BANCA D'ITALIA

EUROSISTEMA

Temi di Discussione

(Working Papers)

Do interbank customer relationships exist? And how did they function in the crisis? Learning from Italy

by Massimiliano Affinito

Number

826

Temi di discussione

(Working papers)

Do interbank customer relationships exist? And how did they
function in the crisis? Learning from Italy

by Massimiliano Affinito

The purpose of the Temi di discussione *series is to promote the circulation of working papers prepared within the Bank of Italy or presented in Bank seminars by outside economists with the aim of stimulating comments and suggestions.*

The views expressed in the articles are those of the authors and do not involve the responsibility of the Bank.

DO INTERBANK CUSTOMER RELATIONSHIPS EXIST?
AND HOW DID THEY FUNCTION IN THE CRISIS?
LEARNING FROM ITALY

by Massimiliano Affinito[*]

Abstract

Using 11 years of monthly Italian bank-by-bank data, this paper correlates the bilateral amounts and the identity of each interbank borrower and lender with a long list of explanatory variables. The results show that interbank customer relationships, i.e. stable and strong relationships between pairs of borrowing and lending banks, do exist in Italy, that they persist over time, and that they functioned well during the crisis, enabling the healthier banks to provide and the troubled ones to receive funds.

Contents

---

[*] Bank of Italy, Economics, Research and International Relations.

1. Introduction[1]

The interbank market is crucial for the correct functioning of all financial system, for implementing monetary policy, and for successive borrowing conditions of households and firms. Its malfunctioning in several systems during the crisis is accordingly a cause of concern (Allen and Carletti, 2008; Brunnermeier, 2009; Heider, Hoerova and Holthausen, 2009). This paper joins the debate with empirical inquiry into: (a) the characteristics that banks consider in assessing other banks' creditworthiness; and (b) any modifications of characteristics during the turmoil.

The focus is on the existence and the functioning of "*interbank* customer relationships". The literature uses the terms "lending relationship," "relationship banking" or "customer relationship" to describe the stable (over time) and strong (quantitatively relevant) relationship that typically arises between banks (lenders) and non-financial firms (borrowers). When, as in this study, both lenders and borrowers are banks, then customer relationships are "interbank". The literature on bank-firm relationships underscores that customer relationships benefit both parties: the lender gets borrower-specific, often proprietary information in order to perform screening and monitoring functions and overcome problems of information asymmetry; the borrower may obtain lower funding cost and greater availability of credit.[2] In particular, since the durable relationship allows for better prediction of when borrowers will bounce back and accommodates inter-temporal smoothing of lenders' income, this literature predicts that lenders will ensure the availability of credit to their long-time customers when they are in difficulty (e.g. Chemmanur and Fulghieri, 1994; Petersen and Rajan, 1994; Kashyap *et al*., 2002), or precisely in times of financial turmoil (De Mitri *et al*., 2010). This paper analyses exactly whether, just as in bank-firm relationships, the frequent and repeated interactions of the interbank market originate special steady relationships among pairs of banks, and whether these "interbank customer relationships" benefit the borrowing banks, in particular those in difficulty during the crisis.

---

[1] Email address: massimiliano.affinito@bancaditalia.it. This paper was written while I was a visiting scholar at the NBER, where I benefited from invaluable discussions and suggestions from James Poterba and participants at an NBER internal meeting (Boston, May 2010). I would also like to thank for their comments, without implicating them in responsibility, an anonymous referee, Ugo Albertazzi, Paolo Angelini, Francesco Columba, Riccardo De Bonis, Antonio Di Cesare, Fabio Farabullini, Mamiza Haq, Michele Manna, Gaetano Marseglia, Lars Norden, Matteo Piazza, Alberto Franco Pozzolo, and participants at the seminar held at the Bank of Italy (Rome, November 2010); at the "Systemic Risk, Basel III, Financial Stability and Regulation Conference" (Sydney, June 2011); at the IFABS-2011 Conference on "Financial Intermediation, Competition and Risk" (Rome, July 2011); at the 38th Annual Meeting of the European Finance Association (Stockholm, August 2011). The opinions expressed are only mine and do not necessarily reflect those of the Bank of Italy or the NBER.

[2] See Lummer and McConnell (1989); Diamond (1991); Rajan (1992); Berglöf and von Thadden (1994); Boot and Thakor (1994); Petersen and Rajan (1995); Berlin and Mester (1999); Boot (2000).

The hypothesis of "interbank customer relationships" is not new, but the novelty of this paper is the fact that, for the first time to my knowledge, I explicitly and empirically test their existence and persistence, and verify their impact during a crisis. For example, Ferri and Marullo Reedtz (1989), analyzing the Italian interbank market in the Eighties, already use the expression interbank customer relationships, but verify neither their existence nor their effects. Furfine (2001) analyses the effects of interbank customer relationships (measured by different indexes) on the U.S. interbank interest rates, but he assumes but does not demonstrate their existence. Cocco *et al.* (2009) step forward. Not only they estimate the effect of interbank customer relationships on the interbank interest rates, but even include in their analysis some determinants of interbank customer relationships. However, they use a considerably smaller number of explanatory variables, and do not explicitly test whether interbank customer relationships exist and persist; neither, of course, they analyze the effects of a financial crisis on interbank customer relationships because their sample covers the Portuguese interbank market between 1997 and 2001. Afonso *et al.* (2010) underscore that "it is important to investigate the role that banking relationships and repeat interactions in the fed funds market can play in improved monitoring of counterparty risks or as a vehicle to provide coinsurance of liquidity needs", but leave this issue as agenda for future research.

In this respect, Italy is an interesting case to study for three main reasons. First, it is a bank-based economy so that, if interbank customer relationships exist, they are likely to matter. Second, since "the Italian banking system has weathered the crisis better than many others" (Draghi, 2009), it is particularly interesting to analyze possible reasons of this resilience. Third, data supervisory reporting requirements in Italy allow one to know the bilateral amounts and identities of every interbank borrower and lender.

My empirical analysis uses nearly 450,000 monthly observations from June 1998 to April 2009. It is a three-step process. I first verify the existence of stable interbank customer relationships by the criteria of length and continuity, running a duration model as in Ongena and Smith (2001); then examine the determinants of strong interbank customer relationships, i.e. the characteristics of the banks that rely more on interbank relationships both as borrowers and as lenders; and lastly study the functioning of interbank customer relationships during the 2007-2009 phase of the crisis. The findings have significant economic and policy implications: interbank customer relationships exist and persist over time; and they enable banks not to lose mutual trust, so that the healthier banks can provide much-need funds to those more severely affected by the crisis.

My paper is related to various fields of research. One is the literature on bank-firm relationships. Despite the evident differences between firm-bank and bank-bank partnerships, I apply some concepts and methodologies developed for the former to the interbank market.

Second, my paper is related to the literature on market discipline in banking, according to which if banks carry out peer monitoring, regulators can use banks' signals to identify risky intermediaries. It is to highlight that, although these concepts were already present in Goodfriend and King (1988), Kaufman (1991), Berger (1991) and Schwartz (1992), who pointed out that banks are the best-informed parties to judge the solvency of illiquid banks, the views set forth in this literature are still contrasting. On the one hand, some authors – Bhattacharya and Gale (1987), Flannery (1996), Allen and Gale (2000), Freixas *et al.* (2000), Freixas and Jorge (2007) Allen *et al.* (2008) – signal that banks should not be able to monitor their peers because interbank markets, like other credit markets, are characterized by moral hazard and asymmetric information. Likewise, Goodfriend (2002) and Martin and McAndrews (2007) claim that banks are not apt to monitor other banks, because the implicit guarantee supplied by central banks, which are expected to intervene in case of crisis, undermines banks' incentives to monitor their peers. On the other hand, Rochet and Tirole (1996) demonstrate that interbank exposures might generate incentives for lending banks to monitor borrowing banks, even if this disciplinary role is relatively ineffective because interbank exposures can be quickly abandoned owing to their typically short-term maturity. Much more, Calomiris (1998) stresses that banks may serve as monitors of other banks because kindred institutions are best able to identify a peer's risk. DeYoung *et al.* (1998), Peek *et al.* (1999), Berger *et al.* (2000), and Furfine (2002) also admit that banks possess knowledge regarding other bank's health, even while highlighting that this is only complementary to the knowledge of central banks. In empirical analysis, admittedly still scarce, the hypothesis of peer monitoring prevails. Furfine (2001) documents that interbank interest rates in the U.S. federal funds market reflect in part the credit risk of the borrowing banks. Ashcraft and Bleakley (2006) find evidence, though weak, of the existence of market discipline. King (2008) demonstrates that high-risk banks pay more than safe banks for interbank loans. Dinger and von Hagen (2009) show that in systems characterized by longer-term interbank exposures the monitoring role of lenders is more important. My paper contributes to this literature by showing that banks maintain long-term relationships and base these relationships on mutual monitoring. And the results suggest that stable interbank customer relationships, and the related peer monitoring, are helpful to macro-regulators in avoiding failures in liquidity reallocation.

Third, the paper relates to the growing literature on the impact of the crisis on the functioning of financial markets, and specifically on the interbank market.[3] In particular, my analysis complements those of Cassola *et al.* (2008); Angelini *et al.* (2011); and Afonso *et al.* (2010). Cassola *et al.* (2008) note that the crisis exacerbated cross-country asymmetric information problems and caused a decline in cross-border transactions; consistently, I show that, unlike cross-country transactions, the Italian domestic interbank market did not experience such a deterioration. Angelini *et al.* (2011) also analyse the Italian interbank market before and after crisis. Although their focus is different, as they study the determinants of the interbank interest rate spread, my findings are consistent with their main conclusion. They find that the widening interbank spread was not due to bank-specific factors but to increasing aggregate risk aversion; accordingly, my paper shows that, during the crisis, interbank customer relationships seemed to work well and bank-specific characteristics, even when deteriorated, did not hamper interbank transactions. Afonso *et al.* (2010) examine the impact of the financial crisis on the U.S. interbank market. They find that, in the days immediately after Lehman Brothers' bankruptcy, borrowing bank-specific characteristics become more important in driving the lending banks' decisions, entailing an increased differentiation on the federal funds market between borrowing banks of high versus low type, not only on the amounts lent but even in the cost of funds. They also show that the return to the pre-crisis levels occurs as the effect of the government support for systematically important banks. By contrast, my analysis shows that Italian inter-group domestic interbank exposures did not decrease after the onset of the crisis, one reason being the presence of interbank customer relationships. This contributes also to explain why government intervention in Italy has been negligible in comparison to other countries (Panetta *et al.*, 2009). Moreover, Afonso *et al.* do not find in the U.S. market a relationship between lending banks' characteristics and amounts lent, while I show that after the crisis in Italy just the healthier banks are willing to be substantial lenders in the interbank customer relationships.

The rest of the paper is organized as follows. Section 2 describes the three steps of my analysis. Section 3 presents my data on dependent variables and on covariates. Section 4 reports the results, Section 5 summarizes robustness checks, and Section 6 concludes.

---

[3] See Dudley (2008); Cassola *et al.* (2008); Gynetelberg and Wooldridge (2008); Michaud and Upper (2008); Angelini *et al.* (2011); Taylor and Williams (2009); Heider *et al.* (2009); Porzio *et al.* (2009); Afonso *et al.* (2010).

2. Empirical strategy

My empirical analysis is divided into three steps. The first examines stability over time and the second the quantitative strength of interbank customer relationships, although the two concepts of stability and strength are constantly intermingled in both stages of analysis. The third step is the inquiry into what happened during the recent financial crisis.

As mentioned in the Introduction, in my first step, I estimate a duration model following Ongena and Smith (2001). Duration models are typically used in labour economics to estimate, say, duration of unemployment; they are used by Ongena and Smith (2001) to estimate the duration of firm-bank relationships; and by me to estimate the duration of bank-bank relationships.

These models analyse the span of time that passes from a beginning condition (initial state) to the occurrence of a certain random event (switch). In my case, the initial state starts when a bank for the first time lends to − or borrows from − another bank (that is, when an interbank relationship between a pair of banks is established); and the switch occurs when the interbank exposure dries up (that is, when the interbank relationship ends or breaks even only for one period).[4]

In particular, these models allow one to estimate the presence of positive or negative duration dependence. Duration dependence is said to be positive when the probability that a switch from the initial state occurs increases as the time span lengthens; negative when that probability decreases and the initial state accordingly proves to be stable. Ongena and Smith (2001) find positive duration dependence in relationships between firms and banks in Norway − firms are more likely to leave a bank as the span increases − and therefore conclude that the value of the firm-bank relationship declines over time. I utilize the same methodology and the same argument but find negative duration dependence, i.e. that the probability of ending or breaking an interbank relationship decreases over time. I accordingly conclude that stable interbank relationships exist.

The presence of positive or negative duration dependence is estimated through a hazard function $\lambda(t)$. The hazard function provides a suitable method for summarising the relation between span length and the likelihood of switching because it determines the probability that a switch will occur, conditional on the span surviving through time t. When $\lambda(t)$ is increasing (decreasing) in t, the hazard function exhibits positive (negative) duration dependence; when $\lambda(t)$ is constant in t, there is constant duration dependence and thus no correlation between span and switch.

---

[4] Relationships which began prior to my sample period are left-censored; relationships continuing after my sample-period are right-censored. Different methods exist to allow for left- and right- censoring. I use them as robustness checks in Section 5.

In formal terms, I use the following proportional hazard specification to estimate $\lambda(t)$:

$$\lambda(t, K^L_{i,t}, K^B_{j,t}, K^{LB}_{i,j,t}) = \lim_{\Delta t_s \to 0} \frac{P(t_s \leq T_s < T_s + \Delta t_s | T_s \geq t_s, K^L_{i,t}, K^B_{j,t}, K^{LB}_{i,j,t}, \alpha, \beta, \gamma)}{\Delta t_s} =$$

$$= \lambda_0(t) \exp(\alpha'^l_k \, \mathrm{K}^L_{i,t} + \beta'^b_k \, \mathrm{K}^B_{j,t} + \gamma'^{lb}_k \, \mathrm{K}^{LB}_{i,j,t}) \tag{1.1}$$

where t_s is the time when a switch from the initial state of interbank relationship occurs; T_s is the span that passes before the switch occurs; $\lambda_0(t)$ is the baseline hazard function that describes the probability of leaving the initial state of relationship for hypothetical banks with no set of characteristics, which serve as a reference group. The duration model also allows one to infer the determinants of duration, which in my case are captured by the adjustment factor $\exp(\alpha'^l_k \mathrm{K}^L_{i,t} + \beta'^b_k \mathrm{K}^B_{j,t} + \gamma'^{lb}_k \mathrm{K}^{LB}_{i,j,t})$, where $K^L_{i,t}$ is a matrix (nt x k^l) of lending banks' characteristics; $K^B_{i,t}$ is a matrix (rt x k^b) of borrowing banks' characteristics; and $\mathrm{K}^{LB}_{i,j,t}$ is a matrix (nrt x k^{lb}) of the characteristics capturing interactions between lending and borrowing banks. The logarithm of λ is linear in $\alpha'^l_k \mathrm{K}^L_{i,t} + \beta'^b_k \mathrm{K}^B_{j,t} + \gamma'^{lb}_k \mathrm{K}^{LB}_{i,j,t}$, where α, β, and γ are vectors of coefficients. Each coefficient therefore measures the proportional change in the hazard rate that can be attributed to an absolute change in the regressors. Finally, k^l, k^b, and k^{lb} indicate the different number of regressors in each matrix.

Computationally, it is standard to adopt the Weibull model as a functional form of the baseline hazard $\lambda_0(t)$.[5] It states that:

$$\lambda_0(t) = \theta \, \varphi \, t^{\varphi-1} \tag{1.2}$$

where $\theta > 0$ and $\varphi > 0$ are unknown parameters. On the basis of estimations: when $\varphi = 1$, the distribution exhibits constant duration dependence; when $\varphi > 1$, positive duration dependence; and when $\varphi < 1$, negative duration dependence.

Once the existence of stable relationships has been investigated, the second step analyses the determinants of strong relationships. To this end, preliminarily, I measure the strength of each lending and borrowing relationship through two indexes. The first is computed as the ratio between the total funds that i lends to j ($L^{i \to j}$) and the total funds that i lends in the interbank market

---

[5] I also use other baseline hazard functions as robustness checks. See Section 5.

$(\sum L^{i \rightarrow N_t})$, which gauges whether j is a substantial interbank borrower of i (substantial borrower index, hereafter SBI):

$$\text{SBI}_{i,j,t} = [\frac{L^{i \rightarrow j}}{\sum L^{i \rightarrow N_t}}]_t , \qquad (2.1)$$

where $i, j = 1, 2, \ldots, N_t$ indicate all pairs of banks $i \neq j$; and $t = 1, 2, \ldots, T$ are the time periods. The subscript t in N_t indicates that the number of banks operating in the interbank market and the number of counterparties change over time and across banks.

The second index is computed as the ratio between the total funds that i borrows from j ($B^{i \leftarrow j}$) and the total funds that i borrows in the interbank market ($\sum B^{i \leftarrow N_t}$), and gauges whether j is a substantial interbank lender of i (substantial lender index, hereafter SLI):

$$\text{SLI}_{i,j,t} = [\frac{B^{i \leftarrow j}}{\sum B^{i \leftarrow N_t}}]_t . \qquad (2.2)$$

The higher the two indexes, the closer the interbank customer relationship. As a check, I also construct alternative measures of the two indexes based on the number of interbank relationships rather than on transacted quantities.[6]

Next I analyse the determinants of these indexes; that is, I try to detect the banking characteristics that strengthen interbank relationships. Again, as in equation (1.1), I investigate the determinants of my indexes using as regressors both lender-side and borrower-side characteristics along with variables measuring the interactions between lenders and borrowers. In formal terms, I estimate the following equation:

$$I_{i,j,t} = \alpha'_k{}^l K^L_{i,t} + \beta'_k{}^b K^B_{j,t} + \gamma'_k{}^{lb} K^{LB}_{i,j,t} + \eta_{i,t} \qquad (2.3)$$

---

[6] Thus, I calculate the relationship between i and j as one to the number of banks that i lent to (or borrowed from) during each period. My indexes are similar to those computed by Furfine (2001); Cocco *et al.* (2009); and in general to those extensively utilized in the literature on bank-firm customer relationships (e.g. Elsas, 2005).

where $I_{i,j,t}$ is equal alternatively to either $SBI_{i,j,t}$ or $SLI_{i,j,t}$, defined in equations (2.1) and (2.2); α'^{l}_{k}, $K^{L}_{i,t}$, β'^{b}_{k}, $K^{B}_{j,t}$, γ'^{lb}_{k}, $K^{LB}_{i,j,t}$ are defined as in equation (1.1), and $\eta_{i,t}$ is the idiosyncratic error $\sim$ i.i.d. $(0, \sigma^{2}_{\eta})$. Since my indexes capture the cross-sectional and the longitudinal dimension of interbank customer relationships, the second step uses the panel estimation as a basic regression model.

