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

Hans Degryse
Tilburg University & CEPR
Department of Finance, CentER, EBC & TILEC
h.degryse@uvt.nl

Vasso Ioannidou
Tilburg University
Department of Finance, CentER & EBC
v.p.ioannidou@uvt.nl

Erik von Schedvin
Tilburg University and Sveriges Riksbank
Department of Finance, CentER & EBC
e.l.vonSchedvin@uvt.nl

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Abstract

Credit contracts are non-exclusive. A string of theoretical papers shows that non-exclusivity generates important negative contractual externalities. Employing a unique dataset, we identify how the contractual externality stemming from the non-exclusivity of credit contracts affects credit supply. In particular, using internal information on a creditor's willingness to lend, we find that a creditor reduces its loan supply when a borrower initiates a loan at another creditor. Consistent with the theoretical literature, the effect is more pronounced the larger the loans from the other creditor. We also find that the initial creditor's willingness to lend does not change if its existing and future loans retain seniority over the other creditors' loans and are secured with assets whose value is high and stable over time.

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1. Introduction

The non-exclusivity of financial contracts is a form of contractual incompleteness that has been at the center of contract theory and an important factor behind several financial crises.

An important risk that needs to be evaluated at the time of entering into a financial contract is the risk that a counterparty might not be able to fulfill its future obligations. This risk is difficult to evaluate as it depends largely on other, often subsequent, exposures. For example, a contract between a borrower and a lender cannot be made contingent on other lenders and in particular on future lenders who have not yet lent to the borrower. Contractual terms could help enforce exclusivity or mitigate the negative externalities from non-exclusivity— the extent and efficiency with which this can be achieved depends on the institutional framework.[1]

The non-exclusivity of financial contracts played a role in several financial crises such as the Latin-American debt crisis in the 1970s, the Asian crisis in the 1990s (Radelet and Sachs (1998) and Bisin and Guaitoli (2004)), as well as the worldwide financial crisis of 2007-2009. Acharya and Bisin (2010), for example, argue that the opacity of the over-the-counter (OTC) markets—where credit derivatives trade— appears to have played a central role in the recent financial crisis by creating counterparty risk externalities.[2] They

[1] See Bizer and DeMarzo (1992), Kahn and Mookherjee (1998), Parlour and Rajan (2001), Bisin and Guaitoli (2004), Bennardo et al. (2009), and Attar et al. (2010) for a theoretical analysis of non-exclusivity in different institutional and game-theoretic settings as well as discussions and analysis on the role of the institutional framework (e.g., information sharing on trades with other creditors).

[2] Acharya and Bisin (2010) argue that the non-exclusivity of financial contracts coupled with the opacity of the OTC market has played an important role in the A.I.G. case. In September 2008, it became public that A.I.G. had a low liquidity position compared to its writing of credit default swaps. Investors started to infer that the protection that A.I.G. offered on its credit default swaps was dramatically reduced. Consequently, investors started to ask for additional collateral. A.I.G.

also show that information on counterparty exposures can help contracting parties to internalize these externalities. Non-exclusivity has also been identified as a factor behind the high interest rates and default rates in the consumer credit card market (see, for example, Parlour and Rajan (2001)).

Despite the substantial theoretical work on the impact of non-exclusivity on financial contracts and its role in major financial crises, up to now, no direct test of the impact of non-exclusivity on the functioning of financial markets was possible due to lack of adequate data. This paper aims to fill this void by employing a unique dataset containing information on a creditor's internal limit to the borrower both before and after a non-exclusivity event realizes. The internal limit indicates the maximum amount this creditor is willing to lend to a borrower; it represents the amount for which the bank's loan supply becomes vertical. Changes in the internal limit represent changes in loan supply. Hence, using this information, we investigate how a creditor's willingness to lend reacts after a firm with whom it held an exclusive relationship acquires loans from other creditors, which we refer to as outside loans. This would not be possible using data on the outstanding level of credit as this is an equilibrium outcome driven both by demand and supply factors whereas the theory concerns supply effects.

A central prediction of the theory of the non-exclusivity of credit contracts is that it dampens the creditors' willingness to lend due the negative externalities arising from future outside loans. These externalities stem from two sources. The first relates to borrower moral hazard as modeled, for example, in Bizer and DeMarzo (1992). A greater

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was unable to pledge this collateral and the U.S.-Treasury had to take over A.I.G. The counterparty risk was so widespread that a default would probably have caused many other defaults, creating a downward spiral.

total indebtedness increases borrower moral hazard leading to a greater probability of default. The second relates to the increased incentives for strategic default following the greater indebtedness as modeled, for example, in Parlour and Rajan (2001). Hence, everything else equal, the increased probability of default should dampen the initial creditor's willingness to provide credit. Contract terms, whose use could be facilitated by the institutional setting, could mitigate the externalities and thus the impact of non-exclusivity. Collateral and credit registries, for example, could help creditors to protect their claims from future outside loans (see, for example, Bennardo et al. (2009) and Attar et al. (2010)) and thus increase their willingness to lend.

Our empirical evidence is consistent with the theories on 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 loans. 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. 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 the claims are secured with assets whose value is high and stable over time.

