What do almost 20 years of micro data and two crises say about the relationship between central bank and interbank market liquidity? Evidence from Italy

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The opinions expressed are only mine
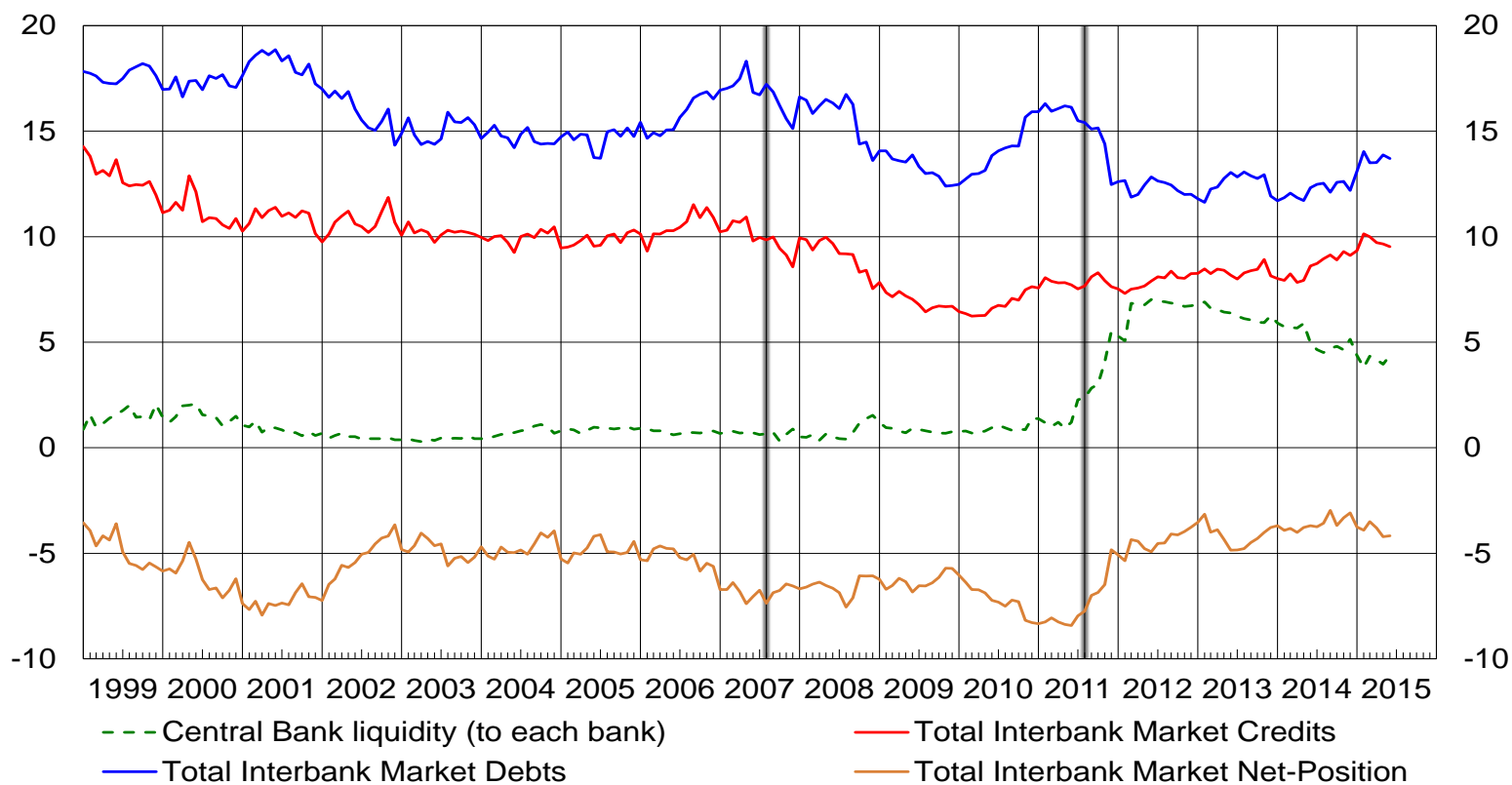
<u>Outline</u>

1.   Motivation

2.   Data

3.   Empirical strategy

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5.   Robustness checks

6.   Conclusions

Motivation

➢ The relationship between CB and IM liquidity is crucial
  ✓ IMs are the first channels through which monetary policy is implemented
  ✓ provide benchmark rates for the pricing of all financial assets
  ✓ allow allocation of funds and risk sharing between banks
  ✓ assure peer monitoring and market discipline
  ✓ are an important indicator of the functioning of the banking market overall
  ✓ a failure in IMs may trigger bank domino effects (financial stability)

➢ During the crises, liquidity and liquidity markets have been at the center of academic and policy debate
  ❑ in normal times CB liquidity is typically provided as demanded, usually not much demanded, by the banking system in order to avoid interest rate volatility, while IMs overcome the asynchronous nature of loan and deposit creation across banks
  ❑ in the crises in several systems around the world IMs faced worrying impairments, and many CBs introduced a wide range of measures to increase liquidity

➢ The joint empirical analysis of the two liquidities is quite scarce, in particular with micro data, due to the lack of comprehensive datasets

➢ This paper tries to contribute exploring the **relationship** at **bank level** between CB and IM liquidity, over 17 years and two crises

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CB and IM liquidity in Italy 1998-2015
(percentage shares of banks' total assets)

- - - Central Bank liquidity (to each bank)   ——— Total Interbank Market Credits
——— Total Interbank Market Debts   ——— Total Interbank Market Net-Position

Motivation

➢ the ***relationship*** between CB and IM liquidity, over 17 years and two crises

✓ exploring whether, to what extent and how the CB and IM liquidity react to each other
✓ whether it is positive or negative (complementary or a substitute)
✓ whether CB liquidity spurs, inhibits or does not affect the IM liquidity, whether this relationship changes over time, in normal times and in the crises, during regular or massive liquidity injections

➢ ***a priori*** the expected sign of the relationship is ***uncertain***

    o   when CBs inject new liquidity, the portfolios of banks become more liquid, some risky assets are removed off balance sheets, strengthening banks' balance sheets, improving collateral values, lowering funding constraints, so helping loosen credit constraints and support general and IM intermediation (complementary role)

(e.g. Allen and Carletti, 2008; Acharya et al., 2008; Sundaresan and Wang, 2009; Freixas et al., 2011; Diamond and Rajan, 2011; Chodorow-Reich, 2014; Andrade et al., 2015; Di Maggio et al., 2016; Goldstein et al., 2016; Darmouni and Rodnyansky, 2016; Daetz et al., 2016; Alves et al., 2016; Kandrac and Schlusche, 2017)

    o   when CBs introduce large injections, they may end up by intermediating between banks and bypassing the IM altogether (substitute role)

(Allen et al., 2009; Bruche and Suarez, 2010; Brunetti et al., 2011; de Haan and van den End, 2013; Gale and Yorulmazer, 2013; Heider et al., 2015)

