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# Private debt renegotiation and financial institutions' network

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## Abstract

We study the influence of financial institutions' network on private debt renegotiation outside of distress. Lenders with a network-central position have access to superior private information, are more experienced and trustworthy and have a greater reputational capital. Using a large sample of more than 10.000 loans issued in 25 European countries we find that network-central lenders have a significant influence on the renegotiation process. Such lenders increase the likelihood of renegotiation, the number of renegotiation rounds, and the number of amendments to the loan agreement. Our findings survive multiple robustness checks and confirm that access to superior information, greater experience, reputation, and trust encourages private debt renegotiation.

*JEL classification:* G21, G24, G32, G34.

*Keywords:* financial contracts, bank loan, renegotiation, syndicated lending, social network analysis, lender network, lender centrality.

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## Abstract

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## 1. Introduction

What is the influence of a lender's financial network on financial contracting? We empirically investigate the influence of a financial institution network position (i.e. centrality) on private debt renegotiation. we rely on two strands of literature: the financial contracting literature focusing on loan renegotiation outside of distress and the literature on social network analysis of credit markets and financial institutions. We link the social network analysis perspective on information production, experience, reputation, and trust of financial institutions on credit markets and the design of private debt contracts.

Financial contracts are crucial for corporate external financing and a major advantage of private debt contracts is their inherent flexibility as they can be renegotiated outside of financial distress (Gorton and Kahn, 2000; Smith and Warner, 1979; Zinbarg, 1975). The literature on debt renegotiation has its origins in the seminal studies on incomplete contracts (Aghion and Bolton, 1992; Grossman and Hart, 1982; Hart and Moore, 1988). The renegotiation of credit agreements is about designing a decision-making mechanism for revising the initial terms in case of contingencies in order to update and complete the initial agreement (Hart and Moore, 1999). In other words, renegotiation arises on the equilibrium path as an ex-post remedy to the initial contractual incompleteness. But as renegotiation is costly (transaction costs, coordination costs, legal costs, type I and II error costs…), making the "right" renegotiation decision remains a challenging task. This is why understanding the major determinants of a private debt renegotiation process is very important because it has far reaching consequences for the design of debt contracts, corporate policy and performance, and financial intermediation efficiency (Gorton and Kahn, 2000).

According to recent evidence, the initial conditions that are embedded in the initial loan contract, such as informational and contractual frictions, bargaining power of counterparties, and allocation of control/decision rights, are important drivers of loan

renegotiation (Godlewski, 2019a; Nikolaev, 2018; Paligorova and Santos, 2016; Saavedra, 2018). These initial conditions depend on lenders' access to timely, relevant, and valuable private information, experience in structuring deals, and reputation and trust on the credit markets. These crucial features rely heavily on collaboration and reciprocity which are important determinants of social capital (Carpenter et al., 2009; Song, 2009), driven by social networks (Cagno and Sciubba, 2010), especially on the syndicated loans' market.[1]

The syndicated loans market bears many social network features because it is both an information network and a capital network (Baum et al., 2004, 2003; Godlewski et al., 2012; Morrison and Wilhelm Jr., 2007). These two important network functions address informational frictions and agency costs issues by reducing screening and monitoring costs of the borrower-lender relationship and by building trust and reputation among lenders. Collaboration is an important feature of bank loan syndication as reciprocal arrangements among lead banks are very common (Cai, 2009; Cai et al., 2017; Champagne and Kryzanowski, 2007; Houston et al., 2018). Furthermore, the syndicated loans market relies heavily on lead banks who bear a pivotal role in the syndicated deal.[2] Reputable, trustworthy, and experienced lead banks with an established track record of deals can enhance monitoring, the ability to attract participants, signal the quality of the deal, and mitigates information asymmetries and agency costs (Bushman and Wittenberg-Moerman, 2012; Gopalan et al., 2011; Johnson, 1997; Panyagometh and Roberts, 2010).

Financial institutions with a central position in a network get access to valuable private information that makes screening and monitoring less costly and more efficient. For instance, Godlewski and Sanditov (2018) show that the presence of central lenders substantially

[1] Which is the largest private debt market and the major source of external financing for firms worldwide (surpassing 5,000 US$bil. and 10,000 deals in 2018; Thomson Reuters, 2018).
[2] Lead banks are responsible for negotiating the key loan terms with the borrower, due diligence, structuring the syndicate, appointing its members and allocating the loan to them, and ex post monitoring. See Taylor and Sansone (2006) for a detailed presentation of syndicated loans.

increases the stock market's reaction to loan announcement. A network-central position is also the consequence of repeated interactions and tie embeddedness that help build trust, reciprocity, and reputation capital (Bülbül, 2013; Chuluun, 2015). The network adds constraint on members' opportunistic behavior, making lenders with central positions more sensitive to reputation concerns. For all these reasons, strong network capabilities and more central positions are crucial ingredients in financial decisions and for financial performances.

Mutual fund portfolio managers place larger bets on firms with which they are connected or through idea sharing, and perform better on these holdings (Cohen et al., 2008; Cujean, 2020). Board connections between acquirer and target firms provide valuable information about the true value of M&A transactions (Cai and Sevilir, 2012). On the IPO market, central underwriters are associated with more successful, greater valuation and liquidity, and larger returns offerings (Bajo et al., 2016). Central VC firms have better fund performance (Hochberg et al., 2007), while central lenders charge lower interest rates to their borrowers (Engelberg et al., 2012; Godlewski et al., 2012) and provide a significant market certification effect (Godlewski and Sanditov, 2018).

Hence, applying social network analysis to credit markets and financial institutions offers a rich perspective to measure the value of screening and monitoring quality, experience, reputation, and trust of the lenders. We hypothesize that thanks to their network position, more central lenders have access to better information, are more experienced and trustworthy and have a greater reputational capital. These features directly influence the initial conditions around loan origination that are important drivers of loan renegotiation. Hence lender's centrality should also have an impact on a loan renegotiation process. The information value of network centrality gives central lenders better screening capacities, helping mitigate adverse selection problems of renegotiation. The experience value of network centrality means better deal structuring capacities while the reputation value of

network centrality signals a better deal, syndicate, borrower, etc. The trust value of a network centrality provides central lenders with better monitoring capacities helping mitigate moral hazard and lower renegotiation costs. Overall, better information, greater experience, reputation and trust should increase renegotiation likelihood, the number of renegotiation rounds and of amended terms.

However, we can also consider that more central lenders are expected to write a "better", more "complete" initial contract thanks to their superior information, experience, reputation and trust. Such contracts are less likely to be renegotiated, enter less renegotiation rounds and have less amended terms because more complete since origination. The threat of losing reputation by making the "wrong" renegotiation decision may also reduce the renegotiation likelihood, the number of rounds or the scope of the amendments.

To perform our empirical analysis, we consider several aspects of the renegotiation process: the likelihood of renegotiation, the number of renegotiation rounds, and the number of amendments to the initial loan. Indeed, multiple renegotiation rounds can occur during the life time of the credit agreement (Roberts, 2015), and large portions of the loan contract can be rewritten by amending several characteristics of the debt contract (Godlewski, 2019b). We consider common social network metrics such as betweenness, closeness, and degree centrality, each measuring how a lender is positioned in a network (Godlewski et al., 2012; Meuleman and Wright, 2009; Wu et al., 2013). Betweenness centrality measures how well a lender is *positioned* in between the other lenders. Lenders with high betweenness centrality may act as important "bridges" or "intermediaries" connecting the other members of the network. The more strategic is the lender position, the higher is its betweenness centrality. Closeness centrality measures a lender *proximity* to other lenders in the network and therefore the "depth" of a lender's network. The closer is a lender to the center of a network, the higher is its closeness centrality. Degree centrality characterizes the *involvement* or "size" of a lender

in a network, with an emphasis on the local network neighborhood. The more connections a lender has, the greater is its degree centrality.

We control for a large set of control variables including loan, lender and borrower characteristics, along with country economic, financial and legal characteristics. We use a sample of more than 10.000 loans issued to almost 7.000 European firms from 25 countries between 1999 and 2017. We focus on the European credit market because its financial system is bank-based and private debt remains the major source of external financing for firms (de Haan et al., 2012; Gomes and Phillips, 2012), making the design of loan contracts of utmost interest. Furthermore, the European legal environment is less protective of creditors. For instance, according to Favara et al. (2012), lenders' recovery rate in the US is close to 90% while it is below 70% in the European Union. Hence, the design of loan contracts becomes very important because the security level of this design may be a substitute for the country-level protection of investors (Miller and Reisel, 2012).

Our findings can be summarized as follows. We confirm the hypothesis that network-central lenders have a positive influence on the entire renegotiation process. We do not find support for the alternative hypothesis that central lenders are able to write more "complete" contracts at origination which are more renegotiation-proof or that the threat of harming their reputation capital by making the "wrong" renegotiation decision reduces the lenders' willingness to enter a renegotiation process. Our findings confirm that better information, greater experience, reputation and trust increase renegotiation likelihood, the number of renegotiation rounds and of amended terms. The results survive numerous robustness checks and confirm the crucial role of legal and institutional environments for private debt renegotiation. Weaker legal protection of creditors decreases the role of reputation and trust for renegotiation. We also uncover that complex deals (with multiple tranches) make network

centrality insignificant for renegotiation. Finally, we find that the benefits of central lenders is not concentrated with the "top dogs" on the credit market.

We contribute to a growing empirical literature on private debt renegotiation and to the literature on social network analysis of financial markets, with a focus on the largest private debt market – the syndicated loans market. According to our knowledge, the closest paper is Godlewski et al. (2012) who study the influence of lender centrality on loan spreads at origination but do not consider the renegotiation of the initial loan agreements. We complement studies on private debt renegotiation (Godlewski, 2019a, 2019b, 2015, 2014; Nikolaev, 2018; Roberts, 2015; Roberts and Sufi, 2009), which do not take the lenders network and centrality into account. We contribute to the literature on the role of connections, networking and reputation in bank lending (Billett et al., 1995; Engelberg et al., 2012; Gatti et al., 2013; McCahery and Schwienbacher, 2010; Ross, 2010) which do not apply social network analysis to compute (deeper and richer) centrality measures of lenders. We extend the existing literature applying social network analysis to syndicated lending (Baum et al., 2004; Godlewski et al., 2012; Houston et al., 2018) by investigating loan renegotiation.

The rest of the article is organized as follows. We present the empirical design in Section II. We discuss the results in Section III. Section IV concludes.

## 2. Empirical design

In this section, we describe our data, methodology and variables.

### 2.1 Data

The main source of our data is the Bloomberg Professional Terminal Service (Bloomberg). We extract all loan amendments in Europe with effective dates between January 1999 and December 2017. This first data set contains description of amended terms, such as changes to amount, maturity, covenants, pricing grid, and definition (which is a non-material amendment). We extract all loans issued to European borrowers (excluding Financial and

Government entities) with effective dates between January 1999 and December 2017. This second data set contains information at origination on loan agreements, such as facility amount, spread, maturity, covenants, collateral, date, type (revolver, term…), purpose (corporate, refinance, acquisition…), currency, etc. We also have information on lenders, such as the number of lenders, the retained shares of the loan, the nationalities (country of incorporation), the roles (or titles), and the identity (names). We merge both datasets (loan amendments and loan agreements at origination with lenders' information) using unique loan identifiers.[3] Next, we use the borrower identifiers to gather firms' characteristics, including descriptive information (name, industry sector, country, identifiers…) and accounting variables and financial ratios.[4] We also use data from the World Bank, Demirguc-Kunt et al. (2012), Djankov et al. (2007), Favara et al. (2012) to obtain (borrower) country level data related to economic growth, credit and stock markets development, the rule of law, and creditors' protection in case of debt restructuring.

### 2.2 Methodology and variables

We start by explaining how we compute the social network metrics, then we describe our renegotiation variables, briefly discuss all other variables, and present the econometric methods.

Broadly defined a network is a collection of nodes and the links between them. In our case, the nodes are the financial institutions operating in the market for syndicated loans, and the links represent the relationships among the lenders as explained below.

As most of the interactions within a syndicate run through the lead banks (Campbell, 2013), we account for the relations only between lead and participant banks in order to reconstruct the network (Baum et al., 2003; Godlewski et al., 2012; Godlewski and Sanditov,

[3] At this stage, the sample size is affected mostly by missing information on lenders, especially on their roles (or titles). This information is crucial to compute social network metrics.
[4] This step reduces drastically the size of the sample with financial information on the borrowing companies.

2018; Wu et al., 2013). Thus, two banks in our networks are directly connected if and only if within the observed period both of them have participated in the same lending syndicate and at least one of them was leading the deal. We identify lead banks by using lenders' titles provided by Bloomberg for each of the deals with the variable *Loan Agent*.[5]

As the network of relationships among banks constantly evolves as old syndicates dissolve and new syndicates are formed, and to account for the dynamic structure of the syndication network, we assume that ties between lead banks and other syndicate members do not disappear immediately but remain active for several years. Hence, in our analysis we employ overlapping moving three-year windows. For each window, we construct lenders' networks considering only the syndicated loans arranged during these periods.[6]

We now turn to the definition of the characteristics of lenders' individual positions within a syndicated lending network.[7] We focus on the three most commonly used centrality measures introduced by Freeman (1979): degree centrality, closeness centrality, and betweenness centrality (Baum et al., 2003; Godlewski et al., 2012; Godlewski and Sanditov, 2018; Houston et al., 2018). These three measures are our main explanatory variables in the subsequent regressions. In simple terms, degree centrality refers to the size of a lender's network; closeness centrality measures the "depth" of lender's network, or how close the lender is to all others in a network; and betweenness centrality is a measure of the "bridging role" of a lender in the network. A more formal description and definition of each centrality measure is provided in the appendix. As we are interested in the most pivotal role of a syndicate lender, we rely on the maximum of each centrality measure over all lenders of a

[5] This procedure allows to clearly identify one lead bank per syndicate but at the cost of losing observations for which such information is unavailable in Bloomberg.
[6] When choosing the window, one needs to balance between short-term considerations, which can lead to the problem of having networks that are too disconnected, and long-term considerations, which shortens the length of the time series (e.g., with a five-year window we miss the first four years of observations).
[7] All variables are defined in detail in the appendix.

syndicate. Indeed, what truly matters for a syndicate capacity to access superior private information, experience, reputation and trust is the most network-central member.

We now turn to the discussion of our renegotiation variables. We consider three main (explained) variables to describe a renegotiation process: renegotiation decision i.e. likelihood (*Renegotiation* equals 1 if a loan is renegotiated, 0 otherwise), renegotiation dynamics i.e. rounds (*Rounds* equals the number of times a loan was renegotiated; 0 for non-renegotiated loans up to 12 times), and renegotiation scope i.e. amended terms (*Amendments* equals the number of amended loan terms following renegotiation; 0 for non-renegotiated loans up to 6).[8] By doing so, we offer three empirical perspectives on the renegotiation process: a simple binary decision to renegotiate a loan, a dynamic perspective considering that a loan can be renegotiated multiple times over time, and a scope perspective considering that a few or all terms of the loan agreement can be amended at renegotiation.

