Creditor Control Rights and Firm Investment Policy*

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February 2007

Abstract

We provide novel empirical evidence of a direct contracting channel through which firm financial policy affects firm investment policy. We examine a large sample of private credit agreements between banks and public firms and find that 32% of the agreements contain an explicit restriction on the firm's capital expenditures. Creditors are more likely to impose a restriction following negative borrower performance. Moreover, the effect of credit downgrades and financial covenant violations on the incidence of capital expenditure restrictions in new contracts is larger than the effect on interest spreads. We also find that restrictions cause a reduction in firm investment and that firms obtaining contracts with a new restriction experience subsequent increases in market valuation and operating performance. The evidence suggests that capital expenditure restrictions reduce inefficient excess investment by managers.

*We thank Ken Ayotte, Allen Berger, Mark Carey, Doug Diamond, Mike Faulkender, Chris Hennessy, Bengt Holmström, Steve Kaplan, Anil Kashyap, Atif Mian, Francisco Perez-Gonzalez, Raghu Rajan, Josh Rauh, Michael Roberts, Carola Schenone, Morten Sørensen, Phil Strahan, and Per Strömberg for helpful comments. This work benefited greatly from seminar participants at the University of Virginia, the University of Delaware, the Board of Governors of the Federal Reserve, the University of Kentucky (Gatton), Cornell University (Johnson), the University of Chicago GSB, the FDIC Center for Financial Research, and the AEA annual meeting. We acknowledge excellent research assistance by Rahul Bhargava, Peiju Huang, and Lin Zhu. Sufi thanks the FDIC Center for Financial Research and the Center for Research in Securities Prices for financial support.

How does a reliance on external finance affect firm investment? This question has been the focus of research across many economic disciplines, including corporate finance, banking, macroeconomics, and development.[1] A prominent line of theoretical research on financial contracting posits a direct contractual link. The foundations of this literature are Townsend (1979) and Gale and Hellwig (1985), who find that debt with foreclosure rights following a payment default emerges as the optimal security when external financiers cannot observe cash flows (see also Hart (1995) and Hart and Moore (1998)). Alternative models assuming a richer contracting environment hypothesize that creditors may exert direct control over investment even when the borrower meets its payment obligations (Jensen and Meckling (1977), Aghion and Bolton (1992), Dewatripont and Tirole (1994)). In these models, in order to alleviate incentive conflicts, creditors may contractually restrict firm investment after negative performance, but well outside payment default states.

To date, there is no empirical research documenting creditors' use of direct contractual restrictions on the investment policy of public firms outside of bankruptcy. To the contrary, in their classic examination of bond covenants, Smith and Warner (1979) state that "extensive direct restrictions on production/investment policy would be expensive to employ and are not observed." More recently, Billett, King, and Mauer (2006) report that fewer than 5% of public bond indentures contain an explicit restriction on firm investments. Past studies documenting an empirical relationship between external finance and investment policy are either agnostic concerning the channel through which an effect occurs (Fazzari, Hubbard, and Petersen (1988); Rauh (2006)), or use external financial frictions such as debt overhang or collateral constraints rather than direct creditor interference to explain their results (Whited (1992), Hubbard (1998), and Hennessy (2004); see Stein (2003) for a discussion).

In this paper, we provide novel empirical evidence that creditors exert direct contractual control over the investment policy of solvent public firms. In particular, we examine almost 4,000 private credit agreements between banks and publicly-traded U.S. corporations and document that roughly one-third of

[1] An incomplete list includes: Corporate finance: Fazzari, Hubbard, and Petersen (1987), Lamont (1997), Hennessy (2004), and Rauh (2006); Macroeconomics/Banking: Bernanke and Gertler (1989), Holmström and Tirole (1997), Kashyap, Stein, and Wilcox (1993); Development: Rajan and Zingales (1998).

the contracts include explicit restrictions on the borrower's capital expenditures. In addition, we demonstrate that these restrictions are more likely to be put in place following a decline in performance or a deterioration in credit quality, and that the restrictions impact actual firm investment policy.

The novelty of our findings is due, in part, to the contracts we examine. Private credit agreements represent an ideal – and largely overlooked – setting for examining the influence of financing on investment. Roughly 80% of all public firms maintain private credit agreements, whereas only 15 to 20% of public firms have public debt (Sufi (2007), Faulkender and Petersen (2006)). Even among firms with public debt, nearly all also have a private credit agreement in the form of a revolving credit facility (Sufi (2007)). Compared with public bonds, private credit agreements contain covenants that are more detailed, comprehensive, and tightly set (Sweeney (1994), Kahan and Tuckman (1995), Chava and Roberts (2006), Sufi (2007)), making an analysis of private contracts essential to understanding the impact of external finance on firm behavior.

Our empirical analysis yields three sets of results. First, we document that private creditors restrict the investment policy of a large fraction of public companies. More specifically, 32% of the private credit agreements in our panel contain an explicit restriction on the firm's capital expenditures, and 40% of the firms in our sample face a restriction in at least one loan between 1996 and 2005. Extrapolating to the entire universe of U.S. public firms, our statistics imply that one in three firms faced a capital expenditure restriction in a private credit agreement at some point during the last 10 years.

Second, we find that creditors obtain more control over firm investment policy in response to negative firm performance and increases in firm credit risk. More specifically, we find that a capital expenditure restriction is more likely to be imposed when a borrower has lower cash flow, higher credit risk as measured by the firm's credit rating, or recently violated a financial covenant in a pre-existing credit agreement. The effect of negative firm performance on the likelihood of having a capital expenditure restriction is both statistically robust and economically meaningful. For example, a firm that is downgraded from the lowest investment-grade S&P rating (BBB) to the highest speculative-grade rating (BB) experiences a 21 percentage point increase in the likelihood of facing a capital expenditure

restriction, which translates to a 95% increase in the likelihood, evaluated at the mean. We also show that control over investment policy is among the most important performance-contingent contractual features found in loan agreements. For instance, whether a loan includes an investment restriction is often more sensitive to changes in firm performance than amendments to interest rates and collateral requirements.

Our results concerning financial covenant violations offer additional insight into the contingency inherent in private credit agreements. A financial covenant violation represents a technical default that gives creditors the right to accelerate the loan, which could force the firm into bankruptcy. We find that creditors often use their acceleration right to introduce capital expenditure restrictions into renegotiated agreements that follow financial covenant violations. In fact, relative to the original agreements, capital expenditure restrictions are almost twice as likely to be observed in renegotiated agreements that follow a covenant violation. While creditors also increase interest rates and demand collateral in response to covenant violations, the elasticity of the capital expenditure restriction with respect to a covenant violation is significantly larger than the elasticity of other loan terms. These results suggest that covenants in loan contracts make the allocation of control over investment policy contingent on the borrower's future performance.

In our third set of results, we show compelling evidence that capital expenditure restrictions constrain firm investment. Identifying the causal effect of the restriction is difficult given that restrictions are imposed in response to negative performance and that the restriction is the outcome of bilateral negotiations. We conduct a variety of tests to resolve this identification problem. We begin by demonstrating that firms obtaining credit agreements with a new restriction experience a 15% decline in investment relative to firms that obtain a credit agreement without a restriction, even after controlling for observed changes in investment opportunities and performance. We then use a sub-sample of agreements for which we collect the exact value of the restriction and show that actual expenditures cluster tightly below the contractual limit. The results are even stronger when we focus on the credit agreements in which a capital expenditure restriction is imposed after being absent in the previous contract. Before the new credit agreement, almost half of the observations are above the yet-to-be imposed restriction amount.

After the restriction is imposed, less than 10% are above the restriction amount, and over 60% of the firms lie in the expenditure area two percentage points below the restriction. Such a dramatic shift in expenditures to the area just below the contractual restriction is difficult to reconcile with the hypothesis that the restrictions do not affect investment policy.

While these results imply that restrictions constrain investment levels below the counter-factual investment level without the restriction, they do not necessarily imply a reduction in efficient investment. To the contrary, we document that firms obtaining a new capital expenditure restriction experience increases in both operating performance and market valuation ratios relative to firms that obtain agreements without a restriction. While we view this last result as preliminary motivation for future research, it suggests that restrictions on investment may bring firms closer to the surplus-maximizing investment level.

Our paper makes a novel contribution to the literature along two dimensions. First, we document that creditors play a much more direct, contractual role in the investment policy of public companies than has previously been recognized in the investment-financing literature. In this respect, the paper most closely related to ours is Chava and Roberts (2006), who show that violations of financial covenants cause a reduction in capital expenditures. However, the primary focus of their study is on identifying the magnitude of the reduction, and they make no mention of the explicit restrictions on capital expenditures that are at the heart of our analysis. More broadly, our paper departs from the extant literature that emphasizes how external financial constraints can lead to inefficiently low investment. Instead, we find empirical support for the optimal financial contracting literature, in which constraints on investment are a second-best solution when management is likely to engage in potentially value-destroying investment. While our results on efficiency implications are admittedly preliminary, they suggest that explicit restrictions on investment may be efficiency improving.

Our second contribution is to the applied financial contracting literature (Kaplan and Strömberg (2003), Kaplan and Strömberg (2004), Lerner, Shane, and Tsai (2004), Benmelech, Garmaise, and Moskowitz (2005)). In contrast to the extant literature, our analysis focuses on private bank credit

agreements obtained by public firms, which are arguably the largest source of financing for corporations. Among this sample, we find support for the hypothesis that creditors exert control over firm investment policy even outside of payment default states. In addition, we demonstrate how creditors use financial covenant violations to impose capital expenditure restrictions in renegotiated agreements. These results are broadly consistent with models by Aghion and Bolton (1992) and Dewatripont and Tirole (1994), in which optimal contracts give decision rights to creditors after negative realizations of noisy performance measures. In documenting how creditors use financial covenant violations to impose restrictions in future contracts, we provide empirical support to the notion that ex post renegotiation considerations play an important role in ex ante contracts (Hart and Moore (1988)). Indeed, creditors' use of financial covenants with acceleration rights is consistent with the hypothesis that "parties can make up for … incompleteness … by building into the contract the mechanism for revising the terms of trade as they receive information about the benefits and costs" (Hart and Moore (1988)).