Motivation

➢ at **_bank level_**

✓ micro data matter
    o   individual banks determine the effectiveness of monetary policy
(e.g. Bernanke and Blinder, 1988 and 1992; Stein, 1998; Kashyap and Stein, 2000; Acharya et al., 2012; Castiglionesi and Wagner, 2013; Yellen, 2013)

    o   the regular functioning of the system and the relation between IM structure, resilience and robustness depends on individual banks
(e.g. Upper and Worms, 2004; Haldane, 2009; Markose et al., 2012; Memmel and Sachs, 2013; León et al., 2016)

✓ disentangle the effects of interbank lending supply and demand, in line with the most recent literature on the transmission of shocks to banks
    (e.g. Khwaja and Mian, 2008; Paravisini, 2008; Schnabl, 2012)

Motivation

The analysis is on the liquidity provided by the Eurosystem to each bank operating in Italy

➢ Eurosystem suits well my purposes
   o does not have an explicit operational target on IM rates, the role of IM is even more pervasive than in the US because of a bank-dominated system
   o the typical way to carry on monetary policy and to inject liquidity in the system by the ECB, both in normal times and in the crises, is the direct lending to banks

➢ Italian banks since a comprehensive micro-database with all CB and IM relationships of *each bank* with *each counterparty* does not exist for the euro area as a whole

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Data

1. **CB liquidity**: all loans that the Eurosystem grants to each banking group or independent bank operating in Italy, both domestic and foreign, through the Bank of Italy

2. **IM exposures**:
   - ~ gross Credits
   - ~ gross Debts
   - ~ Net-Position (= Credits-Debts)

Residence of counterparties	Bilateral or trilateral nature of exposures	Seniority	Maturity
Domestic Extra-Group			
Foreign Extra-Group	Bilateral	Secured and Unsecured	Overnight and Longer-term
Foreign Infra-Group			
CCPs	Trilateral	Secured	
Total Interbank Market =	Total Interbank Market =	Total Interbank Market =	Total Interbank Market

- ✓ aggregated for banking groups or independent banks
- ✓ monthly bank-by-bank data from June 1998 to May 2015 $T = 204$ months
- ✓ the total number of observations is
  - ~ $N_t \times T_i$ = 130,226
  - ~ $N_t \times T_i \times C_{i,t}$ = 984,743

Empirical strategy

Empirical strategy

The analysis explores

- ✓ jointly and at bank level the relationship between CB and IM liquidity
- ✓ investigates *both the possible directions* of the casual nexus between them
- ✓ controls for endogeneity in both cases through *IV regressions*

➤ Three systems of equations

$$cb_{i,t} = \alpha'_1 \, im_{i,t} + \beta'_1 \, M_1{}^R_{i,t-1} + \gamma'_1 \, b_i + \delta'_1 \, p_t + \varepsilon_{1i,t}$$

$$im_{i,t} = \eta'_1 \, M_1{}^R_{i,t-1} + \theta'_1 \, b_i + \lambda'_1 \, p_t + \varphi'_1 \, M_1{}^I_{i,t-1} + \xi_{1i,t}$$

(1)

$$im_{i,t} = \alpha'_2 \, cb_{i,t} + \beta'_2 \, M_2{}^R_{i,t-1} + \gamma'_2 \, b_i + \delta'_2 \, p_t + \varepsilon_{2i,t}$$

$$cb_{i,t} = \eta'_2 \, M_2{}^R_{i,t-1} + \theta'_2 \, b_i + \lambda'_2 \, p_t + \varphi'_2 \, M_2{}^I_{i,t-1} + \xi_{2i,t}$$

(2)

Empirical strategy

➢ Three systems of equations

$$
\begin{cases}
\mathrm{im}_{i,t} = \alpha'_2\, \mathrm{cb}_{i,t} + \beta'_2\, \mathrm{M2}^{R}_{i,t\text{-}1} + \gamma'_2\, \mathrm{b}_i + \delta'_2\, \mathrm{p}_t + \varepsilon_{2i,t} \\[3em]
\mathrm{cb}_{i,t} = \eta'_2\, \mathrm{M2}^{R}_{i,t\text{-}1} + \theta'_2\, \mathrm{b}_i + \lambda'_2\, \mathrm{p}_t + \varphi'_2\, \mathrm{M2}^{I}_{i,t\text{-}1} + \xi_{2i,t}
\end{cases} \quad (2)
$$

$$
\begin{cases}
\boxed{\mathrm{im}_{i,j,t} = \alpha'_3\, \mathrm{cb}_{i,t} + \beta'_3\, \mathrm{M2}^{R}_{i,t\text{-}1} + \gamma'_3\, \mathrm{b}_i + \delta'_3\, \mathrm{p}_t + \chi'_3\, \mathrm{j}_{i,t} + \varepsilon_{3i,j,t}} \\[3em]
\mathrm{cb}_{i,t} = \eta'_3\, \mathrm{M2}^{R}_{i,t\text{-}1} + \theta'_3\, \mathrm{b}_i + \lambda'_3\, \mathrm{p}_t + \varphi'_3\, \mathrm{M2}^{I}_{i,t\text{-}1} + \xi_{3i,t}
\end{cases} \quad (3)
$$

Empirical strategy

➢ Three system of equations: when $im_{i,t}$ are the IM Debts

$$cb_{i,t} = \alpha'_1 \, im_{i,t} + \beta'_1 \, M_1{}^R{}_{i,t-1} + \gamma'_1 \, b_i + \delta'_1 \, p_t + \varepsilon_{1i,t}$$

$$im_{i,t} = \eta'_1 \, M_1{}^R{}_{i,t-1} + \theta'_1 \, b_i + \lambda'_1 \, p_t + \varphi'_1 \, M_1{}^I{}_{i,t-1} + \xi_{1i,t}$$

(1)

When $im_{i,t}$ are the IM Debts

➢ if α_1 , α_2, $\alpha_3 < 0$: banks that are demanding CB liquidity use it as an alternative funding source (substitute)

➢ if α_1 , α_2, $\alpha_3 > 0$: banks that are asking for CB liquidity are also using the IM liquidity (complementarity)

$$im_{i,t} = \alpha'_2 \, cb_{i,t} + \beta'_2 \, M_2{}^R{}_{i,t-1} + \gamma'_2 \, b_i + \delta'_2 \, p_t + \varepsilon_{2i,t}$$

$$cb_{i,t} = \eta'_2 \, M_2{}^R{}_{i,t-1} + \theta'_2 \, b_i + \lambda'_2 \, p_t + \varphi'_2 \, M_2{}^I{}_{i,t-1} + \xi_{2i,t}$$