While there have not been direct investigations of the non-exclusivity externality using credit supply, some papers have investigated the reasons and the impact of establishing single versus multiple bank relationships. Several studies have found that older and larger firms and firms located in countries with a lower degree of judicial efficiency are more likely to maintain multiple relationships (for an overview of the

empirical studies see Degryse, Kim and Ongena (2009)). Some papers also find that firms that borrow from multiple banks are of lower quality (e.g., Petersen and Rajan (1994), Harhoff and Körting (1998)). Farinha and Santos (2002) follow the debt share of firms after initiating multiple relationships. They find that the bank with which the firm had an exclusive relationship loses quickly importance over time. While the findings are overall consistent with the presence of significant negative externalities stemming from the non-exclusivity of loan contracts, these studies do not identify the driving force behind these associations as they cannot disentangle demand and supply factors.

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

To structure our empirical analysis, we review the extant theoretical literature and summarize the key insights in two testable hypotheses. We also briefly discuss the institutional environment to better position our analysis into this literature.

As mentioned earlier, the inefficiencies resulting from the non-exclusivity of financial contracts are addressed in several theoretical papers, each highlighting different sources of the resulting externalities. Regardless of the model employed, additional outside lending imposes externalities on the existing lender by increasing the borrower's probability of default— the specific channel varies across models.

In Bizer and DeMarzo (1992) and Bennardo et al. (2009) an outside loan imposes externalities on prior debt by exacerbating the borrower's *moral hazard* incentives. Everything else equal, a higher total indebtedness reduces the borrower's work effort leading to higher probability of default as in Holmström (1979) and Holmström and Tirole (1997). The outside loan imposes an externality on existing debt because the terms of the loan do not reflect the resulting devaluation of the existing debt. This is in contrast to a one-creditor environment where all effects are internalized by the sole creditor. Because new lenders do not pay for the externality they impose on existing debt, they can offer loans with more attractive terms.[3] As a result borrowers cannot credibly commit to exclusivity. Recognizing the possibility of future outside loans, the initial creditor requires higher interest rates for any given loan (or put differently lends a smaller amount for any given interest rate) than it would if borrowers could commit to exclusivity. This in turn decreases the maximum amount of loans that the borrower can support.

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. Everything else equal, these incentives increase in the total amount borrowed. Hence, multiple lending in this setting creates an externality to all lenders as each loan increases the default risk of the others, which inhibits competition

[3] This sequential contracting 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).

and undermines the availability and the terms of credit. When the externalities are pervasive, it could also result in credit rationing (Bennardo et al. (2009)).

Overall, the theories on contractual externalities predict that when a borrower obtains a loan from another creditor, the maximum amount that the borrower's initial creditor will be willing to lend to this borrower should decrease and it should decrease more the larger the outside loan.[4] This motivates our first testable hypothesis:

(H1) *The theory on contractual externalities predicts that when a borrower obtains an outside loan, then the maximum amount that the initial creditor will be willing to lend to the borrower will decrease and it will decrease more the larger the outside loan.*

In addition to the literature on contractual externalities, alternative theories predict that multiple financing sources may actually decrease the borrower's probability of default, and thus increase the initial creditor's willingness to lend. 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)).[5] In this case, an outside loan should increase the initial creditor's willingness to lend and it should

[4] If the initial creditor anticipated the externalities and priced its debt correctly, the initial creditor's willingness to lend to the borrower should drop by an amount equal to the outside loan. An additional drop might be needed if, for example, the outside bank's willingness to lend was larger than expected. This drop will again depend positively on the size of the outside loan since the borrower's probability of default increases in the size of its total debt.

[5] The willingness of another lender to extend credit to a borrower could also be perceived as a positive signal about the borrower's quality (e.g., Biais and Gollier (1997)). A signal from another lender could be particularly useful when the initial creditor is relatively uninformed or the prospects of the borrower are uncertain.

increase it more the larger the outside loan. Note, however, that any evidence consistent with H1 does not necessarily imply that these alternative theories are not at work. It only implies that theories on contractual externalities dominate empirically.

Creditors could employ several contractual features to mitigate the externalities resulting from the non-exclusivity of debt contracts. 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.[6] 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). As pointed out in Bizer and DeMarzo (1992), 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 incentive for moral hazard i.e., the fear of losing the pledged assets could induce high effort (Holmström and Tirole (1997)).[7] According to Parlour and Rajan (2001), collateral could also be interpreted as a commitment to accept only one contract since it is by definition a non-exempt asset.

[6] For example, with the use 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, for example, 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.

[7] Collateral is also 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 (e.g., Townsend (1979), Gale and Hellwig (1985), Williamson (1986), and Boyd and Smith (1994)).

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 curtail incentives for moral hazard and strategic default resulting from the higher levels of debt.[8] The degree to which a floating charge will mitigate the externalities from future outside loans depends positively on the value of the pledged assets and negatively on the volatility of their values.[9] If, for example, the initial creditor's claims are fully protected for the higher risk of default, 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 if the initial creditor's existing and future claims are fully protected.*

H1 and H2 are tested in the context of a modern banking system, where collateral and credit registries are operational, allowing lenders to mitigate the negative externalities from the non-exclusivity of loan contracts. Everything, else equal, collateral registries facilitate the effective use of collateral (Haselmann et al. (2010)). Similarly, information sharing through credit registries allows lenders to mitigate the negative externalities by

[8] 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.

