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The role of dynamic renegotiation and asymmetric information in financial contracting ☆

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ABSTRACT

Using data from Securities and Exchange Commission filings, I show that the typical bank loan is renegotiated five times, or every nine months. The pricing, maturity, amount, and covenants are all significantly modified during each renegotiation, whose timing is governed by the financial health of the contracting parties and uncertainty regarding the borrowers' credit quality. The relative importance of these factors depends on the duration of the lending relationship. I interpret these results in light of financial contracting theories and emphasize that renegotiation is an important mechanism for dynamically completing contracts and for allocating control rights ex post.

1. Introduction

Privately placed debt is by far the most important source of external financing for firms in Organisation for Economic Co-operation and Development (OECD) countries (Gorton and Winton, 2003). Unsurprisingly, a large literature has developed that examines this form of financing and its implications for corporate behavior.[1] Despite this attention, few studies examine the renegotiation of privately placed debt outside of financial distress. This void is troubling because a large number of theoretical studies show that the possibility of renegotiation can have a significant impact on security design, incentives, and welfare.[2]

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[1] Empirical studies of privately placed debt have examined: debt maturity (e.g., Scherr and Hulburt, 2001; Ortiz-Molina and Penas, 2004; Berger, Espinosa-Vega, Frame, Miller, 2005), pricing (Chava, Livdan, and Purnanandam, 2009; Altman, Gande, and Saunders, 2010), and covenants (Bradley and Roberts, 2003; Chava and Roberts, 2008; Roberts and Sufi, 2009a).

[2] See Section 3 for a discussion of the relevant theories.

This paper helps fill that void using a novel, hand-collected data set of loan paths for a random sample of bank borrowers. A loan path is a sequence of events beginning with an origination and ending with a terminal event, such as maturity or early termination. In between these two termini I record any and all renegotiations that occur, as well as information on the modifications made to the loan. These data enable me to address two broad questions: What happens in renegotiation? And, when does renegotiation occur? For both questions, I focus on how the answer varies as a function of the duration of the lending relationship and the number of renegotiations.

My primary findings are fourfold. First, renegotiations are initiated by borrowers primarily in response to changing conditions, as opposed to lender interventions due to default. Less than 28% of the sample renegotiations are due to a covenant violation or in anticipation of a covenant violation. Yet, more than 75% of all covenant violations lead to a renegotiation. Thus, renegotiations caused by contractual breaches occur infrequently, though when a contractual breach occurs it frequently leads to renegotiation.[3]

Second, most loans are renegotiated multiple times over relatively short horizons, with each renegotiation leading to significant changes to the contract. Ignoring the few short-term loans that are not renegotiated, the typical loan has a maturity at origination of four and a half years but is renegotiated almost five times, or every nine months. This finding is not an artifact of maturity extensions, which occur in less than 20% of renegotiations and typically with modifications to other features of the contract.

Renegotiations produce average increases (decreases) in the pricing, amount, and maturity of the loan equal to 73 (74) basis points, 103 (100) million dollars, and 23 (12) months, respectively. Relative to an average interest rate spread of 205 basis points, loan amount of 200 million dollars, and maturity of 5.5 years, these changes are economically large. They are also mostly independent of the renegotiation round (i.e., first, second, third, etc.) and the duration of the contractual relationship. In addition to modifications of the contract terms, I observe changes to the tranche structure and loan type. Borrowers and lenders frequently repackage loans into more or fewer tranches during renegotiations, while also changing the nature of lenders' commitments from term loans to revolving lines of credit and vice versa.

Third, the plurality of renegotiations (46%) modify only the covenant package. In fact, covenants are more likely to be modified than other loan terms throughout the life of the loan. These modifications are driven largely by borrowers' desires to alter their investment, operating, or financing policies and, to a lesser extent, by borrowers' financial distress. In light of a growing number of contingencies tied to the interest rate (performance pricing grid), amount (borrowing base), and maturity (evergreen provisions), it might not be surprising that covenant modifications are responsible for many renegotiations.[4] Despite the presence of these contingencies, the majority (54%) of renegotiations modify the interest rate, amount, or maturity and over 35% of renegotiations modify an interest rate spread linked to a pricing grid. Thus, while contractual contingencies likely mitigate the transaction costs associated with ex post renegotiation, an important role appears to be allocating bargaining power in renegotiation (Roberts and Sufi, 2009b), which occurs frequently and in spite of the large number of contractual contingencies.

Finally, the timing of renegotiations is governed by three factors: the financial health of the parties to the loan, the uncertainty regarding borrowers' future profitability, and the outcome of renegotiation. Financially weak borrowers and borrowers with more uncertain future prospects accelerate the onset of renegotiation. I also find significant temporal heterogeneity in the impact of these factors on the duration to renegotiation. The timing of initial renegotiations occurs independently of macroeconomic conditions or the outcome of renegotiation. In fact, borrower leverage is the only relevant determinant of the initial renegotiation duration. In contrast, subsequent renegotiations are driven by a combination of factors.

In sum, my evidence highlights the dynamic, state-contingent nature of loan contracts in which renegotiation fills the void left by contractual incompleteness. Alternatively, one can view renegotiation as a means to dynamically complete contracts. While my study is primarily descriptive, my results provide a unique opportunity to comment on theories of financial contracting and offer guidance for future research.

The frequency of renegotiation despite the presence of numerous contractual contingencies emphasizes the fundamental incompleteness of loan contracts (Grossman and Hart, 1986; Hart and Moore, 1988). The focus of most renegotiations on covenant modifications emphasizes that renegotiation is an important mechanism for the allocation of control rights across states (Garleanu and Zwiebel, 2009). Thus, while contracts, via covenants and other contractual contingencies, allocate control rights ex ante (e.g., Aghion and Bolton, 1992; Dewatripont and Tirole, 1994), renegotiation allocates control rights ex post.

The finding that borrowers grant creditors strong control rights suggests that information asymmetry in conjunction with agency problems is an important element of the contracting environment (e.g., Dessein, 2005; Garleanu and Zwiebel, 2009). This finding presents a challenge for theories predicated on symmetric information and hold-up (Hart and Moore, 1998), in which the relative importance of borrower effort for the success of the funded investment dictates that the borrower should retain strong control rights. Further, the persistence of strong creditor control rights throughout the lending relationship suggests that

[3] A number of studies examine the implications of covenant violation, including Smith and Warner (1979), Beneish and Press (1993, 1995), Chen and Wei (1993), Smith (1993), Sweeny (1994), Chava and Roberts (2008), Roberts and Sufi (2009a), and Nini, Smith, and Sufi (2009).

[4] Some covenants do come with contingencies. For example, maintenance covenant thresholds often vary over time in a manner determined by the performance of the company. Net worth covenants often include buildup provisions that increase the threshold with a fraction of positive net income. Restrictions on capital expenditures often include carryovers, which define the amount of unused investment capacity in a given period that could be carried forward into future periods.

information asymmetry about the investments, if not the borrower, is persistent.

I find that increasing borrower uncertainty accelerates the onset of renegotiation. This fact is consistent with the fundamental trade-off between costly, early information acquisition and the potential for future transfers in Garleanu and Zwiebel (2009). When information asymmetry is large and the potential for future transfers high (when borrower uncertainty is high), information acquisition via renegotiation occurs sooner.

Finally, I find little evidence supporting the prediction that ex post moral hazard is mitigated through changes in the interest rate in renegotiation (Gorton and Kahn, 2000). Interest rate changes in renegotiation are monotonically negatively related to the type of news—good or bad—about the investment project. Thus, price modifications occurring in renegotiation appear to primarily reflect changes in credit risk, suggesting that moral hazard concerns could be reflected in the fees or the nonprice terms of the contract.

My paper is most closely related to Roberts and Sufi (2009b), which examines a sample of loans and the first, if any, renegotiation of those loans. Their study is largely a cross-sectional comparison of loans that are and are not renegotiated. In contrast, I take a dynamic view by examining the entire life of loan contracts from origination to termination. This perspective enables me to provide new evidence on contract renegotiation and its determinants, as well as a novel economic message that emphasizes the role of renegotiation as a means to dynamically complete contracts and allocate control rights ex post.[5]

My paper also builds on a number of studies examining specific features of loan contracts. For example, Bradley and Roberts (2003), Dichev and Skinner (2002), and Chava and Roberts (2008) show that loan contract terms are set tightly, significantly restricting the behavior of borrowers. I show that ex post renegotiation enables borrowers to loosen these constraints throughout the contracting relationship as new information becomes available. I also show that ex ante measures of relative control rights are not equivalent to ex post measures. Covenants that are set tightly at origination need not lead to more ex post renegotiation, consistent with an equilibrium view of security design.

Related, Asquith, Beatty, and Weber (2005) show that loan contracts often contain a number of contingencies that alter the terms of the agreement in response to changes to the credit quality of the borrower. I show that these contingencies do not prevent renegotiation. Instead, they merely delay it. Thus, contingencies should be viewed in part as a mechanism to allocate bargaining power (Roberts and Sufi, 2009b), as opposed to just avoiding costly ex post renegotiation.

[5] Ivashina and Sun (2011) look at the role of institutional traders in a subsample of renegotiations in which loan pricing changed. A recent working paper by Mian and Santos (2012) examines the role of loan maturity extensions in mitigating liquidity concerns. More broadly, my study is related to a number of papers examining renegotiation in technical default (see studies mentioned in footnote 2) and payment default (e.g., Asquith, Gertner, and Scharfstein, 1994; Benmelech and Bergman, 2008).

The remainder of the paper proceeds as follows. Section 2 describes the data and presents summary statistics. Section 3 provides the theoretical motivation for my analysis. Sections 4 and 5 present the empirical results. Section 6 concludes.

2. Data and sample statistics

I begin with a random sample of 114 firms in the intersection of Standard and Poor's (S&P) Compustat database and a 2010 extract of Thomson Reuters-Dealscan database.[6] The decision to sample 114 firms is based on two considerations: power and cost. Power considerations necessitate a certain sample size to statistically identify various relations. The unit of observation is a renegotiation event, not a firm. As such, the number of observations used in my analysis is much greater than 114, though the observations are not independent. The cost of drawing this sample is governed by the need to read several thousand Securities and Exchange Commission (SEC) filings to accurately identify renegotiation events and the changes taking place in renegotiation. Admittedly, cost considerations are more important for determining the sample size.

For these firms, I extract all available loan (a.k.a. tranche or facility) information from Dealscan. I exclude all publicly traded and Rule 144a debt from the sample because coordination and free-rider problems stemming from dispersed ownership limit the scope for renegotiation in these issues. In addition, institutional differences can confound comparisons with intermediated debt.

