The Real Side of the Financial Crisis: Bank Vulnerability, Flight to Quality, and Firm Investment Rate

Emanuele Brancati*

April 23, 2014

ABSTRACT

This paper takes advantage of the Italian experience in the Lehman crisis to test the effects of unexpected banking shocks on the real decisions of client firms. I exploit banks' pre-crisis holdings of dollar-denominated assets and liabilities to identify banks' vulnerability to the financial crisis, and match this information with a large sample of small and micro-sized client firms. Results document a lending channel affecting firms' investment rate, amount of borrowing, and probability of financial constraints. This effect is characterised by a flight to quality away from riskier borrowers, and is amplified for clients of more fragile institutions.

JEL classification: E22, G01, G21.

Keywords: Financial crises, bank lending, firm investment, financial constraints.

* Emanuele Brancati: LUISS Guido Carli University, viale Romania 32, 00197 Rome (Italy), and MET, via Sabotino 2A, 00195 Rome. ebrancati@luiss.it, e.brancati@met-economia.it

I wish to thank Susanto Basu, Christopher Baum, Giacomo Candian, Annalisa Castelli, Alexandre Cole, Filippo De Marco, Mikhail Dmitriev, Petra Gay, Liliane Giardino Karlinger, Giuseppe Maggio, Gerardo Manzo, Marco Macchiavelli, Ginevra Marandola, Francesco Nucci, Paolo Paesani, Fabiano Schivardi, Ugo Zannini, seminar participants at Boston College and University of Rome, Tor Vergata. I thank MET for providing the data that made this study possible. A special thank to Pierluigi Balduzzi and Fabio Schiantarelli for their constant suggestions. All errors are my own responsibility.

1 Introduction

The financial crisis of the Fall of 2008 threw economies all over the world into a severe recession. The main cause of this panic is considered to be the US credit boom that skyrocketed up to 2007, followed by the meltdown of sub-prime mortgages and asset-backed securities triggered by the burst of the US housing bubble. This in turn gave rise to a worldwide panic throughout the international banking system, that induced a sharp contraction in credit supply, and damaged firm capability to fund investment projects.

This paper documents the existence of contagion effects of the Lehman crisis even on economies with negligible holdings of toxic assets, no involvement in sub-prime lending, and no shocks to the real estate sector. The analysis focuses on the behavior of Italian banks and its impact on the real decisions of client firms. I explore this bank-lending channel by linking firms' borrowing and investment with the pre-crisis exposure of their lender institutions to dollar-denominated assets and liabilities. Even within stable banking systems, dissimilar exposures to dollar items led to substantially different degrees of bank vulnerability to the crisis: on the one hand, through shocks on the quality of banks' dollar-assets portfolios, on the other, through the shortage of dollar funding that followed the financial turmoil. This simultaneous shock on both sides of the balance sheet affected banks' lending practices, and, consequently, the investment activity of their client firms.

The Italian economy provides an ideal laboratory to test such a channel and to shed light on the developments in continental Europe at large. First, the nature of the financial crisis allows for identifying a supply shock that is independent from the quality of the domestic loan portfolios of Italian banks. While deterioration in lenders' financial solidity has historically coincided with shocks to the condition of their corporate borrowers, the Lehman crisis exploded in the US housing market and was totally unrelated to the business fundamentals of Italian companies. In other words, the crisis of 2008–2009 represents a quasi-natural experiment to study the transmission of credit supply shocks onto the real economy.

The Italian experience is particularly interesting also because of the peculiar structure of the industrial and financial systems. The great diffusion of small and medium enterprises (hereinafter SMEs), together with underdeveloped stock markets, ensures that firms that are constrained by banks also lack access to alternative sources of financing. The impossibility of resorting to capital markets rules out any substitution

effect and is likely to magnify the impact of bank supply shocks.[1] Furthermore, the widespread use of short-term-debt covenants in Italy makes the shock transmission more immediate because of firm need of rolling-over.

Although Italian banks had negligible direct exposures to toxic assets, several institutions held sizable volumes of assets and liabilities that were denominated in US dollars (up to 30% of total assets, Table 1). At the same time, more exposed banks experienced relevant shocks on their asset composition, sharp dry-ups of dollar sources of funding, and exhibited a growth rate of loans that was substantially lower than that of less internationalized institutions (see Figure 1). It is then natural to ask whether there is a causal nexus linking bank exposure to $-assets and liabilities, and the borrowing conditions of client firms. This in turn is likely to be reflected in their investment activities and probability of facing financial constraints.[2]

There are several features of the analysis that is worth mentioning. First, I exploit a newly available survey covering a representative sample of Italian firms. The dataset allows to identify the bank-firm relationships for a large number of small companies with no access to capital markets. Second, I exploit the Lehman crisis as a quasi-natural experiment to explore the effects of exogenous supply shocks. I identify banks' vulnerability to the financial turmoil with their pre-crisis (as of 2006) exposure to $-items (both assets and liabilities). I then interact these measures with time-varying market valuations on the riskiness of the American system (CDS spreads indices). This identification strategy addresses potential problems of endogeneity due to banks' response to demand shocks and anticipatory behavior in determining their asset portfolios. Third, even though the emphasis of the paper is on firm investment rate, I show the effects to operate through a lending channel that in turn affects firms' probability of financial constraints. Fourth, I specifically test two complementary channels of shock transmission operating through the deterioration in the quality of banks' $-asset portfolios (due to the rise in credit risk and potential losses), and through the adverse funding shock that followed the dry-up of $-sources of financing. Finally, I highlight several dimensions of heterogeneity in this effect (both along firm and bank characteristics), and provide some aggregate implications for the economy.

[1] On the contrary, the net effect of banking shocks may be blurrier for firms with easy access to alternative sources of finance. For instance, Adrian, Colla, and Shin (2012) and Becker and Ivashina (2011) document the substitution of bank debt with bond issuance for US firms during the Lehman crisis. This in turn mitigates the effects of adverse supply shocks on bank borrowing.

[2] Indeed, aggregate evidence show that, in times of crisis, clients of highly-exposed banks invested less (9% vs. 15%) and were more financially constrained (10% vs. 8%) than firms borrowing from institutions with low $-exposure.

The empirical analysis provides robust results. The shock that hit Italian banks in the aftermath of the Lehman collapse was transmitted onto client firms with an intensity that depended on bank degree of vulnerability to the financial crisis. This effect was heterogeneous across firms, with a "relative flight to quality" showing a reallocation of loans away from riskier –young and small– borrowers. As a consequence, firm investment moved proportionally. A one-standard deviation increase in bank exposure led to a reduction in the investment rate of a 3-year-old firm (5^{th} percentile of the age distribution) of -0.17 standard deviations (std), together with an increase of +0.11 std in the capital accumulation of a 48-year-old company (95^{th} percentile). These effects were stronger for clients of undercapitalized and illiquid banks or financial institutions that depended more upon interbank finance; i.e. lenders with reduced capability of absorption of adverse financial shocks.

Interestingly, results show strong effects of bank exposure to both $-denominated assets (total $-assets, $-loans to banks, and $-loans to customers) and $-liabilities (total $-liabilities, $-deposits from banks, and $-deposits from customers), even if they are jointly considered. This is the first paper documenting such a complementarity. Moreover, I document similar effects on the amount firms were able to borrow and on their probability of facing financial constraints.

Finally, although the econometric analysis is performed at the firm level, I also derive some aggregate implications for capital accumulation. Bank exposure to $-items led to a reduction in aggregate capital of about 5%, together with a significant reallocation of resources across firms (11% of total capital).

This paper is related to several works. One strand of the literature focuses on the existence of a lending channel of monetary policy building on the theoretical contributions of Kashyap, Stein, and Wilcox (1993) and Kashyap and Stein (2000). Peek and Rosengren (1997, 2000) offer compelling bank-level evidence that shocks to financial institutions matter for loan supply. Exploiting the 1989-drop of the Japanese stock market, they isolate a supply shock in US thanks to the diffusion of American branches of Japanese banks. Their results show the fall in loans granted by Japanese branches in US depended upon their parents' capital positions. Several papers that followed explore the existence of a bank-lending channel, especially during the financial and sovereign-debt crises. The common key ingredient is to find a suitable identification strategy

that allows for isolating supply shocks. Ivashina and Scharfstein (2010) exploit bank exposures to unexpected credit-line drawdowns to analyze lending in US. Puri, Rocholl, and Steffen (2011) identify the magnitude of the shock with the vulnerability to the subprime crisis of German financial institutions. On Spanish data Carbó-Valverde, Degryse, and Rodriguo-Fernandez (2011) take advantage of asset-backed securities and covered bonds to characterize sound and unsound banks. They find more vulnerable banks to cut their lending by more, increase the number of rejected loan-applications and firm financial problems in times of crisis. In the same spirit, Santos (2011) finds a positive relationship between the interest rates charged on corporate loans and the amount of bank losses during the subprime crisis. Also on the lending channel, Cetorelli and Goldberg (2011), Ivashina, Scharfstein, and Stein (2012), and Shin (2012) focus on the role of global banks and their detention of $-denominated assets. Finally, Balduzzi, Brancati, and Schiantarelli (2013) explore the role of bank cost of funding in affecting investment, hiring and borrowing decisions of client firms.

Several analyses explore this transmission mechanism as a function of bank-specific characteristics. Cornett, McNutt, Strahan, and Tehranian (2011) focus on the composition of financing and show the drop in loans is lower for banks that are more liquid or rely on stable sources of financing. Jiménez, Ongena, Peydró, and Saurina (2012) study the beneficial role of liquidity and capitalization in alleviating the effects of tight monetary policies and low GDP growth. Finally, Iyer, Lopes, Peydro, and Schoar (2010) find a sharp decrease in loan supply for banks that were more dependent on interbank finance before the crisis.

The literature on the Italian system is extremely rich, mainly focused on the Credit Register dataset. Among others, Albertazzi and Marchetti (2010) and Gambacorta and Mistrulli (2011), explore the effects of bank capitalization and liquidity on credit supply, while Bonaccorsi and Sette (2012) focus on the role of bank composition of funding.

This paper is also related to the literature on firm investment in times of crisis. Amiti and Weinstein (2013) work on a matched lender-borrower dataset covering loans to listed Japanese firms. After decomposing loan movements into bank, firm, industry, and common shocks they conclude supply-side contractions have a large effect on corporate investment. Campello, Graham, and Harvey (2010) and Campello, Giambona, Graham, and Harvey (2011) document higher reductions in capital spending for financially constrained firms.

They also find evidence of a substitution between credit-lines and internal liquidity in times of credit shortage.[3] Finally, Cingano, Manaresi, and Sette (2013) show a negative effect of the 2007-freeze in the interbank market on investment, value added, and employment of client firms.

This paper contributes to the existing literature along several dimensions. The analysis employs a novel definition of bank vulnerability to show the existence of a contagion effect of the Lehman crisis even on relatively stable banking systems, with negligible holdings of toxic assets and no direct involvement in subprime lending. By exploiting a detailed set of $-denominated items, the empirical strategy documents a bank-lending channel of transmission of financial shocks operating through the effect of both $-assets and $-liabilities. This is the first work highlighting this double-acting shock and documenting at the same time its transmission on firm behavior. Differently from most of the literature, the paper doesn't only show the impact of adverse shocks on bank lending practices, but also quantifies their real effects on the investment activity and probability of financial constraints of client firms.

The work also builds up on the literature on bank characteristics by showing the indirect effect of capitalization and liquidity in mitigating the transmission of negative shocks.

Finally, another contribution is the specific focus on very small firms. International literature worked either on syndicated loans or listed companies. Instead, this paper relies on a sample of small and privately-held firms (even micro-sized companies with less than 10 employees) clearing-out problems of substitution among sources of finance, and clarifying the effects of supply-driven shocks.

The remainder of the paper is organized as follows. Section 2 discusses the empirical strategy, Section 3 provides details on the dataset and describes the assumptions of the analysis, Section 4 presents the results, and Section 5 concludes.

[3] Similarly, Almeida, Campello, Laranjeira, and Weisbenner (2009) prove firms with larger fractions of long-term debt maturing in times of crisis, experience more pronounced reductions in the investment rate compared to otherwise similar firms that didn't need to refinance their debt.

2 The Empirical Strategy

A correct identification of the shock and the inclusion of proper controls for credit demand are crucial issues to investigate the existence of contagion effects operating through a bank-lending channel.

This section presents the empirical methodology employed throughout the paper. First, I describe the identification strategy and discuss endogeneity issues. I then illustrate the econometric methodology and the controls adopted to rule-out demand effects.

2.1 Bank exposure

The Lehman collapse, and the turmoil that followed, was an unanticipated and unexpected event that can be considered as largely exogenous to the financial position of Italian banks and to the quality of their domestic loan portfolios. In other words, the 2008-2009 crisis can be viewed as a quasi-natural experiment to study the transmission of exogenous supply shocks to the real economy.

Although their direct exposure to toxic assets was negligible (Bonaccorsi and Sette, 2012), several Italian banks held relevant volumes of $-denominated items in their balance sheets, most of which were directly related to US clients and lenders. As of 2006, the share of assets and liabilities denominated in US dollars was very heterogeneous across banks: ranging from negligible holdings, up to 30% of their total assets.[4] This in turn exposed banks to substantially different degrees of vulnerability to what happened next: a disruption in the quality of banks' $-asset portfolios and a sudden shortage in their dollar funding sources. Interestingly, bank vulnerability doesn't seem to be associated to other relevant structural characteristics (capitalization, liquidity, dependence on interbank finance, composition of funding, and clients' creditworthiness, see Table 2). This evidence ensures unconfoundedness of the shock and helps in identifying a clear channel.

Several $-denominated items are taken into account. In addition to general exposures to total $-assets and liabilities I explicitly consider $-loans and $-deposits to/from banks or customers. Dollar exposures are then interacted with (common) time-varying market valuations on the riskiness of the US system. CDS indices are employed to weight $-items and to account for variations across time in the severity of the crisis.

[4] Although annual reports suggest that most of the $-denominated exposure is towards US clients, no country-breakdown is provided. However, it is useful to notice that $-exposures still proxy for bank degree of internationalization, allowing to identify more vulnerable institutions. Indeed, given the relative stability of the domestic banking system, it is still reasonable to assume that more internationalized institutions experienced larger shocks to their balance sheet composition than domestic, local institutions.

The ($-item-specific) exposure (*Expo*) of the lender bank of firm i at time t is defined as:

$$\text{Expo}_{i,t} = \frac{\text{Bank \$-item}_{i,2006}}{\text{Bank total assets}_{i,2006}} \times \text{CDS index(USA)}_t. \quad (1)$$

The choice of CDS index(USA)$_t$ varies together with the type of $-denominated item. When dealing with $-exposures toward banks ($-loans to banks and $-deposits from banks) I employ the *US bank sector CDS index 5Y*, a CDS index summarizing the riskiness of the US banking sector. For measures based on $-exposures to customers ($-loans to customers and $-deposits from customers), CDS index(USA)$_t$ is the *CDX.NA.IG index 5Y*, a synthetic risk measure for US corporate credit.[5] When dealing with total $-assets and liabilities, I employ a weighted average of *US banks sector CDS index 5Y*, *CDX.NA.IG index 5Y*, and *US treasury CDS 5Y*.[6,7]

The timing of *Expo* is particularly relevant. Employing pre-crisis measures allows for an identification of banks' fragility in the onset of the turmoil, that is exogenous to the financial position of client firms during the crisis. Since the Lehman shock was unexpected in 2006, pre-crisis holdings of $-denominated items are able to capture bank exposure in "normal times," being independent from to the quality of bank domestic loan portfolios in times of crisis.[8] At the same time, the interaction with time-varying CDS spreads allows to "weight" the same exposure differently across the various stages of the crisis and along the degree of instability in the international banking system.

Figure 2 shows the dynamics of the main CDS indices used in the analysis. As is apparent from the figure, the overall riskiness of the banking and corporate sectors experienced a dramatic increase in 2008 and 2009. This provides a dynamic for *Expo* that follows the severity of the crisis reaching its maximum in 2008.

Notice that this novel definition of *Expo* has different interpretations whether it is computed on asset or liability measures. While *Expo*($-assets) clearly represents the stock of risk accumulated on $-assets as

[5] *CDX.NA.IG index 5Y* is an index, provided by Markit, based on a basket of (125) representative North American corporate credits and proxies for the overall riskiness of US customers.

[6] The choice of the 5-years CDS spreads on senior debt is motivated by the higher liquidity of these markets, ensuring higher precisions of the risk measures.

[7] See the Appendix: variable definitions for further details.

[8] *Vice versa*, contemporaneous measures may suffer from reverse causality problems due to balance-sheet recompositions driven by the crisis. This is related to their correlation with the current financial position of their client firms affecting bank investment opportunities. It is true that the fragility of a small firm can hardly affect the behavior of large banking groups, but problems of reverse causality may still exist if firms are hit by correlated shocks and there is a self-selection of more fragile firms toward more exposed banks.

measured by their "hypothetical insurance cost," the meaning of *Expo*(\$-liabilities) is not as straightforward. On the one hand, the share of \$-liabilities measures the relevance of \$-sources of funding for the lender bank. On the other, the American CDS indices proxy for the overall instability in the US banking system. Thus, taken together, *Expo*(\$-liabilities) can be viewed as a measure of bank risk of shortage on \$-funding.

2.2 Econometric estimation

Although the paper provides results also on firm borrowing and probability of financial constraints, most of the analysis focuses on firm investment rate. The latter is modeled with a standard reduced-form equation augmented with the exposure of the lender bank to dollar-denominated items:

$$\frac{I_{i,t}}{K_{i,t-1}} = \alpha + \beta_{1,t}\text{Expo}_{i,t} + \beta_{2,t}\left(\text{Expo}_{i,t} \times \text{Interacting variable}_{i,t}\right) + \gamma^{\top} X_{i,t} + \mu_i + \eta_t + \varepsilon_{i,t} \tag{2}$$

where $\frac{I_{i,t}}{K_{i,t-1}}$ is the ratio between gross investment at time t and the stock of capital at $t-1$, $Expo_{i,t}$ is bank exposure as defined in Equation 1, and $Interacting\ variable_{i,t}$ is either firm age ($\ln(age_{i,t})$) or size ($\ln(assets_{i,t-1})$). The interaction term allows the effect of *Expo* to vary according to the riskiness of the borrower firm.[9] In the case of $\beta_{1,t} < 0$ and $\beta_{2,t} > 0$, the lending channel would transmit the negative shock to client firms ($\beta_{1,t} < 0$), with a redistribution of resources toward safer borrowers ($\beta_{2,t} > 0$). Coefficients are allowed to be time-varying and to have an additional partial effect in times of crisis (2008-2009).[10,11] Finally, $X_{i,t}$ is a vector of controls including firms' output-to-capital ratio, cash flow-to-capital ratio, age and size, while μ_i and η_t are firm-specific and time fixed effects.[12]

Equation 2 is estimated through two-step System-GMM models (Arellano and Bover, 1995; Blundell and Bond, 1998) with Windmeijer (2005) finite-sample correction of the standard errors. The estimator

[9] Both large and old firms are considered safer clients because of their lower probability of default in the short-term. Typically, bigger firms are also better diversified across customers, suppliers, and regions, and have a greater capability of pledging collaterals.

[10] Given the definition adopted, a one-standard deviation increase in $Expo_{i,t}$ moves the investment rate of firm i by $\beta_{1,pre} + (\beta_{2,pre} \times \text{Interacting variable}_{i,t})$ std in normal periods and by $(\beta_{1,pre} + \beta_{1,crisis}) + [(\beta_{2,pre} + \beta_{1,crisis}) \times \text{Interacting variable}_{i,t}]$ std in times of crisis.

[11] The choice of 2008 as the starting year of the crisis in Italy, is consistent with Schularick and Taylor (2011).