[9] Bennardo et al. (2009) show that high volatility in the value of pledged assets gives outside creditors' incentives to engage in opportunistic lending and induce overborrowing.

conditioning their offers on future borrower behavior (see, for example, Bennardo et al. (2009) and Attar et al. (2010)).[10] Next, we provide more information about the data, our key variables, and the institutional framework.

3. Data and Institutional Setting

The paper makes use of a unique database containing detailed information on all corporate clients of one of the four largest banks in Sweden.[11] The database contains information on the contract and performance characteristics of all business 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, credit type, 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—one of our key variables. The internal limit indicates the maximum amount the bank is willing to lend to the firm. In economic terms, this indicates the amount for which the bank's loan supply becomes vertical. Hence, changes in the internal limit represent changes in loan supply.

The internal limit is determined based on a firm's repayment ability (probability of default) and the bank's expected loss in the event of default (loss given default). It can change during the so called "commitment review" meetings, where the exposure towards the firm is reevaluated. The commitment review meetings typically take place once a year

[10] Bennardo et al. (2009) point out that although information sharing is expected for the most part to mitigate the contractual externalities and expand the availability of credit it could also facilitate opportunistic lending if the value of the assets securing the existing debt is very volatile.

[11] 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.

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. To determine a firm's internal limit, the committee makes use of both 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 financial and non-financial institutions, the firm's external rating, the number, amount, and value of collateral on all outstanding bank loans as well as the number of loan applications. (The bank identities are not revealed.) This information is updated on a monthly basis and at any point in time the bank can obtain a report with historical data for the past twelve months.[12]

Hence, the Swedish institutional setting is such that banks know about past transactions with other creditors and can learn quickly about the borrowers' future borrowing.[13] This provides us with a unique opportunity to study whether the theories on contractual externalities are at work by studying how the internal limit changes following the origination of loans from another bank. (These loans are not syndicated as otherwise the initial creditor can fully control the borrower's loan taking behavior.) As explained below, the bank's response is benchmarked relative to otherwise similar firms.

To obtain additional information about the firm, the bank dataset is merged with accounting data from UC and it is further complemented with information from the Swedish registration office, Bolagsverket. To determine a firm's age, the firm's date of registration is obtained from Bolagsverket. The available data from Bolagsverket allows

[12] Information from the firm's annual accounting statements is also provided for corporations.

[13] In addition, the Swedish firms have few bank relationships (see, for example, Ongena and Smith (2000)). Non-exclusivity events are therefore part of this institutional setting, providing us with a unique laboratory to identify non-exclusivity externalities.

us (as well as current or prospective creditors) to determine whether the firm has posted collateral on any of its outstanding loans and observe whether a bank has a floating charge on the firm. Data on the value of the floating charge assets and the volatility of their values are obtained from the firm's accounting statements.

4. Methodology

To test H1 and H2 we use a matching procedure. This procedure 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 of similar firms that do not obtain loans from other banks (the control group). By matching, we minimize the likelihood that other factors—besides the loans from other banks— are driving the observed adjustments. Next, we describe in detail how our treatment and control groups are defined as well as the firm characteristics that we match on.

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 at some point 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)"). 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 the firm borrows from another bank.

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 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—during its annual commitment review meeting— there are two possibilities about the timing of any reaction following the non-exclusivity event: either the meeting is held sometime between t' and t_0 or it is held sometime between t_0 and t_0+*12*. Hence, to study how the bank reacts to the non-exclusivity event we compare the bank's internal limit between t_0-*12* and t_0+*12*.[14] The bank's reaction is benchmarked relative to a control group which consists of similar firms that enter the sample with an exclusive relationship with our bank and maintain this exclusive relationship until 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-

[14] 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% of the treated firms.

exclusivity event to observe the bank's limit at t_0*+12*. We omit firms with an internal limit lower than SEK 100,000 (this corresponds to about €10,000 euro) at time t_0*-12* since such small exposures are typically determined rather "mechanically".[15] Similarly, we also omit non-exclusivity events with trivial amounts since externalities are expected to be small (if any). In particular, we require that the loan from the other bank is at least 1% of the firm's internal limit at t_0*-12*. Finally, since our goal is to investigate how the bank's loan supply reacts to the non-exclusivity event, we do not include firms whose internal limit at t_0*-12* is equal to their outstanding loans at the bank as these are cases where the internal limit is binding and thus can be driven by both demand and supply factors.

The resulting sample consists of 991 treated firms whereas the control group has 25,980 firm-year observations. Table 1 reports descriptive statistics for both groups. Overall, firms that obtain a loan from another bank (the "treated group") are larger and faster growing firms that are typically riskier (e.g., have worse credit histories and credit ratings), but have more tangible assets and larger cash flows. All in all, these results highlight the importance of controlling as much as possible for any firm characteristics that may influence the bank's internal limits. This also includes firm characteristics that might only be observable to the bank (i.e., proprietary information gathered through past interactions with the firm). Our matching procedure is geared to meet this challenge.

[Insert Table 1 about here]

B. Matching and Empirical Specifications

[15] Firms may always be able to hold a company credit card with a minimum amount. Such amounts are typically determined mechanically. Since we want to focus on strategic interactions, we do not include such automated decisions.