The third step investigates both the effects of the crisis on interbank customer relationships and the way in which interbank customer relationships affect the consequences of the crisis, repeating the exercises of the two previous steps after splitting the entire sample period into two time spans, before and after the crisis.

3. Data

3.1 Key variables: duration and strength of interbank relationships

In the first step, the key variable is the duration of each interbank relationship. In the second step, the dependent variables are the indexes SBI and SLI, computed first on the quantities of interbank exposures in the basic estimations, and then, as a check, on the number of counterparties. In the third step, all the key variables are used. Table 1 reports their summary statistics. Table 2 shows the relations among them, when computed as averages, first by each bank, and then across banks and over time.

All the key variables are computed on monthly Italian bank-by-bank data, drawn from the Bank of Italy's prudential supervisory reports. The Bank of Italy collects information on gross bilateral interbank exposures (assets and liabilities of each bank), and the identity of every counterparty. My sample covers monthly data from June 1998 to April 2009, so the number of time periods is: $t_i = 1, 2, …, T_i$, where $T_i = 131$ if the bank is always present in the interbank market. Since in Italy all banks, including branches of foreign banks, must report to the Bank of Italy, my data refer to all banks operating in Italy. The number of banks $i = 1, 2, …, N_t$ varies in each t from 833 in June 1998 to 771 in April 2009. The number of counterparties $c_{i,t} = 1, 2, …, C_{i,t}$ varies across banks and over time. The final number of observations is $T_i N_t C_{i,t} = 460,964$.

Three aspects deserve emphasis. First, I focus on quantity measures of interbank customer relationships. This choice is not unusual. Emphasis on the quantity dimension has been growing in the literature on interbank markets (e.g. Furfine, 2004 and 2009; King, 2008; Dinger and von Hagen, 2009; Cocco *et al.*, 2009) and is common in the related literature on firm-bank relationships.

Moreover, it allows me to analyse all Italian interbank exposures, including over-the-counter ones for which interest rate data are not available.

Second, although interbank activity is usually at very short maturities, I use end-of-month stocks for my dependent variables, because data on quantities are not available on a more frequent basis. For example, Cocco *et al.* (2009) and Angelini *et al.* (2011) utilize daily data for interest rates, but quarterly or yearly data for their regressors; King (2008) uses only quarterly data; and Dinger and von Hagen (2009) only yearly data.

Third, my key variables are computed on the component of interbank transactions carried out domestically by banks belonging to different banking groups (inter-group exposures). In other words, I dropped the data on non-domestic and intra-group transactions. The non-domestic exposures are removed simply because, although the Bank of Italy's database allows one to obtain the stock of interbank exposures from and to abroad, I could not determine the characteristics of foreign counterparties as regressors. The intra-group (or internal capital market) exposures are removed because these transactions fit into a group-specific scheme, are likely to be decided by the parent bank, and are affected by group task-sharing (e.g. Houston *et al.*, 1997; de Haas and van Lelyveld, 2010). In any case, although intra-group and cross-country transactions were eliminated from the key variables, I retained them as two explanatory variables.

In order to eliminate the intra-group exposures, I used information on the identity of each counterparty and its group. For the banks that changed group during my sample period I traced the current group of affiliation in each t_i, and analyzed their effective inter-group relationships in each period. To exemplify how I computed the span T_s in these cases, let us assume three banks initially belonging to two banking groups: a to group A; b and c to B. Let us assume also that the three banks maintain always mutual interbank exposures, and at t_s c is acquired by group A. Before t_s, I exclude the transactions between b and c as intra-group. After t_s, my counting: (i) continues unchanged for the relationships between a and b because the two banks were and remain in different groups; (ii) ends for a and c because their mutual exposures become intra-group; (iii) starts for the first time for the transactions between b and c because their relationship becomes inter-group.

My approach works well even when an interbank relationship ends because one of the two involved banks leaves the market as a consequence of a merger. In fact, in such circumstances in the abstract there may be a (disputable) measurement error, but in practice in my sample it is unimportant. To clarify this point, let assume again three banks: x and y have an interbank relationship before t_s, and x leaves at t_s because it merges with z. At t_s, my counting of duration of the

relationship between *x* and *y* obviously ceases. Also at t_s, for *y* and *z* there are four hypothetical cases: *y* and *z* (i) continue to have no relationship; (ii) continue a previous relationship; (iii) cease their relationship; (iv) establish a relationship. In the first three cases, my counting of duration does not present problems. Only in the last case, the relationship between *y* and *z* might possibly derive from the past relationship between *x* and *y*, whereas I begin a new count . However, in practice such situations are negligible in my sample.[7]

Figures 1 and 2 plot outstanding amounts and percentage shares of total assets of four kinds of interbank exposures: total, non-domestic, intra-group and inter-group. The figures show that, apart from non-domestic exposures (Cassola *et al.*, 2008; Heider *et al.*, 2009), the amounts of Italian interbank domestic exposures have not fallen since the onset of the crisis. The figures also show that inter-group activity accounts for a relatively small share of total transactions among banks, while an increasing majority is accounted for by the internal capital market. Therefore, my approach serves to remove a large quantity of misleading and noisy information.

An examination of my descriptive statistics serves mainly to confirm the need for more sophisticated statistical tools. The average duration of an interbank relationship is 28 consecutive months, when the average is computed on the *ongoing* duration in each period; it lengthens to 47 consecutive months, when the average is computed on the *final* duration of all relationships; and to 96, when the average is computed on the *final* duration of the *longest* relationships of each bank (Table 1). The average number of borrowers is 5 and the average number of lenders 8. The greater concentration of the borrowing side is confirmed by the average value of SBI, equal to 0.19, which is higher than the average value of SLI, 0.13. In general, longer relationships are associated with stronger relationships and fewer counterparties (Table 2). However, there is no lack of non-linear effects. The hypothesis of the existence and strengthening over time of interbank customer relationships seems to be supported by the fact that the average values of SLI and SBI are increasing (Figure 3), and the number of counterparties is decreasing (Figure 4). On the other hand, these average developments may simply derive from the general process of banking concentration. Figure 5 plots different specifications of the final duration of interbank relationships, both in terms of the

---

[7] There is a second − not less relevant − reason why my approach works well even in the case of point (iv). For completeness on this issue, it is useful to deal with this second reason here, even if I have not yet described my estimations in detail. The case of point (iv) represents a (potential) measurement error. The only possible effect of this error would be to underestimate the length of span T_s. However, since in my estimations I find that relationships are long and stable, my outcomes would have been even stronger without this error. Furthermore, I also checked this issue empirically in my regressions, adding a dummy variable for bank mergers. The dummy had no impact on the likelihood of terminating an interbank relationship or on the other regressors.

number of months and as a percentage of the effective presence in the interbank market. If one refers to the longest interbank relationship of each bank, about 70 per cent of banks and 80 per cent of the interbank market maintain at least one very long-lasting relationship (at least 81 consecutive months or more than 80 per cent of the periods of interbank activity). On the other hand, if one refers to the average duration of all relationships, the distribution is much more uniform.

3.2. Explanatory variables and expected signs

Table 3 lists my explanatory variables, tells how they are calculated, and gives their summary statistics. All regressors are dummy variables, ratios or natural logarithms.[8] My regressors belong to the matrixes $K^B_{j,t}$, $K^L_{i,t}$, and $K^{LB}_{i,j,t}$ of equations (1.1) and (2.3) depending on whether they refer to borrowers, lenders or both. The covariates may be classified in six groups on the basis of the effect they proxy (Table 4).

The first variable, Relationship Duration, is similar to the key variable in the first step of the analysis (T_s in equation 1.1), and thus is used as a regressor only in the second and third steps.[9] In fact, in addition to being the object of the analysis in the first step, the duration of a relationship may affect its strength. In particular, its expected sign is positive if interbank customer relationships persist over time and their length positively affects their strength (as this relates to bank-firm relationship, see Petersan and Rajan, 1994; Berger and Udell, 1995).[10]

The second group of regressors includes seven borrower-specific variables, which are related to agency problems (Table 4, second column, upper panel): Size, Capital, Bad Loans, Structure of Income/Opacity, ROE, Rating, and Banks without Rating. The expected sign of these variables is *ex-ante* ambiguous. On the one hand, if a regressor signals higher asymmetric information, the expected effect on my dependent variables is negative. On the other hand, as is argued in the literature on

---

[8] Estimations of the three steps of my analysis are carried out using banks' previous-quarter balance sheet items to resolve possible endogeneity problems and to replicate the publication delay needed for banks to assess one another.

[9] As a robustness check, Relationship Duration is computed in three alternative ways. First, in the basic estimations, it counts in each period the integer number of consecutive months elapsed in my sample since the start of an interbank relationship between each pair of banks. Equivalently to T_s, the counting starts over whenever a relationship resumes after a break of any length, even one month. Second, to control for the size of the exposures, I recalculated the variable removing the smallest relationships, i.e. those below either the 10th or 25th distribution percentile of SBI and SLI. Third, to control for the effective period of activity of each bank, I computed the variable as a ratio between the number of consecutive months and the total number of months in which the bank is active in the interbank market, such that the variable continues to assume increasing values but weighted for the effective period of activity. In the first definition of the variable, the values and number of observations of Relationship Duration and the spans T_s are partially different (Tables 1-3). This is because T_s excludes one-period relationships, while Relationship Duration counts them as lasting one month.

[10] As detailed in Section 4, the signs of coefficients have an opposite interpretation in my first and second steps of analysis. In particular, in a partially counterintuitive way, the hazard rate estimation predicts that negative coefficients of covariates indicate a longer duration. In this section, I comment on the expected signs in the "intuitive" way.

relationships between banks and non-financial corporations, customer relationships can overcome agency problems, so borrowers may be financed mainly when troubled in the short term and the effect of testable indicators may turn out to be inverted (e.g. Chemmanur and Fulghieri, 1994; Petersen and Rajan, 1994, 1995; Berlin and Mester, 1999; Kashyap *et al.*, 2002).[11]

Two regressors in this group measure the role of rating agencies. "Rating" is coded so as to take values from 1 to 11, where 1 corresponds to the best rating class and 10 to the worst, with 11 assigned to banks with no rating. At the same time, following Angelini *et al.* (2011), I use a dummy variable, "Banks without Rating," that takes the value of 1 for banks with no rating and 0 otherwise. In the estimations, I use four different kinds of credit scores taken from the agency Fitch through the database of Bloomberg.[12] Being an inverse measure, the expected sign of borrowers' Rating is negative if lending banks trust credit rating agencies and use them to value the creditworthiness of borrowing banks; it is positive (or possibly insignificant) if lending banks distrust rating agencies or if interbank customer relationships render their judgement pointless. The prediction of the dummy Banks without Rating is equally uncertain (see Morgan, 2002; Flannery, Kwan, and Nimalendran, 2004).

The seven regressors of the third group of variables are equivalent to the previous ones, but are referred to lenders instead of borrowers. In this case, they do not measure agency problems, but the lending capacity of banks. Their predictions are equally open. For example, lenders' Capital and ROE are positive if only well-capitalized and profitable banks are lenders in the interbank market but negative if well-capitalized and profitable banks are more active outside than inside the interbank market.

The fourth group of regressors concerns three variables related to borrowers' and lenders' liquidity situation. Fund Raising measures the level of liquidity of each bank; Volatility of Liquidity measures the related degree of volatility; and, following Cocco *et al.* (2009), Liquidity Shocks

---

[11] "Size" is particularly interesting in this field of research because of the classical "too big to fail" argument, according to which its effect should be positive as larger banks are more likely to obtain interbank loans because they should not go bankrupt. Moreover, larger firms are typically considered less opaque and thus more creditworthy. On the other hand, the effect might be the opposite because: (i) at least in the wake of the financial turmoil, the Lehman Brothers' failure could have reversed the traditional "too big to fail" argument or made it harder to determine who is "too big"; (ii) larger banks might demand less interbank funding, as they can count upon other sources. The name "Structure of Income/Opacity" derives from the fact that this variable is often used as a proxy of asymmetric information because fee-generating activities are considered less easy to read by other agents compared to interest-generating activities.

[12] Angelini *et al.* (2011) find that Fitch ratings are more informative in the assessment of banks and financial firms. All the credit ratings are obtained as a monthly average of ratings available daily. My first choice is the overall individual rating; the other three types of credit rating are: support, long-term and short-term issuer default rating. Again following Angelini *et al.* (2011), I assign the rating of the controlling company to banks that do not have their own rating but belong to groups with rated banks. However, as a check I remove this hypothesis.

Correlation measures the correlation between the liquidity shocks of each pair of banks. The predictions are again open. For example, the higher Fund Raising is, the less likely a bank should be to request funds from other banks, and the more likely it should be to offer funds. However, the sign might be opposite if, for example, highly liquid banks choose more remunerative investments than interbank lending.

The fifth group of variables includes five covariates that proxy the use banks make of their liquidity. Three regressors refer to both borrowers and lenders: Total Loans, Non-Domestic Assets, and Total Shares. Two are calculated only for borrowers: Intra-group Interbank Net Position measures the net position of each bank inside its banking group (the internal capital market); Non-Domestic Interbank Net Position measures the external net position of each bank. The expected sign of these variables depends on the relative importance of each kind of business.

The last category of regressors comprises two variables called "Securities Interaction", standing for the securities issued by the borrower and held by the lender or vice-versa. These are proxies of the interactions between borrowers and lenders outside the interbank market, the idea being that, as in bank-firm relationships, the information that banks obtain by offering multiple services may be of value in lending (e.g. Degryse and Van Cayseele, 2000). The expected sign is therefore positive.

4. Results

4.1. First step: stability and existence

The results of the first step are reported in Table 5, which presents seven specifications, variously mixing the explanatory variables. Specification (1) is empty of regressors, and the focus is only on the value of the parameter φ of equation (1.2); Specification (6) includes bank-by-bank dummies and the full range of regressors presented in Table 4; Specification (7) includes as regressors also the number of bank counterparties.

The first relevant outcome is that the parameter φ is always significantly less than one, even when, as expected, it increases slightly owing to the addition of the explanatory variables.[13]

---

[13] Besides permitting the estimation of the determinants of duration, the inclusion of regressors serves to control for heterogeneity across observations, and according to Heckman and Singer (1984) and Ongena and Smith (2001) it eliminates possible biases in the outcomes of the parameter φ. In this light, I also ran regressions with and without a time dummy to allow for macroeconomic trends and in particular for the monetary policy stance (Affinito and Farabullini, 2009).

Therefore, interbank customer relationships exhibit negative duration dependence: they exist and are stable, because the probability of their ending or breaking off decreases over time.

The second lesson of this first step concerns the factors driving the probability of ending an interbank relationship. On the borrower side, the duration of interbank relationships is longer: first, if borrowers are well-capitalized and profitable (borrowers' variables Capital and ROE are significantly negative); second, if their business focuses more on fee-generating services than on interest-generating activities (Structure of Income/Opacity is significantly negative); third, if they are either non-rated or well-rated; fourth, if they are net lenders inside their domestic banking group or abroad (Intra-group Interbank Net Position and Non-Domestic Interbank Net Position are significantly negative); and finally if their lending activity is florid (Total Loans is significantly negative). On the contrary, the probability of ending an interbank relationship earlier increases if borrowers are large (Size is significantly positive) and if their liquidity is high in amount and volatility.

On the lender side, the duration of interbank relationships is longer if lenders are well-capitalized, profitable, and liquid. But duration shortens if lenders are large, burdened with non-performing loans, unrated, liquidity-volatile, or with investment directed to other business (Total Loans and Total Shares are significantly positive).

On the interaction side, the duration of interbank relationships increases if borrowers and lenders interact outside the interbank market. In Specification (7), I included as regressors the number of lenders (lending to borrowers) as well as the number of borrowers (borrowing from lenders). The sign of both regressors is significantly negative. This means that the probability of prolonging one's own interbank relationships increases with the number of counterparties.

All the specifications indicate that interbank relationships are long. During my sample period of 131 months, they lasted on average for 70 and 108 consecutive months, respectively, using Specification (7) and (1), and the average values of the explanatory variables. The duration of relationships among banks appears to be particularly long in view of the typically very short maturities of interbank exposures. To verify the robustness of this estimate, I repeated the first step after removing the small relationships, as one could conjecture that duration dependence may change with size of exposure. In an extreme case, banks might maintain some stable relationships but based on small quantities, while doing most of their interbank transactions with rotating counterparties. To control for this, I removed alternatively the exposures under the 10th, 25th and 50th distribution percentile of SBI and SLI defined in equations (2.1) and (2.2). In all cases, φ always remained

significantly less than one. The estimate of the duration diminished but never fell below 60 consecutive months.

Using Specifications (6) and (7), I also quantified the estimated effect of the different regressors on the expected duration of interbank relationships. The last columns of Table 5 report the change of duration in months when shifting from the 25th to the 75th percentile of the distribution of each regressor. For example, moving from the 25th to the 75th percentile of borrowers' Fund Raising, namely comparing two borrowers, one illiquid and the other liquid, the duration of interbank relationships decreases by 97 periods according to Specification (6) and by 66 according to (7). The other economically significant factors in lengthening duration are: both lenders' and borrowers' Total Loans; lenders' Fund Raising; and borrowers' rating and credit scores. Interestingly, a crucial lengthening role is also played by borrowers' Non-Domestic Interbank Net Position: transferring funds abroad does not diminish but actually extends the duration of interbank customer relationships.

4.2. Second step: strength and determinants

Table 6 reports the results of the second step for eight specifications, containing the same covariates for both SLI and SBI.[14] Other estimations are described in the next Section as robustness checks. As is clear in Table 6, and as I explain in this and in the next Section, the results are robust.[15]

The same variables, both on the borrowers' and the lenders' side, often have different signs in the estimations of the SLI and SBI. This depends on the different role played by banks, on the one hand, as "substantial lenders" or "substantial borrowers", and, on the other hand, as "lenders of substantial borrowers" and "borrowers of substantial lenders".[16]

---

[14] As mentioned, in the second step I use panel estimation as a basic model. It is worthwhile clarifying four aspects. First, I ran both fixed effects and random effects models. Results remained stable, in part because my T is large enough. I present results of the fixed effects because the individual effects and the explanatory variables are likely to be correlated, as signalled by the Hausman test. Second, I attempted to cluster both at the borrower and at the lender level. In the specifications displayed, the fixed effects capture the borrowers in the SBI and the lenders in the SLI, as they are the object of the selection process in each respective equation. However, results were stable after switching the individual effects, because I added counterparty dummies consistently with the relevant literature and in line with the presence of the counterparty's characteristics among regressors. Third, as in the first step, I ran regressions with and without a time dummy. Fourth, I adopted the fixed effects adjusting the standard errors for general forms of heteroskedasticity and autocorrelation (Arellano, 1987).