[12] Equation 2 can be derived in a model of imperfectly competitive firms with quadratic adjustment costs of capital. Within this framework, investment can be rearranged as a function of the expected sum of discounted marginal revenue of capital which in turn can be approximated with a fixed-common discount rate, the present value of the firm, and time-specific discount factors that embed all the financial frictions faced by the company. Assuming a Cobb-Douglas production function and a log-linear demand function, the marginal revenue product of capital is proportional to the output-capital ratio (Gilchrist and Himmelberg, 1998). Then, supposing expectations are formed with a VAR(1) process, one can recover a simplified version of Equation 2.

combines the original equation (in level) with its transformed version in first differences, allowing for a dynamic estimation of a small-T, large-N unbalanced panel, and taking into account heteroskedasticity and autocorrelation within firms. Endogenous variables are instrumented with appropriately-lagged levels in the differenced equation and with their first differences in the level equation. Finally, the validity of the instrumenting set is verified through the Arellano-Bond test for autocorrelation and the Hansen J-test of overidentifying restrictions.[13]

One crucial issue is how to disentangle demand and supply effects. The estimation purges unobservable firm characteristics and controls for time-varying common and company-specific demand components. All firm (and bank) unobservable factors that are constant over time, or demand shocks that are common across companies (and banks), are captured by firm and time fixed effects.[14] The specification is thus able to clean out common shocks that are time specific, as well as the permanent self-selection of better firms, with persistently higher investment rate, toward less exposed banks. Moreover, firm cash flow, output, and creditworthiness, control for most of the investment opportunities and demand factors.[15]

The last point that is still to discuss is the possibility of firm demand shocks correlated with bank exposure. In other words, if banks' (pre-crisis) holdings of $-items is correlated with the fragility of their clients in 2008–2009, results may be driven by a spurious correlation between $Expo_{i,t}$ and firm investment rate. This issue may be relevant if more exposed banks have client portfolios skewed toward companies that experienced stronger shocks in times of crisis (smaller, younger, less creditworthy, exporters or firms operating in specific industries and geographical regions).[16]

In order to address this possible self-selection, I include a rich set of firm-class- and bank-time fixed effects. The introduction of time fixed effects specific for firm size (small/medium/large), age (young/medium/old), creditworthiness (high/medium/low creditworthiness), region (20 regions), industry (12 industries), and export status (exporters/non exporters) reassures about the identification of a supply effect.[17] Results are

[13]The Arellano-Bond test of autocorrelation checks for the validity of the instrumenting set by verifying the order of the auto-regressive process of $\Delta\varepsilon_{i,t}$. If the dynamic of $\Delta\varepsilon_{i,t}$ is less persistent than an AR(1), then values lagged twice or more are legitimate (internal) instruments for the endogenous regressors.

[14]Notice that the set of fixed effects also controls for the two components of $Expo_{i,t}$. The 2006 volume of $-items (bank specific but constant over time) is captured by firm (bank) fixed effects, while the US CDS index (time-varying but common across firms) is controlled for by the time fixed effects.

[15]To control for firm creditworthiness, the baseline specification is augmented either with an Altman Z-score or with the principal component of several measures of firm structural solidity.

[16]Since these shocks are time-varying and specific to the firm class, the inclusion of common time fixed effects doesn't control for this spurious correlation.

[17]Notice that alternative methodologies exploiting multiple borrowing to control for demand factors (Khwaja and Mian,

even robust to the inclusion of bank–time fixed effects perfectly controlling for all possible shocks affecting banks' client portfolios.[18]

The other estimations within the paper are variations upon the baseline specification in Equation 2 and are discussed in Section 4.

3 Data

The empirical analysis exploits a large amount of information. The dataset used for the estimations combines the identification of the borrower-lender relationship with firm balance sheet data, bank characteristics, bank exposures to $-denominated items, and CDS spreads related to the US system.

3.1 Sources

Several sources of data contribute to the creation of the final dataset. The crucial information about the lender-borrower relationships comes from the 2011-wave of the MET dataset on the Italian industry, the widest survey administrated in a single European country (Brancati, 2012).[19] The sample is composed by 25,000 firms, with a bayesian sampling scheme representative at size, region and industry levels. Coherently with the Italian industrial structure, the sample is skewed toward small companies, and contains also partnerships and family firms with less than 10 employees. This feature is still unmatched by any other existent dataset, and allows for studying the behavior of a relevant component of the overall economy (about 95% of the population).

The panel structure is recovered by assuming stable lender-borrower connections over time (see Section 3.3 for a detailed discussion). In the (infrequent) case of multiple banking relationships, *Expo* (and the other bank-level variables) is defined as its equally-weighted average across lender banks.[20]

Firms' balance sheets come from CRIBIS D&B, while bank data are from Bankscope Bureau van Dijk.

2008; Schnabl, 2012) are not feasible for this sample. First of all, the specific focus on SMEs makes the diffusion of firms with multiple banking connections extremely low (17% of the sample in Table 4). Moreover, the inclusion of firm×time fixed effects –needed to purge demand components– would require information on the amount borrowed from each of the lender banks. This data is not recoverable from the total stock of bank debt reported in firm balance sheets.

[18] In this case identification is achieved only thanks to the small share of firms with multiple bank connections (17%).

[19] For further details see http://www.met-economia.it.

[20] Since no information on the borrowing shares is available, the simple average is the less distortive option. This assumption concerns only 17% of the sample and does not affect the results (robust for the subsample of firms with single-banking relationships).

Bank exposures to the $-denominated items are hand-collected from bank consolidated annual reports (with a cross-section of 48 banking groups and 110 stand-alone institutions, for a total of 279 individual banks in the sample).[21] Finally, CDS spreads are from Markit (*US bank sector CDS index 5Y* and *US treasury CDS 5Y*) and Bloomberg (*CDX.NA.IG index 5Y*). They are computed as the average over the year of the daily CDS spreads.

All quantitative variables have been scaled by their own standard deviation and winsorized at 1% level in order to reduce the influence of outliers. Overall, the dataset includes roughly 20,000 to 25,000 observations, for a total number of 4,000 to 5,000 firms belonging to manufacturing (60%) and service industries (40%).[22]

3.2 Summary statistics

Tables 3 and 4 present summary statistics for the main variables employed. The top panel of Table 3, documents the strong decline in firm investment and borrowing during the financial (and sovereign-debt) crisis. Firm sales and cash flows follow similar patterns.

The bottom panel of Table 3 shows the evolution of *Expo* throughout the sample period. Following the dynamic of the American CDS indices (Figure 2), *Expo* is increasing with the severity of the financial crisis, reaching its maximum in 2008.

Finally, Table 4 provides details on the borrower-lender identification, and documents the strong reliance of Italian firms on single banking relationships (83% of the sample).[23]

3.3 Stability of the firm-bank relationships

Since the information on the lender-borrower connections is available only in 2011, the panel structure of the data is created by assuming stable firm-bank relationships over time.

[21] For banking groups that are born from mergers in the 2006–2011 period, I constructed the consolidated dollar exposure in 2006 as the asset-weighted average of the exposure of the individual banks composing the group at the end of the sample.

[22] From the original dataset the application of selection-filters produces a relevant contraction in the sample size. The major reduction comes from the focus on companies with "complete" balance-sheet information (roughly 30% of the sample). In addition, a few observations are dropped because of unreasonable values hiding clear problems of measurement error in the balance sheet reports (negative or nil assets, negative or nil sales or negative debts).

[23] This data seems to contradict previous Italian evidence (Albertazzi and Marchetti, 2010; Gambacorta and Mistrulli, 2011; Bofondi, Carpinelli, and Sette, 2012) on the CdR dataset (Centrale dei Rischi, the Italian Credit Register). The relevant difference can be explained by the smaller firm size in my sample. Indeed, the MET survey reports a share of single-bank relationships that is in line with the CdR dataset if one focuses on SMEs with less than 20 employees (80% of companies with single relationship, 15% with double relationship, and 5% of relationships with more than two banks, see for instance Mistrulli and Vacca, 2011).

Economic literature provides compelling evidence on the importance of prolonged bank connections in reducing asymmetric-informational problems for SMEs. Long-term commitments allow to reduce firm cost of credit (Diamond 1991 and D'Auria, Foglia, and Reedtz 1999) and the amount of collateral requested by banks (Berger and Udell, 1995; Harhoff and Körting, 1998; Degryse and VanCayseele, 2000). This in turn lowers firm likelihood of facing financial constraints (Petersen, 1994; Bianco, 1997).

In a system dominated by SMEs, firms do not usually have the reputation needed to get credit from a new financial institution and they have to rely on prolonged relationships (Diamond, 1991; Houston and James, 1996). This issue is even more relevant in times of crisis characterized by increased opaqueness of less-structured companies. Thus, switching banks is not an option for most firms and stability of the existent credit relationships represents the only way to overcome increasing problems of asymmetric information.

Although previous argumentations support the assumption of stability of lending relationships, it is crucial to discuss the relevance of this hypothesis for the results of the paper. Indeed, if the phenomenon of "switcher firms" is large enough, it may even affect the conclusions of this work. In a world where only creditworthy firms are capable to create new relationships with unknown banks, the observation of credit connections at the end of a crisis may be characterized by the polarization sound-banks/sound-firms (unsound-banks/unsound-firms) as a result of the switches. If more creditworthy firms invest more than others, then my results may come from a self-selection of sounder firms towards less exposed banks.

Several evidence and robustness checks reassure on this point. First, ANOVA analyses (not reported) and descriptive statistics on the creditworthiness of client firms do not detect any relevant polarization of client companies toward highly exposed banks (see Table 2 for Altman score). Second, the small average size of the sampled firms makes it extremely hard to switch banks. Third, evidence from Italy indicates that firms attempted to broaden the range of financial sources rather than substitute one bank with another (D'Auria, Foglia, and Reedtz, 1999). Hence, the relevance of the problem would be limited to companies that, at the end of the period, borrow from more than one bank, a small share of the overall sample. Indeed, results are extremely robust if one restricts the analysis to the subsample of firms with single-bank connections. Finally, unobserved bank switches generate measurement errors in the econometric estimation leading to persistent residuals and inducing negative correlations between the set of instruments and the

error term in first difference ($\Delta\varepsilon_{i,t}$).[24] Tests for the autocorrelation of $\Delta\varepsilon_{i,t}$ (Arellano–Bond AR test) and for the exogeneity of the instrumenting matrix (Hansen J test of overidentifying restrictions) always reject this possibility, suggesting that switcher firms are not a relevant issue.

4 Results

4.1 Baseline specification

Results of the baseline specification are summarized in Tables 5 and 6. The investment activity of Italian firms was heavily affected by the vulnerability of their lender banks to the Lehman crisis.

Regression results are provided for the whole set of exposures: columns 1–3 and 4–6 refer, respectively, to $-denominated assets (total $-assets, $-loans to banks, and $-loans to customers) and $-liabilities (total $-liabilities, $-deposits from banks, and $-deposits from customers). The economic and statistical significance of *Expo* highlights a transmission channel from bank exposure to the investment rate of client firms that goes beyond banks' holdings of toxic assets. Even in systems where bank direct involvement in subprime mortgages and asset-backed securities was negligible, the financial crisis had real effects through the lending practice of more exposed banks.

Since the magnitude of *Expo* follows the severity of the crisis (see Table 3), the impact of bank exposure on firm investment rate is particularly strong in 2008 and 2009. Moreover, the inclusion of an interaction term with a crisis indicator (*Expo* $\times$ *Crisis*) highlights an additional marginal effect that strengthens the baseline coefficient. The overall impact in times of crisis is given by $\beta_{1,pre} + \beta_{1,crisis}$ and it is about twice as big as the effect in normal times ($\beta_{1,pre}$).[25] Overall, a one-standard-deviation increase in *Expo* during the crisis leads to a contraction of firm investment rate of about -0.28 std.

This effect is not homogeneous across companies. The sign and significance of the interaction term with

[24] Consider a simple "true" model of the type: $y_{i,t} = \alpha + \beta \text{Expo}_{i(j_t),t} + \varepsilon_{i,t}$, where $y_{i,t}$ is the outcome variable of firm i and $\text{Expo}_{i(j_t),t}$ is the exposure of the actual bank (j_t) with whom firm i has a relationship in time t. If firm i switched bank between t and T (2011), then a measurement error occurs. In practice, one would estimate $y_{i,t} = \alpha + \gamma \text{Expo}_{i(j_T),t} + \nu_{i,t}$, where the new error term contains the difference between the exposure of the actual bank in time t and the one of the imputed bank (i.e. the actual bank in T): $\nu_{i,t} = \beta \text{Expo}_{i(j_t),t} - \gamma \text{Expo}_{i(j_T),t} + \varepsilon_{i,t}$. Since *Expo* are computed from bank $-items in 2006 (then multiplied by a common factor), the sign of $\text{Expo}_{i(j_t),t} - \text{Expo}_{i(j_T),t}$ is the same across all periods. This would produce a process of the error term $\Delta\nu_{i,t}$ that is extremely persistent. Moreover, the negative correlation between lagged values of $\text{Expo}_{i(j_T),t}$ and $\Delta\nu_{i,t}$ would violate the null hypothesis of exogeneity of the instrumenting set.

[25] The additional partial marginal effect is not significant in Table 6 (size interaction).

age (or size) indicate a contraction of the investment rate that is stronger for young and small firms. The impact is softened for old and large companies and is even reversed for firms in the right tail of the age (size) distribution.[26]

Figures 3 and 4 plot the marginal effects of bank exposure in normal and crisis times as a function of firm age. In normal periods, a one-standard-deviation increase in *Expo* leads to a drop in the investment rate of -0.1 std for firms at the 5^{th} percentile of the age distribution (3-year-old firms) and a rise of +0.06 std for companies at the 95^{th} percentile (48-year-old firms). In times of crisis the plot becomes steeper and the marginal effects go, respectively, to -0.17 and +0.11 std.[27] This evidence is compatible with a phenomenon of "relative flight to quality" for exposed banks reallocating their loans away from riskier firms (see for instance Khwaja and Mian, 2008; Albertazzi and Marchetti, 2010): on the one hand, banks contracted the credit access for more opaque young and small firms with higher short-term probability of default, and lower capability of pledging collaterals; on the other, they eased credit (or reduced credit by less) for safer and more established firms (large and old).[28] With this regard, firm age may also proxy for the length of the bank-firm connection capturing phenomena of relationship lending. This interpretation is consistent with the role of soft information in mitigating supply shocks presented by Puri, Rocholl, and Steffen (2011).

As already discussed, the comparison of the top and bottom plots in Figure 3 and 4 does not fully describe the size of the shock. To this aim, Figure 5 takes into account variations in the magnitude of the exposures multiplying the marginal effects by the average value of *Expo* in normal and crisis times. The vertical distance between the black and blue lines clearly shows the strong negative impact of bank vulnerability to the financial crisis.

It is however possible that these effects are driven by a spurious correlation between banks' holdings of $-items and some other fundamentals.[29] To address this issue, Table 7 includes a set of controls for bank solidity. Even after controlling for bank capitalization, liquidity, profitability, dependence on bank-sources

[26] Apart from the baseline specification, the rest of the paper only refers to the interaction with firm age. Results for the size interactions are however consistent (see Appendix 2: size interaction).

[27] Variations reported within the text refer to Figure 4, corresponding to Column 4 of Table 5. The effects associated to the other definitions of *Expo* are comparable in both magnitude and significance.

[28] I use the term "relative flight to quality" because β_1 and β_2 are recovered by netting-out all the common shocks affecting the credit condition of Italian firms. In other words, since time fixed effects (η_t) absorb the contraction in bank credit that is common across all firms, the signs of β_1 and β_2 can be viewed as a relatively stronger effect for small and young companies. Notice that this interpretation still implies a recomposition of banks' total loans toward safer borrowers.

[29] Although Table 2 clearly shows no relevant differences between banks with high or low exposure.

of funding, and potential losses on the exchange rate, results still hold.[30]

A crucial issue is whether these findings are due to supply or demand effects. The baseline specification allows to control for most of the latter. First of all, heterogeneous demand conditions that are persistent over time and common shocks that hit the entire economy are purged by the inclusion of firm-specific and time fixed effects. Moreover, contemporaneous cash flow and output allow to control for most of the residual demand factors and financial needs. Coherently with *a priori* expectations, they are both very positive and significant.

Table 8 presents several robustness checks. Results are robust to a rich set of controls including two measures of firm creditworthiness and an exhaustive set of fixed effects. The inclusion of time fixed effects that are specific for firm size, age, creditworthiness, exporting status, region, industry, or even specific for the lender bank, does not lead to any significant change in the findings.

Results are also consistent for the subsample of firms with single banking relationships. This evidence, together with the Arellano-Bond AR(2) test and Hansen J statistic, ensures that assuming stable firm-bank relationships over time does not induce any significant bias in the estimation.[31]

Finally, results are qualitatively similar for different econometric models (within estimator or difference-GMM) or alternative definitions of the shock (netting out intra-group exposures from *Expo –Expo net–* or employing the beginning-of-period holdings of $-items).[32]

4.2 Heterogeneity across banks

This section explores a different dimension of heterogeneity by testing whether the transmission to client firms (also) depended on the structural solidity of the lender bank. In this regard, bank capitalization, liquidity, and composition of funding may have affected banks' reaction to unexpected shocks, resulting into

[30] As a further controls for banks' fundamentals, I also include the following ratios: total-capital ratio, deposits from banks to total funding, interest expenses to total funding, short-term funding to total funding, short-term funding to long-term funding, return on average equity, return on average assets, cash from banks to total funding, deposits from customers to total funding, loans to banks to total assets, total loans to total deposits, liquid assets to short-term funding (quick ratio), log of total assets, income to total assets, net charge-offs to gross loans, non-performing loans to gross loans, common equity to total assets (leverage). Results are qualitatively and quantitatively unchanged.

[31] If bank switching represented a relevant issue, the measurement error on $Expo_{i,t}$ would produce persistent error terms, and a correlation with the instrumenting set. See footnote 24 for a detailed discussion.

[32] Notice however that the within estimator is not suitable because of the clear endogeneity of contemporaneous sales and cash flow. Similarly, shocks based on current holdings of $-items may be correlated with the financial condition of client firms through banks' reaction to credit demand shocks. If this is the case (differently from $Expo_{i,t}$), $\$\text{-items}_{i,t-1}/\text{Total assets}_{i,t-1}$ can be affected by reverse causality issues.

an amplification or dampening of the transmission mechanism.

Consistent liquidity buffers allow to sit out temporary periods of shortage and to alleviate the short-term effects of a financial crisis, while low capitalization may have exacerbated adverse shocks once tighter prudential regulation on capital requirements was introduced. Likewise, dissimilar funding structures may have improved or worsened banks' relative financial position. The 2008-freeze in the interbank market caused sharp increases in bank cost of funding, resulting in an additional negative shock onto institutions relying heavily on interbank deposits. These dimensions of structural solidity are not closely related to bank exposure (see Table 2) but can be capable of affecting banks' reaction to unexpected shocks.

In order to explore further sources of heterogeneity, banks are classified as "Fragile" and "Not fragile" depending on pre-crisis measures of capitalization, liquidity and dependence on interbank finance. The baseline specification is then augmented with additional partial coefficients that are specific to the fragility-class of the lender bank.[33] Tables 9, 10, and 11 provide clear results and show the crucial role played by bank solidity in counteracting the effects of a negative shock.

Although the effect of *Expo* is negative and significant for all firms (apart from Table 9), the additional partial effect in times of crisis is sizable only for borrowers of undercapitalized and illiquid banks or interbank-dependent financial institutions. Conditional on the lender exposure to $-denominated items, the effect is two to four times bigger for clients of more fragile banks. As in the baseline regression, the transmission mechanism penalizes young and small firms, with a redistribution towards larger and older companies.

Figures 6, 7, and 8 give a graphical representation to this heterogeneity. Taking into account variations in the magnitude of *Expo*, the plots show the huge changes in firm investment rate along time periods and fragility class of the lender bank.

Although these results are consistent with the finding in Albertazzi and Marchetti (2010), Cornett, McNutt, Strahan, and Tehranian (2011), and Puri, Rocholl, and Steffen (2011), the emphasis is however different. The analysis does not provide conclusive evidence on the direct impact of bank solidity, but instead highlights its indirect role in affecting banks' ability to counteract adverse shocks.[34]

[33] Banks are defined as "Fragile" or "Not fragile" depending on the 2006 median value of each distribution. (K) refers to the tier 1 capital ratio (below median = "Fragile (K)," above median = "Not fragile (K)"), (liq) is related to the liquid assets to total assets ratio (below median = "Fragile (liq)," above median = "Not fragile (liq)"), while (interb) refers to the net debts toward banks to total funding ratio (below median = "Not fragile (interb)," above median = "Fragile (interb)"). Pre-crisis values are employed to avoid endogeneity issues.