The goal of the matching procedure is to make the two groups as comparable as possible. Firms are matched with respect to their characteristics at time t_0-*12*. We do not match using characteristics after t_0-*12* as they could be endogenous— the firm's leverage ratios, for example, reflect the loans from the other bank as well as the initial bank's response. The matching variables are selected with respect to factors that are acknowledged by the bank to be instrumental in its determination of the limits as well as variables identified in the literature to affect the firm's likelihood to obtain outside loans.

In particular, apart from matching on time (month-year) we also match on several publicly observable firm characteristics such as industry, firm age, size, asset growth, tangible assets, cash flows, external rating, and recent repayment problems. Some of these variables are observable through the firm's accounting statements; others are observable through the credit registry. To control for bank proprietary information we also control for the firm's internal limit, the distance from the limit (i.e., the difference between the firm's outstanding loans and its internal limit) as well as the interest rate on the most recently originated loan that is outstanding at t_0-*12*.[16] The latter can be particularly useful in capturing relevant firm characteristics that are unobservable to us but observable to the bank. We include the interest rate only in our most conservative specifications as it comes at the expense of degrees of freedom. Table 2 summarizes and defines our matching variables.

[Insert Table 2 about here]

[16] Note that by matching on the firm's internal limit and the distance from the limit we also implicitly match on the firm's outstanding bank debt.

The matching exercise yields 1,550 pairs corresponding to 365 treated firms.[17] When we also match on loan interest rates the sample is reduced to 1,221 pairs and 331 treated firms. The descriptive of these two matched treated groups are reported in Table 1 (to facilitate the comparison with the control group).

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

$$y = \alpha + \varepsilon, \qquad (1)$$

where the dependent variable, y (which we refer to as the bank's "standardized response") is the difference in the adjustment of the internal limit between the "treated" firms and their matched "control" counterparts:

$$y = [Limit_{t_0+12} / Limit_{t_0-12}]_{treated} - [Limit_{t_0+12} / Limit_{t_0-12}]_{control},$$

α is the constant term and ε is the error term in equation (1). A negative and statistically significant α would indicate 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 would also imply the net empirical dominance of these theories over alternative theories that predict an increase in the initial creditor's willingness to lend.

[17] Each treated firm can be matched with more than one control firm. Similarly, a control firm could be a match for more than one treated firm. Treated firms without a match are dropped.

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, *OutsideLoan*, as an explanatory variable[18]:

$$y = \alpha + \beta_1 OutsideLoan + \varepsilon . \qquad (2)$$

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. A negative β_1 and a zero or insignificant α would be 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*:

$$y = \alpha + \beta_1 OutsideLoan + \beta_2 OutsideLoan * Z + \beta_3 Z + \varepsilon . \qquad (3)$$

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. A negative β_1, a positive β_2, and a zero or insignificant α and β_3 would be consistent with H2.

[18] We use the value of total assets at t_0-*12* to avoid endogeneity problems.

For *Z* we mainly employ three indicators: a dummy variable indicating whether the bank has a floating charge on the firm's assets (*FloatingCharge*) as well as two qualifying variables regarding the value of floating charge assets (*FloatingChargeValue*) and the volatility of their values (*FloatingChargeVolatility*). The *FloatingChargeValue* is equal to the value of the assets under the floating charge scaled by total assets at t_0-*12* and the *FloatingChargeVolatility* is a standardized measure of the average standard deviation in the *FloatingChargeValue* over the past three years. This measure is standardized by subtracting its sample mean and then dividing by its sample deviation.

5. Results

We now test our two hypotheses. 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 examine the degree to which the bank's response is mitigated when its claims are protected (H2).

5.1. Non-Exclusivity Externalities and the Size of the Outside Loan: Test of H1

Table 3 reports our findings with respect to H1. Column (I) reports the bank's average response (i.e., equation (1)). Column (II) documents how the bank's response varies with the size of the outside loan (i.e., equation (2)). For both specifications we match the "treated" and "control" firms with respect to all variables discussed above except for the loan rate— the latter is added in corresponding specifications reported in

Columns (III) and (IV).[19] Matching on the loan rate allows us to better control for relevant firm characteristics that might be unobservable to us, but observable to the bank.

[Insert Table 3 about here]

Regardless of our set of matching variables, we find a negative and statistically significant constant term (i.e., the α in equation (1)), consistent with H1. In terms of magnitudes, we find that the bank's internal limits of "treated" firms drop on average by 6.3% to 7.5% more than the internal limits of similar "control" firms (Columns (I) and (III)). This is consistent with banks adjusting their internal limits downwards in view of the negative externalities resulting from the outside loans.

Consistent with this interpretation we also find that the bank decreases its internal limit more, the larger the outside loan. In terms of magnitudes, we find that the coefficient of the *OutsideLoan* in equation (2) ranges between -0.610** and -0.797***, depending upon the matching variables, whereas the constant term is not different from zero (Columns (II) and (IV)).[20] This suggests that a 1 percentage point increase in the *OutsideLoan* (i.e., the outside loan to total assets ratio) decreases the internal limit by 0.61% to 0.80%, relative to a similar control group. This is economically relevant as a 1-

[19] When a firm has more than one recently originated loan that is outstanding at $t_0 - 12$, we use the highest interest rate among those loans. Results are similar if instead of the highest interest rate we use the average interest rate. The results are also similar if the loan rate variable is replaced by the bank's internal rating. We use the loan rate for the specifications reported in the tables since ratings are sometimes missing.

