



European Bank
for Reconstruction and Development

The crisis as a wake-up call: do banks tighten screening and monitoring during a financial crisis?

Ralph de Haas and Neeltje van Horen

Abstract

To what extent was the credit contraction during the global financial crisis due to more intense screening and monitoring by banks? We address this question by analysing changes in the structure of a large number of syndicated loans to private, non-financial corporations. We find an increase in retention rates among syndicate arrangers during the crisis that we cannot explain by borrower risk or interbank liquidity alone. This increased “skin in the game” is especially pronounced when information asymmetries between the borrower and the lending syndicate – or within the syndicate – are high. This indicates that the reduction in bank lending during the crisis was at least partly caused by stricter bank screening and monitoring: a wake-up call.

Keywords: bank lending, financial crisis, loan retention, screening and monitoring, syndication

JEL Classification: D82, G15, G21

Contact details: Ralph de Haas, One Exchange Square, London EC2A 2JN, UK.

Phone: +44 20 7338 7213; Fax: +44 20 7338 6110; email: dehaasr@ebrd.com.

Ralph de Haas is a Senior Economist at the EBRD and Neeltje van Horen is a Senior Economist at the Dutch Central Bank.

The authors thank Stephan Knobloch and Deimante Morkunaite for excellent research assistance and Tanya Abbott, Natalie Jung and Mattia Landoni for helpful assistance with data downloading and programming. Francesco Carobbi and Peter Hanrott of Bank of Tokyo-Mitsubishi and Lorenz Jorgensen of the EBRD provided useful insights into the syndications market. Erik Berglöf, Jaap Bikker, Stijn Claessens, Elena Cubillas Martín, Giovanni Dell'Ariccia, Diemo Dietrich, Stefano Gatti, Stefan Gerlach, Refet Gurkaynak, Dwight Jaffee, Graciela Kaminsky, Evan Kraft, José-Luis Peydró-Alcalde, Peter Sanfey, Sergio Schmukler, Andrei Shleifer, Sweder van Wijnbergen, Jeromin Zettelmeyer and participants at the 15th Dubrovnik Economic Conference, the 24th Congress of the European Economic Association, the 28th SUERF Colloquium, the 8th INFINITI Conference on International Finance, and seminars at the Dutch Central Bank, the EBRD, London Metropolitan Business School, London School of Economics, Bank of Finland, European Central Bank, University of Mainz, Banco de España, Bank of England and the IMF provided helpful comments.

The working paper series has been produced to stimulate debate on the economic transformation of central and eastern Europe and the CIS. Views presented are those of the authors and not necessarily of the EBRD or the Dutch Central Bank.

1. Introduction

Between 2001 and the first half of 2007 large parts of the world experienced a prolonged period of high economic growth. Risk perceptions declined and the global financial system was characterised by abundant liquidity. This changed with the onset of the financial crisis in August 2007 which affected banks through increased uncertainty over borrower quality and a drop in funding. In many countries banks sharply curtailed new credit (Aisen and Franken, 2010) and global syndicated lending fell by 41 per cent in 2008 alone (Dealogic Loan Analytics). This forced credit-constrained firms to reduce investments (Duchin, Ozbas and Sensoy, 2010) and ultimately propagated the crisis from the financial to the real side of the global economy.

We assess to what extent stricter screening and monitoring by banks may have contributed to the reduction in corporate bank lending during the crisis. The screening and monitoring of borrowers on behalf of depositors and other financiers – delegated monitoring – is a key function of banks (Diamond, 1984; 1991; 1996). The intensity with which banks perform this task depends on the level of asymmetric information in relation to the specific borrower and may therefore vary across customer types (Sufi, 2007) and over time (Holmström and Tirole, 1997). In this paper we test whether banks' screening and monitoring intensified at the onset of the financial crisis in mid-2007 and, if so, which borrower types were most affected by this.

The 2007/2009 global financial crisis originated in the US sub-prime mortgage market. Various empirical studies have uncovered evidence that before the crisis banks had gradually relaxed their screening and monitoring standards in this market (Dell'Ariccia, Igan and Laeven, 2008). Keys, Mukherjee, Seru and Vig (2010) and Mian and Sufi (2009) show that securitisation in particular reduced the incentives of US mortgage lenders to properly screen borrowers. We hypothesise that the large-scale losses that materialised in the US sub-prime market in the autumn of 2007 led banks to reassess their screening and monitoring standards more broadly. Analogous to the literature on the transmission of financial crises, we call this sudden and broad increase in risk awareness a “wake-up call”: a tightening of screening and monitoring above and beyond what would be warranted on the basis of increased borrower risk alone.^{1,2}

There are a number of reasons why the crisis may have induced banks to intensify their screening and monitoring efforts for the same level of borrower risk. The collapse of the secondary market for (syndicated) loans likely played a role. Before the crisis loans could easily be sold on the secondary market, but when the problems in the US sub-prime market surfaced lenders could no longer offload their loans to (institutional) investors and had to keep them on their own books. This increased incentives to adequately screen and monitor borrowers.³ Furthermore, many CLO/CDO (collateralised loan/debt obligation) managers exited the (syndicated) loan market. To the extent that these lenders followed less stringent screening standards, the remaining lenders in the market put more emphasis on screening and

¹ Goldstein (1998) coined the term “wake-up call” to describe how international investors reassessed their lending to *all* Asian borrowers when they were confronted with instability in the specific case of Thailand. See also Van Rijckeghem and Weder (2003) and Kaminsky, Reinhart and Végh (2003).

² Ruckes (2004) shows that when the default probability of borrowers increases, lenders start to screen more thoroughly. Rajan (1994), Berger and Udell (2004), and Steffen and Wahrenburg (2008) also find that lending standards are relaxed during business cycle upswings and tightened during negative economic shocks.

³ Berndt and Gupta (2009) find evidence that the possibility of securitisation in the pre-crisis period led to a relaxation of lending standards. Borrowers whose syndicated loans were sold in the secondary loan market under-perform their peers, suggesting that the originate-to-distribute model stimulated adverse selection and/or moral hazard among banks.

monitoring. More generally, it can be argued that the abundant short-term wholesale funding that was available to banks before the crisis was one of the main reasons why banks had gradually reduced their screening and monitoring intensity in the first place (Perotti and Suarez, 2009). Providers of (very) short-term funding to banks were less concerned with imposing discipline because they could exit banks at short notice anyway. The drying up of short-term funding may thus have contributed to the restoration of screening and monitoring discipline in banks.

Empirical evidence on the link between banks' screening and monitoring standards and the credit decline during the crisis is still lacking (Ivashina and Scharfstein, 2010a). An important reason is that banks' screening and monitoring efforts are largely unobservable. Empirical researchers therefore proxy it through using observable variables such as denial rates and loan-to-income ratios (Dell'Ariccia, Igan and Laeven, 2008), asking bank managers about their lending standards through surveys (Maddaloni, Peydró and Scopel, 2009), or making inferences about the strictness of screening and monitoring by examining *ex post* loan quality (Berndt and Gupta, 2009 and Keys, Mukherjee, Seru, and Vig, 2010). In contrast, we study the syndicated loan market and exploit variation in the loan share that arrangers of syndicated loans need to keep on their own balance sheet, the retention rate. The syndicated loan market is particularly well-suited to assess changes in screening and monitoring by banks. First, the crisis exposed some deeper flaws in the originate-to-distribute banking model and the syndicated loan market shares some important characteristics of this model. So, if the crisis induced banks to step up their screening and monitoring efforts this should definitely have occurred in this market. Second, the structure of lending syndicates directly reflects the importance that banks attach to the screening and monitoring of borrowers (Dennis and Mullineaux, 2000; Jones, Lang and Nigro, 2005; Sufi, 2007).⁴ A short primer on loan syndication will make this clear.

Syndicated loans are provided by a group of financial institutions – the syndicate – to a single borrower.⁵ They have become a major source of external finance for a variety of firms in the developed world and emerging markets (DTCC, 2008). A typical syndicate consists of two tiers: arrangers and participants. The arrangers comprise the senior tier and negotiate the lending terms with the borrower, who gives the arrangers a mandate to structure and market the loan. Arrangers usually allocate a substantial part of a loan to a junior tier of syndicate members, the participants. Participants have a more passive role: they buy a portion of the loan but are neither involved in its organisation nor in the screening and monitoring of the borrower. For their internal credit approval processes participants rely on the borrower information that is provided by the arranger(s) in the form of an information memorandum (Fight, 2004). Participants usually do not perform additional borrower due diligence. For monitoring the participants rely on the arrangers as well, who provide them with periodical audited and unaudited accounts and information on the observance of loan covenants.

We hypothesise that at an early stage of the crisis banks tightened their screening and monitoring standards, causing a sharp increase in retention rates. The main reason why

⁴ Arguably banks' screening can best be measured by analysing loan denial rates. However, information on loan applications is difficult to obtain and usually only available for a particular country (for instance, Jiménez, Ongena, Peydró, and Saurina (2010) use data from the Spanish credit registry) or a particular type of bank (Puri, Rocholl, and Steffen (2009) examine loan applications at German Landesbanks). Furthermore, loan denial rates do not provide information about banks' monitoring efforts. By contrast, the retention rate is available on a much broader scale and captures both screening and monitoring efforts (Sufi, 2007).

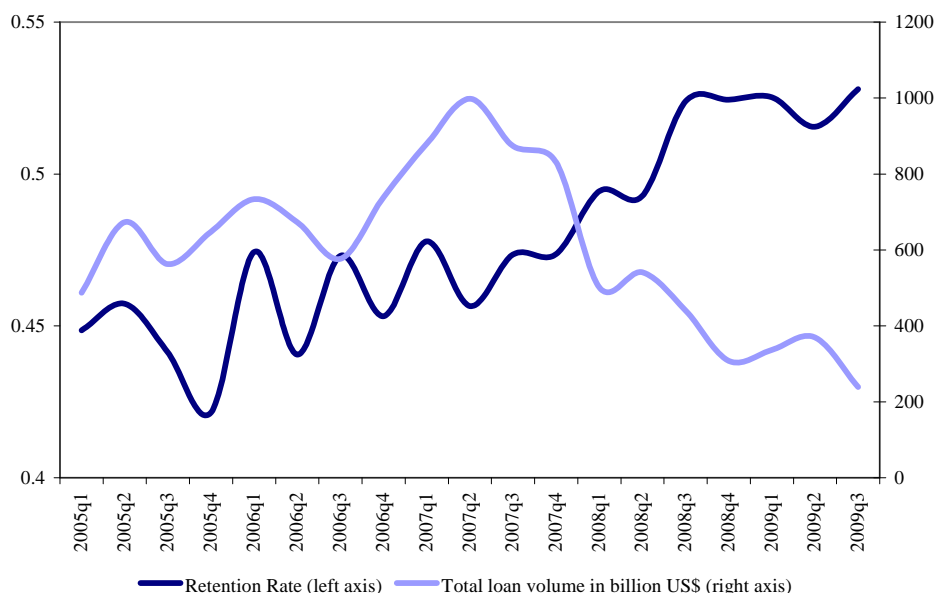
⁵ Through syndication loans are spread across several institutions, allowing each bank to diversify its loan portfolio (Simons, 1993). Dennis and Mullineaux (2000) and Fight (2004) provide extensive descriptions of the syndicated loan market.

increased screening and monitoring translates into higher retention rates is that participants use arrangers as delegated monitors (Diamond, 1984). This entails a functional division between the arranger – responsible for screening and monitoring the borrower – and the institution that provides the funding and ultimately bears the risk. Compared with bilateral lending, where a bank bears all credit risk, arranging banks have a reduced incentive to screen and monitor. To resolve this agency problem arrangers can retain a large enough loan portion on their own balance sheet. Such “skin in the game” is an efficient incentive-compatible mechanism to ensure that arrangers sufficiently screen and monitor (Pennacchi, 1988; Gorton and Pennacchi, 1995; Holmström and Tirole, 1997).⁶ Syndicate participants that want borrowers to be screened and monitored more intensely therefore force arrangers to retain higher loan portions (Sufi, 2007).⁷ We consequently expect that if participant banks became more concerned about screening and monitoring at the start of the crisis – a wake-up call – this led to a significant increase in retention rates.