The rest of the paper proceeds as follows. The next section discusses the data and summary statistics. Section II presents the theoretical framework with which we motivate the empirical analysis. Sections III through V present the results, and Section VI concludes.

I. Data and Summary Statistics

Our investigation centers on the information we gather from the covenants of private credit agreements between banks and public firms. Historically, information on bank loans has been difficult to gather directly because of the customary secrecy between banks and borrowers. As private agreements, the loans are not legal securities and are not subject to direct SEC regulation. However, SEC precedent has established a requirement that public companies include copies of all "material" contracts, including bank loan agreements, with relevant SEC disclosures.[2] The contracts typically appear as exhibits at the end of a 10-K or 10-Q report, or as an attachment to an 8-K filing. The SEC's *Edgar* electronic filing

[2] The reporting requirements for loan contracts fall within item 601(b) of regulation S-K, which is the general provision that requires exhibits to be filed. Item 4 and item 10 under this regulation require disclosure of securities and the disclosure of all material contracts, respectively. Most loan contracts fall within one of these two categories.

system makes it possible to search, extract, and download these credit agreements. We use these agreements to construct our sample of contracts with and without capital expenditure restrictions.

To build our complete dataset, we begin with loan deals from Reuters LPC's *Dealscan* database that have been linked to firms in Standard & Poor's *Compustat* database. To these deals, we match the credit agreements downloaded from *Edgar*. Our final data set includes 3,720 credit agreements to 1,931 public borrowers from 1996 through 2005. Below, we detail the data-collection process.

A. Data: Loan agreements from Edgar

We begin with a sample of loan deals from *Dealscan* that are matched with firm financial characteristics from *Compustat*. Our sample includes deals made to non-financial firms, and we require that each deal have information on the loan amount and the interest spread of all tranches in the deal. The sample is restricted to deals initiated during the years 1996 through 2005. Our starting year corresponds to when the SEC began requiring firms to file electronically; electronic filings are only sparsely available on *Edgar* prior to 1996. Once these restrictions are in place, we are left with 9,580 deals (representing 13,715 loan tranches).

From *Compustat*, we construct financial statistics as the average of the four quarters prior to the loan agreement being signed. Cash flow is constructed using *item 21*, scaled by the book value of total assets (*item 44*). The book leverage ratio is long term debt (*item 51*) plus short term debt (*item 45*), scaled by book assets. The market to book ratio is total assets less the book value of equity plus the market value of equity, all scaled by total assets. The book value of equity is the book value of assets less the book value of liabilities (*item 54*) and preferred stock (*annual item 10*) plus deferred taxes (*item 52*). The market value of equity is common shares outstanding (*item 14*) multiplied by the share price (*item 61*). We include only deals in which the borrower's lagged cash flow, lagged market to book, and the lagged leverage ratio are non-missing.

The main *Dealscan* database contains no information on capital expenditure restrictions. To obtain this information, we use text-search programs to scan every 10-Q, 10-K, and 8-K filing in *Edgar* for loan contracts. More specifically, we match every firm in *Compustat* to its respective set of SEC

filings, and then scan these filings for the following 10 terms in capital letters: "CREDIT AGREEMENT," "LOAN AGREEMENT," "CREDIT FACILITY," "LOAN AND SECURITY AGREEMENT," "LOAN & SECURITY AGREEMENT," "REVOLVING CREDIT," "FINANCING AND SECURITY AGREEMENT," "FINANCING & SECURITY AGREEMENT," "CREDIT AND GUARANTY AGREEMENT," and "CREDIT & GUARANTY AGREEMENT." If we find one of these 10 terms, we also require the document to contain the search term "TABLE OF CONTENTS" within 60 lines after the initial search terms. This process allows us to extract most original credit agreements, and many of the major amendments and restatements of credit agreements, that are contained in *Edgar*. We match the credit agreement to *Dealscan* based on the date of the loan agreement and the company identifier.[3]

Of the 9,580 deals in *Dealscan*, we are able to successfully find almost 40% of the actual credit agreement in *Edgar*, which yields a final sample of 3,720 loan contracts to 1,931 borrowers. We are able to match only 40% because *Dealscan* contains information on some loans that are not reported by firms in their SEC filings. This information is collected directly from financial institutions that report "deal flow" to Reuters LPC. Although Reuters LPC requires that the financial institutions provide enough information on the loans to verify the accuracy of the information, they do not typically obtain the level of detail available from a copy of the credit agreement. Thus, the level of detail in a *Dealscan* record will tend to depend on whether Reuters LPC could find the original credit agreement in an SEC filing.

We have examined the characteristics of the *Dealscan* deals for which we are unable to obtain a contract. We find that the *Dealscan* data quality of unmatched deals is much poorer than matched deals. In particular, data describing financial covenants, collateral, dividend restrictions, and the percentage held by each lender are more likely to be missing in *Dealscan* for deals that we are unable to match to a contract. In terms of any broader sample selection issues, there is no statistically significant difference between the average loan amount or interest spread for matched and unmatched loan deals. In addition,

[3] For less than 5% of deals in *Dealscan*, a borrower has more than one deal signed on the same date. We treat all deals signed on the same date by the same firm as one deal, and we append all credit agreements collected from *EDGAR* for the same firm and the same credit agreement date into one master credit agreement.

the average firm characteristics for matched and unmatched deals are similar. Overall, we do not believe we introduce any significant bias by focusing only on deals that we have matched to contracts.

We also collect data on whether firms violate a financial covenant in the year prior to the loan agreement.[4] Financial covenants are accounting-based risk and performance hurdles that the borrower must meet to be in compliance with the credit agreement. Typical financial covenants include leverage ratios (measures of debt-to-assets or debt-to-cash flow), interest coverage and "fixed charge" ratios (measures of cash-to-interest-type expenses), and measures of net worth (assets – liabilities). The breach of a financial covenant means that the borrower is in technical default on the loan, and that the lender has the *right* to demand immediate repayment of the entire loan. Such a demand can easily trigger a bankruptcy filing because the borrower's other creditors will also typically have the right to demand "acceleration" of payments conditional on the bank debt default. Of course, the bank is not required to accelerate the loan, and can opt to waive the covenant – that is, grant the borrower temporary relief from the covenant – or renegotiate the contract altogether. Thus, financial covenants serve as "tripwires" to renegotiation that put substantial bargaining power in the hands of the banks.

B. Capital Expenditure Restrictions

Using the loan contracts that we match to *Dealscan* deals, we collect information on capital expenditure restrictions contained in the agreement. There are a number of interesting control-oriented covenants in private credit agreements, including restrictions on acquisitions, expenditures on non-capital items, and changes in company ownership (Baird and Rasmussen (2006)). However, we restrict our analysis to capital expenditure restrictions for three reasons. First, covenants restricting capital expenditures are relatively straightforward to identify using our search methodologies. Second, unlike more "boiler-plate" covenants that are in almost all loan agreements, capital expenditure restrictions are deal-specific, and their incidence varies across our sample of contracts. Third, capital expenditure restrictions typically constrain "cash" capital expenditures, (*Item 128* in *Compustat*), the measure most

[4] For more information on how these data are obtained, see Roberts and Sufi (2007).

often used in papers on corporate investment policy. Thus, the capital expenditure restriction pertains specifically to what is usually termed "investment" in the corporate finance literature.[5]

Capital expenditure restrictions are usually documented in the section on negative covenants near the end of the credit agreement, and are commonly set as a nominal dollar amount for a given fiscal year. The capital expenditure restriction contained in the June 29th, 2001 loan agreement for Airborne Express, Inc is a typical example:

> Limitation on Capital Expenditures. Capital Expenditures for each Fiscal Year shall not exceed the maximum levels as set forth below opposite such Fiscal Year:
>
Fiscal Year Ended:	Maximum Level
December 31, 2001	$205,000,000
December 31, 2002	$255,000,000
December 31, 2003	$305,000,000

Alternatively, capital expenditure restrictions are sometimes enforced as percentages of revenue or earnings variables. For example, the loan agreement between American Precision Industries, Inc. and Marine Midland Bank, dated August 31st, 1998 contains the following restriction:

> CAPITAL EXPENDITURES. For any one fiscal year, [the borrower shall not] make or incur aggregate Capital Expenditures in excess of seven and one-half percent (7-1/2%) of the Company's Consolidated net sales as shown on the Company's audited financial statements for such fiscal year.

It is important to emphasize that restrictions are tailored specifically to borrowers, and can be very detailed.

For our full sample of loans, we collect information on whether a loan contract contains a restriction by coding as a restriction any limit on the capital expenditure activities of the firm or any of its subsidiaries. To find such restrictions, we use a text searching algorithm to scan all contracts for the term "capital expenditure." The search program tells us if the term is in the agreement, which we then further examine to confirm whether the agreement has a capital expenditure restriction. For firms that have a capital expenditure restriction, a fiscal year ending in December, and a specific dollar restriction on aggregate capital expenditures defined over the fiscal year, we also collect the actual capital expenditure

[5] Capital expenditure restrictions typically cover cash capital expenditures as reported in a company's Statement of Cash Flows plus the capitalized value of new capital leases.

restriction amount for the first year reported in the loan agreement. We isolate this subset of firms in order to accurately measure the timing and amount of the restriction.[6] This subset includes 486 deals.

C. Summary Statistics

[TABLE 1]

Table 1 contains the summary statistics for the sample of 3,720 private credit agreements signed by 1,931 borrowers. The first statistic is also one of our main results: 32% of the agreements contain an explicit restriction on capital expenditures. Across agreements with a capital expenditure restriction for which we gather the restricted amount, the average level of the restriction measured relative to lagged assets is 8.5%. The average capital expenditures in the year of the agreement for these firms, also measured relative to lagged assets, is 6.4%. The average loan deal amount is $450 million, which represents 34% of book assets. While the loan size may appear large, it is important to understand that over 94% of the deals contain revolving credit facilities, many of which remain unused (Sufi (2007)). Almost half of the credit agreements are obtained by firms with a Standard & Poor's issuer credit rating. Conditional on having a credit rating, only 2% of firms in our sample have a rating of CCC or below. In other words, very few of the borrowers in our sample are in, or very near, bankruptcy.

