2014q4	0.68**	0.031**	0.016	0.0009	0.50	0.023	0.50	0.023
	(0.34)	(0.015)	(0.23)	(0.011)	(0.35)	(0.016)	(0.31)	(0.014)
t=2015q1	0.51*	0.024*	-0.17	-0.0091	0.53*	0.023*	0.21	0.010
	(0.28)	(0.013)	(0.23)	(0.010)	(0.31)	(0.014)	(0.31)	(0.014)
t=2015q2	1.01***	0.047***	-0.057	-0.0033	0.94***	0.042***	0.57*	0.027**
	(0.32)	(0.014)	(0.23)	(0.011)	(0.34)	(0.015)	(0.31)	(0.014)
N	489780	489780	164532	164532	265524	265524	388788	388788
R2	0.72	0.72	0.74	0.74	0.79	0.79	0.66	0.66

Heterogeneous effects

- Sample split according to firm characteristics: credit quality (Cerved index in 9 classes) and size (assets).
- Credit quality: best and average firms (classes 1-6) against worst ones (7-9):
  - ✓ stronger overall effect for best and average firms;
  - ✓ no competition effect for worst ones;
  - ✓ same results also splitting best and average firms.
- Size: above against below median in distribution of assets of firm:
  - ✓ stronger overall and competition effect for smaller firms.

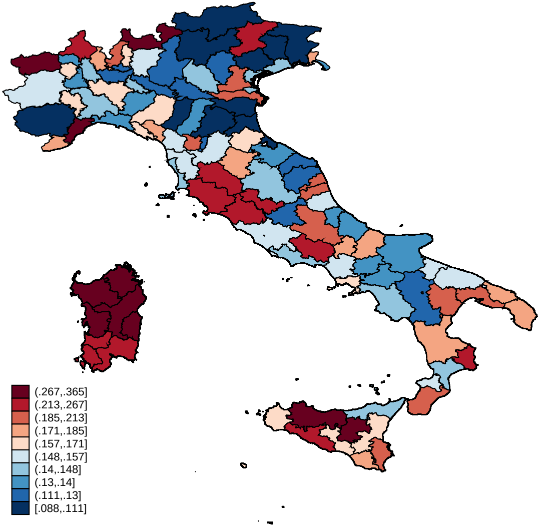
Conclusions

- Study of effectiveness of 1st and 2nd TLTRO and role of competition.
- Policy reduced credit rates of treated banks between 25 and 40 basis points.
- Effect begins one period after second round of policy, in 2015Q1.
- One standard deviation increase in concentration reduces effect of policy by about 4-6 basis points (about 15%-20% of overall effect).
- Stronger effects for smaller and high/medium credit quality firms.

Thanks for your attention!

Additional slides

Geographical distribution of Herfindal indexes



Descriptive statistics for treated and controls

	Treated			Controls		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Panel A: Transaction level variables (1st-3rd quarter 2014)						
Interest rate including expenditures (%)	220776	4.23	2.04	115046	4.14	1.84
Interest rate without expenditures (%)	220776	4.22	2.03	115046	4.12	1.82
Interest rate including expenditures (flows; %)	21243	5.21	2.27	7806	4.74	2.16
Panel B: I-II TLTRO variables						
Borrowing limit (million euros)	43	841.7	2238	61	359	979.1
Log of max allowance	43	19.04	1.55	61	18.10	2.69
Panel C: Banking group variables (1st quarter 2014)						
Assets (million euros)	43	47875	145614	61	17722	48809
Loans over assets ratio (%)	43	53.20	10.25	61	54.68	12.58
Bad loans over loans ratio (%)	43	7.85	2.65	61	10.38	6.57
Government bonds over assets ratio (%)	43	17.93	7.79	61	18.50	9.60
Capital ratio (%)	43	16.75	12.68	61	14.58	5.64
Panel D: Firm variables; by relationship (2013)						
Assets (thousand euros)	74372	6754	38140	38874	8168	45039

	Percentage distribution			
	Treated		Controls	
Classes:	1-6	7-9	1-6	7-9
Credit rating	75%	25%	72%	28%

Robustness checks: methodology

	With bank controls		Firm-time fixed effects		No correction for additionality	
TLTRO	(1)	(2)	(3)	(4)	(5)	(6)
specification:	Dummy	Log	Dummy	Log	Dummy	Log
TLTRO x						
t=2014q4	-0.034	-0.0022	-0.48*	-0.017*	-0.16	-0.005
	(0.12)	(0.0042)	(0.25)	(0.009)	(0.17)	(0.0042)
t=2015q1	-0.53***	-0.020***	-0.44*	-0.017*	-0.74***	-0.019***
	(0.18)	(0.0053)	(0.24)	(0.0087)	(0.19)	(0.0044)
t=2015q2	-0.35***	-0.014***	-0.50**	-0.019**	-0.74***	-0.020***
	(0.11)	(0.0037)	(0.24)	(0.0086)	(0.22)	(0.0053)
TLTRO x HI x						
t=2014q4	0.39	0.019	3.74**	0.13**	0.33	0.016
	(0.32)	(0.015)	(1.88)	(0.065)	(0.26)	(0.011)
t=2015q1	0.23	0.01	1.49	0.059	0.039	0.0066
	(0.29)	(0.012)	(1.77)	(0.063)	(0.2)	(0.008)
t=2015q2	0.58**	0.027**	1.87	0.073	0.33	0.020*
	(0.28)	(0.013)	(1.93)	(0.068)	(0.27)	(0.011)
Group, firm, time f.e.	Yes	Yes	No	No	Yes	Yes
Group, firm-time f.e.	No	No	Yes	Yes	No	No
N	655146	655146	354672	354672	655146	655146
R2	0.73	0.73	0.6	0.6	0.73	0.73

Robustness checks: other rates

TLTRO specification	Net of expenditures (1) Dummy	(2) Log	Credit flows (3) Dummy	(4) Log
TLTRO x				
t=2014q4	-0.13	-0.0054	-0.48***	-0.017***
	(0.15)	(0.0052)	(0.16)	(0.0045)
t=2015q1	-0.44**	-0.017***	-0.75***	-0.026***
	(0.18)	(0.0057)	(0.22)	(0.0063)
t=2015q2	-0.48**	-0.018***	-0.87***	-0.031***
	(0.19)	(0.0062)	(0.25)	(0.0068)
TLTRO x HI x				
t=2014q4	0.49	0.023	0.21	0.010
	(0.31)	(0.014)	(0.21)	(0.0093)
t=2015q1	0.32	0.015	0.38	0.017
	(0.27)	(0.012)	(0.27)	(0.013)
t=2015q2	0.72**	0.033**	0.65**	0.029**
	(0.29)	(0.013)	(0.27)	(0.012)
N	655146	655146	58092	58092
R2	0.73	0.73	0.82	0.82