On the Non-Exclusivity of Loan Contracts: An Empirical Investigation*

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Abstract

Theory argues that the non-exclusivity of financial contracts generates important negative externalities on lenders that may undermine credit availability. Using a difference-in-difference analysis and a unique dataset with internal information on a bank's willingness to lend to each firm, we find that the bank's willingness to lend to a previously exclusive firm decreases when the firm obtains a loan at another bank ("outside loan"). Consistent with the theoretical literature, the effect is more pronounced the larger the outside loans and is muted when the initial bank's existing and future loans retain seniority and are secured with valuable collateral.

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1. Introduction

In most countries, firms gradually move from exclusive bank-lending relationships to borrowing from multiple banks. Engaging multiple banks may allow firms to reduce hold-up problems (e.g., Sharpe (1990), Rajan (1992), and von Thadden (2004)) and dampen shocks impacting the liquidity of their banks (e.g., Detragiache et al. (2001)). The willingness of another bank to extend credit to a firm may also be perceived as a positive signal about its quality (e.g., James (1987)) and thus boost the initial bank's willingness to lend to the firm, particularly when the initial bank is relatively uninformed. Engaging multiple banks, however, could also generate negative externalities to banks that undermine their willingness to lend to a firm.[1] In Bizer and DeMarzo (1992), for example, loans from other banks impose externalities on existing loans by exacerbating firms' incentives for moral hazard. In Parlour and Rajan (2001)) non-exclusivity is argued to increase incentives to overborrow with intentions to strategically default. These incentives increase in the total amount borrowed and in the fraction of assets that firms can exempt from bankruptcy proceedings and they decrease in the amount of pledged assets—collateral in such settings can be thought as a non-exempt asset.

This paper investigates whether the negative externalities highlighted in the theoretical literature are a source of concern for banks and whether they undermine their willingness to lend to a firm. We do so by investigating how a bank's willingness to lend to a previously exclusive firm changes once the firm obtains a loan from another bank (which we refer to as an "outside loan") and benchmark the bank's reaction to an otherwise very similar set of control firms using a difference-in-difference analysis. We also investigate how the bank's response varies depending on whether its existing and future loans retain seniority over outside loans and are

[1] Several theoretical papers study the role of non-exclusivity in financial contracting. See, among others, Bizer and DeMarzo (1992), Kahn and Mookherjee (1998), Parlour and Rajan (2001), Bisin and Guaitoli (2004), Bennardo et al. (2009), Attar et al. (2010) and Attar et al. (2011) for a theoretical analysis of non-exclusivity in different game-theoretic settings covering moral hazard and adverse selection.

secured with valuable collateral. When the negative externalities from outside loans are present and cannot be fully contained with the use of contractual features such as collateral and other covenants or when they are not fully anticipated, an outside loan should trigger a decrease in the initial bank's willingness to lend to the firm.

Despite the substantial theoretical work on the impact of non-exclusivity on credit availability, to date, no direct test of these theories was possible. This is mainly due to the lack of adequate data and the important identification challenges that the research question poses. This paper aims to fill this gap by employing a unique dataset containing information on a bank's internal limit to each firm in an institutional setting that allows for a meaningful test. This is obtained using internal data from one of the largest banks in Sweden between April 2002 and December 2008. The internal limit indicates the maximum amount that a bank is willing to lend to a firm. It represents the amount for which the bank's loan supply becomes vertical. Hence, changes in the internal limit represent changes in loan supply. Using this information, we investigate how the bank's internal limit to a previously exclusive firm changes once the firm acquires a loan at another bank. This would not be possible using data on outstanding loan amounts as these are equilibrium outcomes driven both by demand and supply factors whereas the theory concerns supply effects. Moreover, the institutional setting in Sweden provides a meaningful ground for the analysis. There is a credit bureau and collateral registry in place that allow banks to observe and thus react to outside loans and employ contractual features (such as collateral and other covenants) to mitigate the resulting externalities.

The most important identification challenge that the research question poses stems from the fact that a firm's decision to seek an outside loan may depend on factors that also correlate with the initial bank's willingness to lend to the firm. To decrease the likelihood that such factors are driving the results, the bank's reaction to the outside loan is evaluated using a difference-in-

difference analysis. This allows us to benchmark the adjustment in the internal limit of firms that obtain loans from other banks (the treatment group) with the adjustment in the internal limit over the same period of otherwise very similar firms that do not obtain loans from other banks (the control group). The control firms intend to approximate the treatment firm's internal limit in the absence of an outside loan (i.e., the unobserved counterfactual).[2] Similar firms are obtained by matching on several firm characteristics just prior to the non-exclusivity event. We match on both publicly observable firm characteristics as well as internal variables (such as "distance to limit", loan interest rates, and internal ratings at the initial bank). The internal variables allow us to better approximate the treatment firm's unobserved counterfactual and to better control for factors that may give incentives to turn to another bank. As shown in descriptive statistics, the matching exercise yields pairs that in the year prior to the outside loan are on similar paths with respect to the outcome variable (known as the "parallel trends" assumption) and have similar probabilities of obtaining an outside loan in the following year (i.e., receiving treatment), which are important prerequisites for the difference-in-difference analysis (Roberts and Whited (2010)).

Overall, our findings lend support to the theories on negative contractual externalities. In particular, we find that when a previously exclusive firm, obtains a loan from another bank, the firm's initial bank decreases its internal limit to the firm and it decreases it more the larger the size of the outside loan. In terms of magnitudes, we find that $1 from another bank leads to a decrease in the initial bank's internal limit to the firms by 34 to 50 cents. Consistent with the theoretical literature, we also find that the initial bank's willingness to lend does not change when its existing and future loans are protected from the increased risk of default. In particular,

[2] The identification strategy rests on the assumption that the set of possible control firms contains firms that are similar to the treatment firms. This is not unlikely as information asymmetries between existing and new banks often prevent firms from obtaining credit elsewhere (e.g., Sharpe (1990) and Rajan (1992)) and "winner's curse" makes it optimal for banks to compete for each others' customers using "optimal randomization" (see von Thadden (2004)).

we find that an outside loan does not trigger any change in the initial bank's internal limit to the firm when its existing and future loans retain seniority over the outside loans *and* are secured with assets whose value is high and stable over time.

Sensitivity analysis regarding the timing of the bank's reaction indicates that there are no systematic decreases in the limit in the year just prior to the event window (consistent with the "parallel trends" assumption) and that most of the reaction takes place in the second half of the event window. Additional robustness checks suggest that our estimates are not influenced by unobserved firm heterogeneity. When studying the cross-sectional variation in the bank's reaction, we do not find that the bank's reaction is driven by alternative explanations such as reduced ability to extract hold-up rents, liquidity shocks from the crisis period, and other credit constraints at the bank level. We do find, however, weak evidence suggesting that an outside loan may sometimes carry a positive signal about the firm's quality. In particular, we find that for smaller or younger firms or firms with relatively short lending relationships with the initial bank, any given outside loan triggers a smaller decrease in their internal limit.

The non-exclusivity of credit contracts has played an important role in several financial crises such as the Latin-American debt crisis in the 1970s and the Asian crisis in the 1990s (Radelet and Sachs (1998) and Bisin and Guaitoli (2004)). Non-exclusivity has also been identified as an important factor behind the high interest rates and default rates in the consumer credit card market (e.g., Parlour and Rajan (2001)). More recently, the non-exclusivity in the credit derivatives market has played an important role at the onset of the financial crisis of 2007-2008. Acharya and Bisin (2011) argue that the non-exclusivity of financial contracts coupled with the opacity of the over-the-counter (OTC) markets—where credit default swaps (CDS) trade— created severe externalities from counterparty risk in the CDS market. This is because the risk that a party—in this case the seller of a CDS— might not be able to fulfill its contractual

obligations depends largely on other, often subsequent, exposures. In a theoretical model, the authors show that more transparency on counterparty risk exposures in the OTC market could have helped the contracting parties to internalize the externalities. These insights are in line with the parallel theoretical work on the role of such externalities in credit markets and our findings.

The remainder of the paper is organized as follows. Section 2 reviews the literature and develops two testable hypotheses. Section 3 presents the data and the institutional setting, while Section 4 describes our identification strategy. Section 5 discusses our results and various robustness checks and Section 6 concludes.

2. Testable Hypotheses on the Impact of Non-Exclusivity in Financial Contracting

To structure our empirical analysis, we first discuss the theoretical literature on the negative contractual externalities and summarize their key insights in two testable hypotheses. We then discuss alternative theories and their implications for our analysis.

The inefficiencies resulting from the non-exclusivity of financial contracts are addressed in several theoretical papers, each highlighting different aspects of the resulting externalities.[3] Regardless of the model employed, additional outside lending is assumed to impose negative externalities on the existing lender by increasing the borrower's probability of default, which in turn undermine the availability and terms of credit that borrowers can obtain.

In Bizer and DeMarzo (1992) and Bennardo et al. (2009), for example, an outside loan imposes an externality on existing debt by exacerbating the borrower's *moral hazard* incentives. Everything else equal, a higher total indebtedness reduces the borrower's work effort resulting in a higher probability of default (Holmström and Tirole (1997)). The outside loan imposes an

[3] Because of data availability and the institutional setting in Sweden, our analysis concerns only bank loans to firms. The theory, however, is more general and applies to any type of borrower and lender. Hence, our discussion of the theoretical literature in this section is framed in more general terms using the terms borrowers and lenders.

externality on existing debt because the terms of the outside loan do not reflect the devaluation of the existing debt. This is in sharp contrast to a one-creditor environment where all effects from additional loans are internalized. Because new lenders do not pay for the externality on the existing debt, they can offer loans with more attractive terms. This sequential contracting may also creates incentives for *opportunistic lending* i.e., lenders have incentives to target the customers of other creditors with attractive offers at the expense of the initial lenders. These incentives arise because new lenders do not pay for the externality they impose on existing debt, while they can protect their own claims from the increased risk (e.g., through higher interest rates). In Parlour and Rajan (2001) and Bennardo et al. (2009) the non-exclusivity creates incentives for *strategic default*s. The authors show that when multiple lenders can simultaneously offer loans to a borrower, incentives to overborrow with intentions to default could arise when borrowers can exempt a large fraction of their assets from bankruptcy proceedings. These incentives increase in the total amount borrowed.

Overall, the theories on contractual externalities predict that outside loans create negative externalities on existing lenders that undermine their willingness to lend. When these externalities are not fully anticipated, a loan from another bank is expected to trigger a decrease in the initial bank's willingness to lend the firm. Everything else equal, the bank's reaction is expected to be larger the larger the outside loan as the borrower's default probability increases in the total amount borrowed. This motivates our first testable hypothesis:

(H1) *The theory on contractual externalities predicts that when a borrower obtains an outside loan, the initial creditor's willingness to lend to the borrower will decrease and it will decrease more the larger the outside loan.*

To mitigate the externalities resulting from the non-exclusivity of debt contracts, creditors could employ several contractual features. For example, they could use *covenants* that make loan terms contingent on future borrowing from other sources. Such covenants, however, are not widely used because they introduce other inefficiencies.[4] Moreover, the ability of covenants to enforce exclusivity is bounded by limited liability and in some cases they may even aggravate problems by creating incentives for opportunistic lending (Attar et al. (2010)).