II. Theoretical Background

The summary statistics presented in Table 1 suggest that capital expenditure restrictions are relatively common in private credit agreements. In this section, we motivate our empirical analysis of these restrictions with theoretical insights from the optimal financial contracting literature.

One line of research in this area derives optimal contracts in which external financiers remain passive if interest payments are met but obtain control of the firm's assets in response to a payment default (Townsend (1979), Gale and Hellwig (1985), Hart (1995), and Hart and Moore (1998)). A critical assumption of these models is that cash flows are either unobservable to external financiers (Townsend

[6] Actual restrictions often have rollover provisions that permit some portion of unused annual limits to be carried over to the following fiscal year. To avoid the effect of accumulating limits, we focus on the first year. We use only firms with fiscal year end in December for two reasons. First, the restrictions are sometimes given in terms of calendar years, which would make calculation difficult for firms with alternative fiscal year ends. Second, if a firm has a non-December fiscal year end, it is difficult to ascertain to which fiscal year the restriction applies.

(1979), Gale and Hellwig (1985)) or non-verifiable in courts (Hart (1995), Hart and Moore (1998)), leaving payment defaults as the only mechanism for transferring control rights.

In contrast to the assumptions of these models, contractible performance signals, such as audited earnings information and credit ratings, are almost always available when banks design credit agreements for public firms. An alternative line of contracting theories assume that noisy measures of performance are contractible and argue that creditors may optimally exert a degree of control even outside of payment default. In Jensen and Meckling (1976), contracting parties can reduce agency costs by agreeing to covenants that restrict the borrower from making risky investments. The restrictions are efficient when the costs of abiding by the covenants are smaller than the potential savings from lowered interest payments; for instance, in cases in which performance is low and the potential for risk-shifting is high.

In Aghion and Bolton (1992), there is a contractible signal that is correlated with a negative externality created by managerial private benefits. In this setting, contracts are written so that decision rights optimally shift from the manager to the external financier when private benefits are most likely to distort the manager into inefficient decisions. Their most prominent example is when one of the potential states involves low monetary benefits and high managerial private benefits. In this situation, managers have excess continuation bias. If the contractible signal implies that it is more likely that such a state has been realized, then contracts give decision rights to the external financiers. The decision right in Aghion and Bolton (1992) is quite general and is not limited to asset liquidation. As they note, it includes "decisions such as mergers, takeovers, [or] spinoffs" (p. 477).[7]

Dewatripont and Tirole (1994) assume the existence of ex ante managerial moral hazard. In their model, firm profit is contractible but is not a sufficient statistic to determine whether the manager has shirked. They assume that contracts can specify an investor interference mechanism conditional on profit realizations, where interference is costly for managers. The optimal contract specifies that "poor

[7] In their framework, the manager continues to receive monetary payments even when the creditor obtains decision rights, which makes it difficult to interpret such an outcome as "bankruptcy." Hart (1995) criticizes this aspect of Aghion and Bolton (1992): "One of the most basic features of a debt contract is that what triggers a shift in control is the non-payment of debt … the Aghion-Bolton contract does not have this property" (p. 101).

performance [should be] followed by a high probability of external interference [by creditors], while good performance [should be] rewarded by a low probability of external interference" (p. 1049). In fact, the "external interference" technology in their model gives the creditor the right to decide whether or not an investment should proceed, which is a close theoretical analog to the capital expenditure restrictions we find in private credit agreements. [8]

While Jensen and Meckling (1977), Aghion and Bolton (1992), and Dewatripont and Tirole (1994) make different assumptions and derive a variety hypotheses, we use two common insights from these models to motivate our empirical analysis. First, when contractible performance signals are available, creditors may obtain decision rights even outside of payment default states. Second, creditors are more likely to obtain a degree of control in response to negative realizations of observable performance measures. In other words, we should observe creditors imposing capital expenditure restrictions when borrower performance or credit quality deteriorates. For this latter hypothesis, we also explore whether contracts are explicitly contingent on the borrower's future performance; that is, we explore whether contracts specify that investment will be restricted if performance deteriorates.

III. The Widespread Use of Capital Expenditure Restrictions

[TABLE 2]

In this section, we examine whether creditors contractually restrict the investment policy of public firms outside of bankruptcy. Table 2 documents that 32% of the credit agreements in our sample contain an explicit restriction on capital expenditures. At the borrower level, this proportion translates to 42% of firms in our sample having a capital expenditure restriction at some point between 1996 and 2005. Over roughly the same period, Sufi (2007) shows that over 80% of public firms in the *Compustat* universe utilize private credit agreements in the form of bank lines of credit. These two statistics imply that 34% of *Compustat* firms faced a capital expenditure restriction in a debt contract at some point

[8] Garleanu and Zwiebel (2007) and Demarzo and Fishman (2007) also consider contracts that explicitly restrict borrower investment behavior. Garleanu and Zwiebel (2007) study how debt contracts with exogenously imposed investment restrictions influence the efficiency of renegotiation (see also Berlin and Mester (1992)). Demarzo and Fishman (2007) derive an optimal compensation contract that rewards good-performing managers by allowing them to grow the firm through new investment, and penalizes bad performers by restricting investment growth.

between 1996 and 2005. Capital expenditure restrictions are common across industries, outside of agriculture. In particular, about 40% of credit agreements obtained by borrowers operating in the retail trade, wholesale trade, and services industries contain a restriction, while roughly one-third of credit agreements to manufacturing borrowers have the restriction. Across size categories, restrictions are more common for small firms, but a substantial fraction of firms with over $1 billion in book assets also have agreements containing capital expenditure restrictions.

Conditional on having an S&P issuer credit rating, only 6% of agreements obtained by investment grade borrowers have a capital expenditure restriction. Among junk borrowers, the fraction of agreements with a restriction is 44%. The large difference in the incidence of capital expenditure restrictions among loans to junk and investment grade borrowers is evidence that creditors restrict investment policy in response to credit quality deterioration, something we explore further in Section IV.

Although capital expenditure restrictions are more common on loans to borrowers of lower credit quality, Table 2 shows that restrictions are not exclusively associated with bankrupt firms. For example, 39% of credit agreements obtained by firms with a BB rating have a restriction, and on average, less than 1% of these borrowers default over a one year horizon, according to Moody's historical default probability tables. Capital expenditure restrictions are correlated with borrower performance, but they are not a restriction used exclusively on loans to borrowers that are in or near bankruptcy.

IV. Restrictions and Borrower Performance

A. The Effect of Negative Performance on the Incidence of Restrictions

A general hypothesis of the optimal financial contracting models discussed in Section II is that creditor control of firm investment policy is more likely after negative firm performance. In this section, our main goal is to obtain estimates of the effect of negative performance and credit quality deterioration on the incidence of capital expenditure restrictions. We use three measures. First, we use the borrower's average cash flow scaled by assets in the four quarters prior to the loan origination. Second, we use whether the firm has violated a financial covenant in a pre-existing agreement in the previous four quarters. Finally, we use the borrower's S&P issuer credit rating as a measure of credit quality. The

drawback of the credit rating measure is that it is only available for rated firms, which comprise 49% of our sample.

1. Empirical methodology

Our goal is to estimate the average partial effect of performance and credit quality on the incidence of a capital expenditure restriction in a given borrower's loan agreement. Our main dataset is a panel of credit agreements to firms indexed by i at dates indexed by t. The advantage of a panel over a cross-section is the ability to mitigate biases in coefficient estimates caused by an unobserved effect of a given firm, which we denote, c_i. In a standard linear framework with a continuous left hand side variable, fixed effects estimation explicitly estimates c_i, which allows for arbitrary correlation between the unobserved effect and the observed explanatory variables (Wooldrige (2002)). By allowing for this arbitrary correlation, fixed effects estimation produces consistent estimates of the average partial effects of covariates under the relatively weak assumption that the mean of the error term, conditional on the covariates and the unobserved effect, is zero.

Our outcome of interest is the incidence of a capital expenditure restriction, which is a discrete {0,1} variable. We want to estimate coefficients from the general specification:

$$\Pr(restriction_{it} = 1 \mid X_{it}\beta, c_i) = G(X_{it}\beta, c_i) \qquad (1)$$

Obtaining consistent estimates of the parameter vector β in a panel setting is the subject of a large body of econometric research (Arellano and Honore (2001), Chamberlain (1984), Fernandez-Val (2005), Bester and Hansen (2006)); while there has been progress, there is still no generally agreed upon consistent panel estimator that allows for arbitrary correlation between the unobserved effect and the covariates. One possibility is to assume $G(\,)$ is a linear function and to estimate (1) using a fixed effects linear probability specification. However, such an estimation has several undesirable properties, including the fact that predicted values lie outside the [0, 1] interval and that it imposes the restriction $X_{it}\beta < c_i < 1 - X_{it}\beta$.

In addition to the fixed effects linear probability model, we use a probit model in which the function $G(\,)$ in equation (1) takes the following form:

$$G(z) \equiv \Phi(z) \equiv \int_{-\infty}^{z} \phi(v)dv \tag{2}$$

where $\phi(v)$ is the standard normal density. The probit model has several desirable properties; most important for us is the ability to easily compute average partial effects from coefficient estimates.[9] However, it has the undesirable property that firm unobserved effects cannot be explicitly estimated given the incidental parameters problem. In other words, unlike the linear case, we cannot allow for arbitrary correlation between the unobserved effect and the covariates.

To obtain average partial effects, we use both a pooled probit estimation and a random effects probit estimation. The former takes on the following form:

$$\Pr(restriction_{it} = 1 \mid X_{it}\beta) = \Phi(X_{it}\beta). \tag{3}$$

The random effects probit model makes an explicit assumption about the correlation structure between the unobserved firm effects c_i and covariates X_{it}:

$$\Pr(restriction_{it} = 1 \mid X_{it}\beta, c_i) = \Phi(X_{it}\beta + c_i), \tag{4}$$

together with the assumption:

$$c_i \mid x_i \sim Normal(0, \sigma_c^2). \tag{5}$$

While assumption (5) is quite strict, the random effects probit model has the desirable property of specifying a conditional distribution of the random effect while allowing for straight-forward estimation of average partial effects.