By syndicating part of the loans they structure, arrangers free up space on their balance sheet. This allows them to originate additional loans and earn fee income. When arrangers only need to retain a small portion of each loan, they can originate a large number of syndicated loans and the supply of lending is high. Conversely, when capital-constrained arrangers are required to retain a large loan portion, they can syndicate fewer loans and the supply of syndicated credit is lower.

Chart 1
Retention rate and syndicated lending volume

The figure shows the evolution of the average retention rate and the volume of syndicated lending over the period January 2005 - October 2009. Loans to (quasi-) government entities, loans where an international financial institution is a syndicate member, project finance loans and club loans are excluded. Retention rate measures the share of the loan jointly held by all arrangers. Total loan volume includes both loans with and without information on the loan shares held by individual lenders.



⁶ A related literature analyses similar issues in the context of underwriters’ retention rates during an IPO (Chen, Jhou and Yeh, 2007, and Corwin and Schultz, 2005).

⁷ Increases in retention rates are unlikely to be voluntary but instead reflect pressures from participants. Ivashina (2009) finds that arrangers that need to retain a larger loan portion, charge a higher spread to the borrower in order to compensate for the reduced ability to optimally diversify their loan portfolio.

Fluctuations in retention rates may thus be inversely related to the supply of syndicated lending. Indeed, Chart 1 shows that after the beginning of the crisis in mid-2007 a sharp increase in retention rates was accompanied by a steep decline in syndicated lending volumes.⁸

If increased screening and monitoring caused the sharp increase in retention rates during the crisis, loan retention should have risen in particular when information asymmetries between lenders and the borrower were large (Sufi, 2007). Participants likely became most concerned about adequate screening and borrowing in the case of opaque loans. Arrangers consequently experienced a relatively sharp drop in interest for such loans, prompting them to retain more in order to placate potential participants. Similarly, we expect that when information asymmetries were particularly large within a syndicate – that is, between participants and arrangers – retention rates increased more as well. The sharp reduction in interbank lending that characterised the crisis reflected a decreased trust among banks, at least in terms of being each other’s lending counterparties. This eroded trust may also have increased the costs of delegation (Diamond, 1984; 1991) and as such have negatively affected banks’ ability to cooperate within syndicates.

To analyse both layers of agency problems – between lenders and borrowers and among lenders – we exploit the detailed information on market, borrower and lender heterogeneity in our dataset. Specifically, we test whether the increase in retention rates during the crisis was positively related to various proxies for information asymmetries. Such cross-sectional linkages between the severity of information asymmetries and the increase in retention rates would provide critical evidence that the overall increase in retention rates, and the associated decline in syndicated lending, was caused by stricter screening and monitoring.

Our main findings are as follows. First, we show that – even when controlling for changes in interbank liquidity and borrower risk – the crisis led to a significant and robust increase in arrangers’ retention rates. This increase materialised during the early phase of the crisis, before the collapse of Lehman Brothers and the ensuing sharp output decline. Second, retention rates increased considerably more when information asymmetries were high, such as in the case of loans to first-time borrowers or borrowers in opaque industries. For example, while the retention rate for loans to first-time borrowers increased by almost 11 per cent, arrangers of syndicated loans to borrowers with average borrowing experience (two and a half loans) only needed to increase their retention rate by 7.6 per cent during the crisis. Moreover, we find that experienced arrangers needed to increase their retention rates less than less reputable arrangers. Retention rates also increased less when either the participant or the arranger had prior lending experience with the borrower, its industry or its country. These findings point to a sudden increase in banks’ screening and monitoring at the start of the crisis: a wake-up call.

Our paper is related and contributes to three main strands of the literature. First, it sheds light on the root causes of the transformation of the 2007 financial crisis into the 2008-09 economic crisis. Empirical evidence on the reduction of the supply of bank credit during the crisis is emerging slowly. Ivashina and Scharfstein (2010b) show that US banks sharply reduced their supply of new corporate lending and Cetorelli and Goldberg (2009) document how US banks also reduced their credit to emerging markets during the crisis. For Germany, Puri, Rocholl and Steffen (2009) provide evidence of a crisis-related reduction in lending to retail customers. These studies explore the impact of the crisis on the quantity of bank lending, while we analyse in more detail *why* banks reduced lending.

⁸ Due to reporting lags we may somewhat underestimate the loan volume in the third quarter of 2009 as our final data download was conducted at the beginning of October 2009 (cf. Ivashina and Scharfstein, 2010b).

Second, our paper is related to recent developments in the literature on monetary transmission mechanisms. Borio and Zhu (2008) argue that bank lending standards fluctuate in line with the monetary policy stance and that this relationship is stronger than warranted by the impact of monetary policy on borrower net worth. That is: lending standards fluctuate more than can be explained by the balance sheet channel (Bernanke and Gertler, 1989). Jiménez, Ongena, Peydró and Saurina (2008) and Maddaloni, Peydró and Scopel (2009) find evidence for this channel by showing that low short-term interest rates made banks lend to more risky borrowers. Analogous to this credit-risk taking channel, we analyse whether the crisis acted as a wake-up call during which banks fundamentally reassessed screening and monitoring standards.⁹

Third, we contribute to the burgeoning literature on syndicated lending. Earlier papers have studied the structure of lending syndicates to analyse how banks deal with asymmetric information (Dennis and Mullineaux, 2000; Lee and Mullineaux, 2004; Sufi, 2007), weak creditor rights (Esty and Megginson, 2003), the risk of strategic defaults (Preece and Mullineaux, 1996) and intra-syndicate cultural differences (Giannetti and Yafeh, 2008). We contribute by analysing how the financial crisis and the associated increase in credit and liquidity risk influenced the structure of lending syndicates. As such our results also contribute to the debate about the costs and benefits of securitisation and the role of loan retention (see for instance Shleifer and Vishny, 2010). Although the legal structures surrounding loan syndication and loan securitisation are different¹⁰, the potential agency problems – adverse selection and moral hazard – are the same. Our study adds to this literature by providing insights into how retention rates adjust to market pressure during a crisis.

The remainder of this paper is structured as follows. Section 2 describes our empirical methodology and data. Section 3 explains our empirical results, following which section 4 presents a set of robustness tests. Section 5 presents our conclusions.

⁹ The balance sheet and bank lending channel (Bernanke, 1983) also have a shock equivalent in the seminal Holmström and Tirole (1997) model, where they are called “collateral squeeze” and “credit crunch”, respectively.

¹⁰ A loan sale or securitisation does not change the contract between the borrower and the original lender. Instead a new contract is created by the lender and a third party to sell the cash flow from the underlying loan. In a syndicated loan, all lenders are and remain part of one loan contract with the borrower.

2. Methodology and data

2.1. Empirical methodology

Our aim is to test whether the increase in retention rates during the crisis can be attributed to an increased focus on screening and monitoring. In order to provide compelling evidence it is crucial to distinguish the impact of screening and monitoring from other possible explanations for increased retention rates during the crisis. To do this we employ the following identification strategy.

Our main variable to capture the importance of screening and monitoring is a crisis dummy (*Crisis*) that indicates the structural break or wake-up call effect at the beginning of the crisis. *Crisis* equals zero for syndicated loans signed between January 2005 and September 2007 and one for loans signed during the crisis period, which we define as October 2007-October 2009 (October 2009 is the cut-off date of our dataset). We let the crisis start in October rather than August 2007 because of the time lag between starting loan negotiations and signing a deal.¹¹ The negotiation and arrangement process takes on average eight weeks (Godlewski, 2008). Almost 30 per cent of observations concern loans signed during the crisis; the remainder was signed pre-crisis. If screening and monitoring increased during the crisis this should be reflected in a positive and significant crisis dummy.

Since we are interested to find out whether the outbreak of the crisis led to a broad reassessment of banks' screening and monitoring standards, we also include a *Post Lehman* dummy variable that is one for loans signed after the collapse of Lehman Brothers. This allows us to test whether an increase in retention rates happened before or only after the Lehman bankruptcy and the resulting sharp decline in global economic growth. A "late" increase in retention rates would reflect that banks adjusted their standards mainly in reaction to sharply reduced growth prospects and an overall increase in credit risk. In contrast, an "early" increase in retention rates would show that even before the massive shock of the Lehman collapse banks had already learned a lesson from the sub-prime debacle and had started to increase their screening and monitoring efforts across the board.

A positive and early crisis impact on retention rates is necessary but not sufficient proof for the existence of a wake-up call effect. A first alternative explanation for increased retention rates during the crisis is reduced market liquidity. A reduction in interbank liquidity can drive up retention rates if arrangers decide to retain larger loan portions when financially constrained participants become less eager to participate. Arrangers may retain more of a loan if this is necessary to let a syndication go ahead. The alternative – failure to raise enough money to fulfill the borrower's mandate – may damage the arranger's reputation, its relationship with key borrowers, and future business. The arranger would also forego the fees she earns for structuring syndicated loans (an important source of non-interest income). However, the relationship between retention rates and interbank liquidity is not completely straightforward. It is possible that arrangers and participants are hit equally hard by a liquidity shock so that the distribution of a syndicated loan over both types of lenders remains the same, leaving retention rates largely unaffected.

Since the precise impact of liquidity on retention rates is ultimately an empirical matter, we control for changes in interbank liquidity by including the TED spread (*TED*): the difference

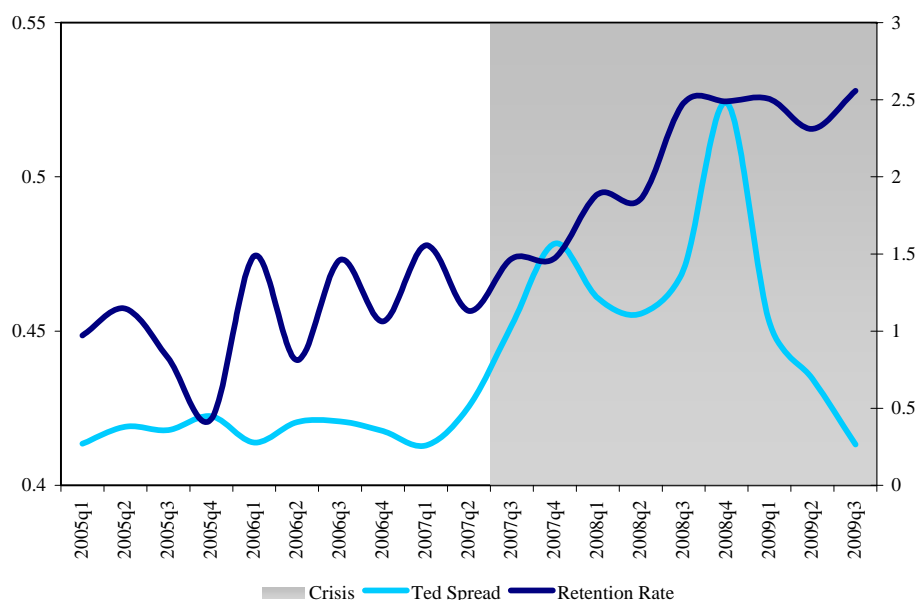
¹¹ On Thursday 9 August 2007, the European Central Bank and the US Federal Reserve injected substantial amounts of liquidity into their banking systems. Other central banks soon followed suit. That week also saw the TED spread – the difference between three-month LIBOR and the three-month T-bill rate – spike above 100 basis points for the first time.

between the three-month interest rate on interbank loans (LIBOR) and US government T-bills. It is a measure of banks' (un)willingness to lend to each other and as such a "useful basis for gauging the severity of the current liquidity crisis" (Brunnermeier, 2009, p. 85). If illiquidity was an important cause of the retention rate increase, we expect a positive relationship between illiquidity – as measured by the TED spread – and the retention rates in loan syndicates.

Chart 2 shows that during the crisis the TED spread increased rapidly and almost in sync with the fast increase in retention rates. However, it also shows that during the crisis – indicated by the grey area – retention rates not only increased but stayed high even when liquidity returned at end-2008 in response to the expansion of the Federal Reserve's programme of foreign exchange swaps with other central banks. This suggests that besides liquidity other factors have been (more) important drivers of the persistent increase in retention rates.

