ACPR
BANQUE DE FRANCE

Débats économiques et financiers
N° 21

The real effects of universal banking on firms' investment: Micro-evidence from 2004-2009

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I am grateful to Ralph De Haas, Leonardo Gambacorta, Johan Hombert, Vasso Ioannidou, Raffaele Passaro, participants to the ACPR internal seminar, Bank of England seminar, Deutsche Bundesbank seminar, 4th EBA Policy Research Workshop, EUROFIDAI seminar, Federal Reserve Board seminar, 9th Swiss Winter Conference on Financial Intermediation for their valuable comments. Any remaining errors are only mine.

SECRÉTARIAT GENERAL DE L'AUTORITÉ DE CONTRÔLE PRUDENTIEL ET DE RÉSOLUTION
DIRECTION DES ÉTUDES

THE REAL EFFECTS OF UNIVERSAL BANKING ON FIRMS' INVESTMENT: MICRO-EVIDENCE FROM 2004-2009

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April 2016

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Abstract:

Most studies analyzing the transmission of financial shocks to the real economy fail to uncover real effects at firm level. Taking into account banks' business models, this article attempts to fix that issue. Two banking models are considered: traditional and universal banks, the latter providing sophisticated financial services (market-making on derivatives, management of large commitments). Relying on a unique database on credits, banks and firms covering more than 5,000 firms over 2004-2009, the paper shows that in period of high liquidity, both models have a similar credit supply, but in liquidity crisis, universal banks had a significantly lower credit supply, contrary to traditional banks, leading to real effects on firm's investment.

Keywords: Bank, Crisis, Retail Bank, Universal Bank, Firm, Credit, Credit Line, Maturity, Long-Term Credit, Short-Term Credit, Liquidity, Investment
JEL Classification: E22; E51; G01; G21; G24

Les effets réels du modèle de banque universelle sur l'investissement des entreprises : Résultats d'une analyse sur la période 2004-2009

Frédéric VINAS

Résumé:

La plupart des analyses sur la transmission de choc financier à l'économie réelle ne mettent pas en évidence d'effets réels. En prenant en compte le modèle d'affaire des banques, cet article propose une approche résolvant ce problème. Deux modèles sont considérés: les banques dites « traditionnelles » et les banques universelles, ces dernières fournissant des services financiers plus sophistiqués que les premières (tels que la tenue de marché des produits dérivés, la gestion de larges expositions au hors-bilan). À partir d'une base de données unique sur les prêts, les banques et les entreprises couvrant plus de 5 000 entreprises, l'étude montre qu'en période de liquidité sur les marchés financiers, les banques universelles et traditionnelles ont une offre de crédit à l'économie réelle similaire. Mais en période de crise de liquidité telle que la crise des « subprimes », les banques universelles ont une offre de crédit significativement plus faible que les banques traditionnelles, impactant l'investissement des entreprises.

Mots clés : Banque, Crise, Banque de détail, Banque Universelle, Entreprise, Crédit, Ligne de Crédit, Maturité, Prêt Long Terme, Prêt Court Terme, Liquidité, Investissement

Classification JEL: E22 ; E51 ; G01 ; G21 ; G24

1 Introduction

This article analyzes the real effects of universal banks and traditional banks on the real economy through the liquidity cycle of 2004-2009. After the financial liberalization of the 1970s and 1980s,[1] the banking sector is now made up of traditional banks and universal banks. Banks called here "traditional" are banks that focus on granting loans and collecting deposits, while "universal" banks have a larger set of financial services and activities, including investment banking activities. Understanding the behavior of universal banks and traditional banks through liquidity cycles has potential implications in corporate finance: do traditional and universal banks provide the same funding services to firms in period of high- and low liquidity on financial markets? How firms should build their funding mix between universal and traditional banks to bypass credit rationing in period of liquidity crisis?

I address the issues raised above using the French economy as a laboratory. This laboratory has several advantages: first the French economy is strongly dependent on banks' funding and firms have few opportunities to find alternative external funding to banking credit. Second, the 2007-2008's liquidity shock is exogenous to France. That shock was triggered by the burst of the U.S. real estate bubble and then was transmitted globally through the financial system. Those conditions set a proper environment to analyze how universal banks and traditional banks transmitted the 2007-2008's financial shocks to the real economy.

Figure 1 illustrates the credit volume provided by traditional and universal banks operating in France over the 2004Q1-2011Q4 period. Figure 1 shows that before 2008 credit exposures of both types of banks had a similar dynamic, but since 2008 a strong discrepancy appears and remains all along the period. The credit volume provided by universal banks is strongly lower than the one provided by retail banks.

To investigate the stylized facts plotted in Figures 1, I proceed in six steps detailed hereafter and summed up as follows: First (step 1) I classify banks lending to the real economy as traditional or universal banks depending on their income structure. Then I

[1] In France, the liberalization gradually untightened the separation of banking activities through the "Debré-Haberer Law" of 1966, 1967 and the "Bank Act" ("Loi Bancaire") of 1984. In the same way, in the U.S. the separation of banking activities gradually disappeared since the first regulatory changes of the 1980's until the Gramm–Leach–Bliley Act of 1999 ([Geyfman, Yeager,2009]).

focus on the period of liquidity crisis analyzing (step 2) the credit supply of traditional and universal banks, and contrasting it by credit types; (step 3) I analyze the credit substitution across banks and (step 4) I analyze the real effects on firm's investment. Then (step 5) I study the credit supply of traditional and universal banks prior to the liquidity crisis. Eventually (step 6), I discuss the channels at play and highlight a channel making universal banks more exposed to liquidity shock compared to traditional banks.

I first select banks that are strong suppliers of credit to the real economy and I identify them as universal or traditional banks depending on their income structure. The intuition is that both models share the common feature of lending to the real economy, but they differ on the other financial services they provide, thus at the end they differ on their income structure. Some banks strongly rely on interest income from non-financial institutions, I call them traditional banks. The others banks mainly rely on "off-balance-sheet" income, i.e. income from market making and proprietary trading on derivatives. Those latter are called universal banks. Final clustering is obtained using a K-means clustering method, but actually clusters are quite clear and the use of other information from the asset side (e.g. the size of banks's trading book), the liability side (e.g. reliance of funding from the capital markets) or the off-balance-sheet side of banks (e.g. nature and size of commitments) lead to similar clusters.

[Insert Figures 1 around here]

In a second step, I study banks' behavior in the crisis period: I analyze the credit supply of universal banks and traditional banks between 2006 and 2009 in the intensive margin.[2] Relying on loan data at bank-firm level, I explain the change in credit at bank-firm level by a dummy distinguishing the type of bank: universal or traditional. To control for firm's credit demand, I use the [Khwaja & Mian, 2008]'s methodology. That methodology selects firms with several banking relations and set fixed effects at firm level, assuming that a firm addresses the same credit demand to all banks of its banking network. In the present work, I select firms having banking relationships with at least one universal bank and one traditional bank in 2006. I then contrast the dynamics of the credit supply by credit type.

[2]It means on bank-firm relations that existed in 2006 and still existed in 2009.

I find that universal banks supplied 10.8% less credit than traditional banks over 2006-2009 (in line with the intuition provided by Figure 1), even controlling for credit demand. I contrast the dynamic by credit type using only the change in long-term loans as dependent variable over 2006-2009 (respectively the change in available credit lines, and the change in short term loans) and I find qualitatively similar results for long term loans and credit lines: universal banks supplied 8.6% less long-term loans than traditional banks and 16.9% less credit lines. Only the supply of short term loans is similar between universal and traditional banks, but short term loans are by far the less important credit in terms of volume (see Figure 2 and the section on descriptive statistics). Actually, funding frictions are concentrated on the most important credit type in terms of volume (long term loans and credit lines) and in terms of maturity (long term loans). For robustness checks, I check that results are not driven by one peculiar universal bank and again results are robust to this.

In a third step, I investigate whether firms could bypass frictions from universal banks over the 2006-2009 period thanks to new bank-firm relationships. To do this, I analyze the change in banking borrowings at firm level over 2006-2009. The identification strategy comes from the following idea: if firms cannot build new bank-firm relations in crisis time, then their banking network prior to the crisis (measured by the share of borrowings from universal banks in 2006) should explain their change in borrowings over 2006-2009. So, in that step I explain the change in borrowings at firm level between 2006 and 2009 by the share of firm's borrowing from universal banks in 2006. To control for firms' credit demand, I set fixed effects at business sector level (2-digit level) with the idea that all firms in a business sector face similar investment opportunities and thus they address similar credit demand to banks. I also control for other firm's characteristics like firm's rating.

I find that firms could not bypass the credit rationing from universal banks over the crisis. A 10 % higher exposure to universal banks prior to the crisis leads to a 1.8% less credit to firms after the crisis, even controlling for credit demand.

In a fourth step, I analyze the real effects of the credit rationing by universal banks on firms' investment. The idea is the following: if firms use part of banking credit for investement, I should find similar results on firms' investment that I find on firms' borrowings. So I use the same identification strategy than in the previous step with firm's investment as

the dependent variable: I explain firms' investment[3] in 2009 by firms' exposure to universal banks computed prior to the crisis in 2006. I control for firm's credit demand with fixed effects at business sector level. I also control for other firm's characteristics: firm's rating, business-to-business borrowing, and firm's access to capital markets.

I find that the more firms borrow from universal banks prior to the crisis, the lower their investment after the crisis: a 10% higher exposure to universal banks prior to the crisis leads to a 0.15% lower firm's investment after the crisis, even controlling for business sector and other firms charateristics.

In a fifth step, I consider the boom period prior to the subprime crisis. I show that contrary to the crisis period, in the boom period universal banks had a similar credit supply than traditional banks.

In a sixth step, I discuss potential channels at play and highlight a channel: universal banks suffer a run on credit lines during the crisis. I explain the probability that a firm draws down a credit line over 2005-2009 by the state of nature (crisis or not) and the type of bank (universal or traditional). I show that in period of liquidity crisis universal banks suffer a run on their credit lines.

