

Financial institution network and the certification value of bank loans

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Abstract

Social networks and reputation are believed to play important roles in mitigating informational frictions related to financial intermediation, in particular bank lending. We investigate the effect of the network and reputation of financial institutions on the certification value of bank loans using data on syndicated loans to European companies. We find that the presence of more central and reputable leaders in a syndicate substantially increases the stock market's reaction to loan announcements. This certification value is reinforced when informational frictions are more important, but vanishes in case of severe disruptions in the functioning of financial markets, such as during the financial crisis of 2008.

Key words: bank loan, syndicated lending, reputation, social network analysis, betweenness centrality, event study, Europe.

JEL Classification: G21, G24, L14.

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Abstract

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1. Introduction

Empirical evidence tends to support the view that bank loans bear a certification value with positive and significant abnormal returns for borrowers' stock around the date of a bank loan announcement (James, 1987; Lummer and McConnell, 1989; Slovin et al., 1992; Best and Zhang, 1993; Preece and Mullineaux, 1996; Focarelli et al., 2008). Indeed, banks are believed to produce valuable private information regarding a borrower's risk profile and quality (Diamond, 1984, 1991; Fama, 1985). Furthermore, maintaining a reputation for diligent screening and monitoring allows financial intermediaries to mitigate agency problems stemming from information asymmetries in the lender-borrower relationship (Leland and Pyle, 1977; Diamond, 1984; Fama, 1985). In the case of syndicated lending¹, which is the largest private bank debt market in the world (4.7 trillion USD in 2014)², financial institutions often rely on a lead bank's reputation in making lending decisions (Ross, 2010). Thus, reputable leaders can enhance monitoring and the ability to attract participants, help show the quality of a borrower and a deal, and reduce agency costs (Johnson 1997; Panyagometh and Roberts 2010; Gopalan et al. 2011; Gatti et al. 2013).

A syndicated loan transaction is heavily dependent upon lead banks because of their pivotal role in structuring the deal, negotiating the terms of the loan agreement, and organizing the syndicate³. The success of the syndication process is a function of negotiations and information flows among all the parties involved in a transaction: borrower, arrangers, and other syndicate members. Due to its complexity and the involvement of multiple actors, loan syndication involves specific agency costs which stem from the fact that different

¹ A loan syndicate comprises a lead bank (agent / arranger) that originates the loan and participant banks (or participants). The lead bank is responsible for negotiating the key loan terms with the borrower, appointing the participants and structuring the syndicate. It is thus responsible for due diligence, allocation of the loan to other syndicate members, and ex post monitoring.

² The benefits of loan syndication both for lenders (portfolio risk and sources of revenues diversification) and borrowers (mostly lower costs as compared to bond issues or a series of bilateral loans) largely explain the success of syndicated lending.

³ See Esty (2001) and Taylor and Sansone (2006) for a detailed presentation of the loan syndication process.

syndicate members have access to different degrees of information which can be harmful for the borrowing firm value.

The reputation of lenders is an important feature of bank syndicates that has recently gained academic interest due to the potential mitigation effects of agency costs⁴. However, empirical evidence on the impact of a financial institution's reputation on a borrowing firm's value and the certification effect of bank loans is scarce. Following the recent interest in social network analysis of the financial industry (Pistor, 2009; Allen and Babus, 2010), the aim of this article is to investigate the effect of a lender's network and reputation on the certification value of bank debt. One of our main contributions is the application of social network analysis to the syndicated loans market.

Indeed, a lender's reputation is closely related to trust and reciprocity which represent critical forms of social capital (Song, 2009), fundamentally driven by social networks (Cagno and Sciubba, 2010). Cohen et al. (2008) show that mutual fund portfolio managers place larger bets on firms they are connected with through their networks, and perform significantly better on these holdings relative to their non-connected holdings. These results suggest that social networks are an important mechanism for information flows. Morrison and Wilhelm Jr. (2007) argue that investment banks exist because they create networks. These financial institutions mainly issue and underwrite securities and these activities require the development of two networks: an information network which allows the acquisition of information about the demand for an issue, and a liquidity network to provide the funds to purchase the securities

The syndicated lending market bears several social network features because it serves as an information network which allows the acquisition of private information on borrowers'

⁴ Adverse selection problems may arise because, unlike arrangers, participants generally do not have direct lending relationships with borrowers. The syndicate structure also weakens the arranger's incentives to screen and monitor borrowers because it holds only a portion of the loan, generating moral hazard problems. Other characteristics such as syndicate size and concentration also have an influence on agency costs (Esty and Megginson, 2003; Lee and Mullineaux, 2004; Jones et al., 2005; François and Missonnier-Piera, 2007; Sufi, 2007; Focarelli et al., 2008; Godlewski, 2010; Bosch and Steffen, 2011).

quality and as a capital network which allows the raising of the necessary funding of loans (Baum et al., 2003; Baum et al., 2004; Morrison and Wilhelm Jr., 2007; Godlewski et al., 2012). Similar conclusions also apply to venture capital financing for which syndication is a mechanism to share complementary knowledge and financial risks among partners (Sorenson and Stuart, 2001; De Clercq and Dimov, 2004; Casamatta and Haritchabalet, 2007; Lerner et al., 2007; Tykvová, 2007).

In a social network framework, repeated interactions over time directly aim at solving problems of informational asymmetries because they create trust and reciprocity. Indeed, previous relationships between lenders can help alleviate informational frictions and the agency costs of syndication. This is why prior relationships between syndicate members have a significant impact on the probability of syndicating a deal together (Champagne and Kryzanowski, 2007). These relationships are often reciprocal arrangements in the sense that lenders maintain stable relationships among members and rotate their roles in subsequent joint syndications (Cai, 2009). Moreover, Bülbül (2013) shows that intense interaction with central coordinators supports trust-building within a network, while Houston et al. (2013) find that connected banks are more likely to partner together in loan syndicates and more central banks in the network are more likely to lead or co-lead large syndicates. Stronger connections between lenders lead to enhanced information sharing, and banks, which are more central within a network, serve as "*intermediaries among intermediaries*".

For all these reasons, the network of a financial institution matters for companies seeking external financing. Indeed, Brander et al. (2002) show that a lead investor's network capital affects its ability to organize a sizable syndicate, which is proven to be valuable to project efficiency. Gulati (1999) finds that accumulated network resources arising from the history of participation in a network of alliances are influential in a firm's decision to join new alliances. Hence, when choosing a lead investor, a firm will take into account a lead investor's network capability as a key factor (Wang and Wang, 2012). Therefore, connections between

borrowers and lenders will affect the pricing and structure of bank loan agreements

(Engelberg et al., 2012; Ferreira and Matos, 2012; Godlewski et al., 2012).

Considering the reputation of lead banks as a certification device reducing the adverse consequences of information asymmetry within a syndicate, Ross (2010) and Gatti et al. (2013) show that loan spreads can be lower when informational frictions are severe. Cai (2009) finds that loans arranged in a reciprocal way are less costly for borrowers, while Godlewski et al. (2012) show that borrowers can gain from reduced loan pricing when they are funded by syndicates composed of lenders that are more central on the syndicated loans market. Furthermore, Hochberg et al. (2007) find that better-networked VC firms have better fund performances and that the portfolio companies of better networked VCs are more likely to survive subsequent financing and eventual exit.

Overall, existing theoretical and empirical evidence suggest that approval from financial institutions with important networks and reputation capital may actually create economic value by reducing the overall costs of external financing for companies. However, an important question remains unanswered: do the network and reputation of a lender matter for the certification value of bank debt?

We seek in this article to provide empirical answers to this important question through an investigation of the role of syndicate network and reputation for the certification value of bank loans and borrowing firm value. The analysis of financial intermediaries' networks provides important insights into the formation of reputation, which is crucial for a financial institution's activity and performance, thus affecting companies seeking external sources of funding, in particular private debt.

Our first contribution is to consider the impact of bank reputation on the certification value of private debt by employing event study methodology to compute abnormal returns of borrower's stock around the bank loan announcement date. With the notable exceptions of Billett et al. (1995) and Ross (2010), who show that lender reputation matters for the

certification value of bank debt, we are not aware of other articles examining this issue. However, providing empirical findings on the role of the reputation of financial intermediaries in increasing a firm's value is of utmost interest, especially when this reputation is severely hampered by various scandals⁵. Furthermore, the above-mentioned authors do not use social network analysis as a proxy for the reputation of financial institutions.

Furthermore, relying on social network analysis to compute alternative proxies of reputation is our second contribution. We believe that relying on a social network approach provides us with a much richer and more comprehensive measure of a lender's reputation. We claim that a greater centrality of syndicate members indicates a higher level of social capital acquired through interaction, reciprocity, and trust. This in turn increases their reputation allowing the mitigation of informational frictions within a syndicate. Following Meuleman and Wright (2009), Godlewski et al. (2012), and Wu et al. (2013) we consider a social network metric called betweenness centrality, which measures how well an actor (in our case a lender) is positioned with respect to control over the flow of information or other resources in a network. Such a central financial institution acting as an *"intermediary among intermediaries"* (Houston et al., 2013) may provide valuable reputation capital and enhance the certification value of a bank loan.

A third contribution concerns our focus on Europe by using a sample of syndicated deals to borrowers from 24 countries over the last 10 years. This is because bank loans are the main source of external capital for European companies. For instance, private credit to GDP reached 120% in the Eurozone, while stock market capitalization to GDP was considerably lower at 32% in 2011 (Global Financial Development Report, 2013). Therefore, empirical

⁵ Recent scandals include JP Morgan and the "London whale" of Bruno Iksil, Barclays Bank and UBS with Libor manipulation, Nomura and insider trading, and HSBC and Standard Chartered with money-laundering problems.

evidence on the effect of bank network and reputation on the certification value of loans and on this effect's impact on borrower value is even more crucial in Europe.

The rest of the article is organized as follows. We present the empirical design in section 2. Section 3 provides the results. We conclude in section 4.

2. Empirical design

In this section, we describe the data we use, how we apply social network analysis to compute various network metrics of lenders, and the event study methodology that we implement.

2.1. Data

We start by extracting all loans for European non-financial companies from January 2001 to June 2011 using the <LSRC> function of Bloomberg Professional Terminal Server (Bloomberg). The initial dataset contains loan agreement characteristics at origination, such as the loan amount, spread, maturity, type of loan, loan purpose, the existence of covenants and/or collateral, and so on. It also contains the loan announcement date that serves to identify the bank loan announcement event date. We also gather information on main bank lending pool characteristics, such as the number of lenders and their identities and roles (or titles) in a syndicate. Unique deal and lender identifiers and syndicate member roles are essential because they allow computing of social network metrics. All deals for which information on lenders' titles are missing are dropped from the sample.

