Uncertainty and Debt Covenants

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Abstract

I examine the use of financial covenants when contracting for debt under uncertainty. Uncertainty, in the context of this study, is a lack of information about future economic events and their consequences for the borrower's creditworthiness. I examine the implications of ex-ante uncertainty that is resolved by information received following loan initiation but prior to maturity. I argue that financial covenants, by transferring control rights ex-post, provide a trigger for creditor-initiated renegotiation when the borrower is revealed to be of low credit quality. Using a large sample of private loans, I predict and find that financial covenant intensity is associated with greater uncertainty. Further, I revisit the agency-based explanation of covenant use and find limited evidence that agency conflicts explain the use of financial covenants.

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1 Introduction

In debt contracting, many questions remain unanswered when a loan is initiated. Will the borrower adopt the optimal investment policy? Will his operating choices maximize the return on these investments? Will he make the contractually stipulated payments of principal and interest? In addressing these questions, the literature has typically followed the agency paradigm and focused on how debt contract design addresses moral hazard problems (Jensen and Meckling [1976]). The lender may have other concerns, however, about the borrower (beyond just the borrower's actions) that are likely to be important when entering the loan contract. For example, the borrower's future performance (which determines his creditworthiness and his ability to repay the loan) is a function of both the borrower's actions and the future state of nature. Thus, as part of her due diligence when considering a prospective borrower, the creditor will seek information about the possible future states of nature and how these will affect the borrower's creditworthiness.[1]

When screening the borrower during initial contracting, the creditor will use many sources of information: her information from any past negotiations with the borrower; examination of the borrower's historical data; private information she receives directly from the borrower; and her knowledge of industry and macroeconomic trends. Some information, however, is unknown and unknowable, even by the most skilled and knowledgable creditor. This information can include unpredictable economic events, unexpected changes in industry demand, or the consequences of geopolitical upheaval. These events, which are likely to affect the borrower's creditworthiness, defy prediction in any conventional sense: either the likelihood of the event is too remote, or there is no discernible historical pattern, or the implications of the event (should it happen) on the borrower are too difficult to project.[2] If this information affects the borrower's ability to repay his loan, its absence is relevant for contracting. In this study, I depart from the action-focused, agency-based perspective on debt contracting to examine this lack of ex-ante information, which I term "uncertainty". Specifically, I develop and test theory

[1] For expositional purposes, I refer to the borrower as "he" and the creditor as "she".

[2] Gleick [1987], referring to analytical attempts to predict future economic events, notes that "In practice, econometric models proved dismally blind to what the future would bring." (pg. 20)

that financial covenants are included in private loans agreements to limit the effects of uncertainty.

I develop an analytic framework that highlights the contracting issues related to uncertainty. An entrepreneur (the borrower) has a risky investment project which he cannot afford. An investor (the creditor) has sufficient funds but lacks the expertise to manage the project, so she lends the funds to the borrower. The creditor gathers information to determine the ultimate payout of the project; since the project is risky, in some cases the borrower will be able to repay the loan, but in others he will not. The central challenge for the creditor is to determine the appropriate contract to offer the borrower. As a benchmark case, I consider an informationally complete debt contract, where the creditor knows the possible amount and timing of the project's cash flows with certainty. In this case, an objectively-determined distribution of the investment project returns leads to a contract that the borrower and creditor will agree on. Moreover, this contract provides no scope for renegotiation, as both parties understand and agree on the full set of future outcomes of the borrower.

A more realistic setting is an informationally incomplete contract, where some information about the investment project's cash flows is unknown during initial contracting. Expanding the analytic framework, I assume that whatever information is not known ex-ante is revealed through an information signal subsequent to loan initiation (but prior to maturity); in other words, the information signal resolves uncertainty ex-post. Also, I assume that the creditor and borrower know ex-ante that the signal is coming (though neither knows what information it will reveal). Having incomplete information during initial contracting makes it difficult to determine the most efficient contract terms. Furthermore, if both parties know that the information signal is coming, they will be hesitant to contract before the signal's receipt, out of concern that the information will reveal the contract to favor the other party. This comprises the central contracting issue related to uncertainty: how can the borrower and creditor agree to a contract ex-ante knowing that new, contract-relevant information will be revealed ex-post?

The solution to this conflict is to explicitly allow for renegotiation in the initial con-

tract. While the borrower implicitly has the ability to renegotiate any time he chooses, the creditor needs an explicit contractual provision to ensure she will be able to force renegotiation.[3] Specifically, the contract must include a provision that shifts control rights to the creditor when she has incentive to change the contract terms; that is, when the information received after contract initiation reveals the borrower to be of low creditworthiness (relative to the level upon which the contract was originally written). I contend that financial covenants serve this purpose.

Financial covenants require the borrower to maintain a threshold level of an accounting-based metric, such as interest coverage or net worth. If the borrower fails to maintain the threshold, the loan enters technical default and the creditor receives control rights. By their structure, financial covenants facilitate creditor-initiated renegotiation. When contracting under uncertainty, the borrower and creditor agree to initial contract terms based on the available (but incomplete) information. Subsequently the covenant accounting metric reveals whether the borrower has had good or poor performance. A good-performance realization allows the borrower to remain in compliance with the covenant and the loan continues with the initial terms. A poor-performance realization triggers the financial covenant, granting the creditor control rights and allowing her to force renegotiation and adjust the terms to reflect the borrower's revealed creditworthiness. Since greater uncertainty exacerbates this conflict, I predict financial covenant use to be increasing in uncertainty about the borrower.

I test this prediction empirically using a large sample of loans from the LPC/Dealscan database. I measure uncertainty about the borrower with a variety of metrics from the literature (Bloom [2009]), including those measured at the borrower-level (stock trading volume, whether the borrower has an S&P rating, and analyst forecast dispersion), industry-level (cross-sectional variability in stock returns and profitability growth), and economy-level (variability of GDP forecasts and multi-factor productivity, and the VIX). I measure financial covenant intensity as the number of financial covenants used in each loan package. Loan-level regressions show a significant association between financial covenant

[3] I discuss the differences in borrower- and creditor-initiated renegotiations in Section 3.3.

use and the borrower- and industry-level uncertainty measures, but not those measured at the economy-level. These results are robust to a variety of alternative measurements and specifications.

I also contrast the predictions based on uncertainty with a common prediction in the literature: agency theory (Smith and Warner [1979]). I identify a setting—the 9/11 Attacks—where uncertainty exogenously increased without a clear corresponding increase in agency conflicts. I find that financial covenant use increased in the period following 9/11. In contrast, inclusion of dividend restrictions and collateral requirements, two contract provisions that directly address agency conflicts, did not change. These results suggest that the uncertainty explanation put forth in this paper is distinct from the agency arguments commonly made in the literature.

This study expands the literature on the the role of financial covenants in private debt contracts. It complements recent studies that consider covenants as "trip wires" triggered by poor borrower performance (Dichev and Skinner [2002]), examine the association between accounting information and credit downgrades (Ball et al. [2008]), and measure the ability of accounting information to capture borrower performance (Christensen and Nikolaev [2012]). This study formalizes the intuition of these studies—that accounting provides information about the borrower's financial condition—and illustrates how financial covenants address uncertainty and incomplete debt contracts. Moreover, the results suggest agency conflicts, which are common explanations for financial covenants, do not appear to be associated with their use. My study presents a setting where the conflict is not over the borrower's actions, but rather the lack of contract-relevant information during initial loan contracting. This departure from agency represents an innovation from past research, and contributes to the growing literature on incomplete contracts and accounting information (Christensen et al. [2016].)

2 Background

2.1 Relation to Existing Literature

Many studies on debt covenants derive their predictions from Agency Theory (Jensen and Meckling [1976]; Smith and Warner [1979]). Specifically, when a borrower assumes risky debt from a creditor, he has incentive to take actions that transfer wealth to shareholders at the expense of the creditor. These transfers are possible because the operating and investing choices of the borrower are unobservable and hence cannot be included in the contract. Much of the early research on covenants is based on the findings of Smith and Warner [1979], who examine negative (or restrictive) covenants. More recent work by Garleanu and Zwiebel [2009] uses an agency framework to explain financial covenant use and design. They argue that the contingent transfer of control rights limits the costs to the creditor when there are agency conflicts.

The explanation for the use of financial covenants that I present in this study differs from agency-based explanations in several important ways. First, the predictions of agency are driven by moral hazard, where the borrower takes some adverse action; in Smith and Warner [1979], the borrower pays a dividend, incurs additional debt, or alters investment policy. My study does not rely on moral hazard, in that the borrower is not assumed to take an adverse action (nor are covenants needed to prevent these actions ex-ante.) Second, the agency literature is based on asymmetric information between the borrower and creditor, with the borrower having an information advantage over the creditor. This information advantage is theorized to provide opportunity and incentive for the borrower to make transfers (Garleanu and Zwiebel [2009]) or lead to adverse selection (Demiroglu and James [2010].) In this study, I do not assume that the borrower has an information advantage. Rather, I assume that the borrower and creditor can costlessly and credibly share information, so that during initial contracting both parties have identical (though potentially incomplete) information sets. Put another way, I conjecture that the borrower and creditor are *equally ignorant* of future shocks and their implications on borrower creditworthiness.

The theory I present in this study is closely related to Incomplete Contracting Theory (Roberts and Sufi [2009a]; Christensen et al. [2016].) In the incomplete contracting setting, there is information that is relevant to the contract but, for a variety of reasons, cannot be included in the contract. For example, Aghion and Bolton [1992] model a setting where an entrepreneur (i.e., the borrower) has the expertise to exploit an investment opportunity but lacks to capital to invest. The investor (i.e., the creditor) has the capital and is willing to lend to the borrower to earn a monetary return. The optimal future action by the borrower is state-contingent. However, the parties cannot contract on the future state of nature ex-ante because either the future state is too difficult to predict or because it is prohibitively costly to specify a slate of actions tied to all possible future states. As such, the contract is incomplete and the contracting parties must agree to ex-post conditional allocations of control rights to force the borrower to take the correct action.

In this study, I apply an incomplete contracting framework to a simple debt setting. Similar to Aghion and Bolton [1992], the contractual incompleteness is due to a lack of knowledge about the future state of nature; specifically, the borrower and creditor do not know and cannot predict the implications of future shocks on the value of the borrower's investment (which correspondingly dictates the borrower's capacity to service his debt.) Here my theory deviates from Aghion and Bolton [1992] and related studies in that I model the value of the borrower's investment as *state contingent* but not *action contingent*. In the setting I describe, the contracting tension is the lack of information itself, due the uncertainty about the value of borrower's investment. In Section 3 I provide analytical framework describing how contractual incompleteness of this sort would affect the initial loan contracting as well as renegotiation. Before doing so, I provide a formal definition of uncertainty, they key construct of this study.

2.2 Uncertainty

In Knight [1921], uncertainty refers to outcomes that are both unknown and unknowable. If a future outcome is completely uncertain, past history is no guide to prediction and

the person trying to make the prediction is simply guessing. Alchian [1950] defines uncertainty as lack of foresight of future events coupled with human beings' inability to process and solve complex problems with many variables. He argues that uncertainty poses a serious threat to the idea of optimization that guides much of economic thought, because it is impossible to optimize when the best outcome is not known and cannot be measured.

A more recent line of empirical research examines how uncertainty affects a variety of outcomes, including economic productivity and stock returns. Bloom [2009] tests the link between "uncertainty shocks" and various measures of economic output, including firm investment and hiring. Jiang et al. [2005] and Zhang [2006] examine the relation between uncertainty and stock returns. Although these papers do not provide a rigorous conceptual definition of uncertainty, their empirical measurements typically capture uncertainty as the second moment of some set of measures, for example cross-sectional variance in GDP forecasts by professional forecasters. The idea of uncertainty (as defined in Knight [1921]) leading to a wider range of outcomes is suggested in Bernanke [1983], who notes "A natural specification of increased uncertainty is a "spread" of the [future] outcomes." (pg. 92) So although these literatures have evolved separately, their conceptual underpinnings are similar.