We control for a large number of variables at the loan, syndicate, borrower, and country levels. All these variables are measured at the time of loan origination and are expected to influence the renegotiation process according to the existing literature (Godlewski, 2019a, 2017; Nikolaev, 2018; Saavedra, 2018). We consider main loan terms such as amount, maturity, collateral and covenants[9] and for the amount outstanding and the number of previously issued loans as well as loan origination year, purpose, and currency. Amount and maturity are related to information asymmetry and uncertainty (Berger et al., 2005; Mosebach, 1999) while collateral and covenants are contractual mechanisms mitigating adverse selection and moral hazard problems (Besanko and Thakor, 1987; Bester, 1985). Secured loans are more prone to renegotiation (Bester, 1994) while covenants renegotiation allows to rebalance the allocation of contractual control rights (Garleanu and Zwiebel, 2009).

[8] The amended terms are: Amount, Covenants financial, Covenants non-financial, Maturity, Pricing, Definition.
[9] Including the loan spreads drastically reduces the sample size as less than half of it contains information on this variable. Therefore, we do not include it in the main regressions.

We also include main characteristics of the banking pool such as the number of lenders[10], the presence of league table lead lenders, of previous bank-borrower relationships and of lenders from the same country as the borrower. The structure and composition of the banking pool are related to informational frictions, especially regarding credit risk diversification, moral hazard and hold-up problems (Bolton and Scharfstein, 1996; Lee and Mullineaux, 2004; Preece and Mullineaux, 1996; Sufi, 2007), while lender's reputation helps mitigating agency problems (Bushman and Wittenberg-Moerman, 2012; Johnson, 1997; McCahery and Schwienbacher, 2010; Ross, 2010). Borrower-lender proximity helps overcome information asymmetry problems (Hauswald and Marquez, 2006; Mian, 2006).

We control for borrower financial characteristics to take their bargaining power and financial health into account, by including size, leverage, liquidity, and profitability proxies.[11] We include borrower rating to proxy for transparency. We consider the economic and financial development of the borrower's country because it affects the cost of external financing by acting on information asymmetry and provides outside options for refinancing(Levine et al., 2000; Rajan and Zingales, 1998). We include legal factors related to creditors protection proxies using the rule of law index, following notably Bae and Goyal (2009) and Qian and Strahan (2007), and proxies for legal renegotiation frictions faced by creditors, following Favara et al. (2012): renegotiation failure index, creditors' priority index and creditors recovery rate.[12] We also control for the legal origin of the borrower's country.

We have three explained variables which are proxies of the renegotiation process: a binary variable *Renegotiation*, a number of renegotiation *Rounds*, and a counting variable of the number of *Amendments*. The nature of each explained variable determines the choice of

[10] An alternative variable is the syndicate concentration measured with the retained shares of the loan by each lender, but this information is often missing in Bloomberg.
[11] All firm variables are symmetrically winsorized at 5% to minimize the influence of outliers.
[12] The renegotiation failure index summarizes several characteristics of debt enforcement procedures that protect creditors from shareholders' strategic default. Priority reflects the order in which creditors' claims are served. Recovery rate is computed for secured creditors, conditional on default.

the regression model: a logit model, an ordered logit model, and a poisson regression respectively. We have three main explanatory variables of interest - the proxies of the lender's network-centrality: *Betweenness, Closeness,* and *Degree*. We propose three different specifications with respect to control variables (under data availability constraints): one with loan and syndicate variables, one with additional borrower variables, and one with loan, syndicate, and country variables. We provide alternative specifications in the robustness checks sub-section.

# 3. Results

In this section, we present descriptive statistics, and we discuss univariate and regression results. We also provide several robustness checks.

### 3.1 Descriptive statistics and univariate results

Our sample contains 10.255 loan facilities to 6.682 borrowing firms from 25 European countries, involving 401 lenders.[13] The sample is comparable to papers on bank loan renegotiation by Nikolaev (2018) for the US and Godlewski (2019a) for Europe. Figure 1 displays a graphical representation of the entire network of the lenders on the European syndicated loans market during the entire time span of the sample (2002-2017). The network is very dense and concentrated, with many connections between all lenders. This suggests that information, experience, reputation and trust are important on the European syndicated loans market.

Table 1 provides descriptive statistics for main explained and explanatory variables by country while table 2 displays descriptive statistics and t-tests for all variables by *Renegotiation* variable.[14] Figure 2 presents the distributions of renegotiation rounds and

[13] Depending on the specification use for regressions, this number can vary due to data availability on particular variables. Due to the method for computing lenders' centrality measures using overlapping three years windows, we "lose" the first three years of our initial sample (1999 to 2001). The final sample starts in 2002 and goes until 2017.

[14] The correlation matrix for all explanatory variables in provided in the appendix.

amendments (excluding non-renegotiated loans). Figure 3 shows all three centrality measures by renegotiation round (from 0 to 12) and amendments (from 0 to 6).

UK, France, Germany, Spain, Netherlands and Italy account for the majority of the loans (75% of the sample), which is consistent with the European market for syndicated loans. The sample renegotiation average rate equals 34%. Renegotiation rates are heterogenous across countries, ranging from 5% in Portugal to 68% in Luxembourg. This is also the case with respect to renegotiation rounds, ranging from 1 to almost 6 (i.e. a loan was renegotiated 6 times during the sample period), while the average (median) of *Rounds* equals 2.69 (2.00). Amendments are less heterogenous across countries, ranging from 1 to almost 3 (i.e. 3 out of a total of 6 loan terms were renegotiated). The average and median of *Amendments* equal to 2.22 and 2.00 in the sample. Network-centrality measures are relatively homogenous across countries, with sample averages close to medians for *Betweenness, Closeness*, and *Degree*.[15] *Betweenness* and *Degree* are statistically larger for renegotiated loans, while *Closeness* is lower. *Betweenness, Closeness*, and *Degree* are stable in levels across rounds and increase for very frequent renegotiations (from 10 rounds and above). *Closeness* slightly increases with amendments while *Betweenness* and *Degree* start decreasing for renegotiations involving rewriting a majority of the loan agreement terms.

Overall, the depth and proximity of a lender's network (*Closeness*) show different behavior with respect to renegotiation likelihood and scope as opposed to a lender's network position or "bridging" (*Betweenness*) and network size and involvement (*Degree*). These preliminary observations show some support for our hypotheses. Lenders with an important bridge position and involvement in a large network are the most reputable and trustworthy, helping to mitigate moral hazard problems and reduce renegotiation costs, thus increasing renegotiation likelihood while reducing the scope of amendments. Lenders with a greater

[15] For ease of interpretation, *Closeness* is multiplied by 1.000 and *Degree* is divided by 1.000.

network's depth and proximity have access to privileged and superior private information allowing them to write better original contracts and thus reducing the renegotiation likelihood, while allowing to amend large portions of the contract.

A vast majority of the other variables are significantly different with respect to renegotiation likelihood. Renegotiated loans are larger, with a slightly longer maturity, and more often secured with covenants attached. They are funded by larger banking pools, with slightly less reputable leaders and lenders from the same country as the borrower, but with more frequent past borrower-lender relationships. Loan renegotiations firms are more often rated, larger, more leveraged, and less liquid. More favorable economic conditions, better financial development, and legal environments protecting creditors are positively associated with loan renegotiation.[16]

Table 3 provides means and t-tests for all variables by Low vs High levels of *Betweenness*, *Closeness*, and *Degree*.[17] All variables exhibit significant differences in means by centrality level. However, we notice that *Maturity* and *Relationship* exhibit different behavior for high level of *Closeness* as compared to the two other centrality measures. In other words, access to superior information allows to reduce adverse selection problems and write contracts with longer maturities at origination, while the informational advantage of past relationships becomes a substitute with a greater network depth and proximity. We also observe that greater network size and involvement (*High Degree*) allows for less collateral at origination. Regarding other variables, we notice that higher centrality is associated with larger loans with covenants, funded by larger syndicates and more league table lenders.

[16] A majority of loans are term loans (62%), denominated in EUR (65%), while USD loans represent 16% of the sample. Acquisition, general corporate, LBO, and debt refinancing loan purposes account for 15%, 17%, 16%, and 37% respectively. Borrowing firms operate in basic materials (8%), communications (10%), consumer (cyclical & non-cyclical) (38%), energy (6%), industrial (26%), technology (3%), utilities (4%), and diversified (3%). French and German legal origin represents 48% and 20% of the sample respectively.

[17] Low vs High with respect to the variable's median, equal to 0.09, 0.41, and 0.21 for *Betweenness*, *Closeness*, and *Degree* respectively.

Borrowers are larger with greater leverage and lower liquidity, more often rated, have larger outstanding amounts and more previous loan issues. Borrower from countries with less developed credit markets but more developed stock markets deal with more central lenders. Lower renegotiation frictions and better creditors' legal protection are also related to higher centralities. These results are overall similar to those with respect to renegotiation likelihood. In other words, a large number of explanatory variables exhibit similar behavior with respect to renegotiation and lender's centrality.

### 3.2 Regression results

We provide results for our main specifications in Table 4. All three centrality measures (*Betweenness, Closeness, Degree*) are significant and positive in all regressions. This first multivariate result supports the hypothesis that access to superior information, greater experience, reputation, and trust, have a positive influence on the entire renegotiation process: the renegotiation likelihood, the number of renegotiation rounds and the number of amended terms. Indeed, better information translates into better screening capacities, helping mitigate adverse selection problems. Greater experience in deal structuring, greater reputation capital, and higher trust allow for better monitoring capacities helping mitigate moral hazard and lower renegotiation costs. Most of loan and syndicated control variables are also significant with coefficients signs consistent with the literature. Larger loans with longer maturities, secured and with covenants attached, funded by numerous lenders are more likely to enter a renegotiation process. Indeed, large loans with long maturities are associated with lower information asymmetry and less uncertainty (Berger et al., 2005; Mosebach, 1999). Secured loans are more prone to renegotiation (Bester, 1994) while amending restrictive covenants allows to rebalance the allocation of contractual control rights (Dessein, 2005; Garleanu and Zwiebel, 2009). Large syndicates are associated with less informational frictions (Lee and Mullineaux, 2004; Preece and Mullineaux, 1996; Sufi, 2007). Less opaque

and thus more transparent rated and frequent issuers are also more likely to renegotiate their loans. The presence of league table lenders, relationship lenders, or lenders from the same country as the borrower, is not significantly related to the renegotiation process.[18]

Table 5 shows the results with additional borrowing firm control variables. Due to data availability, the sample size decreases dramatically, losing almost 80% of the observations. Therefore, we interpret these results with caution. Nevertheless, although less significant, a vast majority of the centrality measures coefficients remain positive in all regressions, with the exception of *Closeness* in the *Renegotiation* equation. Again, these results support the idea that information, experience, reputation, and trust have a positive influence on the renegotiation process. Among the firm variables, we notice that liquidity is the most significant variable across regressions, with a negative coefficient. This result is consistent with the idea that less liquidity constrained firms are less prone to renegotiate their loans.

We include (borrower) country level characteristics to our main specifications and provide the results in Table 6. The sample size is reduced due to data availability when compared to results in Table 3, although the data loss is much less dramatic as with firm variables (Table 5). Due to correlation, for each renegotiation variable (*Renegotiation, Rounds, Amendments*), we propose 4 different specifications, each time including economic and financial development variables, as well as different legal variables separately: *Rule of law, Renegotiation index, Priority*, and *Recovery*.[19] Again, a vast majority of the centrality measures coefficients remain positive in all regressions, with the notable exception of *Closeness* becoming not significant in some equations. Hence, access to superior information, greater experience, reputation, and trust, have a positive influence on loan renegotiation. The centrality proxy for lender's network depth and proximity is a notable exception, suggesting

[18] It is plausible that these features are at least in part embedded into the centrality measures.
[19] We also control for legal origin (French and German) in each regression.

that country level variables, especially legal variables, make this particular network centrality aspect less relevant for the renegotiation process.

Indeed, we notice that among all country variables, proxies for legal protection of creditors are the most significant across all specifications, followed by economic growth proxy. The latter is consistent with the idea that better economic conditions naturally facilitate renegotiation, notably due to greater bargaining power of the borrowers thanks to additional outside options for external financing. Overall quality of the legal environment (*Rule of law*) and specific proxies for creditors legal protection (*Priority* and *Recovery*) have a positive impact on the renegotiation process, while lower renegotiation legal frictions (greater *Renegotiation index* values) have the opposite effect. Better legal protection of creditors reduces the cost of renegotiation, thus enhancing the willingness of lenders to make concessions and update the loan contract through renegotiation. However, when lenders face the risk of shareholders' strategic default, stronger debt enforcement (larger values of *Renegotiation index*) has a negative influence on the renegotiation process. This result can also be explained by the fact that borrowers are less willing to renegotiate their debt in environments with stronger debt enforcement favoring creditors.

To summarize our findings, we confirm the hypothesis that central lenders have a positive influence on the entire renegotiation process. We do not validate the alternative hypothesis that central lenders are able to write more "complete" contracts at origination which are more renegotiation-proof or that the threat of harming their reputation capital by making the "wrong" renegotiation decision reduces the lenders' willingness to enter a renegotiation process. Therefore, our findings confirm that access to superior information, greater experience, reputation, and trust encourages renegotiation. Indeed, the information value of centrality increases screening capacities, helping mitigate adverse selection problems of renegotiation. The experience and reputation values of centrality improves deal structuring

capacities and helps signaling a better deal, syndicate, borrower, etc. The trust value of provides better monitoring capacities helping mitigate moral hazard and lower renegotiation costs. In a nutshell, better information, greater experience, reputation and trust increase renegotiation likelihood, the number of renegotiation rounds and of amended terms.

### 3.3 Robustness checks

We perform several robustness checks at micro and macro levels in Table 7. Micro-level checks deal with specific renegotiations, loan and syndicate characteristics (Panel A). Macro-level checks deal with specific country and time characteristics (Panel B). We present coefficients (and standard errors) for our three network-centrality measures (*Betweenness, Closeness, Degree*) and for the three specifications covering the renegotiation process (*Renegotiation, Rounds, Amendments*). When relevant, we consider medians of particular variables to create necessary sub-samples.

We first consider unique renegotiations and loans, and first loans (Panel A). Unique renegotiations correspond to loans that entered renegotiation only once, eventually signaling more complete initial contracts and/or more efficient amendments as the loans did not re-enter subsequent renegotiations. In such circumstances, the role of lender network-centrality is expected to play a lesser role. On the contrary, unique or first-time loans should be much more sensitive to lender network-centrality as they are more prone to adverse selection and moral hazard problems due to the lack of information. We remark that the results remain robust, with most of the centralities' coefficients being significantly positive.