[34] Since bank classes are based on pre-crisis measures and constant over time, the direct effects of capitalization, liquidity

As a robustness check, each specification is augmented with continuous measures for capitalization, liquidity and dependence on interbank finance. Interestingly, while the main results continue to hold, no direct impact is found for any of these variables. Bank solidity doesn't seem to play a role *per se* but through its positive effect on banks' reaction once unexpected shocks occur.

4.3 The channels

The increased uncertainty on international markets that followed the explosion of the financial crisis hit both the quality of banks' asset portfolios and the stability of their external sources of funding. The generalized rise in credit risk led to a reduction in the expected value of $-denominated assets because of increasing actual and potential losses. These adjustments, in turn, induced a reallocation of loans toward safer borrowers aimed at reducing the overall riskiness unexpectedly accumulated in banks' asset portfolios.[35] A complementary effect occurred on the liability side, where increasing foreign drawdowns caused a shortage of external sources of funding for more exposed banks. This in turn was reflected onto bank overall cost of finance, then transmitted onto firm borrowing conditions.

Table 13 tests for the first channel. In absence of information about actual charge-offs on $-assets, I interact the beginning-of-period $-items with the variation in the (appropriate) CDS spread index.[36] These measures reflect the change in credit risk accumulated on foreign assets and proxy for the magnitude of potential losses if valuations were done through marking-to-market. The latter is then instrumented by *Expo* (as external instruments) to highlight the channel of the shock and to avoid the aforementioned problems of endogeneity.[37] Similarly, Table 14 tests for the shortage channel by instrumenting the drop of $-sources of funding with $Expo_{i,t}$.[38]

Results are coherent with the existence of both transmission channels: the disruption in the quality of

and dependence on bank debt are absorbed by the firm (bank) fixed effects.

[35] Notice that this effect is also compatible with shocks on bank managers' risk aversion. Independently by the occurrence of actual losses, the uncertainty associated with the financial turmoil may have hit the risk aversion of bank managers inducing a policy of reduction in the overall riskiness of banks' assets. This is compatible with the raised difficulty in correctly evaluating counterparts' creditworthiness in times of great opaqueness.

[36] In Column 1 potential losses are computed as ($\Delta CDS_{W\_USA,i,t}\times$ $-assets) and are instrumented with Expo(Tot. assets). In Column 2 they are computed as ($\Delta CDS_{B_USA,t}\times$ $-loans to banks) and are instrumented with Expo(Bank loans). In Column 3 they are computed as ($\Delta CDS_{C_USA,t}\times$ $-loans to customers) and are instrumented with Expo(Cust. loans).

[37] As a robustness check, the analysis is repeated employing actual total losses (independently from the currency) instrumented with $Expo_{i,t}$. Results are coherent, even though the significance of the estimation is strongly reduced.

[38] In Column 1, Δ\$-item$_t$ is the variation within the year of total $-liabilities and is instrumented by Expo(Tot. liab.). In Column 2 Δ\$-item$_t$ is the change of $-deposits from banks and is instrumented by Expo(Bank dep.). While in Column 3, Δ\$-item$_t$ is the variation of $-deposits from customers and is instrumented by Expo(Cust. dep.).

$-asset portfolios and the shortage of $-sources of funding affected more exposed banks, that reacted by reallocating loans away from riskier borrowers.[39] This in turn reduced the investment activity of young and small client firms, and increased the capital accumulation of old and large companies.

4.4 Simultaneous relevance

The significance of each measure of exposure tested so far is not sufficient to infer the existence of a joint effect on both sides of the bank balance sheet. To this purpose, it is crucial to purge the possible spurious correlation among the different definitions of *Expo* and to test their simultaneous relevance in the model.[40]

Given the great amount of variables and interaction terms, I proceed in two stages. A first step analyzes the joint significance of dollar assets and liabilities for each class of exposure (total, bank, or customer).[41] I then perform a "horse race" among the different measures to classify their relative relevance for the transmission of the shock.[42]

Table 15 shows the first results. Apart from customer $-deposits, all variables keep being very negative and significant. Not only the impact of $-liabilities is significant even controlling for $-assets, but also the magnitude of the effect is not even reduced with respect to the baseline specification (Table 5). This evidence clearly shows the complementarity of the two effects.

Table 16 compares aggregate, bank, and customer-based measures. Results document a dominant role for exposures towards international banks and for $-loans to customers. Once again, no significant effect is found for $-customer deposits. Also extremely sensible are the results on total $-assets and liabilities. Once controlled for bank and customer measures, their residual components do not seem to have any additional effect on bank decisions. These findings derive from the very composition of banks' $-portfolios, with negligible exposures to toxic assets and sizable amounts of US sovereign bonds. The latter was still considered

[39] In absence of a "true" first stage regression, Table 12 presents the positive correlation of *Expo* with potential losses and the shortage of $-funding. This association is also confirmed by a set of OLS regressions on $Expo_{i,t}$. In the same spirit of the system-GMM, the two measures are regressed in level and first differences on lagged levels ($t-2$ and $t-3$) and lagged first differences ($t-1$) of $Expo_{i,t}$ (with bank and time fixed effects). The R^2 ranges from 0.40 to 0.51, the coefficient of $Expo_{i,t}$ has the same sign of Table 12, and is always very significant (t-statistics range from 18 to 40).

[40] That is, if the "true" impact only operates through $-assets, the significance of $-liabilities may be the result of banks' attitude to match sources and destination of funding. The high correlation among $-items brings an overestimation of irrelevant components and incorrect inferences about causal nexuses.

[41] Exposures are grouped into three classes: "Total," "Bank" and "Customer". "Total" refers to Expo(Tot. assets) and Expo(Tot. liab.), "Bank" refers to Expo(Bank credit) and Expo(Bank dep.), "Customer" refers to Expo(Cust. credit) and Expo(Cust. dep.).

[42] To limit the number of covariates (and to avoid an explosive size of the instrumenting matrix) I temporary leave aside the additional partial effect in times of crisis.

a safe security from international investors, and did not produce any significant shock for Italian banks.

4.5 Growth of bank debt and financial constraints

Shocks to the banking system affect the real economy through their impact on the credit condition and financial status of client firms. In order to fill in the missing link of the lending channel, Table 17 estimates the effect of *Expo* on firm credit growth. In line with previous findings, bank exposures to dollar-denominated items induced a strong contraction in the amount young and small firms were able to borrow in 2008–2009, with a reduced or reversed effect for old and large companies.

Although this finding is coherent with prior results, it is likely to underestimate the total effect of the lending channel. First, the amount of bank debt is available only for a subsample of larger and older companies, that are less affected by the transmission of the shock.[43] Moreover, the analysis neglects the component of firm funding cost that can be equally important.[44]

One way to synthesize both pieces of information is to look at firm probability of facing financial constraints. To this aim, Table 18 shows the results of a conditional (fixed-effect) logit model on a direct indicator of financial rationing.[45] Even with a very reduced sample, the exposure to the $-denominated assets and liabilities significantly explains the change in firm financial constraint status in times of crisis.[46] Moreover, a standard analysis of excess sensitivity (Fazzari, Hubbard, and Petersen, 1988) provides further insights on this issue. An additional interaction term between *Expo* and firm cash flow (Table 19) highlights a greater investment-to-cash flow sensitivity for firms that are clients of more exposed banks. This is compatible with the existence of financing constraints, and with firms' attempt to substitute external with internal funds.[47]

Taken together, these results confirm the existence of a lending channel during the Lehman crisis, in which

[43] National accounting rules require only certain types of firms to fill in balance sheets in a complete form. Typically, smaller companies write up only a "simplified version" of the balance sheet that does not contain details on the type of outstanding debt. As a result, the drop in the numerosity generates a sample that is biased towards larger (the median number of employees raises from 6 to 46) and older (the median age goes from 17 to 24 years) firms.

[44] Balance sheet data do not contain any information on the interests paid on bank debt.

[45] The dependent variable is a dichotomous measure inferred directly from the following question in the MET survey: "Have there been potentially profitable projects not carried-on because of a lack of finance?" In other words firms are considered financially constrained if their overall investments would have been higher in absence of financial frictions.

[46] Also in this case the sample numerosity drops heavily. First of all, I have to focus on the subsample of firms interviewed in all three waves (2008, 2009, and 2011) of the MET survey (about 7,800 companies). Second, in order to control for time and firm fixed effects I have to focus on (few) companies that changed financial status in one of the three periods (about 2,500 observations).

[47] Although this approach is subject to several critiques (Poterba, 1988; Kaplan and Zingales, 1997, 2000, among others), it is still worth emphasizing the coherence of the results.

the cut of corporate lending by exposed banks translated into a higher probability of financial constraints and a lower investment rate for client-firms.

4.6 Aggregate effects

The analysis proposed so far, documents a negative effect of *Expo* on the investment rate of young and small firms and a reverse impact for old and large companies. This flight to quality implies a redistribution of resources toward safer borrowers but hides information on the overall magnitude of the impact. In order to derive some implied aggregate effects, I compare firm actual investment rate with its counterfactual scenario obtained by fixing *Expo* at its $t-1$ level. This approach is in the spirit of Balduzzi, Brancati, and Schiantarelli (2013) and allows to estimate firm investment rate in absence of changes in the riskiness of the US system between t and $t-1$.

First, notice that Equation 2 can be rewritten as:

$$\begin{aligned}\frac{I_{i,t}}{K_{i,t-1}} =& \alpha + \beta_{1,t}\text{Expo}_{i,t} + \beta_{2,t}\left(\text{Expo}_{i,t} \times \text{Interacting variable}_{i,t}\right) + \gamma^{\top} X_{i,t} + \mu_i + \eta_t + \varepsilon_{i,t} \\ =& \alpha + \beta_{i,t}\text{Expo}_{i,t} + \gamma^{\top} X_{i,t} + \mu_i + \eta_t + \varepsilon_{i,t}\end{aligned} \tag{3}$$

with a coefficient β that is both time and firm specific (depending on the age or the size of the company). The "counterfactual investment rate" of firm i at time t ($\hat{I}_{i,t}$) is defined as:

$$\frac{\hat{I}_{i,t}}{K_{i,t-1}} = \alpha + \beta_{i,t}\text{Expo}_{i,t-1} + \gamma^{\top} X_{i,t} + \mu_i + \eta_t + \varepsilon_{i,t} \tag{4}$$

that, combined with Equation 3 gives:

$$I_{i,t} - \hat{I}_{i,t} = K_{i,t-1}\left[\beta_{i,t}\left(\text{Expo}_{i,t} - \text{Expo}_{i,t-1}\right)\right] \tag{5}$$

which measures the (time-varying) effect of the Lehman shock on the capital accumulation of firm i.

In order to derive aggregate implications I first measure the overall negative effect on young and small firms. The latter is obtained by summing up the difference between actual and hypothetical investment

across firms with negative $I_{it} - \hat{I}_{it}$, and rescaling by the beginning-of-period total capital:[48]

$$\text{NEG}_t = \frac{\sum_{i, I_{it} - \hat{I}_{it} < 0} w_i |I_{i,t} - \hat{I}_{it}|}{\sum_{i=1}^{N_t} w_i K_{it-1}}. \tag{6}$$

Similarly, the positive effect on old and large companies is computed as:

$$\text{POS}_t = \frac{\sum_{i, I_{it} - \hat{I}_{it} \geq 0} w_i (I_{i,t} - \hat{I}_{it})}{\sum_{i=1}^{N_t} w_i K_{it-1}}. \tag{7}$$

The difference between the two, quantifies the overall net effect on the aggregate rate of capital accumulation:

$$\text{NET}_t = \text{POS}_t - \text{NEG}_t, \tag{8}$$

while their summation provides information on the total effect of Δ*Expo*, quantifying the overall redistribution across firms:[49]

$$\text{SUM}_t = \text{POS}_t + \text{NEG}_t. \tag{9}$$

Results are presented in Table 20. The increased riskiness of the US system during the Lehman crisis led to a sizable reduction in the aggregate investment rate, with a net effect of about -5% of total capital. Not only the number of old and big firms with positive effects is lower than the count of small and young companies, but also the cumulated positive effect (3%) isn't large enough to compensate the aggregate negative impact of *Expo* (8%). Finally, this negative effect comes together with a substantial redistribution of resources across firms that is quantifiable around 11% of the total stock of capital.

[48] w_i is the firm-specific sampling weight calibrated in the post-stratification stage of the survey, to reproduce the behavior of the population along several aggregate measures. Its use allows for a better consistency in explaining aggregate phenomena. Unweighted results are however consistent.

[49] The exercise is similar in spirit to Chodorow-Reich (2013).

5 Concluding remarks

The paper shows the existence of contagion effects of the Lehman crisis on relatively safe systems, with negligible exposure to toxic assets and no involvement in subprime lending. The study focuses on the Italian economy and exploits banks' pre-crisis position on $-denominated items to characterize their degree of vulnerability to the Lehman collapse. The empirical analysis takes advantage of exogenous supply shocks to investigate their real effects on domestic-client companies.

I find robust evidence that firm real decisions were strongly affected by the degree of vulnerability of their lender institutions. Client firms of vulnerable banks invested and borrowed less and had a higher probability of financial constraints.

These effects followed several dimensions of heterogeneity, both along firm and bank characteristics. On the one hand, the recomposition of loans toward safer firms caused a strong negative impact on young/small companies and softened or reversed effects for old/large firms. On the other, clients of undercapitalized and illiquid banks, or financial institutions that relied more upon bank-based sources of funding, suffered more in times of crisis. This evidence highlights the positive role of bank solidity in the absorption of adverse shocks.

Most importantly, the paper shows a complementary effect on banks' holdings of $-assets *and* liabilities: through the disruption in the quality of $-asset portfolios, and the sudden dry-up of dollar funding that followed the Lehman collapse. This is the first paper highlighting their coexistence and complementarity.

Finally, while the econometric estimation is performed at the firm level, I also derive some aggregate implications. The increased riskiness that followed the Lehman crisis and hit the Italian banking system, led to a 5% reduction in the aggregate capital accumulation, and a significant reallocation of resources across firms (11% of total capital).

References

Adrian, Tobias, Paolo Colla, and Hyun Song Shin, 2012, Which financial frictions? Parsing the evidence from the financial crisis of 2007–9, *NBER Macro Annual*.

Albertazzi, Ugo, and Domenico Junior Marchetti, 2010, Credit supply, flight to quality and evergreening: An analysis of bank-firm relationships after Lehman, *Bank of Italy, Working Paper* 756.

Almeida, Heitor, Murillo Campello, Bruno Laranjeira, and Scott Weisbenner, 2009, Corporate debt maturity and the real effects of the 2007 credit crisis, *NBER, Working Paper* 14990.

Altman, Edward, John Hartzell, and Matthew Peck, 1995, Emerging markets corporate bonds: A scoring system, *Salomon Brothers Inc, New York*.

Amiti, Mary, and David Weinstein, 2013, How much do bank shocks affect investment? Evidence from matched bank–firm loan data, *NBER, Working Paper* 18890.

Arellano, Manuel, and Olympia Bover, 1995, Another look at the instrumental variable estimation of error-components models, *Journal of Econometrics* 68, 29–51.

Balduzzi, Pierluigi, Emanuele Brancati, and Fabio Schiantarelli, 2013, Financial markets, banks' cost of funding, and firms' decisions: Lessons from two crises, *IZA Discussion Paper* 7872.

Becker, Bo, and Victoria Ivashina, 2011, Cyclicality of credit supply: Firm level evidence, *NBER, Working Paper* 17392.

Berger, Allen, and Gregory Udell, 1995, Relationship lending and lines of credit in small firm finance, *Journal of Business* 68, 351–381.

Bianco, Magda, 1997, Vincoli finanziari e scelte reali delle imprese italiane: Gli effetti di una relazione stabile con una banca, *In: Angeloni, Ignazio, Vittorio Conti, and Franco Passacantando. Le Banche e il Finanziamento delle Imprese. Il Mulino, Bologna.*

Blundell, Richard, and Stephen Bond, 1998, Initial conditions and moment restrictions in dynamic panel data model, *Journal of Econometrics* 87, 115–143.

Bofondi, Marcello, Luisa Carpinelli, and Enrico Sette, 2012, Credit supply during a sovereign crisis, *Mimeo, Bank of Italy.*

Bonaccorsi, Emilia, and Enrico Sette, 2012, Bank balance sheets and the transmission of financial shocks to borrowers: Evidence from the 2007–2008 crisis, *Bank of Italy, Working Paper* 848.

Brancati, Raffaele, 2012, Crisi industriale e crisi fiscale. Rapporto MET 2012. Le relazioni delle imprese, le criticitá, il fisco e le politiche pubbliche, *Meridiana Libri.*

Campello, Murillo, Erasmo Giambona, John R. Graham, and Campbell R. Harvey, 2011, Liquidity management and corporate investment during a financial crisis, *Review of Financial Studies* 24, 1944–1979.

Campello, Murillo, John Graham, and Campbell Harvey, 2010, The real effects of financial constraints: Evidence from a financial crisis, *Journal of Financial Economics* 97, 470–487.

Carbó-Valverde, Santiago, Hans Degryse, and Francisco Rodriguo-Fernandez, 2011, Lending relationships and credit rationing: The impact of securitization, *Tilburg University CentER Discussion Paper* 128.

Cetorelli, Nicola, and Linda S Goldberg, 2011, Global banks and international shock transmission: Evidence from the crisis, *IMF Economic Review* 59, 41–76.

Chodorow-Reich, Gabriel, 2013, The employment effects of credit market disruptions: Firm-level evidence from the 2008-09 financial crisis, *Quarterly Journal of Economics* Forthcoming.

Cingano, Federico, Francesco Manaresi, and Enrico Sette, 2013, Does credit crunch investments down? New evidence on the real effects of the bank-lending channel, *Mimeo, Bank of Italy.*

Cornett, Marcia Millon, Jamie John McNutt, Philip E Strahan, and Hassan Tehranian, 2011, Liquidity risk management and credit supply in the financial crisis, *Journal of Financial Economics* 101, 297–312.

D'Auria, Claudio, Antonella Foglia, and Paolo Marullo Reedtz, 1999, Bank interest rates and credit relationships in Italy, *Journal of Finance* 23, 1067–1093.

Degryse, Hans, and Patrick VanCayseele, 2000, Relationship lending within a bank-based system: Evidence from European small business data, *Journal of Financial Intermediation* 9, 90–109.

Diamond, Douglas, 1991, Monitoring and reputation: The choice between bank loans and directly placed debt, *Journal of Political Economy* 4, 689–721.

Fazzari, Steven, R Glenn Hubbard, and Bruce C Petersen, 1988, Financing constraints and corporate investments, *Brookings Papers on Economic Activity* 19, 141–206.

Gambacorta, Leonardo, and Paolo Emilio Mistrulli, 2011, Bank heterogeneity and interest rate setting: What lessons have we learned since Lehman Brothers?, *Bank of Italy, Working Paper* 829.

Gilchrist, Simon, and Charles Himmelberg, 1998, Investment, fundamentals and finance, *NBER Macro Annual*.

Harhoff, Dietmar, and Timm Körting, 1998, Lending relationships in Germany: Empirical evidence from survey data, *Journal of Banking and Finance* 22, 1317–1353.

Houston, Joel, and Christopher James, 1996, Bank information monopolies and the mix of private and public debt claims, *Journal of Finance* 51, 1863–1889.

Ivashina, Victoria, and David Scharfstein, 2010, Bank lending during the financial crisis of 2008, *Journal of Financial Economics* 97, 319–338.

Ivashina, Victoria, David S Scharfstein, and Jeremy C Stein, 2012, Dollar funding and the lending behavior of global banks, *NBER, Working Paper* 18528.

Iyer, Rajkamal, Samuel Lopes, Jose-Luis Peydro, and Antoinette Schoar, 2010, Interbank liquidity crunch and the firm credit crunch: Evidence from the 2007-2009 crisis, *Unpublished Working Paper, MIT Cambridge, MA*.

Jiménez, Gabriel, Steven Ongena, José-Luis Peydró, and Jesús Saurina, 2012, Credit supply and monetary policy: Identifying the bank balance-sheet channel with loan applications, *American Economic Review* 102, 2301–2326.

Kaplan, Steven N, and Luigi Zingales, 1997, Do financing constraints explain why investment is correlated with cash flow?, *Quarterly Journal of Economics* 112, 169–215.