Using the borrowing company ticker, we extract information regarding a company's rating and daily stock price over the entire time span of the sample. This limits the final sample to listed companies only. We also extract the daily values of main local stock market indices for each country in the sample for abnormal returns' calculations. Furthermore, we use the FactSet database to extract balance sheet and profit & loss information on the borrowers.

Finally, we use the databases of Cihak et al. (2012) (Global Financial Development Database, World Bank) and Djankov et al. (2007) to control for country variables such as private credit or stock market development and for “law and finance” characteristics such as legal origin or creditors’ rights protection.

We end up with a final sample containing 254 companies that issued 465 loan facilities syndicated by 906 lenders. The time span of the sample runs from January 1, 2001 to June 30, 2011 and covers 24 European countries.

2.2. Social network metrics

The linkages among financial institutions can be captured by using a network representation of a financial system. The general concept of a network is quite intuitive. It describes a collection of nodes and the links between them. The nodes may be individuals, firms or countries. A link between two nodes represents a direct relationship between them.

Information on bank participation in syndicated loans (or deals) provides us with an input to construct an “*affiliation network*”. In social network analysis, an affiliation network is a *two-mode (bipartite) network* with two types of nodes: *actors* linked with *events* in which they participate. In our case, the actors are banks, the events are syndicated deals, and the ties connect banks with the deals in which they participate.

Affiliation networks are often used for constructing the corresponding social networks of actors. To make a projection of the bipartite network of syndicated deals, we follow Baum et al. (2003), Godlewski et al. (2012), and Wu et al. (2013) who re-construct bank networks by accounting only for the relationships between lead - participant banks. This approach allows to better capture the structure of information flows in a network of syndicated lending, as banks participating in the same syndicate typically have minimal contacts and their interactions are primarily with lead banks Rhodes (2004).

Using the information on lenders’ titles provided by Bloomberg, we proceed to the classification of lead banks into three categories of leaders. Indeed, it may sometimes be

difficult to precisely identify “true” lead banks, especially when there are multiple arrangers⁶. Furthermore, as the loan market has grown and matured over time, the array of lender titles has proliferated. Finally, relying on the “*Loan Agent*” information provided by Bloomberg would drastically reduce the sample size as this information is often missing.

The most conservative classification (1) considers that only banks bearing the titles of *Mandated Arranger or Lead Arranger* are lead banks. A second classification (2) adds to (1) lenders with such titles as *Lead Manager, Book Runner, Book Manager, Global Coordinator, or Agent*. Finally, a third and last classification (3) considers in addition to (2) all the following titles: *Co-Book Runner(s), Joint Book Runner(s), Joint Lead Manager(s), Co-Lead Manager(s), Co-Arranger(s), Manager(s), Co-Manager(s), or Joint-Book Manager(s)*. Details of the classification rules are provided in the appendix. Overall, we have three different classifications of leadership in the syndicate.

Further, we assume that ties between lead banks and other syndicate members do not disappear immediately but remain active for several years. Hence, we use overlapping moving three-year windows. Thus, for each of the time windows, we construct lenders’ networks considering only the syndicated loans arranged during these periods⁷.

We now turn to the definition of the characteristics of lenders’ individual positions within a syndicated lending network. In general, social networks theory offers a range of metrics to describe the centrality of an agent’s position in a network besides betweenness centrality (Wasserman and Faust, 1994). However, in practice, for many real world networks, these measures of centrality are highly correlated and networks of syndicated lending are no exception (Godlewski et al. 2012; Houston et al. 2013). We focus on betweenness centrality, which captures how well a lender is positioned with respect to control over the flow of information or other resources in a network. The betweenness centrality of lending

⁶ Syndication can involve a joint mandate with more than one lead bank. Such syndications are chosen by the borrower to maximize the success of the desired loan syndication.

⁷ When choosing the time window one needs to balance between short term leading to the potential problem of having networks that are too disconnected and long term, which shortens the length of the time series (for instance with a five-years’ time window we miss the first four years of observations.)

institutions in networks of syndicated deals has been used earlier in Baum et al. (2003), Godlewski et al. (2012), and Houston et al. (2013). We also consider this measure as a proxy of lender reputation following, notably, Godlewski et al. (2012) and Wu et al. (2013). We claim that lender centrality indicates a higher level of social capital acquired through interaction, reciprocity, and trust, ultimately increasing reputation.

Formally, the betweenness centrality of lender i is defined as the number of the shortest paths between all pairs of lenders in a network, which pass through a lender, deflated by the number of alternative shortest paths (normalized by the number of all pairs of lenders):

$$B = \frac{2}{(n-1)(n-2)} \sum_{j < k} \frac{g_i(j, k)}{g(j, k)}$$

where $g_i(j, k)$ is the total number of the shortest paths between lenders j and k and $g(j, k)$ is the total number of the shortest paths between lenders j and k .

As we are interested in syndicate reputation, we compute the average, median, and interquartile betweenness measures by lending syndicate. Apart from a lead bank's reputation, other participants are also sensitive to a leader's reputation and they use information on the reputation of arrangers to maintain the internal rankings of lead banks that guide their future participation decisions. Hence, what matters is the overall reputation of the banking pool (Gopalan et al., 2011; Broihanne and Godlewski, 2014). Average betweenness provides us with a broad metric of syndicate centrality and reputation, while the median value aims at smoothing the discrepancies among the leaders of a syndicate. Interquartile betweenness captures the heterogeneity of centrality and reputation within a syndicate. All these three measures of syndicate network centrality and reputation are the main explanatory variables in our empirical analysis. As we have three classifications of lead banks in a syndicate, we end up with nine social network metrics⁸.

⁸ See variables definitions in the appendix.

2.3. Event study methodology

We use a standard event study methodology to compute the abnormal returns of listed borrowing companies that obtained a loan in order to investigate the impact of lender's centrality and reputation on the certification value of bank debt as well as on shareholder value.

First, we need to identify the event dates. We consider a loan issue as an event and use the announcement/declared date from Bloomberg as day 0. We exclude all contaminated dates, i.e. when another major event for a company occurs (such as an earnings call, sales release or analyst, investor, and shareholder meetings) two days before and two days after day 0. This conservative procedure reduces the sample size considerably.

Second, we need to apply a suitable method to estimate abnormal returns in a multi-event and a multi-country setting. Indeed, companies can have several consecutive loan originations and they may be from different countries. We follow Fuller et al. (2002) for the multi-event aspect and estimate abnormal returns using a modified market model defined as $AR_i = R_i - R_m$, where R_i is the return on company i and R_m is the market index return. We do not estimate market parameters based on a time period before each loan issuance since for frequent issuers there is a high probability that a previous origination would be included in the estimation period, making beta estimations less meaningful. Furthermore, Brown and Warner (1980), Brown and Warner (1985) show that for short-window event studies, weighting the market return by a firm's beta does not significantly improve the estimation. For the multi-country setting, we rely on Campbell et al. (2010) who show that the use of local currency national market indexes is sufficient. Therefore, we use the main stock market index for each country in the sample as a proxy for the market index return⁹.

⁹ The main stock market indexes (with country codes in parentheses) are BEL-20 (BE), SOFIX (BG), PX-50 (CZ), OMXC20 (DK), HEX (FI), CAC40 (FR), DAX (DE), ATHEX 140 (GR), BUX (HU), OMX Iceland (IS), ISEQ (IE), MIB (IT), LUXX (LU), AEX (NL), OSEOBX (NO), WIG (PL), PSI 20 (PT), BET (RO), SAX (SK), SBITOP (SI), IBEX35 (ES), OMXS30 (SE), SMI (CH), and FTSE (UK).

We compute three-day period cumulative abnormal returns (CAR) $(-1, 1)$ and consider them to be a proxy for the certification value of a bank loan and of shareholder value. We perform the following regression:

$$CAR(-1, 1) = \alpha + \beta \times \text{Lenders centrality} \\ + \gamma \times \text{Loan variables} + \theta \times \text{Borrower variables} + \vartheta \times \text{Country variables} + \varepsilon$$

where the focus is on the *Lenders centrality* variables, proxied by various betweenness centrality metrics. We use OLS regressions with robust standard errors clustered at the loan level. We control for a borrower's industry sector, loan currency, loan purpose, and loan origination year fixed effects in each regression.

3. Results

In this section, we start by providing several statistics to describe the sample and the variables. Then, we present and discuss the results of the regressions.

3.1. Descriptive statistics

Figure 1 displays the distribution of loan originations over time. We remark an origination boom in the 2000's with a top at 18% of loan issuance in 2005. The time pattern of the sample follows the time pattern of the European syndicated loan market¹⁰. The statistical distributions of average, median and interquartile betweenness (most conservative definition of lead banks) can be found in Figure 2. All distributions are asymmetric, with the bulk of syndicates having an average and interquartile centrality below 0.04 and 0.05 respectively. Median betweenness is close to 0 for the majority of syndicates. Figure 3 provides box-whisker plots of average, median, and interquartile betweenness using the most conservative definition of lead banks over the time span of the sample. The medians of all metrics are close to the full sample medians for each of the betweenness centrality measures (red lines), which indicates that the distribution of syndicate centrality scores stays reasonably stable throughout the sample period. Figure 4 shows the evolution of all syndicate centrality measures over the

¹⁰ The low percentage in 2011 is due to the fact that our sample stops at the end of June of that year.

time span of the sample, again using the most conservative definition of lead banks. We remark relatively stable although downward trend for all metrics, with the average and interquartile betweenness following a similar pattern while the median being below.

We present the sample composition and lenders centrality measures by borrower country in Table 1. Borrowers come from 24 different European countries. Bank loan announcements to borrowers from the United Kingdom account for 20% of the sample, while France and Spain represent 16% each. These three countries, along with Germany, Italy, and the Netherlands, represent 75% of bank loan announcements in the sample. We also remark an important heterogeneity of syndicate centrality across countries, ranging from 0.0006 in Portugal to 0.0316 in Slovakia in terms of median betweenness¹¹. The average CAR over the timespan of the sample is depicted in Figure 5. We observe a peak in 2010 with average CAR above 3% and a less important peak in 2005 (2.5%). The years 2003, 2006, and 2011 present all negative stock market reactions, close to -1%.

Main descriptive statistics for all variables are shown in Table 2¹². The average CAR is statistically different from 0 at the 1% confidence level (t-statistic equal to 4.79), positive and above 5%. In other words, the average certification value of bank loan announcements and, thus, shareholder value is positive in our sample. The averages of all syndicate centrality measures are relatively close, between 0.01 and 0.02. We remark that all network metrics (average, median and interquartile range) are systematically lower when the definition of lead banks is less conservative (3). Hence, it appears that centrality and reputation are concentrated in a reduced group of lead banks¹³.