Another approach, first discussed in Fama and Miller (1972), is to *prioritize debt* (i.e., allow the borrower's existing debt to retain seniority over new loans). While prioritization avoids dilution of prior debt, Bizer and DeMarzo (1992) point out that this will not solve the externalities from sequential contracting if the higher levels of debt increase the incentives for moral hazard. Asking borrowers to pledge *collateral* could mitigate the increased incentives for moral hazard i.e., the fear of losing the pledged assets could induce high effort (Holmström and Tirole (1997)).[5] Collateral could also be interpreted as a commitment not to engage in strategic default since it is by definition a non-exempt asset (Parlour and Rajan (2001)).[6]

A *floating charge* on the borrower's assets—a special form of collateral that carries over to future loans— could be an effective way to mitigate the contractual externalities as it allows the initial creditor's existing and future loans to retain seniority over future outside loans *and* at the same time curtails incentives for moral hazard and strategic default resulting from the higher

[4] For example, using of debt covenants creditors could permit future borrowing only with the approval of existing creditors. This, however, would give veto power to existing creditors and open the door to hold-up problems (see Smith and Warner (1979) and Bizer and DeMarzo (1992)). Although hold-up problems could be mitigated if contracts could specify ex ante the exact circumstances under which borrowing would be allowed, designing fully state-contingent contracts is very difficult in practice and often prohibitively expensive. Making debt callable is an alternative mechanism. As pointed out in Bizer and DeMarzo (1992), this would solve the problem only if the call price equals the fair market value of debt in the absence of further borrowing. For this to be true the contract would either have to specify the fair market value ex ante, which is as complex as writing a fully state-contingent contract or base the call price on the ex post market price of debt, which again gives rise to hold-up problems.

[5] Collateral is motivated in the literature as a way to mitigate other ex post frictions such as difficulties in enforcing contracts (Banerjee and Newman (1993), Albuquerque and Hopenhayan (2004)) and costly state verification (Townsend (1979), Gale and Hellwig (1985), Williamson (1986)).

[6] In the context of Attar et al. (2010) valuable collateral could be viewed as a way to sidestep limited liability (i.e., an alternative to using courts to enforce unlimited liability).

levels of debt.[7] The degree to which a floating charge will mitigate the externalities from outside loans increases in the value of the pledged assets and decreases in the volatility of their values (see Bennardo et al. (2009)). If, for example, the initial creditor's loss in the event of default is negligible, an outside loan will not impose any externalities to the existing lender and thus should not trigger any changes in its willingness lend. Regular collateral might not solve the externalities as it does not extend to future loans. This leads us to our second testable hypothesis:

(H2) *The theory on contractual externalities predicts that an outside loan will not trigger a change in the initial creditor's willingness to lend to the borrower if the initial creditor's existing and future claims are fully protected.*

Before turning to a description of our data and the institutional framework we briefly discuss the predictions of alternative theories with opposite predictions.[8] Some alternative theories, for example, predict that multiple financing sources may actually decrease the borrower's probability of default, and thus increase the initial creditor's willingness to lend to the borrower. (The outside loan and the initial bank's willingness to lend are complements.) This could happen, for example, if the outside loans facilitate a worthwhile project that the initial creditor could not finance alone (e.g., due to lack of sufficient liquidity as in Detragiache et al. (2001) or a too large exposure to the borrower as in Hertzberg et al. (2011)).[9] The willingness of

[7] Djankov et al. (2008) find that debt contracts secured with a floating charge are enforced more efficiently: they have higher recovery rates and shorter enforcement times.

[8] Other papers in the literature investigate the optimal number of creditors when debtors want to finance a fixed size investment project, i.e., without intentions to overborrow. Bolton and Scharfstein (1996) and Bris and Welch (2005), for example, explore the impact of the debt structure on the efficiency of the renegotiation that may take place in the case of firm default. Others explore banks' monitoring incentives. Carletti (2004), for example, argues that firms may benefit from borrowing from two banks to mitigate the excessive monitoring that takes place when only one bank is engaged (see also Carletti, Cerasi and Daltung (2007)).

[9] Hertzberg et al. (2011) write that "a bank's optimal level of lending is … due to the complementarity, increasing in the expected level of lending of another bank (p.386)."

another lender to extend credit to a borrower could also be perceived as a positive signal about the borrower's quality (see, for example, James (1987) and Biais and Gollier (1997)). We believe that the first possibility (i.e., that the bank cannot finance the project alone) is unlikely in our setting. As discussed later on, the bank in our dataset is one of the largest banks in Sweden, while the vast majority of the firms in our sample are small and medium size enterprises. Moreover, until the end of the sample period (2008), Sweden was relatively unaffected by the financial crisis. Hence, bank liquidity constraints seem unlikely in our sample. The signaling channel, instead, could be operative in our setting, especially since small and medium sized enterprises are relatively more opaque and difficult to evaluate.

In sharp contrast to H1, these alternative theories predict that an outside loan should increase the initial creditor's willingness to lend and it should increase it more the larger the outside loan. Finding evidence consistent with H1 would not necessarily imply that these alternative theories are not at work. It would only imply that the theories on contractual externalities are at work and are sufficiently important to dominate empirically. Nevertheless, in additional analysis we test for these alternative theories by investigating the bank's differential reaction to an outside loan for the sub-sample of firms or periods for which these alternative theories are more likely to be at work. Finally, we also use such cross-sectional tests to examine whether our findings are driven by alternative explanations with predictions similar to the theory on contractual externalities (e.g., re-allocating credit capacity to firms that may be more likely to use it, whether the bank's reactions are driven by a reduced ability to extract rents).

3. Data and Institutional Setting

The paper makes use of a unique dataset containing information on all corporate clients of one of the four largest banks in Sweden.[10] In particular, the data contain detailed information on the contract and performance characteristics of all commercial loans between April 2002 and December 2008 as well as information about the borrowing firm. For each loan, we observe the origination and maturity dates, type of credit, loan amount, interest rate, fees, collateral as well as its subsequent performance. For each firm, we observe its industry, ownership structure, credit history, credit scores as well as the bank's internal limit to the firm—our key dependent variable.

A bank's internal limit to a firm indicates the maximum amount that the bank is willing to lend to the firm. In economic terms, it indicates the amount for which the bank's loan supply becomes vertical. Hence, changes in the internal limit represent changes in loan supply. The aggregate amount of loans granted by loan officers to a firm is not allowed to exceed that limit; they can only lend up to that amount. This amount is not communicated to firms as it does not involve a commitment from the bank.[11] This is in sharp contrast to credit lines that are communicated and are typically committed.[12]

A firm's internal limit is determined based on the firm's repayment ability. It can change during the so called "limit review meetings", where the bank's maximum willingness to lend to the firm is reevaluated. The meetings typically take place once a year on a date determined at the end of the previous meeting, but they can be moved to an earlier date if the firm's condition changes substantially (e.g., if the firm has new investment opportunities or the firm's condition deteriorates substantially). To determine a firm's internal limit, the committee makes use of both

[10] The Swedish banking market is rather concentrated with the four largest banking groups accounting for around 80 percent of total banking assets. At the end of 2003, there were a total of 125 banks established in Sweden.

[11] Although the internal limit is not directly communicated, firms could indirectly learn their internal limits when they become binding. We return to this when we discuss our methodology.

[12] The extant empirical literature has employed lines of credit to study several aspects of the credit markets such as credit constraints and default risk (see Sufi (2009), Jiménez et al. (2009), and Norden and Weber (2010)).

internal proprietary information (e.g., the loan officer's evaluation report) as well as external public information. For example, through the main Swedish credit bureau, Upplysningscentralen (UC), the bank can observe whether the firm had recent repayment problems with other bank and or non-bank counterparties. It can also observe the firm's external rating, the number, amount, and value of collateral on all outstanding bank loans. The bank identities are not revealed. The information is updated monthly and at any point in time the bank can obtain a report with historical data for the past twelve months.[13]

Hence, the Swedish institutional setting is such that banks can learn quickly whether one of their customers obtains loans from another bank and thus can take measures to mitigate any resulting externalities— this is an important prerequisite for our analysis. Moreover, Swedish firms have few bank-lending relationships (see, for example, Ongena and Smith (2000)), which implies that non-exclusivity events are an integral part of this institutional setting. This will not be possible in settings such as Italy, for example, where most firms have multiple bank lending relationships. Hence, the combination of institutional features and data availability provides a unique opportunity to examine whether the theories on contractual externalities are at work by studying how the internal limit changes following the origination of loans from another bank.

Finally, to obtain additional information about the firm, the bank dataset is merged with accounting data from the main credit bureau, UC, and information from the Swedish registration office, Bolagsverket. Accounting data are only available for corporations. This implies that our sample consists only of limited liability firms. To determine a firm's age, the firm's date of registration is obtained from Bolagsverket. The available information from Bolagsverket allows us (as well as current or prospective lenders) to also determine whether the firm has posted

[13] Our dataset does not contain this information. However, we are able to identify whether a firm borrows from another bank by comparing outstanding loans with our bank to a firm's total bank debt reported in the firm's annual accounting statements.

collateral on any of its outstanding loans and observe whether the bank has a floating charge on the firm. This type of information has been found to facilitate a more efficient use of collateral in debt contracts (see Haselmann et al. (2010)). Finally, data on the value and volatility of the floating charge assets are obtained from the bank dataset and the firm's accounting statements.[14]

4. Methodology

Below, we describe in detail how our treatment and control groups are defined as well as the firm characteristics that we match on and why the resulting matched control firms give a reasonable proxy of the unobserved counterfactual.

A. Treatment and Control Groups: Definition and Descriptive Statistics

The *treatment group* consists of firms that enter the sample with an exclusive relationship with our bank and during the sample period obtain a loan from another bank. We define a relationship as exclusive if the firm borrows only from our bank for at least one year and we refer to the first loan(s) from other banks as "outside loan(s)".[15] We identify whether a firm obtains an outside loan by comparing the bank's total outstanding loans to the firm with the firm's total bank debt reported in the firm's annual accounting statements. This allows us to once a year identify whether a firm borrows from other banks. To investigate how the bank responds to an outside loan, we compare the internal limits around the time of the non-exclusivity event.

Figure 1 illustrates our event window. Let t' indicate when the firm obtains a loan from another bank (i.e., when the non-exclusivity event takes place). Let t_0 indicate the time that the

[14] The law determines the types of assets that can be pledged under a floating charge claim and the creditors' rights when a borrower defaults. As of 2004, a floating charge includes inventory, accounts receivable, equipment, real estate, financial assets such as cash, bank deposits, bonds, and stocks and can be invoked during bankruptcy like other collateral types (see Lag (2003:528) om Företagsinteckningar and Cerqueiro et al. (2011)). Banks typically combine a floating charge with a negative pledge clause to ensure the priority and value of the floating charge.

[15] The results presented in the paper are robust to using two or three years cut-offs, even though the sample is then substantially reduced.

firm's first accounting statements following the non-exclusivity event are reported (i.e., this is when we can first observe the outside loan(s)) and t_0-*12* to indicate the time of the firm's last accounting statements prior to the non-exclusivity event. Since the bank decides on the internal limit once a year, there are two possibilities about the timing of any reaction following the non-exclusivity event: the meeting is held either sometime between t' and t_0 or between t_0 and t_0+*12*. Hence, to evaluate how the bank reacts to the non-exclusivity event we study changes in the bank's internal limits between t_0-*12* and t_0+*12*.[16] To further investigate the timing of these changes we also present results for the year prior to the event window and for the two sub-periods of the event window separately (between t_0-*12* and t_0 and between t_0 and t_0+*12*).

[Insert Figure 1 about here]

Due to the length of the event window and the available sample period, the treatment group contains firms that obtain a loan from another bank any time during the period 2004:04 to 2007:12. Given that data are available between 2002:04 and 2008:12, this allows us to verify that all firms enter the sample period with at least one year of an exclusive relationship with our bank and gives us one year after the last possible non-exclusivity event to observe the bank's limit at t_0+*12*. We omit firms with an internal limit lower than SEK 100,000 (approximately $14,000) at time t_0-*12* since such small exposures are typically determined rather "mechanically".[17] We also do not include non-exclusivity events with amounts less than 1 percent of the firm's internal limit at t_0-*12* as these may stem from noise in combining different data sources. Finally, since our

[16] If the firm's relationship with the bank is terminated prior to t_0+*12*, we use the last observed limit between t_0 and t_0+*12*. This involves 6 percent of the treatment firms. About 5 percent of Swedish firms have accounting periods longer than one year. We exclude those firms from our sample.

