

# Universal banks vs retail banks during the Great Recession :

## Do retail banks hedge firms against financial shocks ?

Job Market Paper

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14 septembre 2015

The opinions expressed in this paper do not necessarily reflect views of the Autorité de Contrôle Prudentiel et de Résolution.

### Abstract

The paper compares the credit supply of universal banks and retail banks through the Great Recession and the contribution of both banking models to firm's investment over that time. Universal banks are defined as banks having investment banking activities along with retail lending. Relying on a unique database of loan, firm and bank data over 2006-2009 on France, I show that (i) the larger the firm, the more she borrows from universal banks in the boom period; (ii) universal banks had a lower credit supply than retail banks in the crisis period, even controlling for credit demand. Those two points make large firms more exposed to bank funding constraints compared to small firms during that time. (iii) I find real effects on firm's investment : The more firms borrowed from universal banks prior to the crisis, the less they invested after the crisis. Thus, the paper shows that retail banks provided a "hedge" against financial shocks, making small firms little impacted by the 2007-2008 crisis (at least directly), contrary to large firms.

*JEL classification* : E22, G01, G21, G24.

*Keywords* : Bank, Crisis, Business Model, Universal Banking, Shock, Liquidity, Firm, SME, Credit, Investment.

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# 1 Introduction

Three decades after the financial liberalization of the 1970-80's<sup>1</sup>, three business models are now at play in the regulated banking sector : Retail banking, investment banking and universal banking. This last one gathers retail lending and investment banking activities. The model of universal banking raises questions in the aftermath of the Great Recession : Would a separation of banking activities mitigate the transmission of financial shocks to the real economy ? Post-crisis recommendations like Volcker rule in the USA, Vickers rule in UK and Liikannen report in Europe support the separation of banking activities. But those views lack empirical support. The paper contributes to fill this gap thanks to micro-evidence.

The intuition of the paper is the following. Universal banks provide numerous sophisticated financial services. They sell derivatives, they arrange and grant syndicated loans, they securitize assets etc. But those activities rely on a "high" market liquidity. As soon as it vanishes, several forces may impact universal banks but not retail banks : First keeping assets originally planned to be sold<sup>2</sup> consumes funding that became hard to raise in period of illiquid money markets. Second volatility on market-to-market securities raises market risk that consumes equity. Such forces may limit the credit supply of universal banks in period of financial crisis.

Contrary to universal banks, retail banks focus on retail lending. Roughly said they grant loans and collect deposit, so they are not strongly exposed to market risk. When a shock occurs on financial markets, retail banks keep on lending to the real economy. Figure 2 illustrates the credit supply of those two banking models, but before this I need to define retail banks and universal banks.

The French accounting (French GAAP) separate securities associated to market-making and proprietary trading from other securities. Those securities are called hereafter the "trading book" of the bank. Thanks to this I can properly measure the size of market activities of banks. Figure 1 shows the size of bank's trading book over total asset for bank that

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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 USA 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]).

2. like syndicated loans or securitized assets

are significant supplier of credit to non-financial firms in France in 2006 (cf. below for the definition of significant supplier of credit). I come back to that figure later in the paper, but first of all the figure points a clear cut. A few set of banks host market activities as captured by their trading book size, while other banks do not. I define banks with more than 5% of trading book over total asset as universal banks (also called U-banks hereafter), while the others are defined as retail banks (R-banks hereafter).

Figure 2 describes the supply of long-term loans and available credit lines by banks operating in France over 2006-2009. I focus on those types of credit because my final interest is on firm's investment and (i) long-term loans help firms to fund their long-term investment, particularly for firms that have not a top-ranked credit rating (Diamond 1991), and (ii) a share of available credit lines are used by firms to raise long-term loans.<sup>3</sup> So not considering available credit line would alter the level of bank's credit supply. Figure 2, before 2008Q3 both types of banks had a similar credit supply, but since the highest point of the crisis in 2008Q3 universal banks stopped lending to the real economy while retail banks kept on lending.

To investigate the stylized fact plotted in figure 2, I proceed in three steps. First, relying on banking data I define the business model of each bank in my sample. Two business models are retained. On the one hand banks carrying out investment banking (IB) along with retail lending; they are identified through the size of their trading book. They are called universal banks (or U-banks). On the other hand, banks without any market activities (without trading book) are called retail banks (or R-banks). In a second step, relying on loan data at bank-firm level I estimate the credit supply of each banking model over the Great Recession. Third, because firms may have substituted borrowings, I analyze frictions at firm level and their impact on the real economy through firm's investment.

To analyze bank's credit supply I need to control for firm's credit demand. I rely on [Khwaja & Mian AER 2008]'s methodology. That methodology relies on firms with several banking relations and assumes that a firm addresses the same credit demand to all banks of her banking network. So using loan data at bank-firm level, the methodology enables to

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3. In 2006, prior to the subprime crisis large firms (i.e. firms with more than 50 Million euros) used 10% of their available credit lines to raise long-term loans.

compare the credit supply of universal banks and retail banks to a given credit demand through the crisis.

France is a proper environment for the questions addressed here. First France hosts several international banking groups identified after the crisis as Global Systemically Important Banks by the Financial Stability Board<sup>4</sup>. Those banking groups are BNP Paribas, Groupe BPCE, Groupe Crédit Agricole, Dexia<sup>5</sup>, HSBC and Société Générale. Second, the 2007-2008's liquidity shock is exogenous to France : The 2007-08's liquidity shock came from the real estate bubble's burst in the U.S.A. That shock transmitted globally through the financial system and impacted the world economy. Meanwhile, there was no other shock like a real estate bubble burst in France contrary to Ireland, Spain, the U.S.A. and the U.K.. So France is a proper framework to analyze how the banking system transmits financial shocks to the real economy.

