The crisis as a wake-up call. Do banks tighten lending standards during a financial crisis?

de Haas, Ralph and van Horen, Neeltje

European Bank for Reconstruction and Development (EBRD), Central Bank of the Netherlands (DNB)

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Ralph de Haas and Neeltje van Horen*

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Abstract

We examine whether the global financial crisis has prompted banks to tighten lending standards. By analyzing nearly 31,000 syndicated loans to private borrowers in 65 countries over the period 2005-2009, we find that banks not only cut lending during a crisis but also increase their screening and monitoring. Lending standards are tightened in particular for uncollateralized loans, loans to first-time borrowers, and financial-sector borrowers in developed countries. While in developed countries screening and monitoring increases less for loans to rated borrowers and for loans structured by well-known arrangers, we show that the attenuating impact of credit ratings and arranger reputation does not extend to emerging markets.

JEL Classification: D82, G15, G21

Keywords: bank lending, financial crisis, asymmetric information, screening, monitoring, syndication

* De Haas is with the European Bank for Reconstruction and Development (EBRD) and Van Horen is with the Central Bank of the Netherlands (DNB) and the University of Amsterdam. The authors thank Stephan Knobloch, Deimante Morkunaite, and Natalie Jung for excellent research assistance, Tanya Abbott and Vladislav Chiriac for helpful assistance with data downloading, Mattia Landoni for his tremendous help with programming and Erik Berglöf, Jaap Bikker, Stijn Claessens, Diemo Dietrich, Stefano Gatti, Stefan Gerlach, Refet Gurkaynak, Lorenz Jorgensen, Evan Kraft, Sweder van Wijnbergen, Jeromin Zettelmeyer, and participants at the DNB Lunch Seminar, the EBRD Brown Bag Seminar, and the 15th Dubrovnik Economic Conference for useful comments. E-mail addresses: dehaasr@ebrd.com and n.van.horen@dnb.nl.

1. Introduction

The period between 2001 and the first half of 2007 was a time of exceptionally high economic growth throughout large parts of the world. Risk perceptions came down rapidly and many believe that the unfettered risk taking by banks contributed to the outbreak of the financial crisis in August 2007. The crisis affected banks across the world through increased uncertainty about borrower quality and a concomitant decline in available bank funding.[1] Banks reacted by significantly reducing their volumes of new lending. For example, global syndicated loan volumes fell by 41 per cent, to USD 2.9 trillion, in 2008 according to Dealogic Loan Analytics.

During periods of financial and economic turmoil, when uncertainties about borrower quality increase and banks may see a reduction in available funding, it seems straightforward that banks reduce their overall lending. However, banks tend to be hesitant to terminate relationships with existing borrowers, as ending such relationships can be costly when banks have invested in gathering proprietary information about clients (Rajan, 1992; Ongena, 1999). It can therefore be expected that during a crisis, banks do not just reduce the overall amount of lending, but adjust their lending in other ways as well. However, not much is known about *how* banks change their lending behavior when faced with increased risk. This paper attempts to shed some light on this. We analyze whether banks passively reduced lending across the board during the global financial crisis or whether the crisis acted as a wake-up call for banks to step up screening and monitoring in order to improve the quality of their loan portfolios and to convince depositors and other financiers of their financial health.

Our empirical evidence shows that during the crisis banks indeed did not simply cut lending indiscriminately but started to make a bigger effort to pick better customers and to monitor them more carefully. Lending standards were tightened in particular for borrowers without a borrowing history, without a credit rating or without collateral, and for financial-sector borrowers in high-income countries (which were the focal point of uncertainty about subprime-related losses). Interestingly, we find that while certain formal and informal mechanisms to overcome information asymmetries between borrowers and lenders – such as credit ratings – worked effectively in developed countries, such mechanisms did not insulate borrowers in emerging markets from increased bank scrutiny during the crisis. Our results are corroborated by data on the decline of bank lending volumes. Those loan and borrower categories for which we document the strongest tightening of screening and monitoring standards, are indeed those that saw the sharpest decline in lending volumes during the crisis.

Our results are based on data from the syndicated loan market. Syndicated loans are large loans that are provided by a group of financial institutions – the syndicate – to a single borrower.[2] Through

[1] The rise in credit risk led to widening spreads between interest rates on secured and unsecured inter-bank loans (Taylor, 2008) and between yields on corporate bonds and risk-free government securities.

[2] Dennis and Mullineaux (2000) and Fight (2004) provide extensive descriptions of the syndicated loan market.

syndication loans can be spread across several institutions, allowing each bank to better diversify its loan portfolio (Simons, 1993). This market is of particular interest for several reasons. First, syndicated loans are a major source of external finance for a variety of firms in both the developed world and in emerging markets (DTCC, 2008). Second, syndicated lending combines characteristics of public financing with those of traditional bank lending (Boot, 2000). Like bond markets, there are several creditors involved in lending to a single borrower, but syndicate members still monitor borrowers as is typically the case in relationship lending. Third, in contrast with bilateral bank lending, detailed information on syndicated loans is publicly available which allows us to exploit borrower heterogeneity and control for loan, borrower and lender characteristics. Fourth, and most importantly, the structure of syndicates reveals important information about bank lending standards.

A typical syndicate consists of two tiers of banks: arrangers and participants. The arrangers comprise the senior tier and negotiate the lending terms with the borrower. They are mandated by the borrower to structure, organize, and market the loan. Although arrangers usually retain a part of the loan on their own books, they allocate most of it to the second, junior tier of syndicate members, the participants. On-selling allows arrangers to take on new syndication mandates, earn the related fee income, and better diversify their exposure to individual borrowers (Pennacchi, 1988; Ivashina, 2009). Participants have a more passive role than arrangers: they buy a portion of the loan but are neither involved in its organization nor in the screening and monitoring of the borrower. For their internal credit approval processes participants tend to 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 screening or due diligence of the borrower. Also for the monitoring of the borrower the participants rely on the arrangers, which provide them with periodical updates in the form of audited and unaudited accounts as well as information on the observance of loan covenants.

We exploit the fact that increased screening and monitoring during a crisis will be reflected in changes in the structure of lending syndicates. When screening and monitoring becomes more important for the participating banks, arrangers will need to retain a larger portion of each loan and syndicates will become more concentrated (Sufi, 2007). This mechanism is in line with the theoretical model of Holmström and Tirole (1997) in which uninformed lenders (the participants) have to be convinced that informed lenders (the arrangers) exert the necessary effort in screening and monitoring borrowers. Since arrangers' effort is costly and unobservable to the participants, the latter will want the arrangers to retain a portion of each loan in order to prevent moral hazard. We show that during the crisis arranging banks indeed retain more of each loan and form more concentrated syndicates, in line with an increased focus on screening and monitoring among participating banks.

This paper contributes in several ways to the extant banking literature. First, we use data on a particular type of bank lending to provide novel insights into how banks respond to financial crises.

There exists a considerable literature on the impact of financial crises on the amount of bank lending – see for instance Demirgüç-Kunt, Detragiache and Gupta (2006) – but empirical studies that explore the impact of crises on the underlying bank behavior are few and far between. Second, we contribute to the growing literature on syndicated lending. Earlier papers have studied the structure of lending syndicates to analyze how banks deal with asymmetric information (Dennis and Mullineaux, 2000; Lee and Mullineaux, 2004; Sufi, 2007), with weak creditor rights (Esty and Megginson, 2003), with the risk of strategic defaults (Preece and Mullineaux, 1996), and with cultural differences (Giannetti and Yafeh, 2008). We contribute to this literature by analyzing how the financial crisis and the associated increase in risk and uncertainty have impacted lending syndicates.

The remainder of this paper is structured as follows. Section 2 provides an overview of the literature after which Section 3 describes our data and empirical methodology. Sections 4 and 5 then explain our basic results, after which section 6 goes deeper into the impact of the crisis on lending standards for different borrower types. Section 7 concludes.