I identify originations and renegotiations for each of these firms by examining the SEC filings available in electronic form on the Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system. Through a variety of regulations, the SEC requires that firms detail material debt agreements, sources of liquidity, and long-term debt schedules (e.g., Johnson, 1997; Kaplan and Zingales, 1997). Further, the SEC requires disclosure of any material changes to these debt agreements. Consequently, I am able to collect information on contracts and amendments (i.e., renegotiations), both of which are attached to the filings as exhibits. A limitation of this collection procedure is that electronic filings are available from the SEC beginning only in 1994. However, I am able to extend the sample to pre-1994 periods for loans in which there is a discussion of earlier events.

Fig. 1 presents the distribution of loan originations and renegotiations over the sample period. The cyclical behavior of originations and, to a lesser extent, renegotiations is apparent. The figure also shows the data limitations toward the beginning and end of the sample horizon in which both originations and renegotiations drop off substantially, the latter due to censoring.

2.1. Loan paths

The data collection process enables me to construct loan paths. Each loan path begins with an origination,

[6] I use the link file discussed in Chava and Roberts (2008) to merge these two data sets.

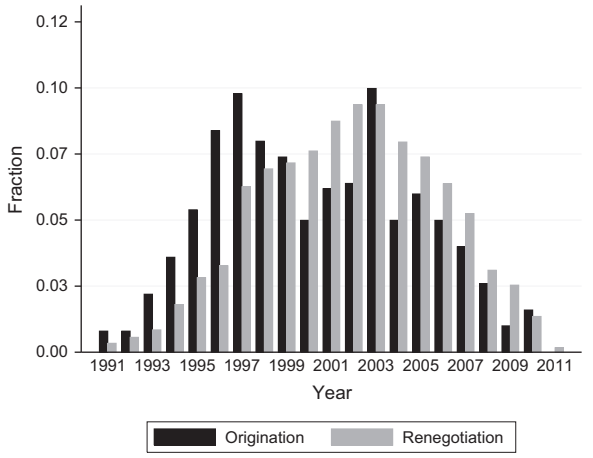

Fig. 1. Distribution of originations and renegotiations by year. The figure presents the empirical histograms of loan originations and renegotiations by year.

includes any and all renegotiations, and ends with one of four possible terminal events.

There are three types of renegotiations: amendments, amended and restated agreements, and rollovers. These renegotiation types differ primarily in their implications for the filings. Amendments spell out only the modifications to the loan; i.e., the terms that change as a result of the renegotiation. Amended and restated agreements result in a new, stand-alone contract that replaces the previous contract and incorporates all amendments up to that point. Rollovers are similar to amended and restated agreements in that they represent a new credit agreement with existing lenders.[7] However, they are identified not from separate attachments in the filings, but from reading the management discussion and analysis in the filings and confirming at least some overlap among the lead lender(s) with the previous contract. They must also occur prior to the most recently stated contract maturity. From an economic standpoint, these distinctions among renegotiation types are less important. All three events correspond to changes to the terms of the contract between the borrower and existing lender(s).

The possible terminal events of a loan path include mature, terminate, replace, and censor. A loan is deemed to have matured if it terminates on the most recently stated maturity date. This is the default terminal event. Loans are assumed to have matured unless I can find evidence in the SEC filings that the loan terminated in a different manner. This determination is governed by the limitations of the data.

Terminated loans are those loans that end before their most recently stated maturity date. Early termination can arise for a variety of reasons. Relatively few loans carry pre-payment penalties and those that do (typically institutional tranches) carry a relatively small penalty (Wright, Cooke, and Gray, 2007). Further, most loans impose a fee on undrawn amounts and require frequent financial reporting distinct from the reporting requirements of the SEC.

The third event refers to loans that are replaced by a new loan from a different lender. The condition that new lenders replace the loan is important. Replacements by the same lender are what I refer to as "rollovers" and are treated as renegotiations. The distinction necessitates the collection of information on the lead lender or, in the case of a syndicated loan, lenders. Most of this information comes from Dealscan, with supplemental data from the SEC filings. I also gather information on bank restructurings to account for bank name changes.[8]

The result of this data collection is a sample of 501 loan paths for the 114 firms. Each observation is an event (e.g., origination, renegotiation, terminus) along a unique loan path for a given firm. (Appendix B presents and discusses a sample loan path in addition to providing further details about the data.) Table 1 presents summary statistics for the sample. Panel A shows that the sample contains 1,773 renegotiations of 501 loans. Amendments tend to occur more quickly than the other two types of renegotiations. They also tend to make less extensive modifications to the contract.

Each loan experiences 3.5 renegotiations over an average stated maturity at origination of 51 months. If I consider the total duration of each loan from origination to terminal event, the average life is 71 months, reflecting a greater tendency to extend instead of shorten the maturity of the loan in renegotiation.

Conditioning the sample on loans that are renegotiated at least once (Panel B) eliminates 27% of the loans, which are mostly short-term loans and loans originated toward the end of the sample horizon whose full loan paths are censored. For this subsample, the average loan is renegotiated almost five times. The average stated maturity at origination is approximately 54 months compared with a total loan duration of 82 months. These renegotiations are not confined to revolving lines of credit. Term loans are renegotiated 4.0 times, on average, compared with 5.5 times for lines of credit.

Panel C summarizes several loan characteristics at origination for both the sample of renegotiations and the Dealscan sample for comparison. Dealscan contains both originations and renegotiations, many of which cannot be clearly distinguished.[9] The loan characteristics are broadly similar across the two samples. The tranches in my sample are dominated by revolving lines of credit and term loans, much like Dealscan. One notable difference is the Other category, which contains 42 loan types in Dealscan but only 12 in my sample. Finally, my deal purpose distribution

[7] For rollovers, I have information for changes to the pricing, amount, and maturity of the contract, but not for changes to covenants.

[8] It is important to recognize the limitations of the data when distinguishing rollovers from replacements. Without a continuous record of loan ownership and sales, there is a certain amount of educated guesswork involved in assignment.

[9] Dealscan has a refinancing indicator variable. In my extract, this variable is missing for 63% of the facility (i.e., loan-level) observations. Further, Dealscan refinancings are defined differently from my definition of renegotiation, making direct comparisons difficult. See Appendix B for further details.

Table 1
Sample statistics.

Panel A presents summary statistics for the entire sample of loan paths. Panel B presents summary statistics for the subsample of loan paths that experience at least one renegotiation. Duration estimates are computed after excluding censored observations. Panel C presents contract characteristic summary statistics for the sample of loans from the Securities and Exchange Commission (SEC) filings and the Dealscan database. Panel D presents borrower characteristic summary statistics for the sample of deals from the SEC filings and the Compustat database. All variables are formally defined in Appendix A.

Panel A: Sample statistics for the entire sample

		Per tranche			
	Count	Mean	Minimum	Median	Maximum
Tranches	501				
Number of Renegotiations	1,773	3.54	0.00	2.00	30.00
Duration to amend and restate (months)	303	12.13	0.69	10.00	49.38
Duration to amend (months)	1,354	7.40	0.03	5.51	55.51
Duration to rollover (months)	116	17.20	1.74	11.34	179.70
Terminal events					
Replace	141				
Terminate	28				
Mature	229				
Censor	103				

Panel B: Sample statistics for the subsample with at least one renegotiation

		Per tranche			
	Count	Mean	Minimum	Median	Maximum
Tranches	364				
Number of Renegotiations	1,773	4.87	1.00	4.00	30.00
Duration to amend and restate (months)	303	12.13	0.69	10.00	49.38
Duration to amend (months)	1,354	7.40	0.03	5.51	55.51
Duration to rollover (months)	116	17.20	1.74	11.34	179.70
Terminal events					
Replace	94				
Terminate	22				
Mature	166				
Censor	82				

Panel C: Contract characteristics

	SEC data				Dealscan data			
	Number of Observations	Mean	Standard Deviation	Median	Number of Observations	Mean	Standard Deviation	Median
Terms								
Tranche amount (millions)	487	196.62	307.12	100.00	245,329	216.11	643.02	65.00
Maturity (months)	481	50.56	26.04	60.00	220,186	55.80	47.94	54.00
All drawn spread (percent)	353	1.99	1.48	1.75	136,587	2.24	1.64	2.00
Number of lenders	173	4.43	4.56	3.00	153,064	3.85	5.23	2.00
Loan type distribution (percent)								
364-day facility	25	4.99			12,486	5.08		
Revolver	266	53.09			89,933	36.57		
Term loan	173	34.53			90,619	36.85		
Other	16	3.19			52,849	21.49		
Deal purpose distribution (percent)								
Corporate purposes	71	14.17			79,382	45.50		
Debt repayment	78	15.57			23,241	13.32		
Leverage/Management Buyout	15	2.99			5,454	3.13		
Takeover	97	19.36			6,666	3.82		
Working capital	87	17.37			20,982	12.03		
Other	52	10.38			38,734	22.20		

Panel D: Borrower characteristics

	SEC data				Compustat data			
	Number of Observations	Mean	Standard Deviation	Median	Number of Observations	Mean	Standard Deviation	Median
Sales (millions)	2,759	412.11	540.32	179.05	394,885	500.66	1,489.35	48.63
Total debt/EBITDA	2,474	12.75	20.38	10.29	366,664	5.65	24.06	2.90
Total debt/Book assets (percent)	2,651	35.01	19.95	33.34	400,737	31.54	51.15	21.58

Table 1 (*continued*)

	SEC data				Compustat data			
	Number of Observations	Mean	Standard Deviation	Median	Number of Observations	Mean	Standard Deviation	Median
EBITDA/Book assets (percent)	2,543	3.29	2.37	3.11	378,183	−1.89	18.75	2.45
Market-to-Book	2,584	1.48	0.63	1.32	383,236	3.06	6.47	1.47
Physical capital/Book assets (percent)	2,731	31.61	22.64	25.83	413,180	30.70	26.03	22.48
Cash/Book assets (percent)	2,731	5.30	6.59	2.76	413,468	17.59	22.29	7.66
Altman's Z-score	2,410	1.89	2.08	1.42	361,163	0.78	24.59	1.70
Fraction with credit rating	2,582	0.42	0.49	0.00	456,373	0.26	0.44	0.00
Vol(EBITDA/Book assets) (percent)	2,612	1.66	1.64	1.10	296,028	4.75	11.30	1.68

is more symmetric than that in Dealscan, which is skewed toward general corporate purposes.

Panel D compares the borrowers' financial characteristics from the renegotiation sample with the characteristics of firms in the Compustat database over the period 1994–2010. My firms are, on average, smaller, more highly levered, and more profitable, and they have fewer growth opportunities (lower market-to-book ratio). These differences reflect my sampling scheme, which conditions on issuing privately placed debt. Fortunately, this condition represents the large majority of the population of publicly traded firms (Strebulaev and Yang, 2013). Appendix A discusses the Compustat data and the macroeconomic data used in my analysis.

3. Theoretical motivation

The theoretical motivation for my study has roots in a vast literature on financial contracting. In discussing this literature, I emphasize renegotiation: how it arises, how it affects security design, and its outcomes. For a broader and more detailed treatment of financial contracting, see the textbooks by Bolton and Dewatripont (2005) and Tirole (2006) and the surveys by Biais, Mariotti, and Rochet (2011) and Sannikov (2012).