(2)

$$im_{i,j,t} = \alpha'_3 \, cb_{i,t} + \beta'_3 \, M_2{}^R{}_{i,t-1} + \gamma'_3 \, b_i + \delta'_3 \, p_t + \chi'_3 \, j_{i,t} + \varepsilon_{3i,j,t}$$

$$cb_{i,t} = \eta'_3 \, M_2{}^R{}_{i,t-1} + \theta'_3 \, b_i + \lambda'_3 \, p_t + \varphi'_3 \, M_2{}^I{}_{i,t-1} + \xi_{3i,t}$$

(3)

Empirical strategy

➢ Three system of equations: when $im_{i,t}$ are the IM Credits

$$cb_{i,t} = \alpha'_1 \, im_{i,t} + \beta'_1 \, M_1^R{}_{i,t-1} + \gamma'_1 \, b_i + \delta'_1 \, p_t + \varepsilon_{1i,t}$$

$$(1)$$

$$im_{i,t} = \eta'_1 \, M_1^R{}_{i,t-1} + \theta'_1 \, b_i + \lambda'_1 \, p_t + \varphi'_1 \, M_1^I{}_{i,t-1} + \xi_{1i,t}$$

When $im_{i,t}$ are the IM Credits

✓ the result is *a-priori* more uncertain

✓ complementarity
  ➢ if $\alpha_1 > 0$: banks asking for CB liquidity redistribute it in the IM
  ➢ if α_2, $\alpha_3 > 0$: banks obtaining CB liquidity increase the IM lending

$$im_{i,t} = \alpha'_2 \, cb_{i,t} + \beta'_2 \, M_2^R{}_{i,t-1} + \gamma'_2 \, b_i + \delta'_2 \, p_t + \varepsilon_{2i,t}$$

$$(2)$$

$$cb_{i,t} = \eta'_2 \, M_2^R{}_{i,t-1} + \theta'_2 \, b_i + \lambda'_2 \, p_t + \varphi'_2 \, M_2^I{}_{i,t-1} + \xi_{2i,t}$$

$$im_{i,j,t} = \alpha'_3 \, cb_{i,t} + \beta'_3 \, M_2^R{}_{i,t-1} + \gamma'_3 \, b_i + \delta'_3 \, p_t + \chi'_3 \, j_{i,t} + \varepsilon_{3i,j,t}$$

$$(3)$$

$$cb_{i,t} = \eta'_3 \, M_2^R{}_{i,t-1} + \theta'_3 \, b_i + \lambda'_3 \, p_t + \varphi'_3 \, M_2^I{}_{i,t-1} + \xi_{3i,t}$$

Empirical strategy - *Instruments*

Matrix $M^I_{i,t-1}$: instruments for Interbank Market positions	Lagged IM positions					see Table 1	
	Rating	Rating agency scores	130,226	10.729	1.288	2.000	11.000
	Banks without rating (0-1)	Banks without rating (0-1)	130,226	0.955	0.207	0.000	1.000
Matrix $M^I_{i,t-1}$: instruments for Central Bank liquidity	Lagged CB liquidity (to each bank)					see Table 1	
	Eurosystem total assets	(weighted for banks' total assets)	130,226	251.9	2018.6	0.053	66784
	ECB official rates	(weighted for banks' total assets)	130,226	0.00	0.0	0.000	0.09
	Euro-area GDP gap	(weighted for banks' total assets)	130,226	0.00	0.0	-0.020	0.01
	Euro area inflation rates	(weighted for banks' total assets)	130,226	0.000	0.002	-0.012	0.077

o Even with macro-variables, instruments are defined at bank-level by using as weights the ratios of total assets of each bank to the euro-area banking system's total assets

o The definition at bank level serves as a further control because it allows me to keep in the estimations all the time fixed effects

Empirical strategy - *Instruments*

IM instruments: banks' credit rating

✓ Rating: coded so as to take values from 1 to 10, from best to worst, plus 11 to designate unrated banks; Banks without Rating is a dummy that takes the value of 1 for banks with no rating and 0 otherwise

✓ Strength/relevance: the literature documents the relevance of rating scores for interbank positions (e.g Morgan, 2002; Ashcraft and Bleakley, 2006; Angelini et al., 2011; Affinito, 2011)

✓ Strength and exogeneity:

Variables		Quartiles of Rating				Dummy rating	
		1	2	3	4	yes	not
Total Interbank Market	Debts	0,018	0,016	0,013	0,011	0,019	0,009
	Credits	0,030	0,040	0,058	0,080	0,030	0,080
	Net	−0,041	−0,041	0,028	0,032	−0,043	0,030
Domestic Extra-Group	Debts	0,050	0,040	0,003	0,001	0,050	0,000
	Credits	0,010	0,022	0,047	0,050	0,030	0,050
	Net	−0,006	−0,009	0,024	0,033	−0,001	0,033
Foreign Extra-Group	Debts	0,061	0,060	0,000	0,000	0,000	0,050
	Credits	0,000	0,020	0,040	0,000	0,000	0,040
	Net	−0,020	−0,010	0,000	0,000	−0,010	0,000
Foreign Infra-Group	Debts	0,012	0,003	0,000	0,000	0,008	0,000
	Credits	0,000	0,002	0,005	0,000	0,004	0,000
	Net	−0,006	−0,001	0,001	0,000	−0,004	0,000
CCPs	Debts	0,000	0,000	0,003	0,004	0,014	0,001
	Credits	0,000	0,020	0,018	0,000	0,003	0,000
	Net	−0,018	−0,018	0,000	0,000	−0,012	−0,001
Domestic Infra-Group	Debts or Credits	0,06	0,03	0,04	0,00	0,04	0,00
Central Bank liquidity (to each bank)		0,000	0,004	0,000	0,010	0,000	0,010
Size		9,67	6,60	5,76	5,57	8,63	5,27
Retail Loans		0,53	0,52	0,47	0,56	0,51	0,56
Bad Loans		0,05	0,05	0,08	0,06	0,05	0,05
Portfolio of Gov't Debt Securities		0,12	0,11	0,11	0,18	0,08	0,18
Portfolio of Bank Bonds		0,02	0,01	0,01	0,02	0,02	0,01
Portfolio of euro Gov't Debt Securities		0,001	0,001	0,002	0,001	0,002	0,001
ROE		0,09	0,07	0,07	0,07	0,08	0,07
Capital		0,12	0,10	0,09	0,12	0,10	0,12
Retail Fundraising		0,60	0,57	0,63	0,71	0,64	0,70

Empirical strategy - *Instruments*

CB instruments: macro variables defined at bank level

- ✓ GDP gap and inflation rates (in line with a sort of Taylor rule)
- ✓ Official rates and CB's total assets (conventional and unconventional monetary policy proxies)

- ➢ Strength/relevance: macro-variables are always present in the behavioral function of CBs

- ➢ Exogeneity: macro-variables are expected to be relevant for monetary policy decisions while exogenous with respect to the changes in the position of each single bank