2. Financial crises, bank lending, and lending standards

The empirical banking literature on the impact of financial crises mostly deals with the influence of crises on the amount of bank lending. Calomiris and Wilson (2004) show that during the Great Depression of the 1930's New York-based banks were forced to substitute loans with riskless assets in order to prevent deposit withdrawals. Demirgüç-Kunt, Detragiache and Gupta (2006) find similar evidence for a broader country sample. In addition to limiting the risk of their asset portfolio, banks also often increase their capital buffer to further isolate depositors from credit risk (see Demirgüç-Kunt, Detragiache and Gupta, 2006 and the references therein). As a result of such 'deleveraging', bank lending tends to contract substantially during a financial crisis (De Haas and Van Lelyveld, 2006; 2009). Also for the current crisis empirical evidence of a reduction in the supply of bank credit is emerging. Ivashina and Scharfstein (2008) show that banks in the US, especially those that experienced draw-downs on revolving credit facilities with existing customers, sharply reduced their supply of new corporate lending. Cetorelli and Goldberg (2009) document how US banks also sharply reduced their credit to emerging markets during the crisis. For Germany, Puri, Rocholl, and Steffen (2009) provide evidence of a crisis-related reduction in bank lending to retail customers.

There is less empirical evidence on *how* banks reduce their lending. In particular, do banks passively cut lending across the board or do they increase screening and monitoring to improve borrower quality at the same time?[3] The screening of new customers will be particularly important when banks

[3] See Allen (1990), Broecker (1990) and Diamond (1984) on the economics of screening and monitoring.

are hesitant to reduce lending to existing customers. This will be the case when banks have invested in client relationships through gathering proprietary information (Rajan, 1992; Ongena, 1999) or through accepting loss-making transactions in the short-term in the hope of establishing profitable relationships in the longer term (Boot, 2000).

We expect that the pay-off of screening and monitoring increased during the crisis. During the preceding boom years, the probability of firms defaulting was relatively low and the advantages of screening and monitoring (such as reduced shirking by firm management) mostly benefited shareholders rather than creditors. During the crisis, as the proportion of firms with a high probability of default increased, the importance of screening and monitoring rose (Ruckes, 2004). There exists indeed some empirical evidence that when borrowers perform well, lending standards are relaxed while they are tightened during a negative economic shock (Rajan, 1994; Berger and Udell, 2004). Steffen and Wahrenburg (2008) find that during recessions banks not only tighten credit standards but also exploit their information monopoly over borrowers by charging higher loan spreads.

Our empirical approach to analyze whether screening and monitoring increased during the current crisis builds on the seminal theoretical work by Holmström and Tirole (1997). A crucial feature of their model is that banks not only invest their own capital in firms but also funds from 'uninformed investors' such as depositors. This reduces their incentive to screen and monitor borrowers and creates an agency problem between banks and their financiers. In order to overcome this moral hazard problem, banks need to inject a sufficient amount of own capital into firms (Leland and Pyle, 1977). Only then will the providers of funding to the banks be reassured that the latter will not shirk.

The Holmström and Tirole (1997) model can be readily applied to the syndicated loan market. Participants are essentially uninformed investors that rely on the screening and monitoring of arrangers. In order to convince participants that they do not shirk, arrangers need to keep a portion of the syndicated loan on their own balance sheet. A higher retention rate implies a greater commitment to monitor, as arrangers have more of their own money at stake. A higher retention also signals that arrangers have thoroughly screened borrowers or have gained private information about them through previous lending relationships. In general, arrangers will want to sell most of each loan in order to free up space on their balance sheet, to engage in new (fee generating) syndications, and to diversify their loan portfolio. Increasing retention rates are thus unlikely to be voluntary but instead reflects pressures from the participants within the syndicate.[4] Several studies find that particularly in the case of opaque borrowers, arrangers are forced to retain a large part of the loan in order to signal that they have appropriately screened the borrower (Dennis and Mullineaux, 2000; Jones, Lang and Nigro,

[4] Ivashina (2009) finds that arrangers that need to retain a larger loan portion in order to reduce agency problems within the syndicate, charge a higher loan spread to the borrower in order to compensate for the fact that this higher stake limits their ability to optimally diversify their loan portfolio.

2005; Sufi, 2007).[5] Similarly, Giannetti and Yafeh (2008) find that arrangers need to retain more of each loan in case of significant cultural differences between them and the participant banks.

On the basis of the literature summarized above, we hypothesize that during the current financial crisis banks have significantly tightened their lending standards in order to overcome the increase in informational asymmetries vis-à-vis potential borrowers. This greater focus on screening and monitoring will be reflected in an increase in the loan share that arrangers individually and jointly retain.[6] When arrangers need to retain more of each loan on their balance sheet, this means that loans are to a lesser extent spread among various lenders. This reduced dispersal in the form of higher arranger stakes will result in more concentrated syndicates, in particular if the number of participants decreases as they become more hesitant to buy syndicated loans in the first place (even if arrangers would keep a larger share of each loan). Finally, we expect that the crisis-related increase in the tightening of lending standards and its impact on syndicate structures will be most pronounced for loans where information asymmetries are relatively high. In the remainder of this paper, we test these predictions by analyzing data on syndicated bank lending before and during the financial crisis.

3. Data and methodology

3.1 Data and summary statistics

We obtain our data from the Dealogic Loan Analytics database, which provides comprehensive data on virtually all global syndicated loans. Lenders have a strong incentive to report deals to Dealogic as this database is used by the financial press to generate league tables of the most successful arrangers. Our dataset contains detailed information on 30,698 syndicated loans to private borrowers in the United States, Japan, Western Europe, various other high-income countries, as well as a number of emerging economies (see the Annex for more details on the geographical break-down of the dataset).[7] All loans were signed between January 2005 and end-April 2009. Just over sixty 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. The tranches of a syndicated deal are negotiated at the same point in time and are part of one contract and as such cannot be treated

[5] 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).

[6] Increasing the number of arrangers could lead to duplication of monitoring efforts or, on the contrary, to free-riding among arrangers (Esty and Megginson, 2003). However, in most syndications an agent bank performs the practicalities of monitoring on behalf of all arrangers. To the extent that this effectively centralizes the monitoring process, adding more arrangers will be less of a problem.

[7] We exclude countries without significant syndicated lending (less than 25 loans over the sample period).

econometrically as individual observations (Sufi, 2007). Using the loan as the unit of observation also prevents oversampling.

Our dataset includes information about the borrower (country of incorporation, industry, and credit rating), about the loan terms (maturity, volume, currency, spread, fee structure, and loan purpose), and about the structure of the syndicate (number of arrangers and participants). For a sub-sample of the data we also have information on the share of the loan held by each lender. Our initial data download consists of 36,397 loans. For each loan we check the availability of information on the identities of all syndicate members and only keep loans with complete and consistent information. We exclude loans to (quasi-) government entities, loans where an international financial institution (such as the EBRD or the IFC) is a syndicate member, and project finance loans (see also Section 4.2). This data cleansing reduces our sample to 30,698 loans. For each loan we categorize all syndicate members as either arrangers or participant banks. We define arrangers as those financial institutions with the title of mandated lead arranger or book runner and classify all other syndicate members as participants.[8,9]

Our main independent variable is a crisis dummy that is '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-April 2009 (the latter date is the cut-off date of our dataset). We let the crisis start in October 2007 rather than August 2007 to take into account that there is a time lag between starting loan negotiations and signing the deal. The negotiation and arrangement process takes on average almost eight weeks (Godlewski, 2008). Thirty percent of all observations concern loans signed during the crisis period; the remainder was signed pre-crisis. Figure 1 depicts the very significant decline in the total volume of syndicated lending during the crisis.[10]

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

[9] 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.

[10] Due to reporting lags we may somewhat underestimate the loan volume in the first quarter of 2009 as our final data download was conducted at the beginning of May 2009 (cf. Ivashina and Scharfstein, 2008).

Figure 1
Total Syndicated Lending Before and During the Crisis (quarterly)

The figure shows the development of syndicated lending volumes over the period January 2005 - April 2009. Loans to (quasi-) government entities, loans where an international financial institution is a syndicate member, and project finance loans are excluded.