Chart 2
Retention rate and interbank liquidity before and during the crisis

The figure shows the evolution of the average retention rate and the TED spread over the period January 2005 - October 2009. Loans to (quasi-) government entities, loans where an international financial institution is a syndicate member, project finance loans and club loans are excluded. Retention rate measures the share of the loan jointly held by all arrangers. The crisis period starts in October 2007.



A second possible explanation for increased retention rates during the crisis is an increase in borrower risk. Fortunately our dataset contains a variety of loan and borrower characteristics that allow us to control to a large extent for borrower and loan risk. In all regressions we include a matrix X_i of loan and borrower-specific variables that capture different risk elements to isolate the crisis impact on retention rates above and beyond the effect on borrower quality.¹² However, since it is impossible to fully control for all dimensions of borrower risk, a positive and significant crisis dummy may still (partly) reflect changes in unobserved borrower risk rather than increased screening and monitoring. We therefore need an additional identification strategy to isolate the screening and monitoring effect from the

¹² Loan-specific variables such as maturity, amount and collateral are specified before the syndication process (during the negotiations between the arrangers and the borrower) and are exogenous to the syndicate structure.

possible impact of unobserved borrower risk. For this we exploit the heterogeneous character of our dataset with respect to the level of information asymmetry.

If screening and monitoring became more important during the crisis this should especially be the case for loans where participants are particularly worried about adequate borrower screening and monitoring. Such concerns may be caused by borrower opaqueness (information asymmetry between the borrower and the syndicate; cf. Simons, 1993 and Sufi, 2007) or by a lack of trust in the arrangers' ability and willingness to screen and monitor (information asymmetry within the syndicate; cf. Dennis and Mullineaux, 2000). We therefore expect a stronger crisis-induced increase in retention rates for loans characterised by large information asymmetries.

Such a differentiated increase is not only in line with our wake-up call hypothesis but also indicates that we adequately control for increased borrower risk during the crisis. A differentiated increase in retention rates could only reflect unobserved borrower risk (rather than intensified screening and monitoring) if unobserved borrower risk would be high for loans characterised by high information asymmetry and low for loans characterised by low information asymmetry. Although this may be the case for certain measures of information asymmetry, such as whether the borrower is rated or not, it is highly unlikely for other measures we use, such as the number of previous interactions between the arrangers and participants. So, finally we interact *Crisis* with a matrix I_i of information asymmetry variables to test whether the crisis impact was particularly strong for loans with high levels of information asymmetries. Our specification looks as follows:

$$(1) \quad RR_i = \alpha + \beta_1 \cdot Crisis + \beta_2 \cdot TED + \gamma' \cdot X_i + \lambda' \cdot I_i + \varphi' \cdot (Crisis \cdot I_i) + \varepsilon_i$$

where subscript i indicates individual loans and γ , λ and φ are coefficient vectors. The dependent variable is one of the following retention rate measures (RR_i): the share of the loan jointly held by all arrangers, the average share of the loan held by each arranger, or the share of the loan jointly held by the two main arrangers. Although our dependent variables are censored between 0 and 1, truncation is not a problem in practice as values are neither clustered around the upper nor the lower bound, and we therefore use OLS. Robustness tests in Section 4 show that our results are consistent when using a Tobit model. We experiment with sector dummies but these are mostly statistically insignificant and we thus exclude them. Including sector dummies does not change any of our results. Standard errors are heteroskedasticity robust and clustered at the borrower level.

2.2. Data and summary statistics

Our main data source is Dealogic Loan Analytics which provides comprehensive data on virtually all global syndicated loans. Lenders have a strong incentive to report to Dealogic as the financial press uses this database to generate league tables of successful arrangers. Our download contains information on syndicated loans to private borrowers across 62 countries. These include the United States, western Europe, various other high-income countries, as well as a number of emerging markets.¹³ All loans were signed between January 2005 and

¹³ We exclude countries without significant syndicated borrowing (less than 25 loans over the sample period). We also exclude the Japanese syndications market as it is heavily dominated by just four Japanese institutions (Bank of Tokyo-Mitsubishi, Mizuho Bank, Sumitomo Mitsui Banking Corp. and UFJ Bank) that focus almost

October 2009. Just over 60 per cent of the loans in our sample consist of multiple tranches. In those cases we compute weighted averages for our variables at the loan level, weighing each tranche by its amount. Tranches are negotiated at the same point in time, are part of one contract and cannot be treated econometrically as individual observations (Sufi, 2007). Using the loan as the unit of observation also prevents oversampling.

In the case of interbank lending the issues of funding illiquidity and screening and monitoring intensity are closely intertwined as increased screening and a reduced willingness to lend by one bank implies a reduction in funding for another. Worries in the interbank market about sub-prime mortgage exposures meant that credit risk and liquidity risk became interdependent during the crisis in particular. We therefore confine ourselves to bank lending to non-financial corporates in order to make a clear distinction between banks' funding problems and their credit concerns.

Our dataset contains information about the borrower (country of incorporation, industry and credit rating), loan terms (maturity, volume, currency, spread, fee structure and loan purpose), and syndicate structure (number and identity of arrangers and participants). We categorise all syndicate members as either arrangers or participant banks. Arrangers are financial institutions with the title of mandated lead arranger or book runner.¹⁴ We classify all other syndicate members as participants.¹⁵ For each loan we check the availability of information on the identity of the syndicate members. We only keep loans with complete and consistent information and exclude loans to government entities, loans with an international financial institution as a syndicate member, and project finance loans (see Section 4). Only about 25 per cent of the loan entries in Loan Analytics contain information on the share of the loan held by each lender (information we need to calculate our dependent variables). As a result, our full-information dataset contains 4,435 loans (see Appendix Table 1 for a geographical breakdown). Overall, this subsample is quite similar to the full data download. However, the loans in our subsample are on average somewhat smaller due to the over-representation of loans to Asian borrowers and the under-representation of loans to US borrowers.

Table 1 provides summary statistics for the variables that we use in our empirical analysis. Over the 2005-09 period arrangers kept on average about half of each loan on their balance sheet. A substantial portion (39 per cent of the loan) is concentrated in the hands of the two largest arrangers (on average a loan is arranged by 2.9 arrangers). The average loan size is US\$ 369 million and the average maturity 4.7 years (both variables are included in logs in the regressions).

The detailed information on borrower and loan characteristics in our dataset allows us to control for various deal characteristics. We create three dummy variables to single out loans that are explicitly designated to refinance an existing loan (*Refin*, 30 per cent of the sample), to acquire a company (*Acq*, 10 per cent) or to be used for general corporate purposes such as working capital (*Corp*, 42 per cent). We also include two risk mitigant dummies that indicate whether repayment is guaranteed by a third-party (*Guarantee*) and whether the loan is secured through collateral (*Secure*). About 12 per cent of the loans is guaranteed while 26 per cent is collateralised. Whereas guarantees and collateral may contain loss-given default, their presence also indicates high *ex ante* risks. Collateralised loans in particular tend to be granted

exclusively on funding Japanese clients at home or overseas (Rhodes, 2004). Contrary to all other countries in our sample no foreign lenders are active in the Japanese syndications market.

¹⁴ Book runners sell the loan to participants but are not involved in negotiations with the borrower.

¹⁵ We believe this is the best way to distinguish between banks that are actively involved in the loan structuring and marketing and those that only provide funds. However, occasionally banks are given the title of mandated arranger or book runner due to the amount they provide, even though they do not do any arranging work.

to borrowers that need more intense monitoring (Berger and Udell, 1990).¹⁶ We therefore expect higher retention rates in the case of collateralised loans.

Table 1: Summary statistics for syndicated loan deals

The table shows summary statistics for the variables that we use in our model. Our sample includes 4,435 syndicated loans signed between January 2005 and October 2009.

	Obs	Mean	Median	St Dev	Min	Max
<i>Retention rate measures</i>						
Total share held by arrangers	4,435	0.52	0.50	0.24	0	1
Average share held by arrangers	4,435	0.28	0.22	0.19	0	1
Share of two largest arrangers	4,435	0.39	0.35	0.20	0	1
<i>Borrower and loan characteristics</i>						
Volume (US\$ million)	4,435	369	146	795	1	22,500
Maturity (years)	4,326	4.71	5.00	2.76	0.50	26.40
Loan is guaranteed	4,435	0.12	0	0.32	0	1
Loan is secured	4,435	0.26	0	0.44	0	1
Loan for refinancing purposes	4,435	0.30	0	0.46	0	1
Loan for acquisition purposes	4,435	0.10	0	0.29	0	1
Loan for general corporate purposes	4,435	0.42	0	0.49	0	1
Institutional investor loan	4,435	0.09	0	0.29	0	1
Number of arrangers in loan	4,435	2.86	2	2.65	1	35
<i>Information asymmetry measures</i>						
Borrower reputation	4,432	2.45	2	2.17	1	18
Rated	4,435	0.17	0	0.38	0	1
Split rating industry	4,363	0.67	0.67	0.04	0.60	0.76
Share arrangers in prior loan to borrower	4,423	0.42	0	0.47	0	1
Number of times arrangers active in same sector (x 1,000)	4,423	1.27	0.58	1.77	0	13.46
Number of times arrangers active in same country (x 1,000)	4,423	4.21	0.57	7.96	0	44.97
Share participants in prior loan to borrower	4,421	0.29	0	0.40	0	1
Number of times participants active in same sector (x 1,000)	4,424	1.38	0.59	2.02	0	16.05
Number of times participants active in same country (x 1,000)	4,424	3.91	0.52	8.01	0	54.37
Arranger reputation	4,435	2.05	0.57	2.99	0	20.07
Number of times arrangers had previous dealing with participants (x 1,000)	4,421	6.28	0.97	13.33	0	101.19

We also create a dummy – *InstInv* – that indicates whether at least one of the participants is an institutional investor (insurance company, pension fund, private equity fund or CDO/CFO manager). This is the case in about 10 per cent of the deals. To the extent that such investors were particularly eager to participate in syndicates (Ivashina and Sun, 2010) they may have focused less on screening and monitoring and thus put less pressure on arrangers to retain larger loan portions during the crisis.

A crucial part of our analysis is to test whether loans characterised by high information asymmetry saw a stronger increase in retention rates during the crisis than loans with low information asymmetry. Such a differentiated impact would point to an increase in banks' focus on screening and monitoring (wake-up call). We therefore construct three sets of variables that proxy for the information asymmetry between the syndicate and the borrower:

- proxies for the information asymmetry between the borrower and the syndication market as a whole
- proxies for the information asymmetry between the borrower and the particular syndicate that is providing the current loan

¹⁶ Indeed, Barbosa and Ribeiro (2007) find that the presence of collateral increases interest rate spreads on syndicated loans while Dennis and Mullineaux (2000) show that the retention rate of collateralised loans is higher so that incentives to monitor are less diluted.

- proxies for the information asymmetry within the syndicate itself.

In the first category we use *RepBor*, a variable that measures the number of times the borrower has raised a syndicated loan since 2000 (including the current loan). On average borrowers raised 1.5 prior loans although borrower history varies between 0 and 17 previous loans. A large number of successful prior loans and the associated reputation can attenuate information asymmetries between borrower and lenders (Diamond, 1991 and Gorton and Pennachi, 1995) and we expect retention rates to be lower for repeat than for first-time borrowers.

We also construct *Rated*, a dummy variable that indicates whether the borrower has been rated by Standard & Poor's (S&P) and/or Moody's. This is the case for 17 per cent of the loans. Rated borrowers are not necessarily less risky but they are less opaque (Lee and Mullineaux, 2004 and Sufi, 2007) as the output of the rating agencies' due diligence – a rating and a rating report – is available to all lenders. We therefore expect a negative impact of the presence of a rating on the retention rate and its increase during the crisis.¹⁷ A related variable is *Split*, which measures the share of firms in the borrower's industry that are rated differently by S&P and Moody's. We calculate this variable on the basis of a subsample of borrowers that are rated by both agencies. A high level of split ratings indicates that rating agencies often disagree on firms' creditworthiness. We expect higher retention rates in such opaque industries. The average borrower in our dataset is based in an industry where 67 per cent of all companies have a split rating. This is somewhat higher than the mean value of 56 per cent reported by Bonaccorsi di Patti and Dell'Ariccia (2004) for a sample of US bond issues (our dataset includes loans to a broader set of countries).