The estimates of average partial effects we choose to report in the next sub-section are from a pooled probit model, a random effects probit model, and a linear probability fixed effects model. As we show below, our coefficient estimates of interest are stable across these different specifications.

2. Results

[9] An alternative model is conditional logit, in which the conditional distribution of *restriction* does not depend on c_i given the logit functional form. The main disadvantage of conditional logit is the difficulty in obtaining partial effects from the index parameter estimates—the distribution of c_i is unrestricted, and it is therefore a non-trivial exercise to decide on what value of c_i should be used to calculate partial effects. See Wooldridge (2002), page 492.

[TABLE 3]

Table 3 presents the estimates. For each estimation model, we present two specifications. The first uses the full sample and examines how lagged cash flow and financial covenant violations affect the incidence of a capital expenditure restriction in the credit agreement. The second specification includes credit rating indicator variables as covariates, and isolates the sample to firms that have a credit rating. The coefficient estimate on cash flow is negative and statistically distinct from zero at the 10 percent level under all specifications. The coefficient estimate in column 1 implies that a one standard deviation decrease in cash flow (0.026) increases the likelihood of having a capital expenditure restriction by 2.5 percentage points, which is an increase of 8% at the mean. The magnitude of the effect is larger among rated firms, and among firms for which we have two agreements in the sample. The fixed effects linear probability estimate in column 7 implies that a one standard deviation in cash flow among this sub-sample (0.022) increases the likelihood of having a capital expenditure restriction by 15% at the mean.

In column 1, the coefficient estimate on the covenant violation indicator variable implies that a firm that violates a financial covenant is 13 percentage points more likely to have a capital expenditure restriction, which is 40% at the mean. The coefficient estimate on the covenant violation indicator variable is stable across all estimation strategies for the full sample (columns 1, 3, 5, and 7). However, the coefficient estimate is smaller in magnitude and statistically weak for the sample of rated firms. This latter result is due mainly to collinearity between the performance measures in the rated sample. A specification that removes the ratings indicator variables and the cash flow variable leads to coefficient estimates on the covenant violation indicator that are almost identical in magnitude and statistical significance to the full sample estimates.

In all estimations, there is a sharp increase in the likelihood of a firm having a capital expenditure as it moves from BBB rated to BB rated—that is, as the firm moves from an investment-grade rating to a "junk" rating. The estimates in column 2 suggest that a firm downgraded from BBB to BB increases the likelihood of having a capital expenditure restriction by 21 percentage points, which is 95% at the mean in the rated sample.

Overall, the results in Table 3 provide support for one of the primary implications from the optimal financial contracting models discussed in Section II. In response to poor firm performance, creditors are more likely to restrict investment. These findings suggest that future contracts are implicitly contingent on the borrower's performance. In other words, borrowers that perform poorly or experience credit quality deterioration are more likely to have restrictions in future loan agreements.

B. Restrictions Versus other Loan Terms

In this section, we explore how other contract terms respond to negative performance in order to understand the relative importance of shifts in control over investment. We focus specifically on capital expenditure restrictions versus interest spreads, whether a loan is secured, and whether a loan contains a restriction on dividend payments.[10]

[TABLE 4]

Table 4 reports the unconditional correlations of the four contract terms we examine and documents that the terms are all positively correlated. In particular, a capital expenditure restriction is most highly correlated with the interest spread and whether the loan is secured. The interest spread is more highly correlated with whether the loan is secured than whether the loan has a capital expenditure restriction. Interestingly, dividend restrictions are least correlated with capital expenditure restrictions.

In order to document the relative importance of negative firm performance on the incidence of capital expenditure restrictions, we obtain estimates of the average partial effect of negative firm performance on other contract terms using the same specifications as in columns 1 and 2 of Table 3. When the outcome of interest is whether the loan is secured or whether the loan contains a dividend restriction, we use a pooled probit estimation.[11] When the outcome of interest is the interest spread (which is a continuous variable), we use OLS.

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[10] We also examine how negative performance affects maturity and the loan amounts. We find weak evidence that loan amounts are positively correlated with cash flow, but generally find that performance has no effect on loan maturity or amount.

[11] The patterns in Figures 1 and 2 are robust to the use of a random effects probit model. While fixed effects linear probability estimates produce similar coefficients for both capital expenditure restrictions and dividend restrictions,

[FIGURE 1]

Figure 1 presents the evidence. It shows the effect of negative performance on the contract term in question, where the effect is stated as the percent change at the mean of the left hand side variable. The left panel examines how a drop in the cash flow of a firm from the 90th to the 10th percentile of the distribution affects the contract terms, whereas the right panel of Figure 1 examines how a financial covenant violation affects contract terms. For example, a drop in a borrower's cash flow from the 90th to the 10th percentile results in a 17% increase in the likelihood of having a capital expenditure restriction at the mean. Figure 1 demonstrates that the effect of a large drop in cash flow has a smaller magnitude effect on the incidence of a capital expenditure restriction than on the interest spread, or the probability that the loan is secured. Figure 1 also shows that the effect of a financial covenant violation on the probability that a loan contains a capital expenditure restriction is significantly larger than the effect on other contract terms. A financial covenant violation increases the incidence of a capital expenditure restriction by almost 45% at the mean; the effect on the interest spread is only 15% at the mean.

When compared to collateralization rates and interest spreads, capital expenditure restrictions are relatively more sensitive to financial covenant violations than to declines in cash flow. This finding offers insight into the purpose of financial covenants, and how creditors use their acceleration right following violations. Our findings suggest that creditors use violations to obtain a degree of control over investment policy, as opposed to using violations only to increase interest spreads. We further explore the effect of financial covenant violations on investment restrictions in the next sub-section.

[FIGURE 2]

Figure 2 examines the partial effects of credit downgrades on contract terms. The omitted group is firms rated A or better, and the graphs show the marginal effect of rating downgrades on various contract terms, where the effects are stated as percent changes at the mean of the left hand side variable. The slope of the downgrade effect is steeper for capital expenditure restrictions than for interest spreads

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the estimates are considerably lower for collateralization. We report the probit estimates in order to remain conservative on the relative effect of performance on capital expenditure restrictions versus collateralization.

or dividend restrictions, but similar for collateralization.[12] A downgrade from A or above to BB leads to a 105% increase in the incidence of a capital expenditure restriction at the mean; a similar downgrade leads to a 60% increase in the interest spread.

C. Contingency

In this section, we examine how creditors make future contract terms contingent on the borrower's future performance. The results in Table 3 suggest that capital expenditure restrictions in loan agreements are *implicitly* contingent on the borrower's past performance—credit agreements are more likely to contain a restriction when the borrower has lower cash flow, has violated a financial covenant, or has lower credit quality. However, these results do not necessarily imply that ex ante contracts are *explicitly* contingent on future performance, as is hypothesized in Aghion and Bolton (1992) and Dewatripont and Tirole (1994). In fact, we find that the vast majority of contracts do not specify an explicit contingency. That is, we rarely find contract provisions that explicitly specify that a restriction will be imposed if the borrower's performance deteriorates.[13] When we do find such a contingency, it is actually the mirror-image of that discussed in theory—the capital expenditure is imposed at the outset of the contract, but the contract promises to remove the restriction conditional upon good borrower performance. Thus, while such contingencies appear feasible, lenders do not specify that control will shift conditional on bad borrower performance. Instead, observed agreements tend to either restrict or not restrict capital expenditures from the outset of the contract.

The lack of explicit contingencies does not imply that contingent control shifts do not occur. One contingency arises from the fact that observed debt contracts always specify an exact maturity date. Given that outstanding debt must be repaid at a specified date, creditors can use the maturity of the loan to revise contract terms in response to negative borrower performance. In general, the optimal contracting models we describe in Section II abstract from maturity considerations. While there are alternative optimal

[12] The coefficient estimate on the CCC or worse indicator variable for the secured regressions is missing given that all credit agreements of firms with a credit rating of CCC or worse are secured.

[13] This stands in contrast to VC contracts; Kaplan and Strömberg (2003) show that is common for these contracts to specify explicit control-oriented contingencies that occur in reaction to bad performance.

contracting models that explore the trade-off between explicit contingencies and maturity (Rajan and Winton (1995), Berglöf and von Thadden (1994), and Flannery (1986)), our results suggest that more theoretical work exploring this trade-off could be fruitful.

Perhaps the closest empirical analog to the contingent contracts hypothesized in Aghion and Bolton (1992) and Dewatripont and Tirole (1994) is creditors' use of financial covenants. As mentioned above, financial covenants are performance-based limits contained in almost all private credit agreements. A borrower that violates a financial covenant is in "technical default" of the credit agreement, and the agreements give the lender the right to accelerate the outstanding loan in response to a technical default. Technical defaults typically lead to a renegotiation of the loan agreement in which creditors use their acceleration right to extract amendment fees and to impose harsher terms in the new renegotiated agreement. It is important to note that financial covenant violations are not uncommon incidents. Roberts and Sufi (2007) report that 1 in 4 public firms violated a financial covenant at some point during a similar sample period.

[TABLE 5]

In Table 5, we present descriptive statistics that show how creditors use financial covenant violations to change terms in renegotiated agreements. We isolate the sample to the set of loan agreements that most closely resemble the contingent contracts envisioned in Aghion and Bolton (1992) and Dewatripont and Tirole (1994). More specifically, we examine "contingent-contract" pairs, where each pair represents two credit agreements between the same borrower and the same lender, the borrower has violated a financial covenant before the new credit agreement, and the origination date of the new agreement is before the maturity date of the old agreement. The new credit agreement therefore most likely represents a renegotiated loan agreement following a technical default by the borrower.