The main findings are the followings. (i) The larger the firm, the more she borrows from universal banks in the boom period. (ii) Universal banks had a lower credit supply than retail banks in the crisis period, even controlling for credit demand. Those two points make large firms more exposed to bank funding constraints in crisis time compared to small firms. (iii) I find real effects on firm's investment : The more firms borrowed from universal banks prior to the crisis, the less they invested after the crisis. Thus, the paper shows that retail banks provided a "hedge" against financial shocks, making small firms little impacted by the 2007-2008 crisis, contrary to large firms.

The main contribution of the paper is to show that retail banks provided a "hedge" against financial shocks during the subprime crisis. Robustness checks extend those results to the European debt crisis. Thus, from a corporate finance point of view, a firm manager that started a new bank-firm relation with a universal bank (because she provides sophisticated financial services that retail banks do not provide like currency swaps etc.), that manager should consider the service provided by retail banks in period of financial crisis : A funding continuation. To my knowledge, this is the first paper taking this bank-business-model approach.

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4. cf. [FSB 2014]

5. Dexia was removed from the list in November 2012 because of her resolution process.

That view is meaningful and provides new insights with regards to the literature analyzing the transmission of liquidity shock to the real economy ([Iyer et al. 2014], [Schnabl 2012], [Cornett et al. 2011]). Those papers take banks as "black boxes". They measure the share of short-term borrowings of a bank (or the share of stable funding like deposits) to explain her credit supply after the shock. But that measure is correlated with others characteristics of banks : Banks with a large trading book have a low share of deposits (cf. descriptive statistics in part 2), a large amount of funding commitments and a large share of commitment on derivatives as well as on interest-rate derivatives, as foreign exchange derivatives, and other derivatives (CDS...). Taking into account in the difference in terms of banking models highlights the exposure of the real economy to financial shocks.

The paper also provides a contribution to the literature analyzing the securities portfolio of banks ([Popov & Van Horen], [Abbassi, Iyer, Peydro, Tous, 2015] (AIPT hereafter)). That literature usually does not consider bank's retail lending except AIPT. AIPT shows spillover effect of securities trading of banks on their credit supply in crisis time. Their paper is complementary to my work. AIPT finds that during the 2008's crisis, banks with a higher level of capital (i) invested more in securities whose price had previously fallen and (ii) decreased their credit supply to the real economy. Thus in crisis time, higher profit opportunities in securities crowd out bank lending. I stand out from AIPT in two striking points. (i) Credit data in AIPT are restricted to exposures over 1.5 Million euros, whereas in my paper credit data start from 0.076 Million euros. This enables to properly take into account small and medium sized firms and show their funding constraints through the Great Recession. (ii) The conclusion of AIPT highlights the role of banks as risk absorbers during the crisis. My paper shows that behind that behavior, composition effects are at play. As in AIPT, banks that handles proprietary trading (here called universal banks) slowed down their credit supply to the real economy during the crisis, but retail banks kept on lending to the real economy.

The paper also contributes to the literature on universal banking. That literature<sup>6</sup> essentially tests if universal banking improves diversification and provides risk-reduction benefits compared to traditional banking and investment banking. That literature does not consider

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6. Through panel data analysis ([Geyfman, Yeager,2009]), simulation, or event studies.

impacts on the real economy.

The paper is also related to the literature on transaction and relationship banks (e.g.[Bolton, Freixas, Gambacorta, Mistrulli 2013]). That literature analyze how bank's build informative capital on firms and decide to grant them a loan. In my paper, I analyze how banks transmit financial shocks to the real economy.

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 2004-2011. Bank's balance sheet are quarterly collected, while financial statement are yearly collected.

The bank sample is restricted to banks having an exposure of at least 1 billion euros on long-term loans and available credit lines on non-financial firms before the crisis (in 2006)<sup>7</sup>.

#### **2.1.1 Definition of banking models**

The paper distinguishes banks according to their market activities. The French banking accounting enables to identify assets used for market-making and proprietary trading, called the "trading book" of the bank. This measure is plotted in figure 1 and shows a clear cut : A few set of banks have marked-to-market assets (over 5% of their total assets), while other banks have nearly zero percent of such assets. In the paper I define banks with more than 5% of marked-to-market assets as universal banks (called U-banks), while the others are defined as retail banks (R-banks).

#### **2.1.2 Descriptive statistics of banks by business model**

Tables 1 and 2 provide descriptive statistics of R- and U-banks measured in 2006Q4.

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7. Justification is mentioned in the introduction.

On average R-banks have a higher share of credit over total asset (65% vs 18%), a higher deposit over total asset (17% vs 6%) than U-banks. The same relations are true for median, first quartile and third quartile. Other statistics on banks revenues show that R-banks rely strongly on interest incomes from non-financial firms contrary to U-banks. On average, interest incomes to non-financial firms represent 44% of banking incomes for R-banks while only 4% for U-banks. On the contrary, off-balance-sheet incomes represent on average 6% of banking incomes of R-banks but 62% of U-banks. So R-banks are in line with a model of retail banks that collect deposits, grant loans to the real economy and are not engaged in market activities. While U-banks strongly rely on revenues from financial market activities.

## 2.2 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 the firm).

Very small firms like sole traders are not obliged to report their balance sheet and financial statements<sup>8</sup>. So the credit registry covers a larger set of firms compared to the database reporting financial information on firms. In 2006, the credit registry reports 902 087 firms borrowing from the bank sample of this study (cf. table 3). But among those, "only" 119 602 firms report balance sheet and financial statements (cf. table 3). Firms with no information are assumed very small firms.

## 2.3 Firms' banking network

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

As reported in table 3, the number of banking relations by firm is increasing with firm's size. Very small firms with sales under 1 Million euro have on average one banking relation (1.1 as reported in column 1), while firms with sales over 50 Millions euros have 3.3 banking relations on average.

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8. cf. <http://vosdroits.service-public.fr/professionnels-entreprises/F31214.xhtml> in French.