[15] Very few regressors appear less stable: 5 out of 68 total regressors. In Section 5, I discuss the reasons of this minor stability. Coherently with the first step, I also ran regressions including as regressors the numbers of counterparties. Although the results were confirmed, I decided not to use those estimations in the second step because (i) my dependent variables already discount the number of counterparties; and (ii) the inverses of the number of counterparties are used as alternative dependent variables in unreported but consistent estimations.

[16] The different effect determined by the same variables in the asset and in the liability side is typical of the literature on interbank markets. The use of the same regressors in the estimations of the two indexes allows me to detect some interesting, sometimes uneven and sometimes mirrored, results. For example, the variable Size presents uneven results. In the SLI, substantial lenders of small borrowers tend to be large banks (the signs of variable Size are negative for

The first variable, Relationship Duration, which is always significantly positive, confirms the persistence of interbank relationships found in the first step and signals that the longer a relationship is, the more likely it is to be strong.

Taken together, the regressors associated with borrowers' agency problems show that although interbank customer relationships exist and persist, monitoring activity on borrowing banks seems to remain necessary. As mentioned, *ex-ante* one might reasonably argue that repeated interbank transactions would allow banks to assess one another and create mutual trust regardless of the short-term conditions. But my outcomes show that interbank customer relationships are based on the observable characteristics of borrowers. In fact, according to the SBI estimation, substantial borrowers tend to be chosen if they have larger Size, greater Capital and less Bad Loans.[17]

The regressors that proxy lending capacity show that substantial lenders have larger Size, lower Capital and a heavier burden of Bad Loans. This seems to suggest that poorly capitalized banks are more likely to be substantial interbank lenders because they are less likely to invest outside the interbank market. As a consequence, they have more bad loans, because they are less accustomed to or less skilled at monitoring the creditworthiness of their non-bank customers; yet they are unrated or well-rated (lenders' Banks without Rating is positive and Rating is negative), because they are likely to assume less risk outside the interbank market.

As far as liquidity is concerned, substantial borrowers tend to be those with sizeable liquidity needs due to both low Fund Raising and high Volatility of Liquidity. On the other hand, banks with high Fund Raising are not substantial lenders, as one might expect, confirming that these banks are more likely to search for more profitable investments outside the interbank market. However, substantial lenders do tend to have low Volatility of Liquidity. The picture remains consistent also as regards Liquidity Shocks Correlation. Borrowers tend to rely on substantial lenders with low Volatility of Liquidity and hence do not worry about Liquidity Shocks Correlation, which turns out to be positive (SLI estimation). In contrast, lenders tend to select substantial borrowers with high Volatility of Liquidity, provided that Liquidity Shocks Correlation is negative (SBI estimation).

The regressors linked to liquidity motivations confirm that when banks are substantial lenders, they are less involved in other kinds of businesses (in SLI, lenders' Total Loans, Non-

---

borrowers and positive for lenders). In the SBI, substantial borrowers of small lenders tend to be large banks. This result is typical and is also due to the fact that larger banks weight more on the balance sheets of their counterparties. An example of mirrored result is represented by the variable Bad Loans. When substantial lenders have high Bad Loans, so have borrowers (SLI estimation); when the value of the ratio is small, it is small for both of them (SBI).

[17] The outcomes of the two borrower variables linked to rating agencies are described in the next sub-section because the results of these two variables seem to depend on a different attitude of banks before and after the financial crisis.

domestic Assets, and Total Shares are negative). At the same time, substantial borrowers rely on interbank relationships to finance all their activities (in SBI, the three borrowers' variables are positive). Moreover, the likelihood of being substantial borrowers increases when banks are net lenders inside a domestic group or abroad, because in such circumstances banks demand a comparatively large amount of funds from every lender in order to set up a stable financing source for themselves, the whole group, and their foreign counterparties.[18]

Finally, the two symmetrical variables Securities' Interaction usually have a positive and significant coefficient showing that interactions undertaken by banks outside the interbank market strengthen their relationship.[19]

4.3. Third step: During the crisis

As explained in Section 2, in order to verify whether interbank customer relationships have continued to exist, and how they functioned during the crisis, I split my entire sample period into two spans, before and after August 2007, the consensus date for the onset of the crisis, and repeated the exercises of the previous two steps.

The most significant conclusion is that interbank customer relationships survived the crisis. The parameter φ is always significantly less than one for equations (1.1) and (1.2) over the months following the onset of the crisis (not reported). Nevertheless, banking practices have changed and adapted, as is shown by the reshaping of coefficients in the estimation of equations (2.1)-(2.3). Table 7 reports the results of Specification (8), chosen because it contains the full range of my explanatory variables. The effect of Relationship Duration is very noticeably unmodified after the meltdown, signalling that the length of the relationship remains a crucial factor in explaining when a bank is a substantial lender or borrower. By contrast, the sign or the statistical significance of some relevant determinants are different before and after the crisis.

First, after the crisis, substantial lenders are rated (in SLI, lenders' dummy Banks without Rating is positive before the crisis and becomes negative after the crisis), and have worse ratings (the variable Rating becomes positive). However, they have higher capital, a higher level of liquidity, a larger amount of loans, and are less opaque. At the same time, borrowers of substantial lenders are

---

[18] On the other hand, in the SLI both regressors are negative. This means that, when a bank is a net lender inside a domestic group or abroad, it does not select one particular lender because it is likely to request funds from many banks.
[19] Interestingly, however, the sign is negative in the SBI for securities held by borrowers and issued by lenders. This seems to corroborate the idea that substantial borrowers do not choose their lenders but are chosen by them.

financed even if, or mainly because, they are in trouble, having less capital, worse ratings, lower ROE, and fewer loans. Moreover, they are financed regardless of bad loans or of being rated.

Second, after the crisis, substantial borrowers are picked out if they have easy-to-read balance sheets (in SBI, Structure of income/Opacity is insignificant before the crisis but becomes significant and negative after it) and higher profits, but with no regard for their rating, liquidity volatility and correlation. Moreover, the financing of substantial borrowers is unrelated or inversely related to the interactions outside the interbank market (in SBI, after the crisis, the two Securities' Interaction variables become, respectively, insignificant and negative). At the same time, lenders of substantial borrowers provide liquidity even if they have less capital, and regardless of their bad loans, structure of income, rating score, amount of loans and shares (these variables become insignificant).

As noted in the previous Section, the results of borrowers' rating and credit scores before and after the crisis are particularly interesting, and clarify the role of rating agencies in the selection of substantial borrowers. In fact, before the crisis, substantial borrowers were chosen either if they were unrated or, if rated, if they had good scores. On the contrary, after the crisis the presence of rating and credit scores become unimportant and substantial borrowers seem to be selected on the basis of a pure lender's assessment.

The marginal effects of the explanatory variables confirm this picture. Table 8 displays the percentage change that both indexes, SLI and SBI, undergo in moving from the 25th to the 75th distribution percentile of each regressor, before and after the crisis. In general, the main determinants are very similar to those concerning the duration of interbank relationships: Size, Fund Raising, Total Loans, rating, and credit scores. Like Furfine (2001), King (2008), and Angelini *et al.* (2011), I find that Capital and Bad Loans play a statistically significant yet economically modest role. Mainly, my results show that the length of relationships affects both SLI and SBI positively and powerfully, both before and after the crisis.

The marginal effects also confirm in terms of economic impact that after the crisis the healthier banks are willing to be substantial lenders and that troubled banks are not deprived of interbank financing. These outcomes corroborate the general predictions of the literature on customer relationships, while for example contradict the hypothesis of Acharya *et al.* (2008), who conjecture that it may be rational for banks with a liquidity surplus not to provide liquidity to needy banks, in hopes of picking up their assets at fire-sale prices.

5. Robustness checks

In addition to the checks described in the previous Sections,[20] I tested the robustness of my results in several additional ways.[21]

5.1 Left and right censoring

Typical of this kind of analysis, my first step suffers from both left and right censoring, which may cause biased and inconsistent estimations (Heckman and Singer, 1984; Kiefer, 1988). Censoring arises because, in order to determine exactly when a relationship starts and ends, one must know its complete history (relationships that began prior to the dataset are left-censored, those continuing after the dataset are right-censored). In this regard, the advantage of my dataset is its length and frequency; my results are confirmed when estimations are carried out over different sub-sample periods; and right-censoring should not jeopardize my findings because, on the contrary, it presumably increased rather than decreased φ in equation (1.2). Nonetheless, I again followed the strategy adopted by Ongena and Smith (2001), and added further checks, in order to assess the sensitivity of my outcomes to censoring. For left-censoring I used two methods: (i) rerunning the regressions on a large number of hypothetical new starting dates; and (ii) eliminating the left-censored observations. For right-censoring, I used three methods: (i) expressing the log-likelihood function as a weighted average of the sample density of completed duration spans and the survivor function of uncompleted spans; (ii) eliminating the right-censored observations; and (iii) calculating the duration of each relationship by considering it either as ended or not after one month, two months or three months of interruption. In all cases, φ remained smaller than 1 both on my entire sample period and after the crisis.

5.2 Different baseline hazard functions

---

[20] In fact, although dispersedly, I have already noted that my outcomes are robust to the following checks: (i) the inclusion of a dummy variable assuming value one when a bank merger occurs, in order to control for relationships terminated because of a merger; (ii) the estimation of φ removing the small relationships, i.e. those under the 10th, 25th and 50th percentile of SBI and SLI; (iii) the alternative measure of SBI and SLI based on the number of interbank relationships rather than quantities transacted; (iv) the two alternative computations of the variable Relationship Duration (the former obtained removing the smallest exposures; the latter calculated as a ratio between the number of consecutive months and the total number of operating months of each bank); (v) the adoption of fixed and random effects in the second and third step; (vi) clustering at borrower and lender level; (vii) the inclusion of a time dummy; (viii) the use of the other three types of credit ratings taken by Fitch; (ix) removal of the hypothesis that the same rating applies to unrated banks of the same group.

[21] Since results always remained very similar to those reported in Tables 5-8, for brevity, I limit the use of additional tables, but, all the robustness checks are available from the author upon request.

In addition to the Weibull hazard function, I estimated equations (1.1)-(1.2) using as an alternative baseline hazard function for $\lambda_0(t)$ the log-logistic, which allows non-monotonic duration dependence. Consistent with my main results, this regression showed that interbank relationships are more likely to end very early, but later on continue to exhibit negative duration dependence. In any case, both the larger log likelihood and the smaller AIC values confirmed the preference for the Weibull model.

5.3 Controlling for endogeneity: discarding explanatory variables and IV estimations

One concern with the fixed effects estimator used in the second step is that the covariates should be strictly exogenous and thus should not depend upon the history of $I_{i,j,t}$ in equation (2.3). To verify the stability of each explanatory variable, and in general to test for possible collinearity, I discarded, in turn, each of the regressors of the matrixes $K^L_{i,t}$, $K^B_{j,t}$, and $K^{LB}_{i,j,t}$. The results can be summarized as follows. First, only a few regressors exhibit less stability: there are only three in the SBI (borrowers' variables Size, Capital, and Volatility of Liquidity); and there are only two in the SLI (borrowers' Rating and lenders' Fund Raising). Second, these regressors never switch the statistical significance of their sign. Third, neither their inclusion nor their exclusion is apt to affect the other regressors. Fourth, the instability of these five variables would not seem to be due to an intrinsic weakness, but to the different roles played before and after the crisis. As a further robustness check, I employed the IV estimator for several variables, with a single IV estimator for each variable or a multiple endogenous regression, where an instrumental variable is included for each potential endogenous regressor. As a vector of instruments, I used either the other regressors or the same regressors computed with a two-quarter lag. The outcomes were always confirmed.[22]

5.4 Banking group consolidated data

One salient feature of the Italian banking system is the widespread presence of banking groups. I have already taken this fact into account because: (i) my key variables in all steps are constructed after eliminating interbank transactions involving banks belonging to the same group; (ii) I used the net intra-group position of each borrower as a control variable. Nevertheless, in order to verify that the composition and the needs of groups do not invalidate my outcomes, I used another, more radical, methodology, consolidating all the data of banks affiliated in the same groups,

---

[22] In particular, although they were expected to be more subject to endogeneity problems, the results were always confirmed for the following variables: Relationship Duration; Liquidity Shocks Correlation; Securities Interaction; borrowers' Rating; Intra-group and Non-Domestic Net Interbank Position.

thus transforming my bank-by-bank data into group-by-group data. In this way, I reran the regressions not for each bank *i* on each other bank *j*, but for each group on each other group. Remarkably, in spite of a drastic reduction in the number of observations and minor changes in coefficients and their significance levels, all outcomes remained confirmed.

5.5 Changing start dates and time spans

In addition to the inclusion of a time dummy, in order to test the sensitivity of my results on different dates and periods, I employed many checks, in particular in the third step. First, I experimented with alternatives to August 2007 as the starting point of the meltdown (e.g. Taylor and Williamson, 2009). I brought forward the outset of the crisis by one or two months (the idea being that some indicators might have changed earlier); also, in the opposite direction, I postponed the crisis by one, two, three, or four months (the idea being that some indicators might have changed later); moreover, I considered the crisis as beginning in September 2008 (with the Lehman failure and exacerbation of the financial crisis). Second, in a similar way, I tested the stability of the results of the pre-crisis period, which is much longer in my sample, repeating the exercises on different and shorter pre-crisis sub-periods. In particular, I tested the results of my pre- and post-crisis comparison by juxtaposing two periods of the same length, that is, comparing the last 21 months prior to the critical point with my 21-month-long post-crisis period.[23] In all cases, results remained stable.

5.6 Adding explanatory variables

In my exercises, I used four extra explanatory variables, which I chose not to display because their time-series are shorter or available for a much smaller sub-set of banks. The first additional regressor is the monthly percentage change in the price of listed banking shares, taken from the Italian Stock Exchange. Its effect turned out to be insignificant. Moreover, on average, there were only 30 listed banks in Italy during my sample period. The second is the 5-year credit default swap, obtained from Datastream. Though interesting, this regressor conflicts with the credit rating and is only available for a handful of banks. The third supplementary regressor is interbank interest rates, calculated as monthly averages of daily data drawn from the *e*-MID, a multilateral screen-based trading facility on which banks electronically exchange interbank deposits and loans. As with the key variables, one can learn the identity of each borrower and lender, and how much each

---

[23] Furthermore, since the Bank of Italy's new prudential supervisory reports went into effect as of December 2008, and this could have produced some discontinuities in my time-series, I repeated all estimations by dropping the last few periods.

intermediary pays or receives. The results indicate that borrowing banks, which pay a lower interest rate, rely more on interbank customer relationships. Nonetheless, while my data on quantities cover the whole Italian interbank market, including over-the-counter transactions, the data sourced from the *e*-MID cover only a small market share. The fourth additional regressor is the ratio of securitized loans to total assets, the idea being that securitizing banks have an additional channel to satisfy their liquidity needs (Affinito and Tagliaferri, 2010). However, the variable turns out not to be significant.[24] In any case, the inclusion of these additional variables left the other results unaltered.

5.7 Secured interbank loans

An alternative hypothesis to explain the persistence of interbank relationships after the crisis is an increase in collateralized interbank lending.[25] Moreover, the use of collateral could have affected my findings on other specific covariates.[26] However, this hypothesis seems to be contradicted by the descriptive statistics. As Figure 6 shows, secured interbank exposures – as a share of total domestic inter-group interbank exposures – decreased starting in 2002, and this trend did not change in the post-crisis period.[27] Nevertheless, I further checked this issue by running equations (1.1) – (2.3) after splitting the interbank inter-group exposures into *unsecured* and *secured* components, and handling in two alternative ways: either subtracting the secured loans from my dependent variables or using the ratio of secured to unsecured interbank exposures as an explanatory variable. The results in the two cases are equivalent. Table 9 reports an example of this kind of check for the second and third steps. Although the additional variable (secured/unsecured interbank exposures) is significantly positive, the results remain basically unchanged.

5.8 Contemporaneous borrowers and lenders

---

[24] Another way of taking account of securitized loans was to add them to the other loans (the same methodology is used in Albertazzi and Marchetti 2010 and De Mitri *et al.*, 2010) in two of my regressors: Bad Loans and Total Loans. In fact, because of securitizations, outstanding loans could decrease without an actual reduction in credit granted. However, the results of my two variables related to loans remained unmodified after this check.

[25] Actually, if this had been the case, then my variable Relationship Duration should have become insignificant, while it remains statistically and economically significant (on my entire sample period, before the crisis, and after the crisis). Nonetheless, allowing for collateralized exposures is useful, because otherwise (although interbank customer relationships continued to exist and banks continued to privilege counterparties with a pre-existing relationship) one might conjecture that, after the onset of the crisis, lending banks started to ask for collateral even from their usual counterparties; or it might even be conjectured that interbank customer relationships survived only thanks to an increase in collateral.

[26] For example, an increase in collateral could explain the pronounced irrelevance of rating agencies and borrowers' credit scores after the crisis.

[27] The secured exposures are interbank repos, which are secured by definition.

In my dataset, some pairs of banks lend to and borrow from each other at the same time. In order to verify whether such particular relationships depend on specific determinants, I repeated all my exercises both excluding this sub-sample of banks and restricting the analysis to it. All results were confirmed. In particular, in the second step limited to this sub-sample, I found that the variable Liquidity Shocks Correlation was always significantly negative, supporting the idea of Cocco *et al.* (2009) that customer relationships allow these banks always to insure against liquidity risk.

5.9 Outliers and quantile regressions

Results were confirmed when I allowed for outliers in the variables of my dataset, progressively removing 10, 15 and 20 per cent of tail observations. Results were similar also running quantile regressions in all steps of my analysis, though the levels of significance did change a bit. This suggests that the existence and the determinants of interbank customer relationships do not change after different thresholds.

5.10 Cooperative banks and branches of foreign banks

A set of checks was performed on cooperative banks and branches of foreign banks, because these two types of institution are often regarded as dissimilar to other banks. The results remained stable removing both types from all steps of my analysis and then removing each of them in turn.[28] Finally, I re-estimated my three steps alternatively on the two types of banks, even though the number of observations was now much smaller. The most interesting effect of this check was that φ becomes greater than 1, indicating that interbank customer relationships do not exist, between pairs of banks that are both cooperative or both foreign, while they do exist in all other cases.

6. Conclusions

As far as I know, the existence of customer relationships between pairs of banks has never been explicitly tested, and it is now of particular interest in view of the recent financial crisis. The literature on bank-firm customer relationships predicts that banks ensure the availability of credit to customer firms mainly during crises or in any case when the latter are in trouble. This paper shows that this also holds when both borrower and lender are banks. Therefore, interbank customer relationships may well be one of the reasons why in Italy during the 2007-2009 financial crisis banks did not lose mutual trust and inter-group domestic interbank exposures did not decline. This outcome

---

[28] In the first step, in particular, φ was always less than 1. In the second and third steps, the branches of foreign banks did not modify the results, and the only effect of removing the cooperative banks was to make some variables insignificant.

carries a relevant policy implication, in that it suggests that mutual confidential knowledge among banks and stable interbank relationships facilitate the reallocation of liquidity among banks even in crisis situations. The paper also analyzed the determinants of the duration of interbank customer relationships and the characteristics of the borrowing and lending banks that rely more heavily on interbank customer relationships. The main findings can be briefly summarized.