Next, we consider small loans (less than 419 US$mil.), short maturity loans (less 6 years), loans without collateral or covenants, deals with many tranches (more than 3), and few past loan issues (less than 3). Smaller loans and shorter maturities are associated with more information asymmetry and uncertainty problems, making lender centrality more important. The absence of collateral may signal less risk in the initial contract while the absence of

covenants may signal less information asymmetry between the borrower and the lender at loan origination. In both cases lender centrality should play a less important role. Complex deals including multiple tranches are expected to be more difficult to renegotiate hence giving more importance to lender centrality. Fewer loan issues is associated with a less known and thus less transparent borrower on the credit market, making lender's centrality more important. We remark that most of our results still remain robust with the notable exception of complex deals. In the case of multiple tranches, lender centralities become all non-significant for the renegotiation process. This result suggests that lender network centrality cannot compensate for more complex loans such as those involving multiple tranches when considering a renegotiation process.

We also consider small syndicates (less than 7 members), syndicates without league table lenders, without relationship lenders, un-rated borrowers, adding bank fixed effects[20], and excluding specific lenders. Concentrated syndicates are better at mitigating moral hazard and coordination problems but usually signal more problematic deals with larger informational frictions. The absence of reputable lenders according to league table means much less reputation to signal the quality of the deal and to reduce moral hazard problems. The absence of past relationships between the lenders and the borrower means less (private) information available and more room for adverse selection problems. Borrowers without rating are considered as less transparent and thus more informationally problematic. Lender centrality should play a more important role in all these cases. Adding bank fixed effects aims at controlling for lenders individual characteristics. Finally, we exclude specific lenders: the first lender in terms of loans (9.65% of the sample): BNP Paribas and the first three lenders in terms of loans (21% of the sample): BNP Paribas, Royal Bank of Scotland, UniCredit. By excluding these major players from the network, we test the resilience of the remaining

[20] Due to convergence problems, regression results for *Amendments* are incomplete.

players and our regression results. Again, all results remain robust with significant and positive coefficients for all centrality measures. These robust checks also confirm that the credit market network and the benefits of central lenders are not due to the presence of "top dogs" on the market.

In Panel B we consider country and time characteristics. We start with specific legal environments, with weak general rule of law (*Rule of law* below 1.65), weak protection of creditors against shareholders in case of default (*Renegotiation index* below 0.45) and low creditors recovery (below 0.56).[21] We expect lender centrality to play a greater role in such more "difficult" legal environments for creditors. We also consider different subsamples with respect to geographical composition such as excluding UK as it corresponds to the largest portion of the sample and because its legal origin and environment is different from most of the Continental Europe, more protective of investors and of creditors in particular. We also focus on the historical core Eurozone members[22] and on GIIPS[23], to verify if our results hold for these specific areas. Finally, we consider post crisis periods, one following the US Crisis (after September 15th, 2008), and one following the EZ Crisis (after December 1st, 2009). Such episodes of deep and large disruptions in the functioning of capital markets with greater uncertainty and informational frictions offer an excellent laboratory to test the robustness of the lender centrality effects. Furthermore, the September 15th, 2008 marks the bankruptcy of Lehman Brothers and a direct shock to the lenders' network.

The results for weaker rule of law and protection of creditors in case of default are similar to our main results, with the exception of *Closeness* becoming not significant. The value of network depth and network center proximity of a lender – hence proxies of her

[21] Due to convergence problems, regressions results are partially incomplete.
[22] Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Spain, Portugal.
[23] Greece, Ireland, Italy, Spain, Portugal. Due to convergence problems, regression results for *Rounds* are not available.

reputation and trust - becomes less important for renegotiation in legal environments that are more “adverse” towards creditors. In other words, weak legal protection of creditors render reputation and trust much less valuable with respect to bank loan renegotiation. It is even more straightforward in the case of lower creditors recovery – all centrality measures become now insignificant. Superior information, greater experience, reputation and trust do not matter for the renegotiation process when creditors recovery is lower. These results point to the importance of the legal and institutional environment for financial contracting and to the imperfect substitute of private arrangements, such as individual informational and reputational network building, to compensate for weaker legal protection of creditors.

The geographic composition of the borrower countries do not affect our main results, as most of the coefficients of centrality measures remain significant and positive when excluding UK or focusing on core Eurozone members. However, *Closeness* becomes insignificant when considering GIIPS area, meaning that the specificities of these countries reduce the effect of network depth and proximity on the renegotiation process. Considering post crisis periods lead to similar results as well, meaning that lender centrality remains important for renegotiation even in periods of greater uncertainty, informational frictions, and disruptions on the credit market network.

Our main results survive multiple robustness checks with respect to specific conditions related to renegotiation, loan, syndicate, country, and time characteristics. Network-central lenders have a positive influence on the entire renegotiation process thanks to their superior information, greater experience, reputation, and trust. Furthermore, we notice some additional interesting results. Centrality becomes non-significant for renegotiation of complex deals with multiple tranches. Legal and institutional environments with weaker protection of creditors make the value of reputation and trust less relevant for renegotiation.

## 4. Conclusion

We provide an empirical link between the social network analysis of credit markets and the design of loan contracts by showing that the influence of lenders' financial network at loan origination is crucial for private debt renegotiation. Using a large sample of more than 10.000 loans issued in 25 European countries we find that lender's network-centrality, measured by various social network metrics (*Betweeenness*, *Closeness*, *Degree*) has a significant and positive influence on the loan renegotiation process: the likelihood of renegotiation, the number of renegotiation rounds, and the number of amendments to the initial loan. Our findings confirm that access to superior information, greater experience, reputation, and trust encourages renegotiation. Our results survive multiple robustness checks with respect to specific renegotiation, loan, syndicate, country, and time characteristics.

We also show that lender's reputation and trust capital is less relevant for the renegotiation of complex deals, while the benefits of network-centrality is not concentrated with the "top dogs" on the credit market. Finally, we find that legal and institutional environments that are less protective of the creditors render the value of financial networks insignificant for private debt renegotiation. This last result point to the crucial important of efficient legal protection of investors for better design of financial contracts.

# Appendix

## A.1 Centrality measures

*Betweenness Centrality.* 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 the lender *i*, 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*. The betweenness centrality score of a vertex is a measure of how well the vertex is positioned on the shortest paths connecting other vertices or, in other words, "in between" how many vertices is our vertex sitting and how unique is the position of the vertex with respect to those paths.

*Closeness Centrality.* Closeness centrality is the inverse to the sum of the distances to all other vertices:

$$C = \frac{1}{\sum_j d(i,j)}.$$

The closer is the vertex to all other vertices in the network, the higher is its closeness centrality.

*Degree Centrality.* The degree centrality of a vertex is equal to the number of connections the vertex breeds. The more connections a lender has, the greater is its degree centrality.

## A.2 Definitions of variables

**Dependent variables**

*Renegotiation* = 1 if a loan is renegotiated (0 otherwise)

*Rounds* = number of renegotiation rounds (0: no renegotiation – 12 renegotiation rounds)

*Amendments* = number of renegotiation amendments (0: no renegotiation – 6 amendments, i.e. all contract terms were amended)

**Main explanatory variables**

*Betweenness* = lenders' betweenness centrality measure (syndicate maximum)

*Closeness* = lenders' closeness centrality measure (syndicate maximum)

*Degree* = lenders' degree centrality measure (syndicate maximum)

**Control variables**

*Loan variables (source: Bloomberg)*

Amount = Loan facility amount at origination (in MLN USD).

Maturity = Loan maturity at origination (in years).

Covenants =1 if loan has covenants.

Secured = 1 if loan is secured.

Outstanding amount = amount outstanding on all loans.

Previous issues = Number of loans previously issued by a firm.

*Lenders variables (source: Bloomberg)*

# lenders = Number of lenders in the syndicate.

League = 1 if the loan agent was listed among the top 3 of the Bloomberg European league table.

Relationship = 1 if a lender syndicated a loan for the same borrower during the last 3 years before the origination year.

% same country = Percentage of lenders in the pool which are from the same country as the borrower.

*Firm variables (source: Bloomberg)*

Rating = 1 if a firm has a rating (Moody's or S&P, Senior Unsecured Debt or LT Issuer Credit).

Sales = Net sales or revenue of the firm (in MLN USD).

Debt / Equity = Total debt to equity.

Current ratio = Current assets to current liabilities.

Operating margin = Operating income to net sales.

*Country variables (sources: World Bank, Demirgüç-Kunt et al. (2012), Djankov et al. (2007), and Favara et al. (2012))*

GDP growth = GDP growth (% annual)

Private credit = Financial resources provided to the private sector by domestic money banks as a share of GDP.

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

Rule of law = Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

Renegotiation index = Measures the probability that shareholders fail to force a renegotiation of debt with creditors.

The index is the average of the following binary (0 if no, 1 if yes) indicators: 1) secured creditors may seize and sell their collateral without court approval, 2) secured creditors may enforce their security either in or out of court, 3) the entire firm's assets can be pledged as collateral, 4) an insolvency or liquidation order cannot be appealed at all, 5) an insolvency case is suspended until the resolution of the appeal, 6) the firm may enter liquidation without attempting reorganization, 7) secured creditors may enforce their security upon commencement of the insolvency proceedings, 8) a defaulting firm must cease operations upon commencement of insolvency proceedings, 9) management does not remain in control of decisions during insolvency proceedings, 10) secured creditors have the right to approve the appointment of the insolvency administrator, 11) secured creditors may dismiss the insolvency administrator, 12) secured creditors vote directly on the reorganization plan.

Priority = Equals 0, 1, 2, 3, or 4 to reflect the order in which creditors' claims are served. A value of 4 indicates that creditors' claims are always served first.

Creditors' recovery = Recovery rate for secured creditors, conditional on default.

## A.3 Correlation matrix for all explanatory variables

| | Betweenness | Closeness | Degree | Facility | Maturity | Secured | Covenants | Outstanding amount | Previous issues | # lenders | League | Relationship | % same country | Rating | Sales (log) | Debt / Equity | Current ratio | Operating margin | GDP growth | Private credit | Stock market | Rule of law | Renegotiation failure | Priority | Recovery |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Betweenness | 1.00 | | | | | | | | | | | | | | | | | | | | | | | | |
| Closeness | 0.36 | 1.00 | | | | | | | | | | | | | | | | | | | | | | | |
| | (0.00) | | | | | | | | | | | | | | | | | | | | | | | | |
| Degree | 0.74 | -0.17 | 1.00 | | | | | | | | | | | | | | | | | | | | | | |
| | (0.00) | (0.00) | | | | | | | | | | | | | | | | | | | | | | | |
| Facility | 0.06 | 0.03 | 0.04 | 1.00 | | | | | | | | | | | | | | | | | | | | | |
| | (0.00) | (0.00) | (0.00) | | | | | | | | | | | | | | | | | | | | | | |
| Maturity | -0.03 | 0.07 | -0.07 | -0.00 | 1.00 | | | | | | | | | | | | | | | | | | | | |
| | (0.00) | (0.00) | (0.00) | (0.89) | | | | | | | | | | | | | | | | | | | | | |
| Secured | -0.04 | -0.17 | 0.05 | 0.01 | 0.24 | 1.00 | | | | | | | | | | | | | | | | | | | |
| | (0.00) | (0.00) | (0.00) | (0.01) | (0.00) | | | | | | | | | | | | | | | | | | | | |
| Covenants | 0.21 | 0.10 | 0.16 | 0.05 | -0.03 | 0.18 | 1.00 | | | | | | | | | | | | | | | | | | |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | | | | | | | | | | | | | | | | | | | |
| Outstanding amount | 0.03 | 0.00 | 0.03 | 0.00 | -0.02 | -0.02 | -0.01 | 1.00 | | | | | | | | | | | | | | | | | |
| | (0.00) | (0.48) | (0.00) | (0.39) | (0.00) | (0.00) | (0.31) | | | | | | | | | | | | | | | | | | |
| Previous issues | 0.14 | 0.13 | 0.08 | 0.03 | 0.17 | 0.18 | 0.07 | 0.14 | 1.00 | | | | | | | | | | | | | | | | |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | | | | | | | | | | | | | | | | | |
| # lenders | 0.45 | 0.14 | 0.36 | 0.10 | 0.02 | 0.07 | 0.26 | 0.03 | 0.14 | 1.00 | | | | | | | | | | | | | | | |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | | | | | | | | | | | | | | | | |
| League | 0.16 | 0.11 | 0.18 | -0.00 | 0.01 | -0.02 | -0.01 | -0.01 | 0.03 | -0.02 | 1.00 | | | | | | | | | | | | | | |
| | (0.00) | (0.00) | (0.00) | (0.56) | (0.01) | (0.00) | (0.05) | (0.01) | (0.00) | (0.00) | | | | | | | | | | | | | | | |
| Relationship | 0.12 | -0.09 | 0.19 | 0.11 | -0.17 | -0.09 | 0.05 | 0.01 | 0.05 | 0.12 | 0.03 | 1.00 | | | | | | | | | | | | | |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.04) | (0.00) | (0.00) | (0.00) | | | | | | | | | | | | | | |
| % same country | -0.16 | 0.01 | -0.18 | -0.01 | 0.01 | 0.00 | -0.02 | 0.01 | -0.02 | -0.25 | -0.01 | -0.05 | 1.00 | | | | | | | | | | | | |
| | (0.00) | (0.01) | (0.00) | (0.30) | (0.10) | (0.83) | (0.01) | (0.05) | (0.00) | (0.00) | (0.23) | (0.00) | | | | | | | | | | | | | |
| Rating | 0.15 | 0.02 | 0.15 | 0.05 | -0.08 | -0.02 | 0.08 | 0.10 | 0.03 | 0.20 | -0.01 | 0.15 | -0.06 | 1.00 | | | | | | | | | | | |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.14) | (0.00) | (0.00) | | | | | | | | | | | | |
| Sales (log) | 0.21 | 0.03 | 0.21 | 0.18 | -0.10 | -0.16 | 0.03 | 0.07 | -0.01 | 0.29 | -0.06 | 0.23 | -0.11 | 0.29 | 1.00 | | | | | | | | | | |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.17) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | | | | | | | | | | | |
| Debt / Equity | 0.01 | 0.04 | -0.00 | -0.02 | 0.04 | 0.12 | 0.08 | -0.01 | -0.00 | 0.04 | 0.02 | -0.03 | -0.03 | 0.05 | 0.01 | 1.00 | | | | | | | | | |
| | (0.22) | (0.00) | (0.65) | (0.08) | (0.00) | (0.00) | (0.00) | (0.21) | (0.70) | (0.00) | (0.11) | (0.01) | (0.01) | (0.00) | (0.29) | | | | | | | | | | |
| Current ratio | -0.07 | -0.07 | -0.05 | -0.09 | -0.02 | -0.04 | -0.04 | -0.01 | -0.11 | -0.12 | -0.03 | -0.02 | 0.06 | -0.09 | -0.12 | -0.23 | 1.00 | | | | | | | | |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.02) | (0.00) | (0.00) | (0.30) | (0.00) | (0.00) | (0.01) | (0.06) | (0.00) | (0.00) | (0.00) | (0.00) | | | | | | | | | |
| Operating margin | 0.02 | 0.05 | 0.03 | 0.07 | 0.13 | 0.09 | 0.04 | 0.02 | 0.06 | 0.04 | 0.00 | -0.06 | 0.01 | 0.04 | -0.03 | 0.07 | 0.05 | 1.00 | | | | | | | |
| | (0.03) | (0.00) | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) | (0.12) | (0.00) | (0.00) | (0.71) | (0.00) | (0.31) | (0.00) | (0.01) | (0.00) | (0.00) | | | | | | | | |
| GDP growth | 0.00 | 0.11 | -0.07 | 0.01 | 0.10 | 0.03 | 0.05 | 0.01 | 0.09 | 0.08 | -0.01 | -0.08 | -0.00 | -0.00 | 0.11 | -0.12 | 0.08 | 0.09 | 1.00 | | | | | | |
| | (0.39) | (0.00) | (0.00) | (0.23) | (0.00) | (0.00) | (0.00) | (0.04) | (0.00) | (0.00) | (0.01) | (0.00) | (0.47) | (0.42) | (0.00) | (0.00) | (0.00) | (0.00) | | | | | | | |
| Private credit | -0.01 | -0.10 | 0.06 | -0.00 | -0.02 | 0.02 | 0.01 | -0.09 | -0.02 | -0.02 | -0.06 | 0.05 | 0.00 | -0.03 | -0.10 | 0.02 | -0.07 | 0.03 | -0.18 | 1.00 | | | | | |
| | (0.04) | (0.00) | (0.00) | (0.42) | (0.01) | (0.00) | (0.15) | (0.00) | (0.01) | (0.00) | (0.00) | (0.00) | (0.85) | (0.00) | (0.00) | (0.05) | (0.00) | (0.01) | (0.00) | | | | | | |
| Stock market | 0.12 | 0.11 | 0.12 | 0.00 | 0.04 | 0.04 | 0.09 | -0.06 | 0.12 | 0.12 | 0.03 | 0.02 | -0.01 | -0.01 | 0.09 | -0.11 | -0.02 | 0.09 | 0.25 | 0.46 | 1.00 | | | | |
| | (0.00) | (0.00) | (0.00) | (0.38) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.16) | (0.28) | (0.00) | (0.00) | (0.02) | (0.00) | (0.00) | (0.00) | | | | | |
| Rule of law | 0.10 | 0.11 | 0.11 | 0.02 | -0.06 | 0.05 | 0.10 | -0.16 | -0.03 | 0.10 | -0.01 | 0.05 | 0.02 | 0.04 | 0.09 | -0.09 | -0.04 | 0.00 | 0.07 | 0.31 | 0.39 | 1.00 | | | |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.14) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.97) | (0.00) | (0.00) | (0.00) | | | | |
| Renegotiation index | -0.11 | -0.08 | -0.15 | -0.01 | -0.02 | -0.05 | -0.02 | -0.03 | -0.03 | 0.03 | -0.16 | -0.00 | 0.01 | 0.00 | 0.02 | -0.02 | 0.09 | -0.03 | 0.21 | 0.25 | 0.09 | 0.22 | 1.00 | | |
| | (0.00) | (0.00) | (0.00) | (0.38) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.76) | (0.09) | (0.79) | (0.05) | (0.09) | (0.00) | (0.03) | (0.00) | (0.00) | (0.00) | (0.00) | | | |
| Priority | 0.10 | 0.09 | 0.08 | 0.02 | -0.11 | 0.09 | 0.11 | -0.01 | -0.03 | 0.07 | -0.04 | 0.01 | 0.08 | 0.08 | 0.19 | -0.04 | -0.09 | -0.04 | 0.06 | -0.21 | 0.01 | 0.61 | 0.18 | 1.00 | |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.35) | (0.00) | (0.00) | (0.00) | (0.13) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.12) | (0.00) | (0.00) | | |
| Recovery | -0.02 | 0.01 | -0.02 | 0.03 | -0.06 | 0.05 | 0.11 | -0.05 | -0.05 | 0.04 | -0.17 | -0.01 | 0.13 | 0.04 | 0.02 | -0.06 | -0.02 | 0.03 | 0.07 | 0.30 | 0.19 | 0.65 | 0.28 | 0.46 | 1.00 |
| | (0.00) | (0.31) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.14) | (0.00) | (0.00) | (0.18) | (0.00) | (0.16) | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | |

# References


Aghion, P., Bolton, P., 1992. An Incomplete Contracts Approach to Financial Contracting. Review of Economic Studies 59, 473–494.

Bae, K., Goyal, V.K., 2009. Creditor rights, enforcement, and bank loans. Journal of Finance 64, 823–860.

Bajo, E., Chemmanur, T.J., Simonyan, K., Tehranian, H., 2016. Underwriter networks, investor attention, and initial public offerings. Journal of Financial Economics 122, 376–408.

Baum, J., Rowley, T.J., Shipilov, A.V., 2004. The Small World of Canadian Capital Markets: Statistical Mechanics of Investment Bank Syndicate Networks. Canadian Journal of Administrative Sciences / Revue Canadienne des Sciences de l'Administration 21, 307–325.

Baum, J., Shipilov, A.V., Rowley, T.J., 2003. Where do small worlds come from? Industrial and Corporate Change 12, 697–725.

Berger, A.N., Espinosa-Vega, M.A., Frame, W.S., Miller, N.H., 2005. Debt maturity, risk, and asymmetric information. Journal of Finance 60, 2895–2923.

Besanko, D., Thakor, A.V., 1987. Collateral and Rationing Sorting Equilibria in Monopolistic and Competitive Credit Markets. International Economic Review 28, 671.

Bester, H., 1985. Screening vs. rationing in credit markets with imperfect information. American Economic Review 75, 850–855.

Bester, H., 1994. The Role of Collateral in a Model of Debt Renegotiation. Journal of Money, Credit and Banking 26, 72.

Billett, M.T., Flannery, M.J., Garfinkel, J.A., 1995. The effect of lender identity on a borrowing firm's equity return. Journal of Finance 50, 699–718.

Bolton, P., Scharfstein, D.S., 1996. Optimal debt structure and the number of creditors. Journal of Political Economy 104, 1–25.

Bülbül, D., 2013. Determinants of trust in banking networks. Journal of Economic Behavior & Organization 85, 236–248.

Bushman, R.M., Wittenberg-Moerman, R., 2012. The Role of Bank Reputation in "Certifying" Future Performance Implications of Borrowers' Accounting Numbers. Journal of Accounting Research 50, 883–930.

Cagno, D.D., Sciubba, E., 2010. Trust, trustworthiness and social networks: Playing a trust game when networks are formed in the lab. Journal of Economic Behavior & Organization 75, 156–167.

Cai, J., 2009. Competition or collaboration? The reciprocity effect in loan syndication.

Cai, J., Eidam, F., Saunders, A., Steffen, S., 2017. Diversification or Specialization? An Analysis of Distance and Collaboration in Loan Syndication Networks (SSRN Scholarly Paper No. ID 2923150). Social Science Research Network, Rochester, NY.

Cai, Y., Sevilir, M., 2012. Board connections and M&A transactions. Journal of Financial Economics 103, 327–349.

Campbell, M., 2013. Syndicated Lending, Practice and Documentation 6th edition, 6th edition. ed. Euromoney Institutional Investor, London.

Carpenter, J., Bowles, S., Gintis, H., Hwang, S.-H., 2009. Strong reciprocity and team production: Theory and evidence. Journal of Economic Behavior & Organization 71, 221–232.

Champagne, C., Kryzanowski, L., 2007. Are current syndicated loan alliances related to past alliances? Journal of Banking & Finance 31, 3145–3161.

Chuluun, T., 2015. The role of underwriter peer networks in IPOs. Journal of Banking & Finance 51, 62–78.

Cohen, L., Frazzini, A., Malloy, C., 2008. The Small World of Investing: Board Connections and Mutual Fund Returns. Journal of Political Economy 116, 951–979.

Cujean, J., 2020. Idea sharing and the performance of mutual funds. Journal of Financial Economics 135, 88–119.

de Haan, J., Oosterloo, S., Schoenmaker, D., 2012. Financial Markets and Institutions: A European Perspective, 2nd ed. Cambridge University Press.

Demirguc-Kunt, A., Levine, R., Cihak, M., Feyen, E., 2012. Benchmarking financial systems around the world ( No. WPS6175). The World Bank.

Dessein, W., 2005. Information and Control in Ventures and Alliances. Journal of Finance 60, 2513–2549.

Djankov, S., McLiesh, C., Shleifer, A., 2007. Private Credit in 129 Countries. Journal of Financial Economics 84, 299–329.

Engelberg, J., Gao, P., Parsons, C.A., 2012. Friends with money. Journal of Financial Economics 103, 169–188.

Favara, G., Schroth, E., Valta, P., 2012. Strategic default and equity risk across countries. Journal of Finance 67, 2051–2095.

Freeman, L.C., 1979. Centrality in social networks conceptual clarification. Social networks 1, 215–239.

Garleanu, N., Zwiebel, J., 2009. Design and Renegotiation of Debt Covenants. Review of Financial Studies 22, 749–781.

Gatti, S., Kleimeier, S., Megginson, W., Steffanoni, A., 2013. Arranger Certification in Project Finance. Financial Management (Wiley-Blackwell) 42, 1–40.
Godlewski, C.J., 2019a. How legal and institutional environments shape the private debt renegotiation process? Journal of Corporate Finance (forthcoming).
Godlewski, C.J., 2019b. Debt Renegotiation and the Design of Financial Contracts. J Financ Serv Res 55, 191–215.
Godlewski, C.J., Sanditov, B., 2018. Financial Institutions Network and the Certification Value of Bank Loans. Financial Management 47, 253–283.
Godlewski, C.J., Sanditov, B., Burger-Helmchen, T., 2012. Bank lending networks, experience, reputation, and borrowing costs: empirical evidence from the French syndicated lending market. Journal of Business Finance & Accounting 39, 113–140.
Gomes, A., Phillips, G., 2012. Why do public firms issue private and public securities? Journal of Financial Intermediation 21, 619–658.
Gopalan, R., Nanda, V., Yerramilli, V., 2011. Does Poor Performance Damage the Reputation of Financial Intermediaries? Evidence from the Loan Syndication Market. Journal of Finance 66, 2083–2120.
Gorton, G., Kahn, J., 2000. The design of bank loan contracts. Review of Financial Studies 13, 331–364.
Grossman, S.J., Hart, O.D., 1982. Corporate Financial Structure and Managerial Incentives (NBER Chapters). National Bureau of Economic Research, Inc.
Hart, O., Moore, J., 1988. Incomplete Contracts and Renegotiation. Econometrica 56, 755–785.
Hart, O., Moore, J., 1999. Foundations of Incomplete Contracts. Review of Economic Studies 66, 115–138.
Hauswald, R., Marquez, R., 2006. Competition and Strategic Information Acquisition in Credit Markets. Review of Financial Studies 19, 967–1000.
Hochberg, Y.V., Ljungqvist, A., Lu, Y., 2007. Whom You Know Matters: Venture Capital Networks and Investment Performance. Journal of Finance 62, 251–301.
Houston, J.F., Lee, J., Suntheim, F., 2018. Social networks in the global banking sector. Journal of Accounting and Economics 65, 237–269.
Johnson, S.A., 1997. The Effect of Bank Reputation on the Value of Bank Loan Agreements. Journal of Accounting, Auditing & Finance 12, 83–100.
Lee, S.W., Mullineaux, D.J., 2004. Monitoring, Financial Distress, and the Structure of Commercial Lending Syndicates. Financial Management 33, 107–130.
Levine, R., Loayza, N., Beck, T., 2000. Financial intermediation and growth: Causality and causes. Journal of Monetary Economics 46, 31–77.
McCahery, J., Schwienbacher, A., 2010. Bank reputation in the private debt market. Journal of Corporate Finance 16, 498–515.
Meuleman, M., Wright, M., 2009. Private equity syndication: Agency costs, reputation and collaboration. Journal of Business Finance & Accounting 36, 616–644.
Mian, A., 2006. Distance constraints: The limits of foreign lending in poor economies. Journal of Finance 61, 1465–1505.
Miller, D.P., Reisel, N., 2012. Do Country-level Investor Protections Affect Security-level Contract Design? Evidence from Foreign Bond Covenants. Rev. Financ. Stud. 25, 408–438.
Morrison, A.D., Wilhelm Jr., W.J., 2007. Investment banking: Institutions, politics, and law. Oxford University Press, USA.
Mosebach, M., 1999. Market response to banks granting lines of credit. Journal of Banking & Finance 23, 1707–1723.
Nikolaev, V.V., 2018. Scope for renegotiation in private debt contracts. Journal of Accounting and Economics 65, 270–301.
Paligorova, T., Santos, J., 2016. Non-Bank Investors and Loan Renegotiations (Staff Working Paper No. 16–60). Bank of Canada.
Panyagometh, K., Roberts, G.S., 2010. Do Lead Banks Exploit Syndicate Participants? Evidence from Ex Post Risk. Financial Management 39, 273–299.
Preece, D., Mullineaux, D.J., 1996. Monitoring, loan renegotiability, and firm value: The role of lending syndicates. Journal of Banking & Finance 20, 577–593.
Qian, J., Strahan, P.E., 2007. How laws and institutions shape financial contracts: The case of bank loans. Journal of Finance 62, 2803–2834.
Rajan, R.G., Zingales, L., 1998. Financial Dependence and Growth. American Economic Review 88, 559–586.
Roberts, M.R., 2015. The role of dynamic renegotiation and asymmetric information in financial contracting. Journal of Financial Economics 116, 61–81.
Ross, D.G., 2010. The "Dominant Bank Effect:" How High Lender Reputation Affects the Information Content and Terms of Bank Loans. Review of Financial Studies 23, 2730–2756.
Saavedra, D., 2018. Syndicate Size and the Choice of Covenants in Debt Contracts. The Accounting Review 93, 301–329.

Smith, C.W., Warner, J.B., 1979. On financial contracting. Journal of Financial Economics 7, 117–161.
Song, F., 2009. Intergroup trust and reciprocity in strategic interactions: Effects of group decision-making mechanisms. Organizational Behavior and Human Decision Processes 108, 164–173.
Sufi, A., 2007. Information Asymmetry and Financing Arrangements: Evidence from Syndicated Loans. Journal of Finance 62, 629–668.
Taylor, A., Sansone, A., 2006. The handbook of loan syndications and trading. McGraw-Hill.
Thomson Reuters, 2018. GLOBAL SYNDICATED LOANS REVIEW.
Wu, W.-S., Chang, H.-H., Suardi, S., Chang, Y., 2013. The Cascade Effect on Lending Conditions: Evidence from the Syndicated Loan Market. Journal of Business Finance & Accounting 40, 1247–1275.
Zinbarg, E.D., 1975. The Private Placement Loan Agreement. Financial Analysts Journal 31, 33–52.