The contributions of the paper are threefold. It first contributes to the literature analyzing the transmission of liquidity shocks to the real economy. Earlier articles studied the aggregate recessive effects of financial frictions after a liquidity shock ([Bernanke 1983]) and contrast effects across firms ([Gertler, Gilchrist 1994]). More recently the literature has relied on a "natural experiment" approach. Articles have exploited the variation of a characteristic of banks in cross-section to explain their credit supply to firms ([Peek, Rosengreen 2000], [Khwaja, Mian 2008], [Iyer et al. 2014], [Schnabl 2012]). Those articles have highlighted different channels of liquidity shocks like the share of interbank borrowings of a bank ([Iyer et al. 2014]) or the reallocation of liquidity between retail lending and capital markets ([Abbassi et al. 2015]). I stand out from the former articles: First I show that banking features are strongly correlated: banks with investment banking activities strongly rely on funding from the capital market and they also strongly provide off-balance-sheet commitments. Because features on the asset-, liability- and off-balance-sheet side are corre-

[3]I compute firms' investment in a year as the difference in firm's immobilization in two consecutive years.

lated, it makes sense to take into account bank's business model and analyze their lending behavior through a liquidity cycle. I show that a small set of banks are particularly impacted by financial frictions and adjust their lending to the real economy, namely universal banks, while the rest of the banking system, namely traditional banks, keeps on lending to the real economy. Second, I also stand out from the above mentioned articles by highlighting the real effects of a credit supply shock on firms' investment. Very few articles uncover real effects at firm level, with the exception of [Chodorow-Reich 2014] on employment, [Gan 2007] and [Almeida et. al. 2011] on firms' investment. But they focus on large (listed) firms. In contrast to those papers, I cover a larger range of firms (more than 5,000 firms) going from medium firms (with sales lower than EUR 50M) to large firms (with sales over EUR 50M).

A second contribution of this paper is on the literature analyzing banks' business models. Papers analyzing banking models essentially compare the risk and return between universal banks, investment banks and traditional banks ([Cornett, Ors & Tehranian, 2002], [Stiroh, 2004,2006], [Geyfman & Yeager, 2009]) using panel data analysis, event studies or simulation. But they do not study the impact of those business models on the real economy. Contrary to those papers, I analyze financial frictions related to those banking models and their impact on the real economy. In boom period, universal banks are large creator of liquidity (e.g. through credit lines as shown in the present paper) and they strongly rely on liquidity from financial market, but in period of financial crisis they stop lending to the real economy. Contrary to traditional banks, they do not provide funding continuation through the liquidity cycle.

The paper also contributes to the literature analyzing why firms have multiple-banking relationships. That literature shows that a bank having an information monopoly on a firm can extract a rent ("hold up"), and the firm may react to this rent extraction in building new bank-firm relations to counteract the hold-up ([Ioannidou, Ongena, 2010]). The paper provides another motivation for multi-banking relations: a diversification effect. The multi-banking relations mitigate the volatility of credit supply coming from the liquidity risk on bank side. The starting idea is closed to [Detragiache et. al. 2000] but I stand out from them on a striking point: their article consider bank's liquidity risk as idiosyncratic, in the present paper I rely on the correlation of the liquidity risk within banks' business models. And I show that, universal banks transmit financial shocks in period of financial crisis, while

traditional banks provide a funding continuation. In the present paper, having a relation with a traditional bank maintains firm's access to credit in period of financial crisis.

The rest of the paper is organized as follows, section 2 presents the data and stylized facts, section 3 the identification strategy, section 4 the results and section 5 concludes.

2 Data and Stylized facts

2.1 Bank data

Data on banks come from the French supervision authority (ACPR). They describe bank's balance sheet and financial statement over the 2004-2011 period. Bank's balance sheet are quarterly collected, while financial statement are biannually collected.

In order to focus on significant lender to the real economy, the bank sample is restricted to banks having an exposure of at least EUR 1 billion of long-term loans and available credit lines on non-financial firms in 2006, i.e. before the crisis.

Some banks have merged over the period of the study. This could lead to an artificial increase in credit exposures to certain borrowers. To take it into account, data of two banks concerned by a merger or an acquisition are agregated prior to the operation, as if the two institutions were already one.

2.1.1 Definition of banking models and descriptive statistics

I classify banks as traditional or universal depending on their income structure. Most banks strongly rely on interest income from NFI while a small set of banks strongly rely on market making and proprietary trading on derivatives.The ones relying more on interest income from non-financial institutions are called traditional banks. The others banks, relying mainly on incomes from on market making and proprietary trading on derivatives, are called universal banks. Final clustering is obtained using a K-means clustering method and leads to 88 traditional banks and 7 universal banks. Actually clusters are quite clear and the use of other information from the asset side (e.g. the size of banks's trading book), the liability side (e.g. reliance of funding from the capital markets) or the off-balance-sheet side of banks (e.g. nature and size of commitments) lead to similar clusters.

Tables 1 and 2 provide descriptive statistics of tradional and universal banks measured in 2006Q4. On the asset side, on average T-banks have a higher share of credit over total asset (64% vs 16%), a lower share of financial securities (10% vs 63%) compared to U-banks, and no trading book as measured by the share of assets used for proprietary trading and market-making (0% vs 21%). The same relations are true for median, first quartile and third quartile. On the liability side, on average T-banks have a higher share of deposit over total asset (64% vs 16%), a higher share of capital (10% vs 5%), a lower share of interbank debt (9% vs 14%), and repo (1% vs 17%).

Other statistics on bank revenues show (by definition) that T-banks rely strongly on interest income from non-financial firms contrary to U-banks. On average, interest income from non-financial firms represent 44% of banking income for T-banks while only 2% for U-banks.

So T-banks are in line with a model of banks that collect deposits (on average 64% of the liability), grant loans to the real economy (64%) and are not involved in market activities (on average 10% of financial securities and 0% of assets in the trading book). While U-banks are also significant lenders to the real economy, they are strongly engaged in other activities than lending to NFI (see also boxplots in Figures 6,7,8 and 9).

[Insert Tables 1 and 2 around here]

[Insert Figure 6,7,8 and 9 around here]

2.2 Loan data

The credit register of the Banque de France describes credit exposures of all banks operating in France to all firms operating in France. Each line details the credit exposures of a given bank to a given firm at a given date over the 2004-2011 period. Data are updated quarterly. Before 2006Q1, credit exposures were reported as soon as they were greater than EUR 76,000. Since 2006Q1, the threshold has been reduced to EUR 25,000. As I run placebo tests before 2006, I decided to restrict data all along the period of study to the former threshold at EUR 76,000.

The nature of credit exposures is described through 13 features and 2 maturities. Loans with a maturity of 1 year or less are defined as short-term loans. They cover overdraft account, factoring and other short term loans. Loans with a maturity above 1 year are defined as medium and long-term loans (called "long-term loans" in the paper). The maturity of loans reported in the credit register is the initial maturity of the loan, not the residual maturity which is not reported in the credit register. Credit lines do not provide information on maturity.Banks and firms are identified at individual (non-consolidated) level in the credit registry.

Figure 2 shows the total credit volume provided by banks over the 2004-2011 period distinguishing by credit types. The most important credit volume is long term loans, next comes credit lines. Both have a similar increasing trend until 2008, then the volume of long term loans stopped increasing, the one of credit lines decreased, then both restarted to increase from 2009. The remaining credit type is short term credit. The volume of short term credit is less important than the others and slowly decreased over the whole period.

2.3 Representativeness of the study

The sample of banks retained in the study covers 73% of credit volume reported in the French credit register in 2006. The remaining 27% split up into a large share of state-owned banks and the rest comes from very specific banks that are not representative of the banking sector: they have very few bank-firm relations (less than 1000), or very low exposure to the real economy (less than EUR 1 billion of long-term loans and available credit lines).

The 73% share covered by the study splits up into 32% from traditional banks with 4% short term loans, 24% of long-term loans and 4% of available credit lines, and 41% from universal banks composed of 7% of short term loans, 17% of long term loans and 16% of available credit lines (see Figure 10).

2.4 Firm data

Data on firms come from the Banque de France. They are yearly updated and available from 2004 to 2011. They describe firm's balance sheet, financial statements, firm's main

activity and firm's credit risk (Banque de France's rating on firms).

Very small firms (individual entrepreneurs) are not obliged to report their balance sheet and financial statements.[4] So the credit register covers a larger set of firms compared to the database reporting balance sheet and financial statements of firms. In 2006, the credit register reports 1,053,438 firms borrowing from the bank sample of this study (see Table 3); but among them, "only" 124,352 firms also report balance sheet and financial statements. Firms with no information are assumed to be very small firms.

[Insert Tables 3 and 4 around here]

2.5 Firms' banking network

Tables 3 and 4 describe firm's banking network by firm's size. The size is defined by firm's sales and measured in 2006.

As reported in Table 3, the number of banking relationships by firm is increasing with firm's size. Very small firms with sales under EUR 1 Million have on average one banking relationship (1.1 see column 1), while firms with sales over EUR 50M have 3.3 banking relationships on average.

The composition of the banking network is also changing with firm's size. Small firms borrow 82% of their credit as long-term loans, 10 % as short-term loans and 7% as credit lines (see columns 3, 6 and 9 of Table 4) while large firms borrow 25% of their credit as long-term loans, 57 % as short-term loans and 19% as credit lines. Due to bank's specialization (e.g. universal banks are strong provider of credit lines), this leads firms to borrow from different types of banks depending on their size. Small firms borrow mainly from T-banks (81% of their credit, see column 1 of Table 4) while large firms borrow mainly from universal banks (59% of their credit, see column 2 of Table 4). So the larger the firm, the more it borrows from universal banks.

[4]For details see `http://vosdroits.service-public.fr/professionnels-entreprises/F31214.xhtml` in French.

3 Identification strategy

The first step of the identification strategy is to show that universal banks and traditional banks differ in terms of credit supply during the subprime crisis. The other steps show that firms could not substitute borrowing across banks over that time leading to real effects on firms' investment.

The first step is detailed hereafter, while the others are detailed along the progression of the paper.

3.1 Identification strategy of the main regression

To show that universal and traditional banks had a different credit supply over the subprime crisis, I need to control for firms' credit demand. Demand of firms borrowing from universal banks could be very different from demand of firms borrowing from T-banks. The former firms could have decreased their credit demand more than the latter.