[17] For example, firms may hold a company credit card with a minimum amount. Since we want to focus on strategic interactions, we do not include such automated decisions.

goal is to investigate how the bank's loan supply reacts to the non-exclusivity event, we also do not include firms whose internal limit at t_0-*12* is binding (i.e., it is equal to their outstanding loans and unused credit lines at t_0-*12*) and thus can be driven by both demand and supply factors. This yields a total of 991 treatment firms.

Figure 2 reports the number of treatment firms in each year as a percentage of the firms with an exclusive bank-lending relationship for which the internal limit is not binding. As can be observed in Figure 2, this percentage is fairly constant over time varying between 4.5 and 5.5 percent and is comparable to rates found in other studies (e.g., 4 percent in Farinha and Santos (2002) for Portugal and 4.5 percent in Ioannidou and Ongena (2010) for Bolivia).

[Insert Figure 2 about here]

In Panel A of Table 1 we compare the characteristics of the treatment firms relative to all other firms with an exclusive relationship with our bank (i.e., a possible control group). About 70 percent of the firms in our sample have a single bank-lending relationship.[18] All variables in Table 1 along with any variable used in the analysis are defined in Table A1 in the Appendix. Compared to the control group, the treatment firms are larger with more tangible assets, lower profitability, lower leverage ratios, higher risk of default (e.g., higher default probabilities, worse credit ratings, and worse credit histories), and higher interest rates on outstanding debt.[19] Consistent with the existing literature, these patterns suggest that the treatment firms are a mix of

[18] For treatment firms, we report their characteristics prior to the outside loan at t_0-*12*. Hence, the number of observations is equal to the number of unique treatment firms. For the control group, we report their characteristics for the period they maintained an exclusive lending relationship with our bank. This yields 18,862 firm-year observations for 7,743 unique firms.

[19] Approximately 60 percent of the average treatment and control firms' debt is bank debt. Non-bank debt consists almost entirely of trade credit for both the treatment and the control firms as most of these firms do not have access to the bond market, a typical characteristic of small and medium sized enterprises with single banking relationships.

larger firms who may be seeking additional or different banks for their growing and changing needs and riskier firms that may have difficulties obtaining adequate funding at their bank.[20]

[Insert Table 1 about here]

Hence, to investigate how the bank responds to an outside loan we employ a difference-in-difference analysis and a matching procedure. As discussed in Roberts and Whited (2010) a matching technique rests on two key assumptions: "overlap" and "unconfoundness". Overlap requires that for each value of the covariates, a firm has a positive probability to be in the treatment or the control group and unconfoundness requires that conditional on the covariates, assignment in the treatment and the control group is as if it were random. Hence, prior to treatment, both groups must have similar paths with respect to the outcome variable (i.e., their internal limits) and have similar probabilities of receiving treatment (i.e., an outside loan).

The existing literature suggests that overlap is not unlikely in this case. Although a firm may want to obtain credit from another bank it may not always be able to— at least not instantaneously. For example, information asymmetries between existing and new banks may prevent firms from obtaining credit elsewhere. In Sharpe (1990) when a high quality firm tries to obtain credit from a new uninformed bank it gets pooled with low quality firms and is offered higher loan rates. This implies that high quality firms are less likely to accept an offer from a new bank and that low quality firms are more likely to accept such offers. In an amended version of the Sharpe's (1990) model, von Thadden (2004) shows that because of "winners curse" banks compete with other banks for their customers using "optimal randomization" for borrowers that

[20] Overall, these patterns are consistent with existing theoretical and empirical literature (see, among others, Sharpe (1990), Ongena and Smith (2001), Farinha and Santos (2002), von Thadden (2004), Ioannidou and Ongena (2010), and Gopalan, Udell, and Yerramilli (2011)).

are—at least to them— observationally identical. This implies that the treatment and the control groups may contain very similar firms (i.e., there is overlap). It also implies that a higher proportion of treatment firms is of lower quality with respect to factors that are observable to their initial bank, but not to the new bank. Evidence in Ioannidou and Ongena (2010) corroborates this prediction. Hence, to satisfy the unconfoundness assumption one needs to match not only on publicly observable firm characteristics, but also on factors that may be unobservable to the new bank, but are observable to the initial bank and affect its credit policies towards the firm. Our matching procedure is geared to meet this challenge.

We begin by identifying a possible set of control firms. This includes firms that, like the treatment firms, have an exclusive relationship with our bank at t_0-*12* for at least one year, but unlike the treatment firms retain this exclusive relationship for at least until the end of the event window, t_0+*12*. Using information from the accounting statements, the credit bureau, and the bank dataset we match these two groups with respect to several firm characteristics at the beginning of the event window, t_0-*12*. The set of publicly observable characteristics includes industry, age, size, asset growth, tangible assets, cash flows, indicators of leverage such as total debt to total assets and total bank debt to total assets, external credit rating, and indicators of recent repayment problems. Some of these variables are observable (to us and other banks) through the firm's accounting statements. Others are observable through the credit bureau. This yields our first set of matching variables, which we refer to as "Match 1". To control for bank proprietary information we additionally match on the firm's internal limit, the distance to limit (i.e., the difference between the firm's internal limit and its outstanding bank debt and committed but unused credit lines), and the interest rate on the most recently originated loan at the initial

bank.[21] This yields our second more preferred matching set, which we refer to as "Match 2". Table A1 in the Appendix lists and defines our matching variables. For our benchmark analysis, we match on each of these variables individually. For discrete variables we use exact matching, while for continuous variables we employ a 40 percent matching window. In robustness tests, we show that our findings are robust to using stricter matching windows (e.g., 30 and 20 percent) or matching on additional firm and market characteristics (e.g., relationship length, regional HHI).

Our matching exercise yields 1,421 pairs corresponding to 350 treatment firms and 1,170 control firms for Match 1 and 549 pairs with 207 treatment firms and 507 control firms for Match 2.[22] As can be observed in Table 1, the treatment firms for which a match can be found are of better quality than their 991 treatment counterparts, especially in Match 2. They are older, smaller firms, with lower assets growth, more tangible assets, higher profitability, higher leverage ratios, lower default risk (e.g., lower default probabilities and perfect credit histories), but with higher interest rates on their loans at the initial bank. Hence, by matching we seem to retain the sub-sample of treatment firms that may be switching or engaging another bank to escape hold-up rents at their initial bank (see, for example, Ioannidou and Ongena (2010)).

When comparing the treatment and control groups in each set, we also observe that the matching exercise reduces significantly differences between the two groups— especially in Match 2. Perhaps more importantly, for both Match 1 and Match 2 the treatment and control firms have similar paths in their limits in the year prior to the outside loans, $\Delta Limit_{t_0-12,t_0-24} / Assets_{t_0-24}$. As can be observed in Table 2, at t_0*-12* both sets of matched treatment and control firms have similar probabilities of obtaining an outside loan in the following year

[21] When a firm has more than one recently originated loan at $t_0 - 12$, we use the highest interest rate among them. Similar results are obtained if we use the average interest rate or the bank's internal rating instead. Matching on the interest rate as opposed to ratings is preferred because the ratings are sometimes missing.

[22] Each treatment firm can be matched with more than one control firm. Similarly, a control firm could be a match for more than one treatment firm. This allows for better matches and smaller biases at the expense of precision (see Rosenbaum (1995)). Treatment firms for which a similar control firm does not exist are dropped from the sample.

(i.e., they have similar probabilities of receiving treatment).[23] In robustness tests, we show that our findings are robust to also directly matching on the predicted probabilities of obtaining an outside loan (using a one percentage point threshold for acceptable differences).

[Insert Table 2 about here]

B. Empirical Specifications

Using the matched samples, we estimate the following baseline model:

$$(\Delta Limit_{t_0+12,t_0-12} / Assets_{t_0-12})_{treatment,control} = \alpha + \varepsilon, \qquad (1)$$

where $(\Delta Limit_{t_0+12,t_0-12} / Assets_{t_0-12})_{treatment,control}$ is the difference in the adjustment of the internal limit between the treatment firms and the matched control firms scaled by their respective total assets at t_0-*12*, which we refer to as the bank's standardized response:

$$(\Delta Limit_{t_0+12,t_0-12} / Assets_{t_0-12})_{treatment,control} = \left[\frac{Limit_{t_0+12} - Limit_{t_0-12}}{Total\ \ Assets_{t_0-12}}\right]_{treatment} - \left[\frac{Limit_{t_0+12} - Limit_{t_0-12}}{Total\ \ Assets_{t_0-12}}\right]_{control}$$

The dependent variable is scaled by total assets to enhance comparability across firms of different size and we use total assets prior to the outside loans to avoid endogeneity problems. α is the constant term, and ε is the error term in equation (1). The model is estimated using OLS.

[23] The estimated probabilities of receiving an outside loan are obtained using the predicted values from a Probit model where the dependent equals one if a previously exclusive firm obtained an outside loan sometime between *t-12* and *t* and equals zero otherwise The independent variables include all firm and market characteristics at *t-12* employed in our matching exercises (see Table A1 in the Appendix). The model is estimated using all firms with an exclusive relationship with the initial bank. Each firm remains in the sample until it becomes non-exclusive.

The level of observations is at the matched treatment and control pair. Because each treatment firm can be matched with multiple firms, the point estimates are adjusted by weighting the observations by one over the number of matched control firms for each treatment firm and the standard errors are clustered at the treatment firm-level. As discussed later, the results are robust to using different estimation techniques (e.g., clustering the standard errors with respect to both the treatment and the control firm) or using one observation per treatment firm.

A negative and statistically significant α indicates that banks decrease their loan supply when a firm originates a loan from another bank, consistent with the theories on contractual externalities and H1. It also implies the net empirical dominance of these theories over alternative theories that predict an increase in the initial creditor's willingness to lend.

To examine whether the bank's response varies with the size of the outside loan we augment equation (1) by adding the size of the outside loan scaled by total assets at t_0-12, *OutsideLoan*, as an explanatory variable:

$$(\Delta Limit_{t_0+12,t_0-12} / Assets_{t_0-12})_{treatment,control} = \alpha + \beta_1 OutsideLoan + \varepsilon \quad (2)$$

The constant term, α, measures the bank's response when the *OutsideLoan* is zero, while β_1 measures the degree to which the bank's response varies with the size of the outside loan. Hence, a negative β_1 and a statistically insignificant α are consistent with H1.

To test H2, we augment equation (2) by introducing an interaction between the *OutsideLoan* and the degree to which the initial bank's claims are protected, *Z*:

$$(\Delta Limit_{t_0+12,t_0-12} / Assets_{t_0-12})_{treatment,control} = \alpha + \beta_1 OutsideLoan + \beta_2 OutsideLoan \times Z + \beta_3 Z + \varepsilon, \quad (3)$$

The constant term, α, measures the bank's response when the *OutsideLoan* is zero and its claims are not protected. β_1 measures the degree to which the bank's response varies with the *OutsideLoan* when its claims are not protected and β_2 measures the difference in the bank's response when its claims are protected. Finally, β_3 measures the bank's response when its claims are protected and the *OutsideLoan* is zero. Hence, a negative β_1, a positive β_2, and zero or not statistically significant α and β_3 are consistent with H2. (A similar model with interaction terms with firm and bank characteristics is used to examine whether our findings are influenced by alternative explanations or theories that predict similar or opposite results.)