Empirical strategy - *Covariates*

Name	Definition	Obs	Mean	Sd. Dev.	Min	Max
Size	Log (Total assets)	130,226	5.741	1.756	2.390	13.666
Reatil Loans	Total performing (non-securitized) loans to the domestic private sector / Total assets					00
Retail Fundraising	(Total deposits and bonds) / Total assets					00
Bad Loans	Total non-performing (non-securitized) loans (private sector) / Total performing (non-securitized) loans (private sector)	130,226	0.054	0.077	0.000	1.000
ROE	Net profits / (Capital and reserves)					0
Capital	Regulatory capital / Total risk weighted assets	119,289	0.119	0.051	0.000	0.806
Portfolio of domestic Government Debt Securities	Holdings of Italian Government bonds / Total assets					08
Portfolio of euro countries' Government Debt Securities	Holdings of other Euro-area countries' Government bonds / Total assets					23
Portfolio of Bank Bonds	Holdings of their own bonds and of other banks' bonds / Total assets	130,226	0.027	0.037	0.000	0.625

liquidity circulation

banks' health

collateral availability

Results

Equation system (1): Dependent variable = CB liquidity

		Total period			Normal times			Global financial crisis			Sovereign debt crisis		
	Specifications:	1	2	3	1	2	3	1	2	3	1	2	3
	Debts			-1.118 *** 0.065			-0.053 0.051			-0.181 0.121			-0.356 *** 0.109
Total Interbank Market	Credits			1.300 *** 0.122			-0.031 0.023			0.152 *** 0.052			2.101 *** 1.659
	Net	0.639 *** 0.032			-0.052 0.039			0.106 *** 0.037			0.304 *** 0.094		

CB liquidity is obtained by banks with positive IM Net-Position: given both the effects of more Credits and less Debts

✓ CB liquidity is obtained by banks with less IM Debts: banks obtaining CB liquidity are those that demand less liquidity from other banks (more expected)

✓ CB liquidity is obtained by banks with more IM Credits: banks obtaining CB liquidity grant more liquidity to other banks

✓ More meaningful

✓ Marginal effects

Equation system (2): Dependent variable = Total IM

		Net	Credits	Debts	Net	Credits	Debts	Net	Credits	Debts	Net	Credits	Debts
		Total period			Normal times			Global financial crisis			Sovereign debt crisis		
Specifications:		**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Central Bank liquidity (to each bank)		0.816 ***	0.088 ***	-0.727 ***	1.210 ***	0.317 ***	-0.894 ***	0.597 ***	0.033 *	-0.566 ***	0.811 ***	0.160 ***	-0.651 ***
		0.008	*0.007*	*0.005*	*0.047*	*0.040*	*0.028*	*0.030*	*0.020*	*0.020*	*0.011*	*0.009*	*0.009*
Domestic Infra-Group	*Debts or Credits*	-0.249 ***	-0.649 ***	-0.400 ***	-0.276 ***	-0.580 ***	-0.304 ***	0.027	-0.472 ***	-0.500 ***	0.086	-0.264 ***	-0.350 ***
		0.022	*0.019*	*0.015*	*0.030*	*0.025*	*0.018*	*0.060*	*0.048*	*0.041*	*0.059*	*0.047*	*0.047*
Siz...												0.012 ***	0.076 ***
												0.002	*0.002*
Retail L...												-0.463 ***	0.047 ***
												0.006	*0.006*
Retail Fun...												0.140 ***	-0.458 ***
												0.006	*0.006*
Bad L...												-0.030 ***	-0.071 ***
												0.007	*0.008*
RO...												-0.011 *	-0.040 ***
												0.006	*0.006*
Cap...												-0.001	-0.269 ***
												0.018	*0.018*
Portfolio of domestic G...												-0.470 ***	0.205 ***
												0.006	*0.006*
Portfolio of euro Go...												-0.392 ***	0.145 ***
												0.031	*0.031*
Portfolio of B...												-0.249 ***	0.023 **
												0.011	*0.011*
Rating		0.010 ***	0.008 ***	-0.002 ***	0.007 ***	0.011 ***	0.004 ***	-0.009 **	-0.011 ***	-0.005 **	0.007 *	0.004 *	-0.004 **
		0.001	*0.001*	*0.001*	*0.002*	*0.002*	*0.001*	*0.003*	*0.003*	*0.002*	*0.004*	*0.003*	*0.002*
Banks without Rating		0.039 ***	0.049 ***	0.016 *	0.088 *	0.037 **	-0.076 **	0.119 ***	0.091 ***	-0.027 **	-0.323 ***	-0.037 **	0.286 ***
		0.013	*0.012*	*0.009*	*0.055*	*0.019*	*0.033*	*0.019*	*0.015*	*0.013*	*0.022*	*0.017*	*0.017*
Constant		0.382 ***	0.413 ***	0.031 ***	0.184 ***	0.405 ***	0.221 ***	0.143 ***	-0.185 ***	-0.328 ***	0.620 ***	0.175 ***	-0.445 ***
		0.014	*0.012*	*0.009*	*0.020*	*0.017*	*0.012*	*0.044*	*0.035*	*0.030*	*0.044*	*0.035*	*0.035*
Bank fixed effects		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed effets		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations		119,289	119,289	119,289	67,839	67,839	67,839	27,210	27,210	27,210	24,240	24,240	24,240
Adj R-squared		0.94	0.94	0.87	0.77	0.77	0.91	0.87	0.87	0.90	0.95	0.92	0.92

✓ CB liquidity is negative as determinant of IM Debts (substitutive)

✓ positive as determinant of IM Credits (banks obtaining CB liquidity on average redistribute the liquidity more strongly)

✓ in quantitative terms measured by the marginal effects, the overall outcome is positive: the CB provision of liquidity spurs interbank lending