To control for credit demand, I use the [Kwhaja & Mian 2008]'s methodology. The methodology relies on firms with several banking relationships and assumes that a firm addresses the same credit demand to all banks of her banking network. Thus the methodology enables to compare the credit supply of universal banks and traditional banks to a given firm through the liquidity crisis.

In the paper, I select the sample of firms that borrows from traditional and universal banks over the subprime crisis. As the first signs of the 2007-2008's crisis started in August 2007 and the highest point of the crisis occurred in September 2008 with the bankruptcy of Lehman Brother's and AIG's bailout, for simplicity I average the credit exposures over the 4 quarters of 2006 for the "pre-crisis" period and the 4 quarters of 2009 for the "post-crisis" period. Averaging pre- and post-crisis exposure is also in line with the criticisms of [Bertrand, Duflo, Mullainathan, 2004] on differences-in-differences estimation. Results are robust to other pre- and post-crisis definition like extending the time period or selecting specific quarters of that time period.

In the paper I concentrate the study on firms with sales above EUR 10M[5] in 2006 (prior

[5]M for Million.

the crisis) because (i) at the end, the paper considers real effects of credit frictions on firm's investment. Firms with sales above EUR 10M have a strongly different investment dynamic compared to small firms (i.e. with sales lower than EUR 10M): both in level and through the business cycle. Figure 4 shows the median gross investment of firms by firm size. Firms with sales above EUR 10M have strongly higher investment dynamics whatever the point in the business cycle compared to small firms. Second, investment of firms with sales above EUR 10M is more correlated with the business cycle, while investment of small firms is more "flat" through the cycle. So considering firms with more than EUR 10M sales focuses the attention on firms with the higher fixed capital formation. (ii) The identification strategy relies on firm's borrowing from several banks at the same time. As reported in Table 3, firms having at least 2 bank-firm relations have more than EUR 10M sales. So the selection of firms with at least 2 bank-firm relations actually concentrates the study on firms with at least EUR 10M sales. By pointing out this now, it makes clear *ex ante* what type of firms are considered in this study.

The main equation is:

$$\Delta log(Credit_{b,f})_{2006\rightarrow 2009} = \beta.UBank_b + \alpha_f + \epsilon_{b,f}, \tag{1}$$

with :

$$\Delta log(Credit_{b,f})_{2006\rightarrow 2009} \equiv log(Credit_{2009,b,f}) - log(Credit_{2006,b,f})$$

where: $\Delta Credit_{b,f}$ is the change in credit (either all types of credit or a given type of credit depending on the interest) granted by a bank to a firm between the pre-crisis period and the post-crisis period measured as the difference in the natural logarithm of credit exposures. The dependent variable is winsorized at 1% to ensure that results are not driven by outliers. $UBank_b$ is a dummy set to 1 for universal banks (see definition in section "Definition of banking models and descriptive statistics"), otherwise it is set to 0. The β coefficient compares the credit supply of universal banks and traditional banks between 2006 and 2009. α_f is a dummy to set fixed effects at firm level. It captures observable and unobservable characteristics of firms. Standard errors are clustered at bank level to take into account the structure of data, i.e. the correlation of errors within a bank.

4 Empirical results

4.1 A lower credit supply of universal banks relative to traditional banks over 2006-2009

Table 5 presents the results for equation (1). The dependent variable is the change in all credits[6] supplied by a bank to a firm over 2006-2009. As indicated in equation (1), the change in credit is computed as the difference in the natural logarithm between credit exposure of 2006 and 2009.

As reported in column (1) universal banks had a lower credit supply (-10.6%) compared to traditional banks over 2006 and 2009. The estimation is on all bank-firm relations as soon as they exist in 2006 and 2009, i.e. the estimation is on the intensive margin which provides more conservative results (see [Kwhaja & Mian, 2008]).

In columns (2) to (3), I restrict estimations to firms borrowing from at least one traditional bank *AND* at least one universal bank in 2006 as in 2009. As reported in column (2), the result is unchanged and suggests that the selection of firms with multiple banking relationships do not change the credit channel analysis.

In column (3) I include firm fixed effects to control for firm's credit demand. Thanks to this, I control for the heterogeneity across observable and unobservable characteristics of firms and compare the credit supply of a universal bank and a traditional bank to a *given* firm (so to a *given* credit demand). The main result remains significant. This is in line with the intuition given by Figure 1. As reported in column (3), once controlled for credit demand at firm level, I find that on average universal banks had a 10.8% lower credit supply than traditional banks between 2006 and 2009.

[Insert Table 5 around here]

4.2 Credit frictions by credit type over 2006-2009

In the previous section I show credit frictions at bank-firm level, but what type of credit is impacted? Short-term loans, long-term loans, credit lines? In this section, I break down

[6] short-term loans, long-term loans and available credit lines

credit and I apply the same regressions as in Table 5. Results are reported in Table 6 respectively for short-term loans (columns (1)-(2)), long-term loans (columns (3)-(4)) and credit lines (columns (5)-(6)).

Columns (1), (3) and (5) report regressions of equation (1) on firms having banking relations at least with one universal bank and one traditional bank, both in 2006 and 2009 (i.e. the intensive margin). Columns (2), (4) and (6) are similar respectively to columns (1), (3) and (5) but with fixed effects at firm level to control for observable and unobservable characteristics of firms.

As reported in column (2) universal banks had a similar credit supply on short term loans compared to traditional banks over 2006 and 2009. Actually, frictions are concentrated on long-term loans and credit lines. As reported in columns (4) and (6), universal banks had a lower supply of long term loans (-8.6%) and credit lines (-16.9%) compared to traditional banks over 2006-2009.

So universal banks adjusted as well their supply of long-term loans AND their supply of available credit lines. This is particularly interesting, because the volume of long-term loans and credit lines is by far more important compared to short term loans. And long-term loans help firms to fund long-term investments (see [Diamond, 1991]).

[Insert Table 6 around here]

4.3 Substitution across banks?

In the former section, I show that universal banks provided a lower credit supply than traditional banks through the financial crisis. But, in case of perfect capital markets, firms could substitute borrowings from a traditional bank for borrowings from a universal bank. If this happened, firms could have fulfilled their borrowing needs over the crisis. And thus, firms would have bypassed the credit supply shocks from universal banks.

I show here that firms could not bypass such frictions during the crisis: the more firms were exposed to universal banks before the crisis, the less they borrowed through the crisis, even controlling for credit demand.

Equation (2) describes the identification strategy of this section:

$$\Delta log(Credit_f)_{2006\rightarrow2009} = \alpha.ExpoToUBank_{2006,f} + Sector_f + OtherControls_f + \epsilon_f \quad (2)$$

with :

- $log(Credit_f)_{2006\rightarrow2009} \equiv log(Credit_{2009,f}) - log(Credit_{2006,f})$
- $ExpoToUBank_{2006,f} \equiv \frac{Credit_{2006,Ubank,f}}{Credit_{2006,Ubank+Tbank,f}}$

The dependent variable $\Delta log(Credit_f)_{2006\rightarrow2009}$ is the difference in the natural logarithm of all credit borrowed by a firm between 2006 and 2009. The dependent variable is winsorized at 1% to ensure that results are not driven by outliers. $ExpoToUBank_{2006,f}$ is the exposure of a firm to universal banks prior to the crisis in 2006. That exposure is computed as the ratio of (short term loans +long term loans + available credit lines) borrowed by the firm from universal banks in 2006 over all (short term loans +long term loans + available credit lines) borrowed by the firm in 2006. If firms can perfectly substitute borrowings from traditional banks to borrowings from universal banks then α should not be significantly different from 0. $Sector_f$ is a control to capture firm's credit demand through her business sector with the idea that all firms in a business sector face similar investment opportunities and thus they address similar credit demand to banks. The variable describing business sectors is 2-digit level and covers more than 50 business sectors. I also add other controls ($OtherControls_f$) like the credit rating of the firm. The credit rating is a dummy set to one for firm having a rating between A and AAA in 2006. The intuition is that firms with a better credit risk rating should be more able to borrow over that period. So a positive coefficient is expected. The credit risk rating is computed prior to the crisis in 2006.

Table 7 reports the results of this analysis. Column (1) reports change in borrowings at firms level and shows that a 10% higher exposure to universal banks prior to the crisis leads to a 1.89% lower firm's borrowing through the crisis. In column (2), fixed effects at business sector level[7] are added (2-digit information). Results remain similar and significant. In Column (3), a dummy is added for firms having a rating AAA to A. Again results remain

[7]More than 50 sectors are considered.

similar. Column (3) also shows that firm with a rating between AAA and A could borrow 12.7% more credit than other firms.

So, funding frictions were at play at bank-firm level: the higher the exposure of firm to universal banks prior the crisis, the lower firms could borrow through the crisis, even controlling for credit demand and firm's credit risk.

[Insert Table 7 around here]

4.4 Real effects on firms' investment

In the previous sections, I show that universal banks provided a lower credit supply than traditional banks through the financial crisis and that firms could not perfectly substitute borrowings within the banking sector, but are there real effects? I show here in the present section that frictions led to negative real effects: the more a firm borrowed from universal banks before the crisis, the less she invested just after the crisis.

Equation (3) describes the identification strategy of this section:

$$Investment_{2009,f} = \alpha.ExpoToUBank_{2006,f} + Sector_f + OtherControls_f + \epsilon_f \qquad (3)$$

with :

- $ExpoToUBank_{2006,f} \equiv \frac{Credit_{2006,Ubank,f}}{Credit_{2006,Ubank+Tbank,f}}$
- $Credit_{year,f} = LongTermLoans_{year,f} + CreditLine_{year,f}$

Table 8 reports the results on the analyze of firms' investment in 2009. The dependent variable is firm's gross investment measured as the difference of firm's immobilization between 2008 and 2009. Firm's investment is regressed on firm's exposure to universal banks measured prior to the crisis in 2006, just like in the former section.

As reported in column (1) of Table 8, the more a firm borrowed from universal banks prior to the crisis, the more it decreased its investment after the crisis. A 10% higher exposure to universal banks prior to the crisis leads to 0.14% less investment after the crisis.