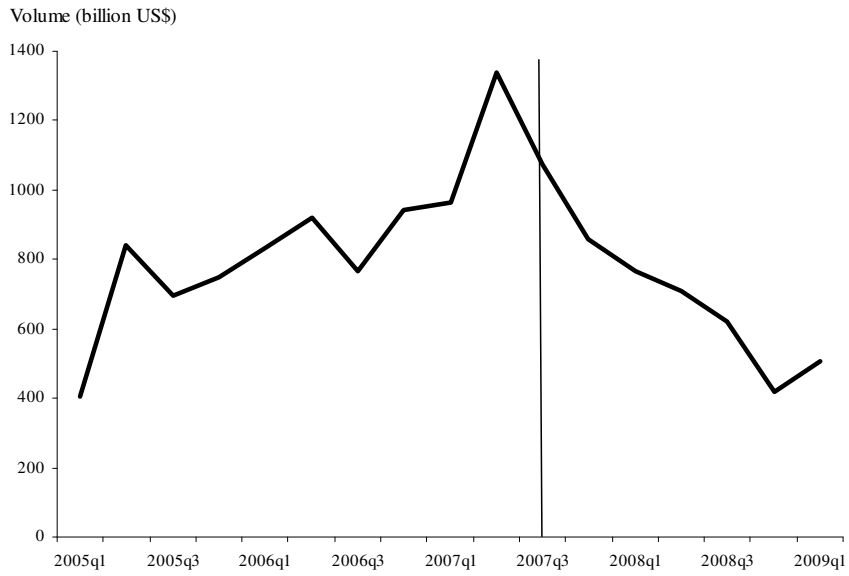

Table 1 provides summary statistics for the variables that we use in the empirical analysis. Before the crisis, the average loan amounts to USD 460 million and has an average maturity of four years and five months. During the crisis, loans become on average 7 per cent smaller and the average maturity shortens by half a year. We create three dummy variables that single out loans with the purpose of refinancing an existing loan, acquiring a company (acquisition finance), or for general corporate purposes (such as working capital). Before the crisis, 25 per cent of all syndicated loans are meant to refinance existing loans and during the crisis only 20 per cent. We also include two risk mitigant dummies. The first one indicates whether a loan is secured through collateral and the second one whether repayment is guaranteed by a third party. Pre-crisis only 4 per cent and 15 per cent of all loans are guaranteed by a third party or secured by collateral, respectively. During the crisis the percentage of secured loans drops to 12 per cent, suggesting banks move away from relatively risky loans (which in general are secured).

As dependent variables we create a number of measures of loan syndicate structure. These include the number of arrangers, the number of participating banks, and the average share and the total share of the loan held by the arrangers. We measure the concentration of the syndicate by the Herfindahl-Hirschman Index (HHI), which is the sum of the squared loan shares held by all syndicate members, and by the combined loan share of the five largest syndicate members. The structure of the lending syndicate changes during the crisis.[11] While the average number of arrangers stays at about 2.4, the

[11] Note that these are basic descriptive statistics where we do not correct for changes in loan size.

average number of participants declines from 4.2 to 3.2. The average percentage of the loan that the arrangers jointly retain increases by 15 per cent to 63 per cent, while the average share kept by each individual arranger remains about the same. Lending syndicates also become more concentrated. The share held by the five largest lenders increases by 4 per cent and the HHI by 3 per cent. Unfortunately, complete information on the distribution of the loan among the syndicate members is only available for just below thirty per cent of the sample (8,753 loans). The characteristics of the loans in the full sample and of those for which we have information on arranger shares and concentration ratios are, however, similar. The main difference between the two samples is that loans in the full information sub-sample are smaller on average.

Table 1
Summary Statistics for Syndicated Loan Deals - Pre-Crisis and Crisis

The table shows summary statistics for our sample of 30,698 syndicated loans signed between January 2005 and April 2009. The pre-crisis period starts January 2005 and ends September 30th 2007, the crisis period includes the rest of the sample period. T-test shows whether the mean of the variable in the pre-crisis period differs significantly from the mean in the crisis period.

	Pre-Crisis			Crisis			
	No.	Mean	St. Dev.	No.	Mean	St. Dev.	T-test
Syndicated loan characteristics							
Volume (US$ million)	20,950	460	1338	9,352	429	1403	0.07
Maturity (years)	20,286	4.41	2.73	8,942	3.93	2.89	0.00
Loan is guaranteed	21,343	0.04	0.19	9,355	0.04	0.20	0.02
Loan is secured	20,953	0.15	0.36	9,355	0.12	0.33	0.00
Loan for refinancing purposes	21,343	0.25	0.43	9,355	0.20	0.40	0.00
Loan for acquisition purposes	21,343	0.15	0.36	9,355	0.13	0.33	0.00
Loan for general corporate purposes	21,343	0.49	0.50	9,355	0.55	0.50	0.00
Syndicate structure characteristics							
Number of arrangers	21,343	2.48	2.30	9,355	2.42	2.24	0.06
Number of participants	21,343	4.20	4.86	9,355	3.24	3.98	0.00
Total share held by arrangers	6,623	0.55	0.26	2,130	0.63	0.27	0.00
Average share held by arrangers	6,578	0.35	0.22	2,109	0.34	0.20	0.08
Concentration: share of five largest lenders	6,623	0.85	0.21	2,130	0.88	0.19	0.00
Concentration: Herfindahl index	6,623	0.29	0.19	2,130	0.30	0.18	0.04
Borrower and lender characteristics							
Borrower has credit rating	21,343	0.25	0.43	9,355	0.21	0.41	0.00
Borrowed at least once in 5 years prior to loan signing	21,343	0.49	0.50	9,355	0.60	0.49	0.00
Located in USA	21,343	0.40	0.49	9,355	0.37	0.48	0.00
Located in Japan	21,343	0.23	0.42	9,355	0.27	0.45	0.00
Located in an emerging market	21,343	0.13	0.34	9,355	0.16	0.36	0.00
Average market share of arrangers at time *t-1*	21,196	1.13	0.97	9,235	1.13	0.99	0.97
Rating of sovereign (numerical, D=1 & AAA=18)	21,343	16.1	3.44	9,355	16.0	3.67	0.02

As independent variables, we create a set of borrower and lender variables. The first dummy variable captures whether the borrower is rated by a rating agency at the time of signing of the loan or not. In general, more information will be publicly available about rated borrowers. The share of rated borrowers drops from 25 to 21 per cent during the crisis. We also create regional dummy variables that indicate whether the borrower is incorporated in the USA, Japan, or an emerging market. About 40 per cent of all borrowers are US firms, about 25 per cent are Japanese, and some 15 per cent are based in an emerging market. There are no major changes in the geographical distribution of the borrowers during the crisis.

We also construct a dummy variable that proxies the reputation of borrowers. It is 'one' if the borrower has at least once successfully raised a syndicated loan during the five years preceding the signing of the current loan. Reputation can attenuate the information asymmetries between borrowers and lenders or between arrangers and participants (Gorton and Pennachi, 1995). We expect that information asymmetries between repeat borrowers and lenders are smaller than between first-time borrowers and lenders (Diamond, 1991). During the crisis there is a significant increase in the percentage of repeat borrowers from 49 per cent to 60 per cent. This increase is not caused by an increase in refinancing deals – these decline significantly during the crisis – but rather by banks providing independent, new loans to borrowers that are already known in the syndications market.

Finally, we construct an arranger reputation variable that captures the experience and skills of the arranger group of a particular loan (Sufi, 2007; Goplan, Nanda and Yerramilli, 2007). Arrangers with a lot of prior experience know that the reputation they have built over time is valuable as it helps them to be involved in future deals as well. They will thus be less inclined to mislead participants as this may jeopardize their reputation and future deal flow. 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 the loan. Champagne and Kryzanowski (2007) find that the probability of a participant joining a syndicate is higher in case of more reputable arrangers.

We first calculate for each year the market share of the top 200 arrangers in the global syndication market. For a loan in year *t*, we then add the market shares in year *t-1* of all arrangers of that loan. For each syndicated loan we thus approximate the joint market share of all arrangers in the previous year. In case an arranger is not in the previous year's top 200, the market share for that arranger is set to zero. The joint 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 total 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. During the crisis the arranger reputation stayed the same at 1.1 per cent of the total syndicated lending market in the previous year.