Renegotiation occurs when the parties to a contract are unable to commit to the terms of their agreement. This lack of commitment is a consequence of an ex post inefficiency arising under the prevailing terms of the contract. At first glance, such an outcome seems odd. Why would agents design a contract in which inefficient outcomes could arise? There are two reasons.

The first reason is that inefficient outcomes could be purposely incorporated into the ex ante contract as means to punish agents for deviations from equilibrium. This just begs the question of why agents, upon arriving at a punishment, do not abandon the contract and sign a new one resulting in a pareto improving outcome. The problem is that if punishments are renegotiated, they might no longer serve as an effective deterrent to off-equilibrium outcomes. If agents know that punishments are not credible because they will be renegotiated away, then ex ante incentives get distorted. Further, financial contracts often specify a payoff distribution (e.g., for the purpose of risk sharing) that might not be realized in renegotiation even though renegotiation leads to a pareto-optimal outcome. These considerations imply that the security design problem must take into account the possibility of renegotiation. Unfortunately, doing so makes the contracting problem significantly more difficult (Maskin and Sjorstrom, 2002). Consequently, a large fraction of the financial contracting literature assumes away the possibility of renegotiation or emphasizes renegotiation-proof contracts in which renegotiation does not occur on the equilibrium path.

For example, early work by Gale and Hellwig (1985) shows that debt is the optimal financing arrangement between entrepreneur and investor. Gale and Hellwig assume that renegotiation does not occur but they recognize that the optimal contract is not robust to renegotiation.[10] Both borrower and lender would be better off renegotiating the contract in bankruptcy so that the lender avoids the full cost of verifying the state and the borrower retains a portion of the asset value. The punishment in this example—costly bankruptcy—is ex post inefficient and, hence, generates scope for pareto-improving renegotiation. However, ex post punishment is necessary from an ex ante perspective to impose discipline on the borrower.

This intuition extends to a number of dynamic theories of financial contracting. Bolton and Scharfstein (1990) assume that renegotiation is infeasible in deriving the optimal contract, but they show that the presence of an enforceable investment covenant would lead to renegotiation because liquidation is inefficient. Similarly, the asymmetric information models of Clementi and Hopenhayn (2006), DeMarzo and Sannikov (2006), DeMarzo and Fishman (2007), and Biais, Mariotti, Rochet, and Villeneuve (2010) produce long-term contracts that are susceptible to renegotiation because of the inefficiency of the punishment, e.g., firing the agent or liquidating her assets.[11] Thus, the common theme among these models relating to renegotiation is that ex post inefficient outcomes arising from the need to impose

[10] Gale and Hellwig (1989) explore the implications of renegotiation in a similar theoretical framework.

[11] One possible interpretation of the state-contingent contracts arising in these models, as well as the dynamic asymmetric information models, is that they are implemented with non-contingent contracts that are then renegotiated in a way that results in the appropriate state contingencies. An alternative interpretation, and one emphasized by the authors of these studies, is that the state-contingent nature of these contracts reflects the contractual contingencies observed in actual debt contracts, such as performance pricing.

ex ante discipline on the agent generate surplus that leads to renegotiation.[12]

The second reason that agents would design a contract in which inefficient outcomes could arise is contractual incompleteness. Contracts could contain gaps, missing provisions, and ambiguities arising from bounded rationality, transaction costs, and non-verifiability of information (Hart, 1995). In this case, inefficient outcomes arise not from explicit punishments in the contract but from contingencies not explicitly addressed in the contract. As such, contractual incompleteness puts renegotiation (or judicial interpretation) at the fore of resolving ex post inefficient outcomes under the contract.

This discussion highlights that inefficient outcomes and unforseen contingencies are likely to give rise to surplus under the terms of the contract and, consequently, provide scope for pareto-improving renegotiation. Specifically, these theories highlight that changes in the credit quality of the borrower, changes to the outside options available to the parties, and the contract itself are all relevant for the onset of renegotiation.

3.1. Implications for renegotiation outcomes and security design

In addition to providing a rationale for the occurrence of renegotiation, several theories provide sharper predictions for what happens in renegotiation and the impact on ex ante security design. For example, Garleanu and Zwiebel (2009) note that with costly renegotiation and symmetric information, as in Hart and Moore (1998), contracts are designed to minimize renegotiation costs by anticipating, as much as possible, future contingencies. Further, with the possibility of holding up ex ante investments, decision rights should be allocated to minimize distortions in ex ante investment. Arguably, borrower effort is more important to the success of funded investments than the effort of creditors, who typically play a passive role in their debtors' investment activities.

Building on these insights, Garleanu and Zwiebel (2009) show that in a setting with asymmetric information stronger rights are granted to the lender in the initial contract, precisely the opposite implication of the traditional incomplete contracts literature. Further, stronger rights are granted to the lender when information asymmetry is greater, when it is more costly for the lender to become informed, and when it is less costly to renegotiate. Renegotiation is also biased toward the uninformed party giving up these rights. In other words, lenders yield strong decision rights by loosening covenants and waiving covenant violations. Finally, the equilibrium represents a trade-off between early and late information acquisition. Acquiring information early results in more efficient initial contracts. The cost of early information acquisition is that the lender could be acquiring costly information when future states of the world do not warrant it, in situations in which the scope for ex post renegotiation is small and there is no need to become informed.

Dessein (2005) studies a closely related model to that in Garleanu and Zwiebel (2009). Like Garleanu and Zwiebel, Dessein shows that better-informed borrowers yield control rights to the less informed lender. Further, adverse selection implies that investor control is increasing in the level of asymmetric information, holding fixed borrower quality. Finally, Dessein shows that investor control is also increasing in the level of ex post uncertainty. Intuitively, more ex post uncertainty makes lender monitoring less effective. Lenders put less faith in their information and are therefore less inclined to intervene.

Gorton and Kahn (2000) embed the one-sided lender moral hazard of Sharpe (1990) and Rajan (1992) in their model by layering on moral hazard on behalf of the borrower. The role of the initial contract is to allocate bargaining power in the renegotiation game that always occurs. Gorton and Kahn show that the key determinant of bank loan pricing is the mitigation of moral hazard, as opposed to the pricing of default risk. Consequently, renegotiated interest rates are non-monotonic in borrower quality. Borrowers experiencing the most favorable news experience no interest rate change because asset substitution is unlikely. Those experiencing only moderately favorable news are granted concessions by the lender (e.g., lower interest rates) to prevent asset substitution by the borrower. Finally, borrowers experiencing the worst news face increased interest rates as lenders attempt to extract some surplus in the face of inevitable asset substitution.

In sum, these theories provide a host of empirical implications. Data limitations, and in particular a lack of random variation in the design of the debt contracts and bargaining in renegotiation, limit my ability to cleanly distinguish among alternative hypotheses. As such, my analysis aims at shedding light on existing theories and providing motivation for future theories.

4. What happens in renegotiation?

Table 2 examines the changes to contract terms made in renegotiation. Panel A examines the probability of modifying each contract term. The column labeled “All” presents the empirical likelihood of each term being modified in the sample of renegotiations. The most frequently changed items are covenants restricting accounting measures, such as the debt-to-EBITDA (earnings before interest, taxes, and depreciation and amortization) ratio, and the interest rate on the loan (yield spread).[13] Changes to the former are sometimes due to violations or anticipated violations of financial covenants. In many cases these changes are not due to financial distress but to changes in the operation, investment, or financial policies of the firm that would adversely affect the constrained ratios. For example, a planned debt issuance

[12] The limited enforcement models of Albuquerque and Hopenhayn (2004), Lorenzoni and Walentin (2007), and Rampini and Viswanathan (2010, 2013) derive optimal long-term contracts that are free from renegotiation (Quadrini, 2004) because the lack of contract enforceability necessitates a long-term contract that remains on the pareto frontier. Kovrijnykh (2013) models partial commitment as a means to incorporate renegotiation along the equilibrium path.

[13] I do not have information on covenant modifications for rollover events, which are excluded from the sample for the analysis of covenant changes. However, visual inspection suggests that rollovers are significantly more likely to modify covenants, and more of them, than amendments and amended and restated agreements.

Table 2
Changes to contract terms in renegotiations.

Panel A presents the probability of a change to each contract term for the whole sample (All) and conditional on a particular renegotiation round. For example, the unconditional probability of changing the amount of the loan is 27%. Conditional on the change occurring in the first renegotiation round, this probability is 28%. Conditional on occurring in the second through fifth renegotiation rounds, this probability is 25%, and so on. The last column presents the slope coefficient from a regression of an indicator variable identifying whether the contract term was changed on the renegotiation round. Panel B presents average percentage changes, unless indicated otherwise in parentheses, in the magnitude of the contract term conditional on whether the change was positive or negative. For example, conditional on a positive change to the maturity of the contract, the average loan maturity increased by 23.12 months. Conditional on this change occurring in the first renegotiation round, the loan maturity increased by 21.82 months. The last column presents the slope coefficient from a regression of an indicator variable identifying whether the contract term was changed on the renegotiation round. Statistical significance for all regression coefficients at the 10%, 5%, and 1% level are denoted by *, **, and ***, respectively. All hypothesis tests are conducted with standard errors robust to within-loan dependence.

	Renegotiation round				
	All	1	2–5	>5	β
Panel A: Contract term changes by renegotiation number					
Renegotiation Frequency	1,773	364	857	552	
Probability of change to contract terms					
Amount	0.27	0.28	0.25	0.29	0.00
Yield spread	0.30	0.29	0.30	0.30	0.00
Fee	0.12	0.08	0.11	0.15	0.01***
Maturity	0.29	0.30	0.27	0.30	0.00
Probability of change to covenant structure					
Accounting measure	0.34	0.30	0.35	0.34	0.00
Distributions	0.07	0.06	0.08	0.08	0.00
Investments	0.16	0.14	0.16	0.18	0.00
Collateral	0.12	0.09	0.13	0.10	−0.00
Financing	0.06	0.05	0.06	0.07	0.00
Panel B: Average Magnitude Changes to Loan Terms					
Positive changes					
Amount	103.17	134.73	110.47	69.57	−4.45
Amount (millions)	102.75	100.68	116.88	84.66	−1.31
Maximum yield spread	0.75	0.61	0.73	0.90	0.03***
Minimum yield spread	0.71	0.55	0.72	0.83	0.03**
Maximum fee	0.17	0.16	0.14	0.21	0.00
Minimum fee	0.15	0.16	0.12	0.18	0.00
Maturity (months)	23.12	21.82	22.82	24.46	0.13
Negative changes					
Amount	−31.13	−28.63	−30.41	−33.08	0.13
Amount (millions)	−99.62	−47.92	−80.15	−145.89	−3.25
Maximum yield spread	−0.75	−0.87	−0.70	−0.74	−0.00
Minimum yield spread	−0.72	−0.90	−0.71	−0.62	0.01
Maximum fee	−0.15	−0.12	−0.16	−0.15	−0.00
Minimum fee	−0.14	−0.13	−0.16	−0.12	0.00
Maturity (months)	−12.24	−9.04	−12.44	−13.12	−0.02

could increase the debt-to-EBITDA ratio beyond its maximal value, or a capital expenditure, if financed with cash, could reduce the current ratio below its minimal value. Loan amounts are also frequently modified, as are changes to the maturity of the loan.