In column (2), fixed effects at business sector level are added. The main results remains significant. In column (3), firm's credit rating, the share of business-to-business (B2B)

lending over total liabilities and firm's access capital market are added. The share of B2B lending and the access to capital market are potential channel to bypass frictions from the banking system. As reported in columns (3), the main explanatory variable remains statistically and economically significant even controling for firm's business sector, credit risk and other funding sources. A 10% higher exposure to universal banks prior to the crisis leads to a 0.15% lower investment after the crisis.

[Insert Table 8 around here]

4.5 Robustness checks

4.5.1 What channel(s) explain(s) bank's behavior during the subprime crisis?

Former sections show that universal and traditional banks had a different credit supply during the subprime crisis, but what channel(s) drive(s) this? Actually several channels might be at play, the liability of universal banks is strongly reliant on financial market (see descriptive statistics measuring the share of interbank borrowings, repo borrowings and bond issuance by banking models), they also have a strong exposure on market risk and important commitments. The present section highlights a liquidity shock that universal banks suffer from their off-balance-sheet due to their pre-crisis commitments.

Section 4.2 has shown that universal banks had a lower credit supply on credit lines and long term loans. Figure 3 shows the sum of long term loans and credit lines provided by universal and traditional banks over the 2004-2011 period. Focusing on 2008, a substitution between credit lines and long term loans seems at play on universal banks side. One assumption tested in this section is that universal banks suffer a run on credit lines during the subprime crisis.

The credit register does not report the drawdown on credit lines, but I can compute a proxy of the drawdown on credit lines to test this assumption. I define a variable capturing the drawdown of credit lines to get long term loans called *Drawdown*. As illustrated in Table 9, I consider that a drawdown occured and the variable *Drawdown* is set to 1 in quarter Q when the credit line exposure of a *given* bank on a *given* firm is decreasing between quarters $Q-1$ and Q, while in the *same* time span an increase in long term loan exposures of the

same bank on the *same* firm is detected between quarters $Q-1$ and Q. Otherwise, when a credit line exposure is positive and different from zero in $Q-1$, but the dynamic described here above does not occur, $Drawdown$ is set to 0 for quarter Q.[8]

Figure 5 shows the dynamic of the drawdown on credit lines ($Drawdown$) for all exposures on the one hand and large exposures above EUR 10M on the other hand. At first glance, considering all credit lines, the average drawdown is quiet stable over the period. Around 20% of credit lines are quarterly draw down prior to the crisis. There is small increase during the subprime crisis and again during the European debt crisis, but over the period the shape is quiet "flat". Focusing on the drawdown of *large* credit lines provides a different picture. Figure 5 shows that prior to the liquidity crisis period, in 2006, 13% of large credit lines were drawdown, then since the begining of the subprime crisis in 2007Q3 the drawdown on large credit lines strongly increased reaching 26% in 2008Q4, before decreasing back to around 13%, eventually it increased again during the European debt crisis. But what type of banks suffers from that drawdown?

Equation (4) describes the identification strategy of this section:

$$\begin{aligned} Drawdown_{q,q-1} = Crisis_{07q3-08q4} + UBank_b + UBank_b * Crisis_{07q3-08q4} \\ + LargeExposure_i + LargeExposure_i * Crisis_{07q3-08q4} + LargeExposure_i * UBank_b \\ + LargeExposure_i * Crisis_{07q3-08q4} * UBank_b + \epsilon_{q,i,b} \end{aligned}$$

The dependant variable $Drawdown$ is the drawndown on credit lines as defined above. $Crisis_{07q3-08q4}$ is a dummy set to 1 during the subprime crisis, i.e. from 2007Q3 to 2008Q4, otherwise it is set to 0. $UBank_b$ is a dummy set to 1 for universal banks (see definition in section "Definition of banking models and descriptive statistics"), otherwise it is set to 0. $LargeExposure_i$ is a dummy set to 1 for credit lines above EUR 10M, 0 otherwise. Standard errors are clustered at bank level.

Table 10 presents the results of the drawdown of credit lines by firms over 2006-2009. I stop the observation period in 2009, because I focus on the supbrime crisis and not the European debt crisis.

[8] See Table 9 for a clear illustration.

Column (1) shows that a higher drawdown of credit lines is at play during the subprime crisis. Column (2) aims at highlighting what time of credit lines are particularly drawdown and what type of banks suffers from that drawdown. Column (2) shows that U-banks were particularly impacted by the drawdown of large credit lines during the subprime crisis.

So precisely when it was hard to borrow from the interbank market, universal banks suffer a higher drawdown of the credits they committed to provide, they had to fulfill those commitments and provide long-term loans to firms (remember the dependent variable precisely capture the drawdown of credit line to get a long term loan). Those credit lines committed to deliver long term loans are for example syndicated loans. This results is in line with the intuition of a subsitution between credit lines and long term loans highlighted on Figure 3.

So in period of boom, universal banks are strong liquidity creator. On average, in 2006Q4, credit lines represented 34% of the total credit provided by U-banks whereas only 12% for T-banks as reported through the ratio credit lines over total credit in Table 1 and 2 (see also Figure 3). Thus universal banks are large liquidity creator in period of high liquidity on financial markets. But this makes universal banks exposed to a run on credit lines in period of liquidity crisis. This is precisely what shows this section (see also Figure 5).

4.5.2 Additional robustness tests

I run additionnal robustness checks. (i) I test different type of pre- and post-crisis definitions for the main results in Table 5 like a post-crisis period going beyond 2009, and again results are still significant. (ii) I show that results are not driven by one universal bank in particular by running the same regression than in column 3 of table 5 and setting a dummy for each universal banks. (iii) I also set dummies at banking group level and again results remain significant.

4.5.3 Placebo test

I run a placebo test prior to the crisis, over 2004-2006 (see Table 11). I use the same identification strategy than the one of Table 5. The variable of interest $UBank_b$ becomes not significant in that case, which shows that universal banks and traditional banks had a

similar credit supply prior to the crisis.

[Insert Table 10 and 11 around here]

5 Conclusion

The present paper analyzes the lending strategy and credit supply of banks belonging to different business models but sharing the common activity of lending to the real economy. This analysis is carried out over the liquidity cycle of 2004-2009. The business models considered are universal banks and traditional banks. Traditional banks focus on the lending to the real economy, they collect deposits and grant credits. Universal banks have a larger supply of financial services and activities. They are engaged in investment banking activities.

The lending strategy of universal banks relies on the creation of liquidity through commitments on their off-balance-sheet. That strategy exposed those banks to a run on credit lines during a liquidity crisis like it occured during the subprime crisis, setting universal banks in a position where they have to fulfill their pre-crisis commitmments precisely at a time it was hard to borrow from financial markets.

While banking literature highlights multi-banking relationships as a way to bypass the hold-up problem and limit the rent extraction of a bank ([Ioannidou, Ongena, 2010]), the present paper highlights the benefits of multi-banking relationships as a funding diversification across banking models, due to the "correlation" of liquidity risk within banking models. Indeed universal banks provide sophisticated intermediation services, but those services are procyclical with market liquidity. On the contrary, traditional banks provide more "basic" intermediation services, but above all, they provide a funding continuation in period of liquidity crisis on financial markets (remember Figure 1).

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7 Appendix

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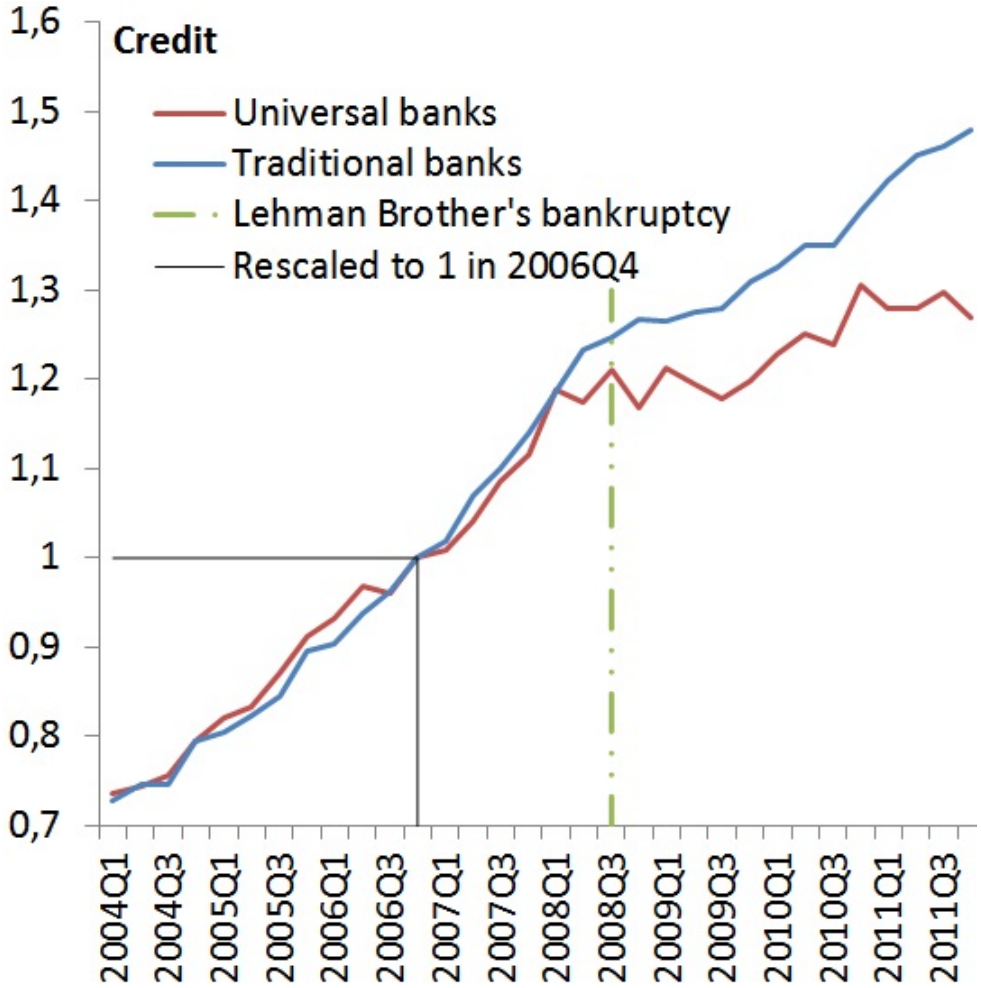
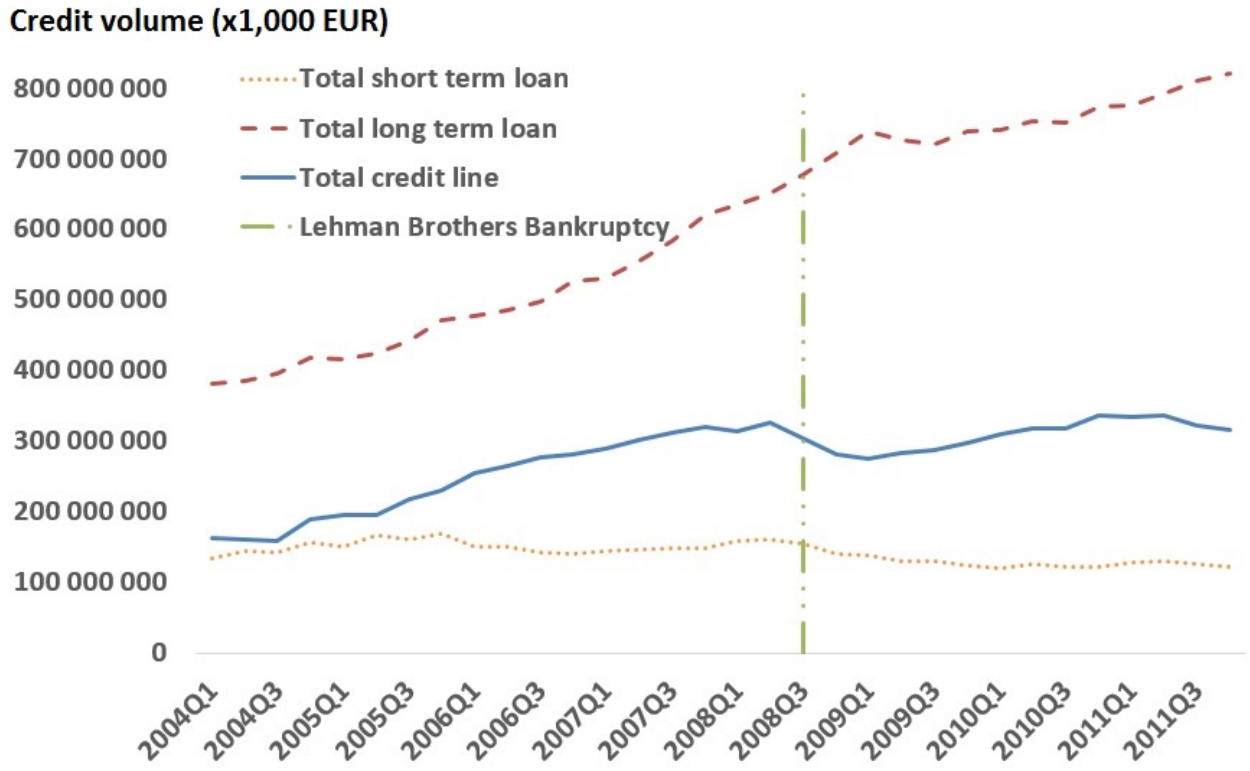
Figure 1: Banks' credit exposure by business model