3.2 Empirical methodology

Throughout the paper we report regressions in which the dependent variable is one of our measures of syndicate structure (SS_i): the number of arrangers, the number of participants, the total share held by the arrangers, the average share held by the arrangers, the share held by the five largest syndicate members, or the Herfindahl index. To measure the impact of the crisis on syndicate structure, we use our crisis dummy ($crisis_i$), either as a stand-alone independent variable or – in Section 6 – to create interaction terms. As explained in the previous sub-section, we also include loan-specific (L_i), borrower-specific (B_i), or arranger-specific (A_i) variables that we expect to have an impact on the structure of syndicates. Loan-specific variables such as maturity, amount and collateral are usually decided upon before the syndication process (during the negotiations between the arrangers and the borrower) and as such are exogenous to the syndicate structure. We experiment with sector dummies but these turn out to be mostly statistically insignificant and we thus exclude them to preserve degrees of freedom. However, including sector dummies does not change any of our results. Our basic regression specification thus looks as follows:

$$SS_i = \alpha + \beta \cdot crisis_i + \gamma_1 \cdot L_i + \gamma_2 \cdot B_i + \gamma_3 \cdot A_i + \varepsilon_i \quad (1)$$

We estimate Tobit regressions since our dependent variables are either censored at one side (number of participants and arrangers) or on both sides (share variables). Throughout all tables the coefficients are marginal effects and all standard errors are heteroskedasticity robust and clustered at the borrower level. We obtain very similar results when clustering at the sector level and when using an OLS regression technique or – in the case of discrete and non-negative dependent variables like the number of arrangers or participants – a Poisson regression technique (results are available upon request).

4. The financial crisis and bank lending standards

4.1 Basic empirical results

Table 2 provides the results of our basic regression estimates to examine the impact of the global financial crisis on various measures of syndicate structure. The first two columns show regressions for the full sample with the number of arrangers and participants as dependent variables, respectively. Columns three to eight show regressions for the sub-sample for which we have full information on the distribution of the loan among the lenders, which allows us to create the share and concentration variables. Columns three and four replicate the first two columns but now for the sub-sample only. The overall similarity between the results in the first two columns and those in columns three and four

adds further confidence to our earlier conclusion that there are no systematic differences between the loans in our full and in our partial sample.

Table 2
Impact of Crisis on Syndicate Structure

This table shows the results of Tobit regressions estimating the impact of the crisis on the structure of loan syndicates. *Crisis* is a dummy which is one for the crisis period (October 2007 until April 2009) and zero for the pre-crisis period (January 2005-September 2007). *Volume* equals the log of the loan amount in dollars. *Maturity* is the log of the maturity of the loan in days. *Rated* is a dummy which is one if the borrower is rated. *Secured* is a dummy which is one if the loan is secured. *Guaranteed* is a dummy which is one if the loan is guaranteed. *Borrower reputation* is a dummy which is one if the borrower borrowed at least once in the five years prior to loan signing. *Arranger reputation* measures the average market share of the arrangers in the year prior to loan signing. *Refinancing, Acquisition* and *Corporate* are loan purpose dummies which are one if the main loan purpose is refinancing, acquisition or general corporate purpose, respectively. The omitted loan purpose group is "Other". *Sovereign rating* is the (numerical) rating of the country in which the borrower is located at time of signing (higher value implies lower risk). *USA* and *Japan* are dummies which are one if the borrower is located in the United States or Japan, respectively. Full sample includes all loans. Partial sample includes only those loans for which the amount held by each syndicate member is available. Standard errors are heteroskedasticity robust and clustered by borrowing firm. All regressions include a constant and coefficients are marginal effects. Robust p-values appear in brackets and ***, ** and * correspond to one, five and ten percent level of significance, respectively.

	Full Sample		Partial Sample					
	No. Arrangers	No. Participants	No. Arrangers	No. Participants	Total Share Held By Arrangers	Mean Share Held By Arrangers	Total Share Held By Top 5 Lenders	Herfindahl Index
Crisis	0.016	-0.833***	0.145***	-1.469***	0.086***	0.016***	0.042***	0.028***
	[0.491]	[0.000]	[0.004]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Volume	0.524***	0.744***	0.568***	1.105***	-0.003	-0.055***	-0.063***	-0.051***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.309]	[0.000]	[0.000]	[0.000]
Maturity	0.098***	0.120***	0.196***	0.343***	-0.011**	-0.016***	-0.017***	-0.010***
	[0.000]	[0.002]	[0.000]	[0.000]	[0.022]	[0.000]	[0.000]	[0.000]
Rated	0.464***	0.258***	0.776***	0.832***	0.024*	-0.037***	-0.032***	-0.021***
	[0.000]	[0.007]	[0.000]	[0.000]	[0.055]	[0.000]	[0.000]	[0.000]
Secured	-0.340***	-0.714***	-0.218***	-0.471***	0.017	0.035***	0.027***	0.024***
	[0.000]	[0.000]	[0.003]	[0.001]	[0.109]	[0.000]	[0.000]	[0.000]
Guaranteed	0.257***	-0.105	0.181	-0.312	0.003	-0.019***	-0.015**	-0.004
	[0.006]	[0.505]	[0.116]	[0.106]	[0.856]	[0.005]	[0.031]	[0.548]
Borrower reputation	0.249***	0.341***	0.294***	0.381***	-0.001	-0.021***	-0.023***	-0.016***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.941]	[0.000]	[0.000]	[0.000]
Arranger reputation	-0.272***	-0.147***	0.073**	0.543***	-0.020***	-0.022***	-0.021***	-0.015***
	[0.000]	[0.000]	[0.036]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Refinancing	0.444***	0.755***	0.667***	1.196***	-0.005	-0.071***	-0.085***	-0.080***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.690]	[0.000]	[0.000]	[0.000]
Acquisition	0.209***	-0.308***	0.576***	-0.322	0.109***	-0.028***	-0.015	-0.025***
	[0.000]	[0.004]	[0.000]	[0.191]	[0.000]	[0.001]	[0.115]	[0.002]
Corporate	0.185***	0.360***	0.533***	0.917***	-0.010	-0.058***	-0.060***	-0.067***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.400]	[0.000]	[0.000]	[0.000]
Sovereign rating	-0.079***	-0.155***	-0.053***	-0.233***	0.008***	0.009***	0.010***	0.009***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
USA	-0.168***	-0.199**	-0.513***	1.550***	-0.126***	0.011*	-0.010*	-0.011**
	[0.000]	[0.014]	[0.000]	[0.000]	[0.000]	[0.063]	[0.092]	[0.040]
Japan	-0.713***	1.195***	-0.525***	2.522***	-0.122***	0.086***	-0.020***	0.019***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.004]	[0.004]
Observations	29,017	29,017	8,042	8,042	8,042	8,042	8,042	8,042
LR chi2	7,217.47	1,938.35	2,955.44	1,317.97	538.25	5,653.61	4,413.37	4,295.68
Log Likelihood	-59,920.98	-78,213.63	-17,115.45	-21,420.06	-2,660.55	3,284.76	-2,487.50	4,097.70

Even when taking into account loan size and numerous other control variables, our results indicate a clear decrease in the number of participants during the crisis of about 27 per cent of the pre-crisis mean. There is no significant change in the number of arrangers in the full sample, while we find a small increase of about 6 per cent of the pre-crisis mean on the basis of the partial sample. Arrangers have reacted to the crisis by jointly retaining an additional 10 per cent of each loan on their own balance sheet, while the average share retained by each arranger increased with 2 per cent. The total loan share held by the top 5 lenders goes up by 4 per cent. As a result of the reduced number of participants and the increased retention rate of the arrangers, lending syndicates become more concentrated during the crisis, as evidenced by the significant increase in the Herfindahl index.

These empirical findings strongly confirm our hypothesis that banks have significantly tightened their lending standards during the crisis. The fact that arranging banks keep more of each loan on their own balance sheet during the crisis suggests that (prospective) participants demand stronger assurances that borrowers have been adequately screened and will be effectively monitored. To a certain extent the crisis thus partially reverses the typical pyramid structure of loan syndications, in which a small number of arrangers distributes a loan to a broad group of participants.

Our various control variables, which proxy for the level of information asymmetry between borrower and lenders, tell an interesting story as well.[12] Unsurprisingly, larger loans are distributed among larger syndicates as each lender needs to take account of exposure limits to individual borrowers. As a result, lending syndicates for large loans are on average less concentrated, which is in line with earlier findings by Lee and Mullineaux (2004) and Sufi (2007).