Regarding control variables, we observe that the average loan amount equals 1.3 billion USD (with a large standard deviation) with a maturity of five years. Half of the loans

¹¹ This could suggest that Slovak companies may turn to large international banks (such as Austrian or German financial institutions) to arrange a loan, while Portuguese borrowers rely more on domestic and smaller banks.

¹² The definition of all variables can be found in the appendix.

¹³ This result is also partly due to the way we have constructed the network. Indeed, most connections run through lead banks so when we have a larger group of leaders, there are more alternative paths by which a pair of banks is connected. It corresponds to the denominator (under summation) in the definition of the betweenness centrality, or, in other words, it makes the positions of the leaders less exclusive in a 'stricter' sense.

are term loans, 20% have been secured at origination and 15% have some financial covenants. The average loan has more than two tranches. Lending syndicates are quite large with 19 members on average. 50% have leaders listed on the European Bloomberg League Table.

Regarding borrower level characteristics, we observe that less than one third of borrowers were rated at the time of loan origination by a major external rating agency such as S&P or Moody's¹⁴. Firms are relatively large with average sales at 12 bln USD. Their debt represents one third of their balance sheet size and they have, on average, a negative profitability.

When looking at the country characteristics, we identify financially developed economies according to private credit and stock market to GDP ratios (at 134% and 93%, respectively) as well as according to important bank concentration (68%) and healthy banking sector (z score at 14.50). The creditor rights average index is 2.13, signaling a good level of protection, while more than half of the sample concerns French law countries. Finally, 20% of bank loan announcements occurred during the global financial crisis.

3.2. Main regression results

We present and discuss now our main estimation results. The focus of this article is the certification value of lenders centrality and reputation around a bank loan announcement date. We consider the roles of financial institution network and reputation as important features enhancing lenders' screening and monitoring. The latter contribute to mitigate informational frictions on the credit market (between borrowers and lenders as well as among lenders of the syndicate) and ultimately may increase the certification value of bank loan announcements. We use nine different measures of syndicate centrality and reputation and test their impact on the borrower stock abnormal return around the date of a bank loan announcement.

¹⁴ Main borrower industry sectors are: Industrial (27.81% of the sample), Consumer (26.93%), Basic materials (8.75%), and Energy (6.46%). Main loan purposes are: Debt refinancing (39.68%), General corporate purposes (31.47%), Project finance (9.16%), and Acquisition (7.79%). Main loan currencies are: EUR (61.55%), USD (21.11%), and GBP (12.9%).

Statistically significant and positive coefficients for centrality variables would confirm their certification value and, thus, a beneficial impact on firm value.

Table 3 provides the baseline results. We test here the impact of all nine syndicate centrality measures on $CAR(-1,1)$ while controlling for loan, syndicate, and borrower characteristics. The main result is that average and median betweenness centrality have a significant and positive impact on borrower stock abnormal return, while interquartile range betweenness is not significant. The effect on abnormal returns is larger when considering a less conservative definition of lead banks in a syndicate. For instance, the coefficient for *avg. Betweenness (3)* is 2.44 while it is equal to 2.05 for *avg. Betweenness (1)*. Furthermore, the median measure of centrality has a larger economic effect than the average measure; for a one standard deviation increase of *med. Betweenness*, $CAR(-1,1)$ increases by 0.04 to 0.05 of a standard deviation, while the increase is closer to 0.03 of a standard deviation when considering *avg. Betweenness*. Hence, syndicate centrality and reputation increase the certification value of bank loans on shareholder value because of their beneficial effect on lender screening and monitoring capacities. Furthermore, these results confirm existing empirical evidence on the role of lender reputation in certifying bank debt (Billett et al., 1995; Ross, 2010).

Turning to control variables, we remark that larger loans with longer maturities, which are secured and have covenants and fund rated borrowers, increase CAR. These results confirm existing empirical findings and are explained by the beneficial impact of lower informational frictions on the certification value of bank loan announcements (Slovin et al., 1992). Indeed, larger loans with longer maturities to less opaque borrowers are usually associated with lower information asymmetries (Mosebach, 1999; Berger et al., 2005) while the presence of collateral and covenants reduces moral hazard and adverse selection problems (Bester, 1985; Besanko and Thakor, 1987; Rajan and Winton, 1995). For all these reasons, the certification effect of bank debt is enhanced when these characteristics are in place. Other

characteristics, in particular, those of a syndicate (such as size or the presence of league table banks), are not significant. Eventually, our centrality measures already capture many important features of syndicate organization implying that these syndicate characteristics are not significant. We also find a stronger certification effect for first time loan issues, which bear a significant and positive effect. Finally, rated and thus less opaque borrowers show significant and positive coefficients.

Next we turn in Table 4 to the results where we include borrowing firm characteristics: log of sales (firm size proxy), debt ratio (financial risk proxy), and Ebitda margin (profitability proxy). Due to scarce data availability for these variables, the initial sample size is reduced by almost 1/3. Therefore, one needs to interpret the results with caution.

When comparing to results in Table 3, we observe that only the coefficients for average betweenness are still significant and positive, while the coefficients for median betweenness are no longer significant. Furthermore, the magnitude of the coefficients is reduced (overall cut by half). However, the economic magnitude of centrality is reinforced: for a one standard deviation increase of *avg. Betweenness*, $CAR(-1,1)$ increases by 0.08 to 0.05 of a standard deviation. Hence, after controlling for borrower variables, the average measure of syndicate centrality and reputation still increases the certification value of bank loans and shareholder value. Among the three firm variables, two have significant and consistent coefficients: larger firms enjoy greater certification effect while the CAR is lower for more indebted borrowers with higher financial risk. We also note that except loan size and maturity, most of other loan and syndicate variables become not significant, while *Secured* and *Term loan* are significant and negative.

Finally, we now turn to the results where we control for borrower country characteristics in terms of financial development, banking industry structure, and the legal protection of creditors. Estimation results are provided in Table 5¹⁵.

¹⁵ We can't include both firm and country characteristics as in such case the sample size is drastically reduced.

We remark that, compared to Table 3, our main results still hold, coefficients for *avg.* and *med. Betweenness* being significant and positive in all specifications. Hence, our findings still hold: syndicate centrality and reputation matter and increase the certification effect of bank debt on shareholder value.

Coefficients for loan and syndicate variables remain similar to Table 3, with the notable exceptions of loan size and secured variables, which become not significant. Furthermore, the coefficient for *First loan* becomes negative but weakly significant while *Term loan* has now a positive effect on CAR. We notice that all additional country variables have significant coefficients, suggesting that the economic, financial, and legal environment of a borrower is important for the certification and shareholder value of a bank debt announcement.

Following the idea that better financial development reduces information asymmetries, more developed stock markets increase CAR. On the contrary, larger credit markets have the opposite effect on abnormal returns. This may be due to the fact that the certification value of a bank loan is weaker in economies where bank credit is abundant. A competitive and more solvent banking industry naturally increases CAR as the certification value of bank debt is stronger in such a case. Finally, better creditor rights protection significantly increases CAR, following the conclusions of law & finance literature (Qian and Strahan, 2007; Bae and Goyal, 2009; Cho et al., 2014).

Overall, lender centrality and, thus, syndicate reputation matter for the certification effect of bank debt and for shareholder value. The latter is substantially increased when a lending syndicate has more central and reputable members. These results confirm existing empirical findings on the role of lender reputation in certifying bank debt (Billett et al., 1995; Ross, 2010). This is because the network and reputation capital of financial institutions enhances screening and monitoring abilities, thus reducing informational frictions on credit markets.

3.3. Additional estimations

Next, we perform several additional regressions by including interaction terms between syndicate centrality measures and various control variables. We aim here at testing the robustness of our main results by investigating if the beneficial impact of lenders centrality on CAR is affected by different deal or country characteristics.

To spare space, we choose to interact *avg. Betweenness (I)* with various proxies of informational frictions among borrower-lender as well as among lenders of a syndicate. We first analyze the effect of loan and syndicate characteristics in Table 6. We rely on several dummy variables for small, short maturity, or secured loans, loans with covenants, small syndicates, and league table lenders¹⁶. Smaller loans with shorter maturities are expected to be more information problematic, while the presence of collateral and covenants usually mitigates adverse selection and moral hazard problems. Smaller syndicates are better at monitoring a borrower, thus eventually signaling a more problematic deal. Finally, being on a league table might be a substitute for centrality and reputation.

Regarding main loan characteristics, we remark that the interaction term with lenders centrality is significant only for smaller loans, and loans with covenants. For the first variable, only the interaction has a significant and positive coefficient, meaning that the certification effect is more important for smaller loans. For the second variable, the interaction is significant and negative, resulting in a large negative combined coefficient ($3.8361 - 9.8643 = -6.0282$). In other words, the certification effect from central and reputable lenders becomes detrimental for shareholder value when the loan has covenants. The presence of this particular contractual arrangement aiming at mitigating moral hazard problems and thus protecting the lenders interests have a positive effect on CAR in Table 3. We can argue that covenants already fulfill their contractual role in providing a certification effect of a bank loan. Adding the presence of central lenders may be counterproductive as such lenders may impose very

¹⁶ For continuous variables, we rely on their sample medians to compute the relevant dummies. Medians of loan amount, maturity, and syndicate equal 729 million USD, 5 years, and 13 lenders respectively.

tight covenants to signal and protect their reputation, leading to a negative impact on shareholder value.

Turning to syndicate features, we observe that the certification value of centrality and reputation is reinforced when a lending syndicate is smaller as the combined coefficient is positive ($-3.9506 + 6.5792 = 2.6286$). Hence, syndicate centrality and reputation reinforce added value in terms of the monitoring of a smaller and tighter pool of lenders as such a syndicate structure is more suitable to cope with moral hazard problems among the members of a banking pool (Lee and Mullineaux, 2004; Sufi, 2007; Bosch and Steffen, 2011). The negative coefficient for *avg. Betweenness* can be explained by the fact that on average, smaller syndicates should have less central and reputable lenders, and that such syndicate structure already tackles main agency problems related to syndicated lending. On the contrary, the presence of league table lenders in a syndicate almost offsets the certification value of central and reputable lenders ($3.5214 - 3.6920 = -0.1706$). In other words, being a league table or a central lender are substitutes with respect to the certification effect of a bank loan on shareholder value.

We provide the interaction results with borrower characteristics in Table 7. We consider dummies computed using sample medians for smaller firms (*Sales* below 5.4 bln USD), less risky firms (*Debt ratio* below 32.40%), and less profitable firms (*Ebitda margin* below 11.39%). Only the first two interaction terms are significant and positive, while the coefficient for the centrality variable is not significant. Hence, the certification effect of central and reputable lenders matters more for smaller and less indebted firms. Smaller firms are usually considered as more opaque and informationally problematic, while low debt may function less good as a disciplining device used by shareholders to control firm's management.