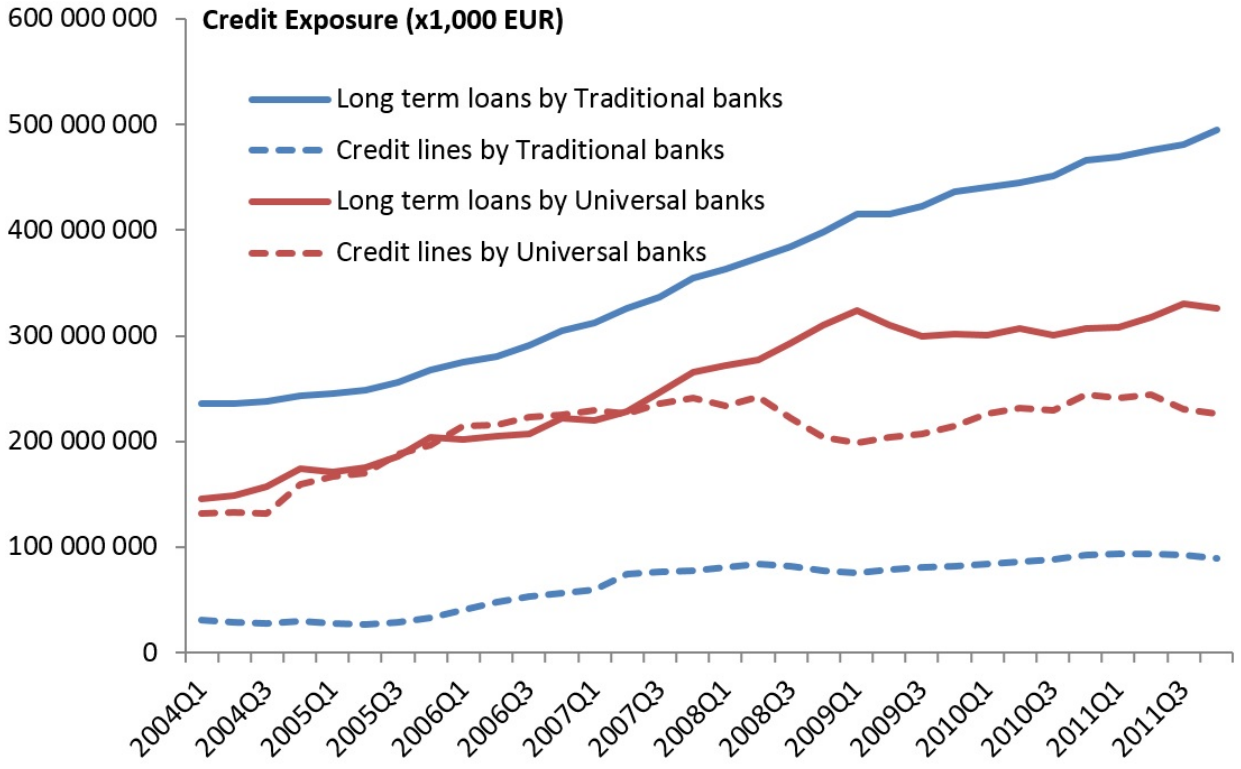
This figure describes the median credit exposure of banks by banking models over the period 2004Q1-2011Q4. To build the figure, I first computed the quarterly credit exposure of each bank on firms as the sum of short-term loans, long-term loans and available credit lines granted to firms. The exposure is then rescaled at 1 in 2006Q4 for each bank. Then I computed the median exposure by banks' business model.

Figure 2: Credit volumes by credit type



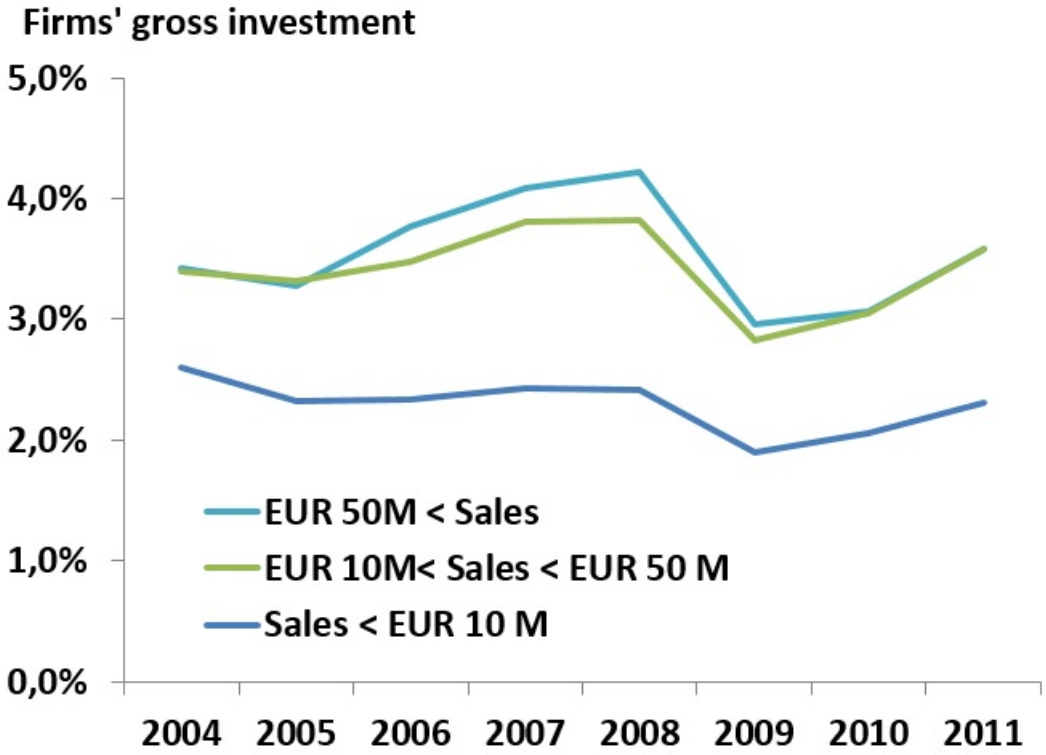
This figure describes the evolution of credit exposures provided by the banks covered in this study for different credit types over the 2004Q1-2011Q4 period. The credit described are short term loans, long term loans (i.e. with a maturity over 1 year) and available credit lines.

Figure 3: Substitution between credit lines and long-term loans at bank level



This figure describes the evolution of credit exposures provided by banking models over the 2004Q1-2011Q4 period. The credit described are long term loans (i.e. with a maturity over 1 year) and available credit lines.

Figure 4: Firm's gross investment by firm's size



This figure shows the median gross investment of firms by firm size over the period 2004-2011. Three sizes of firms are considered: small firms with sales below EUR 10M, medium firms with sales between EUR 10M and EUR 50M and large firms with sales above EUR 50M.

Figure 5: Drawdown of credit lines to get long-term loans

This figure describes the quarterly drawdown of credit lines for all credit lines and large credit lines, i.e. credit lines with an notional amount over EUR 10 M.