**Figure 1 Network of lenders on the European syndicated loans market (2002-2017)**
This figure shows the complete social network representation of the lenders on the European syndicated

loans market for the entire time span of the sample: 2002-2017.

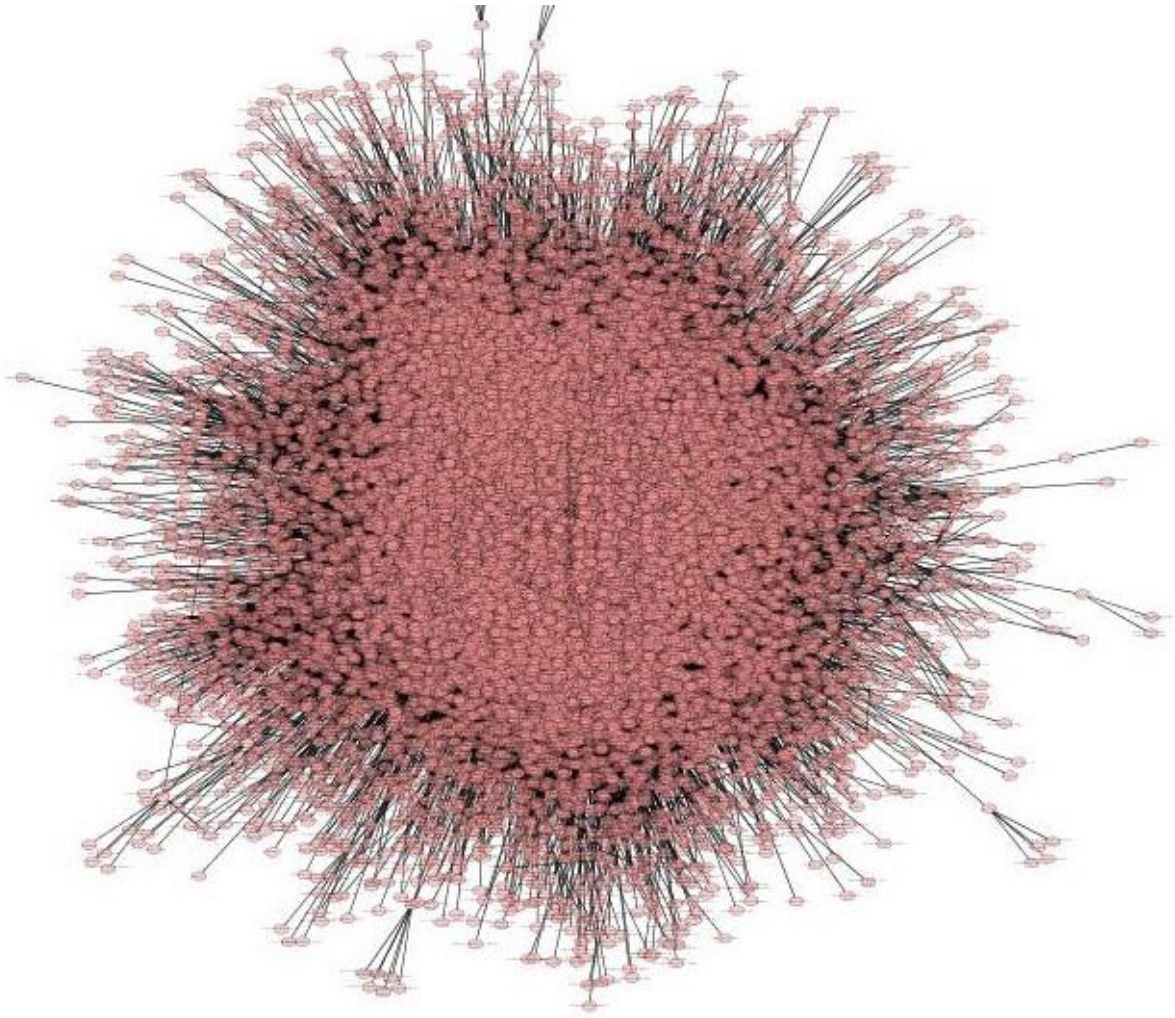


**Figure 2 Renegotiation rounds and amendments**

The upper and lower figures present the distributions of renegotiation rounds and amendments excluding non-renegotiated loans.

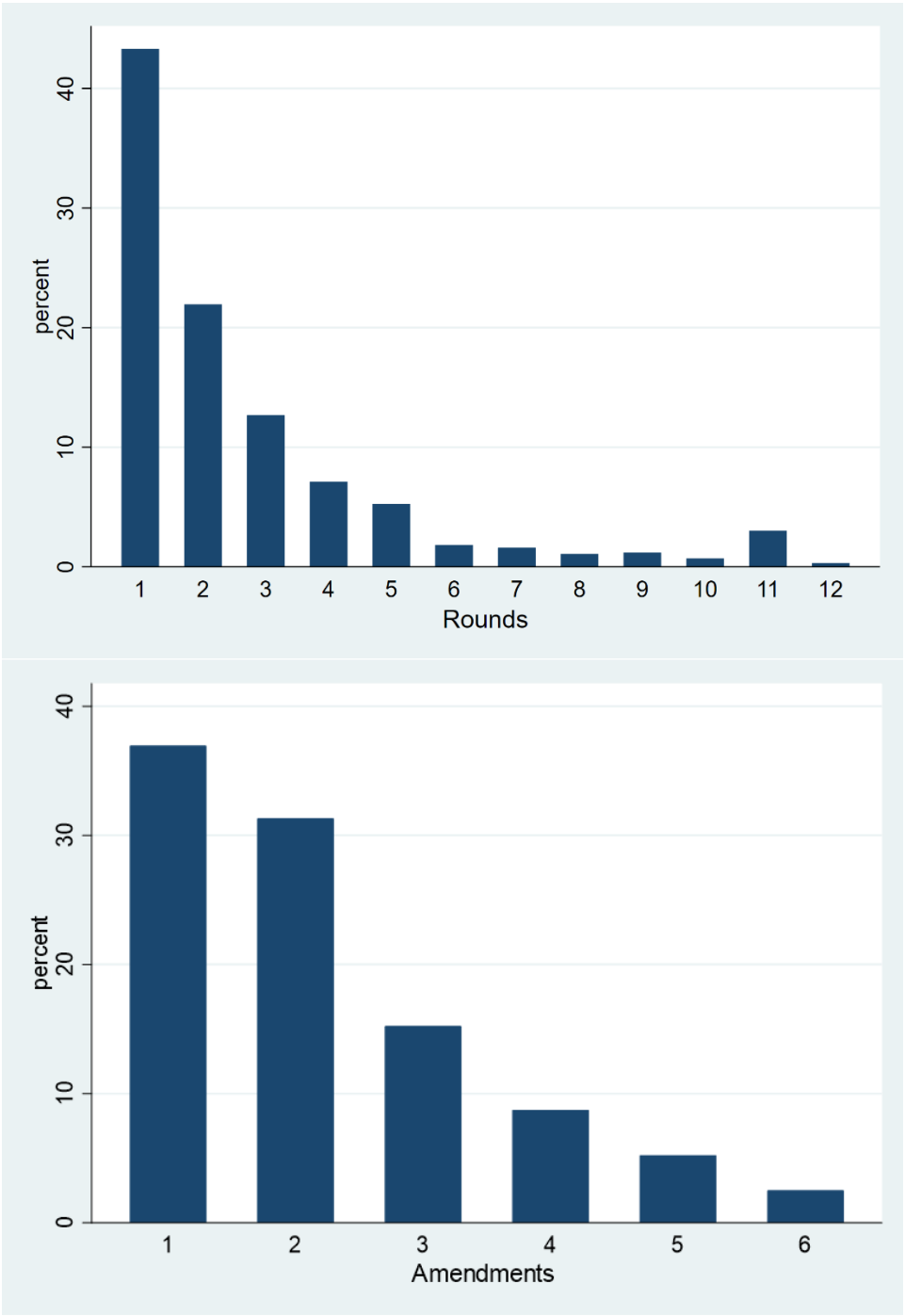
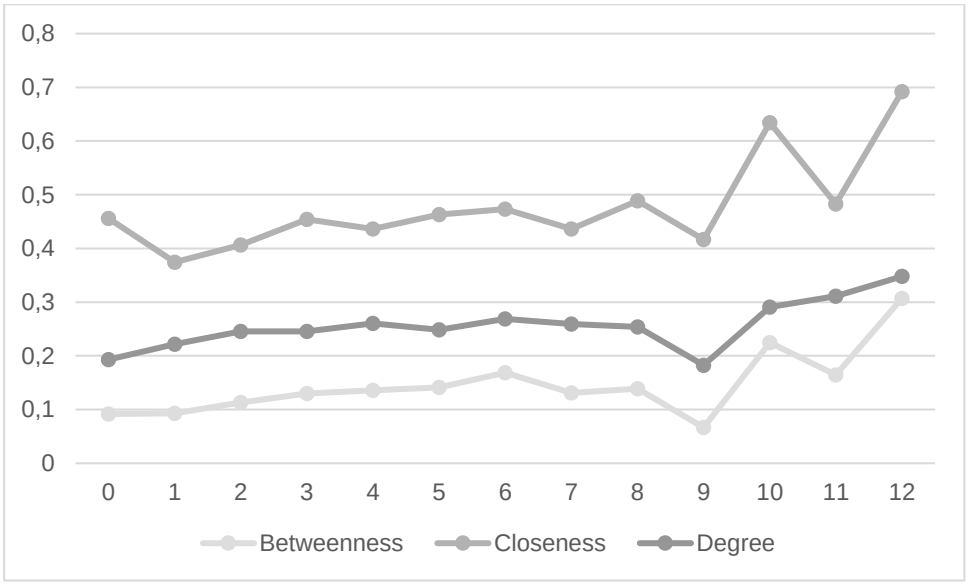
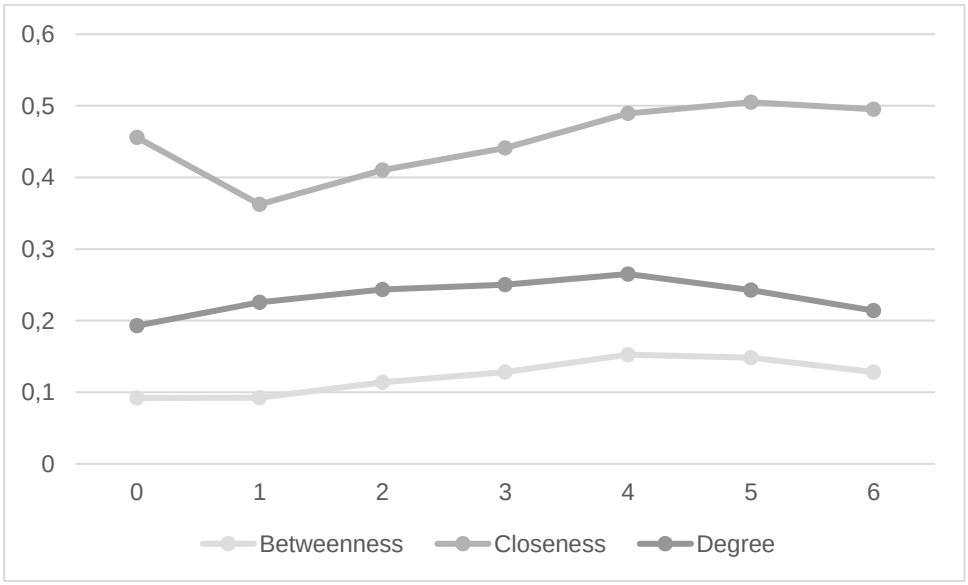


**Figure *3* Network-centrality metrics across renegotiation rounds and amendments**

This figure displays the betweenness, closeness, and degree centrality measures across renegotiation rounds (0 to 12 and 0 to 6 respectively)



## Table 1 Descriptive statistics by country

This table displays the number of loans, the percentage of renegotiated loans, the number of renegotiation rounds, the number of amendments, and the centrality measures (betweenness, closeness, degree) by borrower country.

| Country | # Loans | % Renegotiation | Rounds | Amendments | Betweenness | Closeness | Degree |
|---|---|---|---|---|---|---|---|
| **Austria** | 79 | 0.40 | 1.74 | 1.63 | 0.09 | 0.41 | 0.20 |
| **Belgium** | 195 | 0.34 | 1.77 | 2.08 | 0.10 | 0.44 | 0.22 |
| **Croatia** | 23 | 0.59 | 1.07 | 1.07 | 0.04 | 0.29 | 0.10 |
| **Czech Republic** | 55 | 0.25 | 1.30 | 1.40 | 0.08 | 0.45 | 0.17 |
| **Denmark** | 97 | 0.28 | 1.81 | 1.64 | 0.09 | 0.44 | 0.19 |
| **Finland** | 190 | 0.36 | 1.73 | 1.46 | 0.06 | 0.40 | 0.15 |
| **France** | 1528 | 0.27 | 2.13 | 2.15 | 0.12 | 0.47 | 0.23 |
| **Germany** | 1378 | 0.36 | 2.52 | 2.30 | 0.11 | 0.44 | 0.22 |
| **Greece** | 68 | 0.10 | 1.44 | 1.67 | 0.08 | 0.48 | 0.15 |
| **Hungary** | 41 | 0.42 | 1.76 | 1.72 | 0.09 | 0.47 | 0.21 |
| **Ireland** | 150 | 0.51 | 2.79 | 2.47 | 0.12 | 0.47 | 0.22 |
| **Italy** | 736 | 0.26 | 1.61 | 1.52 | 0.09 | 0.42 | 0.20 |
| **Luxembourg** | 314 | 0.68 | 5.71 | 2.91 | 0.12 | 0.43 | 0.25 |
| **Netherlands** | 767 | 0.46 | 3.33 | 2.57 | 0.11 | 0.44 | 0.22 |
| **Norway** | 347 | 0.35 | 3.32 | 2.91 | 0.06 | 0.38 | 0.15 |
| **Poland** | 96 | 0.36 | 1.74 | 1.09 | 0.07 | 0.39 | 0.16 |
| **Portugal** | 51 | 0.05 | 1.00 | 1.00 | 0.08 | 0.40 | 0.17 |
| **Russian Federation** | 115 | 0.46 | 2.10 | 1.50 | 0.09 | 0.39 | 0.21 |
| **Slovak Republic** | 32 | 0.23 | 5.20 | 1.70 | 0.07 | 0.41 | 0.18 |
| **Slovenia** | 22 | 0.25 | 1.00 | 1.00 | 0.06 | 0.35 | 0.16 |
| **Spain** | 1309 | 0.21 | 1.59 | 1.80 | 0.08 | 0.39 | 0.18 |
| **Sweden** | 271 | 0.35 | 2.00 | 1.76 | 0.08 | 0.45 | 0.18 |
| **Switzerland** | 287 | 0.36 | 1.87 | 1.63 | 0.11 | 0.45 | 0.22 |
| **Turkey** | 107 | 0.30 | 1.33 | 1.05 | 0.04 | 0.30 | 0.12 |
| **United Kingdom** | 1997 | 0.34 | 2.47 | 2.28 | 0.10 | 0.48 | 0.21 |