First, in Italy interbank customer relationships exist and are durable. My data show that, during a sample period of 11 years, they lasted on average at least 5 consecutive years. The duration of interbank relationships is longer if borrowing banks are illiquid, small, unrated or well-rated, and if they engage heavily in lending to firms, households and foreign intermediaries. As to lenders, duration is longer if lending banks are liquid, well-capitalized, and less heavily engaged in other kinds of business. On both the borrowing and the lending side, duration is likely to be greater where banks have connections with a greater number of counterparties.

Second, substantial interbank borrowers and lenders have definable characteristics. Substantial interbank borrowers tend to be large in size and to have high and volatile liquidity needs. Their capitalization is solid, their loan portfolio appears safe, and their business is successful and multifaceted: loans, shares, and non-domestic investments are high. Moreover, when banks are net lenders inside their domestic group or abroad, the probability of being a substantial interbank borrower increases. Substantial lenders are not the most liquid banks, have less lending, shares, and foreign business, and as a consequence they do not need to be highly capitalized, although have good ratings.

Third, in times of financial stability banks seem to select each other on the basis of observable and testable monitoring factors and indicators and use the judgments of rating agencies as a tool for selection.

Fourth, after the outbreak of the crisis, however, the presence and level of ratings become irrelevant, and borrowing banks seem to be selected on the basis of a pre-existing relationship, not on observable indicators, which indeed signal situations of difficulty. Moreover, not only did the crisis fail to impede interbank customer relationships, it actually made healthier banks willing to be substantial interbank lenders and allowed lender banks not to deprive their counterparties of interbank funds. These outcomes confirm for interbank customer relationships the consensus thesis of the literature on bank-firm customer relationships.

References

Acharya V., D. Gromb and T. Yorulmazer (2008)."Imperfect Competition in the Inter-Bank Market for Liquidity as a Rationale for Central Banking," working paper, London Business School; CEPR Discussion paper series n. 6984.

Affinito M. and F. Farabullini (2009), "Does the Law of One Price Hold in Euro-Area Retail Banking?," *International Journal of Central Banking*, 5-1, 5-37.

Affinito M. and E. Tagliaferri (2010), "Why do (or did?) Banks Securitize their Loans? Evidence from Italy," *Journal of Financial Stability*, 6-4, 189-202.

Albertazzi U. and D. Marchetti (2010), "Credit Supply, Flight to Quality and Evergreening: an Analysis of Bank-Firm Relationships after Lehman, Banca d'Italia Working Papers, 756.

Afonso G., A. Kovner and A. Schoar (2010), "Stressed not Frozen: the Fed Funds Market in the Financial Crisis," NBER Working Paper, 15806; *The Journal of Finance*, forthcoming.

Allen F. and D. Gale (2000). "Financial Contagion," *Journal of Political Economy*, 108, 1-33.

Allen F. and E. Carletti (2008), "The Role of Liquidity in Financial Crises," Jackson Hole Symposium on Maintaining Stability in a Changing Financial System, August 21-23.

Allen F., E. Carletti and D. Gale (2008), "Interbank Market Liquidity and Central Bank Intervention", *Journal of Monetary Economics*, 56, 639-652.

Angelini P., A. Nobili and M.C. Picillo (2011), "The Interbank Market after August 2007: What has Changed and Why?," *Journal of Money, Credit and Banking,* forthcoming*;* and Banca d'Italia Working Papers, 2009, 731.

Arellano M. (1987), "Comparing Robust Standard Errors for Within-Group Estimators", *Oxford Bulletin of Economics and Statistics*, 49, 431-434.

Ashcraft A.B. and H. Bleakley (2006), "On the Market Discipline of Informationally-Opaque Firms: Evidence from Bank Borrowers in the Federal Funds Market," *Federal Reserve Bank of New York Staff Reports*, 257.

Berger A.N. (1991), "Market Discipline in Banking," *Proceedings of a Conference on Bank Structure and Competition*, Federal Reserve Bank of Chicago.

Berger A.N., S.M. Davies, and M.J. Flannery (2000), "Comparing Market and Supervisory Assessments of Bank Performance: Who Knows what when?," *Journal of Money, Credit, and Banking*, 32, 3, 641-67.

Berger AN. and G.F. Udell (1995), Relationship Lending and Lines of Credit in Small Firm Finance, *Journal of Business* 68, 351–381.

Berglöf E. and E.L. von Thadden (1994), "Short-Term versus Long-Term Interests: Capital Structure with Multiple Investors", *Quarterly Journal of Economics*, 109, 1055-1084.

Berlin M. and L. Mester (1999), "Deposits and Relationship Lending," *Review of Financial Studies*, 12, 3, 579-607.

Bhattacharya S. and D. Gale (1987), "Preference Shocks, Liquidity and Central Bank Policy," in W. Barnett and K. Singleton (eds.), *New Approaches to Monetary Economics*, Cambridge University Press, 69-88.

Boot A.W.A. and A.V. Thakor (1994), "Moral Hazard and Secured Lending in an Infinitely Repeated Credit Market Game", *International Economic Review*, 35, 899-920.

Boot A.W.A (2000), "Relationship Banking: What do we know?," *Journal of Financial Intermediation*, 9, 7-25.

Brunnermeier M. (2009), "Deciphering the 2007-08 Liquidity and Credit Crunch," *Journal of Economic Perspectives*.

Cassola N., C. Holthausen and M. Lo Duca (2008), "The 2007/2008 Turmoil: a Challenge for the Integration of the Euro Area Money Market?, European Central Bank, mimeo.

Cocco J.F., F.J. Gomes, N.C. Martins (2009), "Lending Relationships in the Interbank Market," *Journal of Financial Intermediation*, 18, 24–48.

de Haas R. and I. van Lelyveld (2010), "Internal Capital Markets and Lending by Multinational Bank Subsidiaries," *Journal of Financial Intermediation*, 19, 1–25.

Degryse H. and P. van Cayseele (2000), Relationship Lending within a Bank-Based System: Evidence from European Small Business Data, *Journal of Financial Intermediation,* 9, 90–109.

DeYoung R., M.J. Flannery, W.W. Lang and S.M. Sorescu (1998), "The Informational Advantage of Specialized Monitors: The Case of Bank Examiners", Working paper.

De Mitri S., G. Gobbi and E. Sette (2010), "Relationship Lending in a Financial Turmoil", Banca d'Italia Working Papers, 772.

Diamond D. (1991), "Monitoring and Reputation: the Choice between Bank Loans and Privately Placed Debt", *Journal of Political Economy*, 99, 689-721.

Dinger V. and J. von Hagen (2009), "Does Interbank Borrowing Reduce Bank Risk?", *Journal of Money, Credit, and Banking*, 41,2-3, 491-506.

Draghi M. (2009), "2009 World Savings Day - Address by the Governor of the Bank of Italy", Rome.

Dudley W. (2008), "May You Live in Interesting Times: The Sequel', Remarks at the Federal Reserve Bank of Chicago's 44th Annual Conference on Bank Structure and Competition, Chicago.

Ferri G. and P. Marullo Reedtz (1989), "Mercato interbancario e gestione degli attivi bancari: tendenze recenti e linee di sviluppo", Banca d'Italia, *Temi di discussione*, 117.

Flannery M., S. Kwan and M. Nimalendran (2004), "Market Evidence on the Opaqueness of Banking Firms' Assets," *Journal of Financial Economics*, 71, 419-460.

Flannery M.J. (1996), "Financial Crises, Payment System Problems, and Discount Window Lending", *Journal of Money, Credit, and Banking*, 28 (4), 804-824.

Freixas X. and J. Jorge (2007), "The Role of Interbank Markets in Monetary Policy: A Model with Rationing", working paper, Universitat Pompeu Fabra.

Freixas X., B. Parigi, and J.C. Rochet (2000), "Systemic Risk, Interbank Relations, and Liquidity Provision by the Central Bank", *Journal of Money, Credit and Banking*, 32-3, 611-638.

Furfine C.H. (2001), "Banks as Monitors of Other Banks: Evidence from the Overnight Federal Funds Market," *The Journal of Business*, 74 (1), 33–58.

Furfine C.H. (2002), "The Interbank Market During a Crisis", *European Economic Review*, 46, 809-820.

Furfine C.H. (2004), "Public Disclosures and Calendar-Related Movements in Risk Premiums: Evidence from Interbank Lending*", Journal of Financial Markets*, 7, 97-116.

Furfine C.H. (2009), "The Liquidity of Liquid Markets during the Financial Crisis", mimeo.

Gyntelberg J. and P. Wooldridge (2008), "Interbank Rate Fixings during the Recent Turmoil', BIS Quarterly Review, 59-72.

Heckman J.J. and B. Singer (1984), "Econometric Duration Analysis", *Journal of Econometrics*, 24, 63-132.

Heider F., M. Hoerova and C. Holthausen (2009), "Liquidity Hoarding and Interbank Market Spreads: The Role of Counterparty Risk", Paper presented at the CEPR-CREI-Journal of Financial Intermediation Conference on the Financial Crisis, Universitat Pompeu Fabra, Barcelona.

Houston J.F., C. James and D. Marcus (1997), "Capital Market Frictions and the Role of Internal Capital Markets in Banking," *Journal of Financial Economics*, 46, 135–164.

Kashyap A., R. Rajan and J. Stein (2002), "Banks as Liquidity Providers: An Explanation for the Coexistence of Lending and Deposit-Taking," *Journal of Finance*, 57, 1, 33-73.

Kaufman G.G. (1991), "Lender of last resort: A contemporary perspective. *Journal of Financial Services Research* 5, 95–110.

Kiefer N.M. (1988), "Economic Duration Data and Hazard Functions", Journal of Economic Literature 26, 646-679.

King T.B. (2008), "Discipline and Liquidity in the Interbank Market," *Journal of Money, Banking and Credit.*, 40, 2-3, 295-317.

Lummer S.L. and J.J. McConnell (1989), "Further evidence on the bank lending process and the capital-market response to bank loan agreements," *Journal of Financial Economics* 25, 99–122.

Michaud F. and C. Upper (2008), "What Drives Interbank Rates? Evidence from the Libor Panel", BIS Quarterly Review. March, 47-58.

Morgan D. (2002), "Rating Banks: Risk and Uncertainty in an Opaque Industry," *American Economic Review*, 92, 4, 874-888.

Ongena S. and D.C. Smith (2001), "The Duration of Bank Relationships," *Journal of Financial Economics*, 61, 3, 449-75.

Panetta F., P. Angelini (coordinators), U. Albertazzi, F. Columba, W. Cornacchia, A. Di Cesare, A. Pilati, C. Salleo, G. Santini (2009), "Financial Sector Pro-cyclicality: Lessons from the Crisis," Bank of Italy Occasional Papers Series, n. 44.

Peek J., E.S. Rosengren and G.M.B. Tootell (1999), "Is Bank Supervision Central to Central Banking", *Quarterly Journal of Economics*, 114, 629–653.

Petersen M. and R. Rajan (1994), "The Benefits of Lending Relationships: Evidence from Small Business Data, *Journal of Finance* 49, 1367–1400.

Petersen M. and R. Rajan (1995), "The Effect of Credit Market Competition on Lending Relationships, *Quart. J. Econ.* 110, 406–443.

Porzio C., F. Battaglia, A. Meles and M.G. Starita (2009), "Financial Turmoil and Asymmetric Information Theory: Evidence from E-MID Platform," University of Napoli Parthenope.

Rajan R.G. (1992), "Insiders and Outsiders: The Choice between Informed and Arm's-Length Debt," *The Journal of Finance* 47, 1367–1400.

Rochet, J.C. and J. Tirole (1996), "Interbank Lending and Systemic Risk", *Journal of Money, Credit, and Banking*, 28, 733-762.

Schwartz A.J. (1992), "The Misuse of the Fed's Discount Window", Federal Reserve Bank of St. Louis Review September-October, 58–69.

Taylor J.B. and J. C. Williams (2009), "A Black Swan in the Money Market", *American Economic Journal: Macroeconomics*, 1, pp. 58-83.

Figures and Tables

Table 1. Summary statistics of key variables: duration and strength of interbank customer relationships

Step	Name	Definition	Obs	Mean	Sd.Dev.	Min	25	75	Max
1st (and 3th): duration of interbank customer relationships	Duration or span: span that passes before the interbank relationship between each pair of banks ends or breaks	a) Computed as the average of the ongoing duration in each period (Ts in equation 1.1)	417,360	28.11	29.09	1	7	41	131
		b) Computed as the average of the final duration of all relationships	417,360	47.63	36.67	1	17	67	131
		c) Computed as the average of the final duration of the longest relationship of each bank	417,360	96.06	40.19	1	61	130	131
2nd (and 3th): strength of interbank customer relationships	SLI - Relevant Lender Index (equation 2.1)	Total loans from each j to each i / Total interbank loans to each i	460,964	0.13	0.27	0	0.01	0.27	1
	SBI - Relevant Borrower Index (equation 2.2)	Total loans from each i to each j / Total interbank loans from each i	460,964	0.19	0.33	0	0.01	0.36	1
2nd (and 3th): strength of interbank customer relationships	Number of lenders	Inverse of the alternative measure of SLI: one / number of banks that i borrows from during each period	460,964	8.07	22.46	1	1	5	77
	Number of borrowers	Inverse of the alternative measure of SBI: one / number of banks that i lends to during each period	460,964	5.25	12.83	1	1	3	60

Table 2. Relations among key variables

Variables		Number of borrowers	Number of lenders	SBI	SLI	T_S (span) average	T_S (span) max
Number of borrowers computed as, first the **total** number of borrowers for each lender in each period, and then the **average** at the same time cross-section and over time	1st quartile	**1**		1		65	103
	2nd quartile	**2**		0.50		53	106
	3rd quartile	**3**		0.33		40	102
	4th quartile	**17.98**		0.12		22	96
Number of lenders computed as, first the **total** number of lenders for each borrower in each period, and then the **average** at the same time cross-section and over time	1st quartile		**1**		1	60	106
	2nd quartile		**2**		0.50	40	99
	3rd quartile		**4**		0.28	29	86
	4th quartile		**27.58**		0.07	25	93
SBI computed as, first the **average** value by lender and period, and then the **average** at the same time cross-section and over time	1st quartile	14.30		**0.17**		26	97
	2nd quartile	2		**0.50**		53	106
	3rd quartile	1		**1**		65	103
	4th quartile	1		**1**		65	103
SLI computed as, first the **average** value by borrower and period, and then the **average** at the same time cross-section and over time	1st quartile		25.60		**0.08**	20	92
	2nd quartile		2.51		**0.43**	35	95
	3rd quartile		1		**1**	60	106
	4th quartile		1		**1**	60	106
T_S (span) — Average computed as, first the **final** duration of each relationship, and then **average** of the final duration of all relationships	1st quartile	6.40	8.12	0.43	0.40	**10**	56
	2nd quartile	10.13	14.30	0.47	0.43	**27**	90
	3rd quartile	3.82	6.48	0.76	0.80	**53**	115
	4th quartile	1.37	1.22	0.84	0.91	**101**	124
T_S (span) — Max computed as, first the **final** duration of each relationship, and then **average** of the final duration of each bank's longest relationship	1st quartile	3.72	6.12	0.65	0.53	17	**35**
	2nd quartile	6.85	9.82	0.52	0.48	41	**93**
	3rd quartile	5.10	8.12	0.69	0.70	66	**129**
	4th quartile	5.10	8.12	0.69	0.70	66	**129**

Figure 1. Interbank loans in Italy
(end-of-month stocks in millions of euros)

Legend: Total interbank loans — Non-domestic interbank laons — Intra-group interbank loans — Inter-group interbank loans
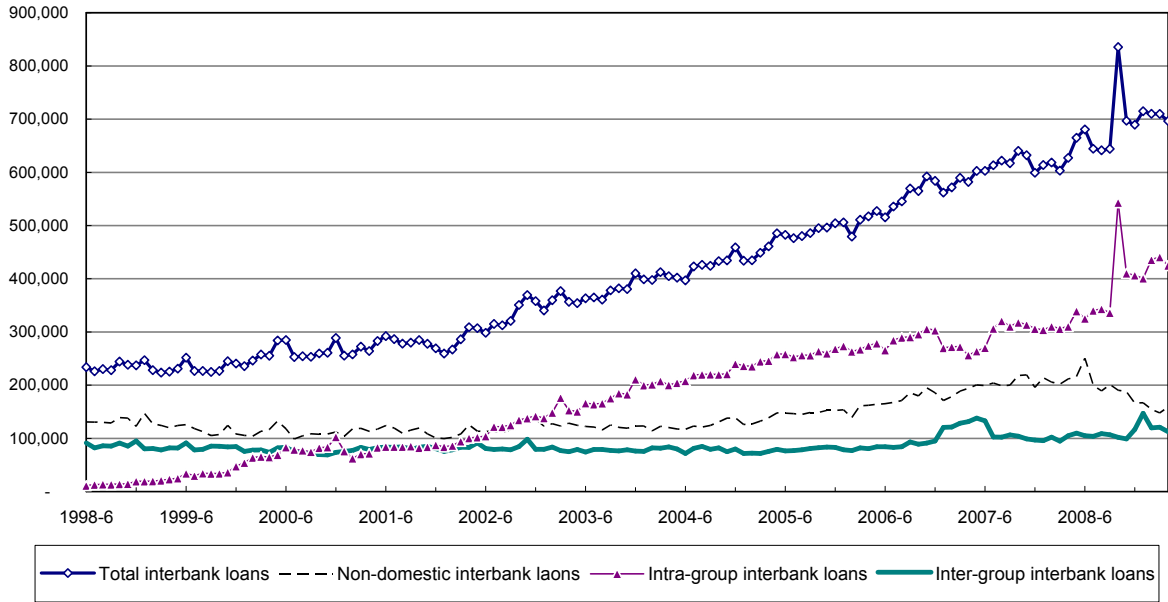
Figure 2. Interbank loans in Italy
(end-of-month percentage share on total assets)