Figure 6: Boxplot of banks' asset by business model in 2006Q4

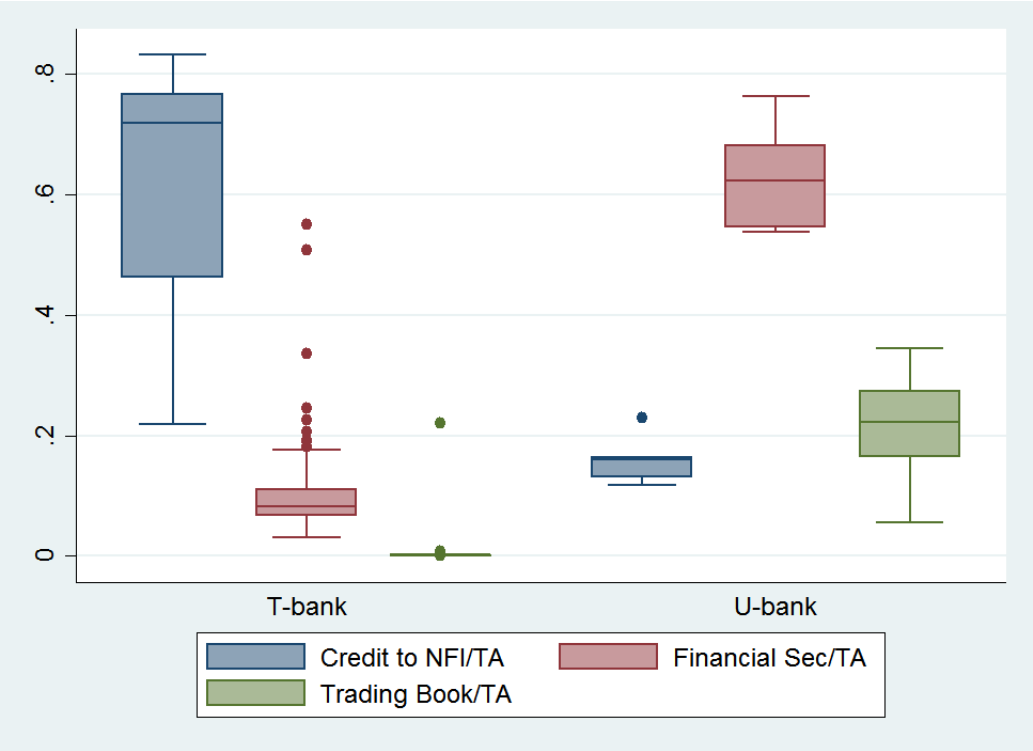


Figure 7: Boxplot of banks' liability by business model in 2006Q4

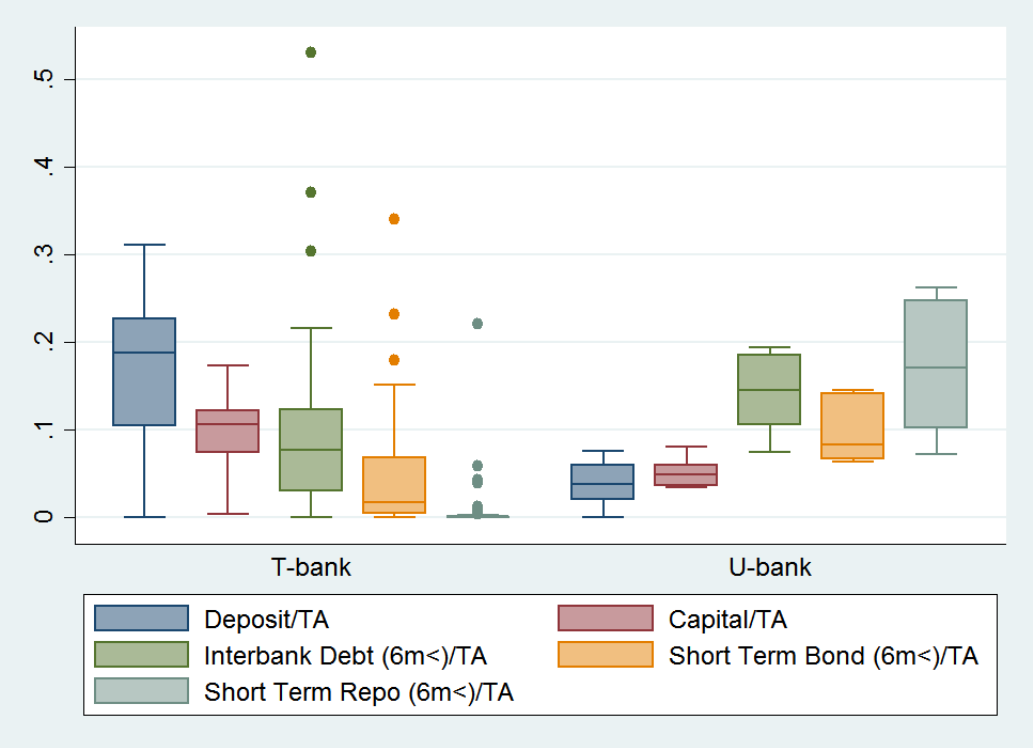


Figure 8: Boxplot of banks' total assets by business model in 2006Q4

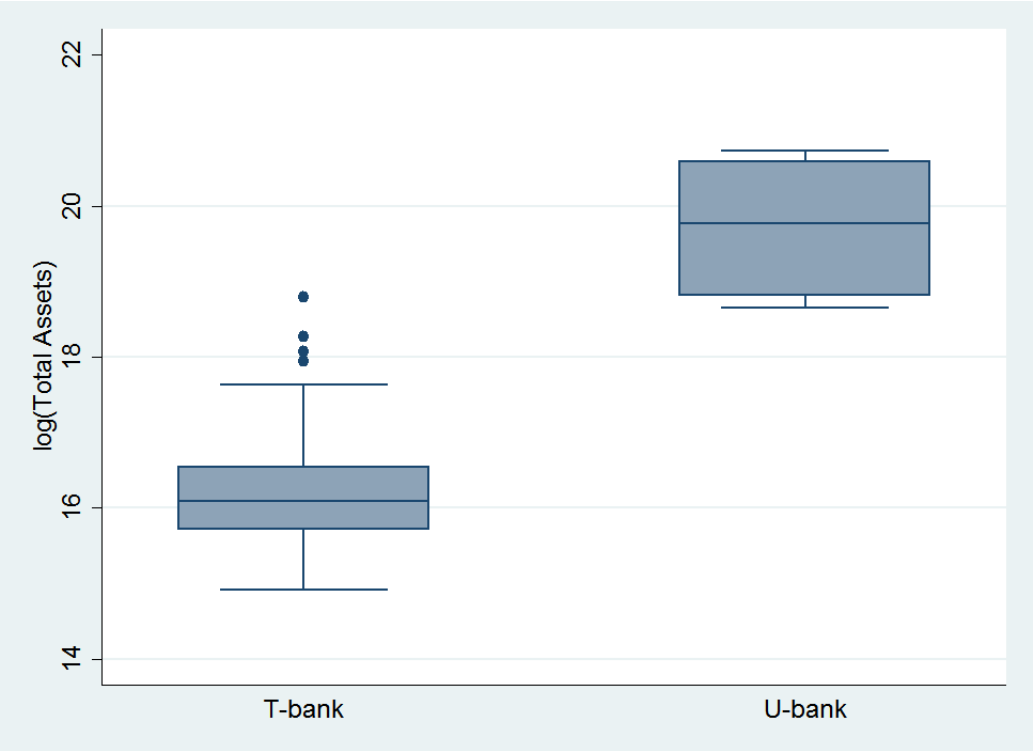


Figure 9: Boxplot of banks' income structure by business model in 2006Q4

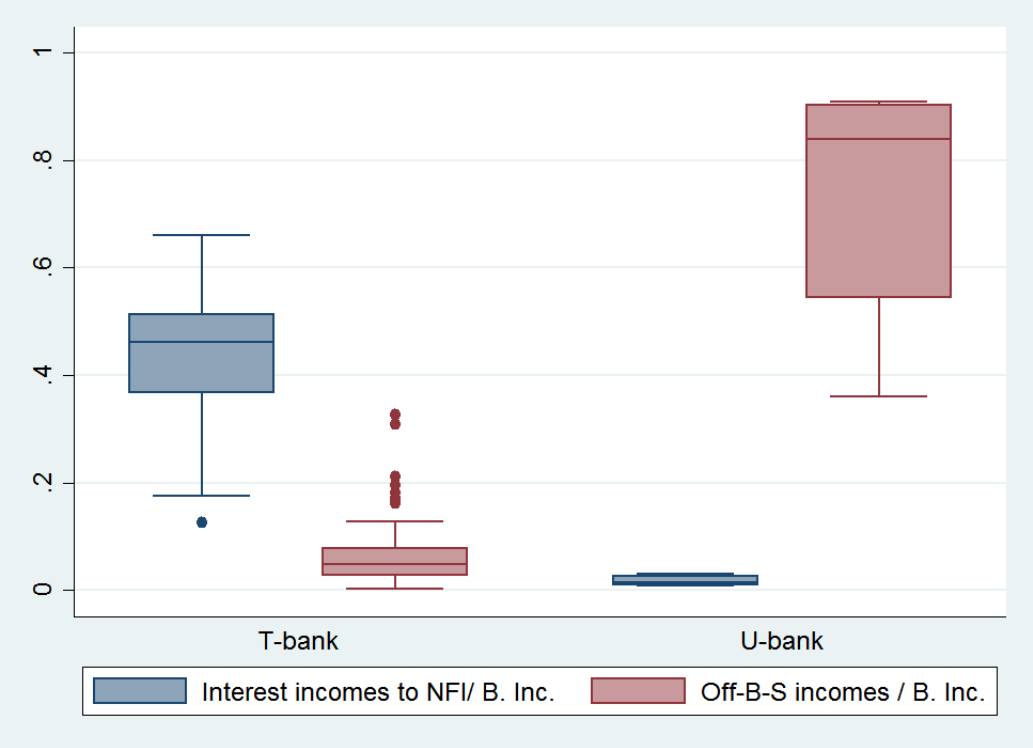
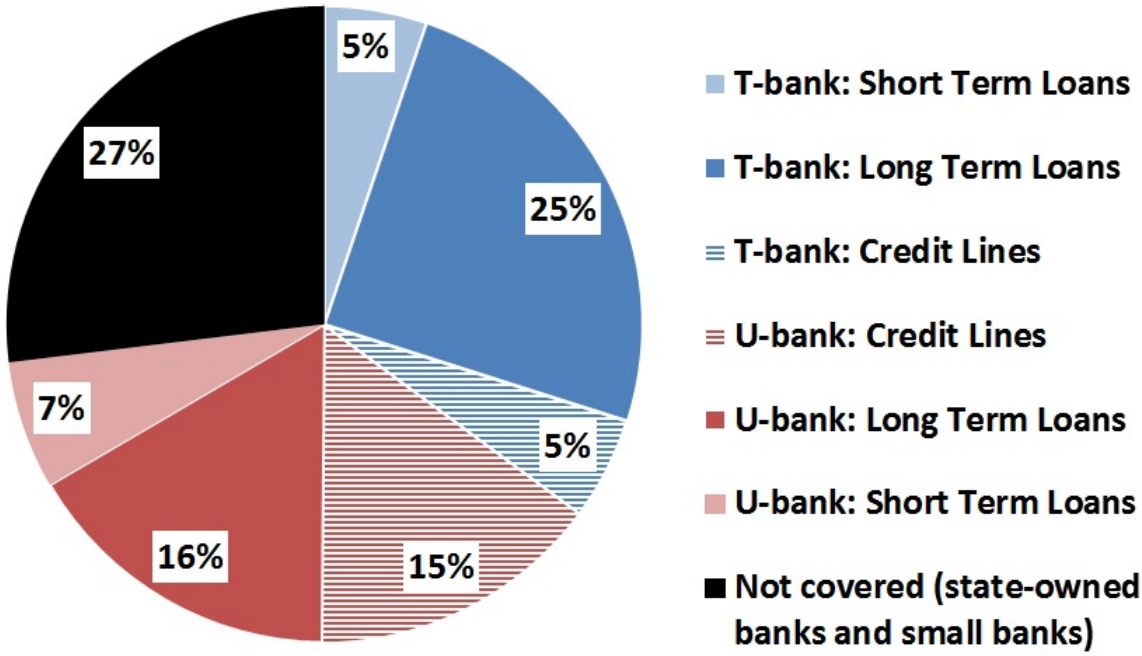