In this study, I adopt a view of uncertainty similar to Knight [1921] and related papers. In the context of debt contracting, uncertainty refers to future events that affect the borrower's creditworthiness, i.e., his capacity to make payments of principal and interest. These events are either impossible to predict or their value implications are too difficult to assess ex-ante. As such, uncertainty is a key source of contractual incompleteness, and the degree of uncertainty will dictate the extent to which the contract is incomplete.

Any discussion of uncertainty must also consider its conceptual counterpart, risk. There are two ways to distinguish uncertainty from risk, each based on the work of Knight [1921]. First, under risk probabilities are known, while under uncertainty probabilities are unknown. In the context of debt contracting, a borrower's investment project has stochastic outcomes: The value of the investment will vary based on the future state

of nature. If the distribution of the project's value is known, the payoff is purely risky. If the distribution is unknown, the payoff is uncertain. Second, risk lends itself to objective measurement while uncertainty does not. Following Savage [1954], any attempt to quantify probabilities under uncertainty cannot be objective because no objective measure exists.[4] In this study I differentiate risk and uncertainty in the manner described above, where risk implies known, objectively-measured distributions, and uncertainty indicates unknown distributions that cannot be objectively measured. This distinction is important because new information and renegotiation has a role under uncertainty but not under risk.

3 Hypothesis Development

I develop the following analytic framework to analyze the role of uncertainty in debt contracting. At time $t = 0$, an entrepreneur with no internal financial resources (the borrower) has an investment opportunity that costs I. The borrower approaches an investor (the creditor) who lacks the ability to exploit the investment opportunity, but has I to lend. The borrower is risk-neutral and solely interested in the financial return of the project; i.e., there are not non-monetary inputs to the borrower's utility. The creditor is also risk-neutral and motivated solely by financial return.

Assume the borrower gets I from the creditor and invests in the project. At a future period m the project matures and yields a final cash flow V. For simplicity, I assume that V follows a simple Bernoulli distribution: V is V_H (the high state outcome) with probability p, and V_L (the low state outcome) with probability $1 - p$. Finally, I include the periodic discount rate τ_m, which captures the time value of money; the expected value will be lower the longer it takes for the final cash flow to be realized. This leads to an expected value $E[V] = \frac{1}{1+\tau_m}[pV_H + (1-p)V_L]$. I make three assumptions about the distribution of V. First, I assume that $E[V]$ is greater than I, and sufficiently high that the borrower will always make the investment (i.e., no underinvestment (Smith and

[4]This perspective on "Knightian Uncertainty" is pervasive in the literature; however, there is disagreement as to whether it is consistent with Knight's original intent (LeRoy and Singell [1987].)

Warner [1979])). Second, I assume that $V_H > I > V_L$. In other words, the higher value outcome is greater than the initial investment, implying full repayment when V_H is realized. Similarly, the lower value outcome is less than the initial investment, so that in some cases the borrower defaults. In short, the loan is risky. Finally, and importantly, I assume that the outcome of the project is state-contingent but not borrower action-contingent. This means that the cash flow V realized at maturity is not a function of the borrower's action, but rather due to other forces outside of the borrower's control. This implies that the agency conflicts often assumed to drive the use of financial covenants are not present in this setting.[5]

3.1 Contracting under Certainty

To analyze contract design under different information assumptions, consider the case where the distribution of V is common knowledge; that is, during initial contracting the borrower and lender know and agree on the values of p, V_H, and V_L, as well as the payoff period m and discount rate τ_m. This case, which I term "certainty", serves as a benchmark to evaluate cases where some of these parameters are not known.

The contract that the creditor will offer is a function of her expected payoff from making the loan. This differs from the expected value of the borrower's investment (noted above) due to asymmetric payoffs to creditors. The creditor expects to receive V_L when the low state is realized (i.e., the liquidation value of the borrower). In the high state, the creditor expects to receive full repayment of the loan principal I plus interest. Defining r as one plus the interest rate, the creditor's expected payoff can be written: $\text{E[payoff]} = \frac{1}{1+\tau_m}[pIr + (1-p)V_L]$. As long as $V_H > I$, the actual value of V_H does not affect the creditor's expected payoff.

The risk-neutral creditor prices the loan by equating the loan principal I to the dis-

[5]This assumption is not meant to suggest that agency conflicts do not exist or are not important in contracts, only that, in the setting I describe, moral hazard is not the focus. I expect that moral hazard problems are relevant in debt contracts, but are addressed through some means other than financial covenants (e.g., negative covenants as described in Smith and Warner [1979], or some other aspect of contract design or capital structure.) More broadly, the different provisions in debt contracts are likely in place to address different sorts of contracting conflicts.

counted expected payoff, leading to the pricing expression:

$$r = \frac{1}{pI}[(1 + \tau_m)I - (1 - p)V_L] \tag{1}$$

This pricing expression has the expected properties: The interest rate is decreasing in p and V_L, and increasing in I and τ_m. When the creditor knows the loan parameters with certainty—i.e., the loan is *informationally complete*—she can objectively calculate r. Due to the common knowledge assumption, the borrower should agree to this objective r. Furthermore, in this case there is no subsequent scope for renegotiation. This is because all information is priced; only *unexpected* information should motivate renegotiation. So, although V is stochastic (i.e., risky), both the creditor and borrower agree on the likelihood of future outcomes, the value of these outcomes, and their timing. No future event can change this assessment, so the ex-ante interest rate of the loan will be satisfactory to both parties over the term of the loan.

3.2 Contracting under Uncertainty

In reality, it is unlikely that the contracting parties know the parameters of the pricing expression with certainty; there are many potential future events that are hard to predict, and their impact on different aspects of the loan are prohibitively difficult to determine ex-ante. Going forward I examine the implications of contracting under *uncertainty*, where some information about the future value of the investment project is unknown.

It is important to recall the distinction between risk and uncertainty and their implications on contracting. Risk, as described in the prior section, implies stochastic outcomes but known parameters. This means a risky distribution can be fully described and contracted on ex-ante. Uncertainty, in contrast, refers to stochastic outcomes where some relevant parameter of the distribution of outcomes is not know ex-ante. In terms of debt contracting, uncertainty results from economic shocks and other impossible-to-predict future events. To examine the uncertainty case, I expand the analytic framework from above. The borrower still receives funds totaling I from the creditor to invest in the

project. Under uncertainty some information about the investment project (and thus future realizations of V) is missing ex-ante. In other words, this contract is *informationally incomplete*.

I make several assumptions about uncertainty and how it affects debt contracting. First, I assume that the borrower and creditor have the same initial information set, so that any information that is missing ex-ante is missing to both the creditor and the borrower; i.e., there is no information asymmetry.[6] Second, I assume that the information, were it available, could affect loan contract terms. Third, I assume that this contract-relevant information is revealed to the contracting parties subsequent to loan initiation but before maturity. Specifically, I assume there is an information signal in period l, where $m > l > 0$. This signal is fully revealing of the ex-ante missing information; i.e., the information makes the contract informationally complete ex-post. This implies that uncertainty is resolved through learning. Fourth, the information revealed in the signal is unambiguous, in the sense that the borrower and creditor will interpret its implications for the value of the investment in the same way. Finally, during initial contracting the borrower and lender both know that the signal will arrive in period l. In short, the contracting parties agree that the contract is incomplete ex-ante, and agree that contract-relevant information will be received, but cannot contract on that information because its implications are not known. I present a timeline of contracting in Figure 1.

How does this anticipated ex-post information signal affect loan contracting? As an example, consider loan pricing where V_L, V_H and τ_m are all known, the amount and timing of I are fixed, but p is uncertain. In other words, the true value of p is not known at $t = 0$, but both the borrower and creditor know this value will be revealed by an information signal in period l. One way to address this uncertainty would be to delay loan initiation until period l when the information will be revealed. If we assume that the investment opportunity is only available at $t = 0$, however, this is not a sufficient solution.

[6] Asymmetric information between the borrower and lender plays a clear role in contracting theory (Demiroglu and James [2010]). In order to focus on symmetric uncertainty between the borrower and creditor, I assume their information endowment is similar.

Alternatively, the creditor and borrower could agree to and contract on an estimated value $\hat{p}$. I assume, for simplicity, that $\hat{p}$ is an estimate based on a common prior belief that the borrower and creditor share about the value of the uncertain p. This estimate $\hat{p}$ will be used in Eq. (1) to generate a contracted interest rate $\hat{r}$ for the loan. Since the borrower and creditor have common priors and agree on $\hat{p}$ (and all other parameters are assumed to be known), they will also agree on $\hat{r}$.[7] If in period l the information reveals p to be equal to $\hat{p}$, both parties should be satisfied with the contract.[8] If, however, the revealed p differs enough from $\hat{p}$, either the creditor or the borrower will be unsatisfied with the contracted rate $\hat{r}$ ex-post. For example, if $p > \hat{p}$, then the borrower is revealed to be more creditworthy than the original loan terms indicate, and will want a different contract ex-post. Similarly, if $p < \hat{p}$, then the creditor is undercompensated for the revealed creditworthiness of the borrower and will be unsatisfied with the original contract.

Since the true p is not revealed until period l, neither the borrower nor the lender will know if the negotiated loan will be satisfactory ex-post; they will only know that the loan terms *could* be unsatisfactory. This knowledge will make both the borrower and lender hesitant to enter into the contract, as each will be concerned that the negotiated terms will turn out to be more favorable to the other contracting party based on the information revealed in period l. This effect will be increasing in the severity of uncertainty.[9]

3.3 Renegotiation

One solution to the above-described problem is to allow the contracting parties to change loan terms contingent on the signal received in period l. Put another way, ex-post differences between r and $\hat{r}$ provide scope for renegotiation in the loan (Nikolaev [2015]). The nature of the information revealed in period l will determine the incentive to renegotiate, and whether uncertainty needs to be addressed contractually.

[7] The relative negotiating position of the borrower and creditor will affect how the rents from project are shared; for example, if the creditor is in a stronger negotiating position (e.g., the borrower has limited alternative capital sources) she will push for a higher value for $\hat{r}$. A "fair" $\hat{p}$ and $\hat{r}$ reflects the assumption of a competitive lending market with multiple borrowers and creditors.

[8] More precisely, p must be sufficiently close to $\hat{p}$ that the cost of changing the contract ex-post is higher than the benefit to either party of changing it.

[9] Uncertainty is more severe when either there are more unknown parameters or when there is relatively little information available about a parameter (or parameters.)

If $\hat{p} < p$, the borrower is revealed to be of higher credit quality than the initial loan terms suggest; from the example above, $\hat{r}$ is higher than r would have been had the ex-post information been contractible. In this case, the borrower will want to renegotiate the loan ex-post. The creditor, however, will not: The high $\hat{r}$ (relative to r) provides the creditor with extra interest income. Since prepayment restrictions are seldom used in private loans (Roberts and Sufi [2009b]), the borrower can plausibly threaten to exit the loan when the information is received and the borrower's type is revealed. Specifically, he can find financing at the more favorable rate r from a different creditor, and use the proceeds to repay his old loan. The original creditor has no recourse in this case, and if she wants to retain the borrower's business will agree to renegotiate the loan at period l to incorporate the new information. This means that the creditor should consent to the borrower's desire to renegotiate, so there is no need to address uncertainty contractually in this case. Moreover, the borrower will feel comfortable contracting under uncertainty even without contractual provisions to address it, knowing that he can take action if needed.