The composition of the banking network is also changing with firm's size. Small firms borrow more from R-banks than large firms do. 83% of firms with sales under 1 Millions euro have their unique banking relation with a R-bank (cf. column 1 of table 4). In contrary, larger firms have a more diversified banking network. They borrow 58% of their long-term loans and available credit line from retail banks, and 42% from universal banks. So the larger the firm, the more she build banking relations with U-banks.

Eventually, large firms rely more on available credit lines than small firms. 79% of large firms rely on such credit while only 37% of such firms rely on available credit line.

## **2.4 Loan data : The credit registry**

The credit registry 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. Data are updated quarterly. Before 2006Q1, credit exposures were reported as soon as they were greater than 76K euros. Since 2006Q1, the threshold has been reduced to 25K euros. As I run placebo tests before 2006, I decided to restrict data all along the period of my study to the former threshold at 76K euros.

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, trade debt, factoring and other short term loans. Loans with a maturity above 1 year are defined as medium and long-term loans. Off-balance-sheet lines of credit do not provide a distinction by maturity.

Banks and firms are identified at non-consolidated level in the credit registry.

### **2.4.1 Credit supply by banking models**

As reported in table 5 from data on each loan at bank-firm level, retail banks increased their credit by 14% on average over 2006-2009 while universal banks increased their credit only by 2% on average. This is in line with the stylized fact of figure 2 where both lines of the figure represents the median exposure at bank level for each banking models. In that figure, lines are adjusted at 1 on 2006Q4 and goes until 1.41 for retail banks and 1.25 for universal banks in 2009Q4. So the different credit supply reported in the aggregated information (16%



=1.41-1.25) represented by figure 2 at bank level is consistent with the one reported on the different average credit supply (14%) at bank-firm level from table 5.

## **2.5 Representativeness of the study**

The sample of long-term loans and available credit retained in the study covers 73% of long-term loans and available credit line reported in the French credit registry in 2006. The remaining 27% share split up into a large share granted by stated-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 1 billion euros of long term loans and available credit lines).

Those 73% share is split up almost-equally into retail banks 35% with 29% of long-term loans and 6% of available credit lines, and 38% from universal banks composed of 20% of long term loans and 18% of available credit lines.

## **3 Identification strategy**

The first step of the identification strategy is to show that universal banks and retail banks had a different credit supply over the subprime crisis. The following steps are then to show that firms could not substitute borrowing across banks over that time, which led to negative real effect on firms' investment.

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

### **3.1 Identification strategy of the main regression**

To show that universal and retail banks had a different credit supply over the subprime crisis, I need to control for firms' credit demand. Demand of firms borrowing from U-banks could be very different from demand of firms borrowing from R-banks. The former firms could have decreased their credit demand more than the latter.

To control for credit demand, I use [Kwhaja & Mian 2008]'s methodology. The methodology relies on firms with several banking relations 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 U-banks and R-banks to a given firm through the liquidity crisis.

So, in the main regression, I restrict the sample of firms to the ones borrowing from R-banks and U-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, I average for simplicity 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 critics 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.

The main equation is :

$$\Delta Loans_{b,f} = \alpha_f + \beta \cdot UniversalBank_b + \epsilon_{b,f} \quad (1)$$

Where :  $\Delta Loans_{b,f}$  is the change in long-term loans and available credit lines of 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.  $\alpha_f$  is a dummy to set fixed effects at firm level. It captures observable and unobservable characteristics of firms.  $UniversalBank_b$  is a dummy set to 1 for U-banks, otherwise it is set to 0. Coefficients  $\beta$  compares the credit supply of U-banks and R-banks. 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 retail banks over 2006-2009

Table 6 presents the main results. The dependent variable is the change in long-term loans and available credit lines supplied by a bank to a firm over 2006-2009. The change in credit is computed as the difference in the natural logarithm between credit exposure of 2006 and 2009. I focus on those types of credit because they are highly relevant to explain firm's investment (more on this in part 4.3). As reported in column (1) universal banks had a lower credit supply (-11.9%) compared to retail 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<sup>9</sup>.

In columns (2) to (5) I restrict estimations to firms borrowing from at least one retail bank AND one universal bank as well in 2006 as in 2009. As reported in column (2), the main result is unchanged and suggests that the selection on firms with multiple banking relations do not change the credit channel analysis.

The dummy variable identifying universal bank relies on the ratio of assets from the trading book over total assets of the bank. In column (3) I replace the dummy variable by the continuous variable used to identify universal banks. The ratio trading book over total assets is also significant at 1%. The higher the size of bank's trading book, the more she decrease her credit supply over the 2006-2009.

In columns (4) and (5) I include firm fixed effects to control for firm's credit demand. So now I compare the credit supply of a universal bank and a retail bank to a given firm (so to a given credit demand) and control for the heterogeneity across observable and unobservable characteristics of firms. The main result remains significant as well for the dummy variable identifying universal banks as the share of trading book over total assets. This is in line with the intuition given by figure 2. Based on data aggregated at bank level, figure 2 reports a 16% higher credit supply of retail banks compared to universal banks (cf. section 2.4.1) which is consistent with the results reported in table 6. As reported in column (4), once

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9. cf. [Kwhaja & Mian, 2008]

controlled for credit demand at firm level, I find that on average retail banks had a 17.8% higher credit supply than universal banks.

This result shows that taking into account banking models within the banking sector highlight an heterogeneity of credit supply over the crisis.