Legend: Total interbank loans — Non-domestic interbank laons — Intra-group interbank loans — Inter-group interbank loans
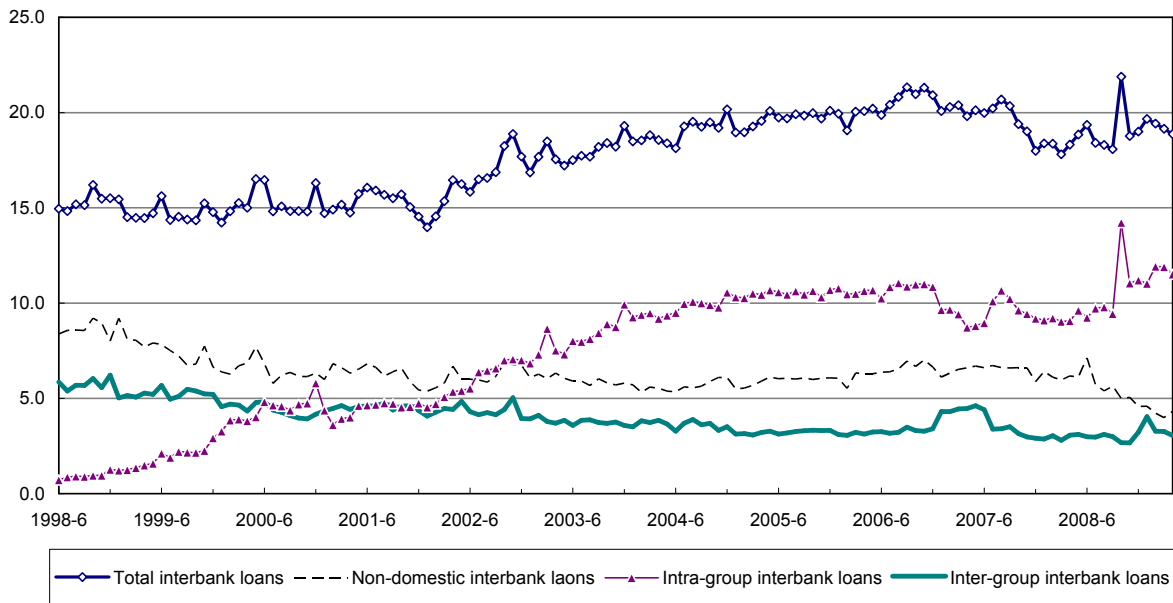
Figure 3. SLI and SBI, computed on end-of-month exposures
(average values in each month)

| | SBI - substantial borrower index | | SLI - substantial lender index |
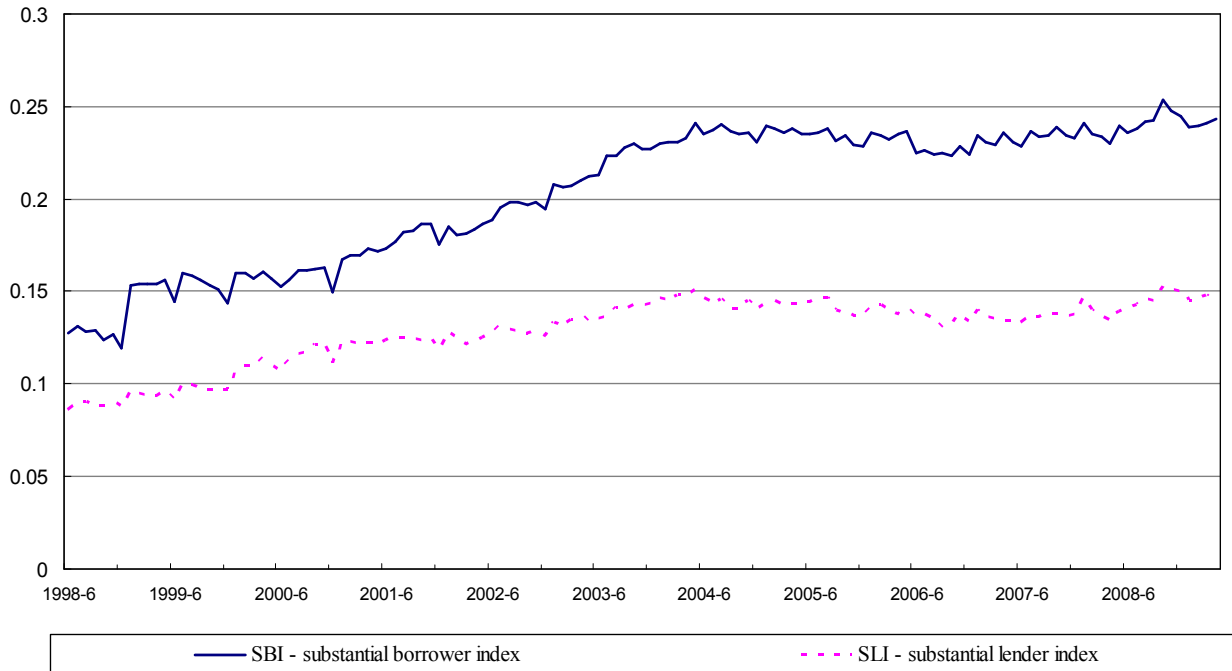
Figure 4. Average number of banks lending to and borrowing from each bank
(average values in each month; equivalent to the inverses of SLI and SBI, computed on the number of relationships)

| | Lenders | | Borrowers |
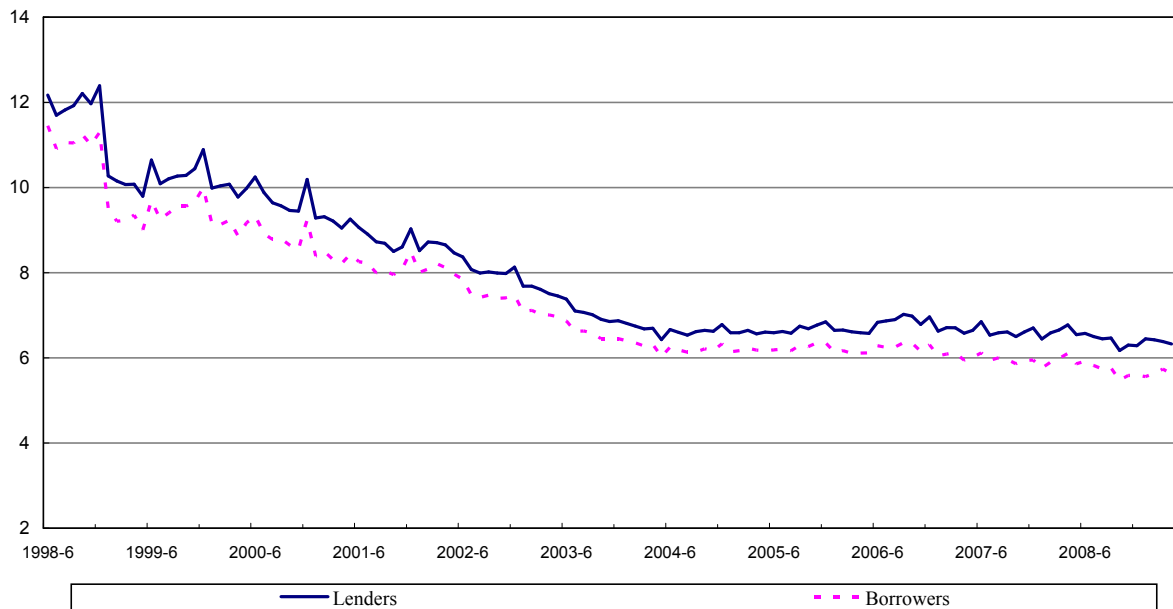
Figure 5. Distribution of *final* duration of interbank customer relationships in my sample

Upper panels report distribution of final duration as percentage shares of number of banks; lower panel as percentage shares of interbank market exposures.
Left side reports duration in terms of number of months; right side as a percentage of the effective presence in the interbank market.

Table 3. Summary statistics of explanatory variables

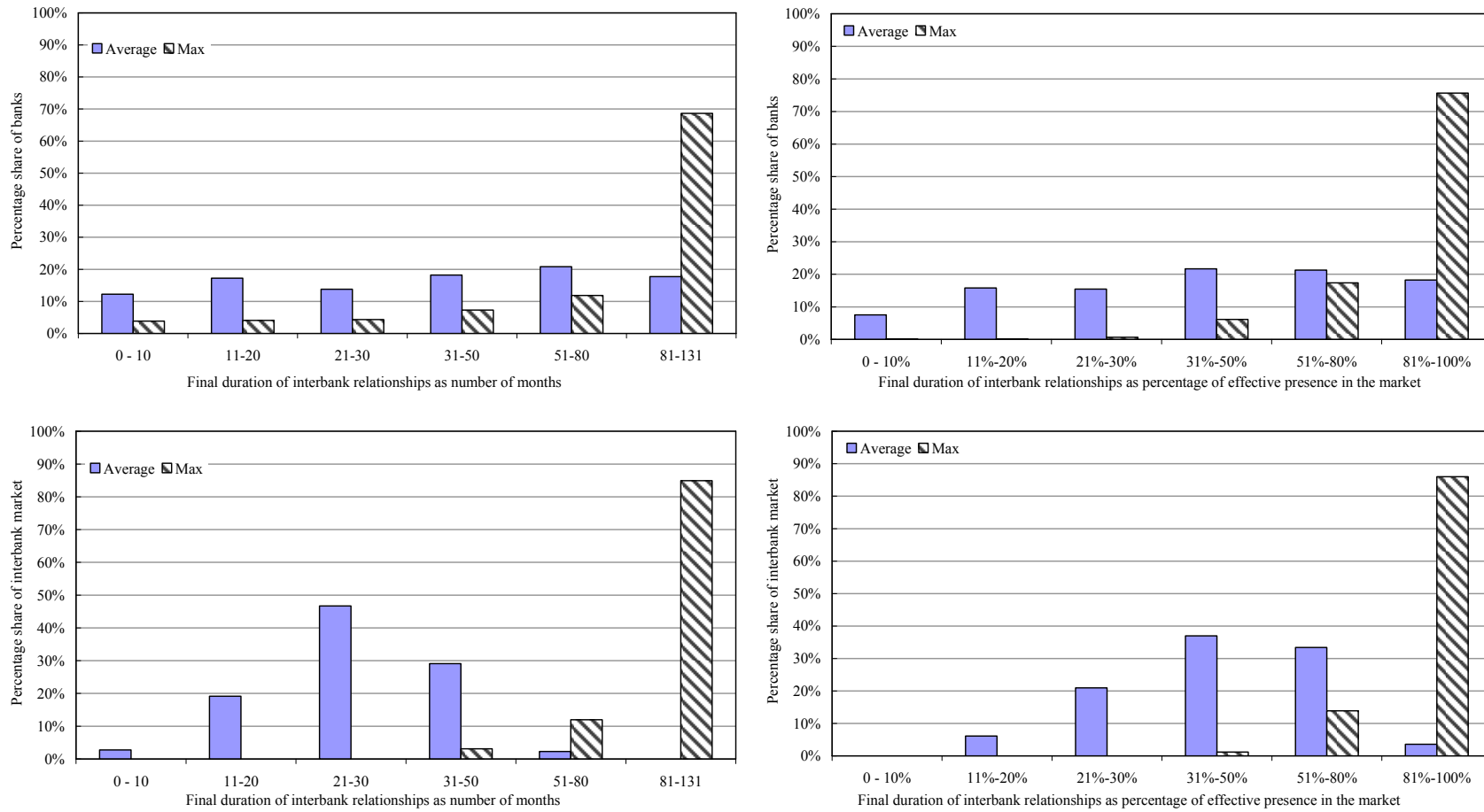| Type	Name	Definition	Source	Obs	Mean	Sd. Dev.	Min	25	75	Max
borrower										
Agency problems	Size	Log (Total assets)	Bank of Italy	456,099	8.30	1.92	0	7.11	9.56	12.97
	Capital	Capital / Total assets	Bank of Italy	453,247	0.09	0.07	0.01	0.05	0.10	1
	Bad loans	Bad loans / Total loans	Bank of Italy	454,373	0.05	0.09	0	0.01	0.06	1
	Structure of income/Opacity	Non-interest income / Net interest income	Bank of Italy	439,170	1.41	15.53	0	1.25	1.87	4.6
	Banks without rating (0-1)	Banks without rating (0-1)	The rating agency Fitch through the database of Bloomberg	460,964	0.51	0.50	0	0	1	1
	Rating	Rating agency scores	The rating agency Fitch through the database of Bloomberg	385,061	8.29	3.30	2	5	11	11
	ROE	Net profits / Capital	Bank of Italy	438,081	0.17	11.24	0	0.00	0.05	0.34
Liquidity needs	Funds Raising	Total deposits and bonds / Total assets	Bank of Italy	456,099	0.49	0.26	0	0.25	0.70	1
	Volatility of Liquidity	Coefficient variation of balance sheet items measuring banking liquidity: deposits, bonds issued, and euro-area Government securities held in portfolio	Bank of Italy	458,147	0.03	0.03	0	0.01	0.03	0.916
Liquidity motivations	Total loans	Total loans / Total assets	Bank of Italy	456,099	0.47	0.25	0	0.30	0.65	1
	Non-domestic assets	Non-domestic assets / Total assets	Bank of Italy	456,099	0.03	0.04	0	0.00	0.03	0.93
	Total shares	Total shares / Total assets	Bank of Italy	456,099	0.04	0.06	0	0.01	0.05	1
	Intra-group interbank net-position	Intra-group interbank net-position	Bank of Italy	426,739	0.01	0.25	-1	0.00	0.03	1
	Non-domestic interbank net-position	Non-domestic interbank net-position	Bank of Italy	426,739	-0.07	0.28	-1	0.22	0.04	1
lender										
Lending capacity	Size	Log (Total assets)	Bank of Italy	458,574	8.36	1.93	0	7.14	9.65	12.97
	Capital	Capital / Total assets	Bank of Italy	457,340	0.09	0.07	0.01	0.05	0.10	1
	Bad loans	Bad loans / Total loans	Bank of Italy	456,482	0.05	0.08	0	0.01	0.06	1
	Structure of income/Opacity	Non-interest income / Net interest income	Bank of Italy	445,772	1.50	15.70	0	1.29	1.88	3.1
	Banks without rating (0-1)	Banks without rating (0-1)	The rating agency Fitch through the database of Bloomberg	460,964	0.46	0.50	0	0	1	1
	Rating	Rating agency scores	The rating agency Fitch through the database of Bloomberg	402,523	7.97	3.36	2	5	11	11
	ROE	Net profits / Capital	Bank of Italy	448,941	0.19	12.76	0	0.00	0.05	0.34
Liquidity provisions	Funds Raising	Total deposits and bonds / Total assets	Bank of Italy	458,574	0.50	0.25	0	0.29	0.70	1
	Volatility of Liquidity	Coefficient variation of balance sheet items measuring banking liquidity: deposits, bonds issued, and euro-area Government securities held in portfolio	Bank of Italy	460,915	0.03	0.03	0	0.01	0.03	0.944
Liquidity motivations	Total loans	Total loans / Total assets	Bank of Italy	458,574	0.47	0.25	0	0.31	0.65	1
	Non-domestic assets	Non-domestic assets / Total assets	Bank of Italy	458,574	0.03	0.04	0	0.00	0.03	0.909
	Total shares	Total shares / Total assets	Bank of Italy	458,574	0.04	0.06	0	0.01	0.05	0.949
borrower and lender										
Duration	Lending relationship duration	Number of consecutive months since the start of lending relationship between each pair of banks	Bank of Italy	460,964	26.21	29.24	0	4	38	131
	Borrowing relationship duration	Number of consecutive months since the start of borrowing relationship between each pair of banks	Bank of Italy	460,964	26.41	29.61	0	4	38	131
Liquidity	Liquidity shocks correlation	Correlation between the liquidity shocks of each pair of banks	Bank of Italy	447,448	0.05	0.52	-1	-0.29	0.42	1
Interaction outside the interbank market	Securities Interaction (lender vs.borrower)	Securities held by the lender issued by the borrower / Total securities held by the lender issued by banks	Bank of Italy	458,574	0.14	0.34	0	0	0.03	1
	Securities Interaction (borrower vs. lender)	Securities held by the borrower issued by the lender / Total securities held by the borrower issued by banks	Bank of Italy	459,723	0.21	0.40	0	0	0.05	1

Table 4. Explanatory variables: matrixes and effects

Matrix → ↓Effect	$K^{B}_{j,t}$ borrower's regressors	$K^{L}_{i,t}$ lender's regressors	$KL^{B}_{i,j,t}$ borrower's and lender's regressors
(1) **Persistency**			Relationship Duration
(2) **Agency problems**	Size Capital Bad Loans Opacity Banks without Rating Rating ROE		
(3) **Lending capacity**		Size Capital Bad Loans Opacity Banks without Rating Rating ROE	
(4) **Liquidity situation**	Fund Raising Volatility of Liquidity	Fund Raising Volatility of Liquidity	Liquidity Shock Correlation
(5) **Liquidity motivations**	Total Loans Non-Domestic Assets Total Shares Intra-Group Interbank Net-Position Non-Domestic Interbank Net-Position	Total Loans Non-Domestic Assets Total Shares	
(6) **Interaction outside the interbank market**			Borrower-lender Securities Interaction Lender-borrower Securities Interaction