If $\hat{p} > p$, the borrower is revealed to be of lower credit quality than the value embedded in the original loan terms. In this case, the creditor will be unsatisfied with $\hat{r}$, because she is undercompenstated for the borrower's true creditworthiness.[10] The borrower, on the other hand will favor the loan terms: The contracted rate is lower than it would have been if the ex-post information was known, meaning the borrower benefits while the creditor bears the cost of the excess riskiness. This situation is recognized in Roberts and Sufi [2009b] who note "...an ex-post reduction in cash flow leads to a situation where the borrower is better off under the initial terms of the contract and, therefore, has little incentive to restructure the contract in a manner reflecting the ex post deteriorating of credit quality." (pg. 161). Whereas the borrower could prepay the loan with new funds, the creditor cannot force the borrower to repay the outstanding loan absent a contractual

[10] In this simple framework, the primary lever for the creditor in setting loan terms is the interest rate; this is due to the assumption of a single investment project with a single cash flow. In reality, the creditor will be pricing the borrower as a set of investments. These investments will have multiple cash flows, and the amount and the timing of these flows will be uncertain. As such, the creditor could potentially vary multiple loan terms—such as maturity, collateral, and restrictive provisions—when setting the contract.

provision. As a result, the creditor will demand a contractual provision that allows her to change loan terms conditional on the information received in period l, specifically when p is revealed to be lower than $\hat{p}$. Absent such a provision, the creditor will be hesitant to enter a loan contract under uncertainty.

Financial covenants, such as interest coverage, net worth, or leverage, require the borrower to maintain a threshold level of an accounting measure. If the borrower fails to maintain the threshold, the loan enters technical default. In technical default, the creditor receives controls rights which allow her to attempt action against the borrower. To avoid such actions, the borrower can agree to renegotiate the loan, yielding concessions that favor the creditor. Consistent with this, Beneish and Press [1993] find that covenant violations are commonly associated with creditor-favorable renegotiated outcomes (e.g., increase in interest spread or decrease in loan amount). In fact, borrowers renegotiate loans in anticipation of financial covenant violations, also leading to creditor-favorable outcomes (Roberts and Sufi [2009b]).

In structuring a covenant to facilitate creditor-initiated renegotiation, the initial interest rate of the loan is set to $\hat{r}$, reflecting the borrower's and lender's shared prior beliefs of p. The covenant is indexed to some accounting-based measure that correlates with borrower financial condition. The covenant threshold is tested periodically; covenant accounting measure provides information about the borrower's creditworthiness. The covenant threshold is set to be triggered when borrower performance is poor and the borrower is revealed to be less creditworthy than the original interest rate implies. If the borrower fails to maintain this threshold, the loan enters technical default: the creditor receives control rights and can attempt to renegotiate the loan to an interest rate consistent with the borrower's revealed creditworthiness.[11] If the covenant is not triggered, the borrower maintains control rights and the initial interest rate stays in place.

[11] A more general interpretation is that the creditor wants a covenant that is triggered when some parameter of the loan (e.g., interest rate, loan amount, maturity) is revealed to be suboptimal ex-post. The creditor will attempt to renegotiate these terms following (or in anticipation of) technical default. This illustrates an important difference between a pre-negotiated loan parameter changes (e.g., performance pricing) and the more general transfer of control rights; if it is unknown what parameter(s) will be revealed as suboptimal, it is difficult to specify a menu of changes ex-ante. I examine performance pricing in greater detail in Section 6.2.1.

In sum, financial covenants, through technical default, facilitate the transfer of control rights to the creditor when the borrower is revealed to have low creditworthiness relative to the ex-ante contract terms. This contingent transfer is more valuable when the contract is informationally incomplete and uncertainty is more severe. This study's hypothesis, stated in alternative form:

> H1: The use of financial covenants is increasing in uncertainty about the future value of the borrower.

4 Sample and Data

4.1 Sample

I draw the sample from the LPC/Dealscan database, collecting private loan agreements initiated between January, 1995 and December, 2013. Sample agreements must be U.S. Dollar denominated loans to U.S.-domiciled borrowers. Further, I require each loan-observation to have covenant data available from Dealscan, from the datasets 'FinancialCovenant' or 'NetWorthCovenant'. This sample selection yields a total of 22,123 observations.[12]

I collect accounting data from Compustat (quarterly), stock trading and returns data from CRSP (daily), and analyst data from I/B/E/S. I match the Dealscan data to these data using the matching table from Chava and Roberts [2008].[13] Dealscan is organized on the facility- and package-level. Facilities are individual loans, such as term loans and revolving lines of credit. Packages are groups of facilities issued under the same loan agreement, generally at the same time and by the same lead lender. All the facilities in a package are governed by the same set of covenants, so the analysis in this study is

[12]Drucker and Puri [2009] find that some Dealscan loan-observations reporting no financial covenants are data errors, and that covenants are in fact included in these loans. In order to include these "cov-lite" loans, but avoid data errors, I collect a subsample of loans that have SEC filings available but no covenants reported on Dealscan. I hand-collect loan agreements from SEC filings (from 10-K, 10-Q, and 8-K filings) to verify which actually have no covenants; I include 429 cov-lite loans in the sample. The results from the analysis are not sensitive to inclusion of these observations.

[13]I thank Michael Roberts for making this data public. I use the link file available in November, 2014, which includes links for packages up to August, 2012. For loans with an active date after August, 2012, I hand-match loans to Compustat by borrower name.

at the package-level. The final sample, after matching to other data, consists of 17,768 loan package-observations. In Table 1, Panel A, I present the distribution of loans by year. The pattern suggests that loan issuance is pro-cyclical; new loan issuance declined around the recession in the early 2000's, and even more dramatically during the Great Recession of 2007–2009 (with only a slight recovery in volume through the end of this study's sample period.)

4.2 Variable Measurement

This study's hypothesis links uncertainty to the use of financial covenants. One way to measure covenant use is to sort borrowers with no financial covenants from those with at least one. However, there are few loan packages with zero covenants, resulting in insufficient variation. Therefore, instead of using a dichotomous variable, I use a count of covenants in each loan package, *FinCovIntensity*, as the dependent variable.[14] I present statistics on *FinCovIntensity* in Table 1, Panel B. The index ranges from zero to seven, with an average of 2.35 financial covenants per loan package.

Since uncertainty is a multi-dimensional construct, I use a wide range of proxies in empirical tests. I start with three borrower-level variables to measure uncertainty specific to the individual borrowers. *Volume* is the average trading volume of the borrower's equity for the 25 days preceding loan initiation. *Unrated* is an indicator variable with a value of one if the borrower has no S&P Senior unsecured debt rating. *Forecast Dispersion* is the standard deviation of analysts earnings forecasts scaled by the average forecast value. These proxies capture uncertainty about the borrower from the perspective of investors, rating agencies, and equity analysts respectively; I predict each to be positively associated with financial covenant use.

The second set of proxies measures uncertainty at the industry-level. Following Bloom

[14]Murfin [2012] notes that financial covenant intensity captures only one dimension of the package's covenant portfolio; three other aspects (the covenants' initial slack (initial value less threshold value of the covenant accounting measure), the variance of the underlying accounting measure, and the correlation between accounting measures) also contribute to the frequency of technical default. To the extent that initial slack and correlation vary between borrowers and packages, this confounds covenant intensity as a proxy for overall covenant protection. However, covenant intensity is commonly used in the literature (Bradley and Roberts [2004]; Billett et al. [2007]; Christensen and Nikolaev [2012]). I examine alternative measures of covenant use, incorporating slack and correlation between measures, in a robustness test.

[2009], I use two measures. I measure quarterly profit growth as the quarterly change in operating income scaled by the average total assets. I then calculate *Profit Growth Uncertainty* as the cross-sectional standard deviation of quarterly profit growth for each quarter and two-digit NAICS industry. This proxy is matched to loans by industry, year, and quarter. *Stock Return Uncertainty* is the cross-sectional standard deviation of stock returns, measured for each month and two-digit NAICS industry. This proxy is matched to loans by industry, year, and month. These proxies capture uncertainty within an industry related to accounting and equity market performance. Since uncertainty is increasing in each of these metrics, I predict a positive association between each and financial covenant use.

The third set of proxies measures economy-wide uncertainty. Two of these measures follow Bloom [2009]. *MFP Growth Uncertainty* is the across-industry standard deviation of the year-on-year change in multifactor productivity (MFP). I collect MFP data from the Bureau of Labor Statistics (BLS), which measures productivity based on five input factors (capital, labor, energy, materials, and purchased services: the "KLEMS" measure). The BLS measures MFP by industry based on NAICS codes.[15] The standard deviation is calculated on an annual basis across the BLS industry groupings. The second measure from Bloom [2009] is *GDP Forecast Uncertainty*. This measure is based on the Livingstone Survey of GDP reported by the Philadelphia Federal Reserve Bank.[16] The survey collects GDP forecasts from a set of economists; forecast uncertainty is the standard deviation of the estimates, calculated semi-annually. The third and final measure of uncertainty is the *VIX*. The *VIX* is the CBOE's traded market volatility index, and captures expectations of future stock market volatility (Drechsler [2010]). I predict a positive association between each of these metrics and financial covenant use. These proxies are matched to loans by year (*MFP Growth Uncertainty*), half-year (*GDP Forecast Uncertainty*), and quarter (*VIX*). I provide more specific definitions of each variable in the Appendix, and descriptive statistics in Table 2, Panel A.

[15]The BLS sorts firms by sectors based on two-, three-, and four-digit NAICS codes; the classification can be found at http://www.bls.gov/mfp/mprdload.htm.

[16]https://www.philadelphiafed.org/research-and-data/real-time-center/livingston-survey

The number of observations available for each variable depends on the unit of observation and data availability. The borrower-level metrics have between 16,908 and 17,768 observations. Industry-level are measured at specific time intervals, either quarterly or monthly. This leads to 1,312 observations for *Profit Growth Uncertainty* and 2,467 observations for *Stock Return Uncertainty*. Economy-wide variables are measured by time, leading to relatively few observations: 79 for *VIX* (monthly), 40 for *GDP Forecast Uncertainty* (semi-annual), and 20 for *MFP Growth Uncertainty* (annual). Since the dataset is constructed on the loan level, I also present the descriptive statistics in Table 2, Panel A at the loan level.

Some of the empirical tests include borrower-level control variables, each potentially associated with financial covenant use. *Leverage* is the ratio of total debt to total assets. *EBITDA* is the ratio of earnings before interest, taxes, depreciation, and amortization to average total assets. This controls for operating performance, which indicates the sufficiency of cash flows to cover debt payments. *Size* is the natural logarithm of the market value of the firm (the market value of equity plus the book value of debt). *Market-to-Book* is the ratio of the market value of the firm to the book value of the firm, and is a common proxy for growth opportunities and agency conflicts. *EDF*, the distance to default (based on Merton [1974]), measures default risk based on the borrower's leverage and asset volatility. I present descriptive statistics for each of these variables in Table 2, Panel B. In Table 3, I present correlations for the eight uncertainty metrics. Although many of the correlations are statistically significant, economically the associations are relatively low; the average absolute correlation is just 0.076 (0.120 for the rank correlations). This suggests that the measures are capturing distinct aspects of uncertainty.

5 Empirical Tests and Results

5.1 Loan-Level Analysis

I start the formal tests with loan-level analysis, examining all eight uncertainty measures and financial covenant use in individual loans. I test H1 using the following panel

regression:

$$FinCovIntensity_j = f(\alpha + \boldsymbol{\beta} Uncertainty_j + \boldsymbol{\Gamma} Controls_j + \tau_t + \iota_i + \varepsilon) \qquad (2)$$

Since *FinCovIntensity* is a count variable, the regression uses a negative binomial function. I test three specifications of Eq. (2). The first includes the three borrower-level uncertainty measures (*Volume*, *Unrated*, and *Forecast Dispersion*) and the controls. Since the uncertainty measures are calculated on the borrower-level, I include fixed effect for industry (2-digit NAICS) and time (year). In the second specification I include the two industry-level uncertainty measures (*Profit Growth Uncertainty* and *Stock Return Uncertainty*) and the controls. Since the uncertainty measures are industry-level, I only include time fixed effects. In the third specification, I include the three economy-level uncertainty measures (*MFP Growth Uncertainty*, *GDP Forecast Uncertainty*, and *VIX*) and the controls. I include industry but not time fixed effects as the uncertainty proxies are measured periodically.