The second set of information variables measures the information asymmetry between the borrower and the specific lending syndicate. *BorArr* measures the share of the arrangers that were at least once part of a syndicate to the same borrower (42 per cent on average) while *ArrSec* and *ArrCountry* measure the sum of the number of times that the arrangers in the syndicate were part of a loan to the same sector or country in the past five years, respectively. The average values are 1,270 and 4,210, respectively: arrangers tend to have more previous country than sector experience.¹⁸ Because previous experience with a borrower, its sector, or its country reduces opaqueness we expect a negative impact on the required retention rates during the crisis (a milder wake-up call).

We construct similar variables from the participant perspective. *BorPart* measures the share of the participants that at least once participated in a previous loan to the same borrower (on average almost a third), while *PartSec* and *PartCountry* measure the number of times that one or more of the participants participated in a loan to the same sector or country as the current borrower. The average values for these last two variables are 1,380 and 3,910. Like arrangers, participants tend to have more prior exposure to particular countries than sectors.

The third type of information variable relates to information asymmetries *within* the lending syndicate. We construct an arranger reputation variable – *ArrRep* – that captures the experience of the arrangers of a loan (Sufi, 2007; Goplan, Nanda and Yerramilli, 2007). According to market practitioners: “If the arranger is one of the market leaders, it is

¹⁷ Arguably also information about publicly listed firms is more readily available and it would be interesting to test whether retention rates increased less for publicly listed firms. Unfortunately, Dealogic does not provide information on whether a borrower is publicly listed or not.

¹⁸ For example, if there are three arrangers in the syndicate and the first one has been active in 50 loans to the same country in the past 5 years, the second one 150 times and the third one 5 times, *ArrCountry* will have a value of 205. The values of *ArrSec* and *ArrCountry* can be especially large if one or several very active arrangers are part of the syndicate.

reasonable for a participant to assume that the transaction will have passed the internal quality checks of that institution and that adequate resources have been applied to the due diligence process. If the arranger has little or no experience handling syndicated transactions, more care may be necessary.” (Rhodes, 2004, p.14). Indeed, Dennis and Mullineaux (2000) and Lee and Mullineaux (2004) find that arrangers with a long history of repeat transactions are able to sell off larger parts of a loan. Champagne and Kryzanowski (2007) find that the probability of a participant joining a syndicate is higher in the case of more reputable arrangers. In line with these results, we expect lower retention rates when arrangers are more experienced.

To calculate *ArrRep* we first determine for each year the market share of the top 200 arrangers in the global syndication market. For a loan in year t , we then take the sum of the market shares in year $t-1$ of all arrangers of that loan. For each loan we thus approximate the joint market share of the arrangers in the previous year. In case an arranger is not in the previous year’s top 200, its market share is set to zero. The market share of arrangers is a good proxy for their reputation since the financial press regularly publishes league tables in which the top arrangers – worldwide and for individual geographical regions – are ranked according to the loan volume they arranged in the previous year. Higher rankings in league tables thus imply increased exposure and a better reputation in the financial community. On average the joint market share of the arrangers is about 2 per cent.

Lastly, we create a variable – *PartArr* – that captures how well the participants know the arrangers in the syndicate. We measure the number of times each participant has interacted with any of the arrangers in the past five years and then add these. The participants in an average loan jointly had 6,280 previous interactions with any of the arrangers.¹⁹ If participants worked together with the arrangers in previous deals they know what to expect from the arrangers and the intra-syndicate information asymmetry is relatively small. Arrangers may also be more inclined to monitor and screen the borrower as they value the continuation of the relationship with the participants. For these reasons we expect that retention rates increase less during the crisis when participants and arrangers worked together in previous loan syndications.

¹⁹ If the syndicate consists of three arrangers and four participants, the variable captures how often the 12 different possible participant-arranger combinations occurred in the previous five years. This previous interaction can be a participant-arranger relationship, but it is also possible that the current participant acted as an arranger (or vice-versa) or that the current arranger and participant cooperated as arrangers or participants.

3. Empirical results

3.1. Basic results

Table 2 presents our basic empirical results both for all loans in our dataset as well as for a sub-sample of international syndicated loans (syndicates where at least one of the lenders is based in a different country than the borrower). Our dataset contains loans to borrowers in a variety of developed and emerging markets and many of these loans are provided by lenders from various countries as well. We nevertheless use the TED spread as a common measure of liquidity in the international money market because a vast majority of financial institutions operating in the syndicated loan market use the same Libor benchmark (London Inter Bank Offered Rate) that underlies the TED spread. To the extent that banks in emerging markets fund themselves through wholesale borrowing abroad, they are directly influenced by changing liquidity conditions at the core of the global financial system. Analysing both sets of loans allows us nevertheless to test whether domestic and international syndicates differ in their sensitivity to the TED spread. If no major differences exist, we can be assured that the TED spread adequately captures market liquidity for most loans in our dataset.

The first nine columns show regression results for the full sample, whereas the last three columns show similar regressions for the sample of international syndicated loans. As dependent variables we use the total loan share held by the arrangers, the loan share held by each arranger on average and the loan share held by the two main arrangers, respectively. For the sample of international loans we only show the regressions where the total loan share is the dependent variable (the results for the other two dependent variables are virtually identical). We control for various loan and borrower characteristics and include regional dummies (the latter not shown).

The first column in each set of three regressions shows a highly significant and positive impact of the *TED spread* on retention rates. When interbank liquidity is tight, retention rates are higher as funding pressures make banks less eager to participate in syndicated loans. Arrangers – who earn most of the syndication fees and have a long-term interest in maintaining relationships with key borrowers – take on a bigger part of each loan. The TED spread as a measure of interbank liquidity works equally well for domestic and international syndicated loans.

In the second column in each set we then simultaneously include *TED spread* and *Crisis* to perform an empirical “horse race” between these potential drivers of retention rates. Interestingly, when we add our *Crisis* dummy the impact of liquidity becomes (just) insignificant. The shock of the crisis itself turns out to be the dominant driver of the increase in retention rates. During the crisis the total loan share held by arrangers increases by 3.9 percentage points (compared with a pre-crisis mean of 50 per cent), the mean arranger share increases by 1.4 percentage points (pre-crisis mean 27 per cent) while the share held by the two largest arrangers increases by 2.4 percentage points (pre-crisis mean 38 per cent). Lastly, the third column in each set shows that adding a *Post Lehman* dummy does not add to the explanatory power of our model (adding the Lehman dummy even slightly adds to the precision of the estimates of the *Crisis* impact). The impact of the crisis on retention rates had already happened before the Lehman collapse.

Table 2: Impact of the crisis on retention rates: is there a wake-up call effect?

This table shows the impact of the crisis on retention rates. *TED spread* equals the difference between the three-month LIBOR and the interest rate on U.S. T-bills of the same maturity. *Crisis* is a dummy which is one for the crisis period (October 2007 - October 2009) and zero for the pre-crisis period (January 2005 - September 2007). *Post Lehman* is a dummy which is one for the period after the collapse of Lehman Brothers (15 September 2008) and zero otherwise. *Volume* equals the log of the loan amount in dollars. *Maturity* is the log of the maturity of the loan in days. *Secure* and *Guarantee* are dummies which are one if the loan is secured or guaranteed, respectively. *RepBor* measures the number of times the borrower has raised a syndicated loan since 2000 (including the current loan). *Rated* is a dummy which is one if the borrower has a rating from S&P and/or Moody's. *Split* measures the share of firms in the borrower's industry that are rated differently by S&P and Moody's. *RepArr* measures the total market share of the arrangers in the year prior to loan signing. *InstInv* is a dummy which is one if at least one of the participants is an institutional investor. *Refin*, *Acq* and *Corp* are loan purpose dummies which are one if the main loan purpose is refinancing, acquisition or general corporate borrowing, respectively. *ArrNum* equals the number of arrangers in the loan. International loans are loans with at least one lender from a different country as the borrower. The model is estimated using OLS. Standard errors are heteroskedasticity robust and clustered by borrower. All regressions include a constant and regional dummies. Robust p-values appear in brackets and ***, ** and * correspond to one, five and ten percent level of significance, respectively.

	All loans									Only international loans		
	Total Share Held By Arrangers			Mean Share Held By Arrangers			Total Share Held By Top 2 Arrangers			Total Share Held By Arrangers		
TED spread	0.039*** [0.000]	0.015 [0.105]	0.014 [0.140]	0.009** [0.048]	0.000 [0.981]	-0.001 [0.910]	0.024*** [0.000]	0.008 [0.349]	0.007 [0.440]	0.046*** [0.000]	0.017 [0.187]	0.016 [0.211]
Crisis		0.036*** [0.001]	0.043*** [0.000]	0.014* [0.086]	0.019** [0.024]	0.024** [0.011]	0.032*** [0.003]	0.042*** [0.003]	0.050*** [0.001]			
Post Lehman			-0.016 [0.177]			-0.012 [0.152]			-0.017 [0.110]			-0.021 [0.176]
Volume	-0.033*** [0.000]	-0.032*** [0.000]	-0.033*** [0.000]	-0.041*** [0.000]	-0.041*** [0.000]	-0.041*** [0.000]	-0.029*** [0.000]	-0.029*** [0.000]	-0.030*** [0.000]	-0.040*** [0.000]	-0.040*** [0.000]	-0.040*** [0.000]
Maturity	-0.014** [0.025]	-0.012* [0.074]	-0.013* [0.058]	-0.017*** [0.001]	-0.016*** [0.002]	-0.016*** [0.001]	-0.010* [0.085]	-0.008 [0.164]	-0.009 [0.127]	-0.004 [0.603]	-0.001 [0.878]	-0.003 [0.753]
Secure	0.044*** [0.000]	0.042*** [0.000]	0.043*** [0.000]	0.025*** [0.000]	0.024*** [0.000]	0.024*** [0.000]	0.033*** [0.000]	0.031*** [0.000]	0.032*** [0.000]	0.051*** [0.000]	0.049*** [0.000]	0.050*** [0.000]
Guarantee	-0.022** [0.047]	-0.022** [0.044]	-0.022** [0.042]	-0.017** [0.028]	-0.018** [0.027]	-0.018** [0.026]	-0.021** [0.041]	-0.021** [0.039]	-0.021** [0.037]	-0.034*** [0.008]	-0.035*** [0.006]	-0.035*** [0.006]
RepBor	-0.005** [0.026]	-0.005** [0.029]	-0.005** [0.028]	-0.003* [0.088]	-0.003* [0.091]	-0.002* [0.094]	-0.004** [0.017]	-0.004** [0.020]	-0.004** [0.018]	-0.004* [0.062]	-0.004* [0.069]	-0.004* [0.067]
Rated	-0.039*** [0.001]	-0.040*** [0.001]	-0.040*** [0.001]	-0.030*** [0.000]	-0.030*** [0.000]	-0.030*** [0.000]	-0.035*** [0.000]	-0.036*** [0.000]	-0.035*** [0.000]	-0.032*** [0.008]	-0.032*** [0.007]	-0.032*** [0.007]
Split	-0.011 [0.903]	-0.015 [0.868]	-0.010*** [0.000]	-0.144** [0.045]	-0.145** [0.042]	-0.005*** [0.000]	-0.088 [0.275]	-0.091 [0.260]	-0.010*** [0.000]	0.046 [0.685]	0.042 [0.710]	-0.007*** [0.000]
RepArr	-0.011*** [0.000]	-0.010*** [0.000]	-0.052*** [0.000]	-0.005*** [0.000]	-0.005*** [0.000]	-0.086*** [0.000]	-0.010*** [0.000]	-0.010*** [0.000]	-0.057*** [0.000]	-0.007*** [0.000]	-0.007*** [0.000]	-0.046*** [0.000]
InstInv	-0.097*** [0.000]	-0.097*** [0.000]	0.029* [0.052]	-0.034*** [0.000]	-0.034*** [0.000]	-0.040*** [0.001]	-0.069*** [0.000]	-0.068*** [0.000]	0.023* [0.098]	-0.103*** [0.000]	-0.102*** [0.000]	0.027 [0.135]
Refin	-0.054*** [0.000]	-0.053*** [0.000]	-0.052*** [0.000]	-0.087*** [0.000]	-0.087*** [0.000]	-0.062*** [0.000]	-0.059*** [0.000]	-0.058*** [0.000]	-0.055*** [0.000]	-0.047*** [0.000]	-0.047*** [0.000]	-0.050*** [0.000]
Acq	0.027* [0.073]	0.029* [0.056]	-0.097*** [0.000]	-0.041*** [0.000]	-0.040*** [0.000]	-0.034*** [0.000]	0.021 [0.127]	0.022 [0.107]	-0.069*** [0.000]	0.025 [0.154]	0.026 [0.145]	-0.102*** [0.000]
Corp	-0.054*** [0.000]	-0.052*** [0.000]	-0.014 [0.874]	-0.062*** [0.000]	-0.062*** [0.000]	-0.145** [0.043]	-0.056*** [0.000]	-0.056*** [0.000]	-0.09 [0.265]	-0.051*** [0.000]	-0.051*** [0.000]	0.042 [0.709]
ArrNum	0.064*** [0.000]	0.063*** [0.000]	0.064*** [0.000]	-0.019*** [0.000]	-0.019*** [0.000]	-0.019*** [0.000]	-0.004*** [0.003]	-0.004*** [0.001]	-0.004*** [0.002]	0.061*** [0.000]	0.060*** [0.000]	0.061*** [0.000]
Observations	4,252	4,252	4,252	4,252	4,252	4,252	4,252	4,252	4,252	2,939	2,939	2,939
R-squared	0.34	0.35	0.35	0.44	0.44	0.44	0.23	0.23	0.23	0.36	0.37	0.37