## 4.2 Substitution across banks ?

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

I show here that frictions were at play 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 :

$$\Delta Loans_f = \alpha.Exposure\_To\_UBank\_In\_2006_f + \beta.Firm\_Sector_f + \epsilon_f \quad (2)$$

The dependent variable  $\Delta Loans_f$  is the change in all long-term loans and available credit lines borrowed by a firm between 2006 and 2009. The dependent variable is computed as the difference of the natural logarithm of exposures between both time period. The dependent variable is winsorized at 1% to ensure that results are not driven by outliers.  $Exposure\_To\_TBank\_In\_2006_f$  is the exposure of a firm to universal banks prior to the crisis in 2006. That exposure is computed as the ratio of (long-term loans + available credit line) borrowed by the firm from universal banks in 2006 over all (long-term loans + available credit line) borrowed by the firm in 2006. If firms can perfectly substitute borrowings from retail banks for borrowings from universal banks then  $\alpha$  should not be significantly different from 0.  $Firm\_Sector_f$  is a control to capture firm's credit demand through her business sector. This variable covers 79 business sectors.

Table 7 reports results of this analysis. Column 1 shows that a 10% increase in firm's exposure to universal banks prior to the crisis leads to a decrease of 1.39% of firms' borrowings

after the crisis.

In column 2, I set fixed effects at firm's business sector level to control for credit demand. The result remains significant.

In columns 3 and 4, I distinguish firms by size through a threshold at 50 millions euros sales. Column 3 reports results for small and medium firms (with sales under 50 millions euros). Column 4 reports results for large firms. In both cases, the coefficients of firm's exposure to U-banks are significant. According to column 4, a 10% increase of large firm's exposure to U-banks prior to the crisis leads to a decrease of 0.9% of firms' borrowings after the crisis.

### 4.3 Real effects on firm's investment

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

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

$$\Delta Investment_f = \alpha.Exposure\_To\_UBank\_In\_2006_f + \beta.Controls_f + \epsilon_f \quad (3)$$

Table 8 reports the results on the analyze of determinants of firms' investment over 2006-2009. The dependent variable is the difference in (the natural logarithm of) gross investment at firm level between 2006 and 2009. Gross investment is computed as the difference of firm's immobilization between two consecutive years. The regression is restricted to firms that had a positive gross investment in 2006, because it makes little sense to compute a gross rate when the initial level is zero or negative. The change in gross investment is regressed on firm's exposure to U-banks measured prior to the crisis in 2006, just like in the former section, and dummies on firm's business sector are added to control for investment demand.

As reported in table 8, the more a firm borrowed from universal banks prior to the crisis, the more she decreased her investment after the crisis. As shown in column 1, a 10% increase

in exposure to U-banks leads to a 0.74% decrease in firms' gross investment after the crisis.

In columns (2) and (3), I add controls to take into account the access of the firm to capital markets. The variable "Bond issuer in 2006" is a dummy set to 1 if the firm had issued bonds in 2006 as reported by her liability structure. If a firm had access to bond issuance in 2006, she could substitute bond issuance for the lower credit supply from universal banks. Thus a positive coefficient should be associated with the dummy "Bond issuer in 2006". I also control firm investment with her share of sales from export activities. Because, within a business sector, firms could have different level of international activities leading to different demand for investment.

Again, results reported in columns (2) and (3) show that the more a firm borrowed from universal banks prior to the crisis, the less she invested over 2006-2009.

In columns (4) and (5), I then disentangle the firm sample by firm size with a threshold at 50 M euros. As reported in columns (4), the results remains significant for firms with sales under 50 Millions euros. Columns (5) reports a stronger coefficient for the main variable of interest for firms with sales over 50 Millions euros of sales.

That stronger coefficient may come from the particularity of the largest firms. Relying on a database of syndicated loans over 1992-2003, [Sufi, 2007] highlights that the smallest firms<sup>10</sup> borrowing from syndicated loan market had 48 Millions dollars sales. My study cover banks operating in France, but not abroad. Largest firms may strongly rely on the syndicated loans market as an intermediary step between the usual banking loans and the issuance of bonds on capital market. Because the syndicated loan market is driven by large universal banks and international investment banks, the 2007-2008's crisis could have impacted large firms even at a stronger level, through the syndicated loan market. This is also what reports [BIS, 2013] in a descriptive analysis of the syndicated loan market. They show that the signed syndicated credits decreased by a third starting from the beginning of the subprime crisis. So in addition to funding constraint coming from universal banks operating in France, largest firms may have encounter additional constraints from international investment banks operating abroad.

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10. The decile of the distribution of firms.

## 4.4 Additionnal results and robustness checks

### 4.4.1 Extensive margin : End of banking relations over 2006-2009

I show in a former section that at the intensive margin level, i.e. in bank-firm relation that existed in 2006 and still existed in 2009, universal banks provided a lower credit supply than retail banks, but what about the extensive margin? Did universal banks stop more frequently bank-firm relations over that period?

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

$$Exit_{b,f} = \beta.U\_Bank_b + \alpha.Over\_50MeSales_f + \gamma.U\_Bank_b*Over\_50MeSales_f + \epsilon_{b,f} \quad (4)$$

For each bank-firm relation that existed in 2006, I build a variable  $EXIT_{b,f}$  which is set to 1 if the relation stopped in 2009 and 0 otherwise.  $U\_Bank_b$  is a dummy set to 1 for universal banks, otherwise it is set to 0. Coefficients  $\beta$  compares the end of a bank-firm relations with a universal bank compared to a retail bank.  $Over\_50MeSales_f$  compares the rate of relation ending between small & medium firms compared to large firms. The dummy is set to 1 if firm's sales is larger than 50 Million euros in 2006, otherwise 0. And  $U\_Bank_b*Over\_50MeSales_f$  analyses if universal banks stopped more frequently banking relation with large firms.

Table 9 reports the results. In both columns, the sample is restricted to firms having at least one banking relation with a universal and one with a retail banks in 2006.

The main variable of interest is the interaction between banking models and the size of firms. The coefficient associated to the interaction variable is positive and significant. It means that universal banks stopped more frequently banking relation with large firms.

Results reported in column (2) are restricted to large firms. The only explanatory variables are the dummy defining universal banks and firm fixed effects. Again, it confirms the results of column 1, universal banks stopped more frequently banking relations with large firms, than retail banks did.