——— , 2000, Investment-cash flow sensitivities are not valid measure of financing constraints, *NBER Working Paper* 7659.

Kashyap, Anil, and Jeremy Stein, 2000, What do a million observations on banks have to say about the monetary transmission mechanism?, *American Economic Review* 90, 407–428.

——— , and David Wilcox, 1993, Monetary policy and credit conditions: Evidence from the composition of external finance, *American Economic Review* 83, 78–98.

Khwaja, Asim Ijaz, and Atif Mian, 2008, Tracing the impact of bank liquidity shocks: Evidence from an emerging market, *American Economic Review* pp. 1413–1442.

Mistrulli, Paolo Emilio, and Valerio Vacca, 2011, I confidi e il credito alle piccole imprese durante la crisi, *Bank of Italy, Working Paper* 105.

Peek, Joe, and Eric Rosengren, 1997, The international transmission of financial shocks, *American Economic Review* 87, 495–505.

——— , 2000, Collateral damage: Effects of the Japanese bank crisis on real activity in the United States, *American Economic Review* 90, 30–45.

Petersen, Mitchell, Raghuram G. Rajan, 1994, The benefits of lending relationships: Evidence from small business data, *Journal of Finance* 49, 3–37.

Poterba, James M, 1988, Comments on Fazzari Hubbard and Petersen, *Brookings Papers on Economic Activity* 1, 200–204.

Puri, Manju, Jorg Rocholl, and Sascha Steffen, 2011, Global retail lending in the aftermath of the US financial crisis: Distinguishing between supply and demand effects, *Journal of Financial Economics* 100, 556–578.

Santos, João, 2011, Bank corporate loan pricing following the subprime crisis, *Review of Financial Studies* 24, 1916–1943.

Schnabl, Philipp, 2012, The international transmission of bank liquidity shocks: Evidence from an emerging market, *Journal of Finance* 67, 897–932.

Schularick, MH, and Alan M Taylor, 2011, Credit booms gone bust, *American Economic Review*.

Shin, Hyun Song, 2012, Global banking glut and loan risk premium, *IMF Economic Review* 60, 155–192.

Windmeijer, Frank, 2005, A finite sample correction for the variance of linear efficient two-step GMM estimators, *Journal of Econometrics* 126, 25–51.

Tables

Table 1: Pre-crisis exposure of Italian banks to dollar-denominated items.

2006:	Mean	Max	Min	Std
$-assets / total assets	7.23%	33.8%	0.31%	9.11%
$-loans to banks / total assets	0.75%	2.99%	0.06%	0.79%
$-loans to customers / total assets	0.82%	4.49%	0.11%	1.06%
$-liabilities / total assets	7.18%	33.9%	0.40%	7.18%
$-deposits from banks / total assets	1.33%	5.83%	0.01%	1.16%
$-deposits from customers / total assets	0.92%	3.47%	0.03%	0.86%

Notes: Bank exposure to dollar-denominated assets and liabilities as of 2006. Values refer to the pool of (279) banks in the sample.

Table 2: Bank characteristics and exposure to dollar-denominated items.

	$-assets		$-liabilities	
2006	High	Low	High	Low
Capitalization	7.00%	6.95%	6.94%	7.04%
Interbank dependence	3.60%	4.42%	4.26%	3.98%
Liquidity	11.9%	12.0%	12.0%	12.0%
Deposits/Total funding	45.1%	45.4%	44.7%	45.5%
Non-performing loans/Total assets	2.70%	2.64%	2.64%	2.42%
Borrowers' Altman Z"-score	2.31	2.30	2.30	2.30

Notes: Bank characteristics by degree of exposure to $-items (2006 values). Banks are classified into financial institutions with *High* and *Low* exposures depending on the median value of Expo($-assets) or Expo($-liabilities) (listed in the top row). All measures are defined in Section 6.2.

Table 3: Summary statistics: firm and bank variables.

	2006	2007	2008	2009	2010	2011
Firms:						
Investment rate	8.55%	8.81%	13.1%	3.58%	3.43%	3.19%
Cash flow	25.9%	27.6%	23.5%	15.9%	18.4%	17.7%
Sales	771%	795%	760%	551%	576%	578%
Growth of bank debt	3.52%	6.53%	0.94%	-7.78%	0.06%	0.00%
Total assets (1m €)	2.23	2.40	2.57	2.53	2.70	2.84
Age	15	16	17	18	19	20
Banks:						
Expo (Tot. assets)	0.14	0.41	1.98	1.74	1.16	1.43
Expo (Bank loans)	0.14	0.41	1.93	1.71	1.14	1.40
Expo (Cust. loans)	0.12	0.39	1.86	1.64	1.10	1.35
Expo (Tot. liab.)	0.15	0.44	2.09	1.84	1.23	1.51
Expo (Bank dep.)	0.17	0.49	2.33	2.06	1.37	1.69
Expo (Cust. dep.)	0.14	0.42	2.03	1.79	1.19	1.47
Capitalization	6.93%	6.76%	6.68%	7.72%	8.90%	9.39%
Liquidity	10.7%	11.4%	9.71%	9.70%	7.45%	7.50%
ROE	11.7%	13.5%	6.67%	3.36%	5.12%	-15.2%
Interbank dependence	3.90%	2.75%	4.35%	3.40%	6.65%	10.1%

Notes: Summary statistics for firms and banks in the sample between 2006 and 2011. Data refer to median values within the year. Bank exposures are expressed in units of standard deviations. All variables are defined in Section 6.2.

Table 4: Summary statistics: type of firm-bank relationships.

	Single	Double	Multiple
Age - Q1	87.5%	10.7%	1.79%
Age - Q2	84.3%	12.5%	3.13%
Age - Q3	83.6%	12.4%	4.03%
Age - Q4	80.5%	15.1%	4.46%
Size - Q1	86.4%	11.4%	2.27%
Size - Q2	87.2%	11.0%	1.75%
Size - Q3	82.2%	13.4%	4.49%
Size - Q4	76.7%	17.0%	6.32%
Total	83.0%	13.3%	3.77%

Notes: Type of banking relationships for firms belonging to different quartiles of the age and size distributions. Companies are grouped into *Single*, *Double*, and *Multiple* depending on the number of lenders (one, two, or more than two). Values refer to the percentage of firms within each class.

Table 5: Firm investment and bank exposure: age interaction.

Dependent variable: investment rate						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	-0.153***	-0.140***	-0.179***	-0.177***	-0.192***	-0.165***
	[0.0522]	[0.0522]	[0.0541]	[0.0542]	[0.0553]	[0.0542]
Expo($-item)×Age	0.0556***	0.0551***	0.0567***	0.0545***	0.0633***	0.0507***
	[0.0138]	[0.0139]	[0.0145]	[0.0145]	[0.0145]	[0.0146]
Expo($-item)×Crisis	-0.119**	-0.129***	-0.115**	-0.109**	-0.0980*	-0.122**
	[0.0490]	[0.0489]	[0.0532]	[0.0534]	[0.0526]	[0.0540]
Expo($-item)×Age×Crisis	0.0331***	0.0344***	0.0352***	0.0358***	0.0316**	0.0373***
	[0.0128]	[0.0129]	[0.0137]	[0.0139]	[0.0131]	[0.0140]
Sales	0.142**	0.142**	0.132**	0.151**	0.131**	0.133**
	[0.0612]	[0.0615]	[0.0622]	[0.0635]	[0.0621]	[0.0622]
Cash flow	0.147***	0.147***	0.122**	0.115**	0.122**	0.124**
	[0.0515]	[0.0517]	[0.0524]	[0.0502]	[0.0524]	[0.0520]
Age	-0.140***	-0.139***	-0.149***	-0.145***	-0.161***	-0.141***
	[0.0147]	[0.0145]	[0.0169]	[0.0169]	[0.0174]	[0.0165]
Constant	0.475***	0.457***	0.543***	0.533***	0.565***	0.529***
	[0.0705]	[0.0685]	[0.0794]	[0.0802]	[0.0841]	[0.0781]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	25409	25409	20773	20519	20773	20773
# firms	4866	4866	3989	3942	3989	3989
Hansen p-value	0.306	0.301	0.446	0.368	0.462	0.435
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.585	0.584	0.255	0.285	0.259	0.252

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 6: Firm investment and bank exposure: size interaction.

Dependent variable: investment rate						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	-0.617***	-0.500***	-0.682***	-0.739***	-0.713***	-0.706***
	[0.139]	[0.140]	[0.133]	[0.134]	[0.136]	[0.134]
Expo($-item)×Size	0.0698***	0.0584***	0.0741***	0.0797***	0.0789***	0.0759***
	[0.0143]	[0.0144]	[0.0135]	[0.0136]	[0.0138]	[0.0136]
Expo($-item)×Crisis	-0.101	-0.136	-0.0930	-0.0769	-0.0546	-0.0980
	[0.123]	[0.125]	[0.125]	[0.126]	[0.122]	[0.127]
Expo($-item)×Size×Crisis	0.00867	0.0121	0.00856	0.00764	0.00465	0.00909
	[0.0125]	[0.0127]	[0.0126]	[0.0127]	[0.0121]	[0.0128]
Sales	0.145**	0.146**	0.138**	0.156**	0.137**	0.138**
	[0.0628]	[0.0632]	[0.0630]	[0.0639]	[0.0630]	[0.0628]
Cash flow	0.139**	0.139***	0.122**	0.112**	0.123**	0.120**
	[0.0541]	[0.0541]	[0.0562]	[0.0539]	[0.0564]	[0.0561]
Size	-0.176***	-0.164***	-0.189***	-0.192***	-0.201***	-0.188***
	[0.0153]	[0.0151]	[0.0169]	[0.0168]	[0.0177]	[0.0166]
Constant	1.645***	1.526***	1.813***	1.839***	1.894***	1.814***
	[0.155]	[0.153]	[0.172]	[0.171]	[0.180]	[0.170]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	25476	25476	20832	20578	20832	20832
# firms	4880	4880	4002	3955	4002	4002
Hansen p-value	0.179	0.170	0.335	0.281	0.337	0.341
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.698	0.697	0.332	0.373	0.348	0.327

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 7: Firm investment and bank exposure: controlling for banks' balance-sheet ratios (age interaction).

Dependent variable: investment rate						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	-0.277***	-0.304***	-0.255***	-0.247***	-0.270***	-0.242***
	[0.0539]	[0.0560]	[0.0679]	[0.0613]	[0.0662]	[0.0633]
Expo($-item)×Age	0.0867***	0.0912***	0.0758***	0.0759***	0.0854***	0.0720***
	[0.0145]	[0.0155]	[0.0158]	[0.0147]	[0.0154]	[0.0149]
Capitalization	-0.0375	-0.0562	-0.0276	-0.0207	-0.00930	-0.0242
	[0.0738]	[0.0709]	[0.0475]	[0.0477]	[0.0490]	[0.0473]
Capitalization×Age	-0.00710	-0.00474	-0.00435	-0.00669	-0.0109	-0.00554
	[0.0251]	[0.0250]	[0.0184]	[0.0184]	[0.0185]	[0.0184]
Liquidity	-0.0653	-0.0739	-0.0258	-0.0238	-0.0262	-0.0247
	[0.0477]	[0.0526]	[0.0365]	[0.0359]	[0.0355]	[0.0360]
Liquidity×Age	0.00230	0.00514	-0.0000117	-0.00176	-0.00212	-0.000461
	[0.00783]	[0.00922]	[0.00722]	[0.00750]	[0.00741]	[0.00739]
ROE	0.124	0.111	0.151	0.165	0.175	0.152
	[0.135]	[0.137]	[0.128]	[0.128]	[0.128]	[0.128]
ROE×Age	-0.0437	-0.0405	-0.0400	-0.0419	-0.0442	-0.0397
	[0.0396]	[0.0400]	[0.0373]	[0.0379]	[0.0384]	[0.0376]
Interbank dependence	-0.105	-0.115	-0.0291	-0.0331	-0.0444	-0.0283
	[0.0649]	[0.0712]	[0.0563]	[0.0562]	[0.0563]	[0.0565]
Interbank dependence×Age	-0.0129	-0.0134	-0.0162	-0.0222	-0.0289	-0.0178
	[0.0238]	[0.0260]	[0.0206]	[0.0192]	[0.0177]	[0.0207]
Sales	0.121***	0.120***	0.129***	0.128***	0.128***	0.128***
	[0.0354]	[0.0354]	[0.0406]	[0.0407]	[0.0406]	[0.0407]
Cash flow	0.189***	0.189***	0.175***	0.174***	0.175***	0.174***
	[0.0485]	[0.0485]	[0.0411]	[0.0409]	[0.0408]	[0.0410]
Age	0.267	0.221	0.251	0.287	0.303	0.265
	[0.352]	[0.343]	[0.338]	[0.340]	[0.348]	[0.338]
Constant	-0.156	0.0993	-0.502	-0.633	-0.667	-0.551
	[1.305]	[1.324]	[1.222]	[1.223]	[1.257]	[1.213]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	16101	16101	13360	13339	13360	13360
# firms	4334	4334	3615	3609	3615	3615
Hansen p-value	0.557	0.575	0.337	0.331	0.389	0.357
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.898	0.969	0.764	0.713	0.721	0.736

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 8: Firm investment and bank exposure: robustness (age interaction).

		Expo($-assets)$_t$	Expo($-assets)$_t$ ×Age	Hansen p
Subsample	Single bank relationship	-0.382*** [0.067]	0.118*** [0.021]	0.234
Time FE specific to:	Common	-0.379*** [0.058]	0.120*** [0.017]	0.420
	Industry (12)	-0.362*** [0.069]	0.118*** [0.021]	0.252
	Region (20)	-0.236*** [0.034]	0.068*** [0.011]	0.235
	Firm age (3)	-0.333*** [0.058]	0.107*** [0.018]	0.242
	Firm size (3)	-0.257*** [0.029]	0.078*** [0.014]	0.183
	Firm creditworthiness (3)	-0.241*** [0.031]	0.065*** [0.022]	0.321
	Exporters (2)	-0.259*** [0.034]	0.075*** [0.009]	0.213
	Lender bank (180)	-0.356*** [0.051]	0.093*** [0.011]	0.179
	All (223)	-0.307*** [0.050]	0.081*** [0.011]	0.200
Additional controls	$\Delta\text{exchange}_t^{\$/€} \times \$\text{-item}_{i,t-1}$	-0.345*** [0.058]	0.111*** [0.017]	0.247
	Altman score	-0.369*** [0.043]	0.102*** [0.012]	0.413
	PC of fin. solidity	-0.327*** [0.043]	0.096*** [0.012]	0.311
Alternative shock	Expo net($-assets)	-0.251*** [0.031]	0.067*** [0.010]	0.481
	$\$\text{-item}_{i,t-1}$/Total assets$_{i,t-1}$	-1.112*** [0.080]	0.465*** [0.037]	0.957
Estimation	Difference GMM	-0.327*** [0.061]	0.104*** [0.017]	0.218
	Within estimator (FE)	-0.338*** [0.043]	0.098*** [0.012]	–

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank is Expo($-assets). For simplicity of exposition, I temporarily leave aside the additional partial effect in times of crisis. All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 9: Firm investment and bank exposure: heterogeneity across banks' capitalization (age interaction).

Dependent variable: investment rate						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	-0.0619	-0.0624	-0.0584	-0.0513	-0.0670	-0.0407
	[0.0492]	[0.0489]	[0.0527]	[0.0528]	[0.0540]	[0.0528]
Expo($-item)×Age	0.0291**	0.0322**	0.0243*	0.0202	0.0299**	0.0170
	[0.0128]	[0.0128]	[0.0140]	[0.0140]	[0.0140]	[0.0140]
Expo($-item)×Crisis×Not fragile (K)	-0.0233	-0.0461	0.0197	0.0295	0.0253	0.0233
	[0.0512]	[0.0507]	[0.0571]	[0.0581]	[0.0556]	[0.0587]
Expo($-item)×Age×Crisis×Not fragile (K)	0.00225	0.00705	-0.00161	-0.00361	-0.00195	-0.00284
	[0.0133]	[0.0133]	[0.0146]	[0.0148]	[0.0139]	[0.0150]
Expo($-item)×Crisis×Fragile (K)	-0.260***	-0.254***	-0.311***	-0.304***	-0.289***	-0.322***
	[0.0606]	[0.0612]	[0.0636]	[0.0638]	[0.0634]	[0.0641]
Expo($-item)×Age×Crisis×Fragile (K)	0.0759***	0.0737***	0.0871***	0.0893***	0.0819***	0.0903***
	[0.0169]	[0.0173]	[0.0172]	[0.0173]	[0.0166]	[0.0175]
Sales	0.142**	0.142**	0.135**	0.153**	0.134**	0.135**
	[0.0619]	[0.0620]	[0.0632]	[0.0645]	[0.0633]	[0.0631]
Cash flow	0.153***	0.152***	0.127**	0.120**	0.128**	0.128**
	[0.0512]	[0.0513]	[0.0520]	[0.0499]	[0.0519]	[0.0519]
Age	-0.123***	-0.125***	-0.125***	-0.120***	-0.134***	-0.117***
	[0.0143]	[0.0141]	[0.0167]	[0.0166]	[0.0171]	[0.0163]
Constant	0.414***	0.408***	0.445***	0.435***	0.455***	0.433***
	[0.0703]	[0.0680]	[0.0796]	[0.0805]	[0.0845]	[0.0784]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	25409	25409	20773	20519	20773	20773
# firms	4866	4866	3989	3942	3989	3989
Hansen p-value	0.253	0.255	0.368	0.304	0.376	0.362
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.595	0.586	0.245	0.279	0.255	0.246

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. Fragile (K) and Not fragile (K) are dummy variables identifying banks with low and high levels of capitalization (tier 1 capital ratio). All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 10: Firm investment and bank exposure: heterogeneity across banks' liquidity (age interaction).

Dependent variable: investment rate						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	-0.122**	-0.106**	-0.167***	-0.162***	-0.172***	-0.153***
	[0.0500]	[0.0498]	[0.0541]	[0.0541]	[0.0547]	[0.0544]
Expo($-item)×Age	0.0461***	0.0445***	0.0531***	0.0504***	0.0578***	0.0472***
	[0.0131]	[0.0131]	[0.0145]	[0.0145]	[0.0143]	[0.0146]
Expo($-item)×Crisis×Not fragile (liq)	-0.0147	-0.0268	0.0391	0.0485	0.0406	0.0433
	[0.0589]	[0.0578]	[0.105]	[0.100]	[0.0811]	[0.110]
Expo($-item)×Age×Crisis×Not fragile (liq)	0.0000148	0.00209	-0.0131	-0.0132	-0.00982	-0.0159
	[0.0157]	[0.0154]	[0.0297]	[0.0284]	[0.0224]	[0.0312]
Expo($-item)×Crisis×Fragile (liq)	-0.172***	-0.190***	-0.130**	-0.126**	-0.121**	-0.137**
	[0.0545]	[0.0555]	[0.0550]	[0.0555]	[0.0552]	[0.0558]
Expo($-item)×Age×Crisis×Fragile (liq)	0.0507***	0.0554***	0.0393***	0.0406***	0.0383***	0.0413***
	[0.0148]	[0.0153]	[0.0142]	[0.0145]	[0.0139]	[0.0145]
Sales	0.141**	0.141**	0.132**	0.151**	0.131**	0.133**
	[0.0615]	[0.0617]	[0.0624]	[0.0638]	[0.0624]	[0.0624]
Cash flow	0.150***	0.149***	0.123**	0.116**	0.123**	0.124**
	[0.0512]	[0.0514]	[0.0522]	[0.0499]	[0.0521]	[0.0518]
Age	-0.135***	-0.134***	-0.145***	-0.141***	-0.156***	-0.138***
	[0.0144]	[0.0143]	[0.0171]	[0.0171]	[0.0174]	[0.0168]
Constant	0.461***	0.445***	0.530***	0.517***	0.546***	0.516***
	[0.0703]	[0.0683]	[0.0802]	[0.0809]	[0.0843]	[0.0790]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	25409	25409	20773	20519	20773	20773
# firms	4866	4866	3989	3942	3989	3989
Hansen p-value	0.280	0.274	0.429	0.352	0.440	0.418
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.606	0.613	0.257	0.287	0.262	0.254

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. Fragile (liq) and Not fragile (liq) are dummy variables identifying banks with low and high levels of liquidity (liquid assets to total assets ratio). All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 11: Firm investment and bank exposure: heterogeneity across banks' dependence on interbank finance (age interaction).