Before analysing the crisis impact on retention rates in more detail in Table 3, we report some interesting results for our control variables. Retention rates for larger loans are significantly lower as larger loans tend to be granted to larger and more transparent companies. Loans secured by collateral are structured by arrangers that individually and jointly need to hold a bigger portion of the loan. Banks monitor secured loans more intensely as these are *ex ante* more risky. In contrast to collateralised loans, we find that guaranteed loans demand less strict screening and monitoring. Arrangers individually and jointly need to retain less of such loans. As expected, arrangers need to retain less in the case of syndicated loans to repeat borrowers, as these borrowers are already “known” in the market. Repeat borrowers are perceived as less risky and loans to such borrowers are plagued by fewer agency problems. This also holds for loans to rated borrowers. We do not find a robust impact of industry opaqueness as measured by the percentage of firms with split ratings.

Lastly, we find that not only borrower reputation but also arranger reputation matters: experienced and reputable arrangers need to retain less of a loan. Arranger reputation reduces agency problems within the lending syndicate. On the participant side, we find that loans where some of the participants are institutional investors display significantly lower retention rates. Compared with banks, institutional investors have been particularly eager to buy into syndicated loans and this has been reflected in their willingness to accept lower retention rates.

3.2. The crisis as a wake-up call: detailed cross-sectional evidence

The previous section showed that although interbank liquidity has influenced retention rates in syndicates, the sharp increase in retention rates at the onset of the crisis in mid-2007 was mainly due to a one-off increase in the loan portions that arrangers needed to retain. We interpret this as evidence of a wake-up call in which banks, after a prolonged period during which lending standards were gradually relaxed, became more concerned about adequate screening and monitoring of borrowers. However, the ultimate test for the correctness of this interpretation of our result lies in interacting *Crisis* with our various measures of information asymmetry.

To analyse whether information asymmetries indeed strengthen the wake-up call effect, we run regressions in which we subsequently interact the crisis dummy with our variables that proxy for the severity of agency problems (see Table 3).²⁰ Control variables are included in all regressions but not shown for reasons of brevity. To preserve space we only show regressions with the total share retained by the arrangers as a dependent variable, but we find similar results when we use our other two retention rate variables instead (results available on request). To the extent that these interaction terms are significant and of the correct sign, we take this as evidence that the crisis-related increase in retention rates indeed signals an increased focus on screening and monitoring.

²⁰ We only interact with *Crisis* and not with *Post Lehman* as the latter variable did not have any additional explanatory power.

Table 3: Information asymmetry and the impact of the crisis on retention rates

This table shows how information asymmetries affect the impact of the crisis on retention rates. The dependent variable is the share of the loans jointly held by the arrangers. *Crisis* is a dummy which is one for the crisis period (October 2007 - October 2009) and zero for the pre-crisis period (January 2005 - September 2007). *RepBor* measures the number of times the borrower has raised a syndicated loan since 2000 (including the current loan). *Rated* is a dummy which is one if the borrower has a rating from S&P and/or Moody's. *Split* measures the share of firms in the borrower's industry that are rated differently by S&P and Moody's. *BorArr* (*BorPart*) measures the share of arrangers (participants) that were at least once part of a syndicate to the same borrower. *ArrSec* (*PartSec*) and *ArrCountry* (*PartCountry*) measure the number of times one or more of the arrangers (participants) were part of a syndicate to the same sector or country. *RepArr* measures the total market share of the arrangers in the year prior to loan signing. *PartArr* measures the number of times the participants have had previous dealings with the arrangers in the syndicate. *TED spread* equals the difference between the three-month LIBOR and the interest rate on U.S. T-bills of the same maturity. All regressions include the same controls as in Table 2. However, for reasons of brevity and clarity we only show the parameter estimates of *RepBor*, *Rated*, *Split* and *RepArr* for the regressions that include the interaction terms with these variables. The model is estimated using OLS. Standard errors are heteroskedasticity robust and clustered by borrower. Robust p-values appear in brackets and ***, ** and * correspond to one, five and ten percent level of significance, respectively.

	Market knowledge about the borrower			Syndicate-specific knowledge about the borrower						Knowledge within syndicate		
Crisis	0.063***	0.040***	-0.187	0.044***	0.052***	0.046***	0.047***	0.047***	0.047***	0.047***	0.047***	0.038***
	[0.000]	[0.000]	[0.121]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Crisis*RepBor	-0.010***											
	[0.000]											
RepBor	-0.003**											
	[0.032]											
Crisis*Rated		-0.023										
		[0.215]										
Rated		-0.033***										
		[0.008]										
Crisis*Split			0.333*									
			[0.063]									
Split			-0.118									
			[0.251]									
Crisis*BorArr				-0.037**								
				[0.010]								
BorArr				-0.042***								
				[0.000]								
Crisis*ArrSec					-0.008**							
					[0.016]							
ArrSec					0.010***							
					[0.000]							
Crisis*ArrCountry						-0.002***						
						[0.003]						
ArrCountry						0.002***						
						[0.000]						
Crisis*BorPart							-0.029*					
							[0.076]					
BorPart							-0.075***					
							[0.000]					
Crisis*PartSec								-0.011***				
								[0.003]				
PartSec								-0.036***				
								[0.000]				
Crisis*PartCountry									-0.005***			
									[0.000]			
PartCountry									-0.008***			
									[0.000]			
Crisis*RepArr										-0.005*		
										[0.054]		
RepArr										-0.009***		
										[0.000]		
Crisis*PartArr											-0.003***	
											[0.000]	
PartArr											-0.005***	
											[0.000]	
TED spread	0.015	0.015	0.016*	0.016*	0.013	0.011	0.015	0.015	0.011	0.018*	0.013	
	[0.111]	[0.108]	[0.095]	[0.097]	[0.162]	[0.235]	[0.125]	[0.107]	[0.240]	[0.054]	[0.151]	
Observations	4,252	4,252	4,252	4,252	4,240	4,239	4,240	4,240	4,241	4,241	4,239	
R-squared	0.35	0.35	0.35	0.35	0.35	0.36	0.35	0.35	0.42	0.40	0.39	

We replicate our finding that on average arrangers needed to retain significantly larger loan shares during the crisis. More importantly, we also find that the size of this wake-up call effect strongly depends on the severity of the agency problems that plague a loan. First, we find that the increase in retention rates is significantly smaller for repeat borrowers (column 1). While having a rating or not does not have a (statistically significant) negative impact on the crisis-related increase in retention rates (column 2), we do find that loans to borrowers from relatively transparent industries – with fewer split ratings – saw a smaller increase in retention rates (column 3).²¹

Our second set of agency variables looks at various forms of information asymmetry between the lending syndicate and the borrower. We expect that loans where such asymmetries were small saw a smaller increase in retention rates during the crisis. This is indeed what we find. Syndicates that are structured by arrangers that have previously dealt with the same borrower, the same country, or the same sector see a smaller increase in retention rates than syndicates where arrangers are working on less familiar territory. In a similar vein, we find that previous relationships between the participants themselves and the borrower, its industry, or its country of incorporation reduce their concerns about adequate screening and monitoring. As a result, retention rates needed to increase significantly less during the crisis for these “familiar” loans.

Our third set of agency variables captures information asymmetries within the lending syndicate. We find – as expected – that arranger reputation (measured as the market share in the syndicated loan market in the previous year) matters. Experienced arrangers still need to increase their retention rates during the crisis, but they need to do so far less than less-experienced competitors. Lender reputation is an important mechanism to control agency problems within the syndicate, in particular during episodes of financial turmoil.²² Lastly, we also find that retention rates increase less during the crisis when the participants had previous dealings with the arrangers in the syndicate. Building relationships reduces asymmetric information problems and increases trust within the syndicate.

3.3. Economic significance of results

Table 4 shows the economic relevance of our results. For an average loan the retention rate increased by almost 8 per cent during the crisis (the share of the loan jointly held by the arrangers increased by 3.9 percentage points compared with a pre-crisis mean of 50). However, when we allow for differences in asymmetric information we see that the impact of the crisis on the required retention rate differs substantially across loans.

²¹ In the split rating regression the main crisis coefficient is negative ($p=0.12$). Because the split rating variable ranges between 0.60 and 0.76 the total crisis impact on retention rate is nevertheless positive and ranges between 0.02 and 0.07 depending on the percentage of split ratings in the borrower’s industry.

²² Gatti, Kleimeier, Megginson, and Steffanoni (2008) use a similar arranger reputation variable and show for a large sample of syndicated project finance loans that during the East Asian and Russian financial crises arranger reputation was a valuable loan certification mechanism. The authors focus on the impact on loan spreads and show that during a crisis reluctant participants are willing to pay for good arrangers in the form of increased arranger fees. We find that this reluctance also translates into different lending structures and that this result also holds for a broader group of syndicated loans and not just project finance loans.

Table 4: Economic significance of crisis impact on retention rates

The table shows the economic significance of the crisis impact on retention rates for loans with varying levels of asymmetric information between borrower and syndicate or within the syndicate. The economic effects are calculated relative to the pre-crisis mean of the share of the loan jointly held by the arrangers.

	Percentage increase retention rate compared to pre-crisis mean (0.50)
Overall crisis impact	7.8
if first time borrower	10.6
if repeat borrower (mean <i>RepBor</i> =2.5)	7.6
if rated	8.0
if unrated	8.0
if transparent industry (<i>Split</i> =0.60)	4.0
if opaque industry (<i>Split</i> =0.76)	5.0
if all are arrangers unfamiliar with borrower	8.8
if arrangers have some knowledge about borrower (mean <i>BorArr</i> =0.42)	5.6
if arrangers have no knowledge about sector	10.4
if arrangers have some knowledge about sector (mean <i>ArrSec</i> =1.27)	8.4
if arrangers have no knowledge about country	9.2
if arrangers have some knowledge about country (mean <i>ArrCountry</i> =4.21)	7.6
if all participants are unfamiliar with borrower	9.4
if participants have some knowledge about borrower (mean <i>BorPart</i> =0.29)	5.0
if participants have no knowledge about sector	9.4
if participants have some knowledge about sector (mean <i>PartSec</i> =1.38)	3.0
if participants have no knowledge about country	9.4
if participants have some knowledge about country (mean <i>PartCountry</i> =3.91)	5.4
if arrangers have no reputation	9.4
if arrangers have some reputation (mean <i>ArrRep</i> =2.05)	3.7
if participants have no prior dealings with any of the arrangers	7.6
if participants have some prior dealings with arrangers (mean <i>PartArr</i> =6.28)	3.8

For example, while the retention rate for loans to first-time borrowers increased by 10.6 per cent, arrangers of syndicated loans to borrowers with average borrowing experience (two and a half loans) only needed to increase their retention rate by 7.6 per cent during the crisis. Furthermore, the retention rate for loans where participants were unfamiliar with the borrower country (sector) increased by 9.4 (9.4) per cent while those loans in which participants had average experience with the country (sector) the retention rate increased by only 5.4 (3.0) per cent. Lastly, retention rates for loans syndicated by arrangers without reputation increased by 9.4 per cent, while retention rates only increased by 3.7 per cent for loans syndicated by arrangers with average reputation. More transparent borrowers, more experienced participants, and more reputable arrangers all contributed to contain the crisis-related correction in the required screening and monitoring intensity and thus in retention rates.