## 4.5 Transmission channels of financial shocks to the real economy

This last section analysis the transmission of financial shocks to the real economy through both banking models. I will show that transmission channels do not apply on the same way between universal banks and retail banks. And more precisely that retail banks were little impacted by financial shocks over 2006-2009.

To do this I enrich the equation (1) to highlight how financial shocks impacted both type of banking models over the subprime crisis. Equation (5) describes the identification strategy of this section :

$$\Delta Loans_{b,f} = \alpha_f + \beta.UniversalBank_b + \gamma.Channel_b + \eta.UniversalBank_b * Channel_b + Control_b + \epsilon_{b,f} \quad (5)$$

Just like in equation (1), here the dependent variable  $\Delta Loans_{b,f}$  is the change in long term loans and available credit lines at bank-firm level between 2006 and 2009. Compared to equation (1), three variables are added :  $Channel_b$  is a characteristics of bank that may explain the transmission of financial shocks of 2007-2008 to the real economy.  $UniversalBank_b * Channel_b$  is an interaction variable to highlight how those shocks impacted universal banks. And  $Control_b$  are variables added at bank level to control for other bank characteristics. Standard errors are clustered at bank level.

Table 10 sums up results. As columns (1)-(2) and columns (3)-(4) provide qualitatively similar results, I only comment results of columns (3)-(4). The only difference between the two set of columns are firms' fixed effects added at firm level in columns (3)-(4).

Column (3) shows how the liquidity constraint on the liability side of banks explains their credit supply through the crisis. The main variables of interest are "Deposit from clients/Total Assets" and the interaction of that variable with the dummy "U-bank". "Deposit from clients/Total Assets" is not statistically significant, which means that retail banks did not suffer from a lack of stable funding like deposit. In contrary to this, the interaction between "U-bank" and "Deposit from clients/Total Assets" is positive and significant at 1%. It means that, among universal banks, the ones with the lower share of deposits over total assets provided the lower credit supply.



Column (4) shows how the market risk taken by banks prior to the crisis explains their credit supply through the crisis. The main variables of interest are "Market risk/Capital" and the interaction of that variable with the dummy "U-bank". "Market risk/Capital" is not statistically significant, which means that retail banks did not suffer from engagement in market activities over the subprime crisis. In contrary to this, the interaction between "U-bank" and "Market risk/Capital" is negative and significant at 1%. It suggests that, among universal banks, the ones with a higher engagement in market activities for a universal bank lead her to provide a lower credit supply to the real economy.

## **4.6 Robustness checks**

I run several robustness checks. First, the main results presented in table 6 are robust to other definitions of the pre- and post-crisis period like a pre-crisis period starting from the beginning of 2007. Second I also run placebo test of that same regression prior to the crisis, for example over 2004-2005. The variable of interest become not significant in that case, which shows that universal banks and retail banks had a similar credit supply prior to the crisis.

## 5 Conclusion

The present paper takes into account the heterogeneity of the banking sector as captured by the size of bank's trading book : Banks having a trading book along with retail lending activities are called universal bank, while banks without trading book are called retail banks. The paper shows the non-linear behavior of universal banks in crisis time, as compared to retail banks.

The paper shows that prior to the crisis retail and universal banks had a similar credit supply to the real economy, but during the subprime crisis universal banks (almost-)stopped lending to the real economy.

As firms could not substitute bank borrowings, those frictions led to negative real effects as shows by firm's investment.

One originality of the paper is to show how firms banking network impact their access to banking credit in crisis time. Because small firms rely essentially on retail banks, they were little impacted by financial shocks of 2007-2008. In contrary, as larger firms strongly rely on universal banks, they were particularly impacted by the subprime crisis, either through a lower credit supply from universal banks or through the end of her bank-firm relation with universal banks.

While banking literature highlighted the role of multibank relations to counteract the hold-up problem and limit the rent extraction on bank side, the present paper highlights the need on firm side to diversify their bank-firm relations by banking models. Indeed universal banks provide sophisticated financial services, but those services are procyclical with market liquidity. On the contrary, retail banks provide more "basic" intermediation services, but above all, they provide a funding continuation in period of liquidity crisis on financial markets.

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FIGURE 1 – Proxy of bank's trading book