The second through fourth columns present the probabilities of a loan modification conditional on the change occurring in a particular renegotiation round. For example, 28% of the initial renegotiation rounds result in a change to the loan amount, while 25% of the second through fifth renegotiation rounds result in a modification of the loan amount. The last column presents the slope coefficient of a linear regression of an indicator variable identifying whether a loan term was modified on a count variable indicating the renegotiation round. Most estimates are economically and statistically small, suggesting no linear univariate relation between the renegotiation round and the propensity to modify different terms of the contract. Visual inspection suggests few clear monotonic relations between the renegotiation round and propensity to change a specific term, with the exception of commitment fees. In sum, Panel A shows that renegotiations lead to a variety of modifications to the contract terms throughout the life of the loan.

Panel B presents the magnitudes of the changes made to the more easily quantifiable terms. Renegotiation leads to significant changes to the amount, pricing, and maturity of the contract in virtually every renegotiation round. The last column shows that the slope coefficient from regressions of the change in the contract term on the renegotiation round is insignificant for each term but for the yield spread. Most contract terms undergo large changes regardless of the renegotiation round in which the change occurs.

The results in Panel B also suggest that the modifications to the pricing of loans results in shifts of the pricing grid because most of the loans in the sample have a pricing grid. In other words, when interest rates or commitment fees are

Table 3
Renegotiation outcome probabilities.

The table presents the probability of different renegotiation outcomes as characterized by the combination of contract terms that are changed. Probabilities are reported in percent. To ease reporting, I combine changes to the yield spread and commitment fee into one category, Pricing. Likewise, I treat all covenant changes as a change to the covenant structure. For example, the most popular renegotiation outcome occurring in 45.91% of all renegotiations changes only the covenant structure of the contract. The next most popular outcome changes the amount, yield spread, fess, and maturity of the contract, and so on. For presentation purposes, I do not report the 11 outcomes that occur in less than 1% of the renegotiations.

Probability	Cumulative probability	Amount	Pricing	Maturity	Covenant structure
45.91	45.91	No	No	No	Yes
11.61	57.52	Yes	Yes	Yes	No
7.79	65.32	No	Yes	No	Yes
5.30	70.62	Yes	No	No	No
4.68	75.29	No	No	Yes	No
4.36	79.66	No	Yes	Yes	No
3.66	83.32	No	Yes	No	No
3.43	86.75	Yes	No	Yes	No
2.34	89.09	No	No	Yes	Yes
2.26	91.35	Yes	No	No	Yes
2.10	93.45	Yes	Yes	No	No
2.03	95.48	Yes	Yes	No	Yes
1.71	97.19	No	Yes	Yes	Yes
1.64	98.83	Yes	Yes	Yes	Yes
1.17	100.00	Yes	No	Yes	Yes

amended, the entire grid is moved up or down. This fact can be inferred from the similar magnitudes of changes to the minimum and maximum yield spread and fee in the whole sample and within each renegotiation round. I also find in untabulated analysis that the width of the pricing grid, i.e., the difference between the maximal and minimal values, changes relatively little in renegotiation.

In sum, the results in Table 2 imply that large changes to contract terms occur throughout the life of a loan. Thus, borrowers and lenders are not moving toward a complete contract but, instead are addressing persistent contractual incompleteness throughout the lending relationship.

4.1. The allocation of control rights

Table 3 presents the distribution of renegotiation outcomes.[14] To ease the presentation, I collapse all covenant related changes into one category and all pricing related changes (yield spread and fee) into another. The table shows that covenant modifications are the plurality (45.91%) of renegotiation outcomes. This finding speaks to the allocation of control rights and the potential importance of asymmetric information in lending markets.

Garleanu and Zwiebel (2009) show that the allocation of control rights is an important distinction between theories predicated on symmetric versus asymmetric information. Previous studies have shown that covenants are set tightly based on two different metrics. The first is an ex ante measure of distance from a covenant threshold. Several studies have shown that this distance appears small based on various norms (e.g., Dichev and Skinner, 2002; Chava and Roberts, 2008; Demiroglu and James, 2010; Murfin, 2012). While suggestive, ex ante measures could be misleading for several reasons. The null hypothesis defining small is subjective and receives little guidance from theory. ex ante measures do not account for the possibility that initial thresholds anticipate future movements away from the threshold. So what could appear to be a tightly set covenant to the econometrician might not be tightly set in practice. Related, ex ante measures ignore potential signaling motives by which better borrowers, who are less likely to breach a covenant, agree to tighter covenants (Demiroglu and James, 2010). Thus, ex ante tight covenants could have little relation to ex post control rights transfers for reasons other than equilibrium outcomes.

The second metric is an ex post measure of covenant violation frequency. Roberts and Sufi (2009a) show that almost a quarter of publicly traded firms experience a covenant violation between 1996 and 2006, suggesting that at least some borrowers yield strong decision rights to lenders. The results in Table 3 expand this ex post metric to encompass all firms, not just covenant violators. I find that less than 28% of renegotiations in the sample occur within a one-year window of a covenant violation. Though, more than 75% of all covenant violations lead to a contract renegotiation. Casual inspection of specific covenant modifications reveals that these changes are made to accommodate the borrowers' future operating and financing activities. Further, untabulated results show that the joint distribution of loan term modifications is fairly stable across renegotiation rounds. Thus, borrowers yield strong decision rights to lenders at all times during the life of the contract.

This finding suggests that information asymmetry is important throughout the lending relationship. It also hints at the primary consequence of information asymmetry. During the course of the lending relationship, lenders can learn about borrowers' types (i.e., the quality of their investment prospects, the ability of management, etc.). However, the incentives for borrowers to engage in ex post moral hazard are persistent. Thus, borrowers concede strong ex ante decision rights throughout the lending relationship, as suggested by Garleanu and Zwiebel (2009) and Dessein (2005).

These results could also be consistent with time-varying information asymmetry, which can generate adverse selection at each renegotiation round. However, the high frequency of and short durations between renegotiation suggests that the degree of information asymmetry would have to be fairly volatile. At a minimum, time-varying information asymmetry is unlikely a complete explanation for this phenomenon.

I investigate the allocation of control rights further in Table 4. Panel A presents the results from a binary logit regression. The dependent variable is an indicator equal to one if the covenant package is modified in a renegotiation and zero otherwise. The independent variables are contemporaneous macroeconomic factors, loan characteristics, lagged borrower characteristics, and loan type fixed effects. Marginal effects are presented as the difference in predicted probabilities of changing a covenant when varying the covariate from the 25th to the 75th percentile

[14] For this analysis, I exclude rollovers for which I do not have information on changes in the covenants between the new and previous contract.

and holding all other covariates fixed at their median values. The coefficient *t*-statistics are in parentheses and are robust to within loan dependence.

The results present a number of insights. First, macroeconomic conditions in the credit markets and the financial strength of commercial lenders play a significant role in whether covenants are modified in renegotiation. When lending standards are tight or the leverage of banks is low, covenants are more likely to be modified. Further, the economic magnitudes of these effects are relatively large. A one interquartile range change in each variable results in an 8 and a 9 percentage point change in the probability of modifying the covenant package, respectively.

Second, the borrower characteristic variables reveal results that are broadly consistent with the motivating theory. As leverage increases and credit quality declines, the probability of modifying a covenant increases. This is precisely when covenants are likely to be violated and when agency problems are at their worst. Thus, covenant modifications are necessary to pre-empt or to address technical default. Firms investing more are less likely to modify their covenants, suggesting that overinvestment—assuming that it is occurring—is less concerning for creditors than for shareholders. Any excess capital expenditures simply add to the collateral available to lenders that are often senior and secured.

Firms facing greater uncertainty, as proxied by their stock return volatility, are more likely to modify their covenants in renegotiation. In fact, this covariate has the largest marginal effect with a one interquartile range increase associated with a 12.6 percentage point increase in the probability of a covenant modification. This finding is consistent with the implications of both Garleanu and Zwiebel (2009) and Dessein (2005) that show increased information asymmetry or uncertainty leads to borrowers relinquishing greater control rights to lenders. However, it is interesting to note that firm-specific, as opposed to macroeconomic, uncertainty is what matters for the allocation of control rights between borrower and lender.

Consistent with the univariate results in Table 3, the renegotiation round is unrelated to covenant modifications. However, the duration of the lending relationship since origination and the duration since the previous event (origination or renegotiation) are both economically significant predictors of covenant modifications. Conditionally, covenants are less likely to be modified as time passes. One interpretation of this duration dependence is that they reflect differences in the covenant packages of the loans or the quality of borrowers not captured by the empirical model. That is, they are spurious results due to omitted variables. However, unreported results including loan fixed effects in the specification reveal similar findings. Loan fixed effects eliminate all cross-sectional variation in the terms of the agreement at origination, thereby ruling out differences in loan agreements as a potential explanation. Further, renegotiations occur frequently and over relatively short horizons as shown earlier. Thus, changing borrower (or lender) quality is unlikely a complete explanation for these findings.

To better understand these results I examine the dynamic behavior of covenant slack throughout the loan. Covenant slack refers to the distance between a covenant threshold and the state of the firm. For example, the covenant slack on a loan restricting the debt-to- EBITDA ratio to be less than 4 when the borrower's actual debt-to-EBITDA ratio is 3 is equal to 1, or 25% on a percentage basis. For a subsample of loan originations and amendments, I gather data from Dealscan on covenant thresholds and buildups and match this to my sample of loan originations and renegotiations.[15] Panel B presents the findings.

The first column presents the observation counts behind each estimate. The number is small because I require information for multiple, contiguous observations on the same accounting covenant within each loan path to compute changes in the covenants over time. The second column shows that the probability of loosening a covenant or decreasing the monthly buildup is statistically equivalent to the probability of tightening a covenant or increasing the monthly buildup. For example, the probability of increasing the slack in the debt-to-EBITDA covenant in renegotiation is 46.24%, statistically indistinguishable from 50%. Likewise, the probability of increasing the monthly buildup in the debt-to-EBITDA covenant is 50.96%, again statistically indistinguishable from 50%. In effect, covenant restrictions do not become systematically looser or tighter as a consequence of renegotiations throughout the loan.