To capture the degree to which the initial bank's claims are protected we mainly employ three indicators: a dummy variable indicating whether the bank has a floating charge on the firm's assets (*FloatingCharge*) and two qualifying variables regarding the value of the floating charge assets (*FloatingChargeValue*) and the volatility of their values (*FloatingChargeVolatility*). The *FloatingChargeValue* is equal to the value of the floating charge assets as reported by the bank scaled by committed bank debt (i.e., outstanding debt and unused credit lines) at t_0-*12*. The *FloatingChargeVolatility* is equal to the volatility of earnings in the three years prior to t_0-*12* divided by the firm's average assets over that period.

Table A2 in the Appendix provides descriptive statistics on the characteristics of treatment firms with and without a floating charge along with characteristics of all firms for our second more conservative sample, Match 2. The firms with and without floating charge are remarkably similar. The only statistically significant difference between them is with respect to age, asset growth, and relationship length. Firms with a floating charge are younger with somewhat slower growth and a shorter lending relationship with their initial bank. With respect to other characteristics, they appear to be of a slightly lower quality: they have less tangible

assets, lower cash flows, a somewhat higher probability of default, and worse external ratings. These differences, however, are not statistically significant.

5. Results

The results section is structured as follows. We first document the bank's average reaction after the firm obtains a loan from another bank and the degree to which the bank's reaction depends on the size of the outside loan (H1). We then subject these results to several robustness checks with respect to the timing of the bank's reaction as well as possible omitted variable biases due to unobserved borrower heterogeneity by employing stricter matching criteria. We also investigate whether our findings are driven by alternative explanations and theories with similar or opposite predictions. We then examine the degree to which the bank's response is mitigated when its existing and future claims are protected (H2).

5.1. The Bank's Average Reaction and the Size of the Outside Loan: Test of H1

Panel A of Table 3 reports our main findings with respect to H1 using our first set of matching variables, Match 1. Column (I) reports the bank's average response (equation (1)), while Column (II) documents how the bank's response varies with the size of the outside loan (equation (2)). The remaining columns of Table 3 report modified specifications of equations (1) and (2) to further investigate the timing of the bank's reaction by looking at the year prior to the event window (i.e., between t_0*-24* and t_0*-12*) and by splitting the event window in two (i.e., between t_0*-12* and t_0 and between t_0 and t_0*+12*).

[Insert Table 3 about here]

The results in Columns (I) and (II) of Panel A indicate that an outside loan is followed by a decrease in the initial bank's willingness to lend to the firm and that the decrease is larger, the larger the outside loan. In particular, as can be observed in Column (I), the constant term in equation (1) is negative and statistically significant. The size of the estimated coefficient indicates that the treatment firm's internal limit to total assets ratio drops on average by 6.6*** percentage points more than the ratio of similar control firms.[24] This amounts to a drop in the average treatment firms' limit to total assets ratio of 15 percent. Moreover, as can be observed in Column (II), this decrease is larger, the larger the outside loan. In particular, the coefficient of the *OutsideLoan* (i.e., the outside loan to total assets ratio) in equation (2) is -0.335***. This implies that $1 from another bank is associated with a drop in the initial bank's limit by 34 cents.[25] Similarly, a 1-standard deviation increase in the *OutsideLoan* (by 0.25) is associated with a drop in the firm's limit to total assets ratio by 0.084 (i.e., -0.335*0.25), which amounts to a drop in the average treatment firm's limit to total assets ratio by 19.6 percent.

When investigating the *timing* of the bank's reaction in Columns (III) to (VIII) of Panel A, we find that there is no systematic decrease in the bank's internal limit prior to the event window and that most of the reactions take place in the second half of the event window.[26] As can be observed in Columns (III) and (IV), neither the constant term in equation (1) nor the coefficient of the *OutsideLoan* in equation (2) are statistically significant in the year prior to the event window. Moreover, as can be observed in Columns (V) to (VIII) both the constant term in equation (1) and the coefficient of the *OutsideLoan* in equation (2) are larger in absolute size and

[24] ***, **, * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

[25] The change in the treatment firm's limit at t_0+12 following a change in outside loan at t_0 is equal to β_1. This is obtained by multiplying both sides of equation (2) with the treatment firm's total assets at t_0 and then taking the derivative with respect to the size of the outside loan. This is possible because the scaling variable, total assets at t_0-12, is not a function of the outside loan.

[26] These models are estimated using the change in the limit in the year prior to the event window (i.e., between t_0-24 and t_0-12 in Columns (III) and (IV)) or the change in the limit over the two sub-periods of the event window (i.e., between t_0-12 and t_0 in Columns (V) and (VI) and between t_0 and t_0+12 in Columns (VII) and (VIII)). All models are estimated for the same set of observations used previously in Columns (I) and (II) of Table 3.

enjoy higher statistical significance when the model is estimated over the second half of the event window, suggesting that most of the reaction takes place between t_0 and t_0+12.

Next, we re-estimate our specifications in Panel A using a more stringent set of matching criteria. As mentioned earlier, factors unobserved to the new bank, but observed to the initial bank maybe driving some of the estimated reactions. Hence, we re-estimate our model after matching on key *internal variables* such as the interest rates on most recently originated loans from the initial bank as well as the firm's limit to total assets ratio and the firm's distance to limit at the initial bank (Match 2). As can be observed in Panel B, the results are very similar to those reported in Panel A. The only difference is that some of the estimated negative reactions are slightly larger. The coefficient of the *OutsideLoan* in Column (II) is now -0.408***, suggesting that 1$ from another bank is associated with a decrease in the initial bank's limit by 41 cents as opposed to 34 cents found earlier. Similarly, a 1-standard deviation increase in the *OutsideLoan* is associated with a drop in the average treatment firm's internal limit to total assets ratio by 24.4 percent as opposed to 19.6 percent found earlier.

To further investigate the robustness of our findings with respect to unobserved firm heterogeneity we also re-estimate equations (1) and (2) using more stringent matching criteria. We first re-estimate our models using *30 and 20 percent matching-windows* as opposed to the 40 percent windows used for our benchmark results. We also re-estimate our models after matching on additional variables such as *Relationship Length* with the initial bank and the Herfindahl-Hirschman Index (HHI) in the region where the firm is located (*Regional HHI*). Finally, to investigate whether the observed decreases in the internal limits during the event window are driven by deterioration in borrower quality that is not yet reflected in the matching variables at t_0*-12*, we also re-estimate equations (1) and (2) for the sub-sample of firms whose condition did not deteriorate during the event window (i.e., firms that did not have any *Repayment Problems* or

an increase in their *Default Probability* during the event window). The results are presented in Table 4 and are in all cases qualitatively very similar to those presented in Table 3.[27] In terms of economic significance, the estimated reactions are similar to those found earlier, with the exception of one case where the estimates are substantially larger (i.e., when we use a 20 percent matching-window on the Match 2 sample). The number of observations in this case, however, is very small so those estimates should be viewed with caution.

[Insert Table 4 about here]

5.1.1. Alternative Explanations with Similar predictions to H1

Before turning to H2, we investigate whether the observed decreases in the internal limits are driven by alternative explanations. It is possible that the initial bank is simply *reallocating limits* to other firms that are more likely to use it. The observed decreases in the internal limit in this case will not be due to concerns about the negative externalities emanating from outside loans, but limit constraints at the bank level. Alternatively, a lending relationship with another bank may decrease the initial bank's ability to *extract rents* from the firm and thus trigger a decrease in its willingness to lend to the firm. Both possibilities are investigated in turn below.

If the observed decreases in the internal limit are driven by credit capacity constraints at the bank level we should also observe that any given outside loan triggers a larger decrease in the internal limit, the smaller the amount of unused credit capacity that the bank has either at the

[27] We also subjected our results to additional robustness checks. First, we re-estimate our main specifications in Columns (I) and (II) of Table 3 using double clustering (i.e., clustering the standard errors with respect to both the treatment and the control firm although this procedure does not allow for weighting the observations). We also re-estimate our models using one observation per match treatment firm by using the closest match among the matched control firms (closest match) or by randomly selecting among the matched control firms (random match). Finally, we re-estimate our models using the subsamples of matched pairs in Match 1 and Match 2 for which the difference in their predicted probabilities of becoming non-exclusive in the following year (as reported in Table 2) is smaller than one percentage point. As can be observed in Table A3 in the Appendix all results are very similar to those presented in Table 3, confirming our findings to alternative estimation choices.

aggregate or at the regional level. Hence, we estimate a model similar to equation (3) where for *Z* we use measures of the bank's unused credit capacity at t_0-*12*.[28] The bank level measure is obtained by taking the difference between the sum of all internal limits to all corporate clients at t_0-*12* and the sum of all their outstanding loan amounts and unused credit lines at t_0-*12*. A corresponding measure at the regional level is obtained in a similar way after aggregating all variables at the bank-region level instead of the bank level. As can be observed in Table 5, credit constraints at the aggregate or at a regional level are not found to trigger larger decreases in the internal limits, suggesting that this alternative explanation is unlikely to be driving our findings.

[Insert Table 5 about here]

To investigate whether the observed decrease in the initial bank's willingness to lend is driven by a reduced ability to extract rents we examine whether any given outside loan triggers a larger negative reaction when rent extraction is expected to have been larger. As highlighted in the literature, proprietary information gathered over the course of bank-firm relationships may allow banks to extract rents from opaque firms that find it difficult to obtain access to other credit providers (see Sharpe (1990), Rajan (1992), and von Thadden (2004), for example). Competitive conditions in the local banking market may also influence the likelihood of obtaining an outside loan and thus the initial bank's ability to extract rents from its customers.

Hence, to investigate this alternative explanation, we estimate a model similar to equation (3) where Z is consecutively replaced with firm and market characteristics that are correlated with a bank's ability to extract rents such as firm size (total assets), age, relationship length with

[28] For all specifications of equation (3) in Tables 5 and 6 we employ standard normalized values of *Z* (i.e., $(Z-\mu(Z))/\sigma(Z)$). Hence, the coefficient of the *OutsideLoan* measures the impact of an outside loan on the dependent variable for firms with average *Z*, while the coefficient of the interaction term, *OutsideLoan*Z*, measures the differential impact of a 1–standard deviation increase in *Z*.

the initial bank, HHI of the local banking market (regional HHI), and fixed fees on lending products to total assets. Everything else equal, rent extraction is expected to have been smaller for larger and older firms that are on average less opaque. Hence, if reduced rents are driving the bank's reaction we should observe smaller reactions for larger and older firms. Larger reactions, instead, are expected for firms with longer relationships with their bank, firms that operate in more concentrated markets, and for firms that were paying high of fees on their lending products. The results are presented in Table 6. In all cases, the estimated coefficients do not support this alternative explanation. The decreases in the internal limit of larger or older firms are not found to be smaller— if anything they are larger (Columns (II) and (IV) of Table 6). Relationship length, regional HHI, and fixed fees on lending products are also not found to systematically explain the variation in the initial bank's reaction (Columns (V) to (X) of Table 6).

[Insert Table 6 about here]

5.1.2. Alternative Theories with Opposite Predictions

Alternative theories that predict an increase in the initial bank's willingness to lend may also be at work for some firms. As mentioned earlier, the initial bank may respond positively to the outside loan if it facilitates a worthwhile project that the bank could not finance alone (e.g., due to liquidity constraints or a too large exposure to the firm) or because the willingness of another bank to extend loans to the firm is perceived as a positive signal about the firm's quality. To the extent that these alternative theories are at work for some firms in our sample, our estimates in Table 3 underestimate the effect of contractual externalities on credit availability.