## Table 2 Descriptive statistics and univariate results by Renegotiation

This table displays means, medians, and standard deviations for all variables (definitions are provided in the appendix) and mean -t-test statistics for explanatory variables by *Renegotiation* variable.

| Variable | Mean | Median | SD | No reneg. | Reneg. | T-test |
|---|---|---|---|---|---|---|
| **Renegotiation** | 0.34 | 0.00 | 0.47 | | | |
| **Rounds** | 2.69 | 2.00 | 2.52 | | | |
| **Amendments** | 2.22 | 2.00 | 1.30 | | | |
| **Betweenness** | 0.10 | 0.09 | 0.07 | 0.0919 | 0.1136 | (-30.77)*** |
| **Closeness** | 0.44 | 0.41 | 0.14 | 0.4557 | 0.4112 | (28.90)*** |
| **Degree** | 0.21 | 0.21 | 0.09 | 0.1930 | 0.2390 | (-48.26)*** |
| **Facility** | 1529.26 | 419.00 | 25987.62 | 1008.7790 | 2549.8242 | (-5.39)*** |
| **Maturity** | 6.52 | 6.00 | 3.62 | 6.4212 | 6.7144 | (-7.11)*** |
| **Secured** | 0.44 | 0.00 | 0.50 | 0.3643 | 0.5934 | (-42.86)*** |
| **Covenants** | 0.11 | 0.00 | 0.31 | 0.0587 | 0.2060 | (-44.22)*** |
| **Outstanding amount** | 3.85 | 0.44 | 48.58 | 3.7202 | 4.0924 | (-0.67) |
| **Previous issues** | 3.73 | 3.00 | 3.03 | 3.5325 | 4.0799 | (-16.00)*** |
| **# lenders** | 9.82 | 7.00 | 10.36 | 7.5914 | 14.1405 | (-60.38)*** |
| **League** | 0.16 | 0.00 | 0.37 | 0.1678 | 0.1537 | (3.50)*** |
| **Relationship** | 0.24 | 0.00 | 0.43 | 0.2132 | 0.2842 | (-14.04)*** |
| **% same country** | 0.25 | 0.17 | 0.30 | 0.2648 | 0.2106 | (15.00)*** |
| **Rating** | 0.11 | 0.00 | 0.31 | 0.0786 | 0.1672 | (-26.17)*** |
| **Sales (log)** | 6.79 | 6.80 | 1.91 | 6.6064 | 7.2328 | (-15.99)*** |
| **Debt / Equity** | 1.32 | 0.81 | 1.61 | 1.3448 | 1.4188 | (-2.07)* |
| **Current ratio** | 0.01 | 0.01 | 0.01 | 0.0149 | 0.0134 | (10.11)*** |
| **Operating margin** | 0.11 | 0.10 | 0.12 | 0.1115 | 0.1114 | (0.01) |
| **GDP growth** | 0.02 | 0.02 | 0.02 | 0.0182 | 0.0207 | (-9.95)*** |
| **Private credit** | 1.13 | 1.08 | 0.36 | 1.1350 | 1.1317 | (0.80) |
| **Stock market** | 0.83 | 0.77 | 0.42 | 0.8146 | 0.8817 | (-12.92)*** |
| **Rule of law** | 1.49 | 1.65 | 0.48 | 1.4505 | 1.5522 | (-19.55)*** |
| **Renegotiation index** | 0.39 | 0.45 | 0.15 | 0.3893 | 0.3922 | (-1.54) |
| **Priority** | 3.32 | 4.00 | 0.78 | 3.2384 | 3.4888 | (-25.01)*** |
| **Recovery** | 0.62 | 0.56 | 0.19 | 0.6025 | 0.6489 | (-18.51)*** |

## Table 3 Univariate results by centrality measures

This table displays means and mean -t-test statistics for explanatory variables by centrality measure. Low vs High with respect to the variable's median, equal to 0.09, 0.41, and 0.21 for Betweenness, Closeness, and Degree respectively.

| | Low betweenness | High betweenness | T-test | Low closeness | High closeness | T-test | Low degree | High degree | T-test |
|---|---|---|---|---|---|---|---|---|---|
| **Facility** | 668.4796 | 2252.5825 | (-5.85)*** | 990.0624 | 2050.9576 | (-3.93)*** | 743.0962 | 2285.4368 | (-5.72)*** |
| **Maturity** | 6.7813 | 6.2984 | (12.38)*** | 6.2634 | 6.7633 | (-12.86)*** | 6.7705 | 6.2774 | (12.69)*** |
| **Secured** | 0.4561 | 0.4294 | (5.15)*** | 0.4808 | 0.4034 | (14.99)*** | 0.4073 | 0.4749 | (-13.08)*** |
| **Covenants** | 0.0646 | 0.1466 | (-25.46)*** | 0.0861 | 0.1315 | (-14.06)*** | 0.0732 | 0.1437 | (-21.93)*** |
| **Outstanding amount** | 2.3456 | 5.0843 | (-5.18)*** | 2.8873 | 4.8768 | (-3.77)*** | 2.5004 | 5.0717 | (-4.88)*** |
| **Previous issues** | 3.4792 | 3.9233 | (-13.51)*** | 3.3385 | 4.1357 | (-24.49)*** | 3.5779 | 3.8539 | (-8.41)*** |
| **# lenders** | 5.7499 | 13.2389 | (-74.40)*** | 8.1009 | 11.4781 | (-31.84)*** | 6.4582 | 13.0456 | (-64.61)*** |
| **League** | 0.0806 | 0.2324 | (-40.30)*** | 0.1191 | 0.2056 | (-22.73)*** | 0.1070 | 0.2168 | (-28.96)*** |
| **Relationship** | 0.1636 | 0.2937 | (-27.24)*** | 0.2579 | 0.2183 | (8.26)*** | 0.1626 | 0.3045 | (-29.97)*** |
| **% same country** | 0.3033 | 0.2019 | (29.84)*** | 0.2518 | 0.2423 | (2.79)** | 0.2909 | 0.2062 | (25.00)*** |
| **Rating** | 0.0626 | 0.1477 | (-26.48)*** | 0.0957 | 0.1214 | (-7.98)*** | 0.0644 | 0.1515 | (-27.23)*** |
| **Sales (log)** | 6.3572 | 7.1079 | (-19.70)*** | 6.6661 | 6.8352 | (-4.36)*** | 6.3347 | 7.1913 | (-22.61)*** |
| **Debt / Equity** | 1.2841 | 1.4745 | (-5.62)*** | 1.3185 | 1.4530 | (-3.97)*** | 1.2836 | 1.4916 | (-6.14)*** |
| **Current ratio** | 0.0156 | 0.0139 | (11.56)*** | 0.0149 | 0.0144 | (3.14)** | 0.0155 | 0.0138 | (11.05)*** |
| **Operating margin** | 0.1023 | 0.1018 | (0.22) | 0.1020 | 0.1021 | (-0.04) | 0.0991 | 0.1051 | (-2.58)** |
| **GDP growth** | 1.9851 | 1.8321 | (6.49)*** | 1.6392 | 2.1359 | (-21.24)*** | 2.0211 | 1.7825 | (10.17)*** |
| **Private credit** | 114.7495 | 112.3059 | (6.22)*** | 116.3515 | 111.1613 | (13.17)*** | 113.8035 | 113.0066 | (2.03)* |
| **Stock market** | 78.8624 | 87.1627 | (-17.48)*** | 77.3621 | 87.6950 | (-21.59)*** | 79.9444 | 87.3380 | (-15.63)*** |
| **Rule of law** | 1.4258 | 1.5352 | (-22.16)*** | 1.4354 | 1.5335 | (-19.93)*** | 1.4390 | 1.5295 | (-18.37)*** |
| **Renegotiation index** | 0.4072 | 0.3753 | (18.16)*** | 0.3990 | 0.3803 | (10.64)*** | 0.4113 | 0.3695 | (24.02)*** |
| **Priority** | 3.1808 | 3.4392 | (-27.73)*** | 3.2397 | 3.4066 | (-17.78)*** | 3.2173 | 3.4177 | (-21.43)*** |
| **Recovery** | 0.6210 | 0.6143 | (2.86)** | 0.6199 | 0.6147 | (2.21)* | 0.6192 | 0.6157 | (1.49) |

## Table 4 Regression results – main specification

This table presents estimated coefficients and standard errors, clustered at the loan facility level (in parentheses), from logit, ordered logit, and poisson regressions respectively. Renegotiation = 1 if a loan is renegotiated (0 otherwise); Rounds = 0 (no renegotiation) to 12 renegotiation rounds; Amendments = 0 (no renegotiation) to 6 amended loan terms. Betweenness, Closeness, Degree are lender's network-centrality measures and our main explanatory variables. All variables are described in the appendix. All regressions include control variables for main loan currencies (USD and EUR), loan type (term), loan purposes (acquisition, general corporate, LBO, debt refinancing). *, **, and *** indicate a statistically significant coefficient at the 10%, 5%, and 1% confidence level.

| | ***Renegotiation*** | | | ***Rounds*** | | | ***Amendments*** | | |
|---|---|---|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(1)** | **(2)** | **(3)** | **(1)** | **(2)** | **(3)** |
| **Betweenness** | 4.6453*** | | | 3.6738*** | | | 5.3348*** | | |
| | (1.2480) | | | (0.8605) | | | (1.5580) | | |
| **Closeness** | | 4.5991** | | | 2.1199** | | | 4.0179* | |
| | | (2.1232) | | | (0.9278) | | | (2.2157) | |
| **Degree** | | | 3.5572*** | | | 3.5910*** | | | 3.4743*** |
| | | | (0.9301) | | | (0.7589) | | | (1.1761) |
| **Facility (log)** | 0.3870*** | 0.3926*** | 0.3839*** | 0.2603*** | 0.2682*** | 0.2467*** | 0.2890*** | 0.2980*** | 0.2843*** |
| | (0.0707) | (0.0728) | (0.0716) | (0.0524) | (0.0539) | (0.0526) | (0.0780) | (0.0803) | (0.0797) |
| **Maturity** | 0.0503*** | 0.0510*** | 0.0510*** | 0.0577*** | 0.0591*** | 0.0572*** | 0.0629*** | 0.0627*** | 0.0633*** |
| | (0.0143) | (0.0145) | (0.0142) | (0.0116) | (0.0116) | (0.0113) | (0.0159) | (0.0162) | (0.0160) |
| **Secured** | 0.5634*** | 0.5441*** | 0.5639*** | 0.5453*** | 0.5364*** | 0.5576*** | 0.6159*** | 0.5893*** | 0.6147*** |
| | (0.0984) | (0.0972) | (0.0974) | (0.0801) | (0.0796) | (0.0791) | (0.1086) | (0.1066) | (0.1076) |
| **Covenants** | 1.5645*** | 1.5623*** | 1.5986*** | 0.6921*** | 0.6995*** | 0.6976*** | 1.4792*** | 1.4780*** | 1.5066*** |
| | (0.1860) | (0.1855) | (0.1852) | (0.1199) | (0.1184) | (0.1193) | (0.2186) | (0.2161) | (0.2187) |
| **Outstanding (log)** | -0.2595*** | -0.2493*** | -0.2628*** | -0.1010*** | -0.0838** | -0.1020*** | -0.2122*** | -0.1963*** | -0.2100*** |
| | (0.0636) | (0.0658) | (0.0649) | (0.0371) | (0.0395) | (0.0374) | (0.0627) | (0.0650) | (0.0642) |
| **Previous issues** | 0.1004*** | 0.1002*** | 0.1026*** | 0.0362*** | 0.0357*** | 0.0380*** | 0.0979*** | 0.1000*** | 0.1002*** |
| | (0.0232) | (0.0235) | (0.0233) | (0.0130) | (0.0131) | (0.0133) | (0.0247) | (0.0252) | (0.0249) |
| **# lenders** | 0.0245** | 0.0312*** | 0.0261*** | 0.0149*** | 0.0188*** | 0.0156*** | 0.0420*** | 0.0494*** | 0.0450*** |
| | (0.0098) | (0.0099) | (0.0098) | (0.0038) | (0.0034) | (0.0038) | (0.0106) | (0.0105) | (0.0107) |
| **League** | 0.1821 | 0.2180 | 0.1540 | -0.0479 | -0.0260 | -0.0725 | 0.0487 | 0.0927 | 0.0361 |
| | (0.1352) | (0.1333) | (0.1383) | (0.1025) | (0.1038) | (0.1037) | (0.1474) | (0.1465) | (0.1490) |
| **Relationship** | -0.0269 | -0.0327 | -0.0335 | 0.0531 | 0.0428 | 0.0492 | 0.0209 | 0.0142 | 0.0169 |
| | (0.1114) | (0.1131) | (0.1109) | (0.0733) | (0.0754) | (0.0718) | (0.1293) | (0.1311) | (0.1284) |
| **% same country** | -0.0235 | -0.0139 | -0.0160 | 0.0715 | 0.0561 | 0.0736 | 0.0814 | 0.0833 | 0.0827 |
| | (0.1351) | (0.1377) | (0.1366) | (0.1340) | (0.1317) | (0.1328) | (0.1878) | (0.1917) | (0.1904) |
| **Rating** | 0.2631** | 0.2636* | 0.2508* | 0.2011*** | 0.1860*** | 0.2094*** | 0.1783 | 0.1751 | 0.1780 |
| | (0.1331) | (0.1380) | (0.1336) | (0.0705) | (0.0720) | (0.0696) | (0.1294) | (0.1323) | (0.1293) |
| **Year** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Country** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Industry** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Loans** | 6361 | 6361 | 6361 | 6361 | 6361 | 6361 | 6361 | 6361 | 6361 |
| **Chi2** | 754.35 | 757.25 | 788.99 | 8787.18 | 8238.17 | 7808.44 | 1233.91 | 1331.37 | 1314.75 |
| **Log.L.** | -10107.22 | -10165.95 | -10110.21 | -21935.87 | -22146.28 | -21867.01 | -19839.43 | -19941.85 | -19878.77 |
| **PseudoR2** | 0.27 | 0.26 | 0.27 | 0.40 | 0.39 | 0.40 | 0.18 | 0.18 | 0.18 |

## Table 5 Regression results – borrower variables included

This table presents estimated coefficients and standard errors, clustered at the loan facility level (in parentheses), from logit, ordered logit, and poisson regressions respectively. Renegotiation = 1 if a loan is renegotiated (0 otherwise); Rounds = 0 (no renegotiation) to 12 renegotiation rounds; Amendments = 0 (no renegotiation) to 6 amended loan terms. Betweenness, Closeness, Degree are lender's network-centrality measures and our main explanatory variables. All variables are described in the appendix. Loan and Syndicate variables and borrower Rating included but not shown. All regressions include control variables for main loan currencies (USD and EUR), loan type (term), loan purposes (acquisition, general corporate, LBO, debt refinancing). *, **, and *** indicate a statistically significant coefficient at the 10%, 5%, and 1% confidence level.