Column 1 of Table 5 reports the fraction of original and renegotiated agreements that contain capital expenditure restrictions. While 36% of credit agreements obtained before the financial covenant violation include a capital expenditure restriction, over 60% of the renegotiated agreements following the violation contain a restriction. That is, the renegotiated agreement after the covenant violation is 68%

more likely to contain a restriction on capital expenditures. Table 5 also shows that the renegotiated loan agreement has an interest spread that is 30% higher than the original loan agreement, that the incidence of requiring collateral increases by 21%, and that dividend restrictions are 8% more likely after a renegotiation. Overall, the evidence in Table 5 is consistent with the evidence in Figure 1. The incidence of capital expenditures is more sensitive to financial covenant violations than other contract terms such as the interest spread or collateralization.

The descriptive analysis in Table 5 provides empirical insight into optimal financial contracting models on two dimensions. First, in place of explicit contingencies, creditors utilize a contractual mechanism (a financial covenant violation) that does not specify the exact consequences of negative borrower performance. Instead, financial covenant violations provide creditors with a strong bargaining position (via their acceleration right) and an ability to change almost any loan term in the renegotiated agreement. Second, rather than writing extensively detailed ex ante contracts, creditors use relatively course financial covenants in order to force renegotiation when the borrower's performance or credit quality deteriorates. The contracting in this particular market is consistent with the notion that, when contracts are incomplete, a mechanism for forcing renegotiation will be written into ex ante contracts (Hart and Moore (1988)).

V. The Impact of Restrictions on Investment

In this section, we examine how capital expenditure restrictions affect investment. We proceed in two steps. First, we present evidence that restrictions cause lower investment levels than would otherwise be observed in the absence of the restriction. Second, we explore the efficiency implications of the reduction in investment caused by the restrictions.

A. Do Restrictions Reduce Investment?

As Section IV demonstrates, restrictions on investment are not randomly imposed. Instead, creditors introduce capital expenditure restrictions into credit agreements in response to deterioration in credit quality or negative performance. The non-randomness introduces a significant identification problem when attempting to measure the impact of the restriction on actual investment because

investment levels for a negatively performing firm are likely to fall even in the absence of a new capital expenditure restriction.

Before addressing this identification problem more formally, we emphasize two facts suggesting that the restrictions are relevant for firm investment policy. First, the optimal financial contracting literature hypothesizes that creditors will impose binding investment restrictions on poorly performing borrowers. It is difficult to construct a reasonable economic framework in which creditors would introduce non-binding investment restrictions after negative performance. This is especially true given that creditors charge lower interest rates in exchange for more covenants (Bradley and Roberts (2003)). If the restrictions provided no benefit to the creditor, then this latter fact suggests that no contract should contain a restriction. Simply stated, economic theory strongly suggests that restrictions introduced in response to negative performance are introduced with the intent of limiting investment.

Second, we can infer the relevance of the restrictions by simply noting their level of detail. As an example, the March 27, 1997 revolving loan agreement for casino operator Hollywood Park, Inc. (now Pinnacle Entertainment, Inc.) contains the following restrictions:

> Capital Expenditures. [Borrower shall not] Make, or become legally obligated to make, any Capital Expenditure except:
>
> (a) Maintenance Capital Expenditures not in excess of (i) $15,000,000 for the Fiscal Year ending December 31, 1997, (ii) $15,000,000 for the Fiscal Year ending December 31, 1998 and (iii) $20,000,000 for any subsequent Fiscal Year;
>
> (b) Capital Expenditures to the extent financed by Indebtedness permitted under Section 6.9(h);
>
> (c) Capital Expenditures for the construction of approximately 200 additional hotel rooms, a restaurant, an entertainment lounge, meeting rooms, retail space and parking facilities at the Reno Property not in excess of $25,000,000;
>
> (d) Capital Expenditures for the construction of buffet and restaurant facilities at the New Orleans Property not in excess of $10,000,000;
>
> (e) Capital Expenditures for the purchase of capital assets which, as of the Closing Date, are leased by Borrower or any Restricted Subsidiary from other Persons pursuant to operating leases not in excess of $8,000,000; and
>
> (f) Capital Expenditures not otherwise permitted above which, when added to all other Basket Expenditures theretofore made, do not exceed $40,000,000.

Imposing such meticulous restrictions requires time and expense, which makes it difficult to see why contracts would include such a covenant unless it provides a real constraint that adds value to the contracting parties.

Such examples are common in credit agreements and suggest that creditors often play two important roles in shaping the investment choices of their borrowers. Ex ante, lenders can directly influence the business plans of their borrowers when setting contract terms. Ex post, lenders retain the right to approve or disapprove of investment above the restriction amount.

[FIGURE 3]

We begin our formal analysis of the effect of restrictions on investment by examining unconditional means of investment by whether a firm has a restriction in their loan agreement. More specifically, in Figure 3, we present the means of capital expenditures scaled by lagged assets before and after a loan origination for three groups of firms: firms for which the contract does not restrict capital expenditure restriction (*no capital expenditure restriction*), firms for which the contract contains a restriction and the prior sample agreement does not contain a restriction (*new capital expenditure restriction*), and firms for which the contract contains a restriction and either we do not have a prior agreement, or the prior agreement already contains a capital expenditure restriction (*capital expenditure restriction*).

Figure 3 indicates that capital expenditures decline through our sample period for all firms. However, the fall in capital expenditures is larger when a firm's contract contains a new capital expenditure restriction. By the end of the year after the agreement is signed, firms with a new capital expenditure restriction experience a decline in capital expenditures (scaled by lagged assets) that is 1.5 percentage points larger than firms without a capital expenditure restriction, translating to nearly a 20% larger decline in investment, measured at the mean.

[TABLE 6]

Table 6 extends the preceding analysis to a regression framework in which we include year indicator variables and changes in firm cash flow and investment opportunities. Columns (1) and (2)

report specifications in which the left hand side variable is the difference in capital expenditures from the year before to the year of the loan agreement, and columns (3) and (4) report specifications in which the change in capital expenditures is measured as the difference between the average over the two years prior to the restriction and the average over the two years beginning in the year of the loan agreement. In all specifications, firms that face a new restriction show a statistically significantly larger decrease in capital expenditures than the other contract categories, even after controlling for changes in cash flow and investment opportunities. The fact that the estimate remains statistically robust to the inclusion of control variables suggests that the decline in investment is not uniquely caused by reduced investment opportunities. The estimates in Table 6 imply that firms facing a new restriction experience a decline in investment that is 15 to 20% larger than firms that do not obtain a restriction.

The regression results in Figure 3 and Table 6 could still be influenced by an unobservable variable that jointly determines the likelihood of getting a new restriction and the level of capital expenditures. In order to buttress our argument that restrictions cause a reduction in investment, we examine the degree of clustering of investment just below the capital expenditure limit. As stated in Section I, we collect the exact capital expenditure limit in the loan agreement for a sub-sample of 486 loans in our sample. We use these data to compute the difference between actual capital expenditures and the contractual limit, and scale the difference by lagged total assets. Values below zero indicate actual expenditures were below the limit, and values above zero indicate that expenditures exceeded the limit.

[FIGURE 4]

Figure 4 plots a histogram of the distribution of actual capital expenditures relative to the amount restricted by the contract. While 27% of observations are within 1% of lagged assets below the restriction, only 9% are within 1% above the restriction, a difference that is statistically distinct from zero at the 1 percent level.[14] Similarly, 50% of observations are within 2% below the restriction, and only 11% are

[14] There are several reasons why actual expenditures may be above the limit, in addition to firms obtaining waivers to the capital expenditure restriction. First, most contracts contain rollover provisions that permit some portion of 'unused' expenditures to be spent the following year. While we attempt to identify contracts that apply only to a single fiscal year, we likely include outstanding contracts where the firm has some rollover capacity. Second,

within 2% above the restriction. The noticeable kink in the empirical distribution from just below to just above zero provides evidence that exceeding the limit is costly. In other words, the distribution presented in Figure 4 is consistent with the hypothesis that restrictions constrain borrower investment below the contractual limit.

An alternative concern with Figure 4 is that the restriction is set at the borrower's planned capital expenditures. In the extreme, the concern is that the distribution of capital expenditures relative to the restriction reflects deviations from planned expenditures, and we would therefore witness the exact same distribution even if the firm did not face a capital expenditure restriction. There are three counterarguments to this concern. First, even if the agreement specifies a limit at planned capital expenditures, it may be the case that, ex ante, the creditor forces planned capital expenditures downward when negotiating the new loan agreement. Second, there is no reason to believe that deviations from planned capital expenditures in the absence of a restriction should show a strong asymmetry above and below the planned amount. Figure 4 suggests a strong asymmetry: the fraction of observations that are -2 to -1% below the limit is more than twice the fraction that are 0 to 1% above the limit, and the difference between the two is statistically distinct from 0 at the 1 percent level.

[TABLE 7]

Third, in Table 7, we find that the size of the kink and shape of the distribution does not vary with the time from the contract origination until the end of the fiscal year. For example, consider two borrowers that have capital expenditure limits applying to the calendar year 2003. The loan is originated for one borrower in January of 2003 and the loan for the other borrower is originated in November of 2003. If the restriction is non-binding and simply represents planned capital expenditures, we would expect more deviations from planned expenditures for the January 2003 borrower given the longer time period between the loan origination and the end of the calendar year. As Table 7 documents, we find no

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contractually defined capital expenditures may differ from the accounting definition used in financial statements. For example, capitalized leases are sometimes included in the contractual limit but accounted for separately from other capital expenditures. While we try to exclude unique definitions of capital expenditures, our measures undoubtedly contain some noise.

evidence to support the alternative planned capital expenditure hypothesis. The distribution of actual capital expenditures relative to the contractual limit is almost identical for firms that sign contracts early or late in the calendar year.

[FIGURE 5]

In Figure 5, we limit the sample to the subset of 81 loans where the current agreement contains a capital expenditure restriction and the immediately prior sample loan for the borrower does not contain a restriction. For this sample, realized capital expenditures from the year prior to the loan agreement are likely unrestricted by a contractual limit, and therefore serve as a plausible counterfactual for the distribution of expenditures in the absence of a restriction.