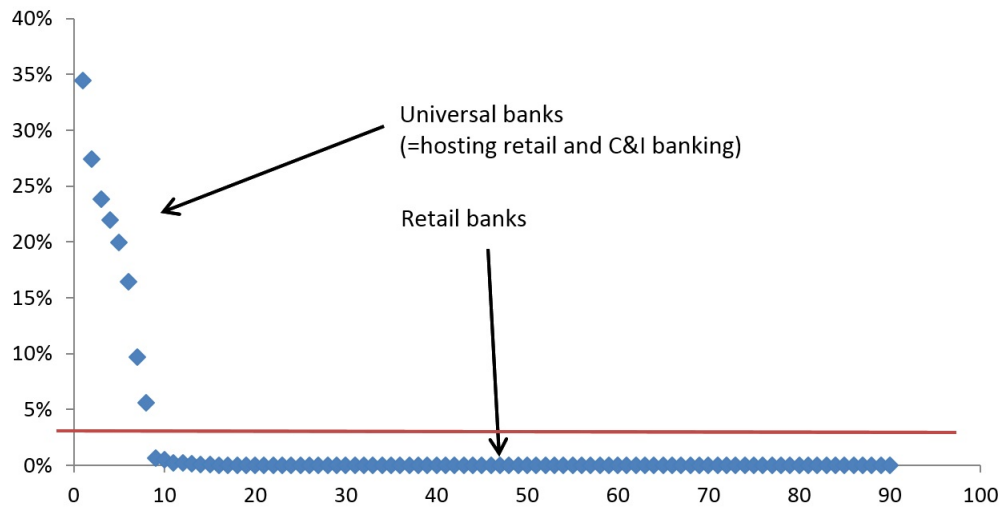


FIGURE 2 – Banks' credit supply by business model

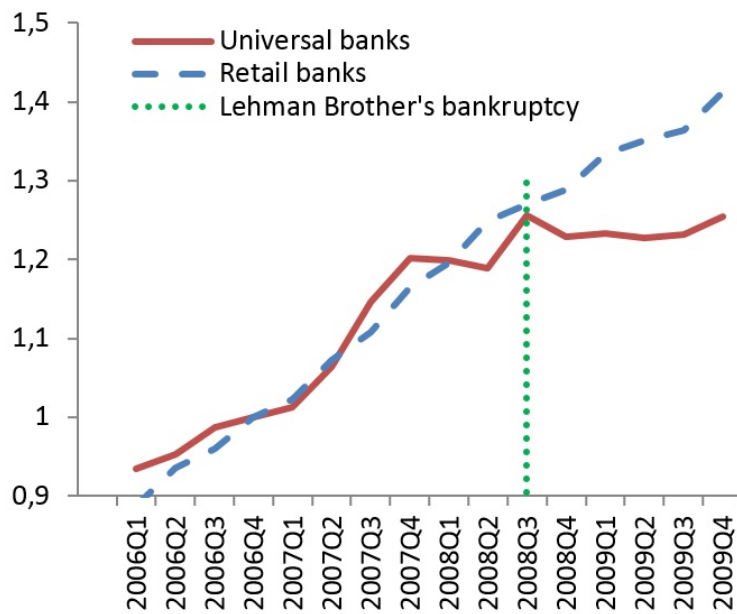


TABLE 1 – Descriptive statistics of retail banks

		Min	Q1	Mean	p50	Q3	Max	St. Dev.	N
Asset	Credit to non-financial inst./ Total Asset (TA)	22%	47%	65%	73%	77%	84%	17%	87
	Financial securities / TA	2%	6%	10%	8%	11%	55%	7%	87
	Proxy of Trading book / TA	0%	0%	0%	0%	0%	1%	0%	87
	Total Asset (Millions euro)	3 025	6 581	13 630	9 026	12 885	111 965	16 841	87
Liability	Deposit / TA	0%	10%	17%	19%	23%	31%	7%	87
	Repo<6 months	0%	0%	0%	0%	0%	6%	1%	87
	Repo<1 year	0%	0%	0%	0%	0%	6%	1%	87
	Debt securities with a maturity <6 months	0%	0%	4%	2%	6%	35%	6%	87
	Debt securities with a maturity <1 year	0%	0%	5%	2%	7%	37%	6%	87
	Capital / TA	0%	7%	10%	11%	12%	17%	3%	87
	Provision/TA	0%	1%	1%	1%	2%	4%	1%	87
	Market Risk / Capital	0%	0%	1%	0%	0%	12%	2%	87
Off-balance sheet	Funding commitment/ TA	3%	7%	11%	10%	12%	70%	7%	87
	Notional commitment on IR derivatives / TA	1%	10%	25%	15%	27%	287%	39%	87
	Notional commitment on FX derivatives / TA	0%	0%	0%	0%	0%	5%	1%	87
	Notional commitment on other derivatives / TA	0%	0%	1%	0%	2%	10%	2%	87
Banking incomes	IR incomes to non-financial inst. / all banking incomes	17%	37%	44%	46%	52%	67%	10%	87
	Off-balance-sheet incomes / all banking incomes	0%	3%	6%	5%	8%	33%	6%	87
	Leasing incomes / all banking incomes	0%	0%	2%	0%	0%	30%	6%	87
Other	Nb. of bank-firm relations	2 019	12 740	23 550	19 449	27 168	166 711	21 343	87

TABLE 2 – Descriptive statistics of universal banks

		Min	Q1	Mean	p50	Q3	Max	St. Dev.	N
Asset	Credit to non-financial inst./ Total Asset (TA))	13%	15%	18%	16%	21%	25%	4%	8
	Financial securities / TA	36%	52%	58%	58%	67%	76%	13%	8
	Proxy of Trading book / TA	6%	13%	20%	21%	26%	34%	9%	8
	Total Asset (Millions euro)	28 055	132 738	371 143	150 950	682 386	1 008 945	379 000	8
Liability	Deposit / TA	0%	3%	6%	5%	6%	19%	6%	8
	Repo<6 months	7%	10%	17%	19%	24%	26%	8%	8
	Repo<1 year	7%	12%	19%	21%	25%	31%	8%	8
	Debt securities with a maturity <6 months	6%	7%	11%	11%	14%	18%	4%	8
	Debt securities with a maturity <1 year	8%	8%	14%	13%	17%	23%	6%	8
	Capital / TA	3%	4%	6%	5%	7%	16%	4%	8
	Provision/TA	0%	0%	0%	0%	0%	1%	0%	8
	Market Risk / Capital	2%	2%	4%	3%	5%	6%	2%	8
Off-balance sheet	Funding commitment/ TA	7%	10%	14%	13%	17%	21%	5%	8
	Notional commitment on IR derivatives / TA	266%	493%	1181%	871%	2028%	2403%	847%	8
	Notional commitment on FX derivatives / TA	0%	1%	43%	19%	74%	156%	57%	8
	Notional commitment on other derivatives / TA	2%	5%	133%	33%	300%	384%	170%	8
Banking incomes	IR incomes to non-financial inst. / all banking incomes	1%	1%	4%	2%	4%	13%	4%	8
	Off-balance-sheet incomes / all banking incomes	20%	45%	62%	62%	88%	91%	26%	8
	Leasing incomes / all banking incomes	0%	0%	0%	0%	0%	0%	0%	8
Other	Nb. of bank-firm relations	8 613	9 107	65 404	29 102	111 978	214 248	78 863	8

TABLE 3 – Firm’s banking network prior to the crisis (2006)

Firm’s size	Average number of banking relations	Only one banking relation	At least one universal bank in firm’s network	Number of firms
sales $\leq$ 1 Million euros or no information	1,1	92%	19%	902 087
1 M euros < sales $\leq$ 10 M euros	1,4	73%	30%	75 859
10 M euros < sales $\leq$ 50 M euros	2,1	43%	52%	13 670
sales < 50 M euros	3,3	35%	69%	2 923

Data are computed from the average exposure of a bank to a firm over the 4 quarters of 2006.