Equation system (2): Dep var = IM segments by residence

Dependent variable:		Domestic Extra-Group			CCPs			Foreign Extra-Group			Domestic Extra-Group			CCPs			Foreign Extra-Group		
		Net-Position									Credits								
		Normal times	Global financial crisis	Sovereign debt crisis	Normal times	Global financial crisis	Sovereign debt crisis	Normal times	Global financial crisis	Sovereign debt crisis	Normal times	Global financial crisis	Sovereign debt crisis	Normal times	Global financial crisis	Sovereign debt crisis	Normal times	Global financial crisis	Sovereign debt crisis
Central Bank liquidity (to each bank)		0.970 *** / 0.095	0.608 *** / 0.055	0.792 *** / 0.019	0.002 / 0.001	-0.055 ** / 0.024	-0.010 / 0.017	0.559 / 0.418	0.211 ** / 0.092	0.189 *** / 0.049	0.329 *** / 0.057	0.058 * / 0.034	0.159 *** / 0.024	0.001 / 0.001	-0.011 * / 0.006	0.001 / 0.003	0.041 / 0.205	-0.014 / 0.015	0.014 / 0.014
Domestic Extra-Group	Net or Debts or Credits				0.000 / 0.000	-0.010 *** / 0.003	0.001 / 0.010	-0.211 *** / 0.053	-0.236 *** / 0.065	-0.164 *** / 0.043				-0.001 *** / 0.000	-0.004 / 0.004	0.006 / 0.004	-0.163 *** / 0.047	-0.068 * / 0.034	-0.140 *** / 0.060
CCPs																	06 / 6	-0.028 / 0.025	0.031 / 0.039
Foreign																			
Foreign Infra-Group	Debts or Credits	-0.085 / 0.072	-0.323 / 0.227	-0.479 *** / 0.105	0.004 / 0.003	-0.392 *** / 0.141	-0.006 / 0.133	-0.200 / 0.129	-0.208 / 0.192	-0.549 *** / 0.075	-0.267 *** / 0.062	-1.039 *** / 0.189	-0.502 *** / 0.130	0.007 / 0.006	0.226 *** / 0.055	0.065 / 0.063	0.032 / 0.125	-0.596 / 0.634	-0.395 *** / 0.116
Domestic Infra-Group	Debts or Credits	-0.280 *** / 0.025	-0.049 / 0.048	0.172 *** / 0.039	0.003 *** / 0.001	0.010 / 0.015	-0.150 ** / 0.066	-0.018 / 0.070	0.055 / 0.075	0.126 ** / 0.056	-0.509 *** / 0.025	-0.385 *** / 0.037	-0.309 *** / 0.046	0.009 *** / 0.001	0.012 * / 0.007	0.045 *** / 0.013	-0.243 *** / 0.090	-0.182 *** / 0.063	-0.070 / 0.063
Rating		0.004 ** / 0.002	-0.004 * / 0.002	0.004 * / 0.002	0.000 *** / 0.000	-0.002 *** / 0.000	0.008 ** / 0.003	0.010 ** / 0.005	-0.010 * / 0.005	0.005 * / 0.003	0.007 *** / 0.001	-0.005 *** / 0.002	0.001 * / 0.000	-0.001 *** / 0.000	0.001 *** / 0.000	0.002 * / 0.001	0.008 * / 0.004	-0.009 ** / 0.004	-0.002 * / 0.001
Banks without Rating																	2 ** / 0	0.024 *** / 0.007	0.001 * / 0.001
Constant																	2 / 3	0.023 / 0.085	0.130 *** / 0.056
All other covariates																	yes	yes	yes
Bank fixed effects																	yes	yes	yes
Time fixed effets		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations		67,839	27,210	24,240	67,839	27,210	24,240	67,839	27,210	24,240	67,839	27,210	24,240	67,839	27,210	24,240	67,839	27,210	24,240
Adj R-squared		0.80	0.85	0.90	0.92	0.84	0.80	0.85	0.85	0.84	0.76	0.84	0.87	0.72	0.71	0.76	0.75	0.82	0.84

✓ Total IM results are confirmed for the Domestic Extra-Group segment

while cross-border wholesale funding became more constrained because of the euro area fragmentation during the crises, the CB liquidity turns out to have encouraged the replacement of the reduced cross-border interbank lending with a rise in domestic interbank lending

Equation system (2): Dep var = IM segments by seniority

Dependent variable:	Secured			Unsecured			Secured			Unsecured		
	Net-Position						Credits					
	Normal times	Global financial crisis	Sovereign debt crisis	Normal times	Global financial crisis	Sovereign debt crisis	Normal times	Global financial crisis	Sovereign debt crisis	Normal times	Global financial crisis	Sovereign debt crisis
CB liquidity (to each bank)	0.148 *** *0.052*	0.013 *0.024*	0.188 *** *0.045*	1.063 *** *0.101*	0.584 *** *0.054*	0.625 *** *0.048*	0.150 *** *0.032*	-0.030 ** *0.015*	0.152 *** *0.043*	0.167 ** *0.078*	0.059 * *0.036*	0.003 *0.042*
All other covariates	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bank fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed effets	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	67,050	27,202	23,732	67,050	27,202	23,732	67,050	27,202	23,732		27,202	23,732
Adj R-s									0.84		0.88	0.88

> CB liquidity impels interbank Unsecured Credits in the global financial crisis and interbank Secured Credits in the sovereign crisis

Depen...						
CB liquidity (to each bank)						
All other covaria...						
Bank fixed effe...						
Time fixed effe...						
Number of observat...						
Adj R-squared	0.68	0.55	0.77	0.92	0.91	0.94

> ✓ the sovereign debt crisis exacerbated the need of Italian banks to protect themselves from bank counterparties' credit risk
> ✓ in a global trend making collateral an ever scarcer resource, the sovereign crisis strengthened the need of banks to use the IM as a tool to adjust their collateral availability and profile

Equation system (2): Dep var = IM segments by maturity

Dependent variable:	Overnight			Longer-term			Overnight			Longer-term		
	Net-Position						Credits					
	Normal times	**Global financial crisis**	**Sovereign debt crisis**	**Normal times**	**Global financial crisis**	**Sovereign debt crisis**	**Normal times**	**Global financial crisis**	**Sovereign debt crisis**	**Normal times**	**Global financial crisis**	**Sovereign debt crisis**
Central Bank liquidity (to each bank)	0.516 *** *0.077*	0.484 *** *0.046*	0.386 *** *0.045*	0.694 *** *0.088*	0.113 *** *0.033*	0.428 *** *0.043*	-0.044 *0.069*	0.066 * *0.037*	-0.034 *0.042*	0.361 *** *0.047*	-0.037 ** *0.015*	0.189 *** *0.043*
All other covariates	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bank fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed effcts	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of									67,050	27,202	23,732
Adj R-s									0.70	0.67	0.69

> CB liquidity spurs interbank Overnight Credits in the global financial crisis and Longer-term Credits in the sovereign crisis

Dependent variable:	Overnight			Longer-term				
	Debts							
Central Bank liquidity (to each bank)								
All other covariates								
Bank fixed effects								
Time fixed effects								
Number of observations	67,050	27,202	23,732	67,050	27,202	23,732		
Adj R-squared	0.88	0.81	0.81	0.88	0.84	0.77		

> ✓ longer maturity of CB liquidity operations turn out to have a direct effect on the maturity of the liquidity exchanged among banks
> ✓ combining the findings of the two breakdowns, banks seem to be willing to lend at longer maturities provided that loans are secured

Equation system (3): Dependent variable = Total IM

Total IM positions

Dependent variable:

Net-Position

	Normal times				Global financial crisis				Sovereign debt crisis			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Central Bank liquidity (to each bank)	0.078 *** *0.005*	0.077 *** *0.005*	0.075 *** *0.006*	0.072 *** *0.006*	0.059 *** *0.003*	0.059 *** *0.003*	0.041 *** *0.004*	0.038 *** *0.005*	0.106 *** *0.007*	0.107 *** *0.007*	0.123 *** *0.009*	0.126 *** *0.009*
Control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	579,221	579,212	545,875	542,700	207,479	207,470	194,888	193,812	198,043	198,041	189,815	188,945
Adj R-squared	0.19	0.20	0.16	0.22	0.25	0.26	0.22	0.24	0.20	0.20	0.15	0.17
Bank fixed effects	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no
Time fixed effets	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no
Counterparty fixed effects	no	yes	no	no	no	yes	no	no	no	yes	no	no
Counterparty FE × Time FE	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
Bank fixed effects × Counterparty FE	no	no	no	yes	no	no	no	yes	no	no	no	yes