Dependent variable: investment rate						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	-0.128**	-0.135***	-0.116**	-0.111**	-0.137**	-0.0964*
	[0.0520]	[0.0521]	[0.0536]	[0.0536]	[0.0553]	[0.0535]
Expo($-item)×Age	0.0487***	0.0535***	0.0399***	0.0370***	0.0490***	0.0322**
	[0.0138]	[0.0138]	[0.0143]	[0.0143]	[0.0145]	[0.0143]
Expo($-item)×Crisis×Not fragile (interb)	-0.0581	-0.0663	-0.0207	-0.0111	-0.0185	-0.0179
	[0.0504]	[0.0504]	[0.0575]	[0.0582]	[0.0556]	[0.0591]
Expo($-item)×Age×Crisis×Not fragile (interb)	0.0148	0.0153	0.0129	0.0114	0.0141	0.0106
	[0.0133]	[0.0134]	[0.0149]	[0.0151]	[0.0141]	[0.0152]
Expo($-item)×Crisis×Fragile (interb)	-0.332***	-0.404***	-0.217***	-0.216***	-0.200***	-0.231***
	[0.0722]	[0.0814]	[0.0643]	[0.0645]	[0.0647]	[0.0646]
Expo($-item)×Age×Crisis×Fragile (interb)	0.0919***	0.113***	0.0631***	0.0654***	0.0594***	0.0672***
	[0.0205]	[0.0235]	[0.0174]	[0.0176]	[0.0172]	[0.0176]
Sales	0.141**	0.141**	0.133**	0.152**	0.132**	0.134**
	[0.0614]	[0.0616]	[0.0627]	[0.0639]	[0.0625]	[0.0626]
Cash flow	0.152***	0.151***	0.125**	0.118**	0.125**	0.127**
	[0.0513]	[0.0515]	[0.0520]	[0.0498]	[0.0520]	[0.0518]
Age	-0.138***	-0.143***	-0.134***	-0.130***	-0.148***	-0.126***
	[0.0147]	[0.0146]	[0.0168]	[0.0167]	[0.0173]	[0.0163]
Constant	0.467***	0.472***	0.483***	0.471***	0.509***	0.467***
	[0.0705]	[0.0686]	[0.0794]	[0.0800]	[0.0841]	[0.0779]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	25409	25409	20773	20519	20773	20773
# firms	4866	4866	3989	3942	3989	3989
Hansen p-value	0.284	0.286	0.389	0.323	0.406	0.380
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.588	0.586	0.254	0.286	0.262	0.250

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. Fragile (interb) and Not fragile (interb) are dummy variables identifying banks with high and low levels dependence on interbank finance (net debts toward banks to total funding ratio). All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 12: Potential losses on $-assets and dry-up of $-funding: correlation matrix with *Expo*.

Pearson correlation coefficients						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot Asset	Bank loans	Cust. loans	Tot Liab	Bank Dep	Cust. Dep
$-item$_{t-1}$×ΔCDS$_t$	0.309***	0.355***	0.171***	–	–	–
-Δ$-item$_t$	–	–	–	0.455***	0.537***	0.181***

Notes: Pairwise correlations coefficients. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6.

Table 13: Firms' investment and banks' potential losses on $-denominated assets (age interaction).

Dependent variable: investment rate			
	(1)	(2)	(3)
$-item:	Tot. assets	Bank loans	Cust. loans
$-item$_{t-1}$×ΔCDS$_t$	0.0833	0.000373	-0.177*
	[0.123]	[0.0874]	[0.103]
$-item$_{t-1}$×ΔCDS$_t$×Age	-0.0337	0.000666	0.0517**
	[0.0337]	[0.0230]	[0.0261]
$-item$_{t-1}$×ΔCDS$_t$×Crisis	-0.539***	-0.503***	-0.355***
	[0.204]	[0.147]	[0.106]
$-item$_{t-1}$×ΔCDS$_t$×Age×Crisis	0.177***	0.159***	0.112***
	[0.0602]	[0.0434]	[0.0284]
Sales	0.183**	0.184***	0.134**
	[0.0715]	[0.0713]	[0.0637]
Cash flow	0.206***	0.207***	0.189***
	[0.0571]	[0.0573]	[0.0564]
Age	-0.793**	-0.848**	-0.714**
	[0.373]	[0.380]	[0.312]
Constant	2.872**	3.058**	2.600**
	[1.313]	[1.334]	[1.101]
Fixed effects			
Time	yes	yes	yes
Firm	yes	yes	yes
# obs.	25809	25809	22347
# firms	5065	5065	4778
Hansen p-value	0.329	0.352	0.412
AR(1) p-value	0.000	0.000	0.000
AR(2) p-value	0.376	0.405	0.208

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The product between the variation in the CDS spread (within the year) and the beginning-of-period $-item (listed in the top row), is a proxy for the expected losses on the specific $-denominated assets (with marking to market). All measures are defined in Section 6.2. Set of instruments: Output, Cash flow and Age are lagged twice or more. Instead of considering lagged values of $-item$_{t-1}$ × ΔCDS$_t$, the instrumenting matrix is enriched with *Expo* (and its interactions) as external instruments. *Expo* varies across specifications. It is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: CDS$_{W_USA,it}$ for column 1, CDS$_{B_USA,t}$ for column 2, and CDS$_{C_USA,t}$ for column 3. Also *Expo* is lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 14: Firms' investment and dry-up of $-denominated funding (age interaction).

Dependent variable: investment rate			
	(1)	(2)	(3)
$-item:	Tot. liab.	Bank dep.	Cust. dep.
-Δ$-item$_t$	-0.417	-0.250	-0.220
	[0.313]	[0.158]	[0.157]
-Δ$-item$_t$×Age	0.133	0.0800	0.0706
	[0.100]	[0.0503]	[0.0498]
-Δ$-item$_t$×Crisis	-1.437***	-1.360***	-1.354***
	[0.259]	[0.294]	[0.188]
-Δ$-item$_t$×Age×Crisis	0.410***	0.419***	0.400***
	[0.0771]	[0.0832]	[0.0552]
Sales	0.163**	0.139**	0.148**
	[0.0678]	[0.0695]	[0.0703]
Cash flow	0.147**	0.153**	0.159**
	[0.0609]	[0.0615]	[0.0629]
Age	-0.595*	-0.704**	-0.644**
	[0.312]	[0.316]	[0.317]
Constant	2.170**	2.557**	2.350**
	[1.095]	[1.107]	[1.115]
Fixed effects			
Time	yes	yes	yes
Firm	yes	yes	yes
# obs.	21812	21920	21920
# firms	4682	4717	4717
Hansen p-value	0.189	0.209	0.182
AR(1) p-value	0.000	0.000	0.000
AR(2) p-value	0.254	0.239	0.300

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. Δ$-item$_t$ is the variation of $-denominated liabilities within the year. The type of $-liability varies across columns and is listed in the top row. All measures are defined in Section 6.2. Set of instruments: Output, Cash flow and Age are lagged twice or more. Instead of considering lagged values of $-item$_{t-1}$ × ΔCDS_t$, the instrumenting matrix is enriched with *Expo* (and its interactions) as external instruments. *Expo* varies across specifications. It is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: CDS$_{W_USA,it}$ for column 1, CDS$_{B_USA,t}$ for column 2, and CDS$_{C_USA,t}$ for column 3. Also *Expo* is lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 15: Firm investment and bank exposure: asset vs. liability measures (age interaction).

Dependent variable: investment rate			
	(1)	(2)	(3)
Class:	Total	Bank	Customers
Expo($-asset(class))	-0.223***	-0.151***	-0.612***
	[0.0496]	[0.0495]	[0.209]
Expo($-asset(class))×Age	0.0679***	0.0509***	0.209***
	[0.0150]	[0.0149]	[0.0659]
Expo($-liability(class))	-0.159***	-0.217***	0.342
	[0.0493]	[0.0487]	[0.209]
Expo($-liability(class))×Age	0.0428***	0.0622***	-0.124*
	[0.0146]	[0.0143]	[0.0660]
Sales	0.175**	0.139**	0.168***
	[0.0724]	[0.0648]	[0.0580]
Cash flow	0.107*	0.133**	0.158**
	[0.0560]	[0.0522]	[0.0677]
Age	-0.194***	-0.198***	-0.158***
	[0.0185]	[0.0177]	[0.0164]
Constant	0.761***	0.735***	0.520***
	[0.0789]	[0.0721]	[0.0715]
Fixed effects			
Time	yes	yes	yes
Firm	yes	yes	yes
# obs.	20519	20773	20773
# firms	3942	3989	3989
Hansen p-value	0.162	0.355	0.330
AR(1) p-value	0.000	0.000	0.000
AR(2) p-value	0.329	0.282	0.303

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. Each column compares asset and liability measures within each class of $-item (listed in the top row). Column 1, compares Expo(Tot. assets) and Expo(Tot. liab.), Column 2 Expo(Bank loans) and Expo(Bank dep.), Column 3 Expo(Cust. loans) and Expo(Cust. dep.). All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 16: Firm investment and bank exposure: total, bank and customer exposures (age interaction).

Dependent variable: investment rate		
	(1)	(2)
Side:	Assets	Liabilities
Expo(Total)	0.218	0.00155
	[0.193]	[0.0181]
Expo(Total)×Age	-0.0857	0.00801
	[0.0592]	[0.0198]
Expo(Bank)	-0.382**	-0.497***
	[0.174]	[0.111]
Expo(Bank)×Age	0.138***	0.158***
	[0.0532]	[0.0346]
Expo(Customer)	-0.248***	0.179
	[0.0584]	[0.111]
Expo(Customer)×Age	0.0757***	-0.0734**
	[0.0176]	[0.0353]
Sales	0.141**	0.173**
	[0.0647]	[0.0674]
Cash flow	0.131**	0.124**
	[0.0529]	[0.0508]
Age	-0.201***	-0.188***
	[0.0179]	[0.0179]
Constant	0.745***	0.714***
	[0.0731]	[0.0729]
Fixed effects		
Time	yes	yes
Firm	yes	yes
# obs.	20773	20147
# firms	3989	3924
Hansen p-value	0.353	0.217
AR(1) p-value	0.000	0.000
AR(2) p-value	0.290	0.336

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. Each column compares all the type of measures within each side of bank balance sheet (asset or liability). Column 1 compares Expo(Tot. assets), Expo(Bank loans), and Expo(Cust. loans). Column 2 compares Expo(Tot. liab.), Expo(Bank dep.), and Expo(Cust. dep.). All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 17: Firms' growth of bank debt and banks' exposure: age interaction.

Dependent Variable: bank debt growth						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	0.0471	0.0277	0.0458	0.0399	0.0396	0.0425
	[0.0491]	[0.0500]	[0.0493]	[0.0504]	[0.0494]	[0.0492]
Expo($-item)×Age	-0.0129	-0.00718	-0.0142	-0.0132	-0.0124	-0.0133
	[0.0128]	[0.0129]	[0.0134]	[0.0137]	[0.0133]	[0.0134]
Expo($-item)×Crisis	-0.0953*	-0.0958*	-0.244***	-0.248***	-0.220***	-0.234***
	[0.0511]	[0.0555]	[0.0751]	[0.0765]	[0.0742]	[0.0744]
Expo($-item)×Age×Crisis	0.0371***	0.0381***	0.0578***	0.0600***	0.0590***	0.0586***
	[0.0127]	[0.0138]	[0.0185]	[0.0189]	[0.0181]	[0.0183]
Sales / TA	0.0664	0.0671	0.0686	0.0794	0.0685	0.0690
	[0.0553]	[0.0553]	[0.0627]	[0.0676]	[0.0629]	[0.0627]
Cash flow / TA	-0.0174	-0.0205	-0.0127	-0.0260	-0.0135	-0.0137
	[0.0839]	[0.0840]	[0.0712]	[0.0748]	[0.0713]	[0.0711]
Age	-0.0399*	-0.0502**	-0.0413**	-0.0429**	-0.0431**	-0.0421**
	[0.0239]	[0.0237]	[0.0200]	[0.0201]	[0.0216]	[0.0207]
Constant	0.253***	0.289***	0.252***	0.263***	0.259***	0.256***
	[0.0916]	[0.0912]	[0.0807]	[0.0821]	[0.0876]	[0.0837]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	16504	16504	14113	13966	14113	14113
# firms	3148	3148	2688	2657	2688	2688
Hansen p-value	0.249	0.254	0.219	0.245	0.214	0.217
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.423	0.418	0.285	0.290	0.284	0.284

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the firms' rate of growth of bank debt between time t and $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 18: Firms' financial constraints status and banks' exposures: age and size interactions.

Dependent Variable: financial constraints $(0, 1)$						
	(1)	(2)	(3)	(4)	(5)	(6)
\$-item	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo(\$-item)×Crisis	0.459***	0.459***	0.453***	0.459***	0.455***	0.461***
	[0.121]	[0.125]	[0.129]	[0.129]	[0.122]	[0.131]
Expo(\$-item)×Age×Crisis	-0.0813**	-0.0790**	-0.0900**	-0.0923**	-0.0892**	-0.0929**
	[0.0351]	[0.0362]	[0.0374]	[0.0373]	[0.0354]	[0.0380]
Age	-0.672***	-0.675***	-0.913***	-0.858***	-0.917***	-0.915***
	[0.236]	[0.236]	[0.270]	[0.271]	[0.271]	[0.270]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	2707	2707	2290	2253	2290	2290
# firms	1053	1053	893	878	893	893
Log lik.	-943.1	-942.6	-799.9	-787.5	-797.0	-800.5
Expo(\$-item)×Crisis	1.021***	1.060***	1.139***	1.105***	1.147***	1.100***
	[0.318]	[0.330]	[0.324]	[0.323]	[0.308]	[0.328]
Expo(\$-item)×Size×Crisis	-0.0854***	-0.0886***	-0.1000***	-0.0967***	-0.100***	-0.0961***
	[0.0325]	[0.0337]	[0.0326]	[0.0325]	[0.0310]	[0.0330]
Size	-0.641***	-0.640***	-0.864***	-0.814***	-0.864***	-0.872***
	[0.237]	[0.237]	[0.270]	[0.271]	[0.272]	[0.270]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	2709	2709	2290	2253	2290	2290
# firms	1054	1054	893	878	893	893
Log lik.	-942.9	-942.1	-798.0	-786.1	-794.9	-799.2

Notes: Conditional logistic regression with time and firm-specific fixed effects. The dependent variable is a direct measure of financial constraints. It takes value 1 if firm investment activity has been limited by the presence of financial frictions, and 0 otherwise. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both \$-item and CDS(USA)$_t$ are column-specific. \$-items are listed in the top row, while the CDS spread index is: CDS$_{W_USA,it}$ for columns 1 and 3, CDS$_{B_USA,t}$ for columns 2 and 5, and CDS$_{C_USA,t}$ for columns 3 and 6. All measures are defined in Section 6.2. Robust standard errors in brackets. ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 19: Firm investment and bank exposure: investment to cash flow sensitivity (age interaction).

Dependent variable: investment rate						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	-0.166***	-0.150***	-0.188***	-0.188***	-0.204***	-0.176***
	[0.0515]	[0.0513]	[0.0536]	[0.0538]	[0.0550]	[0.0538]
Expo($-item)×Age	0.0577***	0.0569***	0.0582***	0.0565***	0.0658***	0.0526***
	[0.0137]	[0.0137]	[0.0143]	[0.0144]	[0.0145]	[0.0144]
Expo($-item)×Crisis	-0.203***	-0.224***	-0.170***	-0.158***	-0.161***	-0.166***
	[0.0563]	[0.0574]	[0.0591]	[0.0590]	[0.0568]	[0.0599]
Expo($-item)×Age ×Crisis	0.0567***	0.0605***	0.0509***	0.0516***	0.0507***	0.0506***
	[0.0146]	[0.0151]	[0.0153]	[0.0154]	[0.0143]	[0.0156]
Sales	0.106***	0.105***	0.0987***	0.104***	0.0957***	0.101***
	[0.0286]	[0.0291]	[0.0371]	[0.0364]	[0.0350]	[0.0367]
Cash flow	0.147***	0.151***	0.122**	0.0996**	0.120**	0.113**
	[0.0327]	[0.0321]	[0.0534]	[0.0495]	[0.0535]	[0.0521]
Cash flow×Crisis	-0.0655	-0.0743	-0.0231	0.00592	0.00201	-0.00617
	[0.0472]	[0.0485]	[0.0689]	[0.0695]	[0.0729]	[0.0656]
Expo×Cash flow×Crisis	0.425***	0.418***	0.267**	0.265**	0.287***	0.248*
	[0.113]	[0.103]	[0.127]	[0.130]	[0.106]	[0.132]
Expo×Age×Cash flow×Crisis	-0.123***	-0.119***	-0.0792**	-0.0831**	-0.0884***	-0.0766**
	[0.0319]	[0.0292]	[0.0358]	[0.0366]	[0.0314]	[0.0375]
Age	-0.147***	-0.147***	-0.153***	-0.153***	-0.168***	-0.146***
	[0.0133]	[0.0130]	[0.0153]	[0.0151]	[0.0159]	[0.0149]
Constant	0.518***	0.501***	0.576***	0.584***	0.611***	0.565***
	[0.0590]	[0.0570]	[0.0665]	[0.0661]	[0.0724]	[0.0648]
Fixed–effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	25409	25409	20773	20519	20773	20773
# firms	4866	4866	3989	3942	3989	3989
Hansen p-value	0.254	0.277	0.266	0.268	0.440	0.265
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.528	0.550	0.203	0.211	0.202	0.194

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 20: Aggregate effects on capital accumulation.

	(1)	(2)	(3)	(4)
	NEG	POS	NET	SUM
$(\text{Expo}_{i,t} - \text{Expo}_{i,t-1})$				
2008	7.14%	3.12%	-4.02%	10.3%
2009 (cumulated)	7.95%	3.38%	-4.57%	11.3%

Notes: Aggregate effects of ΔExpo_{it} on firms' capital accumulation in times of crisis. The table refers to the difference between the actual investment and the counterfactual investment if banks' $Expo_{i,t}$ (in this example Expo(Tot. assets)) had stayed at its $t-1$ value. NEG is the ratio between the aggregate negative difference and the pre-crisis total capital (defined in Equation 6). POS is the ratio between the aggregate positive difference and the pre-crisis total capital (defined in Equation 7). NET is the net effect as defined in Equation 8. SUM is the measure of reallocation in Equation 9.

Figures

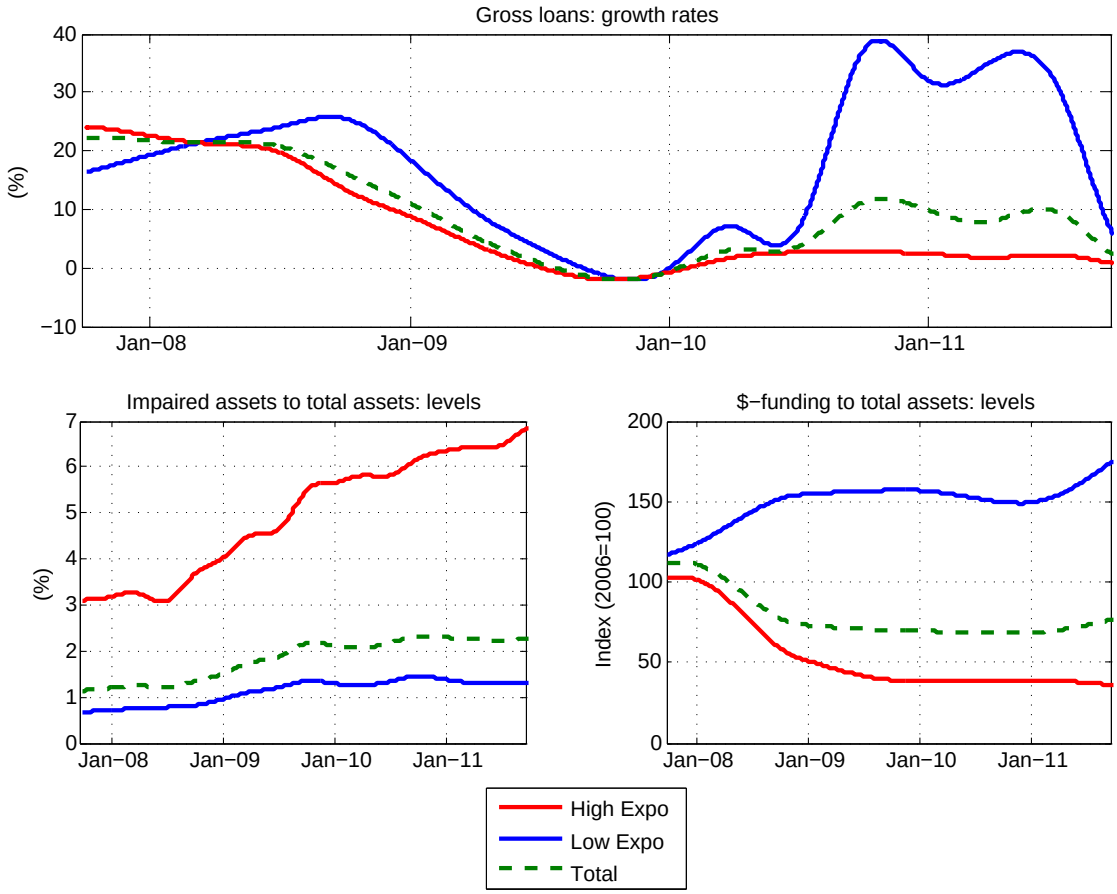

Figure 1: Growth of gross loans, impaired assets, and $ funding by banks' exposure to $-items

Data refer to the 279 banks in the sample. Institutions are grouped into classes with high and low exposure depending on the median value of the $-denominated assets to total assets ratio. The top plot refers to quarterly growth rate of gross loans on 12 months. The bottom-left plot shows the dynamic of impaired assets to total assets ratio. The bottom-right plot shows the evolution of $-funding to total assets ratio indexed as of 2006 (100). Time series are interpolated with a cubic spline.