TABLE 4 – Share of long-term loans and available credit line by bank’s business model (2006)

Firm’s size	From retail banks	From universal banks	Firms with available credit line	Number of firms
sales $\leq$ 1 Million euros or no information	83%	17%	37%	902 087
1 M euros < sales $\leq$ 10 M euros	76%	24%	51%	75 859
10 M euros < sales $\leq$ 50 M euros	69%	31%	64%	13 670
sales < 50 M euros	58%	42%	79%	2 923

Data are computed from the average exposure of a bank to a firm over the 4 quarters of 2006.

TABLE 5 – Change in long-term loans and available credit lines between 2006 and 2009 at bank-firm level

	q1	mean	p50	q3	Std. Dev.	Number of observations
Retail banks	-28%	14%	-13%	16%	97%	639 224
Universal banks	-35%	2%	-18%	0%	95%	134 740

TABLE 6 – Transmission of liquidity shock by banking models

Dependent	Change in LT loans and available credit line through 2006-09				
	1	2	3	4	5
U-bank	-0.119*** (0.017)	-0.182*** (0.022)		-0.178*** (0.040)	
Share of Trading Book			-0.674*** (0.109)		-0.609*** (0.164)
Constant	-0.064*** (0.011)	-0.001 (0.014)	-0.022 (0.018)	-0.002 (0.014)	-0.027* (0.016)
Observations	773,964	88,899	88,899	88,899	88,899
R-squared	1%	1%	1%	53%	53%
Adj. r-squared	1%	1%	1%	16%	15%
F test	52.36	65.57	37.92	20.11	13.81
Prob >F	9.21e-11	0	1.51e-08	1.93e-05	0.000333
Firm's with U- and R-banking relation	No	Yes	Yes	Yes	Yes
Firm's fixed effects	No	No	No	Yes	Yes
Nb of firms	682,579	39,261	39,261	39,261	39,261

In this table the regressions provide a comparison of the transmission of a liquidity shock to the real economy by bank business model. The dependent variable is the change in long-term loans and available credit line at bank-firm level between 2006 and 2009. The exposure of a bank to firm in 2006 (respectively 2009) is the average exposure over the 4 quarters of 2006 (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. *Dummy U-bank* is a dummy set to 1 for U-banks, otherwise it is set to 0. The coefficient of *Dummy U-bank* compares the credit supply of U-banks relative to R-banks. Columns (2) to (5) are restricted to firms with several banking relations including at least a U-bank and a R-bank. Columns (4) and (5) include controls for firms fixed effects. 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

Dependent	Change in Total LT Loans and Available Credit Line at firm level between 2006 and 2009			
	1	2	3	4
Exposure to U-banks in 2006	-0.139*** (0.009)	-0.133*** (0.009)	-0.136*** (0.009)	-0.090* (0.049)
Constant	0.072*** (0.004)	0.070*** (0.004)	0.069*** (0.004)	0.104*** (0.025)
Observations	33,628	33,628	32,276	1,352
R-squared	1%	3%	3%	7%
F test	263.3	238.2	239.8	3.411
Prob >F	0	0	0	0.0650
Control at firm's sector	No	Yes	Yes	Yes
Firm's type	All	All	Sales < 50 M euros	50 M euros < Sales

TABLE 8 – Firm’s exposure on universal banks and their gross investment

Dependent	Change in firm’s gross investment between 2006 and 2009				
	1	2	3	4	5
Exposure to U-banks in 2006	-0.074*** (0.027)	-0.075*** (0.027)	-0.076*** (0.027)	-0.068** (0.027)	-0.359*** (0.128)
Bond issuer in 2006		0.151 (0.108)	0.149 (0.108)	0.159 (0.122)	0.037 (0.227)
Share of sales export in 2006			0.053 (0.086)	0.002 (0.090)	0.926*** (0.310)
Constant	-0.107*** (0.011)	-0.108*** (0.011)	-0.111*** (0.012)	-0.112*** (0.012)	-0.050 (0.072)
Observations	33,628	33,628	33,628	32,276	1,352
R-squared	1%	1%	1%	1%	8%
Adj. r-squared	0%	0%	0%	0%	3%
F test	7.605	4.771	3.306	2.578	5.149
Prob >F	0.00583	0.00848	0.0193	0.0519	0.00153
Control at firm’s sector	Yes	Yes	Yes	Yes	Yes
Firm’s type	All	All	All	Sales < 50 M. euros	50 M. euros < Sales

TABLE 9 – End of bank-firm relations over 2006-2009

Dependent	End of bank-firm relation ?	
	1	2
Dummy U-bank	0.181*** (0.032)	0.687*** (0.105)
Firm with sales over 50 M euros	0.495*** (0.070)	
Dummy U-bank * Firm with sales over 50 M euros	0.509*** (0.095)	
Constant	Yes	No
Observations	118,583	1,912
Pseudo R-squared	1%	3%
Firm fixed effects	No	Yes
Firm size	All	50 M euros < sales