I present the regression results in Table 4. The table shows coefficient estimates and Z-statistics (clustered by borrower and year to address cross-sectional and intertemporal correlation). The first column shows results for the borrower-level uncertainty variables. Each of the coefficients is positive and significant at the one percent level, consistent with the prediction that uncertainty is associated with use of financial covenants. The control variables show that borrowers who have high leverage and strong financial performance have more financial covenants on average, while large borrowers and borrowers with a high market-to-book ratio on average have fewer financial covenants.

The second column shows regression results for the industry-level uncertainty variables. Like the borrower-level variables, both are positively and significantly associated with the number of financial covenants, further supporting the link between financial covenant use and uncertainty. The third column presents results using the economy-level variables. In contrast to the prior sets of measures, these variables do not have a significant association with uncertainty. This suggests that uncertainty due to borrower and industry features are associated with financial covenant use, but that there is no

association between economy-wide uncertainty and financial covenant use.

For robustness, I test three variants of the main regression specification. In the first, I include five loan-level controls in addition to the borrower-level controls.[17] I do not include them in the main regression because loan terms are jointly determined, potentially leading to measurement error due to endogeneity. Second, I run the main regression specification excluding *EDF*. While *EDF* has been shown to be a superior measure of default risk (Hillegeist et al. [2004]; Bharath and Shumway [2008]), its calculation is data-intensive; including *EDF* drops the sample size for the main regressions by approximately 40%. Therefore, I exclude it to ensure results are not driven by sample selection related to availability of *EDF*. Third, I replace *FinCovIntensity* with *PViolate*. *PViolate* is a measure of aggregate covenant strictness developed in Demerjian and Owens [2016]. This measure uses all 15 Dealscan covenants and incorporates their slack, measurement variance, and the covariance between different measures to estimate a single metric capturing the expected likelihood of covenant violation on the loan package-level. In untabulated analysis, I find that inferences are essentially unchanged; the only differences are that the sign on *Forecast Dispersion* is positive but insignificant, and the coefficient on *VIX* is positive and significant (p-value: 0.052) when *PViolate* is the response variable.

An additional concern in the main empirical tests is matching loan-level variables (e.g., covenant data and controls) to variables with different units of measurement (e.g., industry- and economy-level variables.) To ensure the results are robust to these measurement differences, I run aggregate-level analysis using separate regressions for each industry or economy uncertainty variable. For example, I measure *GDP Forecast Uncertainty* semi-annually, so I calculate the average *FinCovIntensity* (and the average controls) for each semi-annual period. I run the regression for each semi-annual period (a total of 40 in this example). I run similar regressions for each time and industry-time grouping. The untabulated results show similar patterns as those reported in Table 4; the industry-level uncertainty metrics have positive, significant coefficients, while the economy-level metrics

[17]The controls include the number of lenders in the loan's syndicate, an indicator for whether the loan has a covenant restricting capital expenditures, an indicator for performance pricing, an indicator for collateral, and the loan's maturity.

have insignificant signs.

The regressions in Table 4 include EDF as a control for risk. However, risk and uncertainty are related concepts; both are based on the idea of stochastic outcomes, with a wider range of outcomes indicating both greater risk and greater uncertainty. This makes differentiating risk and uncertainty with empirical measures difficult. It is unlikely that including control variables for risk in multivariate regression fully controls for this issue. To address the influence of risk more directly, I use regression to create a set of uncertainty measures orthogonalized to risk. Specifically, I run each of the uncertainty measures through the following OLS regression:

$$\begin{aligned} UncertaintyMeasure_j = \alpha + \beta_1 EDF + \beta_2 Rating + \gamma_1 Leverage + \gamma_2 Size + \\ \gamma_3 \, Market\text{-}to\text{-}Book + \tau_t + \iota_i + \epsilon \end{aligned} \tag{3}$$

I run a regression for each of the uncertainty measures to extract risk. *EDF* and *Rating* are the two main proxies for risk; *Rating* is defined as the firm's S&P Senior Unsecured Debt Rating, on a scale from 1 (AAA) to 22 (D).[18] Other variables also have possible associations with risk, so I include them; year and industry indicators capture time varying aspects of risk not captured by the other variables, and are included based on the measurement of the uncertainty variable. The regressions (untabulated) vary in explanatory power, with R^2s ranging from 0.8% (*GDP Forecast Uncertainty*) to 48.6% (*Volume*), suggesting variation in the degree to which these measures capture risk. Additionally, *EDF* is significant in each regression but *Forecast Dispersion* and *GDP Forecast Uncertainty*, and *Rating* is significant for all but *GDP Forecast Uncertainty* and *MFP Growth Uncertainty*. The residual from each of these regressions is the orthogonalized uncertainty proxy. I use these new residual uncertainty measures to reproduce the regression from Eq. (2). I present these results in Table 5. Each variable has the predicted sign and is statistically significant, comparable to the results reported in Table 4.

The empirical tests to this point have tested an index of all financial covenants, implicitly assuming that each type of financial covenant serves the same purpose. Recent

[18] I exclude *Rating* from the regression for *Unrated*, as they are highly correlated.

evidence suggests that different types of covenants serve different roles. Christensen and Nikolaev [2012] classify financial covenants in "performance" and "capital" categories. They show that earnings-based performance covenants (e.g., interest coverage, debt-to-EBITDA) typically monitor the ongoing performance of the firm by allocating control rights ex-post. Capital covenants, which includes net worth and leverage covenants, protect creditors by requiring the borrower to maintain a protective capital cushion within the firm, thus aligning borrower and creditor incentives ex-ante.

Following Christensen and Nikolaev [2012], I consider whether and how performance and capital covenants resolve uncertainty and facilitate transfer of control rights to the creditor. As discussed in the analytic framework in Section 3, financial covenants are useful when they provide information about the performance of the borrower. While earnings are a useful signal for creditors in this context, it is less clear that capital measures provide the same information; since borrowers can, for example, change net worth through various financing activities, capital covenants will not necessarily provide information about the borrower's true performance. This suggests that performance covenants might have a more prominent role in resolving uncertainty about the borrower.[19]

To test this, I create two new financial covenant indices, one for performance covenants and one for capital covenants. I use this as the response variable in the original regression specification in Eq. (2). In Table 6, Panel A, I present results for performance covenants. The results are substantively similar to those reported in Table 4 for all financial covenants: the coefficients on the borrower- and industry-level uncertainty measures are positive and significant. I present results for capital covenants in Table 6, Panel B. These results are considerably different than Table 4: While the coefficient on *Unrated* is positive and significant, all others are either insignificant or significantly negative. This suggests that performance covenants drive the main results.

[19]Consistent with this idea, Nikolaev [2015] finds that performance covenants are associated with debt contract renegotiation, while capital covenants are not (although the paper does not distinguish between borrower- and creditor-initiated renegotiations.)

6 Additional Analysis

In this section, I provide additional tests meant to better separate my uncertainty explanation for financial covenants from explanations based on Agency Theory. I follow this with tests examining the association between uncertainty and other contract provisions.

6.1 Agency Theory

Whether explicitly or implicitly, agency theory is the most commonly invoked explanation for the use of financial covenants in debt contracts. Agency theory, as it relates to debt, predicts that the borrower has incentive to take adverse actions against the creditor to avoid repaying his debt, thus expropriating wealth from the creditor and providing benefits to equity holders. The creditor rationally anticipates this incentive and prices the cost of these transfers into the interest rate. Pioneering research by Jensen and Meckling [1976] shows how limiting the borrower's ability to make agency transfers increases the borrower's value. Smith and Warner [1979] show how restrictive, or negative, covenants directly restrict agency transfers, effectively controlling agency conflicts related to debt.

There are several ways that the theory and predictions in this study differs from agency theory. First, agency theory is based on the borrower taking some hidden, adverse action (i.e., moral hazard). The framework of this study does not rely on moral hazard problems; rather the contracting problem is a lack of contract-relevant information, regardless of borrower action. Second, Smith and Warner [1979] draws links between a specific groups of covenants—negative covenants—and agency conflicts. They show that covenants that restrict specific actions, such as paying dividends or selling assets, limit common manifestations of the agency conflict, such as underinvestment or asset substitution. Their theory and evidence has been applied broadly to all covenants in debt contracts, including financial covenants (Billett et al. [2007]; Bradley and Roberts [2004]; Nash et al. [2003]). However, there are reasons that the analysis in Smith and Warner [1979] may not be applicable to financial covenants. Unlike negative covenants, which require the borrower to take an action to be violated, financial covenants can be violated in the absence of

any adverse action. This suggests financial covenants may be imprecise in controlling agency conflicts. Also, the evidence in Smith and Warner [1979] is based on the bond market. The private debt market, where financial covenants are used extensively, is more informationally opaque than the bond market (Bharath et al. [2008]; Denis and Mihov [2003]), leading to a greater demand for contracting provisions that address uncertainty.

Despite certain conceptual differences, it is not easy to separate agency from uncertainty on a theoretical basis. Although the theory I present here does not feature moral hazard problems, this does not mean that I can dismiss moral hazard and agency as a possible explanation for my results. In fact, uncertainty of the sort I describe likely facilitates moral hazard transfers by obscuring the true value of the borrower; in a sense, agency conflicts can be thought of as a subset of the broader set of contracting problems associated with uncertainty. Empirical separation of agency and uncertainty is also difficult. In the empirical tests, I use a variety of proxies to measure uncertainty; however, some of these could be interpreted as proxies for agency conflicts.[20]

In this section, I present two tests to sharpen the identification of uncertainty versus agency. In the first, I use a specific setting where there was a shock to uncertainty that had a lesser effect on agency incentives. In the second, I examine loans where the creditor also holds significant common equity shares.

6.1.1 Uncertainty Shocks

Shocks to uncertainty, as defined in Bloom [2009], are spikes in the level of market uncertainty that accompany major economic crises (e.g., the Asian Financial Crisis, the Russian Default and LTCM collapse, the Worldcom and Enron scandals, the Subprime Crisis) and significant political events (e.g., the 9/11 Attacks, the Second Gulf War). Bloom [2009] shows that uncertainty is abnormally high for three to six months following

[20] I include the *Market-to-Book* ratio as a control variable in the main tests. This ratio has been used as a proxy for growth opportunities, and thus agency conflicts (Skinner [1993]; Smith and Watts [1992]). The negative coefficient in the main tests is inconsistent with the predictions of agency (where higher levels of the ratio mean greater agency conflicts.) However, there are a variety of alternative interpretations of the market-to-book ratio, including accounting conservatism (Roychowdhury and Watts [2007]) and deficiencies in GAAP (Lev and Sougiannis [1999]), so I do not focus on this result as providing evidence related to agency conflicts.

a shock before returning to normal levels. In selecting a shock, I need to isolate changes in uncertainty that leave agency conflicts unaffected; in other words, find a shock where uncertainty increases regardless of the characteristics of firms in the market. For this reason, I do not consider any of the financial crises, where the events themselves are endogenous to the market. The shock I select is the 9/11 Attacks. This event is political rather than economic, so the spike in uncertainty is not related to any underlying features of firms in the market. Additionally, uncertainty was stable in the period preceding the shock, so the tests will not be confounded by another uncertainty triggering event. I illustrate the level of uncertainty in the time period around 9/11 in Figure 2.