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

standard deviation increase in the *OutsideLoan* (which is around 0.25 in both matched samples) induces a drop of the limit by 16% to 19%, depending on the specification.

All in all, our findings suggest that banks decrease their loan supply once borrowers become non-exclusive and they decrease it more the larger the outside loans, consistent with the theories on contractual externalities. Next, we examine how the bank's response changes when its existing and future claims are protected.

5.2. Protection of the Initial Bank's Claims: Test of H2

Table 4 presents our findings with respect to H2. We first estimate the model in equation (3) using the *FloatingCharge* dummy for our key explanatory variable *Z*. As mentioned earlier, 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 also secured by the assets under the floating charge. Hence, the degree of protection depends on the value of the pledged assets as well as the volatility of their values. Hence, we also estimate the model using *FloatingChargeValue* and *FloatingChargeVolatility* for *Z*.

[Insert Table 4 about here]

In Column (I), the coefficient of the *OutsideLoan*, β_1, is -0.654***, while the coefficient of the interaction term with the *FloatingCharge*, β_2, is 0.678**, resulting in a combined coefficient of 0.024, which is neither economically nor statistically different from zero. Consistent with H2, we also find that the coefficient of the *FloatingCharge*,

β_3, is close to zero and statistically insignificant. Similar results are obtained in Column (VI) when we also match on the loan rate. Our findings suggest that when the bank's claims are protected through a floating charge, the bank does not react to the size of the outside loan.

Column (II) of Table 4 presents our findings with respect to the *FloatingChargeValue*. The coefficient of the *OutsideLoan*, β_1, is -0.656**, while the coefficient of the interaction term, β_2, is 1.327**. This implies that a 1-standard deviation increase in the *FloatingChargeValue* (i.e., an increase of 0.09), decreases the bank's responsiveness with about 0.12. When the *FloatingChargeValue* is larger than 0.49, which is roughly equal to its sample mean, the bank's response becomes positive. Similar results are obtained in Column (VII) when we also match on the loan rate.

In Column (III) we find indeed that any given outside loan triggers a bigger decrease in the bank's willingness to lend, the higher the volatility of the floating charge assets. The coefficient of the *OutsideLoan*, β_1, is -0.654**, while the coefficient of *OutsideLoan*FloatingCharge*, β_2, is 1.026** and the coefficient of *OutsideLoan*FloatingChargeVolatility* is -2.384**.[21] Hence, when the volatility of the pledged assets is 1-standard deviation more than the average volatility (i.e., when *FloatingChargeVolatility* equals one), the bank's responsiveness increases by 2.384, suggesting a floating charge on assets whose values are volatile triggers a much larger

[21] As mentioned earlier, the *FloatingChargeVolatility* is standardized by subtracting the sample mean and dividing by the standard deviation of the volatility measure. However, results are robust to alterations such as using a dummy variable that equals one when the volatility measure is equal or below the 75th percentile, and equals zero otherwise. For example, for Match 1 we find that β_1 is -0.652**, β_2 is 0.789***, and the coefficient of *OutsideLoan*FloatingChargeVolatility* is -2.735***.

contraction in the initial bank's willingness to lend. In contrast, the presence of a floating charge whose value is not very volatile does not generate any reaction. Similar results are obtained in Column (VIII) when we also match on the loan rate.

In Columns (II) and (III) we investigated the impact of *FloatingChargeValue* and *FloatingChargeVolatility* individually. Next, in Columns (IV) and (IX) we combine the two and investigate whether a floating charge with a high *and* stable value mutes the bank's reaction to the outside loan. We therefore create a dummy variable, *FloatingChargeHighValueLowVolatility*, which equals one when the value is high and the volatility is low, and equals zero otherwise.[22] Consistent with H2, the results in Column (IV) show that the bank's willingness to lend does not change in outside loans when the dummy *FloatingChargeHighValueLowVolatility* equals one (i.e. the sum of the coefficients is -0.654-2.123+2.977=0.2). Similar results are obtained in Column (IX) where we also match on the loan rate.

To further understand the role of the floating charge, we also investigate the bank's response when its claims are protected through regular collateral. Our indicator, *Collateral*, is a dummy variable that equals one when the bank's existing debt is secured with collateral (whose value relative to the outstanding loan is greater or equal to 80%) and there is no floating charge on the firm, and it is equal to zero otherwise. Everything else equal, this form of collateral should be less effective as it does not necessarily allow

[22] *FloatingChargeHighValueLowVolatility* is a dummy variable that equals one if the value of the floating charge assets is above the 25th percentile and their volatility is below the 75th percentile, and equals zero otherwise. Similar results are obtained using alternative cut-offs. For example, using the 50th percentile for both value and volatility we find that for Match 1, β_1 is -0.654**, β_2 is -1.580*, and the coefficient of *OutsideLoan*FloatingChargeHighValueLowVolatility* is 2.328**.

the bank's future loans to retain seniority over outside loans and it doesn't automatically carry over to the bank's future loans. It could, however, 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. Results presented in Column (V) of Table 4 suggest that this is not the case. The coefficient of the *OutsideLoan*, β_1, is -0.664**, while the coefficient of the interaction term, β_2, is 0.294. Similar results are obtained in Column (X) when we also match on the loan rate. All in all, these findings suggest that the explanatory power of the floating charge rest on its ability to protect not only the bank's current but also future loans.