We continue our analysis in Table 8 where we include country level interaction terms through several dummies for low stock market, low private credit, low bank z score, high bank concentration, weak creditor rights, and crisis¹⁷. Lower financial development should increase the overall level of information asymmetries in the economy, while a less solvent or less competitive banking sector might be less efficient in screening and monitoring borrowers. Weaker creditor rights might reduce lender willingness to finance companies, while disruption in the normal functioning of financial markets, such as during a major crisis, should increase overall uncertainty and informational frictions in the economy.

Regarding the results for financial development specifications, we remark that syndicate network and reputation matter even more when stock market development is low (joint coefficient equal to $2.0932 + 1.9213 = 4.0145$) while it has a negative impact when credit markets are less developed, although the joint coefficient remains positive ($4.5575 - 3.4674 = 1.0901$). On one hand, less developed financial markets associated with greater information asymmetries in the economy reinforce the certification value of syndicate centrality and reputation for bank loans. On the other hand, in the presence of under-developed and less well functioning credit markets, even the presence of central and reputable lenders cannot mitigate all the information problems in place.

Among banking industry variables, only the interaction term with low bank z score is significant and negative. The joint coefficient becomes negative ($10.0746 - 12.8608 = -2.7862$), signaling that the certification value of a syndicate's network and reputation can be weakened by a less healthy banking industry, where the quality of screening and monitoring might be doubtful.

Finally, we observe a significant and positive coefficient when considering the interaction term between lenders centrality and the creditor rights dummy and a significant

¹⁷ For continuous variables, we rely on their sample medians to compute the relevant dummies. *Low stock market* equals one if a stock market is lower than 0.8944. *Low private credit* equals one if private credit is lower than 1.2992. *Weak creditor rights* equals one if creditor rights is below 2. *Low bank z score* equals one if bank z score is lower than 13.8324. *High bank concentration* equals one if bank concentration is larger than 0.6557. *Crisis* equals one for all bank loan announcements occurring after September 2008.

and negative interaction term with *Crisis*. The first result suggests that centrality and reputation provides an important certification impact in environments where creditor rights are weak. The second finding leads to a negative joint coefficient ($3.2628 - 4.3345 = -1.0717$) and shows that syndicate network and reputation cannot fully compensate for greater uncertainty and information asymmetries during a severe breakdown of the normal functioning of financial markets and institutions.

In a last robustness check exercise, we include the loan spread in our analysis, following notably Focarelli et al. (2008), as an additional loan level control variable. We also test alternative specifications with respect to loan level variables¹⁸.

Including the spread reduces drastically the sample size (283 loans, i.e. a reduction of 40% as compared to the initial sample) as this variable is often non available. The average loan spread equals 121.59 bps with a standard deviation of 115.84 bps. The results for centrality measures remain robust when compared to Table 3, while the coefficient for the spread is not significant.

Furthermore, we also test several alternative specifications regarding loan characteristics. Indeed, main contract characteristics such as amount or maturity can be determined jointly and simultaneously, hence introducing endogeneity problems in the regressions. To tackle this problem without relying on instrumental variables estimations (due to lack of available and viable instruments) we perform several alternative regressions. Each time we use the *avg.*, *med.*, and *iqr. Betweenness (2)* variables and include stepwise different sets of loan characteristics. We perform this exercise with and without the loan spread variable. More precisely, omit at each step one loan level variable: first *Loan amount*, then *Maturity*, and finally *Secured*. Again, the results for syndicate centrality remain robust to these alternative specifications.

¹⁸ All these results are available from the authors upon request.

Overall, most of our previous findings regarding the certification value of syndicate centrality and reputation hold. Thus, our results confirm empirical findings on the role of financial institution reputation in certifying bank loans (Billett et al., 1995; Ross, 2010). We notice that this effect is reinforced when informational frictions are important but also that network and reputation cannot fully compensate for severe uncertainty and information asymmetry, as in the case of a major financial crisis, or when the banking sector is more risky.

4. Conclusion

Using a sample of bank loan announcements for European companies from 2001 to 2011, we investigate the effect of the network and reputation of financial institutions on the certification value of bank loans. Regressions of the borrower stock abnormal return around the bank loan announcement date on several social network measures show that syndicate centrality and reputation matter for the certification effect of bank debt and for shareholder value. The presence of more central and reputable leaders in a syndicate substantially increases the stock market reaction to a loan announcement. This positive impact is even reinforced when informational frictions are important. However, lender network and reputation cannot compensate for severe disruptions in the functioning of financial markets, such as during the financial crisis of 2008.

Overall, we contribute to the recent literature on the role of reputation and social networks in financial intermediation. We show that the reputation and centrality of financial institutions matter (Gopalan et al., 2011; Godlewski et al., 2012; Gatti et al., 2013; Houston et al., 2013; Wu et al., 2013), particularly in enhancing the certification value of bank loans (Billett et al., 1995; Ross, 2010). These results are important for the development of the largest private credit market – the syndicated loans market. Indeed, borrowers can gain by mandating reputable and central arrangers, while the latter should care about their reputation and social capital, notably through maintaining and developing valuable interactions,

reciprocity, and trust. Furthermore, these findings are even more important regarding the European credit market, which is the main channel for the external funding of companies.

Nevertheless, empirical investigation of financial institutions networks and the certification value of bank debt remains an important and exciting avenue for further research. We can point out one possible area related to a limit of the present study which is the potential endogeneity of matching between lenders and borrowers. Indeed, Ross (2010) and Fang (2005) have shown that this matching process is influenced by the relative reputations of both counterparties. To circumvent this issue one would need to gather more information on the reputation of lenders and borrowers, eventually by constructing centrality measures for firms.

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Appendix

Lead bank definitions to compute betweenness centrality measures

(1): lenders bearing the titles of Mandated Arranger or Lead Arranger only

(2): lenders bearing the titles of Mandated Arranger or Lead Arranger or Lead Manager or Book Runner or Book Manager or Global Coordinator or Agent

(3): lenders bearing the titles of Mandated Arranger or Lead Arranger or Lead Manager or Book Runner or Book Manager or Global Coordinator or Agent or Co-Book runner(s) or Joint Book runner(s) or Joint Lead Manager(s) or Co-Lead Manager(s) or Co-Arranger(s) or Manager(s) or Co-Manager(s) or Joint-Book Manager(s)

Variables definitions

CAR (-1,1) = cumulative abnormal return computed around the bank loan announcement date on a 3 days window

avg. Betweenness (1) = lenders' betweenness centrality measure average by syndicate (definition 1)

avg. Betweenness (2) = lenders' betweenness centrality measure average by syndicate (definition 2)

avg. Betweenness (3) = lenders' betweenness centrality measure average by syndicate (definition 3)

med. Betweenness (1) = lenders' betweenness centrality measure median by syndicate (definition 1)

med. Betweenness (2) = lenders' betweenness centrality measure median by syndicate (definition 2)

med. Betweenness (3) = lenders' betweenness centrality measure median by syndicate (definition 3)

iqr. Betweenness (1) = lenders' betweenness centrality measure inter quartile range by syndicate (definition 1)

iqr. Betweenness (2) = lenders' betweenness centrality measure inter quartile range by syndicate (definition 2)

iqr. Betweenness (3) = lenders' betweenness centrality measure inter quartile range by syndicate (definition 3)

Loan level (source: Bloomberg)

Loan amount = loan amount (in mln USD)

Maturity = loan maturity (in years)

Term loan = 1 if loan is a term loan

Secured = 1 if loan is secured

Covenants = 1 if loan has covenants

Syndicate = number of lenders in the syndicate

Tranches = number of loan tranches

League table = 1 if loan agent is listed on the European Bloomberg League Table during the 2000-2010 period

First loan = 1 if the loan is the first loan issue for a borrower over the sample period

Firm level (source: Factset)

Rating = 1 if borrower has a rating from S&P or Moody's (LT Local Issuer Credit or Senior Unsecured Debt ratings)

Sales = gross sales and other operating revenue less discounts, returns and allowances (in mln USD)

Debt ratio = total debt to total assets (%)

Ebitda margin = operating income plus depreciation & amortization to net sales (%)

Country level (source: Global Financial Development Database and Djankov et al. 2007)

Stock market = Total value of all listed shares in a stock market as a percentage of GDP (%)

Private credit = Private credit by deposit money banks and other financial institutions to GDP (%)

French law = 1 if the borrower's country has French legal origin

German law = 1 if the borrower's country has German legal origin

Creditor rights = Average creditor rights index

Bank Z score = Weighted average (based on banks' total assets) of the z-scores of a country's individual banks (Z-score compares a bank's buffers - capitalization and returns - with the volatility of those returns)

Bank concentration = Assets of three largest commercial banks as a share of total commercial banking assets (%)

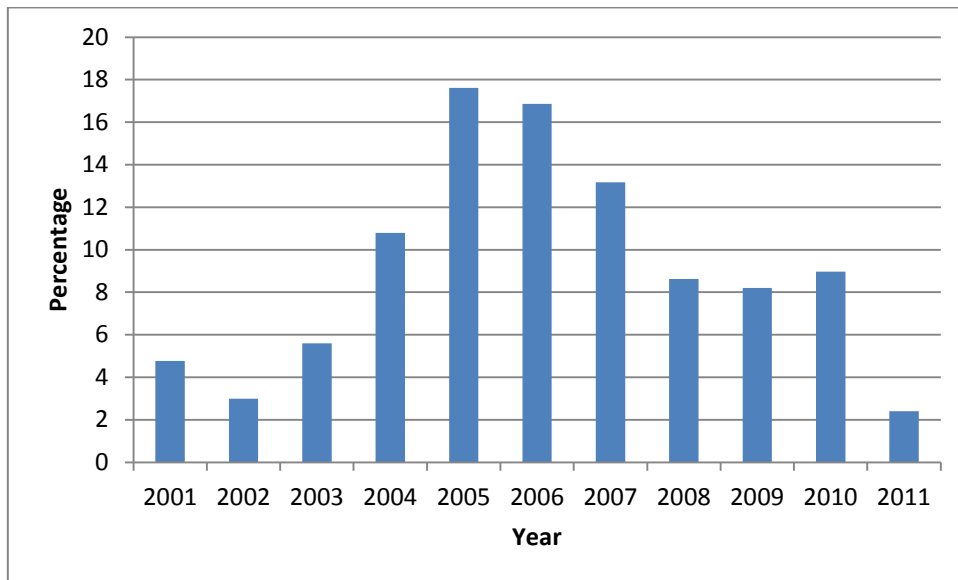


Figure 1 Loans distribution over time

This figure displays the distribution of loans by year in the sample (in percentage). For instance, loans originated in 2005 account for 18% of the loans in the sample.