Although we cannot establish for sure that the overall increase in retention rates can be fully attributed to intensified screening and monitoring, because unobserved borrower risk may potentially also have had an impact, we demonstrate that the crisis impact on retention rates differed significantly between loans with high and low levels of asymmetric information. Our results therefore indicate that bank screening and monitoring became stricter during the financial crisis: the crisis acted as a wake-up call.

4. Robustness

We have identified a strong increase in retention rates during the crisis and argued that this sudden increase cannot only be explained by fluctuations in interbank liquidity or increased (unobserved) borrower risk. Instead we show that the retention rate increase is strongly related to the level of information asymmetry between the borrower and the syndicate (or within the syndicate) in line with an increased focus on screening and monitoring during the crisis. We proceed with a number of tests to see whether our results are robust to different specifications and data samples. In each robustness test we include the control variables of the baseline regressions (Table 2) but do not show the coefficients in Table 5 for reasons of brevity (available on request from the authors).

4.1. Other loan categories

We start by making sure that our baseline results are not driven by the exclusion of certain loan categories. We first analyse whether our results are influenced by the fact that during the crisis the proportion of club deals increases. Club deals are syndicated loans where the borrower itself selects the syndicate members, usually a group of relationship lenders. All lenders have a more or less equal standing and get an (almost) equal fee share. Club deals thus lack the typical two-tier structure of syndicated loans and for this reason we have excluded them so far. Club deals are included and earmarked in the Loan Analytics database. The percentage of loans labelled as club deals increases during the crisis from 6 to 10 per cent. We re-ran our baseline regressions while including club deals and found that this does not change our earlier results.

Second, we check whether including project finance loans changes our results. Project finance loans are syndicated loans to fund a legally independent project. They are to be repaid with the cash flows of that specific project without any recourse to assets of the project sponsors (the equity investors). The project companies involved are often highly leveraged. On the one hand, this combination of high leverage and limited recourse means that lenders take extra care in screening and monitoring the borrower (Esty and Megginson, 2003). On the other hand, findings based on project finance alone are difficult to generalise to bank lending more generally. Kleimeier and Megginson (2000) provide detailed evidence on how project finance and non-project finance syndicated loans differ in terms of syndicate structure, loan pricing and other loan attributes and conclude that “project finance loans differ rather fundamentally from non-project finance loans in almost every important aspect (p. 87)”. For this reason we chose to focus on general syndicated loans. However, when we include project finance loans in our sample – and use a project finance dummy in the regressions – our results remain quantitatively and qualitatively the same.

Table 5: Robustness tests

This table shows several robustness tests. The dependent variable is the share of the loan jointly held by the arrangers. *Crisis* is a dummy which is one for the crisis period (October 2007 - October 2009) and zero for the pre-crisis period (January 2005 - September 2007). *RepBor* measures the number of times the borrower has raised a syndicated loan since 2000 (including the current loan). *Rated* is a dummy which is one if the borrower has a rating from S&P and/or Moody's. *Split* measures the share of firms in borrower's industry that are rated differently by S&P and Moody's. *BorArr* (*BorPart*) measures the share of arrangers (participants) that were at least once part of a syndicate to the same borrower. *ArrSec* (*PartSec*) and *ArrCountry* (*PartCountry*) measure the number of times one or more of the arrangers (participants) were part of a syndicate to the same sector or country. *RepArr* measures the total market share of the arrangers in the year prior to loan signing. *PartArr* measures the number of times the participants have had previous dealings with the arrangers in the syndicate. *X* refers to the variable mentioned in the heading of the column. *Demand* equals the average GDP growth in countries where arrangers were active prior to the crisis (see main text for exact definition). In Heckman regressions we show the parameter estimates for the respective selection variables as well. *Busy* equals the sum of the number of other loans that the arrangers of a particular loan arranged in the same year. *Individualism* equals the average country score on Individualism on the Hofstede (2001) index for the arrangers in the loan. All regressions include the same controls as in Table 2. The model is estimated using OLS. Standard errors are heteroskedasticity robust and clustered by borrower. Robust p-values appear in brackets and ***, ** and * correspond to one, five and ten percent level of significance, respectively.

	Basic	RepBor	Rated	Split	BorArr	ArrSec	ArrCountry	BorPart	PartSec	PartCountry	RepArr	PartArr
Including club deals												
Crisis	0.059*** [0.000]	0.079*** [0.000]	0.060*** [0.000]	-0.196 [0.120]	0.076*** [0.000]	0.073*** [0.000]	0.073*** [0.000]	0.073*** [0.000]	0.067*** [0.000]	0.072*** [0.000]	0.065*** [0.000]	0.059*** [0.000]
Crisis*X		-0.008*** [0.001]	-0.01 [0.627]	0.381** [0.042]	-0.046*** [0.003]	-0.012*** [0.002]	-0.004*** [0.000]	-0.057*** [0.001]	-0.016*** [0.001]	-0.006*** [0.001]	-0.003 [0.171]	-0.004*** [0.000]
X		-0.003** [0.029]	-0.021 [0.102]	-0.286** [0.012]	-0.042*** [0.000]	0.010*** [0.001]	0.003*** [0.000]	-0.160*** [0.000]	-0.049*** [0.000]	-0.008*** [0.000]	-0.007*** [0.000]	-0.006*** [0.000]
Including project finance loans												
Crisis	0.028*** [0.006]	0.052*** [0.000]	0.031*** [0.004]	-0.229* [0.051]	0.037*** [0.002]	0.033*** [0.003]	0.034*** [0.002]	0.033*** [0.005]	0.030*** [0.005]	0.033*** [0.002]	0.033*** [0.002]	0.024** [0.020]
Crisis*X		-0.010*** [0.000]	-0.02 [0.280]	0.383** [0.028]	-0.030** [0.037]	-0.007** [0.050]	-0.002*** [0.006]	-0.024 [0.137]	-0.010*** [0.008]	-0.004*** [0.000]	-0.003 [0.195]	-0.003*** [0.000]
X		-0.003** [0.024]	-0.033*** [0.007]	-0.164 [0.106]	-0.042*** [0.000]	0.009*** [0.001]	0.002*** [0.000]	-0.078*** [0.000]	-0.037*** [0.000]	-0.008*** [0.000]	-0.010*** [0.000]	-0.005*** [0.000]
Correction for changes in demand for syndicated loans												
Crisis	0.035*** [0.001]	0.063*** [0.000]	0.039*** [0.000]	-0.184 [0.129]	0.052*** [0.000]	0.047*** [0.000]	0.046*** [0.000]	0.046*** [0.000]	0.047*** [0.000]	0.047*** [0.000]	0.043*** [0.000]	0.039*** [0.000]
Crisis*X		-0.010*** [0.000]	-0.023 [0.218]	0.327* [0.069]	-0.037** [0.010]	-0.009** [0.015]	-0.002*** [0.003]	-0.029* [0.078]	-0.011*** [0.003]	-0.005*** [0.000]	-0.004* [0.070]	-0.003*** [0.000]
X		-0.003** [0.031]	-0.033*** [0.008]	-0.109 [0.294]	-0.042*** [0.000]	0.010*** [0.000]	0.003*** [0.000]	-0.075*** [0.000]	-0.036*** [0.000]	-0.008*** [0.000]	-0.009*** [0.000]	-0.005*** [0.000]
Demand	-0.001 [0.367]	-0.001 [0.285]	-0.001 [0.348]	-0.001 [0.407]	-0.001 [0.260]	-0.001 [0.359]	-0.001 [0.299]	-0.001 [0.353]	-0.001 [0.311]	-0.001 [0.583]	-0.001 [0.372]	-0.001 [0.892]
Heckman selection model - selection variable is busy												
Crisis	0.035*** [0.001]	0.062*** [0.000]	0.041*** [0.000]	-0.177 [0.146]	0.055*** [0.000]	0.048*** [0.000]	0.051*** [0.000]	0.048*** [0.000]	0.043*** [0.000]	0.043*** [0.000]	0.043*** [0.000]	0.032*** [0.003]
Crisis*X		-0.010*** [0.000]	-0.029* [0.094]	0.317* [0.080]	-0.044*** [0.002]	-0.007* [0.085]	-0.002** [0.016]	-0.034** [0.040]	-0.009*** [0.003]	-0.004*** [0.000]	-0.004* [0.092]	-0.002*** [0.000]
X		-0.004*** [0.001]	-0.043*** [0.000]	-0.132 [0.200]	-0.039*** [0.000]	0.012*** [0.000]	0.004*** [0.000]	-0.073*** [0.000]	-0.032*** [0.000]	-0.005*** [0.000]	-0.009*** [0.000]	-0.004*** [0.000]
Busy	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]
Heckman selection model - selection variable is individualism												
Crisis	0.043*** [0.000]	0.072*** [0.000]	0.051*** [0.000]	-0.162 [0.186]	0.066*** [0.000]	0.054*** [0.000]	0.056*** [0.000]	0.055*** [0.000]	0.051*** [0.000]	0.056*** [0.000]	0.049*** [0.000]	0.045*** [0.000]
Crisis*X		-0.011*** [0.000]	-0.043** [0.015]	0.306* [0.094]	-0.051*** [0.000]	-0.007* [0.086]	-0.002*** [0.009]	-0.038** [0.022]	-0.010*** [0.002]	-0.005*** [0.000]	-0.003 [0.154]	-0.003*** [0.000]
X		-0.004*** [0.000]	-0.033*** [0.003]	-0.079 [0.450]	-0.038*** [0.000]	0.015*** [0.000]	0.004*** [0.000]	-0.084*** [0.000]	-0.037*** [0.000]	-0.008*** [0.000]	-0.006*** [0.001]	-0.006*** [0.000]
Individualism	-0.016*** [0.000]	-0.016*** [0.000]	-0.016*** [0.000]	-0.016*** [0.000]	-0.016*** [0.000]	-0.015*** [0.000]	-0.015*** [0.000]	-0.016*** [0.000]	-0.016*** [0.000]	-0.016*** [0.000]	-0.016*** [0.000]	-0.016*** [0.000]
Start crisis January 2008												
Crisis	0.030*** [0.002]	0.057*** [0.000]	0.033*** [0.001]	-0.263** [0.040]	0.047*** [0.000]	0.041*** [0.000]	0.042*** [0.000]	0.042*** [0.000]	0.037*** [0.000]	0.042*** [0.000]	0.039*** [0.000]	0.027*** [0.004]
Crisis*X		-0.010*** [0.000]	-0.019 [0.322]	0.438** [0.021]	-0.037** [0.016]	-0.008** [0.032]	-0.003*** [0.003]	-0.033* [0.057]	-0.010** [0.010]	-0.005*** [0.000]	-0.005** [0.049]	-0.003*** [0.000]
X		-0.004** [0.033]	-0.035*** [0.004]	-0.132 [0.189]	-0.044*** [0.000]	0.010*** [0.000]	0.002*** [0.000]	-0.076*** [0.000]	-0.037*** [0.000]	-0.008*** [0.000]	-0.004** [0.016]	-0.005*** [0.000]
Begin sample period January 2006												
Crisis	0.030*** [0.007]	0.055*** [0.000]	0.034*** [0.003]	-0.192 [0.153]	0.041*** [0.002]	0.040*** [0.001]	0.040*** [0.001]	0.034*** [0.008]	0.036*** [0.002]	0.038*** [0.001]	0.040*** [0.001]	0.031*** [0.007]
Crisis*X		-0.010*** [0.001]	-0.028 [0.199]	0.331* [0.097]	-0.026 [0.113]	-0.008* [0.053]	-0.002** [0.016]	-0.011 [0.548]	-0.007* [0.100]	-0.004*** [0.000]	-0.005* [0.065]	-0.002*** [0.001]
X		-0.004 [0.121]	-0.021 [0.260]	-0.088 [0.530]	-0.050*** [0.000]	0.011*** [0.002]	0.003*** [0.000]	-0.091*** [0.000]	-0.041*** [0.000]	-0.009*** [0.000]	-0.006*** [0.010]	-0.006*** [0.000]
Tobit												
Crisis	0.033*** [0.004]	0.062*** [0.000]	0.036*** [0.002]	-0.173 [0.176]	0.051*** [0.000]	0.045*** [0.000]	0.044*** [0.000]	0.045*** [0.001]	0.045*** [0.000]	0.045*** [0.000]	0.042*** [0.000]	0.036*** [0.002]
Crisis*X		-0.011*** [0.000]	-0.020 [0.305]	0.307* [0.100]	-0.041*** [0.008]	-0.009** [0.022]	-0.003*** [0.003]	-0.032* [0.060]	-0.012*** [0.003]	-0.005*** [0.000]	-0.005** [0.040]	-0.003*** [0.000]
X		-0.004** [0.037]	-0.037*** [0.004]	-0.122 [0.257]	-0.043*** [0.000]	0.009*** [0.002]	0.002*** [0.001]	-0.088*** [0.000]	-0.038*** [0.000]	-0.009*** [0.000]	-0.010*** [0.000]	-0.006*** [0.000]