| | ***Renegotiation*** | | | ***Rounds*** | | | ***Amendments*** | | |
|---|---|---|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(1)** | **(2)** | **(3)** | **(1)** | **(2)** | **(3)** |
| **Betweenness** | 3.3558* | | | 5.5416*** | | | 4.7026** | | |
| | (2.0006) | | | (1.0760) | | | (2.0162) | | |
| **Closeness** | | 5.1454 | | | 9.5490*** | | | 7.4431* | |
| | | (3.9666) | | | (1.8529) | | | (4.1233) | |
| **Degree** | | | 3.4753** | | | 5.3410*** | | | 3.9579** |
| | | | (1.4822) | | | (0.8741) | | | (1.6230) |
| **Sales (log)** | -0.1010* | -0.1019* | -0.1054* | -0.0550* | -0.0563* | -0.0539* | 0.0414 | 0.0413 | 0.0389 |
| | (0.0604) | (0.0603) | (0.0607) | (0.0300) | (0.0292) | (0.0292) | (0.0542) | (0.0537) | (0.0543) |
| **Debt / Equity** | -0.0872 | -0.0911 | -0.0866 | -0.0642* | -0.0705* | -0.0646* | -0.1044* | -0.1106* | -0.1075* |
| | (0.0607) | (0.0611) | (0.0603) | (0.0374) | (0.0386) | (0.0349) | (0.0618) | (0.0628) | (0.0619) |
| **Current ratio** | -16.5111 | -17.8861 | -16.2642 | -30.0841*** | -32.7744*** | -29.6345*** | -33.4554*** | -34.9854*** | -33.5055*** |
| | (12.3083) | (12.3745) | (12.3412) | (8.8278) | (9.0076) | (8.8549) | (11.9433) | (12.0154) | (11.8535) |
| **Operating margin** | 0.0420 | 0.0316 | 0.0484 | 0.1395 | 0.1492 | 0.0918 | 1.4263* | 1.3739* | 1.4175* |
| | (0.8930) | (0.8851) | (0.8970) | (0.5353) | (0.5319) | (0.5361) | (0.8162) | (0.8102) | (0.8142) |
| **Loan & Syndicate & Rating** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Year** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Country** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Industry** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Loans** | 1405 | 1405 | 1405 | 1423 | 1423 | 1423 | 1420 | 1420 | 1420 |
| **Chi2** | 236.88 | 234.30 | 238.13 | 3340.26 | 3278.36 | 3419.25 | 2741.85 | 2669.47 | 2675.91 |
| **Log.L.** | -2335.47 | -2338.31 | -2328.14 | -4944.57 | -4969.89 | -4900.29 | -4673.23 | -4680.15 | -4667.85 |
| **PseudoR2** | 0.28 | 0.28 | 0.29 | 0.30 | 0.29 | 0.30 | 0.18 | 0.18 | 0.18 |

## Table 6 Regression results – country variables included

This table presents estimated coefficients and standard errors, clustered at the loan facility level (in parentheses), from logit, ordered logit, and poisson regressions respectively. Renegotiation = 1 if a loan is renegotiated (0 otherwise); Rounds = 0 (no renegotiation) to 12 renegotiation rounds; Amendments = 0 (no renegotiation) to 6 amended loan terms. Betweenness, Closeness, Degree are lender's network-centrality measures and our main explanatory variables. All variables are described in the appendix. Loan and Syndicate variables and borrower Rating included but not shown. All regressions include control variables for main loan currencies (USD and EUR), loan type (term), loan purposes (acquisition, general corporate, LBO, debt refinancing). *, **, and *** indicate a statistically significant coefficient at the 10%, 5%, and 1% confidence level.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ***Renegotiation*** | | | | | | |
| **Betweenness** | 4.2531*** | | | 4.8009*** | | | 5.0460*** | | | 5.1316*** | | |
| | (1.3421) | | | (1.4619) | | | (1.4560) | | | (1.4821) | | |
| **Closeness** | | 2.8650 | | | 4.6931* | | | 5.6744** | | | 5.4111** | |
| | | (2.4473) | | | (2.6046) | | | (2.5433) | | | (2.5719) | |
| **Degree** | | | 4.3555*** | | | 4.6990*** | | | 4.9269*** | | | 4.9997*** |
| | | | (1.1407) | | | (1.2180) | | | (1.2117) | | | (1.2306) |
| **GDP growth** | 7.6367 | 7.6626 | 8.8629* | 17.0808*** | 17.8533*** | 17.5052*** | 12.7417*** | 13.2917** | 14.2976*** | 9.5923** | 10.0365** | 10.4950** |
| | (4.8386) | (5.0041) | (5.0367) | (5.1230) | (5.2754) | (5.2152) | (4.9354) | (5.2505) | (5.1076) | (4.8683) | (5.0999) | (5.0277) |
| **Private credit** | -0.2625 | -0.2788 | -0.2304 | 0.1117 | 0.0708 | 0.1773 | 0.1315 | 0.0781 | 0.2122 | -0.4021 | -0.4557 | -0.3038 |
| | (0.2657) | (0.2637) | (0.2680) | (0.3155) | (0.3133) | (0.3156) | (0.3053) | (0.3106) | (0.3100) | (0.2895) | (0.2924) | (0.2911) |
| **Stock market** | -0.0634 | -0.0989 | -0.1111 | 0.2310 | 0.2274 | 0.1473 | -0.0343 | -0.0440 | -0.1202 | 0.1580 | 0.1459 | 0.0765 |
| | (0.2357) | (0.2396) | (0.2425) | (0.2205) | (0.2235) | (0.2223) | (0.2210) | (0.2278) | (0.2265) | (0.2234) | (0.2261) | (0.2251) |
| **Rule of law** | 0.4155*** | 0.4494*** | 0.3771*** | | | | | | | | | |
| | (0.1437) | (0.1479) | (0.1452) | | | | | | | | | |
| **Renegotiation index** | | | | -2.2799*** | -2.4110*** | -2.1142*** | | | | | | |
| | | | | (0.6653) | (0.6680) | (0.6729) | | | | | | |
| **Priority** | | | | | | | 0.2353** | 0.2402** | 0.2223** | | | |
| | | | | | | | (0.1140) | (0.1132) | (0.1126) | | | |
| **Recovery** | | | | | | | | | | 1.3653*** | 1.3555*** | 1.3072*** |
| | | | | | | | | | | (0.3674) | (0.3720) | (0.3686) |
| **Loan & Syndicate & Rating** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Industry** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Legal origin** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Loans** | 4843 | 4843 | 4843 | 3972 | 3972 | 3972 | 3972 | 3972 | 3972 | 3972 | 3972 | 3972 |
| **Chi2** | 482.40 | 485.53 | 500.69 | 430.93 | 434.49 | 442.40 | 423.47 | 425.40 | 440.92 | 428.72 | 433.66 | 441.93 |
| **Log.L.** | -7307.67 | -7360.88 | -7281.22 | -5796.88 | -5839.81 | -5778.26 | -5868.45 | -5912.82 | -5846.61 | -5799.33 | -5847.16 | -5778.00 |
| **PseudoR2** | 0.26 | 0.25 | 0.26 | 0.27 | 0.26 | 0.27 | 0.26 | 0.25 | 0.26 | 0.27 | 0.26 | 0.27 |
| | | | | | | ***Rounds*** | | | | | | |
| **Betweenness** | 3.3194*** | | | 3.6981*** | | | 3.8391*** | | | 3.8109*** | | |
| | (0.9594) | | | (1.0163) | | | (1.0700) | | | (1.0723) | | |
| **Closeness** | | 1.7222 | | | 2.3336 | | | 2.6955* | | | 2.3417 | |
| | | (1.3280) | | | (1.5346) | | | (1.5808) | | | (1.5819) | |
| **Degree** | | | 4.0840*** | | | 4.6917*** | | | 4.8217*** | | | 4.8781*** |
| | | | (1.0457) | | | (0.9158) | | | (0.9817) | | | (0.9677) |
| **GDP growth** | -0.1700 | 0.8930 | 0.5291 | 8.1449 | 8.9834* | 8.4464 | 3.8098 | 4.0652 | 4.8544 | 2.0081 | 2.6222 | 2.5500 |
| | (5.3960) | (5.2287) | (5.5714) | (5.3215) | (5.2378) | (5.3445) | (4.4872) | (4.4407) | (4.5550) | (4.9116) | (4.8307) | (4.9236) |
| **Private credit** | -0.4121* | -0.3584 | -0.3989* | -0.0291 | 0.0100 | 0.0004 | -0.1085 | -0.0863 | -0.0567 | -0.4891* | -0.4555* | -0.4348* |
| | (0.2408) | (0.2393) | (0.2387) | (0.3033) | (0.2955) | (0.2962) | (0.2551) | (0.2561) | (0.2482) | (0.2576) | (0.2503) | (0.2503) |
| **Stock market** | -0.0483 | -0.1069 | -0.0748 | 0.0339 | 0.0087 | -0.0144 | -0.1444 | -0.1584 | -0.2004 | -0.0403 | -0.0685 | -0.0913 |
| | (0.2183) | (0.2174) | (0.2251) | (0.1923) | (0.1885) | (0.1903) | (0.1945) | (0.1933) | (0.1935) | (0.2079) | (0.2004) | (0.2068) |
| **Rule of law** | 0.4041*** | 0.4266*** | 0.3848** | | | | | | | | | |
| | (0.1509) | (0.1563) | (0.1522) | | | | | | | | | |
| **Renegotiation index** | | | | -2.1910*** | -2.2762*** | -2.0772*** | | | | | | |
| | | | | (0.6315) | (0.6158) | (0.6394) | | | | | | |
| **Priority** | | | | | | | 0.2380*** | 0.2351*** | 0.2316*** | | | |
| | | | | | | | (0.0859) | (0.0866) | (0.0822) | | | |
| **Recovery** | | | | | | | | | | 1.0990*** | 1.1132*** | 1.0892*** |
| | | | | | | | | | | (0.2595) | (0.2659) | (0.2484) |
| **Loan & Syndicate & Rating** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Year** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Industry** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Legal origin** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Loans** | 4843 | 4843 | 4843 | 3972 | 3972 | 3972 | 3972 | 3972 | 3972 | 3972 | 3972 | 3972 |
| **Chi2** | 1509.41 | 1533.76 | 1449.51 | 1820.83 | 1958.88 | 1747.31 | 1485.22 | 1670.98 | 1407.71 | 1579.98 | 1699.18 | 1455.82 |
| **Log.L.** | -16081.14 | -16245.77 | -15955.03 | -12495.71 | -12625.44 | -12359.10 | -12653.62 | -12787.50 | -12511.81 | -12523.15 | -12662.62 | -12372.15 |
| **PseudoR2** | 0.34 | 0.33 | 0.34 | 0.37 | 0.36 | 0.37 | 0.36 | 0.35 | 0.37 | 0.36 | 0.36 | 0.37 |
| | | | | | | ***Amendments*** | | | | | | |
| **Betweenness** | 4.5650*** | | | 5.6351*** | | | 5.9390*** | | | 5.9594*** | | |
| | (1.5688) | | | (1.5988) | | | (1.5869) | | | (1.6042) | | |
| **Closeness** | | 3.7932 | | | 6.4948** | | | 7.4184*** | | | 7.0546** | |
| | | (2.7691) | | | (2.7267) | | | (2.6789) | | | (2.7486) | |
| **Degree** | | | 4.4516*** | | | 5.2834*** | | | 5.5534*** | | | 5.5595*** |
| | | | (1.4448) | | | (1.3598) | | | (1.3492) | | | (1.3725) |
| **GDP growth** | 4.3022 | 4.5744 | 5.5212 | 12.6327** | 13.7267** | 13.2117** | 8.5000* | 9.4410* | 10.1284** | 5.1634 | 5.9907 | 6.0733 |
| | (5.4497) | (5.4907) | (5.7168) | (5.6450) | (5.6168) | (5.6986) | (5.0108) | (5.0276) | (5.0876) | (5.2834) | (5.2797) | (5.4134) |
| **Private credit** | -0.3926 | -0.4068 | -0.3618 | 0.0527 | 0.0178 | 0.1089 | -0.0403 | -0.0899 | 0.0407 | -0.5722* | -0.6133* | -0.4818 |
| | (0.2773) | (0.2759) | (0.2810) | (0.3491) | (0.3473) | (0.3518) | (0.3186) | (0.3262) | (0.3260) | (0.3147) | (0.3184) | (0.3165) |
| **Stock market** | -0.1488 | -0.1731 | -0.1978 | -0.0098 | -0.0212 | -0.0874 | -0.1821 | -0.1961 | -0.2710 | -0.0521 | -0.0698 | -0.1312 |
| | (0.2792) | (0.2818) | (0.2918) | (0.2329) | (0.2342) | (0.2341) | (0.2264) | (0.2317) | (0.2318) | (0.2361) | (0.2371) | (0.2378) |
| **Rule of law** | 0.5096*** | 0.5260*** | 0.4803*** | | | | | | | | | |
| | (0.1511) | (0.1544) | (0.1497) | | | | | | | | | |
| **Renegotiation index** | | | | -2.2607*** | -2.3691*** | -2.1115*** | | | | | | |
| | | | | (0.7321) | (0.7346) | (0.7429) | | | | | | |
| **Priority** | | | | | | | 0.2264** | 0.2274** | 0.2217** | | | |
| | | | | | | | (0.1130) | (0.1126) | (0.1109) | | | |
| **Recovery** | | | | | | | | | | 1.6461*** | 1.6177*** | 1.5860*** |
| | | | | | | | | | | (0.3842) | (0.3982) | (0.3776) |
| **Loan & Syndicate & Rating** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Year** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Industry** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Legal origin** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Loans** | 4843 | 4843 | 4843 | 3972 | 3972 | 3972 | 3972 | 3972 | 3972 | 3972 | 3972 | 3972 |
| **Chi2** | 694.44 | 696.32 | 713.76 | 615.00 | 633.25 | 628.80 | 570.06 | 582.37 | 584.37 | 568.08 | 582.58 | 588.68 |
| **Log.L.** | -13871.64 | -13939.85 | -13852.02 | -11064.90 | -11125.93 | -11047.95 | -11118.22 | -11181.34 | -11098.28 | -11042.70 | -11110.55 | -11024.60 |
| **PseudoR2** | 0.18 | 0.18 | 0.18 | 0.19 | 0.19 | 0.20 | 0.19 | 0.19 | 0.19 | 0.20 | 0.19 | 0.20 |

## Table 7 Regression results – robustness checks

This table presents estimated coefficients and standard errors, clustered at the loan facility level (in parentheses), from logit, ordered logit, and poisson regressions respectively. Renegotiation = 1 if a loan is renegotiated (0 otherwise); Rounds = 0 (no renegotiation) to 12 renegotiation rounds; Amendments = 0 (no renegotiation) to 6 amended loan terms. Betweenness, Closeness, Degree are lender's network-centrality measures and our main explanatory variables. All variables are described in the appendix.