Figure 10: Credit covered by the study (in 2006)



This figure describes the reppresentativity of the study. The figure is computed from the credit exposures of banks reported in the credit register of the Banque de France in 2006.

Table 1: Descriptive statistics of traditional banks in 2006Q4

		Q1	Mean	p50	Q3	Std	N
Asset	Credit to non-financial inst. / Total Asset (TA)	46%	64%	72%	77%	17%	88
	Financial securities / TA	7%	10%	8%	11%	8%	88
	Proxy of Trading book / TA	0%	0%	0%	0%	2%	88
	Total Asset (Millions euro)	6 665	15 515	9 698	15 230	19 582	88
Liability	Deposit / TA	10%	17%	19%	23%	7%	88
	Interbank Debt (<6 monthes)	3%	9%	8%	12%	8%	88
	Repo (<6 monthes	0%	1%	0%	0%	2%	88
	Short Term Bonds (<6 monthes)	0%	5%	2%	7%	6%	88
	Capital / TA	7%	10%	11%	12%	3%	88
	Provision/TA	1%	1%	1%	2%	1%	88
Off-balance sheet	Funding commitments/ TA	7%	11%	10%	11%	7%	88
	Notional commitment on IR derivatives / TA	10%	31%	16%	27%	67%	88
Banking income	IR income to non-financial inst. / banking income	37%	44%	46%	51%	10%	88
	Off-balance-sheet income / banking income	3%	6%	5%	8%	6%	88
Other	Nb bank-firm relations	12 940	23 734	20 152	27 721	21 251	88
	Credit lines over Total Credit	8%	12%	12%	16%	7%	88

Table 2: Descriptive statistics of universal banks in 2006Q4

		Q1	Mean	p50	Q3	Std	N
Asset	Credit to non-financial inst, / Total Asset (TA)	13%	16%	16%	16%	4%	7
	Financial securities / TA	55%	63%	62%	68%	8%	7
	Proxy of Trading book / TA	16%	21%	22%	27%	9%	7
	Total Asset (Millions EUR	147 886	453 973	382 693	877 927	362 651	7
Liability	Deposit / TA	2%	4%	4%	6%	3%	7
	Interbank Debt (<6 monthes)	10%	14%	15%	18%	5%	7
	Repo (<6 monthes)	10%	17%	17%	25%	7%	7
	Short Term Bonds (<6 monthes)	7%	10%	8%	14%	3%	7
	Capital / TA	4%	5%	5%	6%	2%	7
	Provision/TA	0%	0%	0%	0%	0%	7
Off-balance sheet	Funding commitments/ TA	10%	13%	11%	15%	4%	7
	Notional commitment on IR derivatives / TA	441%	1402%	1637%	2049%	819%	7
Banking income	IR income to non-financial inst, / banking income	1%	2%	2%	3%	1%	7
	Off-balance-sheet income / banking income	54%	72%	84%	90%	21%	7
Other	Nb bank-firm relations	10 597	73 983	33 884	165 595	84 384	7
	Credit lines over Total Credit	31%	34%	35%	36%	3%	7

Table 3: Firm's banking network prior to the crisis (in 2006)

Firm's size	Average number of banking relations	Only one banking relation	At least one U-bank in firm's network	Borrowing from at least one U-bank and one T-bank	Number of firms
	1	2	3	4	5
sales < EUR 1 M or no info	1,1	92%	20%	3%	947,365
EUR 1M< sales<EUR 10M	1,4	69%	34%	15%	84,871
EUR 10M< sales<EUR 50M	2,3	40%	62%	41%	16,659
EUR 50 M <sales	3,3	32%	84%	50%	4,543

This table describes firms' banking network by firms' size in 2006. Data are computed from the average exposure of a bank to a firm over the 4 quarters of 2006. The table shows that the number of banking relationships by firm is increasing with firm's size. Very small firms (with sales under EUR 1 million) have on average one banking relationship (1.1 as reported in column 1), while firms with sales over EUR 50m have 3.3 banking relationships on average.

Table 4: Firm's funding by credit type and bank's business model (in 2006)

share of ...	all credit		short term loans			long term loans			credit lines			
from...	T-banks	U-banks	all	T-banks	U-banks	all	T-banks	U-banks	all	T-banks	U-banks	Number of firms
	1	2	3	4	5	6	7	8	9	10	11	12
sales < EUR 1 M or no info	81%	19%	10%	8%	2%	83%	67%	15%	7%	6%	1%	947 365
EUR 1M< sales<EUR 10M	74%	26%	30%	21%	9%	55%	42%	14%	14%	11%	3%	84 871
EUR 10M< sales<EUR 50M	61%	39%	42%	22%	20%	41%	27%	14%	17%	12%	5%	16 659
EUR 50 M <sales	41%	59%	57%	19%	39%	25%	14%	11%	18%	9%	9%	4 543

This table describes the structure of banking credit by firms' size. Data are computed from the average exposure of a bank to a firm over the 4 quarters of 2006. Small firms borrows 81% of their credit from T-banks (see column 1), 19% from universal banks. In contrast, larger firms have a more diversified funding structure. The largest firms borrow 41% of their credit from traditional banks and 59% from universal banks. So the larger the firm, the more it borrows from universal banks. The table also shows that small firm rely strongly more on long term loans than large firms (83% vs 25% see column 6), while large firms rely strongly more on short-term debt and credit lines than small firms (see columns (3), (6) and (9)).

Table 5: Supply of credit by banking models through 2006-2009

$$\Delta log(Credit_{b,f})_{2006 \rightarrow 2009} = \beta.U\_Bank_b + \alpha_f + \epsilon_{b,f}$$

Dependent	Change in credit at bank-firm level through 2006-2009		
	1	2	3
Dummy U-bank	-0.106***	-0.109***	-0.108***
	(0.023)	(0.025)	(0.026)
Constant	0.002	0.026	0.025*
	(0.017)	(0.017)	(0.013)
Observations	37,933	22,897	22,897
R-squared	0,4%	0,5%	44,1%
R-squared "within"	-	-	0,8%
F test	22.22	19.76	17.15
Prob >F	8.42e-06	2.40e-05	7.54e-05
Firm with several bank-firm relations	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
Banking Group Fixed Effects	No	No	No
Nb firms	16,548	6.116	6.116

In this table the regressions provide a comparison of banks' credit supply by banking models in period of financial crisis. The dependent variable is the change in the natural logarithm of all credit (short-term loans, long-term loans and available credit lines) at bank-firm level between 2006 and 2009. The exposure of a bank to a firm in 2006 (respectively 2009) is computed as the average exposure over the 4 quarters of 2006 (resp. 2009). I restrict the regression to the intensive margin, i.e. to bank-firm relations that existed in 2006 and that still existed in 2009. In this way the results are more conservative (see [Khwaja & Mian AER 2008]). The variable "*Dummy U-bank*" is a dummy set to 1 for universal banks, otherwise it is set to 0. The coefficient of "*Dummy U-bank*" compares the credit supply of universal banks relative to traditional banks. Columns (2) to (3) are restricted to firms borrowing at least from one universal bank AND one traditional bank. Columns (3) includes controls for firm's credit demand by setting fixed effects at firm level. Standard errors, reported in parentheses, are clustered at bank level. ***, **, * indicate significance levels at 1%, 5% and 10%.