The third and fourth columns present median magnitudes of the covenant slack and buildup up changes conditional on loosening or tightening the covenant. For example, the median increase in slack for capital expenditure covenants is 15.25%, and the median decrease in slack for these covenants is 9.94%. That is, the magnitude by which the median capital expenditure covenant is loosened is larger than that when it is tightened. However, this difference is not statistically distinguishable. In contrast, the median current ratio covenant is loosened by 37% and tightened by 14%, a statistically significant difference. More broadly, the results relating to the magnitude of the changes are mixed. As a whole, covenants appear no more likely to be loosened than tightened as the relationship progresses.

In conjunction with the results in Panel A, covenant modifications become more rare as the lending relationship progresses despite the fact that covenant slack is largely unchanged. Consider a borrower with 25% slack in its debt-to-EBITDA covenant throughout its lending relationship. This same slack is more likely to lead to a covenant modification early in the lending relationship relative to later in the relationship. Hence, the covenant slack is greater from an ex post perspective, but the same from an ex ante perspective.[16]

[15] Buildup (a.k.a. covenant grids, elevators, etc.) refers to contract features in which the covenant thresholds change over the life of the loan, typically in a manner that leads to tighter thresholds. I measure the buildup by computing the percentage change between the threshold at origination and the threshold at maturity divided by the remaining maturity on the loan measured in months. Larger buildups are more restrictive than smaller buildups in that they impose tighter covenants more quickly on the borrower.

[16] This result is not explained by soon-to-mature contracts in which later round renegotiations avoid altering the covenants because the contract is set to expire. The loan duration variable remains statistically significantly negative even after incorporating the remaining time to loan maturity as a control variable.

Table 4
Control rights in renegotiation.

Panel A presents the estimated marginal effects from a logit regression. The dependent variable is an indicator function equal to one if a covenant was modified in a renegotiation and zero otherwise. Macroeconomic variables are contemporaneous with the dependent variable, and borrower characteristics are lagged one quarter. Loan type fixed effects contain indicators for revolving, term, and 364-day loans. The marginal effects are computed as the difference in predicted probabilities when moving from the 75th percentile to the 25th percentile of the variables distribution, holding all other variables constant at their median values. Statistical significance for all regression coefficients at the 10%, 5%, and 1% level are denoted by *, **, and ***, respectively. Heteroskedasticity-consistent *t*-statistics that are robust to within-loan dependence are used to compute statistical significance. Panel B presents statistics on changes to specific accounting covenants occurring in renegotiation including the probability of loosening a covenant (i.e., increasing slack) and the average percentage increase and decrease in the magnitude of any change in slack. Statistical significance of the percentage change in the covenant slack at the 10%, 5%, and 1% level are denoted by *, **, and ***, respectively.

Panel A: Covenant Modification Logit Regression

Variable	Coefficient
Volatility Index	0.008
	(0.200)
Tight Lending Standards	0.084**
	(2.447)
Bank Leverage	−0.091**
	(−2.053)
GDP Growth	0.000
	(0.027)
S&P 500 Return	−0.017
	(−0.788)
Debt/EBITDA	0.036***
	(3.062)
EBITDA/Assets	0.001
	(0.075)
Capital Expenditures/Assets	−0.032***
	(−3.042)
Market-to-Book	0.018
	(1.354)
Stock Return	−0.002
	(−0.092)
Stock Return Volatility	0.126***
	(4.160)
Renegotiation Round	0.013
	(0.602)
Event Duration	−0.116***
	(−5.196)
Loan Duration	−0.053*
	(−1.949)
Loan type fixed effects	Yes
Pr($Y=1$)	0.648
Number of Observations	1,083

Panel B: Dynamics of covenant slack

	Number of observations	Pr(Loosen)	Percentage change in covenant slack	
			Loosen	Tighten
Covenant slack				
Debt/EBITDA	93	46.24	12.07	−23.81
Capital expenditures	22	54.55	15.25	−9.94
Current ratio	17	47.06	37.28	−13.79*
Covenant buildup				
Debt/eBITDA	104	50.96	0.34	−0.16*
Capital expenditures	19	52.63	0.32	−0.42*

This asymmetry is consistent with banks learning about borrowers during the relationship and the efficiency of the contract improving over time by avoiding costly amendments of covenant restrictions. Borrowers and lenders can restructure the contract such that covenant slack is smaller without an increase in costly renegotiation. This asymmetry also shows that ex ante measures of covenant slack are imperfectly correlated with renegotiation and ex post control rights transfers. What appears to be a covenant with little slack could in fact have little chance of resulting in a control rights transfer ex post. These findings follow closely the implications of Garleanu and Zwiebel (2009). They reinforce the importance of asymmetric information and the attenuation of the information asymmetry in the lending relationship over time.

Table 5
Loan pricing and credit risk.

The table presents average interest rate and commitment fee changes in renegotiation for three types of news regarding credit quality. I proxy for news with the borrower's market-to-book ratio and profitability. Bad news is defined as a negative change since the previous renegotiation or origination. I then split all positive changes into two equal-size groups. Small positive changes correspond to moderate news, and large positive changes to good news. Statistically significant differences from zero at the 10%, 5%, and 1% level are denoted by *, **, and ***. All *t*-statistics are reported in parentheses and are robust to within-loan dependence.

	Yield spread		Commitment fee	
News	Market-to-book	Profitability	Market-to-book	Profitability
Bad	0.273***	0.180***	0.030*	0.041**
	(4.245)	(2.906)	(1.878)	(2.043)
Moderate	−0.017	−0.011	0.067*	0.054
	(−0.173)	(−0.110)	(1.661)	(1.121)
Good	−0.349***	−0.314**	−0.034	−0.056**
	(−2.749)	(−2.050)	(−0.818)	(−2.211)
Number of Observations	394	376	121	119

4.2. Moral hazard and pricing in renegotiation

My data also enable me to investigate the implications of Gorton and Kahn (2000), who argue that interest rate changes in renegotiation reflect moral hazard potential, as opposed to credit risk. The most favorable news is accompanied by no change in interest rates, moderately favorable news is met with decreased interest rates, and bad news is met with increased interest rates. Table 5 examines this hypothesis by relating changes in interest rates made in renegotiation to changes in measures of credit quality since the previous event—origination or renegotiation.

I stratify the sample into three groups: (1) bad news, (2) moderate news, and (3) good news. I proxy for news about borrower credit quality and future earnings with changes in the market-to-book ratio and profitability of the borrower. All weakly negative changes fall into group (1). I split all strictly positive changes in the proxy into two equal-size groups. Small positive changes are allocated to group (2); large positive changes, to group (3). I then compute the average change in the interest rate spread and the commitment fee for each of these strata.

Counter to the implication of Gorton and Kahn's model, pricing changes are monotonically related to news about the borrower. The first column shows a significantly negative relation between changes in the interest rate spread and changes in the market-to-book ratio. Negative changes in the market-to-book ratio are met with statistically significant increases of 27 basis points in the yield spread. In contrast, large positive changes in the market-to-book ratio are met with nearly 35 basis point reductions in the yield spread. Small changes are met with no significant modification to the yield spread. Column 2 shows that the relation between yield spread changes and borrower profitability is similarly monotonically negative.[17]

Columns 3 and 4 examine the relation using changes to commitment fees as my pricing measure. Though noisier, the estimates point to a negative relation between news and pricing, at least for the tails of the news distribution. For the market-to-book ratio, small positive changes or moderate news are met with significantly larger increases in commitment fees relative to bad news. However, the difference between the two estimates is statistically indistinguishable. Yet, even with this non-monotonicity, the results run counter to the pricing implication in Gorton and Kahn (2000).

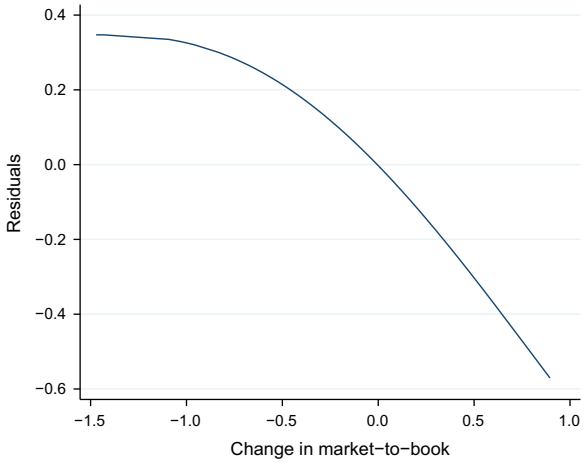

Fig. 2. Interest rate–news relation. The figure presents the fitted values from a fractional regression of the change in yield spread residuals against the change in the market-to-book ratio. The residuals are estimated in a first state linear regression of the change in the yield spread on fixed effects for year, quarter, loan type, and industry and the change in the borrower debt-to-EBITDA (earnings before interest, taxes, depreciation, and amortization) ratio.

Continuing this analysis, I regress the change in yield spreads on a host of control variables: year, quarter, loan, industry fixed effects, and changes in borrower leverage. I then take the residuals from this regression and estimate a fractional polynomial in the change in the market-to-book ratio. In essence, this analysis is akin to a semi-parametric regression of the change in the loan spread that is linear in the control variables and nonparametric in the change in the market-to-book ratio. Fig. 2 plots the fitted values from this second-stage regression against the change in

[17] I exclude from this analysis all renegotiations that do not change the yield spread. Including them as zeros reduces the magnitudes of the estimates, but the monotonically negative relation between news and yield spread remains.

the market-to-book ratio. Clear from the figure is the monotonically negative relation, similar to that found in Table 5.

These results do not imply that moral hazard is irrelevant. Instead, they suggest that moral hazard could be responsible for a statistically undetectable fraction of the change in interest rates occurring in renegotiation. This inference is consistent with the results of previous studies examining the role of information-based market imperfections in determining loan pricing (e.g., Ivashina, 2009; Santos and Winton, 2010).

5. When does renegotiation occur?

This section investigates when renegotiation occurs by estimating the duration until renegotiation, and the economic determinants of that duration.

5.1. Graphical analysis

Fig. 3 presents kernel-smoothed estimates of the renegotiation hazard function by renegotiation round. The hazard is estimated as

$$\hat{h}(t) = \frac{1}{b}\sum_{j=1}^{D} K_t\left(\frac{t-t_j}{b}\right)\left(\hat{H}(t_j) - \hat{H}(t_{j-1})\right), \quad (1)$$

where

$$\hat{H}(t_j) = \sum_{j|t_j \le t} \frac{d_j}{n_j}. \quad (2)$$

t_j represents the failure times, n_j represents the number of loans at risk for failure leading up to t_j, and d_j is the number of failures at t_j. The summation in (1) is over the D times at which failure occurs (Klein and Moeschberger, 2003) and the kernel function, K_t, is given in Muller and Wang (1994). The bandwidth is denoted b. Confidence bands for the smoothed hazard are estimated using the log transformation discussed in Klein and Moeschberger (2003). To ease the presentation, I group renegotiation rounds into three categories: initial, early (second through fifth rounds), and late (sixth round and beyond). I drop observations with durations in excess of 60 months to ease the presentation.