5.3. Robustness Checks

To investigate the robustness of our findings we perform several tests. First, we examine whether our findings could be driven by two potential alternative stories: anticipation and reverse causality. It is possible that the bank could have anticipated that a firm will search and obtain an outside loan and increased its internal limit to the firm to prevent it from searching for other banks. Hence, our observed decrease in the internal limit could simply reflect the adjustment of the internal limit back to "normal levels". To the extent this is true we should observe an increase in the internal limit just prior to the non-exclusivity event. Reverse causality would imply that a reduction in the internal limit has pushed firms to a new bank. If this were true, we should again observe a decrease in internal limit before the non-exclusivity event.[23] To investigate these two alternative

[23] Failure to increase the limit and accommodate the growing needs of the firm could also be a reason to seek outside loans. However, in the absence of negative externalities from the outside loans, the initial bank's internal limit to the firm should not decrease. This alternative explanation

stories, we examine how the internal limit behaves in the period just prior to the non-exclusivity event i.e., between t_0–*24* and t_0–*12*. Employing equations (1) and (2), but using the earlier timing for our dependent variable, we find no evidence for anticipation or reverse causality as both α and β_1 are close to zero and statistically insignificant.

Second, we also investigate whether decreases in the internal limit following the origination of outside loans could be driven by reduced cross-selling opportunities. To measure the bank's cross-selling potential we employ two alternative indicators: a) the number of lending products at the bank, and b) the amount of fixed fees on lending products. Both measures are scaled by total assets. Adding either of the two measures in equation (2) leaves our findings unaffected: α is close to zero and statistically insignificant, while β_1 is negative and statistically significant. The coefficients of the cross-selling variable itself are not statistically significant.

Finally, we re-estimate our models after including additional control variables to control for potential loan specific characteristics such as maturity and interest rate adjustability. Results remain robust to the inclusion of these controls.

6. Conclusions

Credit contracts are non-exclusive. While a set of theoretical papers study the impacts of non-exclusivity on the initial creditor's behavior, up to now, no empirical study has directly investigated the impact of non-exclusivity on the initial creditor's willingness to lend. In this paper, we aim to fill this gap by employing a unique dataset

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could have accounted for our findings in Table 3 if instead of the internal limit we were using the firm's outstanding debt at the initial bank, which tends to decrease over time when firms obtain a new relationship and switch away from the initial bank (Farinha and Santos (2002)).

that allows for the first time to directly investigate how a bank's willingness to lend changes when an exclusive borrower obtains loans from another bank. This would not be possible using data on the outstanding level of credit as this is an equilibrium outcome driven by both demand and supply factors.

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. Consistent with the theoretical literature on contractual externalities, 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. 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 the claims are secured with assets whose value is high and stable over time.

Our results highlight that information on counterparty exposures combined with general collateral that extends to future loans may mitigate the counterparty risk externality— a source of problems in the functioning of credit and insurance markets and an important factor behind several financial crises.

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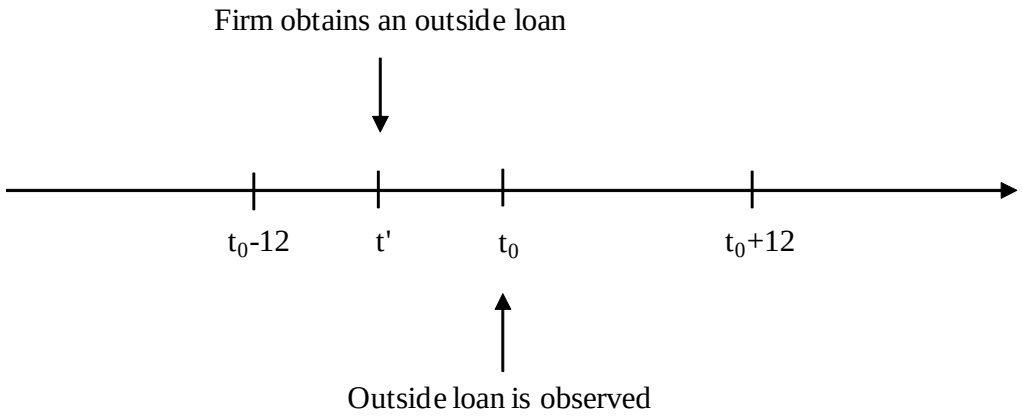
Figure 1: The Event Window



Note.— This figure describes the event window. Firms enter the event window with an exclusive lending relationship with our bank. At time t_0 an outside loan, originated at *t'*, is observed through the firm's accounting statements. The window [t_0*-12*, t_0*+12*] captures the bank's response to an outside loan.