To investigate whether bank liquidity constraints are binding we first re-estimate equation (1) after excluding the crisis period from our sample (i.e., all observations for which the

event window ends in 2008). We also re-estimate a model similar to equation (3) where Z is replaced with the initial bank's exposure to the firm as captured by the ratio of the initial bank's outstanding loans to the firm over the bank's total loans. As can be observed in Columns (V) to (VIII) of Table 5, excluding the crisis period, yields estimates similar to those obtained earlier, while the results in Columns (IX) and (X) show that the bank does not seem to welcome an outside loan when its exposure towards the firm is large— if anything, the bank seems to worry more when its exposure to the firm is larger.

Although our findings in Table 6 are not consistent with a reduced ability to extract rents, they seem to be weakly consistent with the *signaling theory*. The signaling channel—to the extent that is operative— is expected to be particularly important when the initial bank is relatively uninformed about the firm. In such cases, an outside loan should trigger a smaller decrease or even an increase in the initial bank's willingness to lend to the firm. Our findings in Table 6 with respect to firm size (total assets), age, and relationship length are broadly consistent with this hypothesis. When using our second more conservative matching set (Match 2), we find the bank's reduction in its willingness to lend is larger for larger or older firms. Similarly, the decrease in the initial bank's willingness to lend is larger the longer the firm's relationship with the bank— although the interaction term just misses the 10 percent significance level.

5.1.3. Summary of Findings

Before turning to H2, we summarize our findings so far. We find that the negative externalities resulting from non-exclusivity are a source of concern for banks. When a borrower becomes non-exclusive, the initial bank's willingness to lend to the firm decreases. Consistent with the theories on negative externalities, the bank's reaction is larger, the larger the loans from the other bank. Our estimates suggest that a $1 from another bank triggers a decrease in the

initial bank's willingness to lend to the firm by around 34 cents. This estimate increases to 41 cents when we also match on bank internal variables and increases further as we employ stricter matching criteria, suggesting that unobserved borrower heterogeneity works against H1. Sensitivity analysis regarding the timing of the bank's reaction indicates that there are no systematic decreases in the limit in the year prior to the event window and that most of the reaction takes place in the second half of the event window. Results are also found to be robust to alternative estimation choices. Finally, when studying the cross-sectional variation in the bank's reaction, we do not find that the bank's reaction is driven by a reduced ability to extract rents, the crisis period, and other credit constraints at the bank level. We do find, however, weak evidence suggesting that the signaling theories might also be at work. We now turn to H2, which we believe is very important for identification purposes as it tights the bank's reaction to the theories on negative externalities. If the bank's reaction is indeed driven by worries about the increased risk of default from the outside loans, we should observe smaller reactions when the bank's claims retain seniority over outside loans and are protected with valuable collateral. Alternative theories, discussed above, do not have predictions in line with H2.

5.2. Protection through Contractual Features: Test of H2

To investigate whether contractual features such as a floating charge allow banks to mitigate the negative externalities we estimate several specifications of equation (3). We first estimate equation (3) using the *FloatingCharge* dummy. A floating charge is a special form of collateral that automatically carries over to future loans and thus allows the bank's existing, but also future loans to retain seniority over outside loans. The bank's loans are secured by the assets under the floating charge, which implies that the degree with which the initial bank is protected depends on the value of the pledged assets and the volatility of their values. Hence, we also

estimate equation (3) using *FloatingChargeValue* and *FloatingChargeVolatility* instead of the simple dummy for the floating charge. Finally, results with respect to other types of collateral are also presented to better understand the role of the floating charge.

Table 7 presents our findings. All specifications are estimated for both Match 1 and Match 2. Results are qualitatively very similar between them. Hence, to conserve space we mainly discuss the economic significance of the results using Match 2, our second and more conservative sample. As can be observed in Columns (I) and (II), the bank does not react to an outside loan when its claims are protected through a floating charge. For example, in Column (II) the coefficient of the *OutsideLoan* is -0.496***, while the coefficient of the interaction term with the *FloatingCharge* is 0.515***, resulting in a combined coefficient of 0.019, which is neither economically nor statistically different from zero. Consistent with H2, we also find that the coefficient of the *FloatingCharge* is close to zero and it is not statistically significant. These findings suggest that when the initial bank's claims are protected through a floating charge, the bank does not react to the outside loan. Instead, when its claims are not protected, a $1 from another bank triggers a drop in its internal limit to the firm by 50 cents.

[Insert Table 7 about here]

The bank's reaction is also found to vary with the value and volatility of the floating charge assets. As can be observed in Columns (III) and (IV) of Table 7, any given outside loan triggers a smaller negative reaction, the larger the value of the floating charge assets. The opposite is true for volatility. In Column (IV) the coefficient of the *OutsideLoan* is -0.496***, while the coefficients of the interaction terms with value and volatility are 1.437*** and -8.100*, respectively. In terms of economic significance, these estimates imply that a 1-standard deviation

increase in the *FloatingChargeValue* (by 0.26 - see Table A2)[29], decreases the bank's response to the *OutsideLoan* by 0.38 (i.e., 1.437*0.266), while a 1-standard deviation increase in the *FloatingChargeVolatility* (by 0.048) increase the bank's response by -0.39 (i.e., -8.1*0.048).[30]

To further understand the role of the floating charge, we also investigate the bank's response when its claims are protected through other types of collateral (this includes fixed charge claims, pledges and liens). Our indicator, *OtherCollateral*, is a dummy variable that equals one when the bank's existing debt is only secured with other types of collateral whose value relative to the outstanding loan is greater or equal to 80 percent, and it is equal to zero otherwise. Everything else equal, these other types of collateral should be less effective as they do not necessarily allow the bank's future loans to retain seniority over outside loans and they do not automatically carry over to the bank's future loans. They could help mitigate some of the externalities insofar as the fear of losing the pledged assets mitigates the increased moral hazard associated with the higher levels of debt. (Similar results are obtained if we employ even higher ratios of collateral value to outstanding loans for our definition of *OtherCollateral*.)

Results presented in Columns (V) and (VI) of Table 7 suggest that this is not the case. In Column (VI), for example, the coefficient of the *OutsideLoan* is -0.377**, while the coefficient of the interaction term is 0.007. Including the *FloatingCharge* and *OtherCollateral* variables in the same specification yields similar results. In particular, in Column (VIII) the coefficient of *OutsideLoan*FloatingCharge* is 0.500*** whereas the coefficient of *OutsideLoan*OtherCollateral* is -0.007, suggesting that the presence of a floating charge mitigates the negative contractual externalities, while other collateral does not.

[29] In this specification, we do not employ standard normalized values for *Z* so that the coefficient of the *OutsideLoan* measures the effect of the outside loan on the dependent variable in the absence of a floating charge. This makes the coefficient of the *OutsideLoan* comparable across all specifications of Table 7.

[30] This finding is consistent with Bennardo et al. (2009) who argue that volatile collateral values magnify the negative contractual externalities.

All in all, these findings suggest that the explanatory power of the floating charge may rest on its ability to protect not only the bank's current but also future loans.

6. Conclusions

This paper investigates whether the negative externalities highlighted in the theoretical literature on the non-exclusivity of financial contracts are a source of concern for lenders and whether they undermine their willingness to lend. We do so by investigating how a bank's willingness to lend to a firm with whom it held an exclusive lending relationship changes once the firm obtains loans from another bank in a setting where such loans are observable. A combination of data availability and institutional setting provide a unique environment for testing whether these theories are at work. We focus on previously exclusive firms because it provides a cleaner identification of non-exclusivity events. The channels highlighted by these theories, however, are likely operative for non-exclusive firms as well— identification of the effect in that case may be more difficult as anticipation effects on the initial limits are expected to be larger.

Our findings are consistent with the theories on contractual externalities. We find that when a previously exclusive firm obtains a loan from another bank, the firm's initial bank decreases its internal limit to the firm and it decreases it more the larger the size of the outside loans. Our estimates suggest that each $ obtained elsewhere triggers a decrease in the initial bank's willingness to lend to a firm by up to 50 cents. If the bank's initial limits are already lower in expectation of outside loans, these figures should be viewed as underestimates of the degree to which negative externalities may undermine credit availability. The same holds if firms for which the negative externalities are larger are less likely to seek an outside loan. Consistent with the theoretical literature, we also find that the initial bank's willingness to lend does not change when its existing and future loans are protected from the increased risk of default. In

particular, we find that an outside loan does not trigger any change in the initial bank's willingness to lend if its existing and future loans retain seniority over the outside loans and its claims are secured with assets whose value is high and stable over time. Robustness checks show that our findings are robust to many different sub-samples of treatment and control firms and are not driven by a reduced ability to extract rents or aggregate credit constraints at the bank level. We do find, however, weak evidence consistent the signaling theories for small and young firms.

Although our analysis focuses on bank-firm relationships, the insights drawn extend to other markets such as the insurance and credit default swaps markets, where the externalities resulting from the non-exclusivity of financial contracts have played a pivotal role in the global financial crisis of 2007-2009. The collapse of AIG and Lehman Brothers has only highlighted the pressing need for an improved institutional framework that could help the involved parties to better evaluate and internalize the externalities. Consistent with the theoretical literature, we show that the negative externalities stemming from non-exclusivity are a concern for lenders and undermine their willingness to lend. Our results also highlight that information on counterparty exposures combined with contractual features, such as general collateral that extends to future exposures, could mitigate the externalities from counterparty risk.

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Figure 1: The Event Window

This figure illustrates our event window. Let t' indicate when the firm obtains a loan from another bank, which we refer to as "outside loan". Let t_0 indicate the time that the firm's first accounting statements following the non-exclusivity event are reported and t_0-*12* to indicate the time of the firm's last accounting statements prior to the non-exclusivity event. Since the bank decides on the internal limit once a year, to evaluate how the bank reacts to the outside loan we use a primary event window that ranges between t_0-*12* and t_0+*12*.

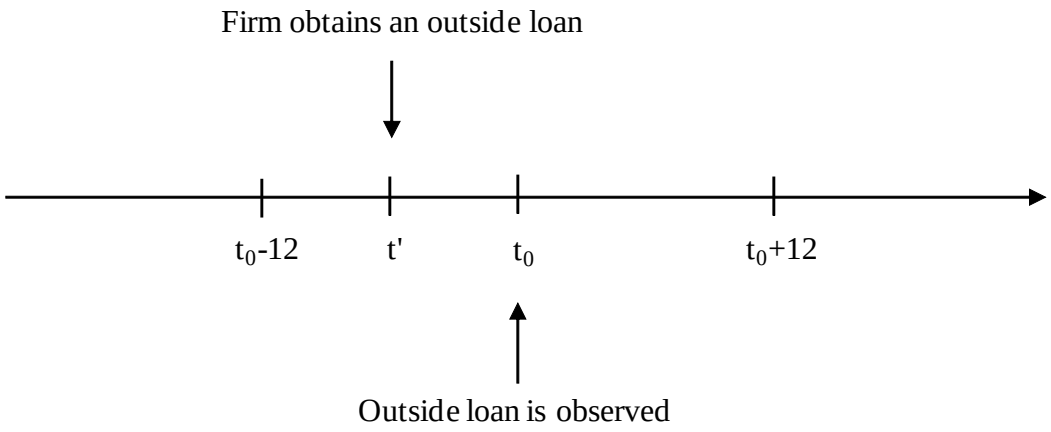

Figure 2: Incidence of Non-Exclusivity Events Each Year

This figure reports the number of treated firms in each year as a percentage of the firms with an exclusive relationship with our bank for the two prior years for which the limit is not binding.