Figure 5 demonstrates that in the year of the agreement in which the restriction applies, the clustering of observations just below the limit is more pronounced than for the broader sample underlying Figure 4. Here, over 60% of the observations are within 2% of assets just below the threshold, suggesting that the limit is most binding immediately after it is first introduced. In addition, actual expenditures in the prior year appear to have little relation with the contractual limit imposed subsequently. Most striking is that 41% of the firms exceeded the yet to be imposed limit in the year prior to the loan origination, while only 7% exceeded the limit after the restriction is imposed. Finally, in the year prior to the agreement, deviations from the region just below the yet to be imposed limit are not asymmetrically skewed downward. To the contrary, there appear to be more deviations above the yet to be imposed limit. This evidence supports the hypothesis that we see fewer deviations above the limit in the year after it is imposed because the restriction is binding, and not because deviations from planned expenditures tend to be negative.

B. Efficiency

Our results above suggest that restrictions restrain firm investment below the counterfactual investment level that we would otherwise witness in the absence of the restriction. However, they do not imply that the reduction in investment is distortionary from an efficiency standpoint. Theoretical research does not provide a clear hypothesis on whether creditor-imposed restrictions promote or distort efficient

investment. For example, in Jensen and Meckling (1976), investment restrictions might reduce efficient investment by preventing risky but positive NPV projects; however, they may also prevent risky but negative NPV projects that would otherwise benefit equity-holders given their convex payoff function. Alternative models such as Aghion and Bolton (1992) and Dewatripont and Tirole (1994) suggest that investment restrictions promote second-best efficient investment by limiting managerial agency problems.

In this subsection, we provide preliminary evidence on the efficiency implications of investment restrictions by examining how market valuation ratios and operating performance changes for firms that obtain a loan agreement with a new restriction. As a measure of firm valuation, we evaluate the market-to-book ratio (MTB). As a measure of operating performance, we evaluate the return on assets (ROA), defined as EBITDA divided by lagged assets.

[FIGURE 6]

The two panels of Figure 6 graph MTB and ROA before and after firms obtain a new credit agreement by whether the agreement contains a capital expenditure restriction. Reflecting the results in Section IV, both MTB and ROA for firms obtaining loans with new limits fall from the year before the contract through the year in which the contract is signed, as capital expenditure restrictions respond to poor performance. However, in the year after the contract, both MTB and ROA increase uniquely for the sample of firms receiving a new restriction. In fact, by two years after the contract, both measures return to their level from one year before the loan origination.[15]

Table 8 presents regression results for the one year change in MTB and ROA from the year the loan is originated to the year after the loan is originated. In the specifications reported in columns (2) and (4), we include controls for the lagged change in the dependent variables. We include these variables to control for possible mean reversion in performance, given that MTB and ROA are falling in the years preceding the loan origination for firms that obtain new restrictions. The difference-in-difference estimates suggest that firms with a new restriction experience a large and statistically significant increase

[15] In Figure 6, we isolate the sample to firms that survive for two years after the loan agreement. The fraction leaving the sample is similar for all three groups of firms, which suggests that survivorship bias is not the source of difference in ex post performance.

in market valuation and operating performance relative to firms that obtain loans without a restriction. The estimate in column 2 implies that firms obtaining loans with a new restriction experience an increase in MTB by 0.13 more than firms obtaining loans without a restriction, which is a nearly 10% increase at the mean MTB. The column 4 estimate implies a relative increase in ROA of 0.01, which is also almost a 10% effect at the mean.

Although we are hesitant to attribute causality to a single feature in the new credit agreement, the increase in market valuation and operating performance for firms receiving a new investment restriction is difficult to reconcile with models where creditors inefficiently constrain positive NPV investment. While admittedly preliminary, the evidence suggests that the reductions in investment caused by capital expenditure restrictions bring firms closer to the surplus-maximizing investment level. In other words, the preliminary evidence suggests that restrictions prevent inefficient excess investment by managers.

VI. Conclusion

This paper provides novel empirical evidence of a direct contracting channel through which firm financial policy affects firm investment policy. We focus on private credit agreements between banks and publicly-traded U.S. corporations, and we document that creditors regularly impose explicit restrictions on capital expenditures. These restrictions are more likely to be put in place after negative borrower performance. In fact, the elasticity of a capital expenditure restriction with respect to borrower performance is often larger than the elasticities of other contract terms, such as the interest spread or a dividend restriction. We describe how creditors use financial covenants and associated acceleration rights to make investment restrictions effectively conditional on the borrower's past performance, and we provide compelling evidence that restrictions on capital expenditures contained in private credit agreements constrain firm investment policy. Finally, we produce preliminary evidence that runs counter to the notion that external financing constraints always reduce positive NPV investment. Instead, our findings suggest that investment restrictions that minimize incentive conflicts may be a second-best solution that prevents otherwise inefficient investment. Overall, we believe these findings represent a

significant contribution to both the empirical investment-financing literature and the applied financial contracting literature.

There are several avenues for future research, two of which we outline here. First, we view our findings on the ex post efficiency implications of investment restrictions as preliminary. More research is needed on this dimension. One obvious angle is to exploit exogenous variation in the imposition of the restrictions documented here, and we hope that researchers are able to utilize our data to answer the efficiency question more definitively. Second, our findings on the contingencies in private credit agreements suggest that more theoretical work is needed on the trade-offs between implicit versus explicit contingencies in incomplete contracts. When is it optimal to place explicit contingencies in financial contracts, as is common in venture capital (Kaplan and Strömberg (2003))? When it is it optimal to exclude explicit contingencies, and instead place into the original contract the mechanism to force renegotiation on all terms, as is common with financial covenants in private credit agreements? Finally, how does the use of maturity interact with the use of explicit contingencies? We hope that our findings, in conjunction with the extant applied financial contracting literature, leads to more theoretical research into these questions.

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Table 1
Summary Statistics

This table presents summary statistics for the sample of 3,720 credit agreements to 1,931 borrowers.

	Mean	Median	St. Dev.	N
Capital expenditure restrictions				
Capital expenditure restriction$_t$ {0,1}	0.319	0.000	0.466	3,720
Restriction, stated as capital expenditures$_t$ /assets$_{t-1}$	0.085	0.056	0.102	486
Capital expenditures$_t$ /assets$_{t-1}$	0.064	0.039	0.089	486
Other loan characteristics				
Agreement amount$_t$ ($M)	450	200	985	3,720
Agreement amount$_t$ / assets$_t$	0.338	0.245	0.308	3,720
Intrerest rate spread$_t$ (basis points above LIBOR)	170	150	119	3,720
Agreement is secured {0,1}	0.647	1.000	0.478	3,117
Agreement contains dividend restriction {0,1}	0.813	1.000	0.390	3,446
Agreement contains a line of credit/revolver {0,1}	0.938	1.000	0.241	3,720
Borrower characteristics				
Cash flow$_{t-1}$ / assets$_{t-1}$	0.034	0.034	0.026	3,720
Financial covenant violation within past year$_{t-1}$	0.063	0.000	0.242	3,720
Total assets$_{t-1}$ ($M)	1,622	674	1,974	3,720
Market to book ratio$_{t-1}$	1.768	1.426	1.136	3,720
Book leverage ratio$_{t-1}$	0.301	0.288	0.193	3,720
Firm has a corporate credit rating$_{t-1}$ {0,1}	0.490	0.000	0.500	3,720
Conditional on borrower having credit rating				
Credit rating (1 = AAA or AA, 2 = A, 3 = BBB …)	3.502	3.000	1.066	1,822
Junk rated {0,1}	0.482	0.000	0.500	1,822
CCC rated or worse {0,1}	0.020	0.000	0.141	1,822

Table 2
Capital Expenditure Restrictions, Across Types of Firms

This table presents the fraction of credit agreements that have a capital expenditure restriction by industry, size, and credit rating.

	Fraction with capital expenditure restriction
Totals	
Fraction of credit agreements with restriction	0.319
Fraction of firms that ever have credit agreement with restriction	0.424
Estimated fraction of all Compustat firms with restriction, using Sufi (2006)	0.336
Fraction of credit agreements with restriction:	
By industry	
Agriculture, minerals, construction	0.154
Manufacturing	0.324
Transportation, communication, and utilities	0.230
Trade—wholesale	0.360
Trade—retail	0.433
Services	0.399
By size (book assets)	
Less than $100M	0.468
$100M to $250M	0.469
$250M to $500M	0.443
$500M to $1,000M	0.381
$1,000M to $2,500M	0.243
$2,500M to $5,000M	0.133
Greater than $5,000M	0.086
Borrower does not have credit rating	0.392
Borrower has credit rating	0.242
Conditional on firm having credit rating	
Investment grade	0.060
Junk rated {0,1}	0.437
AAA, AA rated {0,1}	0.000
A rated {0,1}	0.031
BBB rated {0,1}	0.077
BB rated {0,1}	0.393
B rated {0,1}	0.490
CCC rated or worse {0,1}	0.622

Table 3
Negative Firm Performance and Capital Expenditure Restrictions

This table presents estimated coefficients from estimations that relate the probability of having a capital expenditure restriction in a credit agreement to borrower performance in the 4 quarters preceding the loan origination. All regressions include year indicator variables, loan purpose indicator variables, and loan type indicator variables. In all specifications except for the random effects probit, standard errors are clustered for each borrower.