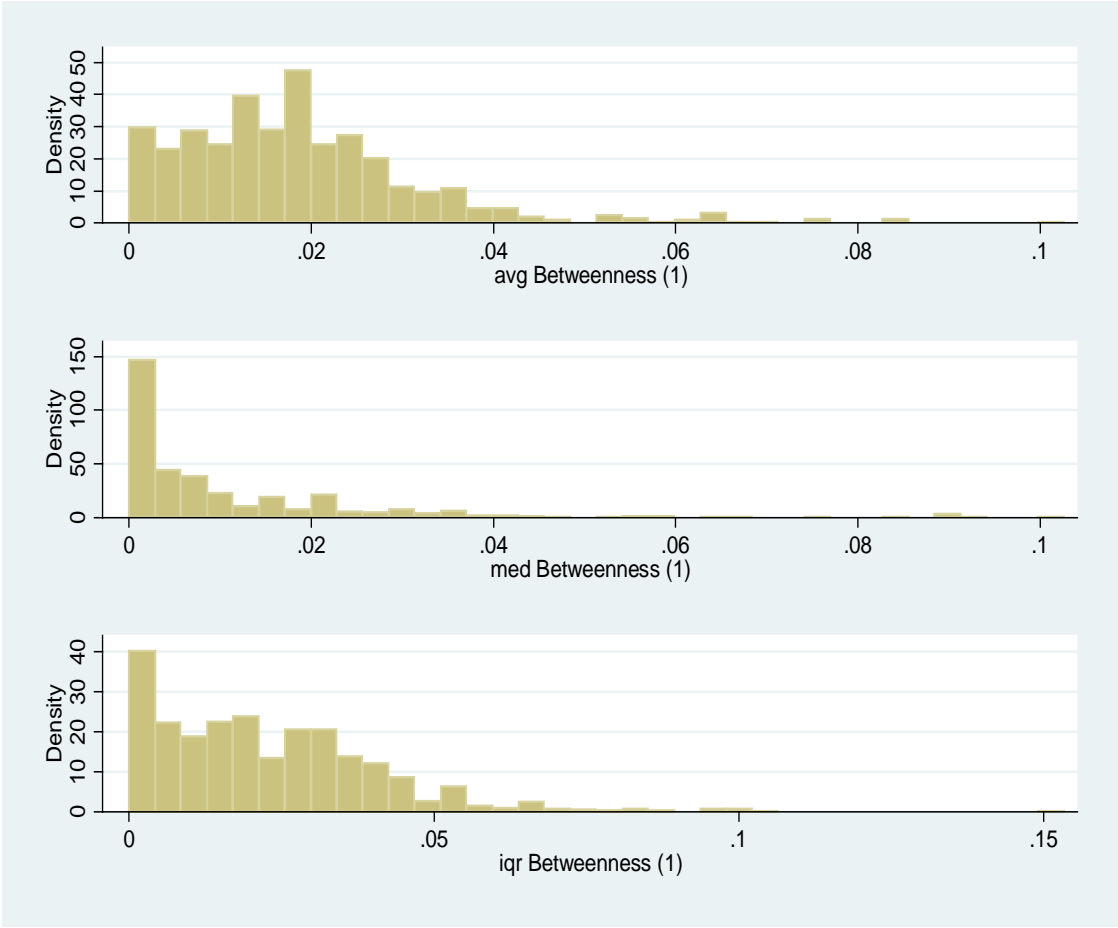


Figure 2 Distributions of syndicate centrality

This figure displays the histograms of syndicate average, median, and interquartile betweenness (according to the most conservative definition of lead banks (1)).

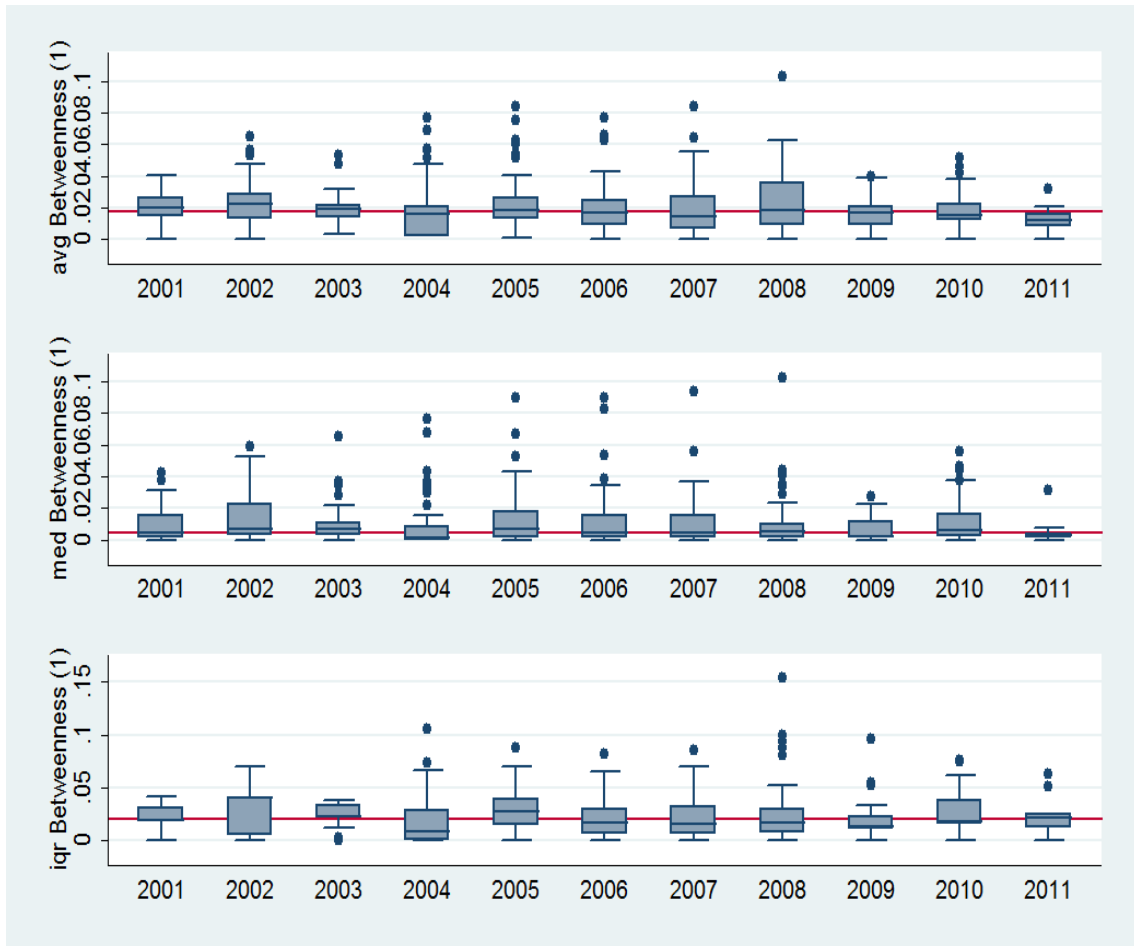


Figure 3 Box-whiskers plots of syndicate centrality

This figure displays the box-whiskers plots of syndicate average, median and interquartile betweenness (according to the most conservative definition of lead banks (1)) over the time span of the sample. The solid lines correspond to the full sample median of the average, median and interquartile betweenness, equal to 0.0173, 0.0046 and 0.0208 respectively.

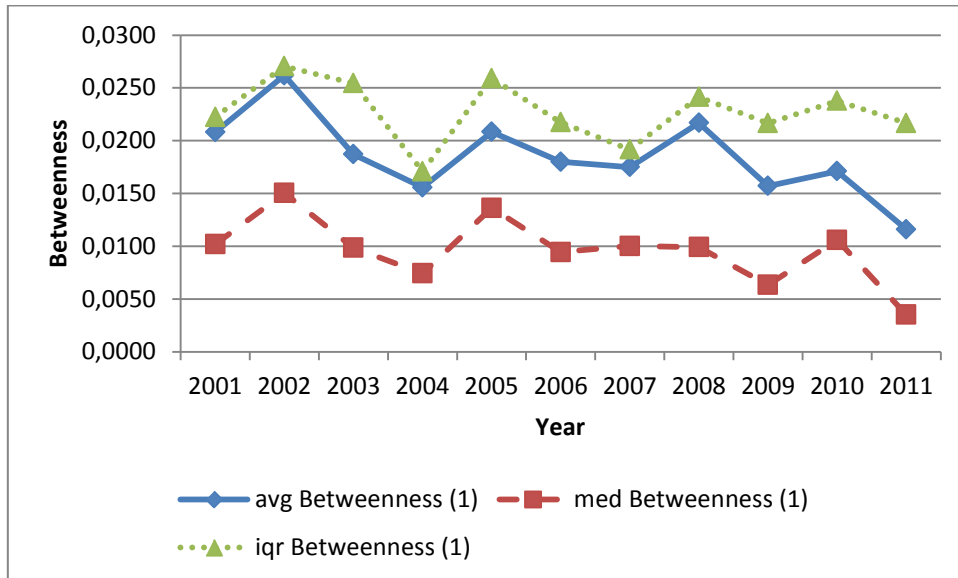


Figure 4 Syndicate centrality over time

This figure displays the evolution of syndicate average, median and interquartile betweenness (according to the most conservative definition of lead banks (1)) over the time span of the sample.

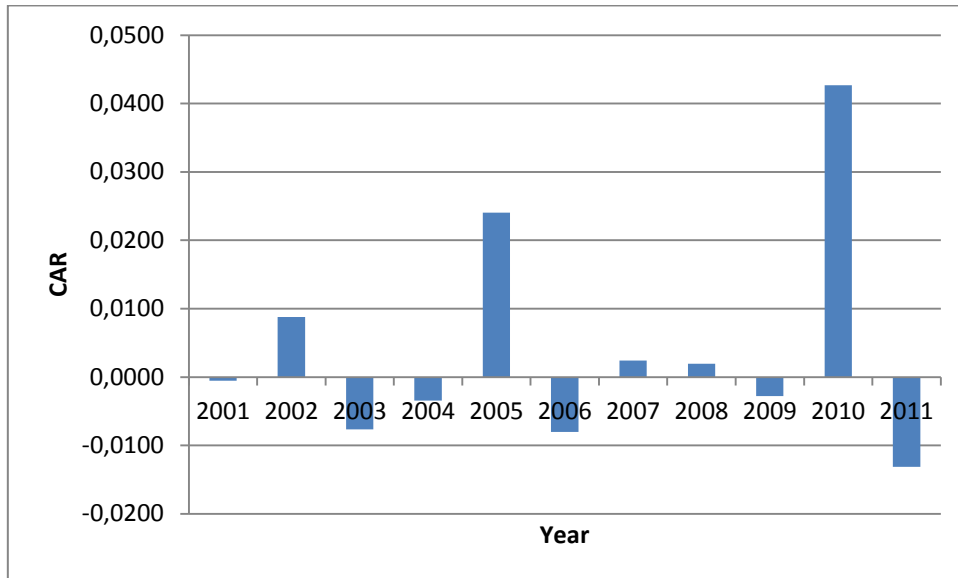


Figure 5 Abnormal returns over time

This figure displays average CAR (-1,1) by year in the sample. For instance, the average CAR in 2005 is around 2.5%.