The shock allows me to avoid using potentially endogenous measures of borrower-, industry-, and economy-level uncertainty in regression analysis. The empirical test takes the form:

$$FinCovIntensity_i = f(\alpha + \boldsymbol{\beta}\, Post + \boldsymbol{\Gamma} Controls_i + \epsilon) \tag{4}$$

I run the regression for loans initiated from September 12, 2000 (one year prior to the shock) to March 12, 2002 (six months after the shock).[21] The variable *Post* is an indicator with a value of one if the observations fall after September 16, 2001 and zero otherwise. The subsample consists of 1,550 packages, with 1,030 prior to the shock and 520 following it (though there are fewer observations in the reported results due to missing control variables). I employ a one-year prior period to benchmark normal uncertainty. The six-month post period is the upper bound suggested in Bloom [2009].[22] Since I expect

[21] After the attacks, the NYSE and NASDAQ did not reopen until September 17. Although the private loan market was not directly affected, I exclude loan packages initiated from September 11 through 16, due to overall disruption in the financial markets. There are only six packages recorded for this period, and their inclusion in the test subsample does not affect inferences.

[22] There are two threats to the validity of the 9/11 attacks as an exogenous shock to uncertainty. First, the Enron accounting scandal was revealed in October, 2001, which falls in the six month post-period. However, the VIX did not reflect any increase in uncertainty when the scandal was initially disclosed. Specifically, from a high in the mid-40s immediately following 9/11, the VIX trended downward and into the low-20s and high-teens through May, 2002. Uncertainty only increased again in June, 2002, coinciding with revelations about accounting problems at Worldcom. It is likely that the market viewed Enron as idiosyncratic at the time the scandal was first made public, and only when another major scandal broke did concern grow that accounting issues were widespread. As such, I do not expect that the Enron scandal contaminates the post-shock period. Second, the U.S. economy was in recession from March until November in 2001. If a recession influences the use of financial covenants, for example, with increased macroeconomic risk leading to greater demand for covenants, this could limit the inferences using this sample. However, this recession was short and shallow, and more important spanned both the pre- and post-periods. As such, it should not damage inferences from this test.

covenant use to increase following the shock, the predicted coefficient on *Post* is positive. Finally, since the test subsample involves a relatively short time period, I exclude year indicators from the set of control variables.

My interpretation of the evidence relies on this economic shock affecting uncertainty but not altering agency conflicts. While it is clear that uncertainty shifts (see Bloom [2009]), it is less clear whether agency conflicts are affected. On one hand, agency conflicts are often linked to the asset composition of the firm (i.e., the investment opportunity set), and adjust relatively slowly to shocks. On the other hand, the *incentives* for agency transfers could rapidly shift in response to a shock. As this is an empirical question, and one on which the inferences from this test rest, I present further evidence to validate that agency conflicts did not change following this shock.

First, I examine whether the use of other contract provisions changed in the *Post* period. The first provisions I examine are covenants restricting dividends. As noted in Smith and Warner [1979] and Kalay [1982], covenants restricting dividend payments directly address the agency cost of debt. Therefore, if agency problems increased following the shock, the use of these covenants should also increase. Second, I examine whether more loans required collateral following the shock. Berger and Udell [1990] find that collateral is associated with greater agency conflicts between the borrower and creditor. If inclusion of dividend restrictions or collateral requirements increased in the *Post* period, this serves as a benchmark to understand changes financial covenant use. I reproduce the regression from Eq. (4) using dividend restrictions and collateral requirements as the dependent variable. Since each of these provisions is dichotomous, I use logit regressions. Third, I provide further validation by separately examining the use of performance and capital covenants over the shock period. In the tests, I test the number of covenants of each type using negative binomial regressions.

I present regression results in Table 7, Panel A. The first column shows the results for financial covenant use. The coefficient on *Post* is positive and significant, indicating loans include more financial covenants following this shock. The results for *Dividends* and *Collateral* are presented in the second and third columns. In each, the coefficient

on *Post* is positive but insignificant. If dividend restrictions and collateral requirements are in place to address agency conflicts, this suggests that agency did not shift following in the *Post* period, and something else must be driving the change in financial covenant use.[23] The regression for *P-Covenants* shows a positive, significant sign on *Post*, while the coefficient on *Post* for *C-Covenants* is insignificant, consistent with Table 4.

To further isolate the effects of uncertainty from agency, I examine how the 9/11 shock had different effects on borrowers in different industries. In addition to increased uncertainty, some industries, such as airlines and tourism, experienced a reduction in expected cash flows following the shock. As theory suggests poor operating performance exacerbates agency conflicts (Berlin and Mester [1992]), it is difficult to separate the affects of agency from uncertainty in the presence of a shock that erodes expected future operating performance. As an additional identification test, I separate observations based on their ex-post earnings performance; the logic behind this partition is that ex-post realized performance serves as a proxy for ex-ante expected performance. Sorting firms by two-digit NAICS code, I measure the change in annual earnings from 2000 to 2002. If an industry had a decline in earnings over this measurement period, I set the value of an indicator variable *Shock Industry* to one, which identifies industries whose future cash flows were directly affected by the shock. In total, 31 of 60 industries experienced earnings declines, and thus are more susceptible to increased agency conflicts. While borrowers in a *Shock Industry* may have experienced a concurrent increase in agency and uncertainty, those borrowers in better performing industries were likely affected just by the uncertainty.

To enhance identification and further isolate the effects of uncertainty from agency, I supplement the regressions run in Table 7, Panel A, with two additional variables: *Shock Industry*, and *Shock Industry * Post*. The main effect captures whether the decline in earnings affected the design of contracts. The interaction term, the variable of interest, identifies if there is a differential effect in the *Post* period between borrowers with strong

[23]It is also notable that *Market-to-Book* is positive and significant in regressions for *Dividends* and *Collateral*. To the extent this variable captures some aspects of agency conflicts, this provides support for the ideas that dividend restrictions and collateral requirements are associated with agency conflicts.

and weak expected future earnings performance. If the change in use of a provision can be explained by agency, then the effect should be concentrated in industries where earnings declined; that is, the coefficient on the interaction term will be positive. A non-positive interaction suggests that agency is not the likely explanation for the provision.

I present the regression results in Table 7, Panel B. The first column shows results for *FinCovIntensity*. The coefficient on *Post* is positive and significant, consistent with Panel A. The coefficient on *Shock Industry* is insignificant, suggesting no difference in financial covenant use based on future industry earnings performance. More important, the coefficient on the interaction term is insignificant, suggesting agency does not explain the number of financial covenants. Turning to the second and third columns, the coefficient on the interaction term in each case is positive and significant. This suggests that dividend restrictions and collateral requirements increased in the *Post* period, but only for borrowers where agency conflicts were predicted to increase most acutely.

6.1.2 Simultaneous Equity and Debt Holdings

Jensen and Meckling [1976] note that one way to address the conflict between borrowers and creditors is to give the creditors an equity stake in the firm; when the equity holder is also a creditor, the incentives for the manager to make agency-related transfers is diminished. To provide a stronger control for agency conflicts, I collect a sample of creditors who also have non-trivial equity stakes in the companies they are lending to. I start by collecting the names of all syndicate members for each loan package in Dealscan. I match these to institutional ownership data from 13F filings from Thomsen Reuters. Following Jiang et al. [2010], I check if any syndicate member owns at least 1% of the outstanding equity of the borrower. I find 947 creditors who have a significant share of equity, who I term "dual holders".[24]

If the uncertainty measures used in this study also capture agency conflicts, it is difficult to draw inferences on the specific role of uncertainty in contracting. The sample of

[24]I expect that a large equity stake by the lead lender (as opposed to any syndicate member) would have a more direct effect in limiting agency conflicts. I collected a sample of these lenders and found there were only 18, too few to run analysis.

dual holders allows me to examine a set of loans that are relatively free of agency conflicts. If the association between uncertainty and covenant use is similar between the groups, it is difficult to argue that agency is the primary driver. If the association is significantly weaker in the dual holder loans, this casts doubt on the uncertainty explanation. To test this, I sort the sample in dual-holders and non-dual holders. I run the main regression specification (Eq. (2)) for each group, and then compare the coefficients. I present these results in Table 8. In the interest of space, I present results only for the uncertainty variables, along with test statistics (χ^2) and p-values of the differences between the coefficients. I present the loan-level variables in Panel A. In two of three the coefficient is larger for dual holders, although none of the differences are statistically significant. I find similar results for industry-level uncertainty metrics, which I present in Panel B; again, neither pair of coefficients differ significantly. The same is true of the economy-level proxies in Panel C, where none of the differences are significant. It is notable that there are significant differences in control variables between the two specification: Untabulated results show that both Size and Leverage have a significantly stronger association with covenant use in the dual holder subsample. These results, coupled with the evidence from the 9/11 shock period, buttress my claim that financial covenant use is not explained by agency conflicts.

6.2 Other Contract Provisions

6.2.1 Performance Pricing

An alternative to ex-post renegotiation of a loan contract is to set conditional changes in contract terms ex-ante; that is, the contract can be written so that satisfaction of specific performance thresholds will automatically trigger changes in the contract without costly renegotiation. A common example of this is performance pricing. This provision, examined in Asquith et al. [2005], sets a "pricing grid", linking realizations of accounting metrics (such as debt-to-EBIDTA) or agency credit ratings to changes in the loan interest spread. The pricing grid represents a set of pre-negotiated interest rate changes based on the borrower's financial performance or credit risk.

Performance pricing would seem like an ideal provision in the setting described in this paper (Armstrong et al. [2010]); in fact, pre-negotiated contract changes are almost certainly less costly than than formal renegotiations triggered by financial covenants. As such, installing pre-determined interest rate changes linked to realized outcomes would be an efficient way to integrate the ex-post resolution of uncertainty into contracts. However, there are ways that performance pricing may not be sufficient to address uncertainty. First, setting performance pricing provisions requires the contracting parties to define a set of performance conditions ex-ante, and link these to the appropriate interest rates. Depending on the degree of uncertainty, it may be challenging to specify the set of possible future states and the appropriate interest rates. Second, even when future states can be reasonably predicted, it is not clear that adjusting the interest rate is the optimal response. Given the large set of additional provisions open to contracting parties (e.g., collateral, maturity, covenants), the optimal contractual adjustment to ex-post information may be adjustment of a non-pricing term. Renegotiation means that the contracting parties could potentially change any contract provision, while performance pricing only allows changes in interest rate. To the extent that lenders want the option to make non-pricing changes to the contract ex-post, performance pricing may not be associated with ex-ante uncertainty.

Using a similar regression specification as Eq. (2), I test the association between performance pricing provisions and uncertainty. The dependent variable in the regression is an indicator with a value of one if the loan has performance pricing; as such, I use logit regression. I present the results in Table 9, Panel A. The regressions show that neither borrower-level nor industry-level uncertainty proxies are associated with performance pricing, and among the industry-level proxies only *MFP Growth Uncertainty* has a significant coefficient. These results suggest, on the whole, that performance pricing is not associated with uncertainty, but rather to address some other contracting problem.[25]

[25] Asquith et al. [2005] present evidence that performance pricing addresses adverse selection costs.

6.2.2 Maturity

Another alternative to ex-post renegotiation is for the creditor to offer shorter loan terms and negotiate new terms as the shorter loans expire. This suggests that greater uncertainty should be associated with shorter loans, other things being equal. However, having a shorter loan introduces certain costs, with the potential for hold up based on what the ex-post information reveals. Therefore, a longer contract with the possibility of renegotiation may be preferable to a series of shorter contracts.

As with the performance pricing test, I reproduce the main regression results with loan maturity as the dependant variable. Since this is a continuous variable, I use OLS regression. Moreover, since I expect uncertainty to potentially drive shorter loan maturities, I expect negative signs on the uncertainty proxies. I present the regression results in Table 9, Panel B. The coefficients on each of the borrower-level uncertainty proxies are insignificant. On the industry-level proxies, the coefficients are positive and significant. This suggests that more uncertainty is associated with *longer* loans, the opposite of predicted. Finally, two of the three economy-level proxies (*MFP Growth Uncertainty* and *VIX*) have negative, significant coefficients. This suggests that financial covenants and loan maturity may be complements, with the former addressing borrower- and industry-level uncertainty and latter addressing economy-wide uncertainty.