Next, we find that loans secured by collateral are provided by more concentrated syndicates that consist of fewer arrangers and participants. Whereas there are fewer arrangers, they each hold a bigger stake of the loan (there is no effect on the joint stake that the arrangers hold). Banks monitor secured loans more intensely, in line with Berger and Udell's (1990) observation that collateralized loans are more risky ex ante because they are granted to borrowers that need more intense monitoring.[13]

The interpretation of our findings on secured loans is further strengthened by our finding on the impact of borrower ratings. While having a rating does not mean that a borrower is less risky per se, a rating implies that the borrower has been scrutinized by one or more rating agencies such as Moody's or Standard & Poor's. The results of this due diligence, in the form of the rating and the accompanying research notes, are publicly available. The information asymmetry between a lending syndicate and a rated borrower will thus be smaller than between a lending syndicate and a non-rated

[12] Section 6 provides details on how different loan and borrower types are impacted differently by the crisis.

[13] 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 collateralized loans is higher so that incentives to monitor are less diluted.

borrower. In line with Lee and Mullineaux (2004) and Sufi (2007) we find that loans to rated borrowers are provided by less concentrated lending syndicates that consist of more arrangers and participants. Each arranger retains a smaller stake on its own balance sheet compared to loans to non-rated borrowers. When information asymmetries are low, there is less need for arranger banks to retain a large part of the loan to convince participants that they sufficiently screen and monitor.

Next, we look at the impact of borrower and lender reputation.[14] We find that syndicated loans to repeat borrowers are granted by larger, less concentrated syndicates in which each arranger retains less of the loan. Repeat borrowers are thus perceived as less risky and loans to such borrowers are plagued by fewer agency problems. We find similar results for arranger reputation: experienced and reputable arrangers can distribute a loan among a broader group of co-arrangers and participants, while jointly and individually retaining less of each loan.[15] Arranger reputation reduces agency problems within the lending syndicate.

Finally, we find a highly significant impact of the sovereign rating of the country where the borrower is based: loans to borrowers in riskier countries (a lower rating) are spread among more syndicate members. This reflects that both arrangers and participants have to abide by strict internal limits on aggregate country exposure. All else equal, banks will thus have a greater incentive to diversify a loan to a borrower in a risky country as in that case exposure limits are more binding.

4.2 Robustness tests

In this section we perform a number of methodological tests to see whether our main results are robust to using different specifications and data samples. In each robustness test we include the full set of control variables that were also included in the baseline regressions (Table 2), although the associated coefficients are not shown in Table 3 for reasons of brevity (available upon request from the authors).

We start by making sure that our baseline results are not driven by the inclusion or exclusion of certain loan categories. We first analyze 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 most syndicated loans. Club deals are included and earmarked in the Loan Analytics database. The percentage of loans labeled as club deals increases during the crisis from 6 to 8 per cent. When we measure the number of club deals more broadly as those loans with only arrangers but without

[14] We measure borrower reputation through a dummy variable that indicates whether the borrower raised at least one loan during the preceding five years. We find similar results when we measure borrower reputation as the log of the number of times that the borrower successfully raised a syndicated loan since 1980.
[15] The impact on the number of lenders is negative in the full sample.

participants, the percentage increases from 15 to 19 per cent. We then re-run our baseline regressions while excluding all club deals, both according to the narrow and the broader definition, and find that their exclusion does not change our earlier results (lines 2 and 3 in Table 3).

Table 3
Impact of Crisis on Syndicate Structure: Robustness Tests

This table summarizes the results of a number of robustness tests by showing the estimates for the crisis dummy in various models. The benchmark model is the model in Table 2, columns 7 and 9. In the first robustness test we exclude all loans identified by Dealogic Loan Analytics as club deals. In the second robustness test we exclude all loans without participants. The third robustness test includes project finance loans. In the fourth robustness test we correct for residual risk (see main text for explanation). In the final two robustness tests we test whether our results hold when we let the crisis start in January 2008 or when the pre-crisis period starts in January 2006. All regressions include the same control variables as the benchmark model. The sample includes only those loans for which the amount held by each syndicate member is available. The regressions are estimated using Tobit. Standard errors are heteroskedasticity robust and clustered by borrowing firm. All regressions include a constant. Coefficients are marginal effects. Robust p-values appear in brackets and ***, ** and * correspond to one, five and ten percent level of significance respectively.

	Mean Share Held By Arrangers	Herfindahl Index
1) Benchmark	0.016***	0.028***
	[0.000]	[0.000]
2) Excluding club deals (narrow)	0.016***	0.026***
	[0.001]	[0.000]
3) Excluding club deals (broad)	0.017***	0.026***
	[0.001]	[0.000]
4) Including project finance loans	0.016***	0.028***
	[0.000]	[0.000]
5) Correcting for residual risk	0.009*	0.020***
	[0.055]	[0.000]
6) Start crisis January 2008	0.015***	0.027***
	[0.001]	[0.000]
7) Start pre-crisis period January 2006	0.011**	0.024***
	[0.019]	[0.000]

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 with no or limited recourse to the borrower's other assets. The project companies involved are often highly leveraged. On the one hand, this combination of high leverage and limited recourse makes it likely that lenders take extra care in screening and monitoring the borrower (Esty and Megginson, 2003). On the other hand, any findings based on project finance alone may make it more difficult to generalize our findings 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 (line 4 in Table 3).

As a third robustness test, we add a new *residual risk* variable to our baseline regressions, which proxies for unobserved loan and borrower characteristics. While we included various control variables in our baseline specification, some loan and borrower characteristics are unobservable to us (such as loan covenants). To construct *residual risk*, we follow Esty and Megginson (2003) and first run an OLS regression in which we regress the loan spread on the independent variables that we used in our baseline regression.[16] The residual of this first-stage regression is then used as the variable *residual risk* in the baseline (Tobit) regression. Adding this variable does not materially change our baseline regression (line 5 in Table 3). As expected, the coefficient for the *residual risk* variable has a positive and significant impact on both the retention rate and syndicate concentration (not shown).

As a fourth methodological check we experiment with a different crisis definition and sample period. While August 2007 is generally regarded as the start of the crisis[17], the negative impact on financing conditions progressively 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 behavior. Our results are robust to starting the crisis at a later point in time (January 2008) and they also remain the same when we start our pre-crisis period in January 2006 instead of January 2005 (lines 6 and 7 in Table 3).

5. Changing syndicate structures during the crisis: alternative interpretations?

In the preceding section we document a significant positive impact of the financial crisis on arranger retention rates and syndicate concentration. We interpret this finding as evidence for an increased concern among banks about borrower quality and an increased assertiveness among participant banks to demand better screening and monitoring from arrangers. That is, during the crisis banks tightened their lending standards. Before we continue our analysis, we use this section to rule out a number of possible alternative explanations.

5.1 Changing participant liquidity

A first potential concern is that our findings partly reflect changes in the liquidity of participants. During the crisis participants may have become less liquid and thus less able to buy parts of

[16] Since we only have data on loan spreads for a limited sub-sample, adding the residual risk variable reduces the number of observations in this robustness test to 3,302.

[17] On Thursday August 9th 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 the three-month T-bill rate and three-month LIBOR, an indicator of perceived credit risk – spike above 100 basis points for the first time.

syndicated loans, leaving arrangers with bigger portions of loans on their balance sheets. There are a number of arguments why such a leftward shift of the supply curve of participant funding is unlikely to drive our results. First, in case of such a shift we would expect many transactions in which arrangers tried to reduce the loan volume during the syndication process. However, information on loan reductions – available from Loan Analytics – shows that during the crisis the loan amount was scaled back in only 1 per cent of all transactions (compared to 0.2 per cent before the crisis) while it was actually *increased* in 5 per cent of the loans. It may still be the case that arrangers, unable to sell a sufficient portion of a loan to (less liquid) participants, decide to keep a larger share on their own balance sheet without trying to renegotiate down the borrower mandate. Renegotiation could harm their reputation and lower future fee income. However, while this may have happened in some individual cases, it is unlikely to be an equilibrium outcome. The syndicated loan market is transparent and information on increased difficulties to sell down loans spreads easily. An arranger might once make the mistake to underwrite a loan that turns out to be too large to sell down, but is not likely to do so persistently during the crisis without any learning taking place.