Specification Type	Probit		Random effects probit		Probit		FE linear probability	
Sample	Full	Rated	Full	Rated	>= 2 loans	Rated & >= 2 loans	>= 2 loans	Rated & >= 2 loans
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BBB rated $_{t-1}$ {0,1}		0.028		0.040		0.026		0.050
		(0.053)		(0.041)		(0.055)		(0.037)
BB rated $_{t-1}$ {0,1}		0.243**		0.296**		0.208**		0.234**
		(0.069)		(0.082)		(0.076)		(0.076)
B rated $_{t-1}$ {0,1}		0.272**		0.349**		0.248**		0.266*
		(0.083)		(0.109)		(0.096)		(0.118)
CCC rated or worse $_{t-1}$ {0,1}		0.346**		0.618**		0.315*		0.562**
		(0.142)		(0.172)		(0.170)		(0.183)
Financial covenant violation$_{t-1}$	0.126**	0.054	0.174**	0.047	0.116*	0.057	0.140*	0.134
	(0.041)	(0.059)	(0.051)	(0.045)	(0.051)	(0.070)	(0.059)	(0.079)
Cash flow$_{t-1}$ / assets$_{t-1}$	-0.942**	-2.008**	-1.147**	-1.391**	-1.942**	-2.144**	-1.987**	-1.761
	(0.368)	(0.623)	(0.380)	(0.438)	(0.535)	(0.724)	(0.737)	(1.160)
Ln(total assets $_{t-1}$ ($M))	-0.069**	-0.052**	-0.084**	-0.039**	-0.081**	-0.049**	-0.053	0.013
	(0.007)	(0.012)	(0.008)	(0.009)	(0.009)	(0.013)	(0.034)	(0.054)
Market to book ratio $_{t-1}$	-0.026**	-0.024	-0.033**	-0.024**	-0.023	-0.018	-0.012	-0.029
	(0.009)	(0.016)	(0.010)	(0.011)	(0.012)	(0.020)	(0.015)	(0.024)
Book leverage ratio$_{t-1}$	0.188**	0.039	0.252**	0.030	0.182**	0.031	0.073	-0.129
	(0.050)	(0.061)	(0.056)	(0.041)	(0.060)	(0.065)	(0.111)	(0.152)
Number of credit agreements	3,720	1,822	3,720	1,822	2,742	1,453	2,742	1,453
Number of firms	1,939	844	1,939	844	961	475	961	475
R^2	0.17	0.30	0.13	0.26	0.20	0.30	0.19	0.22

*,** statistically distinct from 0 at the 5 and 1 percent, respectively

Table 4
Correlations between Capital Expenditure Restrictions and Other Loan Contract Terms

This table presents unconditional correlations between the probability of a loan containing a capital expenditure restriction and other loan contract terms. All correlations are statistically distinct from 0 at the 1 percent level.

	Capital expenditure restriction {0,1}	Dividend restriction{0,1}	Secured {0,1}
Dividend restriction {0,1}	0.26		
Secured {0,1}	0.42	0.38	
Interest rate spread	0.41	0.33	0.59

Table 5
Contingent Contract Analysis

This table presents mean differences in loan contract terms for contingent contract pairs. A contingent contract pair contains two credit agreements between the same borrower and the same bank where the origination date of the later contract is earlier than the maturity date of the earlier contract, and the later contract is preceded by a financial covenant violation. The later contract represents a renegotiated contract, where the renegotiation is caused by a financial covenant violation. Tests for differences in the means cluster standard errors for each borrower.

Contract term	(1) Capital expenditure restriction {0,1}	(2) Interest spread (basis points)	(3) Secured {0,1}	(4) Dividend restriction {0,1}
Original agreement	0.360	195	0.772	0.867
Renegotiated agreement that follows financial covenant violation	0.604*	252**	0.935**	0.940
% increase	68%	29%	21%	8%
Number of credit agreements	103	103	90	95
Number of firms	48	48	46	48

*,** statistically distinct from 0 at the 5 and 1 percent, respectively

Table 6
Capital Expenditures Before and After a Capital Expenditure Restriction

This table presents differences-in-differences estimates relating capital expenditures to whether a firm obtains a credit agreement with a capital expenditure restriction. All observations represent firms that obtain a loan agreement. The *New capital expenditure restriction* indicator variable takes on the value 1 if the credit agreement contains a capital expenditure restriction and the previous credit agreement for the same firm did not contain a restriction. The *Capital expenditure restriction* indicator variable takes on the value 1 if the credit agreement contains a capital expenditure restriction and *New capital expenditure restriction* is equal to 0. The omitted group is firms that obtain loan agreements without a restriction. All regressions include year indicator variables.

Level of differencing	Year before contract – year of contract		Average 2 years before contract – average year of and year after contract	
	(1)	(2)	(3)	(4)
Capital expenditure restriction {0,1}	-0.003	-0.003	-0.004	-0.004
	(0.002)	(0.002)	(0.003)	(0.002)
New capital expenditure restriction {0,1}	-0.014**	-0.011*	-0.014**	-0.010*
	(0.005)	(0.005)	(0.005)	(0.005)
Difference [EBITDA/lagged assets]		0.207**		0.226**
		(0.021)		(0.022)
Difference market to book		-0.005*		0.005
		(0.002)		(0.003)
N	2,812	2,812	2,812	2,812
R^2	0.01	0.10	0.03	0.13

*,** statistically distinct from 0 at the 5 and 1 percent, respectively

Table 7
Capital Expenditures – Contractual Limit
By Time from Contract Origination to End of Year

This table presents the distribution of [(Actual capital expenditures – contractual limit)/lagged assets] by whether the contract was originated 6 months or more before the end of the first year in which the limit applies (column 1) or the contract was originated less than 6 months before the end of the first year in which the limit applies (column 2).

Distribution	(1) >= 6 months	(2) < 6 months
Below -10%	0.030	0.050
(-10%, -9%]	0.000	0.000
(-9%, -8%]	0.010	0.020
(-8%, -7%]	0.030	0.010
(-7%, -6%]	0.020	0.020
(-6%, -5%]	0.020	0.020
(-5%, -4%]	0.060	0.050
(-4%, -3%]	0.070	0.110
(-3%, -2%]	0.120	0.100
(-2%, -1%]	0.210	0.210
(-1%, 0%]	0.260	0.290
(0%, 1%]	0.090	0.080
(1%, 2%]	0.030	0.030
(2%, 3%]	0.010	0.010
(3%, 4%]	0.000	0.000
(4%, 5%]	0.010	0.010
Above 5%	0.020	0.010

*,** statistically distinct from column (1) at the 5 and 1 percent, respectively

Table 8
Value and Operating Performance Before and After a Capital Expenditure Restriction

This table presents differences-in-differences estimates relating the market to book ratio and operating performance to whether a firm obtains a credit agreement with a capital expenditure restriction. All regressions include year indicator variables.

Level of differencing	Year after contract – year of contract			
Dependent variable	(1) Market to book ratio	(2) Market to book ratio	(3) EBITDA/ lagged assets	(4) EBITDA/ lagged assets
Capital expenditure restriction {0,1}	0.039	0.037	0.002	0.003
	(0.023)	(0.022)	(0.003)	(0.003)
New capital expenditure restriction {0,1}	0.134**	0.126**	0.014**	0.011*
	(0.035)	(0.033)	(0.006)	(0.005)
Difference [EBITDA /lagged assets]$_{t-1}$		-0.232		-0.272**
		(0.137)		(0.025)
Difference market to book ratio$_{t-1}$		-0.199**		0.043**
		(0.025)		(0.003)
N	3,033	3,033	3,033	3,033
R^2	0.04	0.09	0.03	0.17

*,** statistically distinct from 0 at the 5 and 1 percent, respectively

Figure 1b: Does a Negative Performance Shock Affect Loan Contract Terms?

This figure presents the marginal effect of negative performance on loan contract terms for a given borrower. It presents the marginal effect on contract terms for a drop in cash flow from the 90th percentile of the distribution to 10th percentile of the distribution (left) and the marginal effect of a financial covenant violation (right). The marginal effect is stated as the percent change relative to the mean. For example, a financial covenant violation in the past year results in a 44% increase in the incidence of a capital expenditure restriction at the mean, and a 14% increase in the interest rate spread at the mean. The estimated marginal effects come from probit estimations for capital expenditure restrictions, secured, and dividend restrictions; they come from OLS for interest spreads.