Table 1 Lenders centrality measures and CAR by borrower country

This table displays the sample composition (percent of sample observations), average, median, and interquartile betweenness (according to the most conservative definition of lead banks (1)), and CAR(-1,1) by borrower country.

Country	Percent	CAR(-1,1)	avg. Betweenness (1)	med. Betweenness (1)	iqr. Betweenness (1)
BELGIUM	1.62	-0.0119	0.0152	0.0064	0.0253
BULGARIA	0.17	-0.0071	0.0057	0.0056	0.0006
CZECH REPUBLIC	0.54	0.0056	0.0050	0.0034	0.0032
DENMARK	1.35	0.0261	0.0076	0.0017	0.0103
FINLAND	0.69	0.0095	0.0062	0.0013	0.0055
FRANCE	16.39	0.0035	0.0265	0.0179	0.0330
GERMANY	5.06	-0.0030	0.0190	0.0098	0.0232
GREECE	0.47	0.0695	0.0048	0.0007	0.0037
HUNGARY	1.82	0.0079	0.0076	0.0020	0.0052
ICELAND	0.64	0.0060	0.0206	0.0127	0.0310
IRELAND	1.01	-0.0204	0.0202	0.0145	0.0204
ITALY	6.71	0.0026	0.0202	0.0087	0.0250
LUXEMBOURG	3.86	-0.0312	0.0058	0.0019	0.0021
NETHERLANDS	8.70	-0.0444	0.0188	0.0086	0.0229
NORWAY	2.70	-0.0558	0.0087	0.0026	0.0119
POLAND	0.74	0.0411	0.0060	0.0011	0.0106
PORTUGAL	0.07	0.0053	0.0130	0.0006	0.0383
ROMANIA	0.15	0.0403	0.0132	0.0071	0.0315
SLOVAKIA	0.15	0.0796	0.0304	0.0316	0.0377
SLOVENIA	1.08	0.0469	0.0104	0.0046	0.0107
SPAIN	16.49	-0.0218	0.0174	0.0092	0.0214
SWEDEN	4.72	0.0012	0.0165	0.0056	0.0246
SWITZERLAND	3.86	0.0689	0.0104	0.0024	0.0093
UNITED KINGDOM	21.03	0.0153	0.0216	0.0128	0.0250

Table 2 Descriptive statistics

This table displays descriptive statistics for all variables (see appendix for definitions).

Variable	N	Mean	SD	Median
CAR (-1,1)	465	0.0544	0.0776	-0.0035
avg. Betweenness (1)	465	0.0185	0.0133	0.0173
avg. Betweenness (2)	465	0.0160	0.0110	0.0146
avg. Betweenness (3)	465	0.0148	0.0101	0.0135
med. Betweenness (1)	465	0.0100	0.0144	0.0046
med. Betweenness (2)	465	0.0090	0.0121	0.0049
med. Betweenness (3)	465	0.0087	0.0112	0.0048
iqr. Betweenness (1)	465	0.0224	0.0181	0.0208
iqr. Betweenness (2)	465	0.0194	0.0148	0.0187
iqr. Betweenness (3)	465	0.0182	0.0135	0.0180
Loan amount	465	1300.0000	1900.0000	729.0000
Maturity	465	5.5236	3.3988	5.0000
Term loan	465	0.5125	0.4999	1.0000
Secured	465	0.2022	0.4017	0.0000
Covenants	465	0.1639	0.3702	0.0000
Syndicate	465	19.4737	23.0466	13.0000
Tranches	465	2.2484	2.4971	2.0000
League table	465	0.4865	0.4999	0.0000
First loan	465	0.5899	0.4919	1.0000
Rating	465	0.3287	0.4698	0.0000
Sales	424	12200.0000	24400.0000	5440.0000
Debt ratio	424	0.3225	0.1741	0.3240
Ebitda margin	357	-1.5600	94.2942	0.1140
Stock market	444	0.9289	0.4273	0.8945
Private credit	431	1.3470	0.4557	1.2992
French law	444	0.5297	0.4992	1.0000
German law	444	0.1405	0.3475	0.0000
Creditor rights	444	2.1323	1.3658	2.0000
Bank Z score	444	14.5010	6.6430	13.8325
Bank concentration	443	0.6806	0.1665	0.6558
Crisis	444	0.2022	0.4017	0.0000

Table 3 Baseline results

This table displays OLS regression results of the CAR(-1,1) on nine different lenders centrality measures and loan, syndicate, and borrower rating variables. Robust standard errors in parentheses are clustered at the bank loan announcement level. All regressions include loan currency, loan purpose, borrower industry, loan year, and borrower country dummies. All variables are defined in appendix. ***, **, and * denotes coefficients that are statistically significant at the 1%, 5%, and 10% level.

Variable	avg. Betweenness			med. Betweenness			iqr. Betweenness		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lenders centrality	2.0545** (0.8432)	2.1096** (0.9829)	2.4473** (1.0758)	2.3471*** (0.6519)	2.7250*** (0.7822)	2.7259*** (0.8327)	0.3337 (0.4445)	-0.0505 (0.4362)	-0.6432 (0.4904)
log(Loan amount)	0.0381*** (0.0075)	0.0393*** (0.0076)	0.0393*** (0.0077)	0.0394*** (0.0082)	0.0399*** (0.0082)	0.0404*** (0.0083)	0.0429*** (0.0081)	0.0447*** (0.0086)	0.0470*** (0.0088)
Maturity	0.0030** (0.0012)	0.0029** (0.0012)	0.0029** (0.0012)	0.0030*** (0.0012)	0.0030** (0.0012)	0.0029** (0.0012)	0.0024** (0.0011)	0.0024** (0.0011)	0.0023** (0.0011)
Term loan	-0.0101 (0.0110)	-0.0127 (0.0111)	-0.0128 (0.0112)	-0.0102 (0.0115)	-0.0116 (0.0115)	-0.0127 (0.0116)	-0.0183 (0.0118)	-0.0202* (0.0121)	-0.0206* (0.0122)
Secured	0.0580* (0.0317)	0.0563* (0.0313)	0.0568* (0.0314)	0.0579* (0.0310)	0.0573* (0.0310)	0.0576* (0.0311)	0.0518* (0.0297)	0.0521* (0.0295)	0.0532* (0.0296)
Covenants	0.1006*** (0.0237)	0.0993*** (0.0236)	0.0989*** (0.0236)	0.1010*** (0.0237)	0.0997*** (0.0237)	0.0983*** (0.0236)	0.0983*** (0.0235)	0.0959*** (0.0231)	0.0941*** (0.0231)
Syndicate	0.0002 (0.0005)	0.0001 (0.0005)	0.0001 (0.0005)	0.0004 (0.0005)	0.0003 (0.0005)	0.0003 (0.0005)	-0.0004 (0.0005)	-0.0005 (0.0004)	-0.0006 (0.0004)
Tranches	-0.0373*** (0.0089)	-0.0373*** (0.0089)	-0.0374*** (0.0090)	-0.0399*** (0.0094)	-0.0395*** (0.0093)	-0.0392*** (0.0093)	-0.0362*** (0.0086)	-0.0362*** (0.0084)	-0.0365*** (0.0084)
League table	0.0158 (0.0189)	0.0140 (0.0185)	0.0144 (0.0185)	0.0206 (0.0191)	0.0184 (0.0187)	0.0176 (0.0187)	0.0106 (0.0178)	0.0100 (0.0174)	0.0090 (0.0176)
First loan	0.0412*** (0.0156)	0.0411*** (0.0155)	0.0411*** (0.0156)	0.0440*** (0.0159)	0.0434*** (0.0159)	0.0426*** (0.0159)	0.0370** (0.0163)	0.0364** (0.0163)	0.0355** (0.0163)
Rating	0.0915*** (0.0219)	0.0927*** (0.0218)	0.0924*** (0.0218)	0.0904*** (0.0215)	0.0912*** (0.0215)	0.0915*** (0.0216)	0.0955*** (0.0212)	0.0956*** (0.0215)	0.0963*** (0.0214)
Intercept	-0.4624*** (0.1251)	-0.4818*** (0.1275)	-0.4793*** (0.1278)	-0.4865*** (0.1366)	-0.4848*** (0.1362)	-0.4929*** (0.1364)	-0.5440*** (0.1361)	-0.5753*** (0.1426)	-0.6145*** (0.1455)
N	465	465	465	465	465	465	465	465	465
Fisher	9.4598	9.4342	9.4378	9.5279	9.4855	9.4568	9.3697	9.4256	9.3931
Adj.R2	0.5068	0.5066	0.5067	0.5073	0.5073	0.5071	0.5061	0.5060	0.5061

Table 4 Results with firm characteristics

This table displays OLS regression results of the CAR(-1,1) on nine different lenders centrality measures and loan, syndicate, borrower rating, and firm variables. Robust standard errors in parentheses are clustered at the bank loan announcement level. All regressions include loan currency, loan purpose, borrower industry, loan year, and borrower country dummies. All variables are defined in appendix. ***, **, and * denotes coefficients that are statistically significant at the 1%, 5%, and 10% level.