4.2. Demand correction

Next we control for the possibility that during the crisis the demand for syndicated loans dropped. A lower demand would mean that, all else equal, arrangers were less constrained by their capital base and thus decided to keep more of each loan on their balance sheet. *A priori* we think this explanation is unlikely as this crisis started as a pure financial crisis, with initially a limited impact on economic growth and loan demand. Only during the later stages of the crisis, in particular after the Lehman collapse, did trade and growth contract precipitously. To proxy for the severity of the reduction in loan demand at the individual arranger level, we create a quarterly variable that measures average quarter-on-quarter GDP growth in the countries where the arranger was active in the pre-crisis period. We weigh the countries by their share in the total pre-crisis loan portfolio of the arranger. As expected this variable only becomes negative in October 2008, when the financial crisis turned into a real crisis in the wake of the Lehman bankruptcy. When we add this variable, its coefficient is negative (lower loan demand leads to higher retention rates) but insignificant, while our main results are robust to this demand correction.

4.3. Sample selection

Our regressions are based on a subsample that contains detailed information on the distribution of the loan over the various arrangers and participants. Only about 25 per cent of the loan entries in Loan Analytics contain such information. When arrangers report a loan to Dealogic they need to fill out a standard form which contains basic information about the loan deal as well as more detailed information such as the exact loan distribution. Whereas arrangers have an incentive to declare the deal to Dealogic – it then counts towards their league table position – they do not have a strong incentive to provide Dealogic with *all* information. This is mostly left to the discretion of the bank. Although our subsample is overall quite similar to the full data set, we are still worried that some of our results may be driven by selection bias in the sense that certain types of lenders tend to disclose more information than others.

We therefore estimate two variants of a two-step Heckman (1979) selection procedure in which we use in the first stage equation a number of instruments that we expect to be linked to the propensity of arrangers to diligently fill out the Dealogic loan forms. The first instrument is the number of other loans that the arrangers of a particular loan organise in the same year. We expect that “busy” arrangers with a high loan flow are less inclined to provide detailed information about each loan. Second, we use the average value of the country score on “Individualism” of the Hofstede (2001) index. Arrangers based in “individualist” countries may be less inclined to fill out information than those in collectivist countries. As expected we find that loans with busy arrangers and loans with arrangers from more individualist societies contain less often full information. While we find some evidence of self-selection in our sample – the estimated coefficients for the inverse Mill’s ratio are not consistently statistically insignificant – Table 5 shows that our earlier results are not affected by this.

4.4. Different periods and estimation technique

Next, we do some further methodological checks by experimenting with a different crisis definition, sample period, and estimation method. While August 2007 is generally regarded as the start of the crisis the negative impact on financing conditions increased during the following months. This means that our “early start” of the crisis is a conservative approach when estimating the crisis impact on bank behaviour. Our results are robust to starting the crisis at a later point in time (January 2008) and, apart from losing significance of some of the

interaction variables, also remain the same when we start our pre-crisis period in January 2006 instead of January 2005. Lastly, our results do not change when we use a Tobit regression technique rather than OLS or when errors are clustered at the sector instead of borrower level (last regression not shown).

4.5. Moral hazard versus adverse selection

We interpret our results as evidence of an increased need to screen and monitor borrowers during the crisis. Participants want to make sure that borrowers have been adequately screened and will be adequately monitored before agreeing to participate in a syndicate. Arrangers need to keep a larger share on their books as participants are concerned about *moral hazard* with respect to arrangers' efforts. However, an alternative interpretation could be that participants do not worry about arrangers' screening and monitor efforts, but rather that, since arrangers have private information about the borrower, there will be *adverse selection*. In this case arrangers do not keep a larger loan share to convince participants that they adequately screen and monitor, but to convince them that they do not only sell down relative risky loans ("lemons") (Akerlof, 1970; Parlour and Plantin, 2008). If this is the case, our results should not be interpreted as evidence that banks react to the crisis by increasing monitoring and screening. Rather, a high retention rate would mainly act as a signal or "certification" of the borrower.^{23,24} Such certification may be particularly important during financial crises (Gatti, Kleimeier, Megginson and Steffanoni, 2008). Regression four in Table 3, however, helps us distinguish between these two possible explanations of our findings (cf. Sufi, 2007).

If moral hazard on the part of the arrangers is driving our results, then the fact that the arrangers keep part of the loan reflects that both arrangers and participants have imperfect knowledge about the borrower and that the participants fear that the arrangers will not screen and monitor sufficiently. In this case, we expect that if there have been previous lending relationships between the arrangers and the borrower, participants are less worried: they know that the arrangers already know the borrower quite well and that additional screening and subsequent monitoring is less crucial. This would translate into a negative coefficient for the relationship variable, as participants feel less need to force arrangers to retain a large portion of the loan in order to prevent shirking.

In the case of adverse selection, the existence of a previous relationship between the arrangers and the borrower implies that the arranger has an information advantage over the participants. Especially for these loans the arranger then has to signal to the participants that the loan is not risky. So in the adverse selection scenario, we expect a positive coefficient for the relationship variable: in the case of a loan to a previous client, the arrangers are forced to retain more of the loan and to form a more concentrated syndicate. The participants' main worry is not so much that the arrangers have insufficiently screened the borrower or will not monitor her adequately, but rather that the arrangers actually know the borrower quite well and will abuse this information.

²³ Banks are "special" because their screening generates proprietary information about the borrower. When a bank decides to lend to a borrower this decision is an implicit endorsement of the borrower as the bank is willing to put its own money at risk. Such a "certification" tends to have a positive impact on the market value of the borrower (James, 1987; Cook, Schellhorn and Spellman, 2003).

²⁴ Note that although the model of Holmström and Tirole (1997, p. 675) explicitly deals with moral hazard, the authors mention that their model can also be thought of as one in which the monitor takes a stake in the borrower to certify that the borrower is sound.

The result in Table 3 shows that during the crisis participants took comfort in prior experience of arrangers rather than being put off by the possibility that arrangers would abuse their superior knowledge of the borrower. In other words, and in line with the wake-up call hypothesis, participants were mostly concerned about insufficient screening and monitoring by the arrangers (moral hazard) rather than arrangers selling “lemons” (adverse selection).²⁵

²⁵ We continue to include our standard control variables, including the number of previous loans of the borrower as a proxy for the general level of information that is available in the market about the borrower.

5. Conclusion

During the global financial crisis the market for syndicated loans shrank significantly. Although reduced market liquidity likely played an important role, a renewed focus on screening and monitoring of borrowers may also have reduced the supply of loans. Although many believe that the crisis induced banks to step up their screening and monitoring, empirical evidence has so far been lacking. This paper provides this evidence by analysing almost 4,500 syndicated loans extended to private corporate borrowers between January 2005 and October 2009. We find that, even when controlling for changes in interbank liquidity and borrower risk, retention rates increased significantly during the crisis, especially for loans characterised by high levels of information asymmetry between borrower and lenders or within the lending syndicate. This increase already materialised before the collapse of Lehman Brothers and the subsequent decline in global growth. The sub-prime mortgage problems that emerged in mid-2007 acted as a wake-up call for banks and led them to review their screening and monitoring standards of their corporate lending as well.

Our findings bear on the current regulatory debate about minimum “skin in the game” retention rates for originating banks.²⁶ In July 2009 the European Parliament amended the Capital Requirements Directive by including a 5 per cent retention requirement for securitisations, while in May 2010 the US Senate passed the Financial Reform Bill which announces the introduction of similar regulations that require a securitiser “to retain not less than 5 per cent of the credit risk for any asset that is transferred, sold, or conveyed through the issuance of an asset-backed security by the securitiser”. Earlier plans to let minimum retention requirements not only apply to securitisations but also to syndicated loans have (at least for the time being) been shelved.

At first sight our results confirm that regulatory retention requirements may indeed not be necessary for syndicated loans. After all, we document a strong, broad-based but market-driven increase in retention rates among syndicate arrangers. Participants, concerned about arrangers’ lax screening and monitoring, were in many cases able to take corrective action without regulatory intervention. Although syndicated lending declined sharply, the market did not break down. This stands in contrast to the securitisation market, where the link between the originator and the ultimate investors was too severed to make any corrective (and collective) action possible.

However, when the market for syndicated lending will expand again, and financial institutions once more start to compete heavily to participate in (oversubscribed) syndicated loans, the pressure on arrangers to retain loan portions that are high enough to guarantee sufficient screening and monitoring may gradually erode. Without the introduction of some form of mandatory retention rates for syndicated loans, the risk exists that old practices will soon return. This may in particular be the case if the secondary market for syndicated loans, where both arrangers and participants can offload their loan stakes, revives again (it dried up almost completely during the crisis). Syndicate *participants* that are likely to sell their loan stake in the secondary market will not be compelled to demand high retention rates from arrangers to ensure adequate screening and monitoring. Likewise, syndicate *arrangers* that sell most of the loan portions that they initially retained no longer have an incentive to screen and monitor.²⁷ Indeed, Berndt and Gupta (2009) show that borrowers whose loans are sold in the secondary syndicated loan market tend to under-perform in the medium term.²⁸ One way

²⁶ See IMF (2009) and Fender and Mitchell (2009) for a critical discussion of these regulatory measures.

²⁷ After loan origination participants sell their stake much more often than arrangers (Ivashina and Sun, 2009).

²⁸ Benmelech, Dlugosz and Ivashina (2009) find that syndicated loans that are used to back collateralised loan obligations (CLOs) do not perform worse than unsecuritised syndicated loans. This suggests that incentives to

to reduce such a negative impact of subsequent loan sales is to require arrangers to hold on to the loan portion they retained at origination. Although such a requirement could be introduced through legislation, participants themselves could also more often demand that restrictions on subsequent loan sales by arrangers are included in loan contracts.

Our results also show that while there was a broad-based increase in retention rates during the crisis the marginal impacts differed across borrower types. This should warn against a simplistic, one-size-fits-all approach to setting minimum retention requirements for securitisations. Uniform retention requirements, such as the 5 per cent rule, may be too high for relatively sound borrower and asset types – and thus stifle the (re-)emergence of securitisation of such loans – while at the same time they may be too low for riskier borrowers – and thus insufficiently resolve agency problems.

screen and monitor may remain sufficiently intact as long as not *all* participants sell their loan stakes to CLO vehicles. When only a limited part of a loan is reallocated to CLOs, the other “regular” participants may still ensure that the arrangers screen and monitor sufficiently.