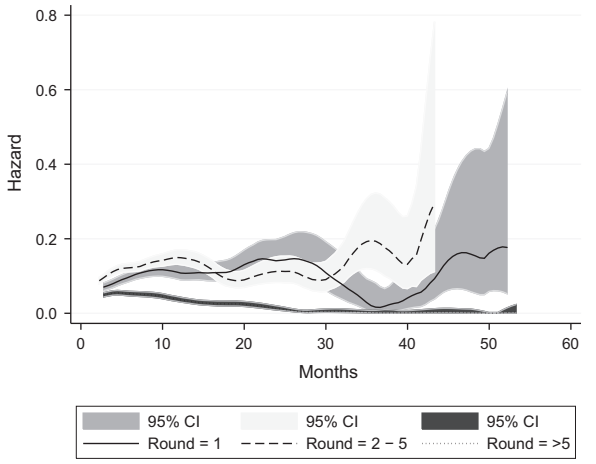

Fig. 3. Hazard functions by renegotiation round. The figure presents kernel smoothed hazard functions for renegotiation stratified by renegotiation round groups. The three groups are all initial renegotiations (Round = 1), rounds two through five, and rounds greater than five. CI corresponds to the 95% confidence interval around the hazard estimate.

There are several features of the figure to note. First, the hazard functions are noticeably different. Visual inspection of the functions and their confidence intervals suggest that there are statistically significant differences across the categories. I formally test the null hypothesis of survival function equality across the three groups by performing a Wilcoxon test. This null is rejected at less than the 1% level. Further, this rejection is not driven by late renegotiations. A pairwise test between initial and early renegotiations also rejects the null of survival function equality at less than the 1% level.

The most apparent difference among the hazard functions is in their level. Initial and early renegotiations are substantially more likely to occur at all durations. This feature is by construction. Late durations occur only if initial and early durations occur. The differences in the form of duration dependence are more interesting. Each estimated hazard is non-monotonic. Firms face an increasing likelihood of renegotiating soon after an origination or previous renegotiation. This likelihood peaks after ten and 12 months for initial and early renegotiations, respectively. For late renegotiations, the peak occurs more quickly—after three months—before a permanent decline. This result is in part due to the effect of maturity. Late renegotiations occur closer to the maturity date of the contract when lenders can exercise the option to not renew the debt. Hence, absent a renegotiation shortly after the previous renegotiation, the likelihood of renegotiating steadily declines in later rounds as contracts are terminated or mature.

Initial and early renegotiation round hazard functions reveal several local minima and maxima over durations in excess of four years. For early renegotiations, the peaks are approximately equally spaced in time, occurring at an annual frequency. In other words, the probability of renegotiating for a second time, for example, conditional on not having done so yet peaks after one, two, and three years. This suggests that the timing of these renegotiations are driven by more than just responses to random shocks, which would be closer to uniformly distributed in event time. Instead, this feature suggests that follow-on renegotiations could be driven in part by transaction cost considerations or seasonal effects.

Speculating, intra-year renegotiations could be too costly early in the relationship and postponed because of costly data collection on the borrower's side or monitoring costs on the lender's side. Borrower discussions with lenders necessitate the gathering of information. Importantly, this information is often unique to the lending relationship and confidential (Leftwich, 1983). Regularly spaced renegotiations could economize on the costs associated with this information collection effort. On the creditor's side, lenders monitor a large number of borrowers whose loan originations are distributed throughout the year. Equal spacing of renegotiations in loan event time avoids having lenders bargain with many borrowers at any one time. Consequently, early renegotiations are delayed until the end of each event year.

Particularly apparent among early renegotiations is the large peak occurring after three years. This peak is due to a change in loan composition and maturity of loans experiencing early renegotiations at this time relative to other times. Specifically, I see a shift in the distribution of loan types from revolvers to term loans, which have an average maturity roughly 50% longer than revolvers. Longer maturities permit changes to the contract to occur after more time elapses because the specter of expiration and the shift in bargaining power to the lender are less imminent. Yet, the three-year duration peak still occurs well before the average maturity of these contracts, 7.2 years. Thus, liquidity risk and maturity extensions are not the sole concerns of most renegotiations.

The peaks among the initial renegotiation hazard function are less pronounced and regular than those of early renegotiations. What is significant is the trough occurring at three years. The likelihood of an initial renegotiation drops precipitously after 26 months to a minimum around 36 months. Unlike the spike in the hazard of early renegotiations at this time, differences in loan type and maturity are not responsible for this trough. The distribution of loan types and average maturities at this duration are similar to those for all loans in the initial renegotiation subsample.

5.2. Multivariate analysis

To better understand differences in the timing of renegotiation more broadly, I turn to a Cox regression model with a shared frailty term. The model for the hazard function, h, is

$$h_{ilt}(t|\alpha) = \alpha_l h_{ilt}(t) = \alpha_l \exp(x_{ilt}\beta) h_0(t). \quad (3)$$

The indices correspond to firm i, loan l, time t. The frailty term, α, is assumed to have a gamma distribution, though assuming an inverse Gaussian distribution has no significant effect on the estimation. This term is akin to a random effect in a linear panel data model and is important for addressing latent heterogeneity across renegotiations within loans. This specification also enables me to address censored observations.

I choose a Cox regression to avoid making an ad hoc assumption about the functional form of the baseline hazard, h_0. In this sense, the model is semi-parametric leaving largely unconstrained the shape of the baseline hazard while requiring a (log) linear relation with the covariates, x. In unreported results, parametric specifications for the baseline hazard, such as exponential, Weibull, lognormal, and log logistic, coupled with maximum likelihood estimation produce qualitatively similar coefficient estimates.

Table 6
When does renegotiation occur?.

The table presents estimated hazard ratios, defined as $\exp(\hat{\beta})$, from a Cox proportional hazard model. The column "All" presents results using the entire sample. The subsequent columns present results conditioning the sample on the renegotiation round. For example, the column headed "2–5" uses only those durations from the second through fifth renegotiation rounds. I incorporate a shared frailty term in the Cox models estimated using samples with multiple renegotiation spells. p-value for $\theta=0$ is the p-value of a likelihood ratio test of the null hypothesis that correlation across spells within a loan is equal to zero. Statistically significant differences from one at the 10%, 5%, and 1% level are denoted by *, **, and ***, respectively. All statistical tests are conducted with standard errors that are robust to within-loan dependence.

	Renegotiation round			
Variable	All	1	2–5	> 5
Volatility Index	0.996	1.005	1.011	0.947***
	(−0.529)	(0.465)	(1.314)	(−3.596)
Tight Lending Standard	0.994***	0.998	0.990***	1.006
	(−2.594)	(−0.652)	(−3.625)	(1.326)
Bank Leverage	1.399***	1.067	1.340***	1.653***
	(6.267)	(0.723)	(5.125)	(3.992)
GDP Growth	1.000	1.002*	1.000	1.000
	(0.216)	(1.710)	(−0.105)	(−0.050)
Debt/EBITDA	1.003*	1.006***	1.004**	1.003
	(1.864)	(3.093)	(2.057)	(1.168)
EBITDA/Assets	0.977	1.008	0.971	0.887*
	(−0.974)	(0.256)	(−1.145)	(−1.767)
Market-to-Book	1.078	0.886	1.057	1.843***
	(0.926)	(−1.252)	(0.650)	(2.970)
Stock Return	0.999	1.000	1.000	0.997***
	(−1.462)	(−0.279)	(−0.081)	(−2.720)
Stock Return Volatility	1.015***	1.011	1.009*	1.031***
	(3.331)	(1.018)	(1.648)	(3.919)
Covenant Change	1.406***	1.023	1.454***	1.648***
	(4.633)	(0.200)	(4.382)	(3.281)
Lag Duration	0.983***		0.980***	0.988
	(−3.043)		(−3.283)	(−0.875)
Loan maturity	Yes	Yes	Yes	Yes
Loan type fixed effects	Yes	Yes	Yes	Yes
p-value for $\theta = 0$	0.001		0.083	0.415
Number of Observations	974	336	721	253

Table 6 presents estimated hazard ratios, defined as $\exp(\hat{\beta})$, and t-statistics. One minus the hazard ratio times one hundred equals the percentage increase or decrease in the baseline hazard function. The first column presents the results using the entire sample or "All" renegotiation rounds. The remaining columns present estimates from the three subsamples conditioned on the renegotiation round: initial (round 1), early (rounds two through five), and late (rounds six and later). Because the sample of initial renegotiations include only one observation per loan, the frailty term is unidentified and dropped from the specification.

For each sample other than initial renegotiations, I include a measure of the duration from the previous round. This variable serves two purposes. First, it captures duration dependence, the notion that previous durations directly impact the current duration and, as such, acts independently of the frailty term, α. Second, this variable serves as a type of restricted error component, complementing the frailty term that captures omitted loan-level effects related to the timing of renegotiation. To further help with any confounding, I include loan type fixed effects and the maturity of the loan at origination.

The results in the first column reveal that the timing of renegotiations across rounds is governed by three factors: the financial health of the parties to the loan, the uncertainty regarding borrowers' future profitability, and the outcome of renegotiation. The first factor is captured by the hazard ratios for the banking sector leverage and borrower leverage (i.e., debt-to-EBITDA). When bank and borrower leverage increase, the hazard function shifts up and renegotiations are accelerated.

The positive relation between bank leverage and the renegotiation hazard appears to be at odds with the negative effect of bank leverage on the probability of a renegotiation leading to a covenant change.[18] Further investigation reveals this disparity is due to two forces. First, a nonlinear relation exists between bank leverage and renegotiation that is concentrated among a relatively small number of observations at the beginning of the sample when balance sheet bank leverage was at its highest in the sample. Second, the difference in variation between the indicator used in the logit and the duration implicit in the hazard model result in different weights assigned to these observations and, consequently, a different impact on the coefficient. Removal of these observations eliminates the statistical significance of the bank leverage variable, but it has little effect on the other coefficients.

The second factor driving the timing of renegotiation is uncertainty about borrowers' future prospects, as captured by borrowers' stock return volatility. More uncertainty about borrowers' prospects is associated with shorter durations until renegotiation. To better understand this result, I interact borrower uncertainty with borrower leverage to determine if greater uncertainty in conjunction with greater credit risk further accelerates renegotiations. In other words, does uncertainty about the borrower generate surplus only when the borrower is in distress? I find no significant association for the interaction effect, consistent with the general finding that many renegotiations have little to do with financial distress. Instead, they are primarily aimed at addressing unforeseen contingencies and information problems between the borrower and lender.

Finally, covenant modifications are associated with shorter durations to renegotiation relative to changes in the amount, price, and maturity. This result is closely related to borrower distress. When I incorporate the interaction between borrower leverage and an indicator for a change to the covenant package, this interaction is statistically significantly positive. Thus, renegotiations arise quickly to address potential moral hazard problems among financially weak borrowers regardless of the financial health of lenders.