Dependent variable:

Credits

	Normal times				Global financial crisis				Sovereign debt crisis			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Central Bank liquidity										2 *	0.021 *** *0.008*	0.022 *** *0.009*
Control variables											yes	yes
Number of observations										,041	189,815	188,945
Adj R-squared										28	0.24	0.25
Bank fixed effects											yes	no
Time fixed effets											no	no
Counterparty fixed effects											no	no
Counterparty FE × Time FE											yes	yes
Bank fixed effects × Counterparty FE											no	yes

> ✓ results are always confirmed; tend to be more statistically significant
> ✓ even controlling for the possible different demand for interbank credit by the counterparties facing banks that obtain the CB liquidity, the CB liquidity impels IM liquidity and lending

	Normal times				Global financial crisis				Sovereign debt crisis			
										2	**3**	**4**
Central Bank liquidity										05 *** *4*	-0.102 *** *0.004*	-0.104 *** *0.005*
Control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	579,221	579,212	545,875	542,700	207,479	207,470	194,888	193,812	198,043	198,041	189,815	188,945
Adj R-squared	0.13	0.13	0.08	0.15	0.17	0.17	0.13	0.16	0.19	0.20	0.14	0.16
Bank fixed effects	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no
Time fixed effets	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no
Counterparty fixed effects	no	yes	no	no	no	yes	no	no	no	yes	no	no
Counterparty FE × Time FE	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
Bank fixed effects × Counterparty FE	no	no	no	yes	no	no	no	yes	no	no	no	yes

Equation system (3): Dep var = IM segments by seniority

	Secured												Unsecured											
Dependent variable:	Net-Position												Net-Position											
	Normal times				Global financial crisis				Sovereign debt crisis				Normal times				Global financial crisis				Sovereign debt crisis			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Central Bank liquidity (to each bank)	0.018 *** *0.004*	0.018 *** *0.003*	0.016 *** *0.003*	0.017 *** *0.003*	0.015 *** *0.001*	0.015 *** *0.001*	0.011 *** *0.002*	0.009 *** *0.002*	0.024 *** *0.005*	0.024 *** *0.005*	0.036 *** *0.007*	0.040 *** *0.008*	0.065 *** *0.004*	0.064 *** *0.004*	0.063 *** *0.005*	0.055 *** *0.005*	0.059 *** *0.003*	0.059 *** *0.003*	0.045 *** *0.004*	0.033 *** *0.005*	0.093 *** *0.006*	0.092 *** *0.006*	0.097 *** *0.007*	0.103 *** *0.008*
Control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	579,221	579,212	545,875	542,700	207,479	207,470	194,888	193,812	198,043	198,041	189,815	188,945	511,220	510,833	477,487	474,340	180,208	180,163	167,582	166,505	169,282	169,273	161,043	160,172
Adj R-squared	0.05	0.05	0.02	0.03	0.12	0.12	0.09	0.09	0.08	0.08	0.04	0.07	0.32	0.32	0.28	0.34	0.36	0.36	0.32	0.35	0.31	0.31	0.26	0.30
Bank fixed effects	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no
Time fixed effets	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no
Counterparty fixed effects	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no
Counterparty FE × Time FE	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
Bank fixed effects × Counterparty FE	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes

	Secured												Unsecured											
Dependent variable:	Credits												Credits											
	Normal times				Global financial crisis				Sovereign debt crisis				Normal times				Global financial crisis				Sovereign debt crisis			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Central Bank liquidity (to each bank)	0.009 *** *0.002*	0.010 *** *0.002*	0.010 *** *0.002*	0.010 *** *0.002*	0.002 *** *0.001*	0.002 *** *0.001*	0.000 *0.001*	0.001 *0.001*	0.012 ** *0.005*	0.012 ** *0.005*	0.016 *** *0.006*	0.017 ** *0.007*	0.030 *** *0.005*	0.029 *** *0.005*	0.024 *** *0.007*	0.020 *** *0.008*	0.030 *** *0.003*	0.029 *** *0.003*	0.012 *** *0.003*	0.006 * *0.004*	0.002 *0.005*	0.002 *0.005*	0.011 *0.007*	0.016 ** *0.007*
Control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	579,221	579,212	545,875	542,700	207,479	207,470	194,888	193,812	198,043	198,041	189,815	188,945	511,220	510,833	477,487	474,340	180,208	180,163	167,582	166,505	169,282	169,273	161,043	160,172
Adj R-squared	0.12	0.12	0.08	0.09	0.18	0.18	0.15	0.14	0.13	0.13	0.06	0.06	0.40	0.40	0.38	0.41	0.45	0.45	0.42	0.45	0.41	0.41	0.37	0.39
Bank fixed effects	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no
Time fixed effets	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no
Counterparty fixed effects	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no
Counterparty FE × Time FE	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
Bank fixed effects × Counterparty FE	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes

	Secured												Unsecured											
Dependent variable:	Debts												Debts											
	Normal times				Global financial crisis				Sovereign debt crisis				Normal times				Global financial crisis				Sovereign debt crisis			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Central Bank liquidity (to each bank)	-0.009 *** *0.003*	-0.009 *** *0.003*	-0.007 ** *0.003*	-0.006 ** *0.003*	-0.013 *** *0.001*	-0.013 *** *0.001*	-0.011 *** *0.002*	-0.008 *** *0.002*	-0.012 *** *0.002*	-0.012 *** *0.002*	-0.020 *** *0.002*	-0.022 *** *0.002*	-0.035 *** *0.006*	-0.035 *** *0.006*	-0.040 *** *0.008*	-0.035 *** *0.009*	-0.029 *** *0.003*	-0.029 *** *0.003*	-0.033 *** *0.004*	-0.026 *** *0.004*	-0.091 *** *0.003*	-0.090 *** *0.003*	-0.086 *** *0.004*	-0.087 *** *0.004*
Control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	579,221	579,212	545,875	542,700	207,479	207,470	194,888	193,812	198,043	198,041	189,815	188,945	511,220	510,833	477,487	474,340	180,208	180,163	167,582	166,505	169,282	169,273	161,043	160,172
Adj R-squared	0.06	0.06	0.04	0.08	0.08	0.08	0.05	0.07	0.07	0.07	0.04	0.07	0.19	0.18	0.13	0.20	0.23	0.23	0.18	0.21	0.34	0.35	0.29	0.34
Bank fixed effects	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no
Time fixed effets	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no
Counterparty fixed effects	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no
Counterparty FE × Time FE	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
Bank fixed effects × Counterparty FE	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes	no	no	no	yes