Panel A shows robustness checks for micro-level variables. Unique renegotiation = loans renegotiated only once in the sample. Unique loan = borrowers with only one loan issue in the sample. First loan = only first loan issues according to the sample. Small loan = loan amount lower than 419 (sample median). Short maturity = loan maturity lower than 6.00. Not secured = loans without collateral. No covenants = loans without covenants attached. Small outstanding = loans with amount outstanding lower than 0.44 (sample median). Few issues = borrower with less than 3 previous loan issues (sample median). Small syndicate = syndicates with less than 7 members (sample median). No league = syndicates without league table lenders. No relationship = syndicates without previous borrower-lender relationship. No rating = borrower without any rating. Many tranches = loans with more than 3 tranches (sample median). Bank fixed effect = regressions including lender fixed effects. No NBP = loans involving BNP Paribas excluded. No BNP RBS UCG = loans involving BNP Paribas or Royal Bank of Scotland or UniCredit excluded. All regressions include loan and syndicate variables, borrower rating and dummy variables for loan year, borrower industry, borrower country, loan currency, loan type and loan purpose.

Panel B shows robustness checks for country-level variables and for country or time dimensions. Low rule of law = Rule of law below 1.65 (sample median). Low renegotiation index = Renegotiation index below 0.45 (sample median). Low recovery = Recovery below 0.56 (sample median). All regressions include loan and syndicate variables, borrower rating and dummy variables for loan year, borrower industry, loan currency, loan type, loan purpose and borrower country legal origin. No UK = loans to UK borrowers excluded. Core EZ = Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Spain, Portugal only. GIIPS = Greece, Ireland, Italy, Spain, Portugal only. Post US Crisis = loans originated after September 15th 2008. Post EZ Crisis = loans originated after December 1st 2009. All regressions include loan and syndicate variables, borrower rating and dummy variables for loan year, borrower industry, loan currency, loan type, loan purpose and borrower country.

*, **, and *** indicate a statistically significant coefficient at the 10%, 5%, and 1% confidence level.

### Panel A

| | ***Renegotiation*** | | | ***Rounds*** | | | ***Amendments*** | | |
|---|---|---|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** |
| | | | | | Unique renegotiation | | | | |
| **Betweenness** | 3.0692** | | | | | | 3.1361** | | |
| | (1.2339) | | | | | | (1.2809) | | |
| **Closeness** | | 3.0240 | | | | | | 3.6579* | |
| | | (1.9648) | | | | | | (1.8914) | |
| **Degree** | | | 1.9674** | | | | | | 2.0296** |
| | | | (0.7935) | | | | | | (0.8087) |
| | | | | | Unique loan | | | | |
| **Betweenness** | 2.7345 | | | 2.9826** | | | 3.3494 | | |
| | (1.9215) | | | (1.4414) | | | (2.0483) | | |
| **Closeness** | | 5.4009 | | | 8.5555*** | | | 7.9124* | |
| | | (3.5386) | | | (2.7746) | | | (4.0572) | |
| **Degree** | | | 2.4730** | | | 2.8370*** | | | 2.8428** |
| | | | (1.1797) | | | (0.9970) | | | (1.2278) |
| | | | | | First loan | | | | |
| **Betweenness** | 3.5770*** | | | 2.9221*** | | | 3.7033** | | |
| | (1.3531) | | | (0.8614) | | | (1.8757) | | |
| **Closeness** | | 6.6811** | | | 5.5732*** | | | 4.4040 | |
| | | (3.0630) | | | (1.9177) | | | (4.4816) | |
| **Degree** | | | 2.5929** | | | 2.9588*** | | | 2.1299 |
| | | | (1.0341) | | | (0.7663) | | | (1.5767) |
| | | | | | Small loan | | | | |
| **Betweenness** | 4.2851** | | | 3.7392*** | | | 4.6834** | | |
| | (1.7155) | | | (1.3068) | | | (2.0699) | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Closeness** | | 7.6951*** | | | 3.6680 | | | 8.5164*** | |
| | | (2.7102) | | | (2.2937) | | | (3.0393) | |
| **Degree** | | | 1.7864* | | | 1.9809** | | | 1.7952* |
| | | | (1.0219) | | | (0.8714) | | | (1.0379) |
| | | | | | Short maturity | | | | |
| **Betweenness** | 6.2218*** | | | 6.8728*** | | | 7.5220*** | | |
| | (1.4035) | | | (0.9232) | | | (1.5707) | | |
| **Closeness** | | 11.0423*** | | | 6.3490*** | | | 9.9574*** | |
| | | (2.4331) | | | (0.7769) | | | (2.0405) | |
| **Degree** | | | 3.3709*** | | | 3.9740*** | | | 3.8264*** |
| | | | (0.9228) | | | (0.6275) | | | (1.0075) |
| | | | | | Not secured | | | | |
| **Betweenness** | 5.3513*** | | | 5.1577*** | | | 6.2128*** | | |
| | (1.2605) | | | (1.0555) | | | (1.4995) | | |
| **Closeness** | | 7.8971*** | | | 5.6879*** | | | 9.7034*** | |
| | | (2.6681) | | | (1.2848) | | | (2.8262) | |
| **Degree** | | | 3.3280*** | | | 4.0860*** | | | 3.2417*** |
| | | | (0.9792) | | | (0.8645) | | | (1.0571) |
| | | | | | No covenants | | | | |
| **Betweenness** | 5.3473*** | | | 4.4379*** | | | 5.2376*** | | |
| | (1.2682) | | | (1.0112) | | | (1.6332) | | |
| **Closeness** | | 6.4961*** | | | 3.0356*** | | | 4.7035* | |
| | | (2.0933) | | | (1.1279) | | | (2.4964) | |
| **Degree** | | | 3.6764*** | | | 3.6714*** | | | 3.0900*** |
| | | | (0.8965) | | | (0.7730) | | | (1.1552) |
| | | | | | Many tranches | | | | |
| **Betweenness** | -0.1381 | | | 1.7072 | | | 1.8430 | | |
| | (3.0313) | | | (1.0972) | | | (2.9258) | | |
| **Closeness** | | 8.7428** | | | 1.1967 | | | 4.9794 | |
| | | (3.6305) | | | (1.0698) | | | (3.4291) | |
| **Degree** | | | 0.6559 | | | 1.3853 | | | 1.0507 |
| | | | (2.2987) | | | (1.0481) | | | (2.3366) |
| | | | | | Few issues | | | | |
| **Betweenness** | 2.9122** | | | 3.2182*** | | | 3.0700** | | |
| | (1.2339) | | | (0.9231) | | | (1.4169) | | |
| **Closeness** | | 7.0940*** | | | 4.1035*** | | | 6.4034*** | |
| | | (2.2626) | | | (1.0365) | | | (2.1255) | |
| **Degree** | | | 1.9236** | | | 3.2473*** | | | 2.0755* |
| | | | (0.9232) | | | (0.7178) | | | (1.1289) |
| | | | | | Small syndicate | | | | |
| **Betweenness** | 3.4632* | | | 3.1959** | | | 3.8812* | | |
| | (1.9725) | | | (1.5217) | | | (2.2357) | | |
| **Closeness** | | 4.2043 | | | 2.9503** | | | 5.0093* | |
| | | (2.8141) | | | (1.3399) | | | (2.8585) | |
| **Degree** | | | 2.2963* | | | 2.4348** | | | 2.4586* |
| | | | (1.2340) | | | (1.1059) | | | (1.4244) |
| | | | | | No league | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Betweenness** | 6.1858*** | | | 4.2771*** | | | 6.7266*** | | |
| | (1.3121) | | | (0.9194) | | | (1.6673) | | |
| **Closeness** | | 5.8355*** | | | 2.2129** | | | 5.0573** | |
| | | (2.1866) | | | (1.0084) | | | (2.4563) | |
| **Degree** | | | 4.5376*** | | | 4.1132*** | | | 4.3687*** |
| | | | (0.9522) | | | (0.8080) | | | (1.2730) |
| | | | | | No relationship | | | | |
| **Betweenness** | 5.1952*** | | | 4.2786*** | | | 6.4280*** | | |
| | (1.3914) | | | (0.9064) | | | (1.8934) | | |
| **Closeness** | | 6.4779** | | | 4.3688** | | | 6.8124* | |
| | | (2.9742) | | | (1.7915) | | | (3.7779) | |
| **Degree** | | | 3.5657*** | | | 4.1327*** | | | 3.7945*** |
| | | | (1.0222) | | | (0.8084) | | | (1.4412) |
| | | | | | No rating | | | | |
| **Betweenness** | 4.8823*** | | | 3.5378*** | | | 5.2391*** | | |
| | (1.3083) | | | (0.9165) | | | (1.6452) | | |
| **Closeness** | | 6.7776*** | | | 3.9823*** | | | 5.3663** | |
| | | (2.0111) | | | (0.9712) | | | (2.1787) | |
| **Degree** | | | 3.4861*** | | | 3.2697*** | | | 3.0037** |
| | | | (0.9522) | | | (0.8205) | | | (1.2104) |
| | | | | | Bank fixed effect | | | | |
| **Betweenness** | 5.0331*** | | | 4.1154*** | | | | | |
| | (1.2266) | | | (0.8216) | | | | | |
| **Closeness** | | 4.6553** | | | 2.5102*** | | | | |
| | | (2.2284) | | | (0.7121) | | | | |
| **Degree** | | | 4.3995*** | | | 4.2872*** | | | 4.3451*** |
| | | | (0.9516) | | | (0.6466) | | | (1.0790) |
| | | | | | no BNP | | | | |
| **Betweenness** | 5.6735*** | | | 4.1711*** | | | 6.4384*** | | |
| | (1.2603) | | | (0.8868) | | | (1.5751) | | |
| **Closeness** | | 5.7104*** | | | 2.3367** | | | 5.0818** | |
| | | (2.1372) | | | (0.9582) | | | (2.2492) | |
| **Degree** | | | 4.1780*** | | | 3.9144*** | | | 4.1465*** |
| | | | (0.9259) | | | (0.7885) | | | (1.1899) |
| | | | | | no BNP RBS UCG | | | | |
| **Betweenness** | 6.3359*** | | | 5.0404*** | | | 6.6596*** | | |
| | (1.4603) | | | (1.0253) | | | (1.8320) | | |
| **Closeness** | | 7.2246*** | | | 3.6984*** | | | 5.6410** | |
| | | (2.2484) | | | (1.0939) | | | (2.6257) | |
| **Degree** | | | 4.3015*** | | | 4.0942*** | | | 4.0754*** |
| | | | (1.0277) | | | (0.7775) | | | (1.3572) |

**Panel B**

| | *Renegotiation* | | | *Rounds* | | | *Amendments* | | |
|---|---|---|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** |
| | | | | | Low rule of law | | | | |
| **Betweenness** | 3.7858** | | | 3.5831*** | | | 4.5632*** | | |
| | (1.5283) | | | (0.9926) | | | (1.7569) | | |
| **Closeness** | | 2.4858 | | | | | | 4.3293 | |
| | | (2.7328) | | | | | | (2.8498) | |
| **Degree** | | | 3.1321** | | | 4.5416*** | | | 3.6895** |
| | | | (1.4578) | | | (1.1144) | | | (1.6045) |
| | | | | | Low renegotiation index | | | | |
| **Betweenness** | 5.3628*** | | | | | | 6.8895*** | | |
| | (1.9000) | | | | | | (2.0911) | | |
| **Closeness** | | 0.1867 | | | | | | 4.2751 | |
| | | (3.6352) | | | | | | (3.1623) | |
| **Degree** | | | 5.5399*** | | | | | | 6.7566*** |
| | | | (1.8591) | | | | | | (2.1876) |
| | | | | | Low recovery | | | | |
| **Betweenness** | 2.9935 | | | 2.4432* | | | 2.5948 | | |
| | (2.2810) | | | (1.3328) | | | (2.5063) | | |
| **Closeness** | | 1.8723 | | | | | | 1.5520 | |
| | | (3.5455) | | | | | | (3.2658) | |
| **Degree** | | | 1.5176 | | | | | | 1.2714 |
| | | | (2.3026) | | | | | | (2.5700) |
| | | | | | No UK | | | | |
| **Betweenness** | 5.4461*** | | | 4.4323*** | | | 6.7649*** | | |
| | (1.3532) | | | (0.8730) | | | (1.6096) | | |
| **Closeness** | | 6.4656*** | | | 2.5371** | | | 5.7237*** | |
| | | (2.2864) | | | (1.0333) | | | (2.1880) | |
| **Degree** | | | 3.8591*** | | | 4.2899*** | | | 4.2082*** |
| | | | (0.9547) | | | (0.6742) | | | (1.1160) |
| | | | | | Core EZ | | | | |
| **Betweenness** | 5.9179*** | | | 3.9685*** | | | 7.5212*** | | |
| | (1.3947) | | | (0.8717) | | | (1.7192) | | |
| **Closeness** | | 6.7587** | | | 2.0246** | | | 5.6143** | |
| | | (2.8118) | | | (0.9630) | | | (2.5291) | |
| **Degree** | | | 4.3023*** | | | 3.8351*** | | | 4.8068*** |
| | | | (1.1185) | | | (0.8362) | | | (1.3141) |
| | | | | | GIIPS | | | | |
| **Betweenness** | 4.4338* | | | | | | 7.5928** | | |
| | (2.4022) | | | | | | (3.2527) | | |
| **Closeness** | | 2.8705 | | | | | | 5.6523 | |
| | | (5.1959) | | | | | | (5.3676) | |
| **Degree** | | | 3.3115** | | | | | | 3.1417* |
| | | | (1.6243) | | | | | | (1.7059) |
| | | | | | Post US Crisis | | | | |
| **Betweenness** | 6.9396*** | | | 4.6455*** | | | 6.4271*** | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1.5152) | | | (1.0000) | | | (1.5121) | |
| **Closeness** | | 12.2316*** | | | 3.4564*** | | | 8.6225*** | |
| | | (2.3529) | | | (0.6121) | | | (1.8625) | |
| **Degree** | | | 3.1949*** | | | 2.9240*** | | | 2.9458*** |
| | | | (0.8323) | | | (0.5794) | | | (0.8589) |
| | | | | | Post EZ Crisis | | | | |
| **Betweenness** | 7.1373*** | | | 4.9962*** | | | 6.5532*** | | |
| | (1.4833) | | | (0.9150) | | | (1.4472) | | |
| **Closeness** | | 12.7509*** | | | 3.6675*** | | | 9.7353*** | |
| | | (2.5337) | | | (0.6673) | | | (1.9759) | |
| **Degree** | | | 3.3727*** | | | 3.3736*** | | | 3.0805*** |
| | | | (0.8015) | | | (0.5028) | | | (0.8117) |

# Working Papers

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