Table 5. First step: stability and existence of interbank customer relationship

Variables			estimations							marginal effects	
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(6)	(7)
φ			0.576 *** *0.003*	0.608 *** *0.004*	0.618 *** *0.004*	0.626 *** *0.004*	0.634 *** *0.004*	0.644 *** *0.004*	0.638 *** *0.005*		
borrower	Agency problems	Size		1.218 *** *0.007*	1.163 *** *0.008*	1.253 *** *0.011*	1.198 *** *0.011*	1.178 *** *0.013*	1.209 *** *0.016*	-31	-10
		Capital		-0.568 * *0.183*	-0.543 * *0.184*	-0.452 ** *0.146*	-0.421 ** *0.142*	-0.111 *** *0.049*	-0.195 *** *0.085*	5	5
		Bad loans						0.930 *ns* *0.142*	0.856 *ns* *0.122*	ns	ns
		Structure of income/Opacity						-0.998 ** *0.001*	-0.998 ** *0.001*	1	1
		Banks without rating (0-1)				-0.719 *** *0.070*	-0.797 ** *0.082*	-0.714 *** *0.082*	-0.673 *** *0.078*	61	37
		Rating				1.090 *** *0.016*	1.072 *** *0.017*	1.077 *** *0.018*	1.104 *** *0.019*	-33	-21
		ROE						-0.999 ** *0.001*	-0.999 * *0.001*	1	1
	Liquidity needs	Funds Raising		6.452 *** *0.541*	6.749 *** *0.584*	4.692 *** *0.383*	5.049 *** *0.425*	6.154 *** *0.569*	5.244 *** *0.470*	-97	-66
		Volatility of Liquidity						5.339 *** *2.303*	2.972 ** *1.285*	-7	-5
	Liquidity motivations	Total loans		-0.262 *** *0.018*	-0.295 *** *0.021*	-0.208 *** *0.014*	-0.230 *** *0.016*	-0.142 *** *0.013*	-0.127 *** *0.011*	52	37
		Non-domestic assets						0.555 ns *0.210*	0.132 ns *0.050*	ns	ns
		Total shares						1.174 ns *0.319*	0.747 ns *0.207*	ns	ns
		Within-group interbank net-position						-0.164 *** *0.010*	-0.206 *** *0.012*	5	3
		Non-domestic interbank net-position						-0.171 *** *0.009*	-0.211 *** *0.012*	44	29
		Number of lenders							-0.991 *** *0.001*		7
lender	Lending capacity	Size		1.193 *** *0.008*	1.266 *** *0.011*	1.145 *** *0.008*	1.212 *** *0.011*	1.149 *** *0.012*	1.305 *** *0.016*	-11	-8
		Capital		-0.299 *** *0.069*	-0.103 *** *0.029*	-0.296 *** *0.070*	-0.118 *** *0.034*	-0.021 *** *0.007*	-0.019 *** *0.008*	27	17
		Bad loans						3.304 *** *0.425*	2.379 *** *0.302*	-3	-2
		Structure of income/Opacity						0.998 ns *0.002*	0.999 ns *0.001*	ns	ns
		Banks without rating (0-1)			1.026 ns *0.099*		1.073 ns *0.109*	1.488 *** *0.155*	0.878 ns *0.096*	2	ns
		Rating			1.055 *** *0.015*		1.042 *** *0.015*	0.991 ns *0.015*	1.095 *** *0.017*	ns	2
		ROE						-0.996 *** *0.001*	-0.995 * *0.004*	1	1
	Liquidity provisions	Funds Raising		-0.511 *** *0.027*	-0.493 *** *0.028*	-0.686 *** *0.039*	-0.662 *** *0.039*	-0.679 *** *0.046*	-0.619 *** *0.041*	47	25
		Volatility of Liquidity						12.591 *** *3.380*	5.073 *** *1.400*	-10	-7
	Liquidity motivations	Total loans		2.713 *** *0.151*	1.878 *** *0.112*	2.543 *** *0.147*	1.790 *** *0.111*	2.969 *** *0.224*	1.786 *** *0.133*	-87	-56
		Non-domestic assets						0.977 ns *0.369*	0.246 ns *0.097*	ns	ns
		Total shares						24.198 *** *7.884*	6.850 *** *2.206*	-21	-15
		Number of borrowers							-0.979 *** *0.001*		19
borrower & lender	Liquidity	Liquidity shocks correlation		1.069 ** *0.035*	1.047 ns *0.035*	1.006 ns *0.033*	0.984 ns *0.034*	1.023 ns *0.036*	0.980 ns *0.035*	ns	ns
	Interaction outside the interbank market	Securities Interaction (borrower vs. lender)		-0.631 *** *0.033*	-0.605 *** *0.035*	-0.598 *** *0.032*	-0.572 *** *0.033*	-0.590 *** *0.037*	-0.499 *** *0.033*	2	1
		Securities Interaction (lender vs. borrower)		-0.527 *** *0.025*	-0.552 *** *0.026*	-0.574 *** *0.030*	-0.593 *** *0.031*	-0.603 *** *0.035*	-0.453 *** *0.027*	1	1
Counterpart dummies				*yes*	*yes*	*yes*	*yes*	*yes*	*yes*		
Constant			-0.551 *** *0.005*	-0.497 *** *0.006*	-0.481 *** *0.006*	-0.469 *** *0.006*	-0.456 *** *0.007*	-0.439 *** *0.007*	-0.450 *** *0.007*		
Number of observations			417,360	389,585	340,254	317,745	273,197	270,028	249,053		

With regard to estimations, Table 5 reports the signs, hazard ratios, robust standard errors in italics, and statistical significance. Due to the inverse relationship between duration and the hazard rate, a negative sign of regressors indicates a longer duration, and a positive sign implies a shorter duration. With regard to marginal effects, Table reports the change of duration in number of months passing from the 25th to the 75th distribution percentile of each regressor (only for Specification (6) and (7). ***, **, and * denote statistical significance at 1, 5 and 10 % level; ns means not-significant.

Table 6. Second step: strength and determinants

	Variables	SLI (1)	SLI (2)	SLI (3)	SLI (4)	SLI (5)	SLI (6)	SLI (7)	SLI (8)	SBI (1)	SBI (2)	SBI (3)	SBI (4)	SBI (5)	SBI (6)	SBI (7)	SBI (8)
borrower – Agency problems	Size		-0.024 ***	-0.024 ***	-0.031 ***	-0.028 ***	-0.032 ***	-0.035 ***	-0.034 ***		0.008 ***	0.007 ***	0.006 ***	0.009 ***	0.011 ***	0.008 ***	0.001
	(s.e.)		*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*		*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
	Capital		0.209 ***	0.295 ***	0.235 ***	0.294 ***	0.261 ***	0.241 ***	0.210 ***		0.037 ***	0.023 **	0.015	0.026 ***	0.058 ***	0.019 *	-0.017
	(s.e.)		*0.010*	*0.011*	*0.012*	*0.011*	*0.013*	*0.012*	*0.014*		*0.009*	*0.009*	*0.010*	*0.009*	*0.012*	*0.010*	*0.015*
	Bad loans						0.044 ***		0.037 ***						-0.069 ***		-0.052 ***
	(s.e.)						*0.008*		*0.008*						*0.007*		*0.008*
	Structure of income/Opacity						-0.001 ***		-0.001 ***						-0.001		-0.001
	(s.e.)						*0.000*		*0.000*						*0.000*		*0.000*
	Banks without rating (0-1)				-0.061 ***		-0.066 ***	-0.058 ***	-0.063 ***					-0.031 ***	-0.028 ***	-0.030 ***	-0.033 ***
	(s.e.)				*0.003*		*0.003*	*0.003*	*0.004*					*0.003*	*0.003*	*0.004*	*0.004*
	Rating				0.001 *		0.001 **	0.000	0.000					0.003 ***	0.002 ***	0.004 ***	0.005 ***
	(s.e.)				*0.001*		*0.001*	*0.001*	*0.001*					*0.000*	*0.000*	*0.001*	*0.001*
	ROE						0.000		0.000						0.000		0.000
	(s.e.)						*0.000*		*0.000*						*0.000*		*0.000*
borrower – Liquidity needs	Fund Raising			0.089 ***	0.067 ***	0.087 ***	0.054 ***	0.063 ***	0.064 ***			-0.059 ***	-0.068 ***	-0.030 ***	-0.023 ***	-0.038 ***	-0.038 ***
	(s.e.)			*0.003*	*0.003*	*0.003*	*0.004*	*0.004*	*0.004*			*0.003*	*0.003*	*0.003*	*0.003*	*0.003*	*0.004*
	Volatility of Liquidity						-0.072 ***		-0.083 ***						0.013		0.019 *
	(s.e.)						*0.010*		*0.011*						*0.009*		*0.011*
borrower – Liquidity motivations	Total loans			0.103 ***	0.073 ***	0.094 ***	0.061 ***	0.066 ***	0.054 ***			0.020 ***	0.020 ***	0.005 *	0.023 ***	0.005 *	0.021 ***
	(s.e.)			*0.003*	*0.003*	*0.003*	*0.003*	*0.003*	*0.003*			*0.003*	*0.003*	*0.003*	*0.003*	*0.003*	*0.003*
	Non-domestic assets						-0.153 ***		-0.139 ***						0.077 ***		0.048 ***
	(s.e.)						*0.011*		*0.012*						*0.011*		*0.012*
	Total shares						-0.174 ***		-0.166 ***						0.038 ***		0.029 ***
	(s.e.)						*0.009*		*0.009*						*0.008*		*0.010*
	Within-group interbank net-position								-0.040 ***								0.010 ***
	(s.e.)								*0.002*								*0.002*
	Non-domestic interbank net-position								-0.035 ***								0.007 ***
	(s.e.)								*0.001*								*0.001*
lender – Lending capacity	Size		0.013 ***	0.010 ***	0.015 ***	0.008 ***	0.017 ***	0.014 ***	0.019 ***		-0.056 ***	-0.055 ***	-0.066 ***	-0.048 ***	-0.051 ***	-0.055 ***	-0.051 ***
	(s.e.)		*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*		*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
	Capital		-0.029 ***	-0.033 ***	-0.023 ***	-0.049 ***	-0.016 ***	-0.039 ***	-0.055 ***		0.067 ***	0.095 ***	0.117 ***	0.128 ***	0.087 ***	0.146 ***	0.119 ***
	(s.e.)		*0.005*	*0.005*	*0.006*	*0.005*	*0.006*	*0.006*	*0.007*		*0.006*	*0.006*	*0.006*	*0.006*	*0.006*	*0.006*	*0.007*
	Bad loans								0.027 ***								-0.112 ***
	(s.e.)								*0.007*								*0.009*
	Structure of income/Opacity								0.000								0.000
	(s.e.)								*0.000*								*0.000*
	Banks without rating (0-1)						0.023 ***	0.024 ***	0.027 ***					-0.025 ***		-0.028 ***	-0.021 ***
	(s.e.)						*0.003*	*0.003*	*0.004*					*0.004*		*0.003*	*0.004*
	Rating						-0.007 ***	-0.006 ***	-0.006 ***					-0.005 ***		-0.005 ***	-0.006 ***
	(s.e.)						*0.000*	*0.001*	*0.001*					*0.001*		*0.001*	*0.001*
	ROE								0.000								0.000
	(s.e.)								*0.000*								*0.000*
lender – Liquidity provisions	Fund Raising			-0.004	-0.005	-0.007 **	-0.004	-0.010 ***	-0.007 *			-0.029 ***	-0.034 ***	-0.040 ***	-0.012 ***	-0.045 ***	-0.054 ***
	(s.e.)			*0.003*	*0.003*	*0.003*	*0.004*	*0.004*	*0.004*			*0.003*	*0.004*	*0.003*	*0.003*	*0.004*	*0.004*
	Volatility of Liquidity						-0.032 ***		-0.073 ***						0.044 ***		0.065 ***
	(s.e.)						*0.011*		*0.012*						*0.013*		*0.016*
lender – Liquidity motivations	Total loans			-0.014 ***	-0.009 ***	-0.008 ***		-0.005 *	-0.006 *			0.090 ***	0.073 ***	0.120 ***		0.101 ***	0.091 ***
	(s.e.)			*0.002*	*0.003*	*0.002*		*0.003*	*0.003*			*0.003*	*0.003*	*0.003*		*0.003*	*0.003*
	Non-domestic assets								-0.076 ***								-0.064 ***
	(s.e.)								*0.011*								*0.011*
	Total shares								-0.023 **								-0.117 ***
	(s.e.)								*0.011*								*0.011*
borrower & lender – Duration	Relationship duration	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***
	(s.e.)	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Liquidity	Liquidity shocks correlation	0.006 ***	0.006 ***	0.006 ***	0.006 ***	0.006 ***	0.006 ***	0.006 ***	0.006 ***	-0.001 ***	-0.001 ***	-0.001 ***	-0.002 ***	-0.002 ***	-0.002 ***	-0.002 ***	-0.003 ***
	(s.e.)	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.001*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.001*
Interaction outside the interbank market	Securities Interaction (borrower vs. lender)	0.034 ***	0.027 ***	0.028 ***	0.020 ***	0.025 ***		0.017 ***	0.016 ***	-0.005 ***	-0.003 **	-0.007 ***	-0.009 ***	-0.003 ***		-0.005 ***	-0.007 ***
	(s.e.)	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*		*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*		*0.001*	*0.001*
	Securities Interaction (lender vs. borrower)	0.004 ***	0.004 ***	0.003 ***	0.005 ***	0.004 ***	0.005 ***	0.006 ***	0.005 ***	0.035 ***	0.024 ***	0.021 ***	0.019 ***	0.036 ***	0.037 ***	0.031 ***	0.031 ***
	(s.e.)	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
	Counterpart dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	constant	0.076	0.192	0.116	0.223	0.280 **	0.252 **	-0.281	0.288 **	-0.001	-0.140	-0.146	0.750 ***	0.187	0.030	0.540 ***	0.484 ***
	(s.e.)	*30.3*	*0.1*	*0.1*	*59.4*	*0.1*	*-0.1*	*77.5*	*0.1*	*32.5*	*27.7*	*27.6*	*0.1*	*45.5*	*0.1*	*0.1*	*0.1*
	Number of observations	405,520	399,964	399,964	326,123	348,944	313,517	280,165	253,200	444,335	438,232	438,232	381,688	364,682	345,024	313,379	277,541
	R-sq	0.15	0.16	0.16	0.19	0.16	0.19	0.19	0.20	0.27	0.28	0.28	0.30	0.20	0.20	0.21	0.21

Table reports regression coefficients and associated standard errors in italics. ***, **, and * denote statistical significance at 1, 5 and 10 % level

Table 7: Third step: over the crisis - statistical significance

		SLI			SBI		
		Total period	pre-crisis	post-crisis	Total period	pre-crisis	post-crisis
		borrower					
Agency problems	Size	-0.034 ***	-0.033 ***	-0.052 ***	0.001	0.003 **	-0.004
		0.001	*0.001*	*0.008*	*0.001*	*0.001*	*0.007*
	Capital	0.210 ***	0.243 ***	-0.154 *	-0.017	-0.002	-0.005
		0.014	*0.015*	*0.091*	*0.015*	*0.016*	*0.083*
	Bad loans	0.037 ***	0.040 ***	0.077	-0.052 ***	-0.045 ***	-0.117 **
		0.008	*0.008*	*0.048*	*0.008*	*0.008*	*0.047*
	Structure of income/Opacity	0.000 ***	0.000	0.000	0.000	0.000	-0.001 ***
		0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
	Banks without rating (0-1)	-0.063 ***	-0.063 ***	-0.019	-0.033 ***	0.012 ***	-0.018
		0.004	*0.004*	*0.028*	*0.004*	*0.004*	*0.025*
	Rating	0.000	0.000	0.008 **	0.005 ***	-0.002 ***	0.005
		0.001	*0.001*	*0.004*	*0.001*	*0.001*	*0.003*
	ROE	0.000	0.000	-0.025 *	0.000	0.000	0.032 ***
		0.000	*0.000*	*0.013*	*0.000*	*0.000*	*0.011*
Liquidity needs	Fund Raising	0.064 ***	0.031 ***	0.261 ***	-0.038 ***	-0.040 ***	-0.049 ***
		0.004	*0.004*	*0.021*	*0.004*	*0.004*	*0.015*
	Volatility of Liquidity	-0.083 ***	-0.077 ***	-0.110 ***	0.019 *	0.034 ***	0.029
		0.011	*0.012*	*0.024*	*0.011*	*0.012*	*0.024*
Liquidity motivations	Total loans	0.054 ***	0.055 ***	-0.066 ***	0.021 ***	0.041 ***	-0.003
		0.003	*0.004*	*0.020*	*0.003*	*0.004*	*0.016*
	Non-domestic assets	-0.166 ***	-0.158 ***	-0.209 ***	0.029 ***	0.026 **	0.085 **
		0.009	*0.010*	*0.044*	*0.010*	*0.010*	*0.039*
	Total shares	-0.139 ***	-0.135 ***	-0.111 *	0.048 ***	-0.003	0.068
		0.012	*0.013*	*0.057*	*0.012*	*0.014*	*0.047*
	Intra-group interbank net-position	-0.040 ***	-0.037 ***	-0.134 ***	0.010 ***	0.009 ***	0.018 ***
		0.002	*0.002*	*0.008*	*0.002*	*0.002*	*0.006*
	Non-domestic interbank net-position	-0.035 ***	-0.031 ***	-0.089 ***	0.007 ***	0.002	0.030 ***
		0.001	*0.002*	*0.005*	*0.001*	*0.002*	*0.004*
		lender					
Lending capacity	Size	0.019 ***	0.011 ***	0.057 ***	-0.051 ***	-0.050 ***	-0.102 ***
		0.001	*0.001*	*0.008*	*0.001*	*0.001*	*0.008*
	Capital	-0.055 ***	-0.061 ***	0.131 *	0.119 ***	0.125 ***	-0.322 ***
		0.007	*0.007*	*0.068*	*0.007*	*0.007*	*0.069*
	Bad loans	0.027 ***	0.026 ***	0.197 ***	-0.112 ***	-0.104 ***	0.020
		0.007	*0.007*	*0.053*	*0.009*	*0.009*	*0.042*
	Structure of income/Opacity	0.000	0.001 ***	-0.001 ***	0.000	-0.001 ***	0.000
		0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
	Banks without rating (0-1)	0.027 ***	0.019 ***	-0.118 ***	-0.021 ***	-0.022 ***	-0.152 ***
		0.004	*0.004*	*0.032*	*0.004*	*0.004*	*0.030*
	Rating	-0.006 ***	-0.005 ***	0.017 ***	-0.006 ***	-0.004 ***	0.004
		0.001	*0.001*	*0.004*	*0.001*	*0.001*	*0.004*
	ROE	0.000	0.000	0.000	0.000	0.000	0.000
		0.000	*0.000*	*0.005*	*0.000*	*0.000*	*0.012*
Liquidity provisions	Funds Raising	-0.007 *	-0.009 **	0.045 **	-0.054 ***	-0.044 ***	-0.117 ***
		0.004	*0.004*	*0.021*	*0.004*	*0.004*	*0.020*
	Volatility of Liquidity	-0.073 ***	-0.047 ***	-0.176 ***	0.065 ***	0.045 ***	0.345 ***
		0.012	*0.013*	*0.036*	*0.016*	*0.016*	*0.055*
Liquidity motivations	Total loans	-0.006 *	0.002	0.120 ***	0.091 ***	0.100 ***	0.000
		0.003	*0.003*	*0.021*	*0.003*	*0.004*	*0.020*
	Non-domestic assets	-0.023 **	-0.018 *	-0.078	-0.117 ***	-0.088 ***	-0.156 ***
		0.011	*0.011*	*0.052*	*0.011*	*0.011*	*0.042*
	Total shares	-0.076 ***	-0.036 ***	-0.189 ***	-0.064 ***	-0.094 ***	-0.080
		0.011	*0.012*	*0.053*	*0.011*	*0.012*	*0.050*
		borrower and lender					
Duration	Relationship duration	0.001 ***	0.001 ***	0.000 ***	0.001 ***	0.001 ***	0.001 ***
		0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Liquidity	Liquidity shocks correlation	0.006 ***	0.005 ***	0.007 ***	-0.003 ***	-0.002 ***	-0.002
		0.001	*0.001*	*0.002*	*0.001*	*0.001*	*0.002*
Interaction outside the interbank market	Securities Interaction (borrower vs. lender)	0.016 ***	0.007 ***	0.009 *	-0.007 ***	0.003 **	0.002
		0.001	*0.001*	*0.005*	*0.001*	*0.002*	*0.004*
	Securities Interaction (lender vs. borrower)	0.005 ***	0.006 ***	0.014 ***	0.031 ***	0.034 ***	-0.008 **
		0.001	*0.002*	*0.004*	*0.001*	*0.002*	*0.004*
Counterpart dummies		yes	yes	yes	yes	yes	yes
constant		0.288 **	0.275 **	-0.240	0.484 ***	0.442 ***	0.962 ***
		0.122	*0.117*	*0.159*	*0.133*	*0.126*	*0.161*
Number of observations		253,200	219,325	33,875	277,541	232,574	44,967
R-sq		0.20	0.17	0.16	0.21	0.12	0.37

Table reports regression coefficients and associated standard errors in italics. ***, **, and * denote statistical significance at 1, 5 and 10 % level.