To see whether our results are partly driven by reduced participant liquidity during the crisis, we first measure for each loan the proportion of participants that is a deposit-taking institution (commercial banks, cooperative banks, etc). Gatev and Strahan (2008) argue, and show empirically, that compared to other financial institutions, such as hedge funds, investment banks and insurance companies, banks have a comparative advantage in liquidity management. In particular, during crisis periods, when market liquidity declines and non-banks see their funding base erode, banks are relatively well-placed to continue lending since their – government guaranteed – deposit base increases. Syndicates in which banks dominate the participant group will thus be less liquidity constrained during a crisis period compared to syndicates with many non-bank participants. An increase in the proportion of non-bank participants during the crisis could thus be an indication of a decrease in average participant liquidity during the crisis. In reality, we find that there is little variation in the composition of participants before and during the crisis. Before the crisis 84 per cent of all participants is a deposit-taking institution, whereas during the crisis this percentage even slightly *increases* to 87 per cent. This increase suggests that, if anything, the composition of lending syndicates has shifted towards institutions with better, not worse, access to liquidity.

As a further check, we create a participant liquidity variable that measures for each loan the share of liquid participants. We consider a participant to be liquid if the number of loans it participates in during the crisis does not drop by more than 56 per cent, which is the decline in lending in the syndicated loan market as a whole. The mean of this participant liquidity variable is 0.34 and the median is 0.25. We rerun our baseline regression adding this variable and also interacting it with our crisis dummy (Table 4, Columns 2 and 3, other controls not shown for reasons of brevity). Our

finding on the positive and significant impact of the crisis on retention rate and concentration is robust to this liquidity correction. Moreover, we find a significant and *positive* impact of participant liquidity on both arranger share and concentration. When participants are less liquid this results in *less* concentrated syndications as each loan is spread among more lenders. Both the robustness of our earlier findings to the inclusion of a participant liquidity measure and the positive coefficient we find for this variable, support our claim that our findings reflect an increased demand for monitoring and screening by the participants and are not driven by reduced participant liquidity during the crisis.

Table 4
Alternative Explanations: Participant Liquidity and Arranger Concentration

This table presents evidence on whether changes in the liquidity position of participants or changes in the concentration in the arranger market are driving our basic results. The crisis dummy is interacted with a variable that proxies the liquidity of the participant group (column 2 and 3) or the concentration in the arranger market (column 4 and 5). *Crisis* is a dummy which is one for the crisis period (October 2007 until April 2009) and zero for the pre-crisis period (January 2005-September 2007). *Arranger concentration* measures the concentration in the arranger market for each country in each year as the Herfindahl-Hirschman Index, i.e. the sum of the squared loan shares held by each arranger active in a particular country in a particular year. *Participant liquidity* equals the share of the participants in a loan that are liquid. A participant is considered liquid if its lending during the crisis (in terms of number of loans) does not drop by more than 56%, which is the decline in lending in the market as a whole. All regressions include the same control variables as the baseline model (Table 2). The sample includes only those loans for which the amount held by each syndicate member is available. The regressions are estimated using Tobit. Standard errors are heteroskedasticity robust and clustered by borrowing firm. All regressions include a constant. Coefficients are marginal effects. Robust p-values appear in brackets and ***, ** and * correspond to one, five and ten percent level of significance respectively.

	Participant liquidity		Arranger Concentration	
	Mean Share Held By Arrangers	Herfindahl Index	Mean Share Held By Arrangers	Herfindahl Index
Crisis	0.019**	0.030***	0.021***	0.035***
	[0.033]	[0.000]	[0.005]	[0.000]
Crisis*Arranger Concentration			-0.032	-0.042
			[0.522]	[0.352]
Arranger Concentration			0.305***	0.287***
			[0.000]	[0.000]
Crisis*Participant Liquidity	-0.011	-0.015		
	[0.493]	[0.325]		
Participant Liquidity	0.016*	0.018**		
	[0.085]	[0.033]		
Observations	6,879	6,879	8,039	8,039
LR chi2	5,713.23	4,485.74	5,684.96	4,504.27
Log Likelihood	2,646.78	3,622.50	3,297.17	4,122.38

5.2 Changes in the competitiveness of the arranger market

A second alternative explanation of our results involves the arranger tier of the syndicate rather than the participant tier. It is possible that our results are partially driven by changes in the arranger market. To the extent that during the crisis a number of investment banks and other arrangers withdrew from the market, this may have made the arranger market less competitive, allowing the remaining arrangers to keep bigger loan portions. To test for the impact of crisis-related changes in the

competitive environment of arrangers, we construct a Herfindahl-Hirschman Index (HHI) for each year and country that measures the concentration of the arranger market. The arranger market is quite competitive, with an average index of about 13 at the country level. These findings are in line with Gatti, Kleimeier, Megginson and Steffanoni (2008) who show that the arranger market for syndicated project finance loans is relatively competitive and non-concentrated. On the global level, the concentration level is as expected smaller at around 4 per cent. In a majority of countries there is a slight *decrease* in concentration of the arranger market during the crisis. This likely reflects that during the crisis some of the dominant arrangers reduced their business and focused more on their home markets, which created opportunities for local banks to start arranging deals (The Banker, 2008).[18] When we include our time-variant and country-specific arranger concentration measure to our basic regressions, we find that our results are robust for this correction for arranger concentration (Table 4, Columns 4 and 5). As expected, the coefficient for the arranger concentration variable is positive (1 per cent level): in more concentrated markets arrangers can retain larger loan shares.

5.3 Increased syndicate concentration to facilitate low-cost restructuring

Increased syndicate concentration may also reflect that during the crisis default risks increased and lenders consequently started to streamline syndicates to facilitate debt restructuring (Bolton and Scharfstein, 1996). However, this recontracting hypothesis predicts smaller, more concentrated syndicates but *not* an increase in arranger retention rates. In fact, it does not predict anything about the relative loan shares of arrangers and participants. Since we find an increase in both retention rates and concentration, our overall evidence is more in line with the screening and monitoring hypothesis. Second, if increased concentration would mainly serve to facilitate low-cost recontracting in case of unavoidable (non-strategic) defaults, this effect would likely be smaller in countries with high legal risk, where contracts are difficult to enforce. In such countries banks may even *reduce* concentration to deter strategic defaults (Esty and Megginson, 2003). Section 6 shows that our results are very significant in both developed countries and emerging markets, even though in the latter legal systems are less developed. Again, our results point to a tightening of bank lending standards during the crisis.

[18] When experienced arrangers leave the market during the crisis, participants may force the remaining or new arrangers – which are relatively unknown – to retain a bigger chunk of each loan. Note, however, that the average arranger experience did not change significantly during the crisis (Table 1). We explicitly analyze the impact of arranger reputation on syndicate structure in Section 6.

5.4 Increased agency problems during the crisis: 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 is that participants do not so much 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 relatively risky loans. If this is the case, our results should not be interpreted as evidence that banks react to the crisis by increasing monitoring and screening.

In order to distinguish between these two possible explanations of our findings, we follow Sufi (2007) and measure the number of previous relationships between the arrangers and the particular borrower. We construct two *relationship* variables. The first one equals the log of (1 plus) the number of times (one or more of) the arranger(s) in the current loan structured a loan in the past for the same borrower. The second one is a dummy which is 'one' if at least one of the arrangers in the current loan structured a loan in the past for the same borrower and 'zero' otherwise. We add these variables (one at a time) to our baseline regression and interact them with our crisis dummy. We also 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.

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 sufficiently screen and monitor the borrower. In this case, we expect that if there have been previous lending relationships between the arrangers and the borrower, participants will be 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 types of loans the arranger then has to signal to the participants that the loan is not risky. So in the adverse selection scenario, we would expect a positive coefficient for the *relationship* variable: in case of loans to previous clients, the arrangers will be 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.

The results in Table 5 show that we can interpret our findings as evidence of increased monitoring and screening by banks during the crisis (other control variables are not shown for reasons of brevity). In case of previous lending relationships between the same arrangers and a borrower, the arrangers need to retain less of the loan and the syndicate becomes more diffuse. In case of risky clients retention rates increase and lending syndicates become more concentrated because participants fear that arrangers will shirk, not because they expect arrangers to sell bad loans. During the crisis the impact of previous relationships between the borrower and the same arrangers does not change, or becomes even more negative, implying that the increased share retained by arrangers and the stronger syndicate concentration during the crisis is the result of moral hazard and not adverse selection.