7 Conclusion

I examine financial covenant use in a framework that incorporates uncertainty, information, and renegotiation. I argue that financial covenants, which transfer control rights to the creditor when the borrower performs poorly, facilitate contracting under uncertainty. Using a large sample of private loan contracts, I find that financial covenant use is increasing in uncertainty, consistent with prediction.

Uncertainty has received significant attention in the equity market literature; for example, both Jiang et al. [2005] and Zhang [2006] show that uncertainty affects stock returns. The effects of uncertainty on contracting have received relatively less attention.

In this paper I present a analytic framework in the vein of Incomplete Contracting (Christensen et al. [2016]) that shows one way that uncertainty can be addressed via ex-ante contract design. One innovation of this framework is that the predictions do not rely on moral hazard, but rather on ex-ante uncertainty about the future state of the world. While I focus on financial covenants, the framework is likely applicable to many aspects of debt contract design.

There are some limitations to this study that may limit the inferences that readers can draw. First, in the analytical framework I argue that financial covenants serve to facilitate creditor-initiated renegotiations. However, as noted earlier, it is difficult to identify which renegotiations are creditor-initiated. As such, I can only observe that uncertainty is associated with financial covenant use, but I cannot determine whether financial covenant use actually leads to creditor-favorable renegotiation. Second, I attempt to provide an explanation for covenant use that does not rely on agency conflicts. As I describe, it is conceptually and practically difficult to separate the threat of agency conflicts from uncertainty. While I attempt to separate these two constructs using an exogenous shock and creditors with substantial equity holdings, the results should nonetheless be interpreted with caution.

Appendix

Variable	Definition	Source
Measures of Covenant Use		
Financial Covenant Intensity (FinCovIntensity)	Index of Financial Covenants (sum of Coverage, Debt-to-Earnings, Leverage, Current Ratio, Net Worth, and EBITDA)	Dealscan
PViolate	Expected likelihood of financial covenant violation, from Demerjian and Owens [2016]	Authors
Performance Covenants	Index of performance covenants (sum of Coverage, Debt-to-Earnings, and EBITDA)	Dealscan
Capital Covenants	Index of capital covenants (sum of Leverage, Current Ratio, and Net Worth)	Dealscan
Uncertainty Measures		
Volume	25-day average equity trading volume (scaled by total shares outstanding)	CRSP
Unated	Indicator if firm does not have a S&P Senior Unsecured debt rating (SPLTICRM)	Compustat
Forecast Dispersion	The standard deviation of analysts' earnings forecasts scaled by the average forecast value	I/B/E/S
Profit Growth Uncertainty	The cross-sectional standard deviation of quarterly profit growth by two-digit NAICS code; profit growth is quarterly operating income (OIBDPQ) divided by average total assets (ATQ)	Compustat
Stock Return Uncertainty	The cross-sectional standard deviation of monthly stock returns by two-digit NAICS code	CRSP
MFP Growth Uncertainty	The cross-industry standard deviation of year-on-year changes in multifactor productivity	Bureau of Labor Statistics
GDP Forecast Uncertainty	The standard deviation of semi-annual GDP forecasts in the Livingstone Survey	Philadelphia Federal Reserve
VIX	The quarterly average level of the CBOE traded market volatility index	Chicago Board of Exchange
Controls & Other Variables		
Leverage	Long-term debt (DLCQ+DLTTQ) scaled by total assets (ATQ)	Compustat
EBITDA	Operating income (OIBDPQ) scaled by average total assets (ATQ)	Compustat
Size	Natural logarithm of estimated firm market value: market value of equity (CSHOQ*PRCCQ) plus book value of debt (DLCQ+DLTTQ)	Compustat
Market-to-Book	Firm market value ((CSHOQ*PRCCQ) + (DLCQ+DLTTQ)) scaled by total assets (ATQ)	Compustat
EDF	Distance-to-default based on Merton [1974] and calculated as in Hillegeist et al. [2004]	CRSP & Compustat
Post	Indicator with value of one for packages initiated between September 17, 2001 and March 15, 2002 and zero between September 12, 2000 and September 10, 2001	n/a
Dividend Restriction	Indicator for negative covenant restricting dividends	Dealscan
Collateral	Indicator for Collateral Requirement	Dealscan

Shock Industry	Indicator with a value of one if an industry had a decline in aggregate earnings from 2000 to 2002, based on two-digit NAICS code	Compustat
Dual	Indicator for if any syndicate member holds at least 1% of the borrower's equity at the time of loan initiation	Dealscan & Thomsen Reuters (13F Filings)
Performance Pricing	Indicator for use of Performance Pricing Provision	Dealscan
Maturity	Term to maturity in days	Dealscan

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Table 1: Loan & Covenant Data

Panel A: Loan by Year

Financial Covenant Intensity	**Frequency**	**Percent**
Year	**Loans**	**%**
1995	595	3.4
1996	1,336	7.5
1997	1,574	8.9
1998	1,299	7.3
1999	1,039	5.9
2000	944	5.3
2001	1,000	5.6
2002	1,111	6.3
2003	1,080	6.1
2004	1,204	6.8
2005	1,160	6.5
2006	1,033	5.8
2007	863	4.9
2008	617	3.5
2009	425	2.4
2010	554	3.1
2011	698	3.9
2012	613	3.5
2013	623	3.5

Panel B: Financial Covenants

Financial Covenant Intensity	**Frequency**	**Percent**
0	429	2.4%
1	3,519	19.8%
2	6,321	35.6%
3	5,019	28.3%
4	2,004	11.3%
5	416	2.3%
6	59	0.3%
7	1	0.0%
Total	**17,768**	

Notes to Table 1: Panel A shows the number of loan package per year. Panel B shows the number of financial covenants per package for the sample period.

Table 2: Descriptive Statistics

Panel A: Uncertainty Variables

Variable	Obs.	Mean	Standard Deviation	Min.	1st Quartile	Median	3rd Quartile	Max.
Volume	16,908	6.918	6.862	0.092	2.485	4.899	8.786	48.784
Unrated	17,768	0.581	0.493	0.000	0.000	1.000	1.000	1.000
Forecast Dispersion	17,768	0.057	0.250	0.000	0.000	0.007	0.029	4.998
Profit Growth Uncertainty	17,335	0.075	0.093	0.006	0.028	0.049	0.079	0.933
Stock Return Uncertainty	17,624	0.151	0.060	0.041	0.112	0.145	0.182	0.782
MFP Growth Uncertainty	17,768	0.051	0.011	0.028	0.044	0.045	0.060	0.071
GDP Forecast Uncertainty	17,768	0.010	0.004	0.004	0.008	0.010	0.013	0.031
VIX	17,768	20.773	7.235	10.420	15.450	19.710	24.420	59.890

Panel B: Control Variables

Variable	Obs.	Mean	Standard Deviation	Min.	1st Quartile	Median	3rd Quartile	Max.
Leverage	15,916	0.284	0.208	0.000	0.119	0.265	0.407	1.111
EBITDA	13,872	0.133	0.111	-0.610	0.082	0.130	0.187	0.608
Size	15,445	6.768	1.930	-0.171	5.407	6.801	8.104	12.693
Market-to-Book	17,019	1.713	1.077	0.514	1.105	1.382	1.913	14.804
EDF	10,531	3.964	4.420	-48.897	1.265	3.038	5.555	77.486

Notes to Table 2: This table presents descriptive statistics on the proxy measures for uncertainty and other control variables. VOLUME is the 25-day average number of shares traded, scaled by total shares outstanding. UNRATED is an indicator variable with a value of one if the firm has no S&P debt rating, and zero otherwise. FORECAST DISPERSION is the standard deviation of analysts' estimates of the borrower's earnings, measured in the quarter preceding loan initiation. PROFIT GROWTH UNCERTAINTY is the cross-sectional standard deviation in profit growth, measured by quarter and industry (based on two-digit NAICS code). STOCK RETURN UNCERTAINTY is the cross-sectional standard deviation of stock returns, measured by month and industry. MFP GROWTH UNCERTAINTY is cross-sectional standard deviation in multi-factor productivity growth, measured on an annual basis. GDP FORECAST UNCERTAINTY is cross-sectional standard deviation of GDP forecast estimates in the Livingstone Survey (reported by the Philadelphia Federal Reserve Bank), measured on a semi-annual basis. VIX is the 30-day average value of the CBOE Market Volatility Index. LEVERAGE is the ratio of total long-term debt to total assets. EBITDA is the ratio of earnings before interest, taxes, deprecation, and amortization scaled by average total assets. SIZE is the natural logarithm of the market value of the firm (market value of equity plus the book value of debt). MARKET-TO-BOOK is the ratio of the market value of the firm to total assets. EDF is the distance-to-default, based on the Merton [1974] model and calculated following Hillegeist et al. [2004]. All continuous variables are winsorized at the top and bottom 1%.

Table 3: Correlations

	Volume	Unrated	Forecast Dispersion	Profit Growth Uncertainty	Stock Return Uncertainty	MFP Growth Uncertainty	GDP Forecast Uncertainty	VIX
Volume		-0.089	0.065	0.118	-0.006	0.037	0.052	0.017
Unrated	-0.175		-0.042	-0.062	0.153	-0.009	0.054	0.046
Forecast Dispersion	0.296	-0.277		0.096	-0.010	0.004	0.003	0.020
Profit Growth Uncertainty	0.168	-0.020	0.087		0.029	-0.036	-0.061	-0.037
Stock Return Uncertainty	-0.073	0.173	-0.111	0.275		0.192	0.141	0.252
MFP Growth Uncertainty	0.007	-0.019	-0.018	0.113	0.202		0.131	0.350
GDP Forecast Uncertainty	-0.015	0.062	-0.035	-0.082	0.119	0.069		0.029
VIX	-0.064	0.069	-0.077	0.003	0.357	0.379	0.016	

Notes to Table 3: This table presents univariate correlations and details of the principal components analysis of the uncertainty variables. VOLUME is the 25-day average number of shares traded, scaled by total shares outstanding. UNRATED is an indicator variable with a value of one if the firm has no S&P debt rating, and zero otherwise. FORECAST DISPERSION is the standard deviation of analysts' estimates of the borrower's earnings, measured in the quarter preceding loan initiation. PROFIT GROWTH UNCERTAINTY is the cross-sectional standard deviation in profit growth, measured by quarter and industry (based on two-digit NAICS code). STOCK RETURN UNCERTAINTY is the cross-sectional standard deviation of stock returns, measured by month and industry. MFP GROWTH UNCERTAINTY is cross-sectional standard deviation in multi-factor productivity growth, measured on an annual basis. GDP FORECAST UNCERTAINTY is cross-sectional standard deviation of GDP forecast estimates in the Livingstone Survey (reported by the Philadelphia Federal Reserve Bank), measured on a semi-annual basis. VIX is the 30-day average value of the CBOE Market Volatility Index. The number of observations in each cell ranges from 16,908 to 17,768 depending on the availability of the underlying variables.