Variable	avg. Betweenness			med. Betweenness			iqr. Betweenness		
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Lenders centrality	1.0409*** (0.3602)	0.8847** (0.4482)	0.8788* (0.4918)	0.4168 (0.2748)	0.3827 (0.3646)	0.2190 (0.4183)	0.2902 (0.1991)	0.3967* (0.2319)	0.3133 (0.2670)
log(Loan amount)	0.0062 (0.0038)	0.0070* (0.0038)	0.0072* (0.0038)	0.0082** (0.0035)	0.0083** (0.0035)	0.0085** (0.0036)	0.0077** (0.0037)	0.0073* (0.0038)	0.0076** (0.0039)
Maturity	0.0012* (0.0006)	0.0011* (0.0006)	0.0011* (0.0006)	0.0010* (0.0006)	0.0010* (0.0006)	0.0010 (0.0006)	0.0010 (0.0006)	0.0010 (0.0006)	0.0010 (0.0006)
Term loan	-0.0224*** (0.0086)	-0.0241*** (0.0086)	-0.0246*** (0.0086)	-0.0257*** (0.0085)	-0.0261*** (0.0085)	-0.0269*** (0.0086)	-0.0259*** (0.0087)	-0.0262*** (0.0085)	-0.0271*** (0.0083)
Secured	-0.0320*** (0.0120)	-0.0324*** (0.0120)	-0.0325*** (0.0120)	-0.0335*** (0.0119)	-0.0335*** (0.0120)	-0.0337*** (0.0120)	-0.0348*** (0.0114)	-0.0351*** (0.0115)	-0.0348*** (0.0114)
Covenants	0.0009 (0.0112)	-0.0002 (0.0112)	-0.0005 (0.0112)	-0.0012 (0.0112)	-0.0015 (0.0112)	-0.0021 (0.0112)	-0.0003 (0.0110)	0.0003 (0.0110)	-0.0007 (0.0110)
Syndicate	-0.0000 (0.0003)	-0.0001 (0.0003)	-0.0002 (0.0003)	-0.0002 (0.0003)	-0.0002 (0.0003)	-0.0003 (0.0003)	-0.0003 (0.0003)	-0.0002 (0.0003)	-0.0003 (0.0003)
Tranches	0.0024 (0.0015)	0.0021 (0.0016)	0.0021 (0.0016)	0.0019 (0.0015)	0.0018 (0.0015)	0.0017 (0.0015)	0.0020 (0.0016)	0.0022 (0.0016)	0.0020 (0.0016)
League table	-0.0027 (0.0073)	-0.0042 (0.0072)	-0.0045 (0.0072)	-0.0050 (0.0073)	-0.0056 (0.0073)	-0.0063 (0.0073)	-0.0062 (0.0069)	-0.0060 (0.0069)	-0.0062 (0.0070)
First loan	0.0077 (0.0108)	0.0068 (0.0109)	0.0065 (0.0110)	0.0068 (0.0108)	0.0063 (0.0109)	0.0060 (0.0109)	0.0067 (0.0108)	0.0071 (0.0107)	0.0066 (0.0107)
Rating	-0.0104 (0.0090)	-0.0095 (0.0091)	-0.0094 (0.0091)	-0.0084 (0.0091)	-0.0079 (0.0091)	-0.0072 (0.0091)	-0.0072 (0.0088)	-0.0078 (0.0088)	-0.0075 (0.0088)
log(Sales)	0.0078** (0.0036)	0.0078** (0.0036)	0.0078** (0.0036)	0.0076** (0.0035)	0.0076** (0.0036)	0.0077** (0.0036)	0.0076** (0.0035)	0.0077** (0.0036)	0.0077** (0.0036)
Debt ratio	-0.0861*** (0.0266)	-0.0873*** (0.0266)	-0.0879*** (0.0266)	-0.0896*** (0.0262)	-0.0902*** (0.0259)	-0.0892*** (0.0259)	-0.0856*** (0.0270)	-0.0853*** (0.0269)	-0.0854*** (0.0273)
Ebitda margin	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)
Intercept	-0.1245* (0.0723)	-0.1389* (0.0735)	-0.1420* (0.0738)	-0.1607** (0.0701)	-0.1623** (0.0708)	-0.1660** (0.0715)	-0.1530** (0.0748)	-0.1461* (0.0763)	-0.1523** (0.0771)
N	359	359	359	359	359	359	359	359	359
Fisher	80.1839	79.9093	78.8819	85.8851	82.1303	76.0077	77.0583	77.2990	74.7480
Adj.R2	0.1266	0.1250	0.1247	0.1239	0.1237	0.1234	0.1239	0.1240	0.1237

Table 5 Results with country characteristics

This table displays OLS regression results of the CAR(-1,1) on nine different lenders centrality measures and loan, syndicate, borrower rating and country variables. Robust standard errors in parentheses are clustered at the bank loan announcement level. All regressions include loan currency, loan purpose, borrower industry, and loan year dummies. All variables are defined in appendix. ***, **, and * denotes coefficients that are statistically significant at the 1%, 5%, and 10% level.

Variable	avg. Betweenness			med. Betweenness			iqr. Betweenness		
	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
Lenders centrality	2.8043*** (0.9111)	2.2539** (1.0611)	2.5384** (1.1783)	2.5948*** (0.7608)	2.4133*** (0.8805)	2.5824*** (0.9688)	0.9349* (0.5222)	-0.4434 (0.5331)	-0.8280 (0.6009)
log(Loan amount)	0.0017 (0.0084)	0.0051 (0.0084)	0.0052 (0.0084)	0.0034 (0.0087)	0.0055 (0.0086)	0.0058 (0.0086)	0.0064 (0.0089)	0.0137 (0.0093)	0.0152 (0.0094)
Maturity	0.0052** (0.0021)	0.0048** (0.0021)	0.0048** (0.0021)	0.0052** (0.0021)	0.0049** (0.0021)	0.0049** (0.0021)	0.0044** (0.0021)	0.0041** (0.0020)	0.0040** (0.0020)
Term loan	0.1144*** (0.0204)	0.1087*** (0.0199)	0.1084*** (0.0198)	0.1100*** (0.0196)	0.1072*** (0.0194)	0.1068*** (0.0193)	0.1062*** (0.0198)	0.0997*** (0.0188)	0.1001*** (0.0186)
Secured	-0.0269 (0.0347)	-0.0303 (0.0345)	-0.0300 (0.0345)	-0.0301 (0.0340)	-0.0311 (0.0340)	-0.0305 (0.0342)	-0.0351 (0.0333)	-0.0327 (0.0333)	-0.0320 (0.0334)
Covenants	0.0554* (0.0323)	0.0538* (0.0323)	0.0532 (0.0323)	0.0538* (0.0322)	0.0530 (0.0322)	0.0523 (0.0323)	0.0587* (0.0319)	0.0526* (0.0319)	0.0521 (0.0319)
Syndicate	-0.0007 (0.0012)	-0.0010 (0.0011)	-0.0010 (0.0011)	-0.0002 (0.0012)	-0.0006 (0.0012)	-0.0006 (0.0012)	-0.0015 (0.0012)	-0.0020* (0.0012)	-0.0021* (0.0012)
Tranches	-0.0358*** (0.0108)	-0.0352*** (0.0108)	-0.0353*** (0.0108)	-0.0377*** (0.0110)	-0.0367*** (0.0110)	-0.0367*** (0.0110)	-0.0343*** (0.0105)	-0.0344*** (0.0104)	-0.0346*** (0.0105)
League table	-0.0105 (0.0242)	-0.0130 (0.0240)	-0.0130 (0.0240)	-0.0079 (0.0242)	-0.0111 (0.0241)	-0.0113 (0.0241)	-0.0142 (0.0237)	-0.0155 (0.0235)	-0.0163 (0.0237)
First loan	-0.0472* (0.0261)	-0.0493* (0.0262)	-0.0493* (0.0262)	-0.0456* (0.0261)	-0.0481* (0.0263)	-0.0483* (0.0263)	-0.0530** (0.0270)	-0.0553** (0.0271)	-0.0559** (0.0271)
Rating	0.3248*** (0.0359)	0.3268*** (0.0360)	0.3266*** (0.0360)	0.3244*** (0.0357)	0.3261*** (0.0359)	0.3262*** (0.0358)	0.3300*** (0.0362)	0.3314*** (0.0362)	0.3319*** (0.0361)
Stock market	0.1781*** (0.0597)	0.1727*** (0.0592)	0.1718*** (0.0590)	0.1794*** (0.0596)	0.1776*** (0.0598)	0.1770*** (0.0597)	0.1749*** (0.0598)	0.1695*** (0.0589)	0.1703*** (0.0589)
Private credit	-0.5216*** (0.0685)	-0.5159*** (0.0680)	-0.5161*** (0.0680)	-0.5292*** (0.0693)	-0.5242*** (0.0692)	-0.5237*** (0.0691)	-0.5109*** (0.0675)	-0.5060*** (0.0666)	-0.5057*** (0.0666)
Bank Z score	0.0145*** (0.0021)	0.0144*** (0.0021)	0.0144*** (0.0021)	0.0146*** (0.0021)	0.0145*** (0.0021)	0.0145*** (0.0021)	0.0145*** (0.0022)	0.0140*** (0.0021)	0.0140*** (0.0021)
Bank concentration	-0.3837*** (0.0630)	-0.3983*** (0.0635)	-0.3977*** (0.0634)	-0.3780*** (0.0625)	-0.3899*** (0.0631)	-0.3917*** (0.0630)	-0.4113*** (0.0638)	-0.4278*** (0.0641)	-0.4299*** (0.0639)
French law	0.0656*** (0.0233)	0.0695*** (0.0236)	0.0692*** (0.0235)	0.0696*** (0.0238)	0.0725*** (0.0240)	0.0722*** (0.0239)	0.0735*** (0.0242)	0.0754*** (0.0244)	0.0758*** (0.0244)
German law	0.2122** (0.0935)	0.2111** (0.0935)	0.2114** (0.0935)	0.2091** (0.0937)	0.2088** (0.0937)	0.2088** (0.0937)	0.2135** (0.0939)	0.2046** (0.0942)	0.2031** (0.0943)
Creditor rights	0.1581*** (0.0203)	0.1569*** (0.0202)	0.1568*** (0.0202)	0.1602*** (0.0205)	0.1588*** (0.0204)	0.1590*** (0.0205)	0.1570*** (0.0204)	0.1543*** (0.0200)	0.1538*** (0.0200)
Intercept	0.6104*** (0.2029)	0.5629*** (0.2011)	0.5633*** (0.2017)	0.5938*** (0.2061)	0.5681*** (0.2039)	0.5628*** (0.2045)	0.5337*** (0.2052)	0.4352** (0.2063)	0.4125** (0.2084)
N	430	430	430	430	430	430	430	430	430
Fisher	3.5792	3.6009	3.6008	3.6211	3.6282	3.6301	3.6039	3.6197	3.6256
Adj.R2	0.1842	0.1833	0.1834	0.1843	0.1837	0.1837	0.1829	0.1825	0.1826

Table 6 Results with loan and syndicate interaction terms

This table displays OLS regression results of the CAR(-1,1) on a lenders centrality measure and various loan and syndicate interaction terms, as well as loan, syndicate, and borrower rating variables. Each column corresponds to a regression including one particular variable interacted with average Betweenness (1). For continuous variables we rely on their sample medians to compute the relevant dummies. Small loan = 1 if loan amount is lower than 729 million USD. Short maturity = 1 if loan maturity is lower than 5 years. Small syndicate = 1 if syndicate has less than 13 lenders. Robust standard errors in parentheses are clustered at the bank loan announcement level. All regressions include loan currency, loan purpose, borrower industry, loan year, and borrower country dummies. All variables are defined in appendix. ***, **, and * denotes coefficients that are statistically significant at the 1%, 5%, and 10% level.