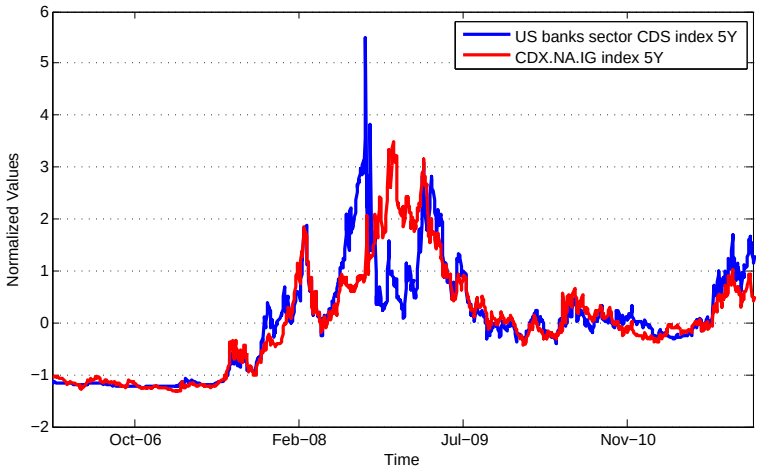

Figure 2: US CDS spread indices in 2006–2011.
Daily CDS spreads indices for US banking and corporate sectors between January 2006 and December 2011. The two series have been demeaned and standardized.

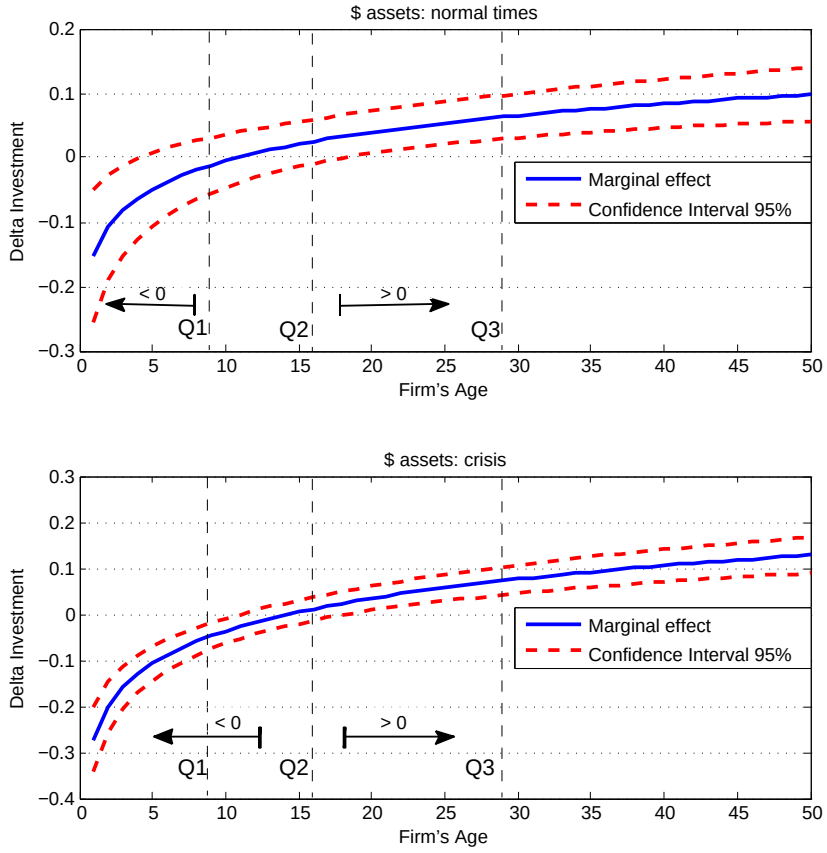

Figure 3: Flight to quality across firms' age: marginal effects of $-assets.
Marginal effect of a one-standard deviation increase in banks' exposure on the investment rate of client firms. The coefficient varies across different levels of firms' age. The top and bottom plots report, respectively, the marginal effects for pre-crisis and crisis times. The black arrows highlight the regions of significance of the specific coefficient. Q1, Q2 and Q3 represent the 1^{st}, 2^{nd} and 3^{rd} quartiles of the firms' age distribution in the sample. Both investment and *Expo* are expressed in units of standard deviations. *Expo*=Expo(Tot. assets).

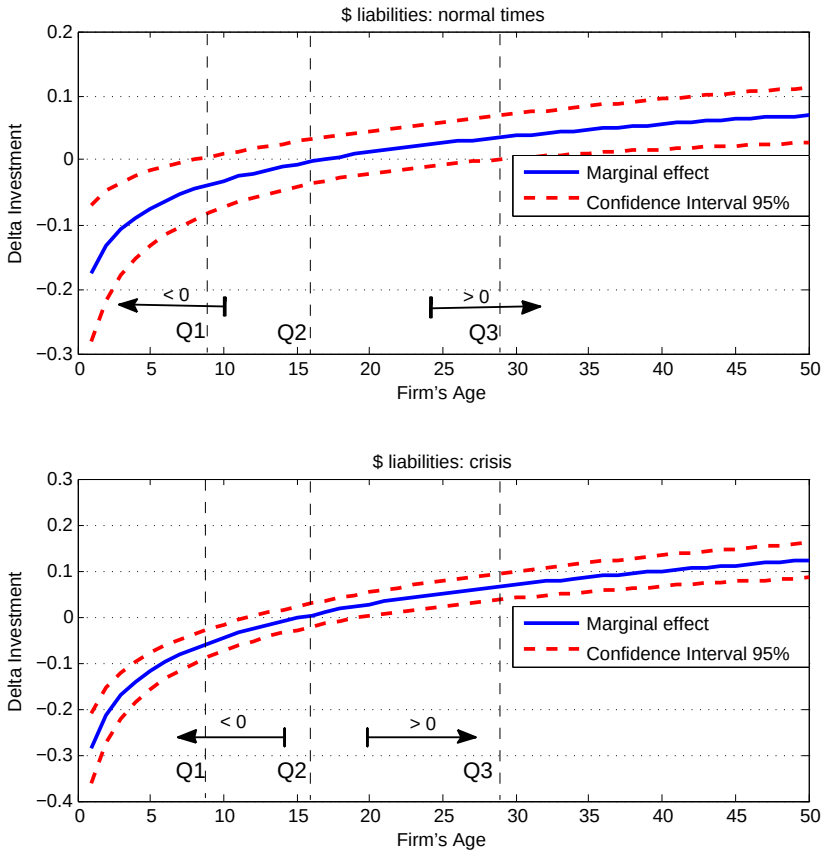

Figure 4: Flight to quality across firms' age: marginal effects of $-liabilities.

Marginal effect of a one-standard deviation increase in banks' exposure on the investment rate of client firms. The coefficient varies across different levels of firms' age. The top and bottom plots report, respectively, the marginal effects for pre-crisis and crisis times. The black arrows highlight the regions of significance of the specific coefficient. Q1, Q2 and Q3 represent the 1^{st}, 2^{nd} and 3^{rd} quartiles of the firms' age distribution in the sample. Both investment and *Expo* are expressed in units of standard deviations. *Expo*=Expo(Tot. liab.).

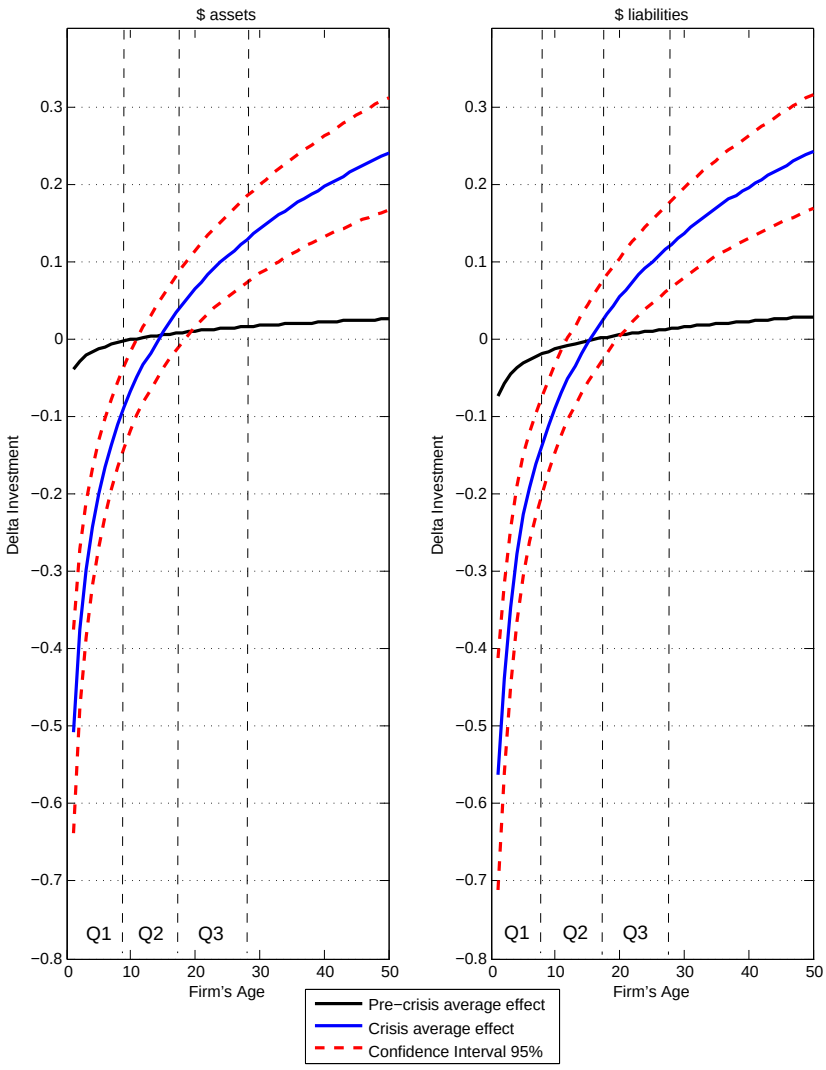

Figure 5: Flight to quality across firms' age: average effects.

Average effect of bank exposure on investment as a function of firm's age. The left and right plots are associated, respectively, to Expo(Tot. assets) and Expo(Tot. liab.). The black lines show the effect in the pre-crisis period, the blue lines report the coefficients in times of crisis, and the dotted red lines their 95% confidence interval. Q1, Q2 and Q3 represent the 1^{st}, 2^{nd} and 3^{rd} quartiles of the firms' age distribution in the sample. All variables are expressed in units of standard deviations.

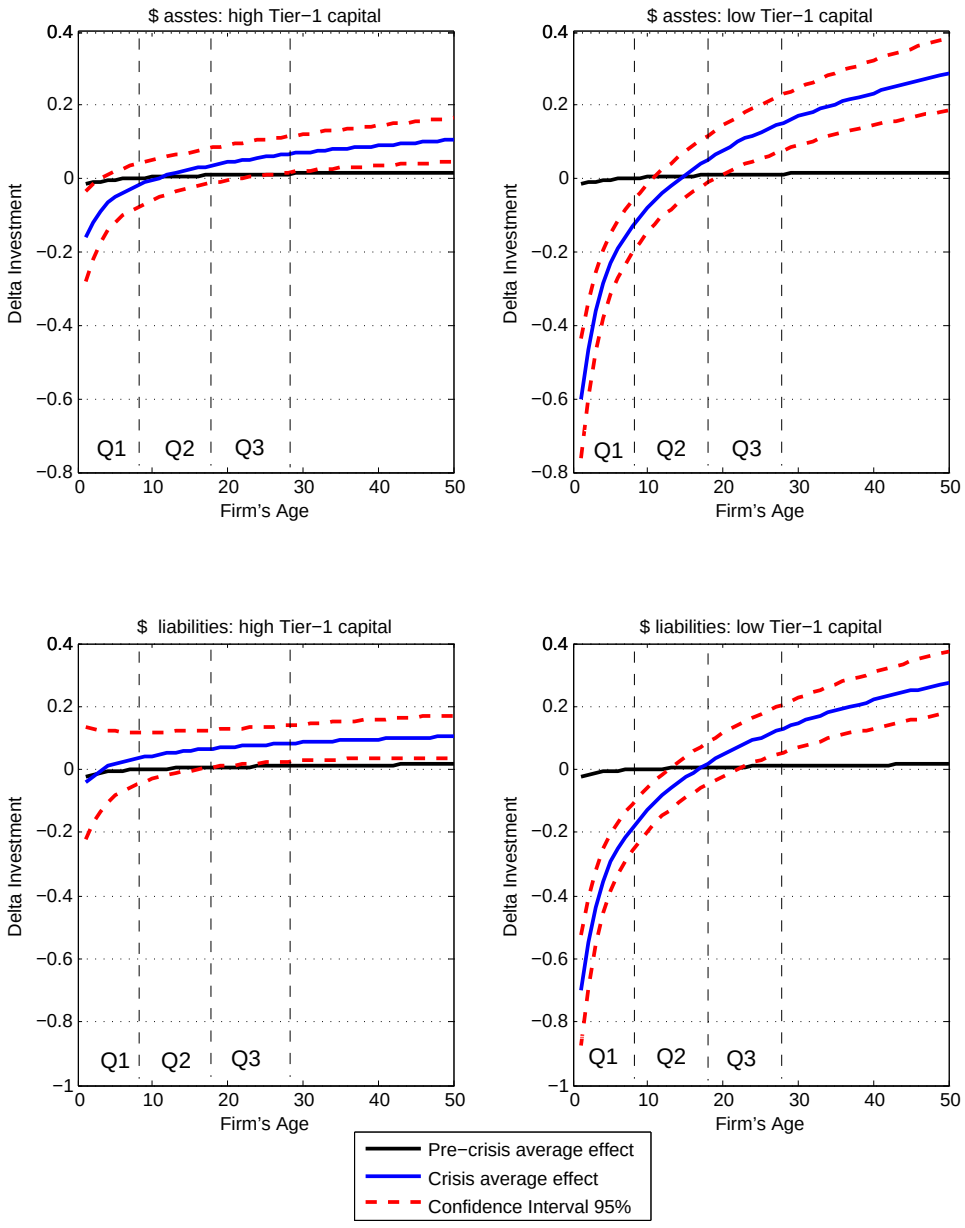

Figure 6: Flight to quality across firms' age: average effects by bank capitalization.

Average effect of bank exposure on firm investment as a function of firm age and bank capitalization. The left and right plots are associated, respectively, to high and low levels of bank capitalization as defined in Appendix 1: variable definitions. Top plots are associated to variations in Expo(Tot. assets) while the bottom plots show the effect of changes in Expo(Tot. liab.). The black lines show the effect in the pre-crisis period, the blue lines report the coefficients in times of crisis, and the dotted red lines their 95% confidence interval. Q1, Q2 and Q3 represent the 1^{st}, 2^{nd} and 3^{rd} quartiles of the firms' age distribution in the sample. All variables are expressed in units of standard deviations.

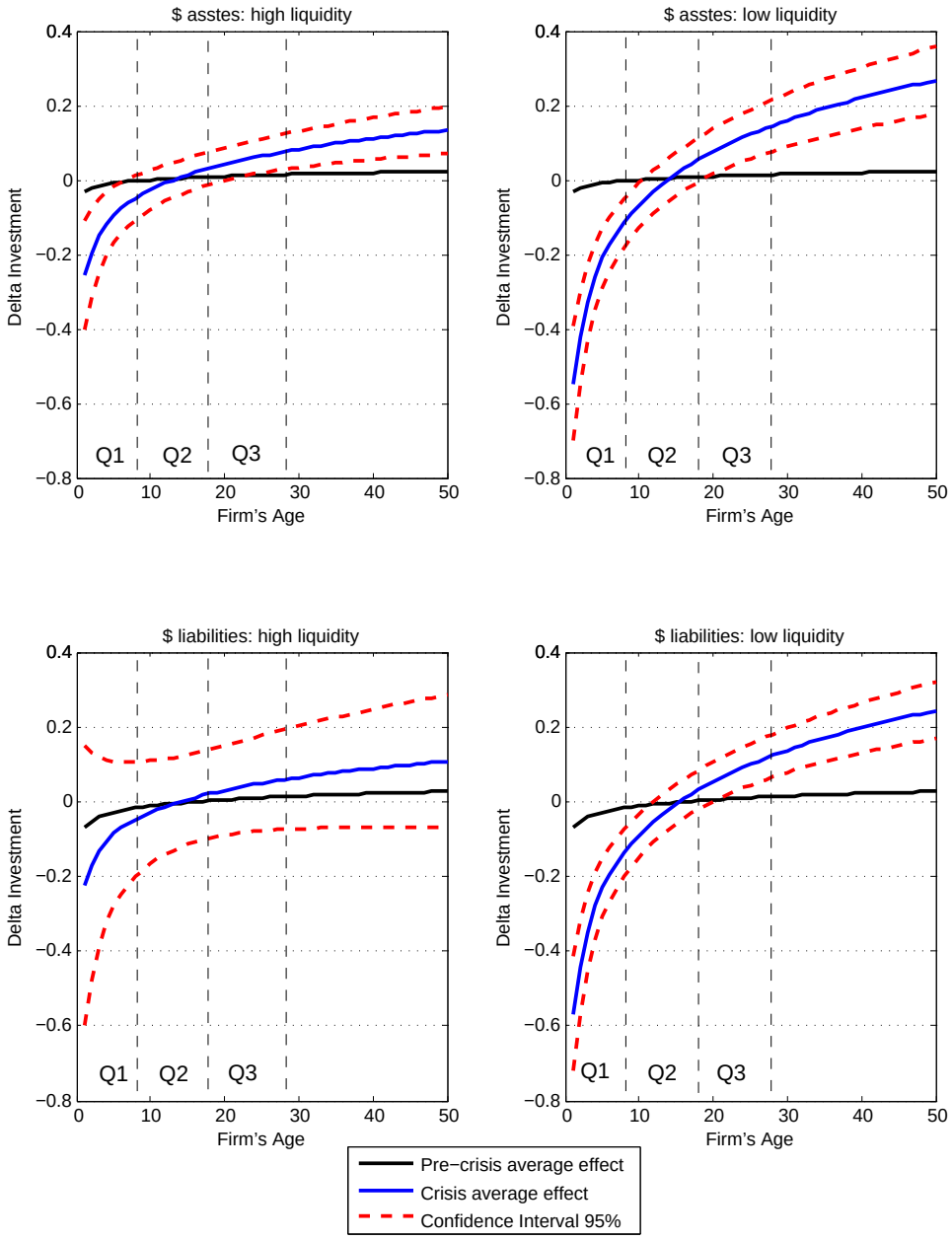

Figure 7: Flight to quality across firms' age: average effects by bank liquidity.