Equation system (3): Dep var = IM segments by maturity

Overnight

Net-Position

Dependent variable:	Normal times 1	2	3	4	Global financial crisis 1	2	3	4	Sovereign debt crisis 1	2	3	4
Central Bank liquidity (to each bank)	0.052 *** 0.003	0.052 *** 0.003	0.047 *** 0.004	0.045 *** 0.004	0.050 *** 0.003	0.049 *** 0.003	0.032 *** 0.004	0.022 *** 0.004	0.040 *** 0.005	0.040 *** 0.006	0.054 *** 0.007	0.067 *** 0.007
Control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	511,220	510,833	477,487	474,340	180,208	180,163	167,583	166,505	169,282	169,273	161,046	160,172
Adj R-squared	0.31	0.31	0.31	0.36	0.40	0.40	0.36	0.39	0.28	0.28	0.22	0.25
Bank fixed effects	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no
Time fixed effets	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no
Counterparty fixed effects	no	yes	no	no	no	yes	no	no	no	yes	no	no
Counterparty FE × Time FE	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
Bank fixed effects × Counterparty FE	no	no	no	yes	no	no	no	yes	no	no	no	yes

Credits

Dependent variable:	Normal times 1	2	3	4	Global financial crisis 1	2	3	4	Sovereign debt crisis 1	2	3	4
Central Bank liquidity (to each bank)	0.028 *** 0.005	0.028 *** 0.005	0.022 *** 0.006	0.016 ** 0.007	0.030 *** 0.002	0.030 *** 0.002	0.011 *** 0.003	0.006 * 0.003	-0.004 0.005	-0.003 0.005	0.002 0.007	0.015 ** 0.007
Control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	511,220	510,833	477,487	474,340	180,208	180,163	167,583	166,505	169,282	169,273	161,046	160,172
Adj R-squared	0.41	0.41	0.38	0.41	0.46	0.46	0.43	0.45	0.41	0.41	0.36	0.39
Bank fixed effects	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no
Time fixed effets	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no
Counterparty fixed effects	no	yes	no	no	no	yes	no	no	no	yes	no	no
Counterparty FE × Time FE	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
Bank fixed effects × Counterparty FE	no	no	no	yes	no	no	no	yes	no	no	no	yes

Debts

Dependent variable:	Normal times 1	2	3	4	Global financial crisis 1	2	3	4	Sovereign debt crisis 1	2	3	4
Central Bank liquidity (to each bank)	-0.024 *** 0.006	-0.024 *** 0.006	-0.025 *** 0.007	-0.029 *** 0.008	-0.019 *** 0.002	-0.019 *** 0.002	-0.021 *** 0.003	-0.016 *** 0.003	-0.044 *** 0.002	-0.043 *** 0.002	-0.052 *** 0.003	-0.052 *** 0.003
Control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	511,220	510,833	477,487	474,340	180,208	180,163	167,583	166,505	169,282	169,273	161,046	160,172
Adj R-squared	0.12	0.12	0.11	0.15	0.22	0.22	0.17	0.20	0.28	0.28	0.23	0.26
Bank fixed effects	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no
Time fixed effets	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no
Counterparty fixed effects	no	yes	no	no	no	yes	no	no	no	yes	no	no
Counterparty FE × Time FE	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
Bank fixed effects × Counterparty FE	no	no	no	yes	no	no	no	yes	no	no	no	yes

Longer-term

Net-Position

Dependent variable:	Normal times 1	2	3	4	Global financial crisis 1	2	3	4	Sovereign debt crisis 1	2	3	4
Central Bank liquidity (to each bank)	0.030 *** 0.004	0.030 *** 0.004	0.032 *** 0.004	0.028 *** 0.004	0.023 *** 0.002	0.023 *** 0.002	0.021 *** 0.003	0.021 *** 0.003	0.066 ** 0.005	0.067 *** 0.005	0.071 ** 0.007	0.074 *** 0.008
Control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	579,221	579,212	545,875	542,700	207,479	207,470	194,888	193,812	198,043	198,041	189,815	188,945
Adj R-squared	0.15	0.15	0.11	0.12	0.13	0.12	0.07	0.09	0.15	0.15	0.10	0.13
Bank fixed effects	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no
Time fixed effets	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no
Counterparty fixed effects	no	yes	no	no	no	yes	no	no	no	yes	no	no
Counterparty FE × Time FE	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
Bank fixed effects × Counterparty FE	no	no	no	yes	no	no	no	yes	no	no	no	yes

Credits

Dependent variable:	Normal times 1	2	3	4	Global financial crisis 1	2	3	4	Sovereign debt crisis 1	2	3	4
Central Bank liquidity (to each bank)	0.015 *** 0.002	0.015 *** 0.002	0.015 *** 0.002	0.016 *** 0.002	0.001 0.001	0.001 0.001	0.000 0.001	0.001 0.001	0.012 ** 0.005	0.012 ** 0.005	0.016 ** 0.007	0.019 ** 0.008
Control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	579,221	579,212	545,875	542,700	207,479	207,470	194,888	193,812	198,043	198,041	189,815	188,945
Adj R-squared	0.11	0.11	0.09	0.09	0.16	0.16	0.12	0.18	0.13	0.13	0.07	0.09
Bank fixed effects	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no
Time fixed effets	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no
Counterparty fixed effects	no	yes	no	no	no	yes	no	no	no	yes	no	no
Counterparty FE × Time FE	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
Bank fixed effects × Counterparty FE	no	no	no	yes	no	no	no	yes	no	no	no	yes

Debts

Dependent variable:	Normal times 1	2	3	4	Global financial crisis 1	2	3	4	Sovereign debt crisis 1	2	3	4
Central Bank liquidity (to each bank)	-0.015 *** 0.004	-0.015 *** 0.004	-0.016 *** 0.004	-0.012 *** 0.004	-0.022 *** 0.002	-0.022 *** 0.002	-0.021 *** 0.003	-0.020 *** 0.003	-0.054 *** 0.003	-0.055 *** 0.003	-0.055 *** 0.003	-0.056 *** 0.003
Control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	579,221	579,212	545,875	542,700	207,479	207,470	194,888	193,812	198,043	198,041	189,815	188,945
Adj R-squared	0.18	0.18	0.14	0.15	0.13	0.13	0.08	0.10	0.15	0.15	0.11	0.13
Bank fixed effects	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no
Time fixed effets	yes	yes	no	no	yes	yes	no	no	yes	yes	no	no
Counterparty fixed effects	no	yes	no	no	no	yes	no	no	no	yes	no	no
Counterparty FE × Time FE	no	no	yes	yes	no	no	yes	yes	no	no	yes	yes
Bank fixed effects × Counterparty FE	no	no	no	yes	no	no	no	yes	no	no	no	yes