Table 5
Alternative Explanation: Adverse Selection versus Moral Hazard

This table presents evidence on whether the increase in retention rates of mandated arrangers and the higher syndicate concentration are the result of adverse selection or moral hazard. The crisis dummy is interacted with two variables that capture the intensity of the relationship between borrower and arrangers. *Crisis* is a dummy which is one for the crisis period (October 2007 until April 2009) and zero for the pre-crisis period (January 2005 September 2007). *Relationship* equals the log of the number of times the arranger(s) of the current loan structured a loan for the same borrower in the past. *Relationship (dummy)* is one if the arranger(s) in the current loan structured at least one loan in the past for the same borrower. All regressions include the same control variables as the baseline model (Table 2). The sample includes only those loans for which the amount held by each syndicate member is available. The regressions are estimated using Tobit. Standard errors are heteroskedasticity robust and clustered by borrowing firm. All regressions include a constant. Coefficients are marginal effects. Robust p-values appear in brackets and ***, ** and * correspond to one, five and ten percent level of significance respectively.

	Mean Share Held By Arrangers		Herfindahl Index	
	(1)	(2)	(1)	(2)
Crisis	0.018**	0.019**	0.035***	0.036***
	[0.013]	[0.034]	[0.000]	[0.000]
Crisis*Relationship	-0.003		-0.009**	
	[0.199]		[0.022]	
Relationship	-0.021***		-0.007***	
	[0.001]		[0.003]	
Crisis*Relationship (dummy)		-0.008		-0.015
		[0.515]		[0.134]
Relationship (dummy)		-0.016**		-0.003**
		[0.016]		[0.010]
Observations	8,042	8,042	8,042	8,042
LR chi2	5,488.97	5,294.57	4,445.87	4,352.02
Log Likelihood	3,185.64	3,175.68	4,100.74	4,097.58

6. The financial crisis and bank lending standards: cross-sectional heterogeneity

The preceding section showed that banks reacted to the financial crisis by stepping up their screening and monitoring efforts, as reflected in smaller and more concentrated lending syndicates. We also

found that when information asymmetries are relatively large, such as in the case of risky loans to unrated borrowers, banks tend to lend in small groups. We argued that this stresses the importance of overcoming agency problems. If this is indeed the underlying cause, one would expect that the onset of the global financial crisis has impacted upon different types of borrowers differently. To analyze this, we estimate a set of regressions in which we interact the crisis dummy with a number of variables that proxy for the importance of agency problems.

Table 6 summarizes the results (control variables are included in all regressions but not shown for reasons of brevity). We replicate our earlier finding that lending syndicates became more concentrated and that arrangers retain larger loan shares during the crisis. We also find that during the crisis lending standards were tightened in particular for financial sector borrowers (columns 1a). This is not surprising given that the global financial crisis was triggered by bad asset problems in the financial sector. Indeed, we find that the additional scrutiny placed on financial firms during the crisis was limited to developed (high-income OECD) countries, i.e. the countries where uncertainties about sub-prime asset quality were concentrated (columns 1b). In sharp contrast, we find that in emerging markets, lending standards for financial firms were not increased by more than for other industries.[19]

Next, we find that across the board the crisis impact seems to hold for both rated and unrated borrowers: we do not find a significant coefficient for the interaction term of the crisis dummy and the rating dummy (columns 2a). So while we find that a credit rating reduces agency problems during normal economic times, we do not seem to find evidence of a differentiated impact of the crisis on rated versus unrated borrowers. However, this picture changes significantly when we allow the coefficient to differ between developed and emerging markets (columns 2b). Slicing the data in this way reveals that there is a highly significant difference between rich and poorer countries. In the former, the crisis-induced tightening of bank lending standards is almost fully annulled for rated borrowers. In developed markets having a credit rating protects borrowers from increased scrutiny by banks during a crisis. In sharp contrast, in emerging markets credit ratings do not succeed in reassuring (participating) banks, which still insist that arrangers retain larger loan shares and form more concentrated syndicates in order to guarantee adequate levels of screening and monitoring.

As a further step, we now examine whether there is a differentiated impact of the crisis on experienced borrowers that built up a borrower track-record over time. Interestingly, borrower reputation matters during the crisis: while arrangers need to hold more of loans to first-time borrowers and form more concentrated syndicates, this is much less the case for repeat borrowers (columns 3a).

[19] As our definition of developed countries is rather narrow (only high-income OECD countries), we check whether our results also hold when we define developed countries as all high-income countries (see the World Bank website for an overview of the countries in these groupings). Our results are robust to this broader definition of developed countries.

Lending standards for syndicated loans to repeat borrowers are not tightened during the crisis and this holds for both developed countries and emerging markets (columns 3b). So, whereas a credit rating does not shield borrowers in emerging markets from the impact of the crisis, having built up a reputation as a 'good' borrower does help to contain the increase in information asymmetries between borrowers and lenders. What mattered most during the crisis for emerging market borrowers was whether the borrower has been exposed to banks' scrutiny during earlier syndications and not so much whether the borrower has been rated by an external rating agency.

Next we show that during the crisis collateralized loans see a significantly smaller increase in retention rates among arrangers compared to non-secured loans (columns 4a). While monitoring and screening gain in importance during the crisis across the board, this is less the case for secured loans. This holds for both developed countries and emerging markets (columns 4b). So while collateral does not yield much protection to lenders in normal economic times, and mainly serves as an indicator of a loan's underlying riskiness (Table 2), we find that collateralized loans suffer much less from increased agency problems during the crisis. When default rates go up and the presence of collateral starts to matter, banks start to value the safety of the presence of collateral.

We also test whether there is a differentiated crisis impact across arrangers with a varying amount of reputation (measured as the market share in the syndicated loan market in the previous year). Our initial estimations do not show such an impact of arranger reputation (columns 5a), but when we split the sample into developed countries versus emerging markets (columns 5b) we find strong evidence that in developed countries arranger experience is particularly important during a financial crisis. Experienced arrangers still need to increase their retention rates during the crisis, but they need to do so far less than less experienced competitors. Clearly, lender reputation is a crucial mechanism to control agency problems within the syndicate, in particular during episodes of financial turmoil.[20] However, in emerging markets we find that during the crisis participating banks forced experienced arrangers to hold larger stakes of loans and form more concentrated syndicates compared to less experienced arrangers. This last result is intriguing as it suggests that during the crisis experienced arrangers, often large Western investment banks, were unable to convince emerging market participant banks that they would (be able to) adequately screen and monitor local borrowers.

[20] 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, that this result also holds for a broader group of syndicated loans and, crucially, that this effect is limited to developed countries.

Table 6
Information Asymmetry and Impact Crisis on Syndicate Structure

This table presents evidence on how the impact of the crisis has affected financial and non-financial firms differently and on how this differentiated impact differs between developed countries and emerging markets. *Crisis* is a dummy which is one for the crisis period (October 2007 until April 2009) and zero for the pre-crisis period (January 2005-September 2007). *Financial* is a dummy which is one if the borrower industry is "financial services" according to Loan Analytics. *EM* is a dummy which is one if the country is not a high-income OECD country. All regressions include the same control variables as the baseline model (Table 2). The sample includes only those loans for which the amount held by each syndicate member is available. The regressions are estimated using Tobit. Standard errors are heteroskedasticity robust and clustered by borrowing firm. All regressions include a constant. Coefficients are marginal effects. The robust p-values appear in brackets and ***, ** and * correspond to one, five and ten percent level of significance respectively.