Average effect of bank exposure on firm investment as a function of firm age and bank liquidity. The left and right plots are associated, respectively, to high and low levels of bank liquidity as defined in Appendix 1: variable definitions. Top plots are associated to variations in Expo(Tot. assets) while the bottom plots show the effect of changes in Expo(Tot. liab.). The black lines show the effect in the pre-crisis period, the blue lines report the coefficients in times of crisis, and the dotted red lines their 95% confidence interval. Q1, Q2 and Q3 represent the 1^{st}, 2^{nd} and 3^{rd} quartiles of the firms' age distribution in the sample. All variables are expressed in units of standard deviations.

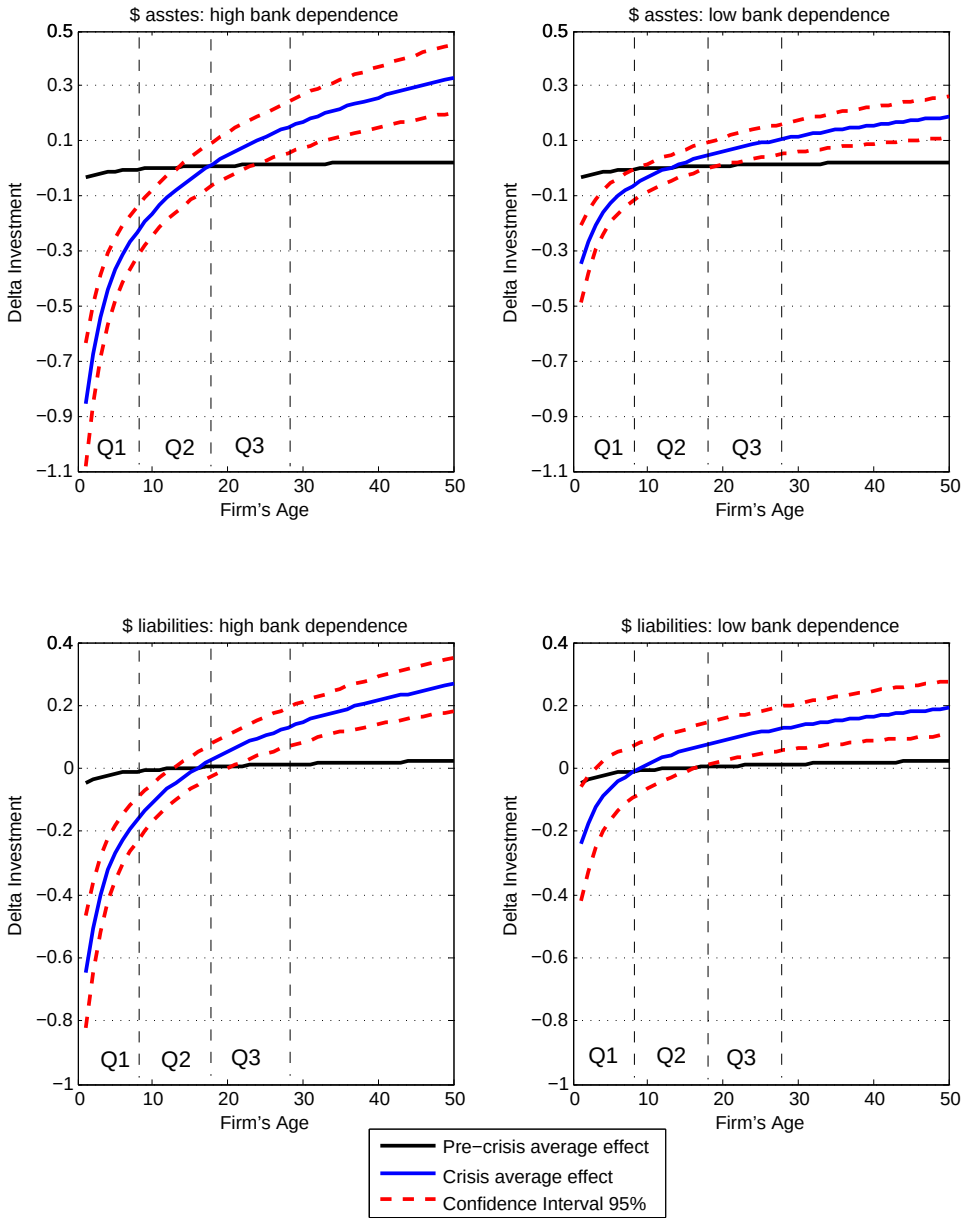

Figure 8: Flight to quality across firms' age: average effects by bank interbank dependence.
Average effect of bank exposure on firm investment as a function of firm age and bank interbank dependence. The left and right plots are associated, respectively, to high and low levels of bank interbank dependence as defined in Appendix 1: variable definitions. Top plots are associated to variations in Expo(Tot. assets) while the bottom plots show the effect of changes in Expo(Tot. liab.). The black lines show the effect in the pre-crisis period, the blue lines report the coefficients in times of crisis, and the dotted red lines their 95% confidence interval. Q1, Q2 and Q3 represent the 1^{st}, 2^{nd} and 3^{rd} quartiles of the firms' age distribution in the sample. All variables are expressed in units of standard deviations.

6 Appendix

6.1 Banks in the sample

dollar-denominated items are available for 48 banking groups and 110 individual banks (covering a total of 279 individual banks; see numbers by group in parenthesis): Allianz, Banca Centroveneto, Banca Centrpadana, Banca Commerciale Sanmarinese, Banca del Cilento, Banca del Fucino, Banca del Sud, Banca del Territorio, Banca della Val di Chiana Banca della Valsabbina, Banca delle Alpi Marittime, Banca di Alba, Banca di Anagni, Banca di Cagliari, Banca di Cascina, Banca di Cherasco, Banca di Credito Popolare (2), Banca di Piacenza, Banca di Rimini, Banca di Salerno, Banca di Udine, Banca Etica, Banca Etruria (3), Banca Friulovest, Banca Galileo, Banca Generali, Banca Malatestiana, Banca Marca, Banca Marche (2), Banca Mediolanum, Banca Nazionale del Lavoro, Banca Picena Truentina, Banca Piemonte, Banca Popolare Canavese, Banca Popolare del Cassinate, Banca Popolare del Frusinate, Banca Popolare del Lavoro e del Piccolo Risparmio, Banca Popolare dell'Alto Adige, Banca Popolare dell'Emilia Romagna (15), Banca Popolare delle Provincie Molisane, Banca Popolare di Aquara, Banca Popolare di Bari (2), Banca Popolare di Cividale, Banca Popolare di Cortona, Banca Popolare di Fondi, Banca Popolare di Marostica, Banca Popolare di Milano (5), Banca Popolare di Prato, Banca Popolare di Puglia e Basilicata, Banca Popolare di Ragusa, Banca Popolare di Sondrio, Banca Popolare di Spoleto, Banca Popolare di Treviso, Banca Popolare di Valconca, Banca Popolare di Vicenza (3), Banca Popolare Lajatico, Banca Popolare Pugliese (4), Banca Popolare San Felice, Banca Popolare Sant'Angelo, Banca Popolare Vesuviana, Banca Prealpi, Banca Reggiana, Banca Rurale di brandia, Banca Sella, Banca Tuscia, Banca Valdostano, Banca Veronese, Bancadria, Banco Azzoaglio, Banco della Maremma, Banco della Provincia di Macerata, Banco delle Tre Venezie, Banco di Biella, Banco di Cascia, Banco di Desio e della Brianza, Banco di Pescia, Banco Popolare (13), Banco Stabiese, Bank of China, Bank of Tokyo, Barclays, Cassa di Garda, Cassa di Risparmio di Asti (3), Cassa di Risparmio di Bolzano (2), Cassa di Risparmio di Cento, Cassa di Risparmio di Cesena (2), Cassa di Risparmio di Chieti, Cassa di Risparmio di Fermo, Cassa di Risparmio di Ferrara (2), Cassa di Risparmio di Genova (4), Cassa di Risparmio di Ravenna (3), Cassa di Risparmio di Rimini, Cassa di Risparmio di Saluzzo, Cassa di Risparmio di San Miniato, Cassa di Risparmio di Volterra, Cassa Lombarda, Cassa Padana, Cassa

Rurale Aldeno Cadine, Cassa Rurale Artigiana di Cantu, Cassa Rurale del Brennero, Cassa Rurale della Bassa Vallagarina, Cassa Rurale della Val di Fiemme, Cassa Rurale della Valle dei Laghi, Cassa Rurale della Valsugana, Cassa Rurale di Bolzano, Cassa Rurale di Brendola, Cassa Rurale di Cambiano, Cassa Rurale di Carrara e Venezia, Cassa Rurale di Castellana Grotte, Cassa Rurale di Funes, Cassa Rurale di Lavis, Cassa Rurale di Ledro, Cassa Rurale di Mezzolombardo, Cassa Rurale di Pergine, Cassa Rurale di Pinzolo, Cassa Rurale di Rovereto, Cassa Rurale di Strembo, Cassa Rurale di Tassullo e Nanno, Cassa Rurale di Trento, Cassa Rurale di Tuenno, Cassa Rurale Lizzina, Cassa Rurale Primiero e Vanoi, Cassa Rurale Rabbi Caldes, Cassa Rurale San Candido, Casse Rurali Trentine, Cerea, Chiantibanca, Citibank, Compass Bank, Credit Agricole (4), Credito Trevigiano, Credito di Corinaldo, Credito Emiliano, Credito Etneo, Credito Valdinevole, Credito Valdostano, Credito Valtellinese (6), Crediumbria, Crediveneto, Depfa Bank, Deutsche Bank, Emil, HSBC, Hypo Alpe Adria Bank, Iccrea, Ifis, ING Bank, Intesa Sanpaolo (34), Monte dei Paschi di Siena (4), Raiffeisen Bank, Reale Mutua, Tercas (3), Unicredit (9), Unione di Banche Italiane (16), Unipol Banca, Veneto Banca (3).

6.2 Variable definition

Firm variables

Variable name	Definition
Investment rate	$\Delta \text{GK}_t/\text{K}_{t-1}$.
GK_t	tangible fixed assets$_t$ + accumulated depreciation$_t$.
K_{t-1}	tangible fixed assets$_{t-1}$.
Sales	Sales$_t$/K$_{t-1}$.
Cash flow	(EBIT$_t$– interest payments$_t$ – non-operating income$_t$ – extraordinary items$_t$)/K$_{t-1}$.
Age	$\ln(1 + \text{age}_t)$.
Size	ln(total assets$_{t-1}$).
Crisis	Indicator variable for 2008–2009 period.
Sales / TA	Sales$_t$/Total assets$_{t-1}$.
Cash flow / TA	Cash flow$_t$/Total assets$_{t-1}$.
Growth of bank debt	$\Delta \ln(\text{Bank debt})_t$.
Financial constraint	Dummy variable identifying financially constrained firms.[a]
Altman score	Altman score as computed in Altman, Hartzell, and Peck (1995).[b]

[a] It is a dichotomous measure extracted directly from the following question in the MET survey: "Have there been potentially profitable projects not carried-on by the firm due to a lack of financial sources?"

[b] $Z''_{i,t} = 6.56X_{1,i,t-1} + 3.26X_{2,i,t-1} + 6.72X_{3,i,t-1} + 1.05X_{4,i,t-1}$ where $X_{1,i,t-1}$ to $X_{4,i,t-1}$ are (in order): working capital to total assets, retained earnings to total assets, EBIT to total assets, and book value of equity to total liabilities.

Bank variables	
Variable name	Definition
Expo(Tot. assets)	($-assets$_{i,2006}$/Total assets$_{i,2006}$) $\times$ CDS$_{W_USA,\,i,t}$.
Expo(Bank loans)	($-loans to banks$_{i,2006}$/Total assets$_{i,2006}$) $\times$ CDS$_{B_USA,\,t}$.
Expo(Cust. loans)	($-loans to customers$_{i,2006}$/Total assets$_{i,2006}$) $\times$ CDS$_{C_USA,\,t}$.
Expo(Tot. liab.)	($-liabilities$_{i,2006}$/Total assets$_{i,2006}$) $\times$ CDS$_{W_USA,\,i,t}$.
Expo(Bank dep.)	($-deposits from banks$_{i,2006}$/Total assets$_{i,2006}$) $\times$ CDS$_{B_USA,\,t}$.
Expo(Cust. dep.)	($-deposits from customers$_{i,2006}$/Total assets$_{i,2006}$) $\times$ CDS$_{C_USA,\,t}$.
CDS$_{B_USA,\,t}$	Average of daily *US banks sector CDS indices 5Y* over the year (senior debt).
CDS$_{C_USA,\,t}$	Average of daily *CDX.NA.IG indices 5Y* over the year (senior debt).
CDS$_{W_USA,\,i,t}$	Bank-specific weighted average of CDS$_{B_USA,\,t}$, CDS$_{C_USA,\,t}$ and the 5-year CDS on US treasury bonds (senior debt).[a]
Capitalization	Tier 1 capital ratio$_{t-1}$.
Liquidity	Liquid assets$_{t-1}$/Total assets$_{t-1}$.
ROE	Return on equity$_{t-1}$.
Interbank dependence	(Deposits from banks$_{t-1}$ – Loans to banks$_{t-1}$)/Total funding$_{t-1}$.
exchange$^{\$/€}$	Dollar-to-Euro exchange rate.
Expo net	(($-item$_{i,2006}$ − Intra-group $-exchanges$_{i,2006}$)/Total assets$_{i,2006}$) $\times$ CDS index(USA)$_t$.
Fragile (K)	Dummy variable for low capitalized banks (below median of Capitalization$_{2006}$).
Not fragile (K)	1 - Fragile (K).
Fragile (liq)	Dummy variable for less liquid banks (below median of Liquidity$_{2006}$).
Not fragile (liq)	1 - Fragile (liq).
Fragile (interb)	Dummy variable for banks more dependent on bank-based sources of finance (below median of Interbank dependence$_{2006}$).
Not fragile (interb)	1 - Fragile (interb).

[a] For total $-assets, the weights are, respectively, w_1 = $-loans to banks$_{i,2006}$/$-assets$_{i,2006}$, w_2 = $-loans to customers$_{i,2006}$/$-assets$_{i,2006}$ and $w_3 = 1 - (w_1 + w_2)$. For total $-liabilities the weights are, w_4 = $-deposits from banks$_{i,2006}$/$-liabilities$_{i,2006}$, w_5 = $-deposits from customers$_{i,2006}$/$-liabilities$_{i,2006}$ and $w_6 = 1 - (w_4 + w_5)$. CDS$_{W_USA,\,i,t}$=$w_{1(4)}$CDS$_{B_USA,\,t}$+$w_{2(5)}$CDS$_{C_USA,\,t}$+w$_{3(6)}$5Y US treasury CDS.

6.3 Additional tables

Table 21: Sample composition of the MET surveys

	2008	2009	2011
Micro (1-9)	38.4%	60.0%	61.6%
Small (10-49)	38.4%	26.0%	24.7%
Medium (50-249)	19.5%	10.4%	10.6%
Large (>250)	3.60%	3.50%	3.10%
North	46.6%	39.8%	42.1%
Center	32.0%	33.7%	31.8%
South	21.4%	26.5%	26.1%
High-tech	33.5%	29.1%	31.1%
Non high-tech	66.5%	70.9%	68.9%
Numerosity	24896	22340	25090

Notes: composition by firms' size classes, geographical macro-regions and industrial macro-sectors. The original sample is mainly stratified along 12 industries, 20 regions and four size classes (# employees). The large numerosity is compatible with an oversampling of more innovative firms in the manufacturing sector, and of companies in certain geographical regions. The oversampling scheme is performed with Bayesian models exploiting the observed frequencies of previous waves. The survey is administrated *via* phone calls or *via* web with the assistance of a phone operator. The actual administration follows a preselection of the most suitable answerer. In the case of incoherent answers along the survey, firms are interviewed a second time as an additional control of validity. For further details about the sampling scheme, the administration methods, and the control procedures see http://www.met-economia.it.

Table 22: Firm investment and bank exposure: heterogeneity across banks' capitalization (age interaction). Controlling for capitalization.

Dependent variable: investment rate						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	-0.119**	-0.122**	-0.0961*	-0.0981*	-0.155***	-0.0674
	[0.0532]	[0.0526]	[0.0562]	[0.0566]	[0.0578]	[0.0561]
Expo($-item)×Age	0.0304**	0.0347**	0.0194	0.0172	0.0346**	0.0105
	[0.0141]	[0.0140]	[0.0152]	[0.0153]	[0.0155]	[0.0152]
Expo($-item)×Crisis×Not fragile (K)	-0.000155	-0.0225	0.0383	0.0559	0.0683	0.0379
	[0.0523]	[0.0523]	[0.0568]	[0.0575]	[0.0550]	[0.0582]
Expo($-item)×Age×Crisis×Not fragile (K)	0.00390	0.00927	0.000171	-0.00311	-0.00467	-0.000500
	[0.0136]	[0.0136]	[0.0147]	[0.0148]	[0.0139]	[0.0150]
Expo($-item)×Crisis×Fragile (K)	-0.242***	-0.249***	-0.261***	-0.246***	-0.212***	-0.276***
	[0.0628]	[0.0646]	[0.0624]	[0.0630]	[0.0620]	[0.0632]
Expo($-item)×Age×Crisis×Fragile (K)	0.0830***	0.0849***	0.0847***	0.0858***	0.0754***	0.0884***
	[0.0172]	[0.0178]	[0.0171]	[0.0173]	[0.0165]	[0.0174]
Capitalization	0.00782	0.00769	0.00164	0.000384	0.00633	0.00118
	[0.0178]	[0.0180]	[0.0200]	[0.0201]	[0.0197]	[0.0199]
Capitalization×Age	-0.00413	-0.00384	-0.000805	-0.000646	-0.000941	-0.00105
	[0.00543]	[0.00548]	[0.00628]	[0.00631]	[0.00639]	[0.00624]
Sales	0.105*	0.104*	0.127*	0.159*	0.127*	0.127*
	[0.0612]	[0.0611]	[0.0767]	[0.0826]	[0.0768]	[0.0767]
Cash flow	0.152***	0.151***	0.139**	0.116**	0.140**	0.139**
	[0.0510]	[0.0510]	[0.0566]	[0.0559]	[0.0566]	[0.0566]
Age	-0.110***	-0.115***	-0.111***	-0.106***	-0.130***	-0.0992***
	[0.0274]	[0.0275]	[0.0339]	[0.0335]	[0.0349]	[0.0329]
Constant	0.512***	0.511***	0.527***	0.525***	0.587***	0.494***
	[0.111]	[0.109]	[0.137]	[0.136]	[0.136]	[0.134]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	19485	19485	15890	15669	15890	15890
# firms	4610	4610	3792	3746	3792	3792
Hansen p-value	0.149	0.155	0.236	0.130	0.220	0.232
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.594	0.597	0.491	0.501	0.500	0.492

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. Fragile (K) and Not fragile (K) are dummy variables identifying banks with low and high levels of capitalization (tier 1 capital ratio). All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

6.4 Size interaction

Table 23: Firm investment and bank exposure: controlling for banks' balance-sheet ratios (size interaction).