Extension:
Bank types and money center banks

Bank types: possible behavior vis-à-vis CB and IM

		Total Interbank Market - Net Position			
		< 0	= 0	> 0	
Net-liquidity position with the CB	**≥ 0**	secondary liquidity users	wholesale liquidity uninterested	secondary liquidity redistributors	**CB liquidity non-users**
	< 0	liquidity eagers	only primary liquidity users	primary liquidity redistributors	**CB liquidity users**
		IM liquidity users	**IM liquidity uniterested**	**IM liquidity reditributors**	**Total**

Bank types: actual behavior in Italy vis-à-vis CB and IM

		Total Interbank Market - Net Position											
		< 0						> 0					
Net-liquidity position with the CB	**≥ 0**	**secondary liquidity users**						**secondary liquidity redistributors**					
		Normal times		Global financial crisis		Sovereign debt crisis		Normal times		Global financial crisis		Sovereign debt crisis	
		Number of banks	Total assets	Number of banks	Total assets	Number of banks	Total assets	Number of banks	Total assets	Number of banks	Total assets	Number of banks	Total assets
		21.5	38.2	21.0	49.9	52.8	10.9	68.8	17.1	73.2	12.9	25.5	2.9
	< 0	**liquidity eagers**						**primary liquidity redistributors**					
		Normal times		Global financial crisis		Sovereign debt crisis		Normal times		Global financial crisis		Sovereign debt crisis	
		Number of banks	Total assets	Number of banks	Total assets	Number of banks	Total assets	Number of banks	Total assets	Number of banks	Total assets	Number of banks	Total assets
		1.8	40.3	2.8	30.9	11.4	63.4	0.7	4.2	0.9	3.3	8.3	22.8

Bank types: transition matrix

		To: Sovereign debt crisis			
		secondary liquidity users	secondary liquidity redistributors	liquidity eagers	primary liquidity redistributors
From: Normal times	secondary liquidity users	**14.5**	11.5	32.7	22.9
	secondary liquidity redistributors	76.0	**68.2**	52.2	60.4
	liquidity eagers	1.6	0.0	**4.4**	4.2
	primary liquidity redistributors	1.3	0.0	2.6	**0.0**
	other	6.6	20.4	8.1	12.5
	Total	100.0	100.0	100.0	100.0

		To: Sovereign debt crisis			
		secondary liquidity users	secondary liquidity redistributors	liquidity eagers	primary liquidity redistributors
From: Global financial crisis	secondary liquidity users	**21.8**	3.8	24.8	12.5
	secondary liquidity redistributors	76.0	**89.2**	44.3	68.8
	liquidity eagers	0.0	0.0	**20.4**	4.2
	primary liquidity redistributors	0.3	0.0	4.4	**10.4**
	other	1.9	7.0	6.2	4.2
	Total	100.0	100.0	100.0	100.0

Bank types: likelihood (random effects probit estimations)

	primary liquidity redistributors			liquidity eagers		
	Normal times	Global financial crisis	Sovereign debt crisis	Normal times	Global financial crisis	Sovereign debt crisis
Central Bank liquidity (to each bank)	32.125 *** 2.470	22.481 *** 2.001	27.763 *** 1.015	9.798 *** 1.314	17.451 *** 1.503	0.454 0.510
Domestic Infra-Group *Debts or Credits*	-5.749 *** 2.069	-9.977 ** 4.129	-2.958 3.189	2.243 * 1.239	-0.524 2.421	4.853 * 2.734
Size	0.447 *** 0.068	0.897 *** 0.180	0.536 *** 0.090	0.634 *** 0.088	1.229 *** 0.172	1.229 *** 0.097
Retail Loans	-1.354 ** 0.562	-1.339 * 0.749	-3.132 *** 0.569	4.243 *** 0.892	3.195 *** 0.987	6.663 *** 0.632
Retail Fundraising	2.211 *** 0.589	2.682 *** 0.874	8.057 *** 0.735	-5.613 *** 0.652	-1.680 ** 0.700	-2.412 *** 0.449
Bad Loans	1.805 *** 0.692	0.593 2.202	0.638 1.027	-1.181 0.803	-5.252 * 2.812	-4.547 *** 1.030
ROE	-1.093 0.754	-1.777 1.155	-0.823 0.632	-1.387 ** 0.618	-0.191 0.987	-1.062 ** 0.514
Capital	-5.896 *** 2.222	7.567 *** 1.927	10.257 *** 1.596	-3.695 2.358	-10.755 *** 2.527	5.063 *** 1.832
Portfolio of domestic Gov't Debt Securities	-3.559 *** 0.918	-10.196 *** 1.810	-10.748 *** 0.698	2.665 *** 0.944	-0.140 1.555	9.401 *** 0.678
Por. Gov't Debt Se. other euro-area countries	11.713 *** 2.789	4.269 3.786	-17.889 *** 3.164	15.682 *** 3.824	-7.062 8.637	9.176 *** 3.272
Portfolio of Bank Bonds	0.551 1.772	-7.611 *** 2.133	-6.435 *** 1.110	5.076 *** 1.599	3.434 ** 1.697	7.654 *** 0.916
Rating	0.091 0.133	-0.812 *** 0.219	-0.159 0.149	-0.870 *** 0.109	0.130 0.100	-0.065 0.132
Banks without Rating	-1.104 0.909	6.542 *** 1.599	2.157 ** 1.005	4.099 *** 0.796	-0.414 0.586	-0.276 0.943
Constant	-7.181 *** 1.175	-9.685 *** 2.214	-11.849 *** 1.477	-3.672 *** 1.267	-15.490 *** 2.208	-15.783 *** 1.449
Bank random effects	yes	yes	yes	yes	yes	yes
Time fixed effets	yes	yes	yes	yes	yes	yes
Number of observations	65,073	27,210	24,240	65,073	27,210	24,240
rho	0.67	0.71	0.79	0.78	0.80	0.80

Other robustness checks

✓   Heterogeneous IV tests

✓   Interaction terms

✓   Net CB liquidity

✓   Foreign banks

✓   Time spans

<u>Conclusions</u>

❖ During the crises CB liquidity and IM liquidity have been at the center of debate

❖ The paper contributes with the advantage of using an unique micro database containing seventeen years of monthly micro bank-by-bank and counterparty-by-counterparty data

❖ The analysis investigates both the possible causal directions of the mutual relationship while controlling for their mutual endogeneity and for demand and supply effects

➢ in Italy CB and IM liquidities have a complementary role, even in the crises

➢ CB larger liquidity provisions amplify IM reactivity: banks obtaining CB liquidity do not limit to use it for their needs but redistribute it to other banks speeding up IM lending

➢ CB liquidity allows banks to compensate and adjust domestic and cross-border interbank exposures, secured and unsecured transactions, short-term and longer-term interbank lending

➢ when CB liquidity is provided abundantly, some banks tend to take on a pivotal role as borrowers from the CB and redistributors to other banks

➢ redistributing banks tend to be healthy, specialized in interbank activity and with smaller portfolios of collateral, which are instead concentrated in the net borrowing banks

Thank you for your attention!

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