Table 4: Loan-Level Regressions

Variable	Pred. Sign	(1)	(2)	(3)
Volume	+	**0.033*** (4.36)**		
Unrated	+	**0.078*** (4.27)**		
Forecast Dispersion	+	**0.055*** (3.83)**		
Profit Growth Uncertainty	+		**0.193*** (3.50)**	
Stock Return Uncertainty	+		**0.428*** (3.67)**	
MFP Growth Uncertainty	+			**0.435 (0.25)**
GDP Growth Uncertainty	+			**0.075 (0.03)**
VIX	+			**0.000 (0.15)**
Leverage		0.165*** (4.13)	0.100** (2.55)	0.149*** (3.62)
EBITDA		0.604*** (8.77)	0.773*** (10.28)	0.726*** (10.16)
Size		-0.062*** (-9.68)	-0.077*** (-13.22)	-0.085*** (-13.48)
Market-to-Book		-0.020** (-2.36)	-0.014 (-1.62)	-0.013 (-1.19)
EDF		0.003** (2.57)	0.002** (2.23)	0.003** (2.21)
Constant		1.178*** (13.07)	1.134*** (23.59)	1.340*** (10.12)
Year-Quarter Fixed Effects		Yes	Yes	No
Industry Fixed Effects		Yes	No	Yes
Observations		7,989	7,846	8,063

Notes to Table 4: This table presents loan-level regression results. The response variable in each regression is FINCOVINTENSITY, the number of financial covenants used in the loan package. Since the response is a count variable, I use negative binomial regression. VOLUME is the 25-day average number of shares traded, scaled by total shares outstanding. UNRATED is an indicator variable with a value of one if the firm has no S&P debt rating, and zero otherwise. FORECAST DISPERSION is the standard deviation of analysts' estimates of the borrower's earnings, measured in the quarter preceding loan initiation. PROFIT GROWTH UNCERTAINTY is the cross-sectional standard deviation in profit growth, measured by quarter and industry (based on two-digit NAICS code). STOCK RETURN UNCERTAINTY is the cross-sectional standard deviation of stock returns, measured by month and industry. MFP GROWTH UNCERTAINTY is cross-sectional standard deviation in multi-factor productivity growth, measured on an annual basis. GDP FORECAST UNCERTAINTY is cross-sectional standard deviation of GDP forecast estimates in the Livingstone Survey (reported by the Philadelphia Federal Reserve Bank), measured on a semi-annual basis. VIX is the 30-day average value of the CBOE Market Volatility Index. LEVERAGE is the ratio of total long-term debt to total assets. EBITDA is the ratio of earnings before interest, taxes, deprecation, and amortization scaled by average total assets. SIZE is the natural logarithm of the market value of the firm (market value of equity plus the book value of debt). MARKET-TO-BOOK is the ratio of the market value of the firm to total assets. EDF is the distance-to-default, based on the Merton [1974] model and calculated following Hillegeist et al. [2004]. All continuous variables are winsorized at the top and bottom 1%. *** and ** indicate statistical significance at the 1% and 5% levels respectively (two-tailed tests).

Table 5: Loan-Level Regressions Controlling for Risk

Variable	Pred. Sign	(1)	(2)	(3)
Volume*	+	**0.065*** (3.36)**		
Unrated*	+	**0.155*** (3.94)**		
Forecast Dispersion*	+	**0.112*** (3.34)**		
Profit Growth Uncertainty*	+		**0.367*** (3.09)**	
Stock Return Uncertainty*	+		**0.940*** (3.51)**	
MFP Growth Uncertainty*	+			**0.887 (0.24)**
GDP Growth Uncertainty*	+			**0.404 (0.07)**
VIX*	+			**0.001 (0.25)**
Leverage		0.258*** (2.71)	0.213** (2.36)	0.322*** (3.26)
EBITDA		1.382*** (8.36)	1.730*** (9.58)	1.624*** (9.93)
Size		-0.155*** (-13.87)	-0.175*** (-14.86)	-0.188*** (-15.06)
Market-to-Book		-0.028 (-1.48)	-0.027 (-1.37)	-0.031 (-1.30)
EDF		0.005* (1.83)	0.004 (1.51)	0.006 (1.43)
Constant		3.178*** (18.66)	3.172*** (40.56)	3.506*** (18.81)
Year-Quarter Fixed Effects		Yes	Yes	No
Industry Fixed Effects		Yes	No	Yes
Observations		7,989	7,846	8,063

Notes to Table 5: This table reports presents multivariate regression results controlling for risk. The response variable in each regression is FINCOVINTENSITY, the number of financial covenants used in the loan package. Since the response is a count variable, I use negative binomial regression. To control for the effects of risk, the seven uncertainty proxies (VOLUME, UNRATED, FORECAST DISPERSION, PROFIT GROWTH UNCERTAINTY, STOCK RETURN UNCERTAINTY, MFP GROWTH UNCERTAINTY, GDP GROWTH UNCERTAINTY, VIX) are orthogonalized against two proxies for risk, EDF and RATING, as well as controls; the measure used in the regression is residual from the regression: $Uncertainty\_Measure_j = \alpha + \beta_1 EDF + \beta_2 RATING + \gamma_1 LEVERAGE + \gamma_2 SIZE + \gamma_3 MARKET - TO - BOOK + \Theta Year Indicators + \Lambda Industry Indicators + \epsilon$ (The regression for UNRATED does not including RATING). The orthogonalized variables are denoted with an asterisk (*). VOLUME is the 25-day average number of shares traded, scaled by total shares outstanding. UNRATED is an indicator variable with a value of one if the firm has no S&P debt rating, and zero otherwise. FORECAST DISPERSION is the standard deviation of analysts' estimates of the borrower's earnings, measured in the quarter preceding loan initiation. PROFIT GROWTH UNCERTAINTY is the cross-sectional standard deviation in profit growth, measured by quarter and industry (based on two-digit NAICS code). STOCK RETURN UNCERTAINTY is the cross-sectional standard deviation of stock returns, measured by month and industry. MFP GROWTH UNCERTAINTY is cross-sectional standard deviation in multi-factor productivity growth, measured on an annual basis. GDP FORECAST UNCERTAINTY is cross-sectional standard deviation of GDP forecast estimates in the Livingstone Survey (reported by the Philadelphia Federal Reserve Bank), measured on a semi-annual basis. VIX is the 30-day average value of the CBOE Market Volatility Index. LEVERAGE is the ratio of total long-term debt to total assets. EBITDA is the ratio of earnings before interest, taxes, deprecation, and amortization scaled by average total assets. SIZE is the natural logarithm of the market value of the firm (market value of equity plus the book value of debt). MARKET-TO-BOOK is the ratio of the market value of the firm to total assets. EDF is the distance-to-default, based on the Merton [1974] model and calculated following Hillegeist et al. [2004]. All continuous variables are winsorized at the top and bottom 1%. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively (two-tailed tests).

Table 6: Loan-Level Regressions by Covenant Type

Panel A: Performance Covenants				
Variable	**Pred. Sign**	**(1)**	**(2)**	**(3)**
Volume	+	**0.059*** (4.63)**		
Unrated	+	**0.117*** (2.97)**		
Forecast Dispersion	+	**0.129*** (5.00)**		
Profit Growth Uncertainty	+		**0.356* (1.93)**	
Stock Return Uncertainty	+		**2.291*** (7.19)**	
MFP Growth Uncertainty	+			**3.451 (1.63)**
GDP Growth Uncertainty	+			**-11.250* (-1.68)**
VIX	+			**-0.003 (-0.86)**
Leverage		0.668*** (7.67)	0.603** (7.51)	0.512*** (6.24)
EBITDA		1.504*** (10.59)	1.728*** (11.10)	1.474*** (9.52)
Size		-0.084*** (-5.18)	-0.123*** (-8.14)	-0.064*** (-4.31)
Market-to-Book		-0.045*** (-2.85)	0.001 (0.08)	-0.041*** (-2.61)
EDF		0.007** (2.05)	0.003 (0.88)	0.006 (1.84)
Constant		1.365*** (5.28)	0.955*** (8.74)	1.876*** (5.64)
Year-Quarter Fixed Effects		Yes	Yes	No
Industry Fixed Effects		Yes	No	Yes
Observations		7,848	7,669	7,882
Panel B: Capital Covenants				
Variable	**Pred. Sign**	**(1)**	**(2)**	**(3)**
Volume	+	**0.006 (0.41)**		
Unrated	+	**0.097*** (3.22)**		
Forecast Dispersion	+	**-0.043* (-1.71)**		
Profit Growth Uncertainty	+		**-0.123 (-0.73)**	
Stock Return Uncertainty	+		**-1.468*** (-4.25)**	
MFP Growth Uncertainty	+			**-2.531 (-0.49)**
GDP Growth Uncertainty	+			**11.847 (1.06)**
VIX	+			**0.004 (0.79)**
Leverage		-0.472*** (-7.92)	-0.544*** (-9.27)	-0.326*** (-4.59)
EBITDA		-0.361*** (-2.58)	-0.416*** (-2.64)	-0.262 (-1.59)
Size		-0.033** (-2.15)	-0.036*** (-2.22)	-0.118*** (-6.11)
Market-to-Book		0.004 (0.29)	-0.015 (-0.79)	0.40** (2.00)
EDF		-0.006* (-1.88)	-0.003 (-0.74)	-0.004 (-1.12)
Constant		1.683*** (9.14)	2.082*** (20.07)	1.620*** (4.46)
Year-Quarter Fixed Effects		Yes	Yes	No
Industry Fixed Effects		Yes	No	Yes
Observations		7,848	7,669	7,882

Notes to Table 6: This table reports presents multivariate regression results by covenant type. The response variable in Panel A is an index of PERFORMANCE COVENANTS, including interest coverage, cash interest coverage, debt-to-EBITDA, senior debt-to-EBITDA, debt service coverage, fixed charge coverage, and EBITDA (all defined on Dealscan). The response variable in Panel B is an index of CAPITAL COVENANTS, including leverage, debt-to-equity, debt-to-

tangible net worth, senior leverage, net worth, tangible net worth, current ratio, and quick ratio. Since the responses are count variables, I use negative binomial regression. VOLUME is the 25-day average number of shares traded, scaled by total shares outstanding. UNRATED is an indicator variable with a value of one if the firm has no S&P debt rating, and zero otherwise. FORECAST DISPERSION is the standard deviation of analysts' estimates of the borrower's earnings, measured in the quarter preceding loan initiation. PROFIT GROWTH UNCERTAINTY is the cross-sectional standard deviation in profit growth, measured by quarter and industry (based on two-digit NAICS code). STOCK RETURN UNCERTAINTY is the cross-sectional standard deviation of stock returns, measured by month and industry. MFP GROWTH UNCERTAINTY is cross-sectional standard deviation in multi-factor productivity growth, measured on an annual basis. GDP FORECAST UNCERTAINTY is cross-sectional standard deviation of GDP forecast estimates in the Livingstone Survey (reported by the Philadelphia Federal Reserve Bank), measured on a semi-annual basis. VIX is the 30-day average value of the CBOE Market Volatility Index. LEVERAGE is the ratio of total long-term debt to total assets. EBITDA is the ratio of earnings before interest, taxes, deprecation, and amortization scaled by average total assets. SIZE is the natural logarithm of the market value of the firm (market value of equity plus the book value of debt). MARKET-TO-BOOK is the ratio of the market value of the firm to total assets. EDF is the distance-to-default, based on the Merton [1974] model and calculated following Hillegeist et al. [2004]. All continuous variables are winsorized at the top and bottom 1%. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively (two-tailed tests).