Dependent variable: investment rate						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	-0.649***	-0.548***	-0.725***	-0.753***	-0.743***	-0.749***
	[0.148]	[0.141]	[0.138]	[0.139]	[0.145]	[0.138]
Expo($-item)×Size	0.0697***	0.0589***	0.0735***	0.0775***	0.0774***	0.0760***
	[0.0155]	[0.0152]	[0.0130]	[0.0135]	[0.0141]	[0.0132]
Capitalization	-0.0816	-0.0750	-0.0609	-0.0615	-0.0523	-0.0587
	[0.0752]	[0.0697]	[0.0486]	[0.0487]	[0.0506]	[0.0482]
Capitalization×Size	0.00186	0.000449	0.000704	0.000720	-0.000831	0.000705
	[0.00908]	[0.00867]	[0.00624]	[0.00626]	[0.00637]	[0.00625]
Liquidity	-0.0590	-0.0712	-0.0372	-0.0308	-0.0316	-0.0346
	[0.0449]	[0.0491]	[0.0345]	[0.0338]	[0.0338]	[0.0340]
Liquidity×Size	0.00170	0.00258	0.00142	0.00113	0.000960	0.00148
	[0.00286]	[0.00333]	[0.00259]	[0.00264]	[0.00262]	[0.00262]
ROE	0.0324	0.0178	0.289	0.282	0.280	0.293
	[0.388]	[0.384]	[0.377]	[0.383]	[0.387]	[0.378]
ROE ×Size	-0.00593	-0.00451	-0.0303	-0.0282	-0.0274	-0.0304
	[0.0412]	[0.0406]	[0.0404]	[0.0409]	[0.0412]	[0.0405]
Interbank dependence	-0.105	-0.100	-0.000926	-0.00505	-0.0131	0.000757
	[0.0648]	[0.0726]	[0.0531]	[0.0528]	[0.0528]	[0.0534]
Interbank dependence×Size	-0.00130	-0.00307	-0.00195	-0.00393	-0.00691	-0.00222
	[0.00795]	[0.00847]	[0.00724]	[0.00666]	[0.00607]	[0.00725]
Sales	0.115***	0.114***	0.125***	0.125***	0.125***	0.125***
	[0.0359]	[0.0360]	[0.0405]	[0.0405]	[0.0405]	[0.0405]
Cash flow	0.180***	0.181***	0.173***	0.173***	0.173***	0.172***
	[0.0480]	[0.0479]	[0.0405]	[0.0404]	[0.0404]	[0.0405]
Size	-0.125	-0.112	0.0597	0.0434	0.0314	0.0609
	[0.300]	[0.299]	[0.310]	[0.310]	[0.312]	[0.308]
Constant	1.946	1.870	-0.109	0.00245	0.142	-0.154
	[2.920]	[2.964]	[2.944]	[2.953]	[2.972]	[2.928]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	16138	16138	13395	13374	13395	13395
# firms	4346	4346	3627	3621	3627	3627
Hansen p-value	0.297	0.315	0.264	0.222	0.239	0.275
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.745	0.746	0.780	0.759	0.751	0.771

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 24: Firm investment and bank exposure: heterogeneity across banks' capitalization (size interaction).

Dependent variable: investment rate						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	-0.357***	-0.249*	-0.415***	-0.468***	-0.428***	-0.449***
	[0.132]	[0.134]	[0.127]	[0.127]	[0.130]	[0.128]
Expo($-item)×Size	0.0425***	0.0319**	0.0471***	0.0520***	0.0500***	0.0499***
	[0.0135]	[0.0136]	[0.0129]	[0.0128]	[0.0130]	[0.0129]
Expo($-item)×Crisis×Not fragile (K)	0.235*	0.207	0.231	0.254*	0.259*	0.227
	[0.135]	[0.134]	[0.145]	[0.147]	[0.139]	[0.148]
Expo($-item)×Size×Crisis×Not fragile (K)	-0.0273**	-0.0249*	-0.0236	-0.0256*	-0.0263*	-0.0231
	[0.0138]	[0.0137]	[0.0146]	[0.0148]	[0.0139]	[0.0150]
Expo($-item)×Crisis×Fragile (K)	-0.578***	-0.628***	-0.586***	-0.558***	-0.549***	-0.566***
	[0.154]	[0.160]	[0.147]	[0.148]	[0.145]	[0.148]
Expo($-item)×Size×Crisis×Fragile (K)	0.0593***	0.0646***	0.0579***	0.0564***	0.0539***	0.0560***
	[0.0159]	[0.0165]	[0.0150]	[0.0150]	[0.0146]	[0.0152]
Sales	0.145**	0.147**	0.137**	0.154**	0.137**	0.136**
	[0.0638]	[0.0642]	[0.0640]	[0.0650]	[0.0643]	[0.0637]
Cash flow	0.143***	0.142***	0.123**	0.115**	0.125**	0.123**
	[0.0542]	[0.0541]	[0.0565]	[0.0540]	[0.0565]	[0.0564]
Size	-0.155***	-0.145***	-0.167***	-0.169***	-0.175***	-0.168***
	[0.0148]	[0.0145]	[0.0166]	[0.0164]	[0.0173]	[0.0164]
Constant	1.445***	1.340***	1.585***	1.609***	1.630***	1.602***
	[0.151]	[0.148]	[0.170]	[0.168]	[0.177]	[0.168]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	25476	25476	20832	20578	20832	20832
# firms	4880	4880	4002	3955	4002	4002
Hansen p-value	0.155	0.149	0.310	0.257	0.304	0.318
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.601	0.596	0.259	0.298	0.275	0.257

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. Fragile (K) and Not fragile (K) are dummy variables identifying banks with low and high levels of capitalization (tier 1 capital ratio). All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 25: Firm investment and bank exposure: heterogeneity across banks' liquidity (size interaction).

Dependent variable: investment rate						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	-0.522***	-0.404***	-0.606***	-0.670***	-0.634***	-0.644***
	[0.135]	[0.136]	[0.133]	[0.134]	[0.136]	[0.135]
Expo($-item)×Size	0.0598***	0.0482***	0.0660***	0.0725***	0.0707***	0.0694***
	[0.0139]	[0.0139]	[0.0135]	[0.0136]	[0.0137]	[0.0137]
Expo($-item)×Crisis×Not fragile (liq)	0.349**	0.255*	-0.00506	0.866***	0.654***	0.971***
	[0.154]	[0.150]	[0.129]	[0.292]	[0.223]	[0.342]
Expo($-item)×Size×Crisis×Not fragile (liq)	-0.0395**	-0.0299*	-0.00126	-0.0924***	-0.0701***	-0.104***
	[0.0158]	[0.0153]	[0.0130]	[0.0302]	[0.0231]	[0.0351]
Expo($-item)×Crisis×Fragile (liq)	-0.316**	-0.367**	-0.566***	-0.161	-0.160	-0.172
	[0.139]	[0.144]	[0.194]	[0.130]	[0.128]	[0.131]
Expo($-item)×Size×Crisis×Fragile (liq)	0.0319**	0.0373**	0.0595***	0.0164	0.0156	0.0168
	[0.0143]	[0.0148]	[0.0201]	[0.0131]	[0.0128]	[0.0132]
Sales	0.145**	0.146**	0.140**	0.157**	0.139**	0.139**
	[0.0634]	[0.0639]	[0.0633]	[0.0644]	[0.0635]	[0.0632]
Cash flow	0.143***	0.143***	0.122**	0.116**	0.127**	0.124**
	[0.0541]	[0.0541]	[0.0561]	[0.0538]	[0.0563]	[0.0559]
Size	-0.170***	-0.160***	-0.183***	-0.183***	-0.192***	-0.180***
	[0.0151]	[0.0149]	[0.0169]	[0.0170]	[0.0178]	[0.0169]
Constant	1.594***	1.484***	1.748***	1.754***	1.802***	1.735***
	[0.154]	[0.151]	[0.172]	[0.173]	[0.181]	[0.172]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	25476	25476	20832	20578	20832	20832
# firms	4880	4880	4002	3955	4002	4002
Hansen p-value	0.162	0.152	0.332	0.273	0.325	0.336
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.659	0.672	0.308	0.327	0.307	0.286

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. Fragile (liq) and Not fragile (liq) are dummy variables identifying banks with low and high levels of liquidity (liquid assets to total assets ratio). All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 26: Firm investment and bank exposure: heterogeneity across banks' dependence on interbank finance (size interaction).

Dependent variable: investment rate						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	-0.550***	-0.503***	-0.479***	-0.553***	-0.532***	-0.513***
	[0.138]	[0.140]	[0.128]	[0.128]	[0.132]	[0.128]
Expo($-item)×Size	0.0629***	0.0588***	0.0535***	0.0607***	0.0605***	0.0563***
	[0.0141]	[0.0144]	[0.0129]	[0.0129]	[0.0133]	[0.0129]
Expo($-item)×Crisis×Not fragile (interb)	0.130	0.101	0.221	0.221	0.211	0.217
	[0.131]	[0.131]	[0.153]	[0.155]	[0.143]	[0.158]
Expo($-item)×Size×Crisis×Not fragile (interb)	-0.0159	-0.0135	-0.0221	-0.0216	-0.0208	-0.0221
	[0.0135]	[0.0134]	[0.0155]	[0.0157]	[0.0144]	[0.0160]
Expo($-item)×Crisis×Fragile (interb)	-0.855***	-1.142***	-0.459***	-0.413***	-0.429***	-0.436***
	[0.187]	[0.223]	[0.143]	[0.143]	[0.144]	[0.143]
Expo($-item)×Size×Crisis×Fragile (interb)	0.0858***	0.115***	0.0463***	0.0422***	0.0431***	0.0439***
	[0.0192]	[0.0227]	[0.0145]	[0.0145]	[0.0144]	[0.0146]
Sales	0.147**	0.147**	0.139**	0.156**	0.138**	0.138**
	[0.0631]	[0.0634]	[0.0634]	[0.0642]	[0.0633]	[0.0632]
Cash flow	0.141***	0.141***	0.121**	0.113**	0.123**	0.121**
	[0.0539]	[0.0539]	[0.0559]	[0.0535]	[0.0560]	[0.0559]
Size	-0.174***	-0.172***	-0.169***	-0.173***	-0.182***	-0.169***
	[0.0153]	[0.0152]	[0.0168]	[0.0166]	[0.0176]	[0.0165]
Constant	1.627***	1.593***	1.607***	1.653***	1.700***	1.625***
	[0.155]	[0.154]	[0.172]	[0.170]	[0.180]	[0.169]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	25476	25476	20832	20578	20832	20832
# firms	4880	4880	4002	3955	4002	4002
Hansen p-value	0.164	0.158	0.309	0.260	0.307	0.317
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.636	0.628	0.287	0.330	0.306	0.284

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. Fragile (interb) and Not fragile (interb) are dummy variables identifying banks with high and low levels dependence on interbank finance (net debts toward banks to total funding ratio). All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 27: Firms' investment and banks' potential losses on $-denominated assets (size interaction).

Dependent variable: investment rate			
	(1)	(2)	(3)
$-item:	Tot. assets	Bank loans	Cust. loans
$-item$_{t-1}$ × ΔCDS$_t$	0.366	0.347	0.139
	[0.250]	[0.230]	[0.212]
$-item$_{t-1}$ × ΔCDS$_t$ × Size	-0.0402	-0.0355	-0.0148
	[0.0254]	[0.0235]	[0.0212]
$-item$_{t-1}$ × ΔCDS$_t$ × Crisis	-0.827***	-0.876***	-0.941***
	[0.272]	[0.251]	[0.235]
$-item$_{t-1}$ × ΔCDS$_t$ × Size × Crisis	0.0922***	0.0953***	0.101***
	[0.0278]	[0.0259]	[0.0235]
Sales	0.127*	0.127*	0.107*
	[0.0650]	[0.0650]	[0.0635]
Cash flow	0.169***	0.169***	0.148***
	[0.0553]	[0.0554]	[0.0556]
Size	-0.109***	-0.112***	-0.121***
	[0.0114]	[0.0115]	[0.0117]
Constant	1.093***	1.111***	1.208***
	[0.122]	[0.122]	[0.124]
Fixed effects			
Time	yes	yes	yes
Firm	yes	yes	yes
# obs.	25872	25872	22402
# firms	5080	5080	4791
Hansen p-value	0.245	0.238	0.255
AR(1) p-value	0.000	0.000	0.000
AR(2) p-value	0.316	0.335	0.211

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. The product between the variation in the CDS spread (within the year) and the beginning-of-period $-item, is a proxy for the expected losses on the specific $-denominated assets (with marking to market). All measures are defined in Section 6.2. Set of instruments: Output, Cash flow and Age are lagged twice or more. Instead of considering lagged values of $-item$_{t-1}$ × ΔCDS$_t$, the instrumenting matrix is enriched with *Expo* (and its interactions) as external instrument. *Expo* varies across specifications. It is consistently defined as in Equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: CDS$_{W_USA,it}$ for column 1, CDS$_{B_USA,t}$ for column 2, and CDS$_{C_USA,t}$ for column 3. Also *Expo* is lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 28: Firms' investment and dry-up of $-denominated funding (size interaction).

Dependent variable: investment rate			
	(1)	(2)	(3)
$-item:	Tot. liab.	Bank dep.	Cust. dep.
Δ\$-item$_t$	0.0231	0.000979	-0.0214
	[0.173]	[0.0863]	[0.0897]
Δ\$-item$_t$ $\times$Size	-0.000292	0.000962	0.00330
	[0.0179]	[0.00894]	[0.00929]
Δ\$-item$_t$ $\times$Crisis	2.782***	2.013***	2.512***
	[0.587]	[0.326]	[0.439]
Δ\$-item$_t$ $\times$Size$\times$Crisis	-0.290***	-0.221***	-0.263***
	[0.0617]	[0.0334]	[0.0455]
Sales	0.125*	0.113	0.115*
	[0.0660]	[0.0687]	[0.0688]
Cash flow	0.117*	0.118*	0.121*
	[0.0623]	[0.0638]	[0.0640]
Size	-0.110***	-0.133***	-0.107***
	[0.0124]	[0.0130]	[0.0122]
Constant	1.107***	1.320***	1.080***
	[0.131]	[0.136]	[0.130]
Fixed effects			
Time	yes	yes	yes
Firm	yes	yes	yes
# obs.	21871	21979	21979
# firms	4695	4730	4730
Hansen p-value	0.174	0.138	0.157
AR(1) p-value	0.000	0.000	0.000
AR(2) p-value	0.326	0.399	0.301

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. Δ\$-item$_t$ is the variation of \$-denominated liabilities within the year. The type of \$-liability varies across columns and is listed in the top row.. All measures are defined in Section 6.2. Set of instruments: Output, Cash flow and Age are lagged twice or more. Instead of considering lagged values of \$-item$_{t-1} \times \Delta$CDS$_t$, the instrumenting matrix is enriched with *Expo* (and its interactions) as external instrument. *Expo* varies across specifications. It is consistently defined as in Equation 1 and both \$-item and CDS(USA)$_t$ are column-specific. \$-items are listed in the top row, while the CDS spread index is: CDS$_{W_USA,it}$ for column 1, CDS$_{B_USA,t}$ for column 2, and CDS$_{C_USA,t}$ for column 3. Also *Expo* is lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 29: Firm investment and bank exposure: asset vs. liability measures (size interaction).

Dependent variable: investment rate			
	(1)	(2)	(3)
Class:	Total	Bank	Customers
Expo($-asset(class))	-0.346***	-0.247*	-1.054
	[0.134]	[0.128]	[0.799]
Expo($-asset(class))×Size	0.0421***	0.0277**	0.121
	[0.0139]	[0.0134]	[0.0824]
Expo($-liability(class))	-0.553***	-0.617***	-0.342
	[0.114]	[0.112]	[0.727]
Expo($-liability(class))×Size	0.0596***	0.0647***	0.0279
	[0.0119]	[0.0116]	[0.0747]
Sales	0.165**	0.268***	0.167***
	[0.0698]	[0.0661]	[0.0588]
Cash flow	0.0815	0.157***	0.173***
	[0.0616]	[0.0493]	[0.0666]
Size	-0.213***	-0.194***	-0.373***
	[0.0185]	[0.0183]	[0.0606]
Constant	1.958***	1.863***	3.533***
	[0.186]	[0.184]	[0.588]
Fixed effects			
Time	yes	yes	yes
Firm	yes	yes	yes
# obs.	20578	20832	20773
# firms	3955	4002	3989
Hansen p-value	0.233	0.114	0.249
AR(1) p-value	0.000	0.000	0.000
AR(2) p-value	0.448	0.499	0.363

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. Each column compares asset and liability measures within each class of $-item (listed in the top row). Column 1, compares Expo(Tot. assets) and Expo(Tot. liab.), Column 2 Expo(Bank loans) and Expo(Bank dep.), Column 3 Expo(Cust. loans) and Expo(Cust. dep.). All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 30: Firm investment and bank exposure: total, bank and customer exposures (size interaction).

Dependent variable: investment rate		
	(1)	(2)
Side:	Assets	Liabilities
Expo(Total)	4.583	0.0192
	[3.742]	[0.0184]
Expo(Total)×Size	-0.485	0.000604
	[0.393]	[0.00688]
Expo(Bank)	-5.803*	-1.493***
	[3.335]	[0.452]
Expo(Bank)×Size	0.620*	0.167***
	[0.350]	[0.0470]
Expo(Customer)	-2.524***	0.0632
	[0.895]	[0.355]
Expo(Customer)×Size	0.268***	-0.0149
	[0.0932]	[0.0379]
Sales	0.134*	0.182***
	[0.0687]	[0.0488]
Cash flow	0.121**	0.148***
	[0.0597]	[0.0447]
Size	-0.599***	-0.385***
	[0.0605]	[0.0585]
Constant	5.599***	3.614***
	[0.585]	[0.566]
Fixed effects		
Time	yes	yes
Firm	yes	yes
# obs.	20773	20147
# firms	3989	3924
Hansen p-value	0.346	0.140
AR(1) p-value	0.000	0.000
AR(2) p-value	0.216	0.447

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the ratio between firm gross investment at time t and the stock of capital at $t-1$. Each column compares all the type of measures within each side of bank balance sheet (asset or liability). Column 1 compares Expo(Tot. assets), Expo(Bank loans), and Expo(Cust. loans). Column 2 compares Expo(Tot. liab.), Expo(Bank dep.), and Expo(Cust. dep.). All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 31: Firms' growth of bank debt and banks' exposure: size interaction.

Dependent Variable: bank debt growth						
	(1)	(2)	(3)	(4)	(5)	(6)
$-item:	Tot. assets	Bank loans	Cust. loans	Tot. liab.	Bank dep.	Cust. dep.
Expo($-item)	0.126	0.0351	-0.0290	0.0551	-0.0759	-0.0392
	[0.177]	[0.187]	[0.332]	[0.320]	[0.329]	[0.328]
Expo($-item)×Size	-0.0121	-0.00383	0.00220	-0.00584	0.00678	0.00325
	[0.0167]	[0.0176]	[0.0310]	[0.0298]	[0.0307]	[0.0306]
Expo($-item)×Crisis	-0.321**	-0.278**	-0.814***	-0.776***	-0.764***	-0.770***
	[0.131]	[0.131]	[0.279]	[0.278]	[0.262]	[0.271]
Expo($-item)×Size×Crisis	0.0348***	0.0319**	0.0733***	0.0697***	0.0712***	0.0703***
	[0.0124]	[0.0126]	[0.0253]	[0.0252]	[0.0236]	[0.0244]
Sales / TA	0.0587***	0.0583***	0.0287	0.0445**	0.0284	0.0286
	[0.0223]	[0.0222]	[0.0237]	[0.0218]	[0.0238]	[0.0237]
Cash flow / TA	0.0400	0.0409	0.0715**	0.0480	0.0722**	0.0716**
	[0.0275]	[0.0274]	[0.0343]	[0.0308]	[0.0343]	[0.0343]
Size	-0.0662**	-0.0755**	-0.0826***	-0.0753***	-0.0899***	-0.0840***
	[0.0283]	[0.0314]	[0.0289]	[0.0279]	[0.0317]	[0.0299]
Constant	0.782***	0.885***	0.954***	0.876***	1.030***	0.969***
	[0.303]	[0.336]	[0.313]	[0.303]	[0.344]	[0.324]
Fixed effects						
Time	yes	yes	yes	yes	yes	yes
Firm	yes	yes	yes	yes	yes	yes
# obs.	13154	13154	11268	11153	11268	11268
# firms	2799	2799	2396	2368	2396	2396
Hansen p-value	0.579	0.596	0.602	0.579	0.594	0.599
AR(1) p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.269	0.235	0.180	0.221	0.176	0.178

Notes: Two-step system-GMM with time and firm-specific fixed effects. The dependent variable is the firms' bank debt growth between time t and $t-1$. The exposure of the lender-bank varies across specifications. *Expo* is consistently defined as in equation 1 and both $-item and CDS(USA)$_t$ are column-specific. $-items are listed in the top row, while the CDS spread index is: $CDS_{W\_USA,it}$ for columns 1 and 3, $CDS_{B\_USA,t}$ for columns 2 and 5, and $CDS_{C\_USA,t}$ for columns 3 and 6. All measures are defined in Section 6.2. Set of instruments: all variables are lagged twice or more. Robust standard errors in brackets (Windmeijer correction). ***,**,* indicate statistical significance at 1%, 5%, and 10%, respectively.