Turning to the remaining three columns, several differences emerge in how the timing of renegotiations responds to these factors depending on the renegotiation round. For initial renegotiations, the only statistically significant determinants are Gross Domestic Product (GDP) growth and the borrowers' leverage, as measured by the ratio of total debt to EBITDA. Borrowers with high leverage (debt-to-EBITDA) and better economic times are met with quicker initial renegotiations. However, the GDP growth coefficient is economically small and only marginally significant.

In contrast, the timing of early (two through five) and late (greater than five) renegotiation rounds is governed more closely by macroeconomic factors, borrower credit quality, and whether or not the covenant package is modified. Post-initial renegotiations are accelerated when the banking sector's leverage increases, though these results remain sensitive to the early observations. Increasing macroeconomic uncertainty accelerates early renegotiation rounds but decelerates later renegotiation rounds. An explanation for this reversal is not obvious. Late renegotiations are closely related to the current (EBITDA-to-assets) and future (stock return) profitability of the borrower, both of which are negatively associated with the hazard function. In contrast, late renegotiations are accelerated by increases in firm-specific uncertainty and renegotiations that modify the covenant package.

What does this heterogeneity across renegotiation rounds mean? Unfortunately, theory has little to say on these relations, and there are undoubtedly many plausible interpretations. However, when interpreted in light of the previous findings, the results are consistent with the broader theme of information asymmetry and its reduction throughout the lending relationship. Specifically, lenders learn more from observable signals as time progresses and monitoring frequency increases. Early renegotiations appear to be guided relatively less by observable signals and more by ex ante expectations.

My final investigation of when renegotiation occurs examines which ex ante characteristics predict the number of renegotiation rounds. This analysis is useful from two perspectives. First, it offers another robustness test for the previous findings. I attempt to mitigate confounding from borrower heterogeneity with the frailty term, lagged

[18] I thank a referee for bringing this to my attention.

duration, and fixed effects. However, this is an imperfect solution. Consequently, a plausible interpretation of the previous findings can be based on selection. Firms that experience early and late renegotiations select on unobservables that are unrelated to information problems. Thus, the question is whether firms that experience more renegotiations are different from those that experience fewer renegotiations. I can test only for observable differences, but this analysis is at least suggestive.

The second use of this analysis is as another investigation of existing theories. The models in Dessein (2005) and Garleanu and Zwiebel (2009) predict a close relation between information-related problems and renegotiation. I can offer more evidence of this relation by examining information-related proxies and the expected frequency of renegotiation.

Table 7 presents estimates from a zero-inflated, negative binomial model of the number of amendments. This model captures the essential features of the dependent variable, which is a count variable containing many zero values. Intuitively, the negative binomial aspect of this model is akin to a Poisson model for count data. The key difference is that the negative binomial relaxes the Poisson restriction that the mean of the distribution equals its variance. The zero-inflated aspect simply adjusts the count probabilities by the likelihood of experiencing a nonzero count. For further details, see Long and Freese (2001).

The body of the table presents estimated marginal effects, defined as the change in the expected number of renegotiation rounds corresponding to a change in the independent variable from the 25th percentile to the 75th percentile. The normalization eases the interpretation of the estimates and enables comparisons across coefficients. All *t*-statistics are presented in parentheses and are computed using standard errors that are robust to within-deal dependence.

The results suggest that selection on observable borrower characteristics is unlikely responsible for the differences observed in Table 7. Columns 6 and 7 reveal that only one of the borrower characteristics, capital expenditures, is

Table 7
Predicting the number of renegotiation rounds.
The table presents marginal effects from zero-inflated negative binomial regressions of the number of amendments of each tranche on various determinants measured in the month prior to the start of the tranche. The marginal effects are the expected change in the number of amendments in response to an interquartile change in the explanatory variable. Loan type fixed effects contain indicators for term and revolving loans. Terminal event fixed effects contain indicators for tranches that end in termination, replacement, or censor. Figures in parentheses are heteroskedasticity-consistent *t*-statistics that are robust to within-deal dependence. Statistically significant differences from zero at the 10%, 5%, and 1% level are denoted by *, **, and ***, respectively.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Loan-to-Assets	0.412***	0.184**	0.375***	0.176*	0.269***	0.227***	0.130
	(3.048)	(2.192)	(2.969)	(1.916)	(3.335)	(2.936)	(1.056)
Maturity	0.463**	0.470***	0.672**	0.507*	0.647***	0.589***	0.621*
	(2.122)	(2.810)	(2.075)	(1.957)	(3.585)	(3.281)	(1.709)
Yield Spread	0.426**	0.580***	0.951**	0.711**	0.313	0.393**	0.261
	(2.320)	(3.790)	(2.281)	(2.249)	(1.619)	(2.162)	(0.721)
Fees			0.203	0.053			0.236
			(0.718)	(0.253)			(1.168)
Investment Restriction			1.326***	1.454***			1.206***
			(2.721)	(3.582)			(2.651)
Volatility Index		0.149		−0.112		0.220	0.059
		(0.820)		(−0.380)		(1.170)	(0.196)
Lending Standards		0.247		−0.064		0.272	0.048
		(1.403)		(−0.242)		(1.516)	(0.161)
Bank Leverage		0.747***		1.222***		0.559***	1.118***
		(4.683)		(4.869)		(2.700)	(3.642)
GDP Growth		−0.064		−0.191		−0.041	−0.072
		(−0.472)		(−0.935)		(−0.283)	(−0.336)
Log(Sales)					−0.367	−0.250	−0.408
					(−1.511)	(−1.109)	(−1.571)
Debt/EBITDA					0.028	0.027	−0.025
					(1.333)	(1.459)	(−0.891)
Earnings					0.124**	0.093	−0.083
					(2.227)	(1.589)	(−0.604)
Market-to-Book					−0.267*	−0.167	0.165
					(−1.745)	(−1.434)	(1.411)
Stock Return					−0.169*	−0.049	−0.015
					(−1.932)	(−0.667)	(−0.209)
Stock Return Volatility					0.369**	0.117	0.092
					(1.991)	(0.639)	(0.412)
Capital Expenditures					−0.217**	−0.251**	−0.007
					(−2.033)	(−2.245)	(−0.034)
Loan type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Terminal event fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Average number of amendments	2.689	2.696	2.968	2.968	2.559	2.550	2.806
Number of observations	338	438	252	252	379	378	216

significantly associated with the number of renegotiation rounds after controlling for macroeconomic conditions and covenant features. Yet, this coefficient is not robust to the inclusion of contracts terms, namely, fees and the presence of an investment restriction. In other words, more or less renegotiation is not associated with a particular type of borrower, at least not as represented by observable characteristics. Instead, contract characteristics and macroeconomic conditions are the most significant predictors of the number of renegotiation rounds. These results also speak to the motivating theory.

Garleanu and Zwiebel (2009) suggest that renegotiation is a response to initially tight contracts designed to mitigate information-related problems. By tight, these authors refer to contracts that severely restrict the behavior of borrowers. Column 1 focuses on the three primary contract characteristics (amount, maturity, and interest rate) as well as macroeconomic factors. All three contract characteristics are strongly positively correlated with the number of future renegotiation rounds. The maturity result emphasizes the point that renegotiation is not just about maturity extensions. Instead, longer maturity loans demand even more renegotiations possibly because of the greater potential for unforeseeable contingencies and because of relatively tighter covenant packages.

The interest rate on drawn funds, the "alldrawn spread" in Dealscan terminology, is also positively related to the number of renegotiation rounds. A higher interest rate is indicative of a more restrictive contract insofar as larger interest payments lead to less funds for alternative purposes both good (positive net present value projects) and bad (negative net present value projects as in Jensen, 1986). While the bulk of this spread is likely due to credit risk, existing empirical work has shown that an economically significant premium is associated with asymmetric information embedded in the interest rate (e.g., Moerman, 2009; Santos and Winton, 2010). Further, this premium covaries positively with credit risk. Thus, this result is suggestive of a positive link between asymmetric information and the frequency of renegotiation.

Column 2 incorporates macroeconomics factors. The banking sector leverage is the only significant factor. Loans originated when bank leverage is high are more likely to be frequently renegotiated. Given the procyclical nature of bank leverage (Adrian and Shin, 2010), this finding suggests that loans originated in good times experience fewer renegotiations ex post. Several papers have shown that lending terms, both price and non-price, are strongly procyclical. Looser contracts are originated in good times (e.g., Bradley and Roberts, 2003; Roberts and Sufi, 2009b). Thus, during good times when contracts are less restrictive, it is not surprising that there is less renegotiation.

Column 3 incorporates two additional contract terms: loan commitment fees (a.k.a. "allundrawn" in Dealscan terminology) and an indicator identifying the presence of a capital expenditure restriction. If one views loan contracts as two-part tariffs, then any surplus could be due in part to the magnitude of the fees imposed by lenders. In addition, many of the renegotiations are motivated by strategic changes to firms' investment policies according to the management discussion and analysis sections of the filings.

The remaining columns (re)introduce macroeconomic factors and borrower characteristics. Though none of the latter factors is statistically significant, they cause a significant attenuation in the yield spread coefficient because of common credit risk variation.

In light of the earlier discussion of bank leverage, I reestimate each model in Table 7 after excluding pre-1997 observations. The results reinforce the tabulated findings that the bank leverage coefficient is significantly positive. They also reveal the robustness of the other coefficient estimates, which are qualitatively similar.

In sum, the robust findings are that the financial health of the bank sector, maturity of the contract, and presence of an investment restriction all predict the number of renegotiation rounds. Economically, these results are consistent with theories predicated on information asymmetry and the appropriate allocation of control rights in different states of the world (Garleanu and Zwiebel, 2009). Renegotiations are an ex post mechanism designed to address information problems at the contracting stage.

6. Conclusion

I show that frequent renegotiation is an integral part of bank lending. The role of renegotiation is as an ex post remedy to ex ante restrictive contracts that grant lenders strong control rights when confronted with an informational disadvantage. It is precisely because borrowers are able to renegotiate the terms of their contracts that they are willing to accept such restrictive contracts in the first place. Renegotiation is also a means to dynamically complete contracts, which are inherently incomplete.

Ex post renegotiations have several important implications for bank lending. In particular, renegotiation influences the design of the initial contract. It influences the terms of the agreement once the relationship is under way. And, it influences the behavior of the contracting parties throughout the relationship.

On a more practical level, my study also provides a cautionary note for researchers investigating loan contracts. When ex post renegotiation is possible—all but inevitable—the role of the initial terms of the contract is different than when parties are able to commit not to renegotiate. Contracts are necessarily structured with future bargaining in mind. I hope that future research further explores the implications of ex post bargaining for ex ante security design.

Appendix A. Data and variable definitions

All renegotiation data used in this study are gathered from filings on the SEC EDGAR website. Dealscan information was provided by Thompson Reuter's Loan Pricing Corporation via electronic media in August 2010. Dealscan and Compustat are matched via the link file used in Chava and Roberts (2008). Information on AAA and BAA bond yields (daily), three-month Treasury bill yields (daily), the S&P 500 Composite index (daily), three-month London Interbank Offered Rate (LIBOR), and GDP (quarterly) come from Global Financial Data.