Table 1: Variable Definitions and Descriptive Statistics

		Treated			Control			Treated (Match 1)			Treated (Match 2)		
Variables	Definition	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Total Assets	Total assets of the firm (in 1,000 SEK)	389,000	3,093	7,600,000	129,000	2,951	3,250,000	13,600	2,857	60,200	11,300	2,857	36,700
Asset Growth	Total assets at *t* / Total assets at *t-12*	1.119	1.017	0.717	1.105	1.009	1.958	1.050	1.017	0.207	1.051	1.017	0.208
Tangible Assets	Tangible assets / Total assets	0.716	0.814	0.270	0.665	0.747	0.282	0.793	0.867	0.199	0.798	0.868	0.194
Firm Age	Firm age in years	18.828	15.000	14.601	19.352	16.000	15.202	20.425	17.000	13.478	20.722	17.000	13.671
Cash Flow	Cash flow / Total assets	0.042	0.045	0.174	0.012	0.024	0.464	0.047	0.048	0.085	0.050	0.050	0.082
External Rating	Probability of default (in %)	3.106	1.200	5.876	2.472	0.900	5.873	1.753	1.200	2.264	1.794	1.200	2.349
External Rating (1-5)	dummy = 1 is highest and 5 is lowest credit risk rating	3.193	3.000	1.118	3.396	3.000	1.060	3.304	3.000	0.844	3.296	3.000	0.851
Recent Repayment Problems	dummy = 1 if recent repayment problem with supplier, = 0 otherwise.	0.032	0.000	0.177	0.019	0.000	0.136	0.000	0.000	0.000	0.000	0.000	0.000
Internal Limit	Maximum exposure to the firm in (in 1,000 SEK)	29,200	1,046	230,000	12,000	878	131,000	6,468	1,171	30,300	5,389	1,171	18,300
Internal Limit to Total Assets	Internal limit / Total assets	0.430	0.367	0.312	0.470	0.352	1.895	0.437	0.411	0.208	0.438	0.414	0.208
Distance to Limit	(Internal limit- Outstanding bank debt) / Total assets	0.135	0.048	0.191	0.057	0.019	4.713	0.088	0.036	0.116	0.091	0.039	0.118
Loan Interest Rate (%)	Annual interest rate of the loan (in %)	6.418	6.600	2.201	6.319	6.450	2.245	6.554	6.550	1.749	6.677	6.700	1.671
Total Bank Debt	Total bank debt (in 1,000 SEK)	20,100	940	160,000	8,256	783	81,500	5,718	1,060	25,600	4,820	1,060	16,000
Total Bank Debt to Total Assets	Total bank debt / total assets	0.370	0.319	0.265	0.422	0.314	1.811	0.401	0.376	0.203	0.401	0.376	0.202
Outside Loan	Outside loan (i.e. loan initiated at other bank) / Total assets	0.179	0.055	0.523	-	-	-	0.134	0.047	0.257	0.127	0.046	0.242
Outside Loan to Internal Limit	Outside loan/ Internal limit	0.781	0.146	3.708	-	-	-	0.393	0.109	0.899	0.374	0.105	0.854
Adjustment	$[Limit_{t_0+12}/Limit_{t_0-12}]_{Treated} - 1$	-0.062	-0.073	0.783	-	-	-	-0.104	-0.063	0.494	-0.101	-0.064	0.504
Floating Charge	dummy =1 if debt is secured with floating charge, zero otherwise	0.066	0.000	0.248	-	-	-	0.068	0.000	0.253	0.066	0.000	0.249
Floating Charge Value	Value of movables to total assets (if floating charge=1)	0.432	0.469	0.123	-	-	-	0.457	0.471	0.090	0.469	0.483	0.075
Floating Charge Volatility	Volatility of movables (if floating charge = 1)	0.074	0.036	0.102	-	-	-	0.083	0.032	0.137	0.077	0.028	0.140
Floating Charge High Value Low Volatility	dummy=1 if floating charge, high value (top 75 p) and low volatility (low 75 p)	0.027	0.000	0.163	-	-	-	0.033	0.000	0.179	0.033	0.000	0.180
Collateral	dummy=1 if collateral value >80% of total bank debt	0.209	0.000	0.407	0.216	0.000	0.412	0.249	0.000	0.433	0.236	0.000	0.425
#Obs			991			25,980			365			331	

Note.— We report the mean, median and standard deviation (SD) for the treated group, the control group, the treated group after the first (Treated (Match 1)) and second matching procedure (Treated (Match 2)). The matching variables and procedure are in Table 2.

Table 2: Definition of Matching Variables

Matching Variables	Match 1	Match 2	#	Possible Values
Public				
A. Basic characteristics				
1. Period: Month	X	X	45	2003:04 - 2006:12
2. Industry	X	X	46	Two digit NACE codes
3. Firm age	X	X	2	= 1 if the firm is younger then 10 years, and zero otherwise
4. Total Assets	X	X	2	= 1 if the matched firm has a similar total assets (using a (-40%, +40%) window), and =0 otherwise
5. Asset Growth	X	X	2	= 1 if the matched firm has a similar assets growth during (t0-24, t0-12) (using a (-40%, +40%) window), and =0 otherwise
6. Tangible Assets	X	X	2	= 1 if the matched firm has a similar tangible assets to total assets (using a (-40%, +40%) window), and =0 otherwise
B. Performance characteristics				
7. Cash Flow	X	X	2	= 1 if the matched firm has a similar EBITDA to total assets (using a (-25%, +25%) window), and =0 otherwise
C. Risk characteristics				
8. External Rating	X	X	5	(1-5) corresponding to a PD in the [8.05%, 100%), [3.05%, 8.05%), [0.75%, 3.05%), [0.25%, 0.75%), and [0, 0.25%) range
9. Recent Repayment Problems	X	X	2	= 1 if the firm defaulted on any payments during the last 24 months
Private				
D. Credit supply characteristics				
10. Internal Limit	X	X	2	= 1 if the matched firm has a similar internal limit (using a (-40%, +40%) window), and =0 otherwise
11. Distance to Limit	X	X	2	= 1 if the matched firm has a similar outstanding debt to internal limit ratio (using a (-40%, +40%) window), and =0 otherwise
E. Internal rating				
12. Loan Interest Rate		X	3	= 1 if the matched firm has a similar loan interest rate (using a (-40%, +40%) window), and =0 otherwise