Table 6: Credit supply by banking models in period of financial crisis: decomposing short-term loans, long-term loans and available credit lines

$$\Delta log(Short\_Term\_Loan_{b,f})_{2006\rightarrow2009} = \beta.U\_Bank_b + \alpha_f + \epsilon_{b,f}$$
and
$$\Delta log(Long\_Term\_Loan_{b,f})_{2006\rightarrow2009} = \beta.U\_Bank_b + \alpha_f + \epsilon_{b,f}$$
and
$$\Delta log(Credit\_Line_{b,f})_{2006\rightarrow2009} = \beta.U\_Bank_b + \alpha_f + \epsilon_{b,f}$$

Dependent: Change in...	Short-term loans		Long-term loans		Available credit lines	
	1	2	3	4	5	6
Dummy U-bank(dummy)	-0.004	0.012	-0.085***	-0.086**	-0.195***	-0.169**
	(0.035)	(0.030)	(0.030)	(0.034)	(0.062)	(0.068)
Constant	-0.089***	-0.096***	0.012	0.012	0.113**	0.101*
	(0.024)	(0.023)	(0.016)	(0.013)	(0.054)	(0.055)
Observations	13,206	13,206	11,278	11,278	3,545	3,545
R-squared	0,0%	46,4%	0,2%	46,7%	0,6%	40,9%
R-squared "within"	-	0.0%	-	0.3%	-	0.7%
F test	0.0117	0.157	7.881	6.192	9.867	6.252
Prob >F	0.914	0.693	0.00607	0.0146	0.00232	0.0144
Firm with several bank-firm relations	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	Yes	No	Yes	No	Yes
Nb firms	3,718	3,718	3,255	3,255	958	958

This table provides similar regression as in Table 5 columns (2) and (3). The difference comes from the dependent variables. Here in columns (1)-(2), the dependent variable is the change in the natural logarithm of short-term loans at bank-firm level. In columns (3)-(4), the dependent variable is the change in the natural logarithm of long-term loans. In columns (5)-(6), the dependent variable is the change in the natural logarithm of available credit lines. Standard errors, reported in parentheses, are clustered at bank level. ***, **, * indicate significance levels at 1%, 5% and 10%.

Table 7: Change in borrowings at firm level between 2006 and 2009

$$\Delta log(Credit_f)_{2006\rightarrow2009} = \alpha.ExpoToUBank_{2006,f} + Sector_f + OtherControls_f + \epsilon_f$$

with :

$$ExpoToUBank_{2006,f} \equiv \frac{Credit_{2006,Ubank,f}}{Credit_{2006,Ubank+Tbank,f}}$$

Dependent	Change in credit at firm level between 2006 and 2009		
	1	2	3
Exposure to U-banks in 2006	-0.189***	-0.172***	-0.177***
	(0.034)	(0.035)	(0.034)
Rating AAA to A			0.120***
			(0.018)
Constant	Yes	Yes	Yes
Observations	6,710	6,710	6,710
R-squared	0,5%	2,7%	3,3%
F test	31.17	24.63	34.96
Prob >F	2.45e-08	7.13e-07	0
Sector Fixed Effects	No	Yes	Yes

In this table the regressions analyze if the banking network of a firm prior to the crisis explains her borrowing through the crisis. The idea is the following: Even if universal banks had a lower credit supply in the crisis, firms could have bypassed such frictions in building new bank-firm relations and thus fulfilled their borrowing needs. But if firms cannot build new bank-firm relations, then their banking network prior to the crisis should explain their borrowing through the crisis. The dependent variable is the change in borrowings of a firm between 2006 and 2009. To compute this, first I compute the average borrowings of a firm to each bank it is borrowing in 2006. Then I sum all those borrowing across banks for a given firm. I do the same in 2009. And then I compute the difference in the natural logarithm of borrowings of a firm between 2006 and 2009. Data are winsorized at 1%. The variable "*Exposure to U-banks in 2006*" is the share of firms borrowing from universal banks in 2006, thus it describes the banking network of a firm prior to the crisis. The variable "*Rating AAA to A*" is a dummy set to 1 if the firm had a rating A, AA or AAA in 2006. The note comes from Banque de France's credit rating. In columns (2) to (3), I control for firm's credit demand by setting fixed effects on the business sector of the firm (2-digit level, more than 50 sectors). In order to have enough variation across *Exposure to universal banks*, I restrict to business sectors having at least 10 firms.Standard errors, reported in parentheses, are clustered at bank level. ***, **, * indicate significance levels at 1%, 5% and 10%.

Table 8: Firm's investment in 2009

$$Investment_{f,2009} = \alpha.ExpoToUBank_{2006,f} + Sector_f + OtherControls_f + \epsilon_f$$

with :

$$ExpoToUBank_{2006,f} \equiv \frac{Credit_{2006,Ubank,f}}{Credit_{2006,Ubank+Tbank,f}}$$

Dependent	Firm's Investment in 2009		
	1	2	3
Exposure to U-banks in 2006	-0.014***	-0.016***	-0.015***
	(0.005)	(0.005)	(0.005)
Rating AAA to A			Yes
B2B Lending			Yes
Bond Issuer in 2006			Yes
Constant	Yes	Yes	Yes
Observations	6,710	6,710	6,710
R-squared	0,1%	1,7%	1,9%
F test	9.906	11.91	5.668
Prob >F	0.00165	0.000562	0.000150
Sector Fixed Effects	Yes	Yes	Yes

In this table the regressions analyze if the frictions coming from universal banks explains the ability of a firm to invest through the crisis. The idea is the following: if firms use banking credit lines to finance investment, I should find the same results on firms' investment that I find on firms' borrowings (see Table 7), So I use the same identification strategy than in Table 7: I explain firms' investment in 2009 by the share of firms' borrowing from universal banks prior to the crisis. Investment is the difference in firm's immobilization between two consecutive years. I cannot take into account depreciation because my database does not report depreciation. *Exposure to universal banks* is the share of firms borrowing from universal banks in 2006, thus it describes the banking network of a firm prior to the crisis. Additionnal controls are firm's credit rating, borrowing from Business-to-Business and access to capital market. All controls are computed prior to the crisis in 2006. The variable *Rating AAA to A* is a dummy set to 1 if the firm had a rating A, AA or AAA in 2006. The note comes from Banque de France's credit rating. The variable *Share of B2B lending* measure the share of firm's borrowign from business-to-business over total asset of the firms. The variable *Bond Issuer* is a dummy set to 1 if the firm had outstanding bonds on its liability in 2006. In columns (2) and (3), I control for firm's credit demand by setting fixed effects on the business sector of the firm. In order to have enough variation across *Exposure to universal banks*, I restrict to business sectors having at least 10 firms. Results are robust to other thresholds at 20 or 50 firms. Standard errors, reported in parentheses. ***, **, * indicate significance levels at 1%, 5% and 10%.

Table 9: Computation of the drawdown on a credit line to get a long-term loan

Bank	Firm	Quarter	Credit line Expo.	Loan Expo	Short-Term Loan Expo.	Long-Term Loan Expo.	Drawdown of a credit line to get a long-term loan (*Drawdown*)
		Q-2	100	20	10	10	.
		Q-1	100	20	10	10	0
		Q	50	70	10	60	1
A	1	Q+1	50	90	30	60	0
		Q+2	50	80	20	60	0
		Q+3	0	130	70	60	0
		Q+4	0	130	70	60	.

The credit register does not report the drawdown on credit lines, but I can compute a proxy of the drawdown on credit lines. I define a variable capturing the drawdown of credit lines to get long term loans called *Drawdown*. I consider that a drawdown occured and the variable *Drawdown* is set to 1 in quarter Q when the credit line exposure of a *given* bank on a *given* firm is decreasing between quarters $Q-1$ and Q, while in the *same* time span an increase in long term loan exposures of the *same* bank on the *same* firm is detected between quarters $Q-1$ and Q. Otherwise, when a credit line exposure is positive and different from zero in $Q-1$, but the dynamic described here above does not occure, *Drawdown* is set to 0 for quarter Q.

Table 10: Quarterly drawdown of credit lines over 2006-2009

$$Drawdown_{q,q-1} = Crisis_{07q3-08q4} + UBank_b + UBank_b * Crisis_{07q3-08q4}$$
$$+LargeExposure_i + LargeExposure_i * Crisis_{07q3-08q4} + LargeExposure_i * UBank_b$$
$$+LargeExposure_i * Crisis_{07q3-08q4} * UBank_b + \epsilon_{q,i,b}$$

Dependent	Drawdown of a credit line at bank-firm level	
	1	2
$Crisis_{07q3-08q4}$	0.130***	0.132***
	(0.022)	(0.023)
U-bank		-0.033
		(0.517)
U-bank * Crisis		-0.051
		(0.051)
Large Expo		0.152
		(0.182)
Large Expo * $Crisis_{07q3-08q4}$		-0.090
		(0.124)
Large Expo * U-bank		0.097
		(0.540)
Large Expo * U-bank * $Crisis_{07q3-08q4}$		0.308**
		(0.136)
Constant	Yes	Yes
Observations	456,643	456,643
Prob >F	2.80e-09	1.60e-10
Pseudo R2	0.000673	0.000851

In this table the regressions analyses the drawdown of credit lines between 2006 and 2009. Columns (1) and (2) report results of logit regressions. The dependant variable *Drawdown* is the drawndown on credit lines as defined in Table 9. $Crisis_{07q3-08q4}$ is a dummy set to 1 during the subprime crisis, i.e. from 2007Q3 to 2008Q4, otherwise it is set to 0. $UBank_b$ is a dummy set to 1 for universal banks (see definition in section "Definition of banking models and descriptive statistics"), otherwise it is set to 0. $LargeExposure_i$ is a dummy set to 1 for credit lines above EUR 10M, 0 otherwise. Pseudo-R2 is very small because results are driven by the drawdown of large credit lines, which are a small amount of available credit lines but represent an important volume of credit what is not capture by the regression as the dependent is a 0/1 dummy and does not consider the volume of credit drawdown. Standard errors, reported in parentheses, are clustered at bank level. ***, **, * indicate significance levels at 1%, 5% and 10%.

Table 11: Placebo test: credit supply by banking models in period of boom

$$\Delta log(Credit)_{2004 \rightarrow 2006,b,f} = \beta.U\_Bank_b + \alpha_f + \epsilon_{b,f}$$

Dependent	Change in credit at bank-firm level through 2004-2005	
	1	2
Dummy U-bank(dummy)	-0.032	-0.030
	(0.022)	(0.018)
Constant	-0.036**	-0.036**
	(0.017)	(0.015)
Observations	25,340	25,340
R-squared	0,1%	42,0%
F test	2.184	2.696
Prob >F	0.143	0.104

In this table the regressions provide a comparison of banks' credit supply by banking models in period of high liquidity on financial markets. I run the same regressions than in Table 5 columns (2) and (3). The difference comes from the period covered here: 2004-2006.

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