Table 7: Exogenous Shock to Uncertainty - The 9/11 Attacks

Panel A: Main Regression

Variable	Predicted Sign	Financial Covenant Intensity	Dividend Restriction	Collateral Requirements	P-Covenant Intensity	C-Covenant Intensity
Post	+/?/?/+/?	**0.137*** (3.95)**	**0.015 (0.07)**	**0.229 (0.88)**	**0.165*** (3.22)**	**0.014 (0.22)**
Leverage		0.075 (0.71)	1.768** (1.98)	4.754*** (5.71)	0.549*** (3.63)	-0.719*** (-3.67)
EBITDA		1.002*** (6.21)	-1.926 (-1.46)	-3.080** (-2.27)	1.473*** (5.24)	0.808 (0.31)
Size		-0.067*** (-6.74)	-0.796*** (-7.93)	-1.058*** (-9.62)	-0.064*** (-3.64)	-0.056*** (-2.78)
Market-to-Book		-0.047*** (-2.71)	0.495*** (2.93)	0.181* (1.88)	-0.071** (-2.33)	-0.019 (-0.62)
EDF		-0.004 (-0.71)	0.052 (1.52)	-0.059 (-1.58)	-0.020** (-1.96)	0.015* (1.92)
Constant		1.200*** (18.49)	5.592*** (6.87)	6.870*** (9.10)	0.507*** (4.52)	0.498*** (4.31)
Year Fixed Effects		No	No	No	No	No
Industry Fixed Effects		Yes	Yes	Yes	Yes	Yes
Regression Function		Negative Binomial	Logit	Logit	Negative Binomial	Negative Binomial
Observations		639	592	541	627	627

Panel B: Industry Tests

Variable	Predicted Sign	Financial Covenant Intensity	Dividend Restriction	Collateral Requirements
Post	+ / ? / ?	**0.118*** (2.09)**	**-0.412 (-1.26)**	**-0.364 (-0.98)**
Shock Industry		-0.052 (-1.04)	-0.134 (-0.48)	-0.131 (-0.43)
Post × Shock Industry	? / + / +	**0.034 (0.48)**	**0.814* (1.87)**	**1.041** (2.01)**
Leverage		0.069 (0.66)	1.737* (1.95)	4.827*** (5.70)
EBITDA		1.019*** (6.32)	-1.898 (-1.46)	-3.108** (-2.26)
Size		-0.068*** (-6.76)	-0.800*** (-7.92)	-1.077*** (-9.66)
Market-to-Book		-0.047*** (-2.71)	0.487*** (2.90)	0.180* (1.80)
EDF		-0.005 (-0.85)	0.057* (1.68)	-0.059 (-1.55)
Constant		1.233*** (15.81)	5.703*** (7.65)	7.068*** (8.98)
Year Fixed Effects		No	No	No
Industry Fixed Effects		Yes	Yes	Yes
Regression Function		Negative Binomial	Logit	Logit
Observations		639	592	541

Notes to Table 7: This table reports regression results of the use of financial covenants before and after the 9/11 Attacks. The test sample includes packages initiated between September 12, 2000 and March 15, 2002, and excludes packages from September 11 through 16, 2001. The variable POST is an indicator with a value of one for packages starting after September 16, 2001, and zero otherwise. The variable SHOCK INDUSTRY is an indicator with a value of one for packages in industries that saw a decline in earnings performance from 2000 to 2002. The response variable in the first specification is FINCOVINTENSITY, the number of financial covenants used in the package. Since this response is a count variable, I use negative binomial regression. The response variable in the second specification is DIVIDEND RESTRICTION, and indicator with a value of one when the loan contract restricts dividend payments, and zero otherwise. The response in the third column is COLLATERAL REQUIREMENTS, an indicator with a value of one when the loan contract requires collateral. Since these responses are dichotomous, I use logit regression. The fourth column uses PERFORMANCE COVENANTS (P-COVENANT INTENSITY) as the response, an index counting the number of interest coverage, cash interest coverage, debt-to-EBITDA, senior debt-to-EBITDA, debt service coverage, fixed charge coverage, and EBITDA covenants (all defined on Dealscan). The fifth column use CAPITAL COVENANTS (C-COVENANT INTENSITY) as the response, an index counting the number of leverage, debt-to-equity, debt-to-tangible net worth, senior leverage, net worth, tangible net worth, current ratio, and quick ratio covenants. LEVERAGE is the ratio of total long-term debt to total assets. EBITDA is the ratio of earnings before interest, taxes, deprecation, and amortization scaled by average total assets. SIZE is the natural logarithm of the market value of the firm (market value of equity plus the book value of debt). MARKET-TO-BOOK is the ratio of the market value of the firm to total assets. EDF is the distance-to-default, based on the Merton [1974]. Each regression includes indicator variables for industry (based on two digit NAICS code); standard errors are clustered by borrower. All continuous variables are winsorized at the top and bottom 1%. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively (two-tailed tests).

Table 8: Dual Holders

Variable	**Dual = 0 coeff. (t-stat)**	**Dual = 1 coeff. (t-stat)**	**Difference**	**Test χ^2 (p-value)**
Panel A: Borrower-level uncertainty				
Volume	0.032 (4.58)	0.047 (1.86)	0.015	0.33 (0.57)
Unrated	0.085 (4.83)	0.011 (0.21)	-0.076	1.73 (0.19)
Forecast Dispersion	0.052 (3.00)	0.134 (2.17)	0.082	1.66 (0.19)
Panel B: Industry-level uncertainty				
Profit Growth Uncertainty	0.204 (3.52)	0.022 (0.14)	-0.182	1.31 (0.25)
Stock Return Uncertainty	0.385 (2.85)	1.147 (2.30)	0.762	2.25 (0.13)
Panel C: Economy-level uncertainty				
MFP Growth Uncertainty	0.328 (0.59)	0.531 (0.36)	0.203	0.02 (0.89)
GDP Growth Uncertainty	0.093 (0.08)	-2.522 (-0.55)	-2.615	0.31 (0.58)
VIX	0.000 (0.51)	-0.000 (-0.011)	-0.001	0.06 (0.80)

Notes to Table 8: This table presents regression results separating loan observations into those where a creditor has a substantial equity share (DUAL = 1) and not (DUAL = 0). A loan has a DUAL holder if any syndicate member holds at least 1% of the outstanding stock of the borrower at the time of loan initiation. The response variable in each regression is FINCOVINTENSITY, the number of financial covenants used in the loan package. VOLUME is the 25-day average number of shares traded, scaled by total shares outstanding. UNRATED is an indicator variable with a value of one if the firm has no S&P debt rating, and zero otherwise. FORECAST DISPERSION is the standard deviation of analysts' estimates of the borrower's earnings, measured in the quarter preceding loan initiation. PROFIT GROWTH UNCERTAINTY is the cross-sectional standard deviation in profit growth, measured by quarter and industry (based on two-digit NAICS code). STOCK RETURN UNCERTAINTY is the cross-sectional standard deviation of stock returns, measured by month and industry. MFP GROWTH UNCERTAINTY is cross-sectional standard deviation in multi-factor productivity growth, measured on an annual basis. GDP FORECAST UNCERTAINTY is cross-sectional standard deviation of GDP forecast estimates in the Livingstone Survey (reported by the Philadelphia Federal Reserve Bank), measured on a semi-annual basis. VIX is the 30-day average value of the CBOE Market Volatility Index. The regressions include the control variables (LEVERAGE, EBITDA, SIZE, MARKET-TO-BOOK, EDF) described in prior tables, as well as the same fixed effects.

Table 9: Other Loan Provisions

Panel A: Performance Pricing				
Variable	**Pred. Sign**	**(1)**	**(2)**	**(3)**
Volume	+	**-0.062**		
		(-0.64)		
Unrated	+	**-0.314*** **		
		(-3.06)		
Forecast Dispersion	+	**-0.043**		
		(-0.97)		
Profit Growth Uncertainty	+		**0.867**	
			(1.06)	
Stock Return Uncertainty	+		**0.134**	
			(0.31)	
MFP Growth Uncertainty	+			**26.558*** **
				(3.38)
GDP Growth Uncertainty	+			**-4.127**
				(-0.37)
VIX	+			**-0.016**
				(-1.57)
Leverage		-0.841***	-0.573**	-0.635***
		(-3.83)	(-3.03)	(-2.82)
EBITDA		3.911***	2.449***	4.024***
		(8.36)	(8.87)	(8.84)
Size		0.299***	0.332***	0.295***
		(7.04)	(9.15)	(6.83)
Market-to-Book		-0.267***	-0.312***	-0.265***
		(-5.39)	(-5.89)	(-5.29)
EDF		0.030***	0.025**	0.030***
		(2.68)	(2.19)	(2.69)
Constant		-1.331**	-1.999***	-2.117***
		(-2.40)	(-7.35)	(-3.17)
Year-Quarter Fixed Effects		Yes	Yes	No
Industry Fixed Effects		Yes	No	Yes
Observations		7,989	7,846	8,063
Panel B: Maturity				
Variable	**Pred. Sign**	**(1)**	**(2)**	**(3)**
Volume	-	**0.032**		
		(1.57)		
Unrated	-	**-0.017**		
		(-0.75)		
Forecast Dispersion	-	**0.002**		
		(0.18)		
Profit Growth Uncertainty	-		**1.064*** **	
			(5.48)	
Stock Return Uncertainty	-		**0.132** **	
			(2.05)	
MFP Growth Uncertainty	-			**-6.576*** **
				(-9.22)
GDP Growth Uncertainty	-			**0.373**
				(0.22)
VIX	-			**-0.013*** **
				(-11.99)
Leverage		0.251***	0.265**	0.144***
		(5.39)	(5.78)	(3.11)
EBITDA		0.951***	1.054***	0.956***
		(10.16)	(11.33)	(10.36)
Size		-0.019**	-0.023***	0.012**
		(-2.51)	(-3.99)	(2.04)
Market-to-Book		-0.074***	-0.070***	-0.078***
		(-7.45)	(-7.29)	(-8.36)
EDF		0.010***	0.009**	0.010***
		(5.07)	(4.10)	(4.94)
Constant		7.469***	7.035***	7.714***
		(85.06)	(110.44)	(86.62)
Year-Quarter Fixed Effects		Yes	Yes	No
Industry Fixed Effects		Yes	No	Yes
Observations		7,931	7,786	8,003

Notes to Table 9: This table reports regression results on other contractual provisions. In Panel A, the response variable is PERFORMANCE PRICING, an indicator variable with a value of one if the loan package includes a performance pricing provision. Since this response is dichotomous, I use logit regression. In Panel B, the response variable is MATURITY, the natural logarithm of the term to maturity of the loan package. Since this resopnse is continuous, I use OLS

regression. VOLUME is the 25-day average number of shares traded, scaled by total shares outstanding. UNRATED is an indicator variable with a value of one if the firm has no S&P debt rating, and zero otherwise. FORECAST DISPERSION is the standard deviation of analysts' estimates of the borrower's earnings, measured in the quarter preceding loan initiation. PROFIT GROWTH UNCERTAINTY is the cross-sectional standard deviation in profit growth, measured by quarter and industry (based on two-digit NAICS code). STOCK RETURN UNCERTAINTY is the cross-sectional standard deviation of stock returns, measured by month and industry. MFP GROWTH UNCERTAINTY is cross-sectional standard deviation in multi-factor productivity growth, measured on an annual basis. GDP FORECAST UNCERTAINTY is cross-sectional standard deviation of GDP forecast estimates in the Livingstone Survey (reported by the Philadelphia Federal Reserve Bank), measured on a semi-annual basis. VIX is the 30-day average value of the CBOE Market Volatility Index. LEVERAGE is the ratio of total long-term debt to total assets. EBITDA is the ratio of earnings before interest, taxes, deprecation, and amortization scaled by average total assets. SIZE is the natural logarithm of the market value of the firm (market value of equity plus the book value of debt). MARKET-TO-BOOK is the ratio of the market value of the firm to total assets. EDF is the distance-to-default, based on the Merton [1974] model and calculated following Hillegeist et al. [2004]. All continuous variables are winsorized at the top and bottom 1%. *** and ** indicate statistical significance at the 1% and 5% levels respectively (two-tailed tests).

Figure 1: Timeline

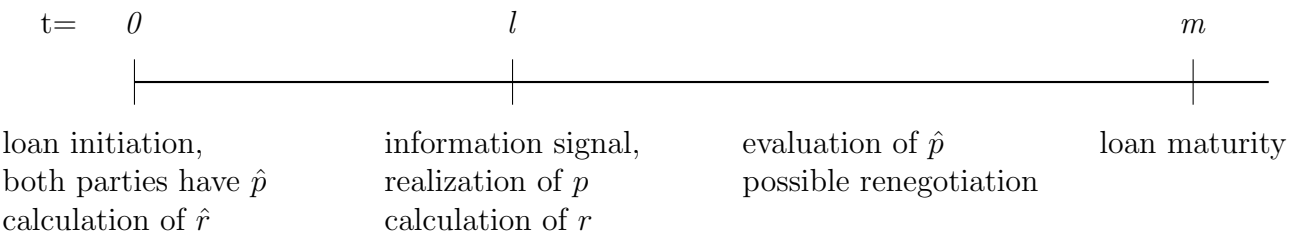

Figure 2: VIX Closing Value around the 9/11 Attacks