Note.— The table reports the variables included in the two matching procedures (Match 1 and Match 2), the number of possible values (#) and a list of values for each matching variable.

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

Dependent variable: $[Limit_{t_0+12}/Limit_{t_0-12}]_{Treated}$ - $[Limit_{t_0+12}/Limit_{t_0-12}]_{Control}$				
	(I)	(II)	(III)	(IV)
	Match 1	Match 1	Match 2	Match 2
Number of Observations (Matched Pairs)	1,550	1,550	1,221	1,221
Number of Treated Firms	365	365	331	331
Intercept	-0.063*	0.018	-0.075**	0.026
	(-1.839)	(0.406)	(-2.031)	(0.581)
OutsideLoan		-0.610**		-0.797***
		(-2.325)		(-3.475)
R^2	-	0.03	-	0.04

Note.— The table reports results from matched regressions relating the standardized response in the internal limit to a constant term (columns (I) and (III)) and to the size of outside loan (i.e. loan provided by another bank; columns (II) and (IV)). Columns (I) and (II) report the results for the first matching procedure (Match 1) whereas columns (III) and (IV) those for the second procedure (Match 2). The definitions of all variables and matching procedures are provided in Table 2. We weigh each observation by one over the number matched control group firms for each treated firm. T-statistics calculated on robust standard errors, clustered on a treated-firm level, are reported in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 4: Non-Exclusivity Externalities and Protection of Initial Creditor's Claims: Test of H2

	Dependent variable: $[Limit_{t_0+12}/Limit_{t_0-12}]_{Treated}$ - $[Limit_{t_0+12}/Limit_{t_0-12}]_{Control}$									
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)
	Match 1	Match 1	Match 1	Match 1	Match 1	Match 2	Match 2	Match 2	Match 2	Match 2
Number of Observations (Matched Pairs)	1,550	1,550	1,550	1,550	1,550	1,221	1,221	1,221	1,221	1,221
Number of Treated Firms	365	365	365	365	365	331	331	331	331	331
Intercept	0.021	0.021	0.022	0.021	0.047	0.032	0.033	0.032	0.032	0.051
	(0.455)	(0.444)	(0.464)	(0.455)	(0.911)	(0.716)	(0.726)	(0.706)	(0.715)	(1.011)
OutsideLoan	-0.654**	-0.656**	-0.654**	-0.654**	-0.664**	-0.871***	-0.873***	-0.871***	-0.871***	-0.869***
	(-2.446)	(-2.460)	(-2.444)	(-2.445)	(-2.013)	(-4.160)	(-4.179)	(-4.160)	(-4.157)	(-3.281)
FloatingCharge	-0.036		-0.004	0.135		-0.059		-0.068	0.125	
	(-0.245)		(-0.021)	(1.281)		(-0.370)		(-0.365)	(1.006)	
OutsideLoan x FloatingCharge	0.678**		1.026**	-2.123**		0.936***		1.299***	-1.157**	
	(2.012)		(2.566)	(-2.456)		(3.357)		(3.464)	(-2.517)	
FloatingChargeValue		-0.047					-0.125			
		(-0.136)					(-0.343)			
OutsideLoan x FloatingChargeValue		1.327**					1.776***			
		(2.180)					(3.399)			
FloatingChargeVolatility			0.111					0.155		
			(0.751)					(1.040)		
OutsideLoan x FloatingChargeVolatility			-2.384**					-2.424*		
			(-2.325)					(-1.891)		
FloatingChargeHighValueLowVolatility				-0.195					-0.165	
				(-0.661)					(-0.249)	
OutsideLoan x FloatingChargeHighValueLowVolatility				2.977***					1.733*	
				(3.489)					(1.795)	
Collateral					-0.139					-0.134
					(-1.617)					(-1.530)
OutsideLoan x Collateral					0.294					0.388
					(0.716)					(1.028)
R^2	0.03	0.03	0.03	0.04	0.03	0.05	0.05	0.05	0.05	0.05

Note: The table reports results from matched regressions relating the standardized response in the internal limit to a set of explanatory variables. Columns (I) to (V) report the results for the first matching procedure (Match 1) whereas columns (VI) to (X) report the corresponding results for the second matching procedure (Match 2). The definitions of all variables are provided in Table 2. We weigh each observation by one over the number of matched control-group firms for each treated firm. T-statistics calculated on robust standard errors, clustered on a treated-firm level, are reported in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.