Table 8. Third step: over the crisis - marginal effects

		SLI		SBI	
		pre-crisis	post-crisis	pre-crisis	post-crisis
Average values of the indexes		**0.112**	**0.179**	**0.131**	**0.222**
borrower					
Agency problems	Size	-35.9	-35.2	20.9	n.s.
	Capital	15.5	-5.5	n.s.	n.s.
	Bad loans	0.0	n.s.	0.0	-0.5
	Structure of income/Opacity	n.s.	n.s.	n.s.	-0.1
	Banks without rating (0-1)	-45.1	n.s.	15.7	n.s.
	Rating	n.s.	39.2	-10.2	n.s.
	ROE	n.s.	-1.1	n.s.	0.1
Liquidity needs	Funds Raising	14.4	18.8	-23.8	-21.7
	Volatility of Liquidity	-1.8	-1.7	0.8	n.s.
Liquidity motivations	Total loans	30.5	-14.0	3.7	n.s.
	Non domestic assets	-5.9	-5.9	1.5	5.2
	Total shares	-3.4	-2.2	n.s.	n.s.
	Intra-group interbank net-position	-0.9	-2.2	0.1	0.5
	Non-domestic interbank net-position	-6.9	-11.2	n.s.	7.6
lender					
Lending capacity	Size	15.4	24.7	-58.8	-64.6
	Capital	-1.8	1.1	5.6	-4.8
	Bad loans	0.0	1.1	-4.4	n.s.
	Structure of income/Opacity	0.1	-0.1	-0.1	n.s.
	Banks without rating (0-1)	29.2	-3.4	-16.8	-43.4
	Rating	-17.1	4.4	-18.8	n.s.
	ROE	n.s.	n.s.	n.s.	n.s.
Liquidity provisions	Funds Raising	-14.8	2.7	-9.4	-17.1
	Volatility of Liquidity	-0.9	-0.6	0.8	2.7
Liquidity motivations	Total loans	n.s.	17.0	29.8	n.s.
	Non domestic assets	-4.6	n.s.	-3.0	-3.5
	Total shares	-0.9	-2.7	-2.3	n.s.
borrower and lender					
Duration	Relationship duration	20.5	3.1	13.4	16.6
Liquidity	Liquidity shocks correlation	2.7	1.1	-1.5	n.s.
Interaction outside the interbank market	Securities Interaction (borrower vs. lender)	0.1	0.1	0.1	n.s.
	Securities Interaction (lender vs. borrower)	0.0	0.0	0.1	-0.1

Table displays the percentage change that indexes SLI and SBI undergo passing from the 25th to the 75th distribution percentile of each regressor, before and after the crisis.

Figure 6. Secured interbank loans
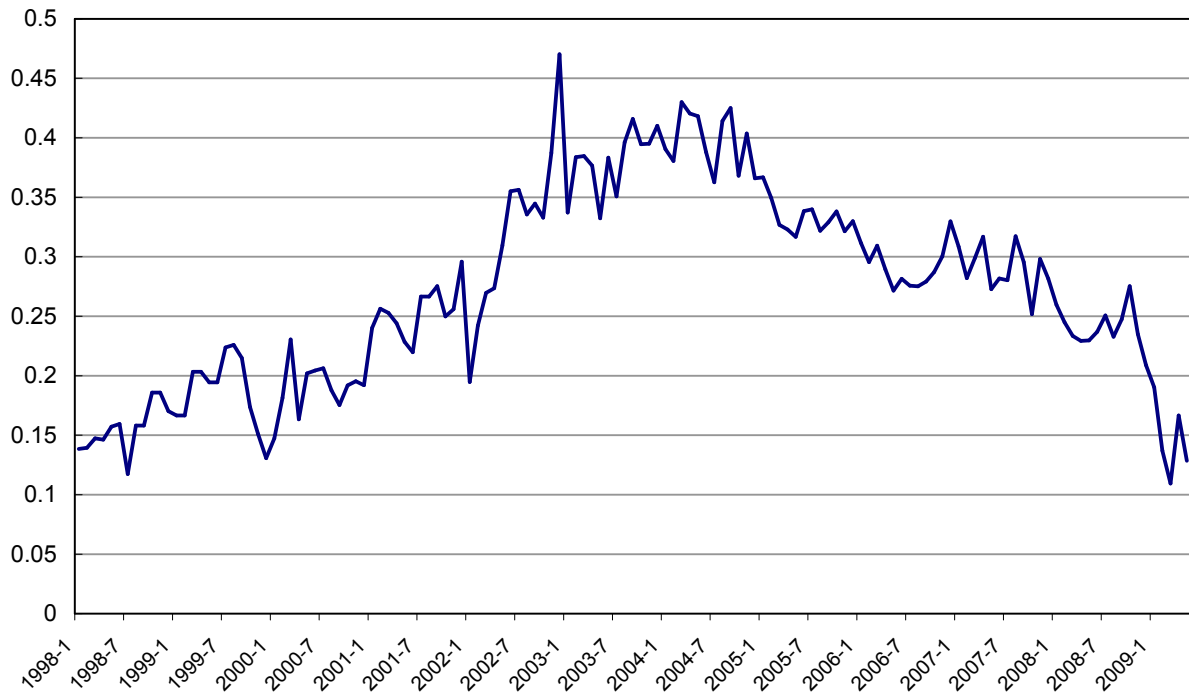*(as a share of total interbank domestic inter-group exposures)*

Table 9: Allowing for secured interbank loans

		SLI		SBI	
		pre-crisis	post-crisis	pre-crisis	post-crisis
borrower					
Agency problems	Size	-0.031 ***	-0.053 ***	0.001	0.001
		0.001	*0.008*	*0.001*	*0.007*
	Capital	0.238 ***	-0.136 *	-0.021	0.002
		0.014	*0.088*	*0.015*	*0.082*
	Bad loans	0.047 ***	-0.005	-0.038 ***	-0.102 **
		0.008	*0.047*	*0.008*	*0.046*
	Structure of income/Opacity	0.000	0.000	0.000	-0.001 *
		0.000	*0.000*	*0.000*	*0.000*
	Banks without rating (0-1)	-0.059 ***	0.025	0.008 **	0.006
		0.004	*0.027*	*0.004*	*0.025*
	Rating	-0.001	0.002 *	-0.001 **	0.002
		0.001	*0.001*	*0.001*	*0.003*
	ROE	0.000	-0.027 **	0.000	0.036 ***
		0.000	*0.013*	*0.000*	*0.011*
Liquidity needs	Fund Raising	0.019 ***	0.248 ***	-0.045 ***	-0.041 ***
		0.004	*0.020*	*0.004*	*0.015*
	Volatility of Liquidity	-0.084 ***	-0.095 ***	0.007 *	0.025
		0.011	*0.024*	*0.004*	*0.024*
Liquidity motivations	Total loans	0.061 ***	-0.062 ***	0.047 ***	-0.009
		0.003	*0.020*	*0.004*	*0.016*
	Non-domestic assets	-0.121 ***	-0.152 ***	0.053 **	0.098 **
		0.012	*0.055*	*0.010*	*0.038*
	Total shares	-0.153 ***	-0.118 ***	-0.007	0.026
		0.009	*0.043*	*0.013*	*0.046*
	Intra-group interbank net-position	-0.035 ***	-0.138 ***	0.009 ***	0.018 ***
		0.002	*0.008*	*0.002*	*0.006*
	Non-domestic interbank net-position	-0.027 ***	-0.090 ***	-0.002	0.027 ***
		0.001	*0.005*	*0.002*	*0.004*
lender					
Lending capacity	Size	0.011 ***	0.049 ***	-0.046 ***	-0.102 ***
		0.001	*0.008*	*0.001*	*0.008*
	Capital	-0.059 ***	0.099 *	0.126 ***	-0.320 ***
		0.006	*0.066*	*0.007*	*0.067*
	Bad loans	0.031 ***	0.198 ***	-0.091 ***	0.003
		0.007	*0.051*	*0.009*	*0.041*
	Structure of income/Opacity	0.001 **	-0.001 **	-0.001 ***	0.000
		0.000	*0.000*	*0.000*	*0.000*
	Banks without rating (0-1)	0.011 ***	-0.076 ***	-0.019 ***	-0.130 ***
		0.004	*0.031*	*0.004*	*0.029*
	Rating	-0.003 ***	0.011 ***	-0.005 ***	-0.001
		0.001	*0.004*	*0.001*	*0.004*
	ROE	0.000	-0.001	0.000	-0.001
		0.000	*0.005*	*0.000*	*0.012*
Liquidity provisions	Funds Raising	-0.009 **	0.035 *	-0.039 ***	-0.128 ***
		0.004	*0.020*	*0.004*	*0.019*
	Volatility of Liquidity	-0.083 ***	-0.174 ***	0.031 **	0.326 ***
		0.012	*0.035*	*0.015*	*0.054*
Liquidity motivations	Total loans	0.006 *	0.115 ***	0.096 ***	0.006
		0.003	*0.021*	*0.004*	*0.020*
	Non-domestic assets	-0.012 *	-0.035	-0.099 ***	-0.158 ***
		0.010	*0.050*	*0.012*	*0.042*
	Total shares	-0.033 ***	-0.108 ***	-0.077 ***	-0.062
		0.011	*0.051*	*0.011*	*0.049*
borrower and lender					
Duration	Relationship duration	0.001 ***	0.000 ***	0.001 ***	0.001 ***
		0.000	*0.000*	*0.000*	*0.000*
Liquidity	Liquidity shocks correlation	0.005 ***	0.007 ***	-0.002 ***	-0.002
		0.001	*0.002*	*0.001*	*0.002*
Interaction outside the interbank market	Securities Interaction (borrower vs. lender)	0.007 ***	0.009 *	0.003 **	0.002
		0.001	*0.005*	*0.002*	*0.004*
	Securities Interaction (lender vs. borrower)	0.006 ***	0.014 ***	0.034 ***	-0.008 **
		0.002	*0.004*	*0.002*	*0.004*
Garantees	Secured / unsecured interbank loans	0.809 ***	0.609 ***	0.731 ***	0.742 ***
		0.006	*0.013*	*0.005*	*0.017*
Counterpart dummies		yes	yes	yes	yes
constant		0.226 **	-0.170	0.431 ***	1.012 ***
		0.015	*0.111*	*0.120*	*0.158*
Number of observations		219,325	33,875	232,574	44,967
R-sq		0.23	0.21	0.20	0.40

Table reports regression coefficients and associated standard errors in italics. ***, **, and * denote statistical significance at 1, 5 and 10 % level.

RECENTLY PUBLISHED "TEMI" (*)

N. 804 – *Il miglioramento qualitativo delle produzioni italiane: evidenze da prezzi e strategie delle imprese*, by Valter di Giacinto and Giacinto Micucci (April 2011).

N. 805 – *What determines annuity demand at retirement?*, by Giuseppe Cappelletti, Giovanni Guazzarotti and Pietro Tommasino (April 2011).

N. 806 – *Heterogeneity and learning with complete markets*, by Sergio Santoro (April 2011).

N. 807 – *Housing, consumption and monetary policy: how different are the U.S. and the euro area?*, by Alberto Musso, Stefano Neri and Livio Stracca (April 2011).

N. 808 – *The monetary transmission mechanism in the euro area: has it changed and why?*, by Martina Cecioni and Stefano Neri (April 2011).

N. 809 – *Convergence clubs, the euro-area rank and the relationship between banking and real convergence*, by Massimiliano Affinito (June 2011).

N. 810 – *The welfare effect of foreign monetary conservatism with non-atomistic wage setters*, by Vincenzo Cuciniello (June 2011).

N. 811 – *Schooling and youth mortality: learning from a mass military exemption*, by Piero Cipollone and Alfonso Rosolia (June 2011).

N. 812 – *Welfare costs of inflation and the circulation of US currency abroad*, by Alessandro Calza and Andrea Zaghini (June 2011).

N. 813 – *Legal status of immigrants and criminal behavior: evidence from a natural experiment*, by Giovanni Mastrobuoni and Paolo Pinotti (June 2011).

N. 814 – *An unexpected crisis? Looking at pricing effectiveness of different banks*, by Valerio Vacca (July 2011).

N. 815 – *Skills or culture? An analysis of the decision to work by immigrant women in Italy*, by Antonio Accetturo and Luigi Infante (July 2011).

N. 816 – *Home bias in interbank lending and banks' resolution regimes*, by Michele Manna (July 2011).

N. 817 – *Macroeconomic determinants of carry trade activity*, by Alessio Anzuini and Fabio Fornari (September 2011).

N. 818 – *Leaving home and housing prices. The experience of Italian youth emancipation*, by Francesca Modena and Concetta Rondinelli (September 2011).

N. 819 – *The interbank market after the financial turmoil: squeezing liquidity in a "lemons market" or asking liquidity "on tap"*, by Antonio De Socio (September 2011).

N. 820 – *The relationship between the PMI and the Italian index of industrial production and the impact of the latest economic crisis*, by Valentina Aprigliano (September 2011).

N. 821 – *Inside the sovereign credit default swap market: price discovery, announcements, market behaviour and corporate sector*, by Alessandro Carboni (September 2011).

N. 822 – *The demand for energy of Italian households*, by Ivan Faiella (September 2011).

N. 823 – *Sull'ampiezza ottimale delle giurisdizioni locali: il caso delle province italiane*, by Guglielmo Barone (September 2011).

N. 824 – *The public-private pay gap: a robust quantile approach*, by Domenico Depalo and Raffaela Giordano (September 2011).

––––––––––––

(*) Requests for copies should be sent to:
Banca d'Italia – Servizio Studi di struttura economica e finanziaria – Divisione Biblioteca e Archivio storico – Via Nazionale, 91 – 00184 Rome – (fax 0039 06 47922059). They are available on the Internet www.bancaditalia.it.

"TEMI" LATER PUBLISHED ELSEWHERE

2008

P. ANGELINI, *Liquidity and announcement effects in the euro area*, Giornale degli Economisti e Annali di Economia, v. 67, 1, pp. 1-20, **TD No. 451 (October 2002)**.

P. ANGELINI, P. DEL GIOVANE, S. SIVIERO and D. TERLIZZESE, *Monetary policy in a monetary union: What role for regional information?*, International Journal of Central Banking, v. 4, 3, pp. 1-28, **TD No. 457 (December 2002)**.

F. SCHIVARDI and R. TORRINI, *Identifying the effects of firing restrictions through size-contingent Differences in regulation*, Labour Economics, v. 15, 3, pp. 482-511, **TD No. 504 (June 2004)**.

L. GUISO and M. PAIELLA,, *Risk aversion, wealth and background risk*, Journal of the European Economic Association, v. 6, 6, pp. 1109-1150, **TD No. 483 (September 2003)**.

C. BIANCOTTI, G. D'ALESSIO and A. NERI, *Measurement errors in the Bank of Italy's survey of household income and wealth*, Review of Income and Wealth, v. 54, 3, pp. 466-493, **TD No. 520 (October 2004)**.

S. MOMIGLIANO, J. HENRY and P. HERNÁNDEZ DE COS, *The impact of government budget on prices: Evidence from macroeconometric models*, Journal of Policy Modelling, v. 30, 1, pp. 123-143 **TD No. 523 (October 2004)**.

L. GAMBACORTA, *How do banks set interest rates?*, European Economic Review, v. 52, 5, pp. 792-819, **TD No. 542 (February 2005)**.

P. ANGELINI and A. GENERALE, *On the evolution of firm size distributions*, American Economic Review, v. 98, 1, pp. 426-438, **TD No. 549 (June 2005)**.

R. FELICI and M. PAGNINI, *Distance, bank heterogeneity and entry in local banking markets*, The Journal of Industrial Economics, v. 56, 3, pp. 500-534, **No. 557 (June 2005)**.

S. DI ADDARIO and E. PATACCHINI, *Wages and the city. Evidence from Italy*, Labour Economics, v.15, 5, pp. 1040-1061, **TD No. 570 (January 2006)**.

S. SCALIA, *Is foreign exchange intervention effective?*, Journal of International Money and Finance, v. 27, 4, pp. 529-546, **TD No. 579 (February 2006)**.

M. PERICOLI and M. TABOGA, *Canonical term-structure models with observable factors and the dynamics of bond risk premia*, Journal of Money, Credit and Banking, v. 40, 7, pp. 1471-88, **TD No. 580 (February 2006)**.

E. VIVIANO, *Entry regulations and labour market outcomes. Evidence from the Italian retail trade sector*, Labour Economics, v. 15, 6, pp. 1200-1222, **TD No. 594 (May 2006)**.

S. FEDERICO and G. A. MINERVA, *Outward FDI and local employment growth in Italy*, Review of World Economics, Journal of Money, Credit and Banking, v. 144, 2, pp. 295-324, **TD No. 613 (February 2007)**.

F. BUSETTI and A. HARVEY, *Testing for trend*, Econometric Theory, v. 24, 1, pp. 72-87, **TD No. 614 (February 2007)**.

V. CESTARI, P. DEL GIOVANE and C. ROSSI-ARNAUD, *Memory for prices and the Euro cash changeover: an analysis for cinema prices in Italy*, In P. Del Giovane e R. Sabbatini (eds.), The Euro Inflation and Consumers' Perceptions. Lessons from Italy, Berlin-Heidelberg, Springer, **TD No. 619 (February 2007)**.

B. H. HALL, F. LOTTI and J. MAIRESSE, *Employment, innovation and productivity: evidence from Italian manufacturing microdata*, Industrial and Corporate Change, v. 17, 4, pp. 813-839, **TD No. 622 (April 2007)**.

J. SOUSA and A. ZAGHINI, *Monetary policy shocks in the Euro Area and global liquidity spillovers*, International Journal of Finance and Economics, v.13, 3, pp. 205-218, **TD No. 629 (June 2007)**.

M. DEL GATTO, GIANMARCO I. P. OTTAVIANO and M. PAGNINI, *Openness to trade and industry cost dispersion: Evidence from a panel of Italian firms*, Journal of Regional Science, v. 48, 1, pp. 97-129, **TD No. 635 (June 2007)**.

P. DEL GIOVANE, S. FABIANI and R. SABBATINI, *What's behind "inflation perceptions"? A survey-based analysis of Italian consumers*, in P. Del Giovane e R. Sabbatini (eds.), *The Euro Inflation and Consumers' Perceptions. Lessons from Italy*, Berlin-Heidelberg, Springer, **TD No. 655 (January 2008)**.

R. BRONZINI, G. DE BLASIO, G. PELLEGRINI and A. SCOGNAMIGLIO, *La valutazione del credito d'imposta per gli investimenti*, Rivista di politica economica, v. 98, 4, pp. 79-112, **TD No. 661 (April 2008)**.