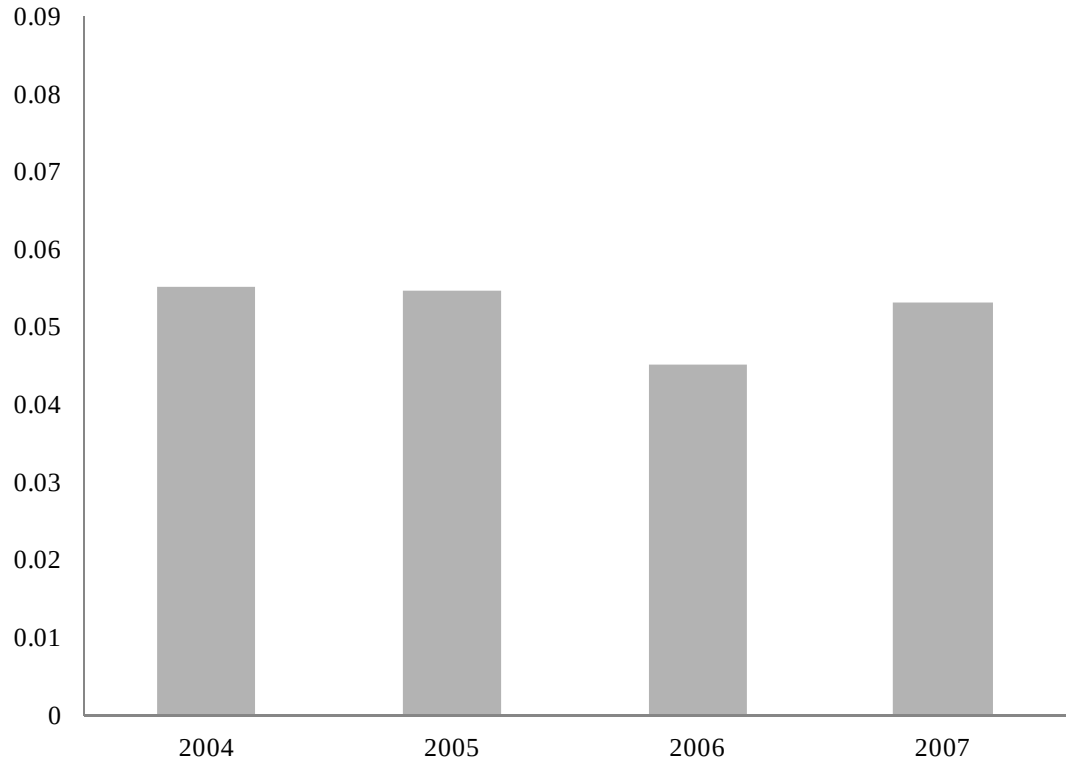

Table 1: Descriptive Statistics

Panel A presents descriptive statistics for the characteristics of treatment and control (i.e., the universe of exclusive firms) groups in the sample, while Panel B presents descriptive statistics for the treatment and control groups in Match 1 and Match 2. Descriptive statistics for the control group are based on the number of observations – an observation is included when it serves as a potential control for one or many treatment firms. All variables are defined in Table A1 in the Appendix along with the list of matching variables for Match 1 and Match 2. *, **, and *** reported next to the mean and median values of each control group indicate whether the corresponding values are statistically different with respect to the corresponding treatment group at the 1, 5, and 10 percent levels, respectively. Differences in means are assessed using the Student's t-test. Differences in medians are assessed using the Wilcoxon-Mann-Whitney test for continuous variables and the Pearson's Chi-square test for categorical variables.

	Panel A: Prior to Matching									**Panel B: After Matching**																
	Treatment			**Control**						**Treatment (Match 1)**			**Control (Match 1)**						**Treatment (Match 2)**			**Control (Match 2)**				
Variables	**Mean**	**Median**	**SD**	**Mean**		**Median**		**SD**		**Mean**	**Median**	**SD**	**Mean**		**Median**		**SD**		**Mean**	**Median**	**SD**	**Mean**		**Median**		**SD**
I. Firm Characteristics																										
Public																										
Age	18.83	15.00	14.60	19.53		16.00		15.20		20.48	16.50	13.87	23.38	***	19.00	***	15.39		21.25	17.00	14.05	22.36		17.00		15.18
Total Assets	389,000	3,093	7,600,000	140,000	**	3,029		3,380,000		24,200	3,006	207,000	11,700		3,142		92,200		10,400	2,890	32,800	9,409		3,470		20,900
Asset Growth	1.12	1.02	0.72	1.12		1.01		2.27		1.07	1.03	0.25	1.03	***	1.00	***	0.19		1.07	1.04	0.22	1.02	***	1.00	***	0.16
Tangible Assets	0.72	0.81	0.27	0.67	***	0.75	***	0.28		0.79	0.87	0.19	0.81		0.85		0.16		0.81	0.87	0.17	0.84	*	0.88		0.14
Profitability	0.04	0.04	0.17	0.05		0.06	***	0.24		0.06	0.05	0.08	0.06		0.06		0.07		0.05	0.05	0.07	0.06		0.06	*	0.07
Leverage	0.43	0.42	0.30	0.45		0.44	***	0.31		0.47	0.46	0.22	0.50		0.50	**	0.20		0.51	0.50	0.21	0.51		0.51	**	0.19
Bank Debt	0.27	0.21	0.25	0.28	**	0.22	***	0.26		0.30	0.25	0.23	0.32		0.28		0.23		0.34	0.31	0.22	0.35		0.33		0.23
Default Probability	3.11	1.20	5.88	2.32	***	0.90	***	5.43		1.81	1.20	2.30	1.53	**	1.00		1.97		1.82	1.20	2.35	1.57		1.00		2.38
External Rating	3.19	3.00	1.12	3.41	***	3.00	***	1.04		3.30	3.00	0.85	3.38	*	3.00		0.77		3.28	3.00	0.84	3.41	*	3.00	*	0.81
Repayment Problems	0.03	0.00	0.18	0.02	***	0.00	***	0.13		0.00	0.00	0.00	0.00		0.00		0.00		0.00	0.00	0.00	0.00		0.00		0.00
Private																										
Internal Limit	0.43	0.37	0.31	0.42	***	0.36	***	0.35		0.43	0.40	0.21	0.44		0.41		0.25		0.45	0.42	0.20	0.47		0.44		0.20
Distance to Limit	0.13	0.05	0.19	0.16		0.07		0.22		0.12	0.05	0.16	0.12		0.05		0.15		0.09	0.04	0.10	0.06	*	0.03		0.09
Loan Interest Rate	6.42	6.60	2.20	6.31	***	6.45	***	2.23		6.52	6.57	1.75	6.40		6.50		2.06		6.61	6.60	1.61	6.19	***	6.25	***	1.71
Relationship Length	10.61	10.00	6.28	11.23	***	10.00	***	6.42		11.12	10.50	6.44	12.59	***	12.00	***	6.57		11.43	11.00	6.41	12.18		11.00		6.77
II. Outside Loan																										
Outside Loan	0.18	0.05	0.52	-		-		-		0.12	0.05	0.25	-		-		-		0.13	0.05	0.27	-		-		-
III. Limit Changes																										
$\Delta Limit_{t0-12,t0-24}/Assets_{t0-24}$	0.02	-0.01	0.26	0.02		0.00	**	0.44		0.02	-0.01	0.19	0.01		0.00		0.20		0.02	-0.01	0.17	0.00		-0.01		0.12
$\Delta Limit_{t0+12,t0-12}/Assets_{t0-12}$	-0.06	-0.03	0.34	0.01	***	0.00	***	0.40		-0.06	-0.03	0.24	0.01	***	0.00	***	0.27		-0.05	-0.03	0.27	0.02	***	-0.01	***	0.25
Number of Firms		991				7,743					350				954					207				436		
Number of Observations		991				18,862					350				1,170					207				507		

Table 2: Estimated Propensity Score Distributions

The table presents descriptive statistics of the estimated probability at t_0-*12* of obtaining an outside loan between t_0-*12* and t_0. The estimates are obtained using the predicted values from the following Probit model: $P(Y_t) = F(X_{t-12}) + \varepsilon$, where *Y* is a dummy variable that equals one if a previously exclusive firm obtained an outside loan sometime between *t-12* and *t* and *X* is vector that includes all indicators employed in the matching exercises (see Table A1 in the Appendix). The model is estimated using all firms with an exclusive relationship with the initial bank. Each firm remains in the sample until it becomes non-exclusive or until the end of the sample. Panel A reports descriptive statistics for the treatment and control firms prior to matching. Panel B reports descriptive statistics for the remaining treatment and control groups after matching using Match 1 and Match 2, respectively. *Difference* reports descriptive statistics of the difference in the estimated probabilities between each pair of treatment and control firms in each of the three groups.

	Obs.	Mean	SD	Min	P5	Median	P95	Max
Panel A: Before Matching								
Treatment	991	0.07	0.05	0.01	0.02	0.06	0.16	0.52
Control	18,862	0.05	0.03	0.01	0.02	0.04	0.10	0.57
Difference	157,835	0.01	0.03	-0.26	-0.04	0.01	0.06	0.21
Panel B: After Matching								
Match 1								
Treatment	350	0.05	0.02	0.02	0.02	0.05	0.09	0.22
Control	1,170	0.05	0.02	0.01	0.02	0.04	0.08	0.19
Difference	1,421	0.00	0.02	-0.10	-0.02	0.00	0.04	0.13
Match 2								
Treatment	207	0.05	0.02	0.02	0.02	0.05	0.09	0.13
Control	507	0.05	0.02	0.02	0.02	0.04	0.08	0.13
Difference	549	0.00	0.01	-0.04	-0.01	0.00	0.02	0.05

Table 3: Non-Exclusivity Externalities and the Size of the Outside Loan: Test of H1

The table reports OLS estimates from matched regressions relating the standardized response in the internal limit to a constant term (Columns (I), (III), (V), and (VII)) and to *OutsideLoan* (i.e. the size of a loan at another bank divided by the firm's total assets at t_0-*12*; Columns (II), (IV), (VI), and (VIII)). Panel A reports results for Match 1 whereas Panel B reports results for Match 2. In Columns (I) and (II), the dependent variable is the standardized change in the limit over the event window (t_0-*12*, t_0+*12*) (i.e., $(\Delta Limit_{t_0+12,t_0-12}/Assets_{t_0-12})_{treatment,control} = [(Limit_{t_0+12\ -}\ Limit_{t_0-12})/Total\ Assets_{t_0-12}]_{treatment} - [(Limit_{t_0+12\ -}\ Limit_{t_0-12})/Total\ Assets_{t_0-12}]_{control}$). In Columns (III) and (IV), the dependent variable is re-defined as the standardized change in the limit between t_0-*24* and t_0-*12* (i.e., the year prior to the event window). In Columns (V) to (VIII), the event window is split in two using the standardized change in the limit between t_0-*12* and t_0 (Columns (V) and (VI)) and between t_0 and t_0+*12* (Columns (VII) and (VIII)). All variables are defined in Table A1 in the Appendix along with the list of matching variables for Match 1 and Match 2. All models are estimated using OLS, weighting the observations by one over the number of matched control firms for each treatment firm. T-statistics calculated on robust standard errors, clustered on a treatment-firm level, are reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

	Event Window (t_0-12, t_0+12)		**A Year Prior (t_0-24, t_0-12)**		**Split Event Window in Two (t_0-12, t_0)**		**(t_0, t_0+12)**	
	(I)	**(II)**	**(III)**	**(IV)**	**(V)**	**(VI)**	**(VII)**	**(VIII)**
Panel A: Match 1								
Intercept	-0.066***	-0.026	-0.009	-0.015	-0.024**	-0.011	-0.042***	-0.015
	(-4.176)	(-1.416)	(-0.965)	(-1.432)	(-2.228)	(-0.975)	(-3.461)	(-1.066)
OutsideLoan		-0.335***		0.042		-0.108**		-0.233***
		(-3.384)		(0.810)		(-2.014)		(-2.676)
Number of Obs (Matched Pairs)	1,421	1,421	859	859	1,421	1,421	1,421	1,421
Number of Treatment Firms	350	350	228	228	350	350	350	350
Panel B: Match 2								
Intercept	-0.062***	-0.014	0.002	0.008	-0.018	0.001	-0.044**	-0.014
	(-2.877)	(-0.559)	(0.226)	(0.763)	(-1.373)	(0.052)	(-2.371)	(-0.678)
OutsideLoan		-0.408***		-0.046		-0.158**		-0.250**
		(-3.152)		(-1.105)		(-2.027)		(-2.300)
Number of Obs (Matched Pairs)	549	549	344	344	549	549	549	549
Number of Treatment Firms	207	207	132	132	207	207	207	207