TABLE 10 – Transmission channels of liquidity shock by banking models

Dependent	Change in LT loans and available credit line through 2006-09			
	1	2	3	4
U-bank	-0.273*** (0.045)	-0.044 (0.074)	-0.275*** (0.055)	0.148* (0.086)
Deposit from clients/Total Asset	-0.216 (0.140)		0.234 (0.203)	
U-bank*(Deposit from clients/Total Asset)	1.594*** (0.356)		2.497*** (0.598)	
Market Risk /Capital		0.215 (0.721)		0.368 (0.634)
U-bank*(Market Risk /Capital)		-4.443** (1.923)		-9.621*** (2.719)
ln(Total Assets)	-0.005 (0.011)	-0.006 (0.011)	0.002 (0.012)	-0.016 (0.012)
Constant	0.137 (0.185)	0.117 (0.180)	-0.065 (0.202)	0.269 (0.192)
Observations	67,163	67,163	67,163	67,163
R-squared	1%	1%	44%	44%
F test	35.78	23.64	29.42	24.75
Prob >F	0	0	0	0
Firm's with U- and R-banking relation	Yes	Yes	Yes	Yes
Firm's fixed effects	No	No	Yes	Yes

TABLE 11 – Correlation Matrix

	Credit /Total Asset (TA)	Financial securities / TA	Proxy of Trading book / TA	Deposit / TA	Capital / TA	Total Asset	Funding engagement given to banks / TA	Funding engagement given to non-banks / TA	Notional engagement on IR derivatives / TA	Notional engagement on FX derivatives / TA	Notional engagement on other derivatives / TA	Change in LT loans and available credit line through 2006-09	IR incomes to non-bank / all banking incomes	Derivative incomes / all banking incomes	Factoring incomes /all banking incomes	Securities custody incomes / all banking incomes	Leasing incomes / all banking incomes
Credit / Total Asset (TA)	1	-0.77145	-0.61296	0.66112	0.62558	-0.52121	-0.63622	0.50514	-0.57568	-0.45061	-0.45294	0.04335	0.87299	-0.56438	-0.22928	0.56299	0.09704
Financial securities / TA	-0.77145	1	0.85305	-0.5075	-0.48831	0.66382	0.60913	-0.26205	0.80452	0.56636	0.64672	-0.12092	-0.83233	0.80433	0.25073	-0.71101	-0.11418
Proxy of Trading book / TA	-0.61296	0.85305	1	-0.32478	-0.30506	0.67363	0.49086	-0.1236	0.72546	0.47354	0.68928	-0.1016	-0.70547	0.81542	0.24861	-0.57947	-0.07987
Deposit / TA	0.66112	-0.5075	-0.32478	1	0.65283	-0.352	-0.46284	0.28021	-0.38003	-0.29537	-0.2879	-0.03414	0.54528	-0.36873	-0.13971	0.59134	0.23205
Capital / TA	0.62558	-0.48831	-0.30506	0.65283	1	-0.34361	-0.38099	0.34455	-0.388	-0.29241	-0.2774	0.14632	0.46687	-0.34083	-0.14384	0.35862	0.00979
Total Asset	-0.52121	0.66382	0.67363	-0.352	-0.34361	1	0.54543	-0.11562	0.82166	0.78351	0.84456	-0.19428	-0.61196	0.81822	0.67451	-0.5471	-0.0739
Funding engagement given to banks / TA	-0.63622	0.60913	0.49086	-0.46284	-0.38099	0.54543	1	-0.06521	0.6855	0.38157	0.59857	-0.2515	-0.59155	0.52233	0.27275	-0.54592	-0.12323
Funding engagement given to non-banks / TA	0.50514	-0.26205	-0.1236	0.28021	0.34455	-0.11562	-0.06521	1	-0.10489	-0.08955	-0.03952	-0.14214	0.47348	-0.06434	-0.09962	0.08181	-0.0934
Notional engagement on IR derivatives / TA	-0.57568	0.80452	0.72546	-0.38003	-0.388	0.82166	0.6855	-0.10489	1	0.67939	0.77559	-0.13329	-0.668	0.8251	0.53416	-0.59301	-0.06906
Notional engagement on FX derivatives / TA	-0.45061	0.56636	0.47354	-0.29537	-0.29241	0.78351	0.38157	-0.08955	0.67939	1	0.5611	-0.23562	-0.51174	0.75088	0.50414	-0.46261	-0.0598
Notional engagement on other derivatives / TA	-0.45294	0.64672	0.68928	-0.2879	-0.2774	0.84456	0.59857	-0.03952	0.77559	0.5611	1	-0.17801	-0.52319	0.66573	0.30305	-0.46722	-0.05998
Change in LT loans and available credit line through 2006-09	0.04335	-0.12092	-0.1016	-0.03414	0.14632	-0.19428	-0.2515	-0.14214	-0.13329	-0.23562	-0.17801	1	0.06242	-0.20529	-0.1023	0.02924	0.04069
IR incomes to non-bank / all banking incomes	0.87299	-0.83233	-0.70547	0.54528	0.46687	-0.61196	-0.59155	0.47348	-0.668	-0.51174	-0.52319	0.06242	1	-0.73825	-0.26974	0.62995	-0.07502
Derivative incomes / all banking incomes	-0.56438	0.80433	0.81542	-0.36873	-0.34083	0.81822	0.52233	-0.06434	0.8251	0.75088	0.66573	0.5589	-0.20529	1	0.43029	-0.69163	-0.09932
Factoring incomes /all banking incomes	-0.22928	0.25073	0.24861	-0.13971	-0.14384	0.67451	0.27275	-0.09962	0.53416	0.50414	0.30305	-0.1023	-0.26974	0.43029	1	-0.23979	-0.02938
Securities custody incomes / over all banking incomes	0.56299	-0.71101	-0.57947	0.59134	0.35862	-0.5471	-0.54592	0.08181	-0.59301	-0.46261	-0.46722	0.02924	0.62995	-0.69163	-0.23979	1	0.03912
Leasing incomes / all banking incomes	0.09704	-0.11418	-0.07987	0.23205	0.00979	-0.0739	-0.12323	-0.0934	-0.06906	-0.0598	-0.05998	0.04069	-0.07502	-0.09932	-0.02938	0.03912	1
	0.3629	0.2839	0.4543	0.0278	0.927	0.4888	0.2472	0.3813	0.5178	0.5755	0.5744	0.7033	0.4822	0.3517	0.7834	0.7143	