Stock return information comes from the Center for Research in Security Prices (CRSP). I use the CRSP value-weighted index inclusive of dividends, VWRETD, to measure the equity market return. Stock return volatility is computed as a one-year rolling standard deviation of monthly stock returns.

Standard and Poor's quarterly Compustat database is used for borrower accounting information. The borrower characteristics variables used in this study and how they are constructed are listed below. Statement of cash flow variables are disaggregated into quarterly flows. I also construct four-quarter moving averages of each variable that are used in the analysis. All ratios are Winsorized at the upper and lower 1 percentiles. Earnings volatility is computed as the standard deviation of the annual change in operating income before depreciation using a three year moving window. This standard deviation is normalized by the average assets of the firm over the same three years. Physical capital is defined as net property, plant, and equipment.

The borrower characteristics are constructed according to the following formulas. Compustat variable names are in italics.

Altman's Z-Score = 1.2 * [(*actq* − *lctq*)/*atq*] + 1.4 * (*req* / *atq*) + 3.3 * (*piq*/*atq*) + 0.6 * [(*prccq***cshoq*)/*ltq*] + 0.999 *(*saleq*/*atq*)

Book Leverage = Total Debt/Book Assets = (*dlcq* + *dlttq*)/*atq*

Cash = Cash/Book Assets = *cheq*/*atq*

Market-to-Book = [*atq* − (*atq* − *ltq* + *txditcq*) + (*prccq***cshoq*)]/*atq*

Current Ratio = *actq*/*lctq*

Tangibility = *ppentq*/*atq*

Profitability = *oibdpq*/*atq*

Total Debt/EBITDA = (*dlcq* + *dlttq*)/*oibdpq*

Cash Flow = (*ibq* + *dpq*)/*atq*

Interest Coverage = Interest Expense/EBITDA = *xintq*/*oibdpq*

Investment = *capxq*/*atq*

Acquisitions = *aqcq*/*atq*

Log(Book Assets) = ln(*atq*)

Log(Sales) = ln(*saleq*)

Collateral = *ppentq* + *invtq* + *cheq* + *rectq*/*atq*

Appendix B. Sample loan path

In this appendix, I examine the loan path for Aeroflex Inc., a global provider of radio frequency and componentry used in wireless communications systems. Panel A of Table B1 presents the loan observations for Aeroflex Inc. available in the Dealscan extract. Dealscan identifies four separate deals, or packages, as indicated by Package ID. The first deal consists of two tranches: a revolver and a term loan, which both begin in March 1996. The second deal consists of three tranches beginning in February 1999. The third deal consists of two tranches beginning in February 2003, and the final deal is a single tranche revolver that begins in March 2006.

Panel B of Table B1 lists the entire loan path for each tranche as culled from the SEC filings. The Dealscan facility and package identifiers are provided in the first two columns. The tranche identifier is in the third. The data

Table B1
Sample loan path.

Panel A presents a snapshot of loan data for Aeroflex Inc from a 2010 Dealscan extract. Facility ID identifies the tranche and Package ID identifies the deal. Panel B presents the entire loan path at the tranche level constructed from information in the Securities and Exchange Commission (SEC) filings. Tranche ID is the internal loan identifier. Event identifies the type of event and the amendment number for each loan is given in parentheses. Maturity is the maturity of the loan, measured in months. Amount is the amount of the loan commitment, measured in millions of dollars. Spread is the interest rate spread on the loan over LIBOR (London Interbank Offered Rate), measured in percent. Fee is the commitment fee, measured in percent. Covenant indicates whether or not the covenant package was modified.

Panel A: Dealscan data for Aeroflex Inc.

Facility ID	Package ID	Loan type	Event date	Maturity date	Amount (millions)
62943	47875	Revolver	3/15/1996	3/31/1999	16
62944	47875	Term	3/15/1996	9/30/2000	4
67178	50913	Term	2/25/1999	12/31/2002	20
67177	50913	Revolver	2/25/1999	12/31/2002	23
67179	50913	Revolver	2/25/1999	4/30/2008	4
145204	114755	Revolver	2/14/2003	2/14/2007	50
145320	114755	Term	2/14/2003	4/30/2008	3
194507	147799	Revolver	3/21/2006	3/21/2011	100

Panel B: Tranche level loan path data for Aeroflex Inc.

Deal ID	Facility ID	Loan ID	Event	Loan type	Event date	Maturity	Amount	Spread	Fee	Covenant
		1	Origination	Revolver	4/24/1989		50.0			
		1	Amend (1)	Revolver	11/2/1989					
		1	Amend (2)	Revolver	9/27/1990					
		1	Amend (3)	Revolver	11/27/1990					
		1	Amend/Restate (4)	Revolver	10/10/1991		23.5			
		1	Amend (5)	Revolver	10/5/1992					
		1	Amend/Restate (6)	Revolver	4/11/1994		16.0			
		1	Amend (7)	Revolver	6/22/1994					
		1	Amend (8)	Revolver	1/1/1995					
47875	62943	1	Amend/Restate (9)	Revolver	3/15/1996	36		3.00	0.50	
		1	Amend (10)	Revolver	7/1/1997		22.0			Yes
		1	Amend (11)	Revolver	4/30/1998		27.0	2.00		
50913	67177	1	Amend/Restate (12)	Revolver	2/25/1999	46	23.0	1.75	0.25	
		1	Amend (13)	Revolver	12/20/2002					
114755	145204	1	Amend/Restate (14)	Revolver	2/14/2003	48	50.0		0.30	
		1	Amend (15)	Revolver	3/31/2003					
		1	Amend (16)	Revolver	6/26/2003					
		1	Amend (17)	Revolver	7/24/2003					
		1	Amend (18)	Revolver	10/31/2003					
		1	Amend (19)	Revolver	9/28/2004					
		1	Amend (20)	Revolver	4/19/2005					
		1	Amend (21)	Revolver	5/20/2005					
		1	Terminate	Revolver	3/21/2006					
		2	Origination	Term	10/10/1991		15.0			
		2	Amend (1)	Term	10/5/1992					
		2	Amend/Restate (2)	Term	4/11/1994		4.0			
		2	Amend (3)	Term	6/22/1994					
		2	Amend (4)	Term	1/1/1995					
47875	62944	2	Amend/Restate (5)	Term	3/15/1996	54		3.25		
		2	Amend (6)	Term	7/1/1997		16.0			Yes
		2	Terminate	Term	4/30/1998					
50913	67178	3	Origination	Term	2/25/1999	46	20.0	2.00		
		3	Mature	Term	12/31/2002					
50913	67179	4	Origination	Revolver	2/25/1999	110	4.5	1.50		
114755	145320	4	Amend/Restate (1)	Term	2/14/2003	62	3.2			
		4	Amend (2)	Term	3/31/2003					
		4	Amend (3)	Term	6/26/2003					
		4	Amend (4)	Term	7/24/2003					
		4	Amend (5)	Term	10/31/2003					
		4	Amend (6)	Term	9/28/2004					
		4	Amend (7)	Term	4/19/2005					
		4	Amend (8)	Term	5/20/2005					
		4	Amend (9)	Term	3/21/2006					Yes
		4	Mature	Term	4/30/2008					
147799	194507	5	Origination	Revolver	3/21/2006	60	100.0	1.13		
		5	Amend (1)	Revolver	8/28/2006					
		5	Mature	Revolver	3/21/2011					

are sorted by tranche identifier and event date to emphasize the notion of a loan path and the organization of the data. I also present a subset of the information on changes to the maturity, amount, interest rate spread, and covenant package.

The contract corresponding to the first package in Dealscan (Package ID 47875) is available in an 8-K filed on March 25, 1996. From the discussion in the recitals and definitions sections of the contract, I identify this deal as the third amended and restated credit agreement. I can also determine the entire lineage of the loan up to this point. The contract was originated on April 24, 1989 as a single tranche revolver with an aggregate commitment of $50 million. The contract was then amended three times before being amended and restated on October 10, 1991. On this date, the revolver amount was reduced to $23.5 million and a new $15 million term loan tranche (Tranche ID, 2) was added to the deal. These two tranches underwent one more amendment on October 5, 1992 before the deal was amended and restated for a second time on April 11, 1994. This second amended and restated contract is amended two more times before being amended and restated for the third time on March 15, 1996. Thus, the third amended and restated agreement on March 15, 1996 is the ninth amendment to the contract originated on April 24, 1989.

All subsequent renegotiations are found as exhibits in the filings. The third restated contract underwent two more amendments, the last of which terminated the term loan and rolled any outstanding amounts under this tranche into the revolving line of credit, which was increased from 22 million to 27 million dollars on April 30, 1998. In February 1999, the agreement was amended and restated for the fourth time, which reintroduced a term loan tranche (Tranche ID, 3) and an additional revolving line of credit (Tranche ID, 4). This secondary revolver was converted to a $3.2 million term loan on February 14, 2003, and the original revolver's maturity was extended and its credit line increased to $50 million. There are eight subsequent amendments, the last of which announces the termination and replacement of the revolving line of credit with a new line of credit (Dealscan package ID 147799) and several changes to the term loan tranche.

A few points are worth mentioning. First, while the sheer number of renegotiations is extreme in this example, it highlights a number of features of the lending process. For example, tranches within a credit agreement are often terminated and introduced during the life of the agreement. Also, renegotiations can affect all or only some of the tranches of a credit agreement. The renegotiation process is complex, making for a rich analysis but a costly data collection effort, hence the restriction on the sample size.

Second, the availability of data in the early and mid-1990s is typically limited to the date of a renegotiation event because there are no electronic filings. Occasionally, I can glean one or two contract terms, such as the amount in the Aeroflex case, but this often depends on whether or not that term is being changed by a renegotiation.

Third, Dealscan observations do not correspond to any particular type of event. In the Aeroflex example, each Dealscan observation corresponds to an amended and restated contract. This is not always the case. For the 817 unique Dealscan observations contained in the sample, 59% correspond to an origination, 29% correspond to an amended and restated contract, and 13% correspond to an amendment.

Fourth, Table B1 provides only a snapshot of the available data and the implications of renegotiations. For observations in Dealscan, there is often detailed information on many loan terms. For observations not in Dealscan, I collect information on changes to five different types of covenant changes in addition to information on pricing, maturity, and amount modifications. Specifically, I note changes to covenants restricting accounting measures (e.g., debt-to-EBITDA), distributions (e.g., dividends), investments (e.g., acquisitions, capital expenditures), collateral, and financing (e.g., debt or equity issuances).

I track amendments at the tranche level. Doing so enables an examination of which contract terms change and how they change. However, amendments often do not clearly delineate to which tranche they apply, particularly in cases in which qualitative changes are made (e.g., definitions and covenants). For these cases, I assume that all tranches are affected.

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