Variable	Small loan	Short maturity	Secured	Covenants	Small syndicate	League table
avg Betweenness (1)	0.6244 (0.9649)	2.1705** (0.8786)	2.0629** (1.0118)	3.8361*** (0.9387)	-3.9506*** (1.0456)	3.5214** (1.3673)
avg. Betweenness (1) x Variable	2.2794*** (0.6512)	-0.4267 (0.5348)	-0.0232 (0.8824)	-9.8643*** (1.8801)	6.5792*** (0.7612)	-3.6920** (1.4997)
log(Loan amount)	0.0515*** (0.0092)	0.0381*** (0.0075)	0.0381*** (0.0075)	0.0384*** (0.0076)	0.0542*** (0.0086)	0.0388*** (0.0077)
Maturity	0.0026** (0.0012)	0.0025* (0.0014)	0.0030** (0.0012)	0.0037*** (0.0012)	0.0027** (0.0012)	0.0026** (0.0012)
Term loan	-0.0119 (0.0111)	-0.0093 (0.0112)	-0.0101 (0.0110)	-0.0106 (0.0112)	-0.0315*** (0.0121)	-0.0086 (0.0109)
Secured	0.0584* (0.0318)	0.0580* (0.0317)	0.0584 (0.0396)	0.0534* (0.0315)	0.0548* (0.0317)	0.0585* (0.0318)
Covenants	0.1007*** (0.0237)	0.0997*** (0.0232)	0.1006*** (0.0236)	0.2749*** (0.0508)	0.1166*** (0.0240)	0.0991*** (0.0236)
Syndicate	0.0001 (0.0005)	0.0002 (0.0005)	0.0002 (0.0005)	0.0007 (0.0005)	0.0016*** (0.0005)	-0.0000 (0.0005)
Tranches	-0.0361*** (0.0089)	-0.0374*** (0.0089)	-0.0373*** (0.0088)	-0.0370*** (0.0088)	-0.0397*** (0.0089)	-0.0392*** (0.0095)
League table	0.0130 (0.0191)	0.0161 (0.0189)	0.0158 (0.0188)	0.0144 (0.0188)	0.0141 (0.0188)	0.0904* (0.0462)
First loan	0.0404*** (0.0156)	0.0409*** (0.0156)	0.0412*** (0.0155)	0.0518*** (0.0160)	0.0331** (0.0154)	0.0425*** (0.0154)
Rating	0.0939*** (0.0219)	0.0917*** (0.0220)	0.0915*** (0.0225)	0.0860*** (0.0208)	0.0936*** (0.0218)	0.0925*** (0.0219)
Intercept	-0.7189*** (0.1569)	-0.4608*** (0.1253)	-0.4626*** (0.1273)	-0.5370*** (0.1298)	-0.8102*** (0.1477)	-0.5065*** (0.1358)
N	465	465	465	465	465	465
Fisher	9.0845	9.2324	9.2990	9.4089	8.9212	9.3342
Adj.R2	0.5073	0.5067	0.5067	0.5102	0.5115	0.5075

Table 7 Results with firm interaction terms

This table displays OLS regression results of the CAR(-1,1) on a lenders centrality measure and various firm interaction terms, as well as loan, syndicate, borrower rating, and firm variables. Each column corresponds to a regression including one particular variable interacted with average Betweenness (1). For continuous variables we rely on their sample medians to compute the relevant dummies. Low sales = 1 if Sales are lower than 5440 mln USD. Low debt = 1 if Debt ratio is lower than 0.3240. Low profit = 1 if Ebitda margin is lower than 0.1139. Robust standard errors in parentheses are clustered at the bank loan announcement level. All regressions include loan currency, loan purpose, borrower industry, loan year, and borrower country dummies. All variables are defined in appendix. ***, **, and * denotes coefficients that are statistically significant at the 1%, 5%, and 10% level.

Variable	Low sales	Low debt	Low profit
avg Betweenness (1)	-0.2916 (0.6321)	0.4310 (0.5512)	1.0274*** (0.3425)
avg. Betweenness (1) x Variable	1.8076*** (0.5238)	1.0551** (0.4952)	0.0530 (0.3574)
log(Loan amount)	0.0075* (0.0040)	0.0067* (0.0040)	0.0063* (0.0037)
Maturity	0.0011* (0.0006)	0.0011 (0.0007)	0.0012* (0.0006)
Term loan	-0.0268*** (0.0093)	-0.0222*** (0.0086)	-0.0222** (0.0086)
Secured	-0.0297*** (0.0115)	-0.0326*** (0.0121)	-0.0318*** (0.0123)
Covenants	0.0066 (0.0116)	-0.0006 (0.0108)	0.0008 (0.0111)
Syndicate	-0.0002 (0.0004)	-0.0001 (0.0003)	-0.0000 (0.0003)
Tranches	0.0014 (0.0015)	0.0029* (0.0015)	0.0023 (0.0015)
League table	-0.0079 (0.0078)	-0.0013 (0.0073)	-0.0026 (0.0073)
First loan	0.0076 (0.0108)	0.0092 (0.0114)	0.0078 (0.0106)
Rating	-0.0107 (0.0090)	-0.0125 (0.0090)	-0.0103 (0.0088)
log(Sales)	0.0160*** (0.0039)	0.0085** (0.0035)	0.0077** (0.0035)
Debt ratio	-0.1014*** (0.0293)	-0.0330 (0.0286)	-0.0856*** (0.0285)
Ebitda margin	-0.0000** (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)
Intercept	-0.1887** (0.0833)	-0.1642* (0.0850)	-0.1260* (0.0731)
N	359	359	359
Fisher	37.8035	75.1207	80.7505
Adj.R2	0.1322	0.1281	0.1263

Table 8 Results with country interaction terms

This table displays OLS regression results of the CAR(-1,1) on a lenders centrality measure and various country interaction terms, as well as loan, syndicate, borrower rating, and country variables. Each column corresponds to a regression including one particular variable interacted with average Betweenness (1). For continuous variables we rely on their sample medians to compute the relevant dummies. Low stock market = 1 if stock market is lower than 0.8944. Low private credit = 1 if private credit is lower than 1.2992. Weak creditor rights = 1 if creditor rights is below 2. Low bank z score = 1 if bank z score is lower than 13.8324. High bank concentration = 1 if bank concentration is larger than 0.6557. Crisis = 1 for all bank loan announcements occurring after September 2008. Robust standard errors in parentheses are clustered at the bank loan announcement level. All regressions include loan currency, loan purpose, borrower industry, and loan year dummies. All variables are defined in appendix. ***, **, and * denotes coefficients that are statistically significant at the 1%, 5%, and 10% level.

Variable	Low stock market	Low private credit	Low bank z score	High bank concentration	Weak creditor rights	Crisis
avg Betweenness (1)	2.0932*** (0.7764)	4.5575*** (1.2161)	10.0746*** (1.6462)	3.3854*** (0.9420)	0.7350 (1.4932)	3.2628*** (1.0173)
avg. Betweenness (1) x Variable	1.9213** (0.8808)	-3.4674*** (1.2093)	-12.8608*** (1.9697)	-2.0184 (2.3215)	5.1910** (2.2267)	-4.3345* (2.2521)
log(Loan amount)	0.0024 (0.0085)	0.0017 (0.0084)	-0.0001 (0.0086)	0.0037 (0.0076)	0.0075 (0.0076)	0.0023 (0.0084)
Maturity	0.0053** (0.0021)	0.0053** (0.0021)	0.0057*** (0.0021)	0.0052** (0.0021)	0.0047** (0.0021)	0.0051** (0.0021)
Term loan	0.1167*** (0.0208)	0.1098*** (0.0202)	0.1245*** (0.0212)	0.1107*** (0.0201)	0.1129*** (0.0203)	0.1186*** (0.0212)
Secured	-0.0290 (0.0343)	-0.0252 (0.0348)	-0.0186 (0.0349)	-0.0290 (0.0365)	-0.0249 (0.0345)	-0.0235 (0.0352)
Covenants	0.0587* (0.0324)	0.0555* (0.0323)	0.0485 (0.0323)	0.0545* (0.0328)	0.0515 (0.0331)	0.0544* (0.0323)
Syndicate	-0.0008 (0.0012)	-0.0004 (0.0012)	0.0008 (0.0011)	-0.0008 (0.0012)	-0.0010 (0.0012)	-0.0007 (0.0012)
Tranches	-0.0372*** (0.0111)	-0.0372*** (0.0109)	-0.0419*** (0.0107)	-0.0351*** (0.0114)	-0.0350*** (0.0111)	-0.0367*** (0.0110)
League table	-0.0072 (0.0247)	-0.0065 (0.0243)	-0.0036 (0.0240)	-0.0154 (0.0269)	-0.0214 (0.0273)	-0.0097 (0.0243)
First loan	-0.0431* (0.0253)	-0.0487* (0.0262)	-0.0133 (0.0243)	-0.0436* (0.0264)	-0.0462* (0.0260)	-0.0466* (0.0260)
Rating	0.3290*** (0.0364)	0.3222*** (0.0359)	0.3222*** (0.0350)	0.3274*** (0.0372)	0.3214*** (0.0351)	0.3249*** (0.0360)
Stock market	0.2061*** (0.0656)	0.1651*** (0.0577)	0.1473** (0.0614)	0.1666** (0.0700)	0.1715*** (0.0620)	0.1755*** (0.0592)
Private credit	-0.5283*** (0.0698)	-0.5676*** (0.0764)	-0.5436*** (0.0701)	-0.5054*** (0.0730)	-0.5294*** (0.0685)	-0.5252*** (0.0691)
Bank Z score	0.0151*** (0.0022)	0.0141*** (0.0021)	0.0010 (0.0016)	0.0152*** (0.0025)	0.0161*** (0.0024)	0.0144*** (0.0021)
Bank concentration	-0.3737*** (0.0635)	-0.3862*** (0.0630)	-0.3489*** (0.0605)	-0.3155*** (0.0852)	-0.3824*** (0.0623)	-0.3725*** (0.0624)
French law	0.0628*** (0.0230)	0.0619*** (0.0230)	0.0697*** (0.0239)	0.0749*** (0.0233)	0.1048*** (0.0249)	0.0651*** (0.0233)
German law	0.2025** (0.0940)	0.2118** (0.0934)	0.2443** (0.0961)	0.2325** (0.1128)	0.2450** (0.1056)	0.2115** (0.0935)

Creditor rights	0.1629*** (0.0212)	0.1491*** (0.0193)	0.1743*** (0.0218)	0.1623*** (0.0213)	0.1989*** (0.0279)	0.1587*** (0.0204)
Crisis						0.6929*** (0.0971)
Intercept	0.5529*** (0.2044)	0.7167*** (0.2065)	0.6278*** (0.2059)	0.4965*** (0.1918)	0.3772** (0.1883)	-0.0650 (0.1801)
N	430	430	430	430	430	430
Fisher	3.4986	3.5080	3.5930	3.4154	3.4640	3.4498
Adj.R2	0.1849	0.1854	0.2004	0.1847	0.1860	0.1849