Table 4: Robustness Checks with Respect to Unobserved Firm Heterogeneity

[14:31:53] Vasso Ioannidou: Robustness Checks with respect to unbserved heterogeneityThe table reports estimation results for equations (1) and (2). In all cases, the dependent variable is the standardized change in the internal limit over the event window (i.e., $(\Delta Limit_{t_0+12,t_0-12}/Assets_{t_0-12})_{treatment,control}$ = [($Limit_{t_0+12}$ – $Limit_{t_0-12}$)/*Total Assets*$_{t_0-12}$]$_{treatment}$ - [($Limit_{t_0+12}$ – $Limit_{t_0-12}$)/*Total Assets*$_{t_0-12}$]$_{control}$). *OutsideLoan* indicates the size of the outside loan scaled by the firm's *Total Assets* at t_0-*12*. Panel A reports estimation results after imposing stricter windows to the matching variables in Match 1 (i.e., 30 and 20 percent), by consecutively matching on *Relationship Length* and *Regional HHI* in addition to our matching variables in Match 1, and re-estimating the model for firms whose condition did not deteriorate during the event window (i.e., firms that did not have *Repayment Problems* or an increase in their *Default Probability* during the event window). Panel B reports estimates of corresponding specifications using Match 2 as a basis. All variables are defined in Table A1 in the Appendix along with the list of matching variables for Match 1 and Match 2. All models are estimated using OLS, weighting the observations by one over the number of matched control firms for each treatment firm. T-statistics calculated on robust standard errors, clustered on a treatment-firm level, are reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

	Stricter Windows: 30%		**Stricter Windows: 20%**		**Relationship Length**		**Regional HHI**		**No Drop in Quality**	
	(I)	**(II)**	**(III)**	**(IV)**	**(V)**	**(VI)**	**(VII)**	**(VIII)**	**(IX)**	**(X)**
Panel A: Match1										
Intercept	-0.055***	-0.020	-0.066*	-0.020	-0.068***	-0.028	-0.071***	-0.032	-0.070***	-0.030
	(-2.770)	(-0.883)	(-1.908)	(-0.520)	(-3.141)	(-1.112)	(-4.119)	(-1.583)	(-4.361)	(-1.562)
OutsideLoan		-0.329***		-0.382**		-0.319***		-0.320***		-0.363***
		(-2.842)		(-2.371)		(-2.753)		(-3.059)		(-2.911)
Number of Obs (Matched Pairs)	646	646	193	193	474	474	1,120	1,120	916	916
Number of Treatment Firms	228	228	116	116	218	218	312	312	255	255
Panel B: Match 2										
Intercept	-0.060*	-0.009	-0.114	0.037	-0.068*	-0.007	-0.060**	-0.012	-0.069***	-0.007
	(-1.678)	(-0.213)	(-1.671)	(0.736)	(-1.958)	(-0.181)	(-2.488)	(-0.459)	(-3.316)	(-0.351)
OutsideLoan		-0.446***		-1.120***		-0.435***		-0.393***		-0.610***
		(-2.950)		(-9.100)		(-2.870)		(-2.942)		(-6.471)
Number of Obs (Matched Pairs)	173	173	27	27	201	201	435	435	339	339
Number of Treatment Firms	97	97	21	21	122	122	180	180	154	154

Table 5: Bank Limit Capacity and Liquidity Constraints

The table reports estimation results for equations (1) to (3) for both Match 1 and Match 2. The dependent variable is the standardized change in the internal limit over the event window (i.e., $(\Delta Limit_{t_0+12,t_0-12}/Assets_{t_0-12})_{treatment,control} = [(Limit_{t_0+12} - Limit_{t_0-12})/Total\ Assets_{t_0-12}]_{treatment} - [(Limit_{t_0+12} - Limit_{t_0-12})/Total\ Assets_{t_0-12}]_{control}$). *OutsideLoan* equals the size of the outside loan scaled by the firm's *Total Assets* at t_0-*12*. Columns (I) and (II), report estimation results for equation (3) where the interaction variable *Z* is the bank's *Unused Limit Capacity* at the bank-level. In Columns (III) and (IV), *Z* is replaced with the bank's Unused Limit Capacity at the bank-region level. Columns (V) to (VIII) report estimation results for equations (1) and (2) after excluding the crisis period (i.e., all observations for which the event window ends in 2008). Columns (IX) and (X) report estimation results for equation (3), where *Z* is the initial *Bank's Exposure* to the firm. The variables *Z* have been standard normalized. All variables are defined in Table A1 in the Appendix along with the list of matching variables for Match 1 and Match 2. All models are estimated using OLS, weighting the observations by one over the number of matched control firms for each treatment firm. T-statistics calculated on robust standard errors, clustered on a treatment-firm level, are reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

	Unused Limit Capacity				**No Crisis Period**				**Bank's Exposure**	
	Bank-Level		**Bank-Region Level**							
	Match 1	**Match 2**	**Match 1**	**Match 2**	**Match 1**		**Match 2**		**Match 1**	**Match 2**
	(I)	**(II)**	**(III)**	**(IV)**	**(V)**	**(VI)**	**(VII)**	**(VIII)**	**(IX)**	**(X)**
Intercept	-0.024	-0.008	-0.029	-0.015	-0.051***	-0.019	-0.066**	-0.019	-0.026	-0.015
	(-1.299)	(-0.363)	(-1.612)	(-0.626)	(-3.028)	(-0.954)	(-2.520)	(-0.628)	(-1.406)	(-0.619)
OutsideLoan	-0.356***	-0.491***	-0.297***	-0.359**		-0.291**		-0.453**	-0.335***	-0.386***
	(-3.239)	(-4.293)	(-2.716)	(-2.555)		(-2.279)		(-2.271)	(-3.355)	(-3.019)
*OutsideLoan*Z*	0.067	0.146	-0.016	-0.050**					-0.013	-0.039
	(0.720)	(1.451)	(-0.746)	(-2.341)					(-0.214)	(-0.264)
Z	-0.026	-0.008	0.130	0.223					0.003	-0.072**
	(-1.431)	(-0.350)	(0.997)	(1.481)					(0.148)	(-2.117)
Number of Obs (Matched Pairs)	1,421	549	1,421	549	1,183	1,183	435	435	1,421	549
Number of Treatment Firms	350	207	350	207	277	277	160	160	350	207

Table 6: Reduced Possibilities for Rent Extraction and the Signaling Theories

The table reports estimation results for equation (3) for both Match 1 and Match 2. The dependent variable is the standardized change in the internal limit over the event window (i.e., $(\Delta Limit_{t_0+12,t_0-12}/Assets_{t_0-12})_{treatment,control}$ = $[(Limit_{t_0+12} - Limit_{t_0-12})/Total\ Assets_{t_0-12}]_{treatment}$ - $[(Limit_{t_0+12} - Limit_{t_0-12})/Total\ Assets_{t_0-12}]_{control}$). *OutsideLoan* equals the size of the outside loan scaled by the firm's *Total Assets* at t_0-*12*. The interaction variable, Z, is consecutively replaced with the following firm and market characteristics at t_0-*12*: *Total Assets* (Columns (I) and (II)), *Age* (Columns (III) and (IV)), *Relationship Length* (Columns (V) and (VI)), *Regional HHI* (Columns (VII) and (VIII)), and *Fees* (Columns (IX) and (X)). The variables *Z* have been standard normalized. All variables are defined in Table A1 in the Appendix along with the list of matching variables for Match 1 and Match 2. All models are estimated using OLS, weighting the observations by one over the number of matched control firms for each treatment firm. T-statistics calculated on robust standard errors, clustered on a treatment-firm level, are reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

	Total Assets		**Age**		**Relationship Length**		**Regional HHI**		**Fees**	
	Match 1	**Match 2**	**Match 1**	**Match 2**	**Match 1**	**Match 2**	**Match 1**	**Match 2**	**Match 1**	**Match 2**
	(I)	**(II)**	**(III)**	**(IV)**	**(V)**	**(VI)**	**(VII)**	**(VIII)**	**(IX)**	**(X)**
Intercept	-0.028	-0.008	-0.024	-0.007	-0.024	-0.012	-0.025	-0.014	-0.026	-0.018
	(-1.437)	(-0.320)	(-1.299)	(-0.314)	(-1.307)	(-0.495)	(-1.363)	(-0.579)	(-1.373)	(-0.745)
OutsideLoan	-0.329***	-0.413***	-0.367***	-0.539***	-0.342***	-0.427***	-0.348***	-0.404***	-0.348***	-0.324**
	(-3.235)	(-4.027)	(-3.037)	(-4.579)	(-3.396)	(-3.588)	(-4.111)	(-3.495)	(-3.134)	(-2.352)
*OutsideLoan*Z*	0.016	-0.236***	-0.067	-0.188***	-0.076	-0.203	0.097	0.092	-0.027	0.118
	(0.236)	(-3.006)	(-0.647)	(-3.046)	(-0.759)	(-1.625)	(0.989)	(0.584)	(-0.267)	(0.730)
Z	-0.013	0.019	0.007	-0.005	0.029	0.042	-0.004	-0.001	-0.007	-0.003
	(-0.650)	(0.655)	(0.390)	(-0.220)	(1.383)	(1.457)	(-0.174)	(-0.035)	(-0.544)	(-0.151)
Number of Obs (Matched Pairs)	1,421	549	1,421	549	1,421	549	1,421	549	1,421	549
Number of Treatment Firms	350	207	350	207	350	207	350	207	350	207

Table 7: Non-Exclusivity Externalities and Protection of Initial Creditor's Claims: Test of H2

The table reports estimation results for equation (3). The dependent variable is the standardized change in the internal limit over the event window (i.e., $(\Delta Limit_{t_0+12,t_0-12}/Assets_{t_0-12})_{treatment,control}$ = $[(Limit_{t_0+12\ -}\ Limit_{t_0-12})/Total\ Assets_{t_0-12}]_{treatment}$ - $[(Limit_{t_0+12\ -}\ Limit_{t_0-12})/Total\ Assets_{t_0-12}]_{control}$). *OutsideLoan* equals the size of the outside loan scaled by the firm's *Total Assets* at t_0-*12*. *Floating Charge* is a dummy variable indicating if the initial bank's loans to the firm are secured by a floating charge. *FloatingChargeValue* indicates the value of the floating charge assets over the committed amount. *FloatingChargeVolatility* indicates the average volatility in the firm's earnings over the three prior years scaled by the firm's average assets over the same period. *OtherCollateral* is a dummy variable indicating whether the initial bank's debt is secured by any other type of collateral. All variables are defined in Table A1 in the Appendix along with the list of matching variables for Match 1 and Match 2. All models are estimated using OLS, weighting the observations by one over the number of matched control firms for each treatment firm. T-statistics calculated on robust standard errors, clustered on a treatment-firm level, are reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