References

- Aisen, A. and M. Franken (2010), “Bank credit during the 2008 financial crisis: A cross-country comparison, IMF Working Paper 10/47”, International Monetary Fund, Washington, D.C.
- Akerlof, G.A. (1970), “The market for ‘lemons’: Quality uncertainty and the market mechanism”, *Quarterly Journal of Economics* 84, 488-500.
- Barbosa, L. and N. Ribeiro (2007), “Determinants of spreads in syndicated loans to euro area borrowers”, *Economic Bulletin*, Summer, Banco de Portugal, Lisbon, 65-78.
- Benmelech, E., J. Dlugosz and V. Ivashina (2009), “What lies beneath: Is there adverse selection in CLO collateral”, mimeo.
- Bernanke, B. (1983), “Non-monetary effects of the financial crisis in the propagation of the Great Depression”, *American Economic Review* 73, 257-76.
- Bernanke, B. and M. Gertler (1989), “Agency costs, net worth, and business fluctuations, *American Economic Review*” 79, 14-31.
- Berndt, A. and A. Gupta (2009), “Moral hazard and adverse selection in the originate-to-distribute model of bank credit”, *Journal of Monetary Economics* 56, 725-743.
- Berger, A. and G. Udell (1990), “Collateral, loan quality, and bank risk”, *Journal of Monetary Economics* 25, 21-42.
- Berger, A. and G. Udell (2004), “The institutional memory hypothesis and the procyclicality of bank lending behavior”, *Journal of Financial Intermediation* 13, 458-495.
- Bonaccorsi di Patti, E. and G. Dell’Ariccia (2004), “Bank competition and firm creation”, *Journal of Money, Credit and Banking* 36, 225-251.
- Borio, C. and H. Zhu (2008), “Capital regulation, risk-taking and monetary policy: A missing link in the transmission mechanism?”, BIS Working Paper No. 268, Bank for International Settlements, Basel.
- Brunnermeier, M.K. (2009), “Deciphering the liquidity and credit crunch 2007–2008”, *Journal of Economic Perspectives* 23, 77-100.
- Cetorelli, N. and L.S. Goldberg (2009), “Globalized banks: Lending to emerging markets in the crisis”, Federal Reserve Bank of New York Staff Report No. 377, New York.
- Champagne, C. and L. Kryzanowski (2007), “Are current syndicated loan alliances related to past alliances?”, *Journal of Banking & Finance* 31, 3145-3161.
- Chen, H.C., C.J. Jhou and H.C. Yeh (2007), “Signaling by underwriter retention rate in the IPO market”, *Applied Economics* 39, 1973-1983.
- Cook, D.O., Schellhorn, C.D. and L.J. Spellman (2003), “Lender certification premiums”, *Journal of Banking & Finance* 27, 1561-1579.
- Corwin, S.A. and P. Schultz (2005), “The role of IPO underwriting syndicates: Pricing, information production, and underwriter competition”, *Journal of Finance* 60, 443-486.
- Dell’Ariccia, G., D. Igan and L. Laeven (2008), “Credit booms and lending standards: Evidence from the subprime mortgage market”, IMF Working Paper No. 08/106, International Monetary Fund, Washington, D.C.

- Dennis, S.A. and D.J. Mullineaux (2000), “Syndicated loans”, *Journal of Financial Intermediation* 9, 404-426.
- Depository Trust and Clearing Corporation (DTCC) (2008), *Transforming the Syndicated Loan Market. A White Paper to the Industry*, www.dtcc.com/downloads/leadership/whitepapers/Transforming_Syndicated_Loan_Market.pdf
- Diamond, D.W. (1984), “Financial intermediation and delegated monitoring” *Review of Economic Studies* 51, 393-414.
- Diamond, D.W. (1991), “Monitoring and reputation: The choice between bank loans and directly placed debt”, *Journal of Political Economy* 99, 689-721.
- Diamond, D.W. (1996), “Financial intermediation as delegated monitoring: A simple example”, *Federal Reserve Bank of Richmond Economic Quarterly* 82, no. 3: 51-66.
- Duchin, R., O. Ozbas and B.A. Sensoy (2010), “Costly external finance, corporate investment, and the subprime mortgage credit crisis”, *Journal of Financial Economics* 97, 418-435.
- Esty, B.C. and W.L. Megginson (2003), “Creditor rights, enforcement and debt ownership structure: evidence from the global syndicated loan market”, *Journal of Financial and Quantitative Analysis* 38, 37-59.
- Fender, I. and J. Mitchell (2009), “The future of securitization: how to align incentives?”, *BIS Quarterly Review*, September, 27-43.
- Fight, A. (2004), *Syndicated lending*, Elsevier Butterworth-Heinemann, Oxford.
- Gatti, S., S. Kleimeier, W.L. Megginson and A. Steffanoni (2008), “Arranger certification in project finance”, mimeo.
- Giannetti, M. and Y. Yafeh (2008), “Do cultural differences between contracting parties matter? Evidence from syndicated bank loans”, CEPR Discussion Paper 7020, CEPR, London.
- Godlewski, C.J. (2008), “What drives the arrangement timetable of bank loan syndications?”, Laboratoire de Recherche en Gestion et Economie Working Paper No. 2008-02, Université de Strasbourg.
- Goldstein, M. (1998), *The Asian Financial Crises: Causes, Cures, and Systemic Implications*, Policy Analyses in International Economics 55, Institute for International Economics Washington, D.C.
- Goplan, R., V. Nanda and V. Yerramilli (2007), “Lead arranger reputation and the loan syndication market”, mimeo.
- Gorton, G. and G. Pennachi (1995), “Banks and loan sales: Marketing non-marketable assets”, *Journal of Monetary Economics* 35, 389-411.
- Heckman, J. (1979), “Sample selection bias as a specification error”, *Econometrica* 47, 153–61.
- Hofstede, G. (2001), *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations*, 2nd ed., Thousand Oaks, CA: SAGE Publications.
- Holmström, B. and J. Tirole (1997), “Financial intermediation, loanable funds, and the real sector”, *Quarterly Journal of Economics* 112, 663-691.

- IMF (2009), “*Global Financial Stability Report: Navigating the financial challenges ahead*”, International Monetary Fund, Washington, D.C.
- Ivashina, V. (2009), “Asymmetric information effects on loan spreads”, *Journal of Financial Economics* 92, 300-319.
- Ivashina, V. and D. Scharfstein (2010a), “Bank lending during the financial crisis of 2008”, *Journal of Financial Economics* 97, 319-338.
- Ivashina, V. and D. Scharfstein (2010b), “Loan syndication and credit cycles”, *American Economic Review: Papers and Proceedings* 100, no. 2: 1-8.
- Ivashina, V. and Z. Sun (2010), “Institutional demand pressure and the cost of corporate loans”, *Journal of Financial Economics*, forthcoming.
- James, C. (1987), “Some evidence on the uniqueness of bank loans”, *Journal of Financial Economics* 19, 217-238.
- Jiménez, G., S. Ongena, J.L. Peydró and J. Saurina (2008), “Hazardous times for monetary policy: What do twenty-three million bank loans say about the effects of monetary policy on credit-risk taking?”, Banco de España Working Paper No. 833, Banco de España, Madrid.
- Jiménez G., S. Ongena, J.L. Peydró and J. Saurina (2010), “Credit supply: Identifying balance-sheet channels with loan applications and granted loans”, mimeo.
- Jones, J.D., W.W. Lang and P.J. Nigro (2005), “Agent bank behavior in bank loan syndications”, *Journal of Financial Research* 28, 385-402.
- Kaminsky, G.L., C.M. Reinhart, and C.A. Végh (2003), “The unholy trinity of financial contagion”, *Journal of Economic Perspectives* 17, no. 4: 51-74.
- Keys, B.J., Mukherjee, T., Seru, A. and V. Vig (2010), “Did securitization lead to lax screening? Evidence from subprime loans”, *Quarterly Journal of Economics* 125, 307-362.
- Kleimeier, S. and W.L. Megginson (2000), “Are project finance loans different from other syndicated credits?”, *Journal of Applied Corporate Finance* 13, 75-87.
- Lee, S.W. and D.J. Mullineaux (2004), “Monitoring, financial distress, and the structure of commercial lending syndicates”, *Financial Management* 33, 107-129.
- Maddaloni, A., J. Peydró and S. Scopel (2009), “Does monetary policy affect bank credit standards? Evidence from the Euro area bank lending survey”, mimeo.
- Mian, A. and A. Sufi (2009), “The consequences of mortgage credit expansion: Evidence from the 2007 mortgage default crisis”, *Quarterly Journal of Economics* 124, 1449-1496.
- Parlour, C.A. and G. Plantin (2008), “Loan sales and relationship banking”, *Journal of Finance* 63, 1291-1314.
- Pennacchi, G. (1988), “Loan sales and the cost of bank capital”, *Journal of Finance* 43, 375-396.
- Perotti, E. and J. Suarez (2009), “Liquidity insurance for systemic crises”, CEPR Policy Insight 31.
- Preece, D. and D.J. Mullineaux (1996), “Monitoring, loan renegotiability, and firm value: The role of lending syndicates”, *Journal of Banking & Finance* 20, 577-593.
- Puri, M., J. Rocholl, and S. Steffen (2009), “The impact of the U.S. financial crisis on global retail banking”, mimeo.

- Rajan, R.G. (1994), "Why bank credit policies fluctuate: A theory and some evidence", *Quarterly Journal of Economics* 109, 399-441.
- Rhodes, T. (2004), "*Syndicated Lending. Practice and Documentation*", 4th ed., Euromoney, London.
- Ruckes, M. (2004), "Bank competition and credit standards", *Review of Financial Studies* 17, 1073-1102.
- Simons, K. (1993), "Why do banks syndicate loans?", *New England Economic Review* 4, 45-52.
- Shleifer, A. and R.W. Vishny (2010), "Unstable banking", *Journal of Financial Economics* 97, 306-318.
- Steffen, S. and M. Wahrenburg (2008), "Syndicated loans, lending relationships and the business cycle", mimeo.
- Sufi, A. (2007), "Information asymmetry and financing arrangements: Evidence from syndicated loans", *Journal of Finance* 62, 629-668.
- Van Rijckeghem, C. and B. Weder (2003), "Spillovers through banking centers: A panel data analysis of bank flows", *Journal of International Money and Finance* 22, no. 4: 483-509.

Appendix Table 1
Geographic distribution of the sample

Region	Country	Per cent	Region	Country	Per cent
North America	United States	34.97	Asia and Pacific	Vietnam	0.18
	Canada	2.48		Thailand	0.63
	Bermuda	0.25		Taiwan, China	12.78
Western Europe	Norway	3.31		Singapore	2.64
	Italy	3.04		Philippines	0.34
	Spain	2.91		New Zealand	1.58
	France	2.23		Malaysia	0.74
	Germany	2.21		Korea, Rep.	3.09
	United Kingdom	1.69		Indonesia	0.77
	Netherlands	1.69		India	3.40
	Greece	0.92		Hong Kong, China	2.80
	Sweden	0.74	China	3.31	
	Belgium	0.59	Australia	4.53	
	Switzerland	0.47	Latin America	Brazil	0.52
	Finland	0.38		Mexico	0.32
	Denmark	0.27		Chile	0.34
	Ireland	0.20		Panama	0.23
Portugal	0.16	Peru		0.07	
Austria	0.16	Middle East and Africa	Argentina	0.09	
Luxembourg	0.09		United Arab Emirates	0.27	
Iceland	0.05		Turkey	0.25	
Eastern Europe and Central Asia	Russian Federation		0.63	South Africa	0.18
	Czech Republic		0.20	Qatar	0.02
	Poland		0.20	Saudi Arabia	0.11
	Ukraine		0.18	Kuwait	0.02
	Hungary		0.11	Bahrain	0.02
	Kazakhstan	0.07	Egypt, Arab Rep.	0.02	
	Latvia	0.05	Oman	0.05	
	Romania	0.05	Iran, Islamic Rep.	0.02	
Slovenia	0.02	Sub-Saharan Africa	Liberia	0.25	
			Nigeria	0.05	
			Mauritius	0.05	