B. BORTOLOTTI, and P. PINOTTI, *Delayed privatization,* Public Choice, v. 136, 3-4, pp. 331-351, **TD No. 663 (April 2008).**

R. BONCI and F. COLUMBA, *Monetary policy effects: New evidence from the Italian flow of funds,* Applied Economics , v. 40, 21, pp. 2803-2818, **TD No. 678 (June 2008).**

M. CUCCULELLI, and G. MICUCCI, *Family Succession and firm performance: evidence from Italian family firms,* Journal of Corporate Finance, v. 14, 1, pp. 17-31, **TD No. 680 (June 2008).**

A. SILVESTRINI and D. VEREDAS, *Temporal aggregation of univariate and multivariate time series models: a survey,* Journal of Economic Surveys, v. 22, 3, pp. 458-497, **TD No. 685 (August 2008).**

2009

F. PANETTA, F. SCHIVARDI and M. SHUM, *Do mergers improve information? Evidence from the loan market*, Journal of Money, Credit, and Banking, v. 41, 4, pp. 673-709, **TD No. 521 (October 2004).**

M. BUGAMELLI and F. PATERNÒ, *Do workers' remittances reduce the probability of current account reversals?*, World Development, v. 37, 12, pp. 1821-1838, **TD No. 573 (January 2006).**

P. PAGANO and M. PISANI, *Risk-adjusted forecasts of oil prices*, The B.E. Journal of Macroeconomics, v. 9, 1, Article 24, **TD No. 585 (March 2006).**

M. PERICOLI and M. SBRACIA, *The CAPM and the risk appetite index: theoretical differences, empirical similarities, and implementation problems*, International Finance, v. 12, 2, pp. 123-150, **TD No. 586 (March 2006).**

U. ALBERTAZZI and L. GAMBACORTA, *Bank profitability and the business cycle,* Journal of Financial Stability, v. 5, 4, pp. 393-409, **TD No. 601 (September 2006).**

S. MAGRI, *The financing of small innovative firms: the Italian case*, Economics of Innovation and New Technology, v. 18, 2, pp. 181-204, **TD No. 640 (September 2007).**

V. DI GIACINTO and G. MICUCCI, *The producer service sector in Italy: long-term growth and its local determinants,* Spatial Economic Analysis, Vol. 4, No. 4, pp. 391-425, **TD No. 643 (September 2007).**

F. LORENZO, L. MONTEFORTE and L. SESSA, *The general equilibrium effects of fiscal policy: estimates for the euro area*, Journal of Public Economics, v. 93, 3-4, pp. 559-585, **TD No. 652 (November 2007).**

R. GOLINELLI and S. MOMIGLIANO, *The Cyclical Reaction of Fiscal Policies in the Euro Area. A Critical Survey of Empirical Research*, Fiscal Studies, v. 30, 1, pp. 39-72, **TD No. 654 (January 2008).**

P. DEL GIOVANE, S. FABIANI and R. SABBATINI, *What's behind "Inflation Perceptions"? A survey-based analysis of Italian consumers,* Giornale degli Economisti e Annali di Economia, v. 68, 1, pp. 25-52, **TD No. 655 (January 2008).**

F. MACCHERONI, M. MARINACCI, A. RUSTICHINI and M. TABOGA, *Portfolio selection with monotone mean-variance preferences,* Mathematical Finance, v. 19, 3, pp. 487-521, **TD No. 664 (April 2008).**

M. AFFINITO and M. PIAZZA, *What are borders made of? An analysis of barriers to European banking integration*, in P. Alessandrini, M. Fratianni and A. Zazzaro (eds.): The Changing Geography of Banking and Finance, Dordrecht Heidelberg London New York, Springer, **TD No. 666 (April 2008).**

A. BRANDOLINI, *On applying synthetic indices of multidimensional well-being: health and income inequalities in France, Germany, Italy, and the United Kingdom*, in R. Gotoh and P. Dumouchel (eds.), Against Injustice. The New Economics of Amartya Sen, Cambridge, Cambridge University Press, **TD No. 668 (April 2008).**

G. FERRERO and A. NOBILI, *Futures contract rates as monetary policy forecasts,* International Journal of Central Banking, v. 5, 2, pp. 109-145, **TD No. 681 (June 2008).**

P. CASADIO, M. LO CONTE and A. NERI, *Balancing work and family in Italy: the new mothers' employment decisions around childbearing*, in T. Addabbo and G. Solinas (eds.), Non-Standard Employment and Qualità of Work, Physica-Verlag. A Sprinter Company, **TD No. 684 (August 2008).**

L. ARCIERO, C. BIANCOTTI, L. D'AURIZIO and C. IMPENNA, *Exploring agent-based methods for the analysis of payment systems: A crisis model for StarLogo TNG,* Journal of Artificial Societies and Social Simulation, v. 12, 1, **TD No. 686 (August 2008).**

A. CALZA and A. ZAGHINI, *Nonlinearities in the dynamics of the euro area demand for M1*, Macroeconomic Dynamics, v. 13, 1, pp. 1-19, **TD No. 690 (September 2008).**

L. FRANCESCO and A. SECCHI, *Technological change and the households' demand for currency*, Journal of Monetary Economics, v. 56, 2, pp. 222-230, **TD No. 697 (December 2008).**

G. ASCARI and T. ROPELE, *Trend inflation, taylor principle, and indeterminacy*, Journal of Money, Credit and Banking, v. 41, 8, pp. 1557-1584, **TD No. 708 (May 2007).**

S. COLAROSSI and A. ZAGHINI, *Gradualism, transparency and the improved operational framework: a look at overnight volatility transmission*, International Finance, v. 12, 2, pp. 151-170, **TD No. 710 (May 2009).**

M. BUGAMELLI, F. SCHIVARDI and R. ZIZZA, *The euro and firm restructuring*, in A. Alesina e F. Giavazzi (eds): Europe and the Euro, Chicago, University of Chicago Press, **TD No. 716 (June 2009).**

B. HALL, F. LOTTI and J. MAIRESSE, *Innovation and productivity in SMEs: empirical evidence for Italy*, Small Business Economics, v. 33, 1, pp. 13-33, **TD No. 718 (June 2009).**

2010

A. PRATI and M. SBRACIA, *Uncertainty and currency crises: evidence from survey data*, Journal of Monetary Economics, v, 57, 6, pp. 668-681, **TD No. 446 (July 2002).**

L. MONTEFORTE and S. SIVIERO, *The Economic Consequences of Euro Area Modelling Shortcuts*, Applied Economics, v. 42, 19-21, pp. 2399-2415, **TD No. 458 (December 2002).**

S. MAGRI, *Debt maturity choice of nonpublic Italian firms* , Journal of Money, Credit, and Banking, v.42, 2-3, pp. 443-463, **TD No. 574 (January 2006).**

R. BRONZINI and P. PISELLI, *Determinants of long-run regional productivity with geographical spillovers: the role of R&D, human capital and public infrastructure,* Regional Science and Urban Economics, v. 39, 2, pp.187-199, **TD No. 597 (September 2006).**

E. IOSSA and G. PALUMBO, *Over-optimism and lender liability in the consumer credit market,* Oxford Economic Papers, v. 62, 2, pp. 374-394, **TD No. 598 (September 2006).**

S. NERI and A. NOBILI, *The transmission of US monetary policy to the euro area,* International Finance, v. 13, 1, pp. 55-78, **TD No. 606 (December 2006).**

F. ALTISSIMO, R. CRISTADORO, M. FORNI, M. LIPPI and G. VERONESE, *New Eurocoin: Tracking Economic Growth in Real Time,* Review of Economics and Statistics, v. 92, 4, pp. 1024-1034, **TD No. 631 (June 2007).**

A. CIARLONE, P. PISELLI and G. TREBESCHI, *Emerging Markets' Spreads and Global Financial Conditions*, Journal of International Financial Markets, Institutions & Money, v. 19, 2, pp. 222-239, **TD No. 637 (June 2007).**

U. ALBERTAZZI and L. GAMBACORTA, *Bank profitability and taxation,* Journal of Banking and Finance, v. 34, 11, pp. 2801-2810, **TD No. 649 (November 2007).**

M. IACOVIELLO and S. NERI, *Housing market spillovers: evidence from an estimated DSGE model,* American Economic Journal: Macroeconomics, v. 2, 2, pp. 125-164, **TD No. 659 (January 2008).**

F. BALASSONE, F. MAURA and S. ZOTTERI, *Cyclical asymmetry in fiscal variables in the EU*, Empirica, **TD No. 671**, v. 37, 4, pp. 381-402 **(June 2008).**

F. D'AMURI, O. GIANMARCO I.P. and P. GIOVANNI, *The labor market impact of immigration on the western german labor market in the 1990s,* European Economic Review, v. 54, 4, pp. 550-570, **TD No. 687 (August 2008).**

A. ACCETTURO, *Agglomeration and growth: the effects of commuting costs,* Papers in Regional Science, v. 89, 1, pp. 173-190, **TD No. 688 (September 2008).**

S. NOBILI and G. PALAZZO, *Explaining and forecasting bond risk premiums,* Financial Analysts Journal, v. 66, 4, pp. 67-82, **TD No. 689 (September 2008).**

A. B. ATKINSON and A. BRANDOLINI, *On analysing the world distribution of income*, World Bank Economic Review , v. 24, 1 , pp. 1-37, **TD No. 701 (January 2009).**

R. CAPPARIELLO and R. ZIZZA, *Dropping the Books and Working Off the Books,* Labour, v. 24, 2, pp. 139-162 ,**TD No. 702 (January 2009).**

C. NICOLETTI and C. RONDINELLI, *The (mis)specification of discrete duration models with unobserved heterogeneity: a Monte Carlo study,* Journal of Econometrics, v. 159, 1, pp. 1-13, **TD No. 705 (March 2009).**

L. FORNI, A. GERALI and M. PISANI, *Macroeconomic effects of greater competition in the service sector: the case of Italy,* Macroeconomic Dynamics, v. 14, 5, pp. 677-708, **TD No. 706 (March 2009).**

V. DI GIACINTO, G. MICUCCI and P. MONTANARO, *Dynamic macroeconomic effects of public capital: evidence from regional Italian data,* Giornale degli economisti e annali di economia, v. 69, 1, pp. 29-66, **TD No. 733 (November 2009).**

F. COLUMBA, L. GAMBACORTA and P. E. MISTRULLI, *Mutual Guarantee institutions and small business finance,* Journal of Financial Stability, v. 6, 1, pp. 45-54, **TD No. 735 (November 2009).**

A. GERALI, S. NERI, L. SESSA and F. M. SIGNORETTI, *Credit and banking in a DSGE model of the Euro Area,* Journal of Money, Credit and Banking, v. 42, 6, pp. 107-141, **TD No. 740 (January 2010).**

M. AFFINITO and E. TAGLIAFERRI, *Why do (or did?) banks securitize their loans? Evidence from Italy*, Journal of Financial Stability, v. 6, 4, pp. 189-202, **TD No. 741 (January 2010).**

S. FEDERICO, *Outsourcing versus integration at home or abroad and firm heterogeneity,* Empirica, v. 37, 1, pp. 47-63, **TD No. 742 (February 2010).**

V. DI GIACINTO, *On vector autoregressive modeling in space and time,* Journal of Geographical Systems, v. 12, 2, pp. 125-154, **TD No. 746 (February 2010).**

S. MOCETTI and C. PORELLO, *How does immigration affect native internal mobility? new evidence from Italy,* Regional Science and Urban Economics, v. 40, 6, pp. 427-439, **TD No. 748 (March 2010).**

A. DI CESARE and G. GUAZZAROTTI, *An analysis of the determinants of credit default swap spread changes before and during the subprime financial turmoil,* Journal of Current Issues in Finance, Business and Economics, v. 3, 4, pp., **TD No. 749 (March 2010).**

P. CIPOLLONE, P. MONTANARO and P. SESTITO, *Value-added measures in Italian high schools: problems and findings*, Giornale degli economisti e annali di economia, v. 69, 2, pp. 81-114, **TD No. 754 (March 2010).**

A. BRANDOLINI, S. MAGRI and T. M SMEEDING, *Asset-based measurement of poverty*, Journal of Policy Analysis and Management, v. 29, 2 , pp. 267-284, **TD No. 755 (March 2010).**

G. CAPPELLETTI, *A Note on rationalizability and restrictions on beliefs,* The B.E. Journal of Theoretical Economics, v. 10, 1, pp. 1-11,**TD No. 757 (April 2010).**

S. DI ADDARIO and D. VURI, *Entrepreneurship and market size. the case of young college graduates in Italy*, Labour Economics, v. 17, 5, pp. 848-858, **TD No. 775 (September 2010).**

A. CALZA and A. ZAGHINI, *Sectoral money demand and the great disinflation in the US*, Journal of Money, Credit, and Banking, v. 42, 8, pp. 1663-1678, **TD No. 785 (January 2011).**

2011

S. DI ADDARIO, *Job search in thick markets*, Journal of Urban Economics, v. 69, 3, pp. 303-318, **TD No. 605 (December 2006).**

E. CIAPANNA, *Directed matching with endogenous markov probability: clients or competitors?*, The RAND Journal of Economics, v. 42, 1, pp. 92-120, **TD No. 665 (April 2008).**

L. FORNI, A. GERALI and M. PISANI, *The Macroeconomics of Fiscal Consolidation in a Monetary Union: the Case of Italy,* in Luigi Paganetto (ed.), Recovery after the crisis. Perspectives and policies, VDM Verlag Dr. Muller, **TD No. 747 (March 2010).**

A. DI CESARE and G. GUAZZAROTTI, *An analysis of the determinants of credit default swap changes before and during the subprime financial turmoil*, in Barbara L. Campos and Janet P. Wilkins (eds.), The Financial Crisis: Issues in Business, Finance and Global Economics, New York, Nova Science Publishers, Inc., **TD No. 749 (March 2010).**

G. GRANDE and I. VISCO, *A public guarantee of a minimum return to defined contribution pension scheme members,* The Journal of Risk, v. 13, 3, pp. 3-43, **TD No. 762 (June 2010).**

P. DEL GIOVANE, G. ERAMO and A. NOBILI, *Disentangling demand and supply in credit developments: a survey-based analysis for Italy,* Journal of Banking and Finance, v. 35, 10, pp. 2719-2732, **TD No. 764 (June 2010).**

M. TABOGA, *Under/over-valuation of the stock market and cyclically adjusted earnings*, International Finance, v. 14, 1, pp. 135-164, **TD No. 780 (December 2010).**

S. NERI, *Housing, consumption and monetary policy: how different are the U.S. and the Euro area?*, Journal of Banking and Finance, v.35, 11, pp. 3019-3041, **TD No. 807 (April 2011).**

FORTHCOMING

M. BUGAMELLI and A. ROSOLIA, *Produttività e concorrenza estera*, Rivista di politica economica, **TD No. 578 (February 2006).**

G. DE BLASIO and G. NUZZO, *Historical traditions of civicness and local economic development,* Journal of Regional Science, **TD No. 591 (May 2006).**

F. CINGANO and A. ROSOLIA, *People I know: job search and social networks*, Journal of Labor Economics, **TD No. 600 (September 2006).**

F. SCHIVARDI and E. VIVIANO, *Entry barriers in retail trade*, Economic Journal, **TD No. 616 (February 2007).**

G. FERRERO, A. NOBILI and P. PASSIGLIA, *Assessing excess liquidity in the Euro Area: the role of sectoral distribution of money,* Applied Economics, **TD No. 627 (April 2007).**

P. E. MISTRULLI, *Assessing financial contagion in the interbank market: maximun entropy versus observed interbank lending patterns,* Journal of Banking & Finance, **TD No. 641 (September 2007).**

Y. ALTUNBAS, L. GAMBACORTA and D. MARQUÉS, *Securitisation and the bank lending channel*, European Economic Review, **TD No. 653 (November 2007).**

M. BUGAMELLI and F. PATERNÒ, *Output growth volatility and remittances*, Economica, **TD No. 673 (June 2008).**

V. DI GIACINTO e M. PAGNINI, *Local and global agglomeration patterns: two econometrics-based indicators,* Regional Science and Urban Economics, **TD No. 674 (June 2008).**

G. BARONE and F. CINGANO, *Service regulation and growth: evidence from OECD countries,* Economic Journal, **TD No. 675 (June 2008).**

S. MOCETTI, *Educational choices and the selection process before and after compulsory school*, Education Economics, **TD No. 691 (September 2008).**

P. SESTITO and E. VIVIANO, *Reservation wages: explaining some puzzling regional patterns*, Labour, **TD No. 696 (December 2008).**

P. PINOTTI, M. BIANCHI and P. BUONANNO, *Do immigrants cause crime?*, Journal of the European Economic Association, **TD No. 698 (December 2008).**

R. GIORDANO and P. TOMMASINO, *What determines debt intolerance? The role of political and monetary institutions*, European Journal of Political Economy, **TD No. 700 (January 2009).**

F. LIPPI and A. NOBILI, *Oil and the macroeconomy: a quantitative structural analysis,* Journal of European Economic Association, **TD No. 704 (March 2009).**

F. CINGANO and P. PINOTTI, *Politicians at work. The private returns and social costs of political connections*, Journal of the European Economic Association, **TD No. 709 (May 2009).**

Y. ALTUNBAS, L. GAMBACORTA, and D. MARQUÉS-IBÁÑEZ, *Bank risk and monetary policy,* Journal of Financial Stability, **TD No. 712 (May 2009).**

P. ANGELINI, A. NOBILI e C. PICILLO, *The interbank market after August 2007: What has changed, and why?*, Journal of Money, Credit and Banking, **TD No. 731 (October 2009).**

G. BARONE and S. MOCETTI, *Tax morale and public spending inefficiency,* International Tax and Public Finance, **TD No. 732 (November 2009).**

L. FORNI, A. GERALI and M. PISANI, *The macroeconomics of fiscal consolidations in euro area countries,* Journal of Economic Dynamics and Control, **TD No. 747 (March 2010).**

G. BARONE, R. FELICI and M. PAGNINI, *Switching costs in local credit markets,* International Journal of Industrial Organization, **TD No. 760 (June 2010).**

G. BARONE and S. MOCETTI, *With a little help from abroad: the effect of low-skilled immigration on the female labour supply,* Labour Economics, **TD No. 766 (July 2010).**

S. MAGRI and R. PICO, *The rise of risk-based pricing of mortgage interest rates in Italy*, Journal of Banking and Finance, **TD No. 778 (October 2010).**

A. ACCETTURO and G. DE BLASIO, *Policies for local development: an evaluation of Italy's "Patti Territoriali",* Regional Science and Urban Economics, **TD No. 789 (January 2006).**

E. COCOZZA and P. PISELLI, *Testing for east-west contagion in the European banking sector during the financial crisis,* in R. Matoušek; D. Stavárek (eds.), Financial Integration in the European Union, Taylor & Francis, **TD No. 790 (February 2011).**

S. NERI and T. ROPELE, *Imperfect information, real-time data and monetary policy in the Euro area,* The Economic Journal, **TD No. 802 (March 2011).**