	Mean Share Held By Arrangers										Herfindahl Index									
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Crisis	0.014***	0.018***	0.018***	0.023***	0.028***	0.037***	0.024***	0.022***	0.017***	0.029***	0.026***	0.027***	0.030***	0.033***	0.040***	0.046***	0.033***	0.031***	0.029***	0.040***
	[0.004]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.003]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Crisis*Financial	0.018*	0.034**									0.019**	0.038***								
	[0.095]	[0.012]									[0.043]	[0.001]								
Financial	0.008	0.008									0.010*	0.010*								
	[0.203]	[0.216]									[0.071]	[0.075]								
Crisis*EM		-0.014		-0.008		-0.013		0.011		-0.030***		-0.003		-0.003		-0.007		0.013		-0.028**
		[0.137]		[0.437]		[0.258]		[0.280]		[0.009]		[0.752]		[0.756]		[0.525]		[0.159]		[0.011]
Crisis*Financial*EM		-0.038**										-0.048***								
		[0.043]										[0.004]								
Crisis*Rated			-0.004	-0.026**									-0.005	-0.025**						
			[0.701]	[0.023]									[0.670]	[0.030]						
Crisis*Rated*EM				0.060***										0.058**						
				[0.005]										[0.011]						
Crisis*Borrower Reputation					-0.022***	-0.032***									-0.021***	-0.028***				
					[0.007]	[0.001]									[0.005]	[0.001]				
Crisis*Borrower Reputation*EM						0.022										0.019				
						[0.161]										[0.197]				
Crisis*Secured							-0.033***	-0.027**									-0.018*	-0.013		
							[0.002]	[0.050]									[0.069]	[0.326]		
Crisis*Secured*EM								-0.014										-0.014		
								[0.455]										[0.417]		
Crisis*Arranger Reputation									0.000	-0.015**									0.002	-0.014**
									[0.986]	[0.012]									[0.793]	[0.029]
Crisis*Arranger Reputation*EM										0.064***										0.070***
										[0.000]										[0.000]
Observations	8,042	8,042	8,042	8,042	8,042	8,042	8,042	8,042	8,042	8,042	8,042.00	8,042	8,042	8,042	8,042	8,042	8,042	8,042	8,042	8,042
LR chi2	5,564.12	5,607.86	5,597.54	5,781.76	5,585.94	5,780.43	5,585.32	5,723.38	5,577.83	5,736.09	4,383.60	4,423.06	4,395.76	4,522.60	4,383.04	4,526.77	4,375.98	4,475.26	4,406.02	4,516.60
Log Likelihood	3,283.75	3,289.43	3,278.49	3,318.53	3,281.91	3,319.87	3,283.48	3,319.58	3,278.43	3,326.97	4,110.53	4,116.21	4,102.32	4,133.14	4,106.02	4,133.76	4,104.02	4,130.79	4,102.27	4,147.05

This may either be the case because local participants were afraid that such arrangers were pre-occupied with their 'trouble at home' or because they were of the opinion that without additional incentives (in the form of higher retention rates) these arrangers would not be able to adequately monitor distant emerging market borrowers in relatively unknown and opaque local markets.

We end this section by cross-checking our regression results with some descriptive statistics on the impact of the crisis on lending volumes to different borrower types (both number of loans and USD loan volumes). The severity of the decline in lending volumes to certain borrower types should roughly correspond with the relative increase in screening and monitoring we find in our econometric analysis. Indeed, the statistics in Table 7 show that during the crisis first-time borrowers saw a much sharper decline in access to funding than repeat borrowers.

Table 7
Impact of crisis on lending volumes

The table shows percentage change in number of loans and in the total dollar amount of lending between the pre-crisis (January 2005-September 2007) and crisis (October 2007-April 2009) periods for different types of borrowers. All calculations are based on the partial sample for which full information on loan shares is available.

	High-Income Countries	Emerging Markets
Number of loans		
All borrowers	-71%	-57%
Financial firm	-68%	-61%
Non-financial firm	-72%	-55%
First time borrower	-80%	-59%
Repeat borrower	-58%	-53%
Rated borrower	-68%	-61%
Non-rated borrower	-72%	-56%
Secured loan	-64%	-32%
Non-secured loan	-72%	-64%
Total dollar amount of lending		
All borrowers	-66%	-48%
Financial firm	-68%	-59%
Non-financial firm	-65%	-43%
First time borrower	-76%	-49%
Repeat borrower	-58%	-47%
Rated borrower	-65%	-60%
Non-rated borrower	-67%	-43%
Secured loan	-56%	-5%
Non-secured loan	-67%	-60%

The same holds for unsecured loans, which declined much faster in both number and volume during the crisis than loans to borrowers that had pledged collateral. Likewise, unrated borrowers saw the volume and number of loans decline by more than unrated borrowers, but, in line with our regression results, this only holds for high-income countries. Finally, the dollar amount of lending to financial firms decreased faster than on average, although we do not find that this crisis impact was limited to developed countries.

Overall these rough descriptives – where we do not control for various loan and borrower characteristics as we did in our regression analysis – thus show that the differentiated impact of the crisis on banks' screening and monitoring also reflects 'real life' implications for the borrowers involved in terms of actual access to finance during the financial crisis.

7. Conclusions

We use data on almost 31,000 syndicated loans to borrowers across 65 countries to examine how banks have adapted their lending standards during the current financial crisis. Our results show that during the crisis banks significantly stepped up their screening and monitoring efforts. This confirms earlier, more descriptive evidence that during the financial crisis banks became more selective in lending to new customers (Ivashina and Scharfstein, 2008). We find that during a crisis arranging banks retain larger portions of loans and form more concentrated syndicates, reflecting that syndicate participants want to reduce the dilution of arrangers' incentives to monitor. We demonstrate that our results reflect participants' concerns about moral hazard with respect to arranger efforts and not about adverse selection. We also show that our results are neither driven by changes in participants' liquidity position nor by changes in the competitiveness of the arranger market.

We do not find a homogenous increase in arrangers' retention rates and in syndicate concentration across the board, but instead show that screening and monitoring increased more when agency problems are larger. During the crisis banks tightened their lending standards in particular for uncollateralized loans, loans to first-time borrowers, and loans to borrowers in the financial sector. While in developed countries screening and monitoring needed to increase less in case of loans to rated borrowers and loans structured by well-known arrangers, we do not find any evidence of such an attenuating impact of credit ratings and arranger reputation on agency problems in emerging markets.

Our findings have important implications for firms that want to minimize the risk of getting cut off from new bank funding during a financial crisis. In order to convince banks to keep lending during periods of financial turmoil, firms should make sure that they build up a track-record of successful syndicated borrowing during times of economic calm. Applying for a credit rating, and the associated increase in transparency, will also pay off, not only pre-crisis but in particular during a crisis. Once

the crisis hits, firms that contemplate raising a syndicated loan may choose to pick a relatively experienced mandated lead arranger in order to minimize agency problems within the syndicate.

Unfortunately, for emerging market borrowers the options to prepare for increased bank scrutiny during a financial crisis are more limited. Their main strategy should be to develop a track-record of borrowing in the syndicated market. Contrary to borrowers in developed countries emerging market borrowers cannot "buy" the trust of participant banks by applying for (and paying for) a credit rating or by picking (and paying for) a prominent arranger to structure the loan. Emerging market borrowers still have to earn their reputation the hard way through gradually building up (repeat) exposure to banks' own scrutiny during earlier syndications.

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Annex

Table A1
Geographic distribution of the sample

Region	Country	Per cent	Region	Country	Per cent
North America	United States	38.75	Asia and Pacific	Japan	24.48
	Canada	3.94		Taiwan, China	2.24
	Bermuda	0.30		Australia	1.87
				Hong Kong, China	1.04
Westen Europe	United Kingdom	3.78		Korea, Rep.	0.95
	France	2.90		Singapore	0.95
	Germany	1.91		India	0.89
	Spain	1.61		China	0.74
	Italy	1.59		New Zealand	0.51
	Norway	1.08		Indonesia	0.29
	Netherlands	1.03		Malaysia	0.26
	Sweden	0.50		Thailand	0.18
	Switzerland	0.48		Philippines	0.16
	Greece	0.38		Vietnam	0.07
	Belgium	0.34			
	Denmark	0.30	Latin America	Brazil	0.42
	Finland	0.26		Mexico	0.33
	Ireland	0.20		Chile	0.17
	Luxembourg	0.18		Panama	0.10
	Portugal	0.16		Argentina	0.08
	Iceland	0.14		Peru	0.07
	Austria	0.12			
			Middle East and Africa	Turkey	0.44
Eastern Europe and Central Asia	Russian Federation	1.31		United Arab Emirates	0.33
	Ukraine	0.31		Kuwait	0.19
	Kazakhstan	0.23		South Africa	0.14
	Czech Republic	0.13		Qatar	0.10
	Poland	0.12		Saudi Arabia	0.09
	Romania	0.10		Bahrain	0.07
	Hungary	0.09		Egypt, Arab Rep.	0.07
	Bulgaria	0.07		Oman	0.06
	Latvia	0.07		Iran, Islamic Rep.	0.02
	Slovenia	0.07			
	Croatia	0.06	Sub-Saharan Africa	Liberia	0.08
	Azerbaijan	0.04		Nigeria	0.07