	Floating Charge				**Other Collateral**			
	Match 1	**Match 2**	**Match 1**	**Match 2**	**Match 1**	**Match 2**	**Match 1**	**Match 2**
	(I)	**(II)**	**(III)**	**(IV)**	**(V)**	**(VI)**	**(VII)**	**(VIII)**
Intercept	-0.027	-0.013	-0.027	-0.013	-0.022	-0.011	-0.023	-0.011
	(-1.410)	(-0.509)	(-1.428)	(-0.515)	(-1.032)	(-0.395)	(-1.017)	(-0.373)
OutsideLoan	-0.374***	-0.496***	-0.374***	-0.496***	-0.323***	-0.377**	-0.373***	-0.482***
	(-3.803)	(-4.359)	(-3.810)	(-4.348)	(-2.662)	(-2.569)	(-3.000)	(-3.584)
*OutsideLoan * FloatingCharge*	0.328*	0.515***					0.327*	0.500***
	(1.847)	(3.614)					(1.692)	(3.137)
FloatingCharge	0.029	0.053					0.025	0.051
	(0.435)	(0.564)					(0.363)	(0.537)
*OutsideLoan * FloatingChargeValue*			1.157***	1.437***				
			(4.226)	(4.758)				
FloatingChargeValue			-0.015	-0.045				
			(-0.094)	(-0.192)				
*OutsideLoan * FloatingChargeVolatility*			-8.382***	-8.100*				
			(-2.757)	(-1.849)				
FloatingChargeVolatility			0.846	1.203				
			(0.915)	(0.748)				
*OutsideLoan * OtherCollateral*					-0.024	-0.007	-0.024	-0.007
					(-0.635)	(-0.140)	(-0.606)	(-0.145)
OtherCollateral					-0.033	-0.168	0.018	-0.064
					(-0.189)	(-0.774)	(0.102)	(-0.306)
Number of Obs (Matched Pairs)	1421	549	1421	549	1421	549	1421	549
Number of Treatment Firms	350	207	350	207	350	207	350	207

Appendix

Table A1: Variable Names and Definitions

This table defines all variables used in the analysis. It also indicates which matching variables are used in Match 1, 2, and in subsequent robustness checks (Other). For discrete variables we use exact matching, while for continuous variables we employ a 40 percent matching window.

Variable Names	Definitions	Matching Sets		
		1	2	Other
I. Dependent Variable				
$(\Delta Limit_{t_0+12,t_0-12}/Assets_{t_0-12})_{treatment}$	$[(Limit_{t_0+12} - Limit_{t_0-12})/Assets_{t_0-12}]_{treatment}$			
$(\Delta Limit_{t_0+12,t_0-12}/Assets_{t_0-12})_{control}$	$[(Limit_{t_0+12} - Limit_{t_0-12})/Assets_{t_0-12}]_{control}$			
$(\Delta Limit_{t_0+12,t_0-12}/Assets_{t_0-12})_{treatment,\ control}$	$(\Delta Limit_{t_0+12,t_0-12}/Assets_{t_0-12})_{treatment} - (\Delta Limit_{t_0+12,t_0-12}/Assets_{t_0-12})_{control}$			
II. Key Explanatory Variable				
Outside Loan	A loan initiated at another bank between t_0-*12* and t_0 to total assets at t_0-*12*			
III. Matching Variables				
Calendar Time				
Month-Year	Dummy variables for each of the 45 months in the sample (2003:04-2006:12)	X	X	
Public Firm Characteristics				
Industry	Two digit NACE codes			
Age	Number of years since the date of registration	X	X	
Total Assets	Total firm assets (in 1,000 SEK)	X	X	
Asset Growth	Total assets at *t* / Total assets at *t-12*	X	X	
Tangible Assets	Fixed assets, accounts receivable, and inventories to total assets	X	X	
Profitability	Eearnings before interest and taxes to total assets	X	X	
Leverage	All debt obligations excluding unused credit lines and taxes to total assets	X	X	
Bank Debt	All bank debt obligations excluding unused credit lines to total assets	X	X	
Default Probability	Probability of default estimated by the main Swedish credit bureau	X	X	
External Rating	Takes values 1, 2,…5, where 1 indicates the worse and 5 the best rating	X	X	
Repayment Problems	A dummy = 1 if recent repayment problems with third parties, = 0 otherwise	X	X	
Private Firm Characteristics				
Loan Interest Rate	Annualized interest rate on outstanding loans at the initial bank (in %)		X	
Internal Limit	Internal limit to total assets		X	
Distance to Limit	(Internal limit- Outstanding bank debt - Unused credit lines) / Internal limit		X	
Internal Rating	Takes values 1, 2,…5, where 1 indicates the worse and 5 the best rating			X
Relationship Length	Number of years since the earliest observed credit product at the initial bank			X
Inside Loan	Matched control firm got a loan from the initial bank between t_0-12 and t_0			X
Market Concentration				
Regional HHI	Herfindahl-Hirschman Index at the regional level			X
IV. Other Variables				
Unused Limit Capacity	Internal Limits - (Outstanding Loans + Unused Credit Lines), where			
_Bank-Level	* obtained after aggregating each component across all corporate clients			
_Bank-Region Level	* obtained after aggregating each component across all corporate clients in each region			
Bank's Exposure	Outstanding loans to a firm to total bank loans			
Fees	Total fees on lending products			
Floating Charge	A dummy =1 if initial bank's debt is secured with floating charge, = 0 otherwise			
Floating Charge Value	Value of floating charge assets (estimated by the bank)/Committed debt			
Floating Charge Volatility	Three-year earnings volatility /three-year average assets (if floating charge=1)			
Other Collateral	A dummy = 1 if the initial bank 's debt is secured by any other type of collateral with value greater or equal than 80% of the bank's outstanding debt			

Table A2: Characteristics of Firms with and without a Floating Charge (Match 2)

The table reports the mean, median and standard deviation (SD) of the characteristics of treatment firms, treatment firms with floating charge, and treatment firms without floating charge in Match 2. Variable definitions are in Table A1 in the Appendix. *, **, and *** reported next to the mean and median values of the no floating charge group indicate whether the corresponding values are statistically different relative to the floating charge group at the 10%, 5%, and 1% levels, respectively. Differences in means are assessed using the Student's t-test. Differences in medians are assessed using the Wilcoxon-Mann-Whitney test for continuous variables and the Pearson's Chi-square test for categorical variables.

	Match 2										
	Treatment Firms			**Floating Charge**			**No Floating Charge**				
Variables	Mean	Median	SD	Mean	Median	SD	Mean		Median		SD
I. Firm Characteristics											
Public											
Age	21.251	17.000	14.047	12.938	11.500	8.858	21.948	**	17.000	***	14.193
Total Assets	10,400	2,890	32,800	11,800	2,583	21,800	10,300		2,895		33,600
Asset Growth	1.067	1.036	0.221	0.968	0.998	0.180	1.076	*	1.037		0.222
Tangible Assets	0.814	0.870	0.173	0.771	0.804	0.223	0.817		0.870		0.169
Profitability	0.051	0.050	0.070	0.028	0.040	0.080	0.053		0.051		0.069
Leverage	0.507	0.498	0.206	0.518	0.510	0.209	0.506		0.498		0.206
Bank Debt	0.336	0.307	0.222	0.322	0.211	0.268	0.337		0.317		0.219
Default Probability	1.816	1.200	2.347	1.881	1.850	1.442	1.811		1.200		2.409
External Rating	3.280	3.000	0.835	3.188	3.000	0.911	3.288		3.000		0.831
Repayment Problems	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000		0.000
Private											
Internal Limit	0.450	0.421	0.201	0.488	0.400	0.296	0.447		0.429		0.191
Distance to Limit	0.088	0.037	0.104	0.118	0.033	0.129	0.085		0.039		0.102
Loan Interest Rate	6.607	6.600	1.609	6.090	5.970	1.835	6.650		6.650		1.587
Relationship Length	11.435	11.000	6.410	7.938	7.000	4.074	11.728	**	11.000	**	6.490
II. Outside Loan											
OutsideLoan	0.126	0.046	0.269	0.133	0.046	0.316	0.118		0.046		0.199
III. Limit Changes											
$\Delta Limit_{t0-24,t0-12} / Assets_{t0-24}$	0.019	-0.007	0.168	-0.028	-0.044	0.031	0.023		-0.005		0.175
$\Delta Limit_{t0+12,t0-12} / Assets_{t0-12}$	-0.050	-0.026	0.269	-0.023	-0.008	0.261	-0.053		-0.027		0.270
IV. Collateral Information											
Floating Charge	0.077	0.000	0.268	1.000	1.000	0.000	0.000		0.000		0.000
Floating Charge Value	0.561	0.598	0.266	0.561	0.598	0.266	-		-		-
Floating Charge Volatility	0.077	0.070	0.048	0.077	0.070	0.048	-		-		-
OtherCollateral	0.198	0.000	0.400	0.125	0.000	0.342	0.215		0.000		0.412

Table A3: Additional Robustness Checks: Alternative Estimation Choices and No Crisis Period

The table reports estimation results for equations (1) and (2). The dependent variable is the standardized change in the internal limit over the event window (i.e., $(\Delta Limit_{t_0+12,t_0-12}/Assets_{t_0-12})_{treatment,control}$ = $[(Limit_{t_0+12\ -}\ Limit_{t_0-12})/Total\ Assets_{t_0-12}]_{treatment}$ - $[(Limit_{t_0+12\ -}\ Limit_{t_0-12})/Total\ Assets_{t_0-12}]_{control}$). *OutsideLoan* equals the size of the outside loan scaled by the firm's *Total Assets* at t_0-*12*. Panel A reports estimates using Match 1 and Panel B reports corresponding specifications for Match 2. Columns (I) and (II) report OLS estimates for equations (1) and (2), respectively, after clustering the standard errors with respect to both the treatment and the control groups. This procedure does not allow for weighting the observations. Columns (III) and (IV) report OLS estimates for equations (1) and (2) using one observation per match treatment firm by using the closest match among the matched treatment and control firms. This is obtained by creating a measure of "total distance" between each pair by summing their differences with respect to each matching variable and retaining the pair with the smaller distance for each treatment firm. Columns (V) and (VI) report OLS estimates for equations (1) and (2) using one observation per treatment firm by randomly selecting among the matched control firms whenever the matching procedure yields more than one matched control firm for each treatment firm. Columns (VII) and (VIII) report OLS estimates for equations (1) and (2) using the subsamples of matched pairs in Match 1 and Match 2 for which the difference in the propensity to become non-exclusive (as reported in Table 2) is smaller than one percentage point. All variables are defined in Table A1 in the Appendix along with the list of matching variables for Match 1 and Match 2. T-statistics calculated on robust standard errors, clustered on a treatment-firm level, are reported in parentheses except for Columns (I) and (II) where there is double clustering. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

	Double-Clustering		**Closest Match**		**Random Match**		**Propensity Score**	
	(I)	**(II)**	**(III)**	**(IV)**	**(V)**	**(VI)**	**(VII)**	**(VIII)**
Panel A: Match 1								
Intercept	-0.071***	-0.016	-0.063***	-0.026	-0.065***	-0.029	-0.072***	-0.023
	(-3.047)	(-0.685)	(-3.636)	(-1.271)	(-3.886)	(-1.482)	(-3.421)	(-0.943)
OutsideLoan		-0.469***		-0.311***		-0.302***		-0.407***
		(-3.936)		(-2.942)		(-2.803)		(-3.368)
Number of Obs (Matched Pairs)	1,421	1,421	350	350	350	350	744	744
Number of Treatment Firms	350	350	350	350	350	350	248	248
Panel B: Match 2								
Intercept	-0.068*	0.007	-0.066***	-0.017	-0.060***	-0.009	-0.065**	-0.022
	(-1.882)	(0.203)	(-2.674)	(-0.599)	(-2.648)	(-0.366)	(-2.363)	(-0.702)
OutsideLoan		-0.608***		-0.418***		-0.429***		-0.347**
		(-4.425)		(-3.200)		(-3.176)		(-2.444)
Number of Obs (Matched Pairs)	549	549	207	207	207	207	355	355
Number of Treatment Firms	207	207	207	207	207	207	162	162