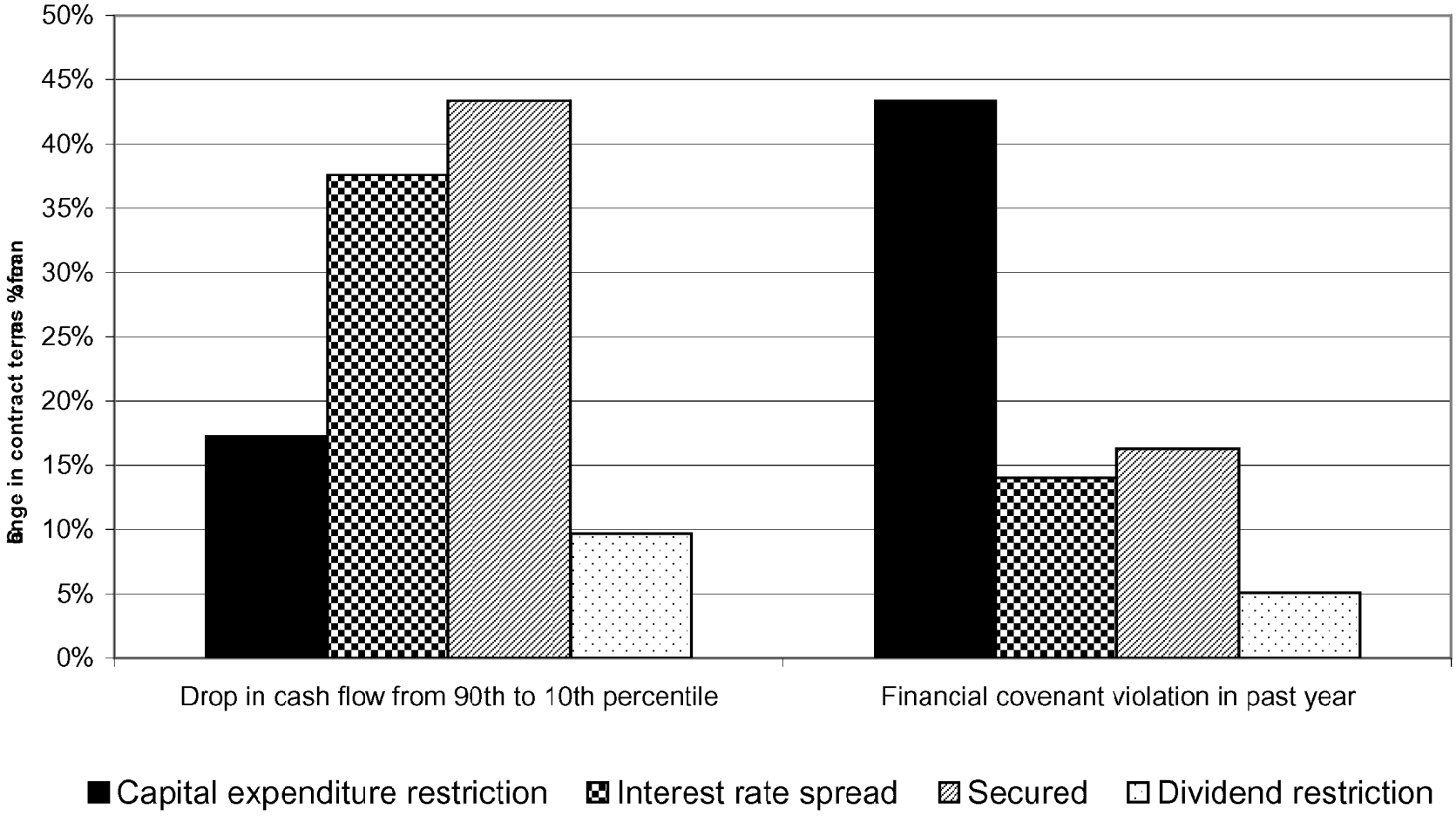

Figure 2: Changes in Loan Contract Terms in Response to Credit Downgrades

This figure presents the marginal effect of credit downgrades from A or above on loan contract terms for a given borrower. The marginal effect is stated as the percent change relative to the mean. For example, a firm that is downgraded from A to B experiences a 60% increase in the likelihood of having a capital expenditure restriction at the mean. The estimated marginal effects come from probit estimations for capital expenditure restrictions, secured, and dividend restrictions; they come from OLS estimations for interest spreads.

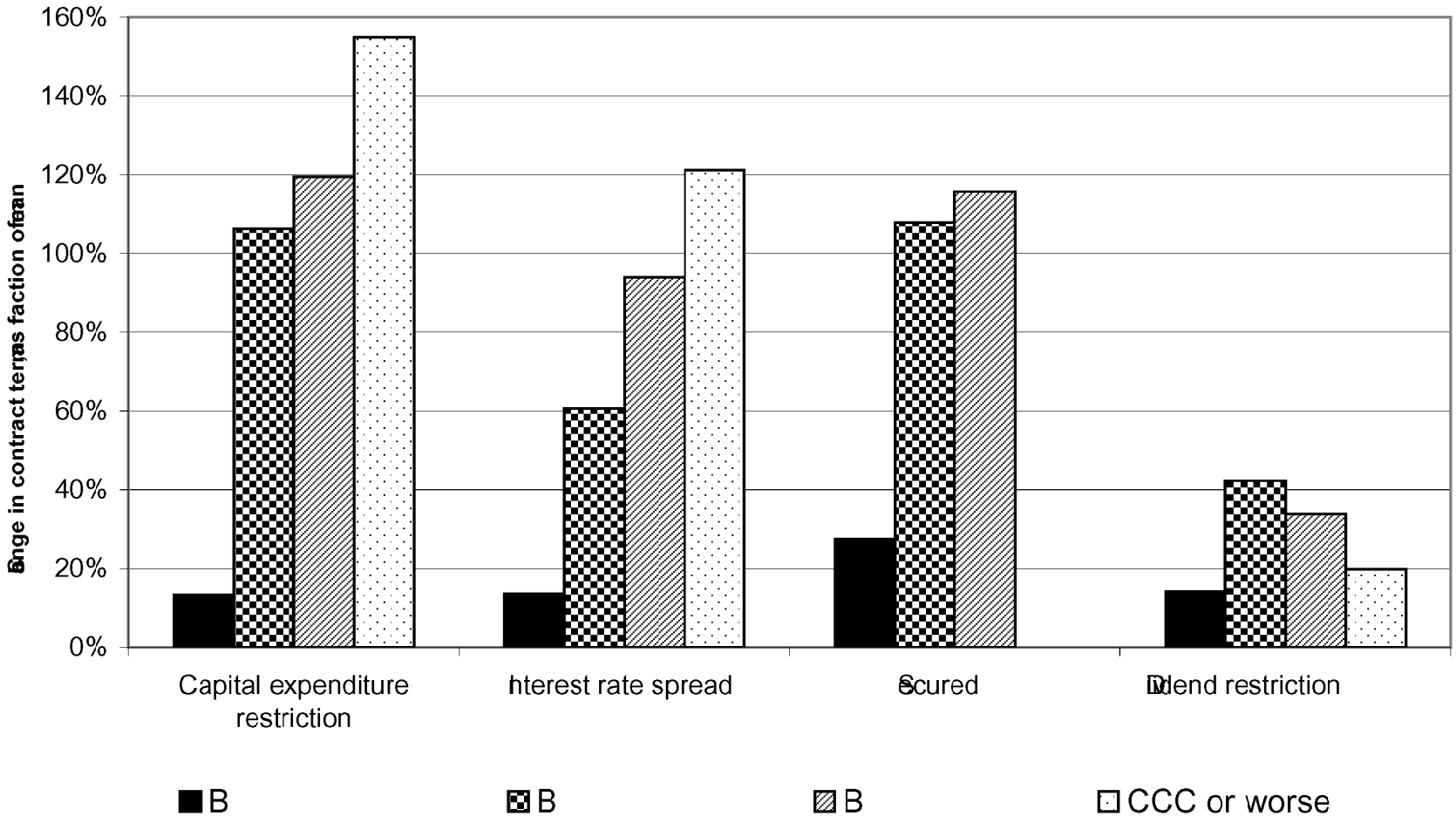

Figure 3: Capital Expenditures, by Whether Contract Contains Capital Expenditure Restriction

This figure presents average capital expenditures before and after a loan contract is signed, by whether the loan contract contains a capital expenditure restriction. A *New Capital Expenditure Restriction* is a restriction in the contract of a borrower whose last loan contract did not contain a restriction.

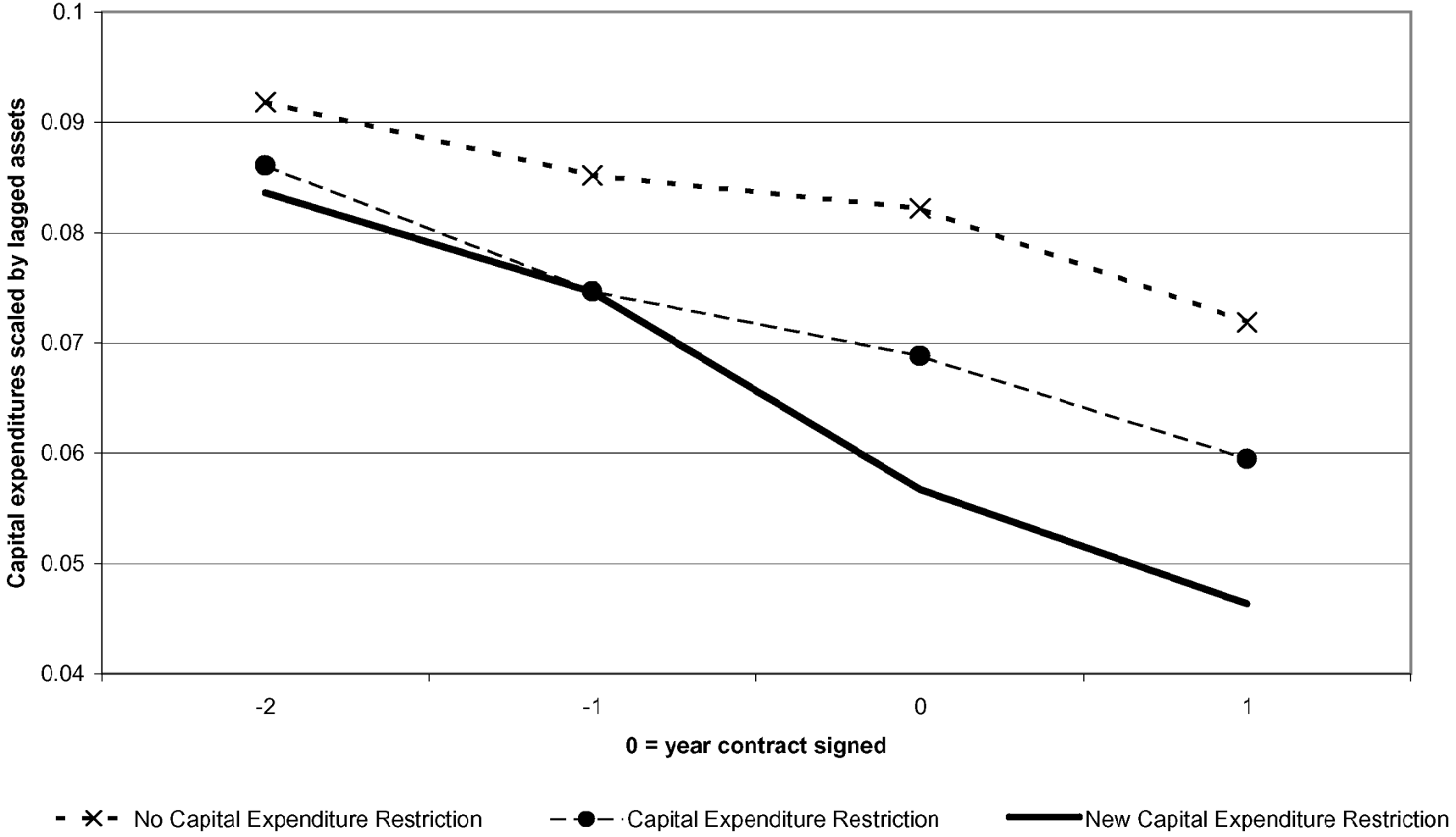

Figure 4: Capital Expenditures - Contractual Limit

This figure presents a histogram of the difference between actual capital expenditures and the capital expenditure limit, expressed as a ratio to lagged assets. Actual capital expenditures are for the first fiscal year after the loan contract is signed. The sample includes the 486 contracts for which we collect the contractual limit.

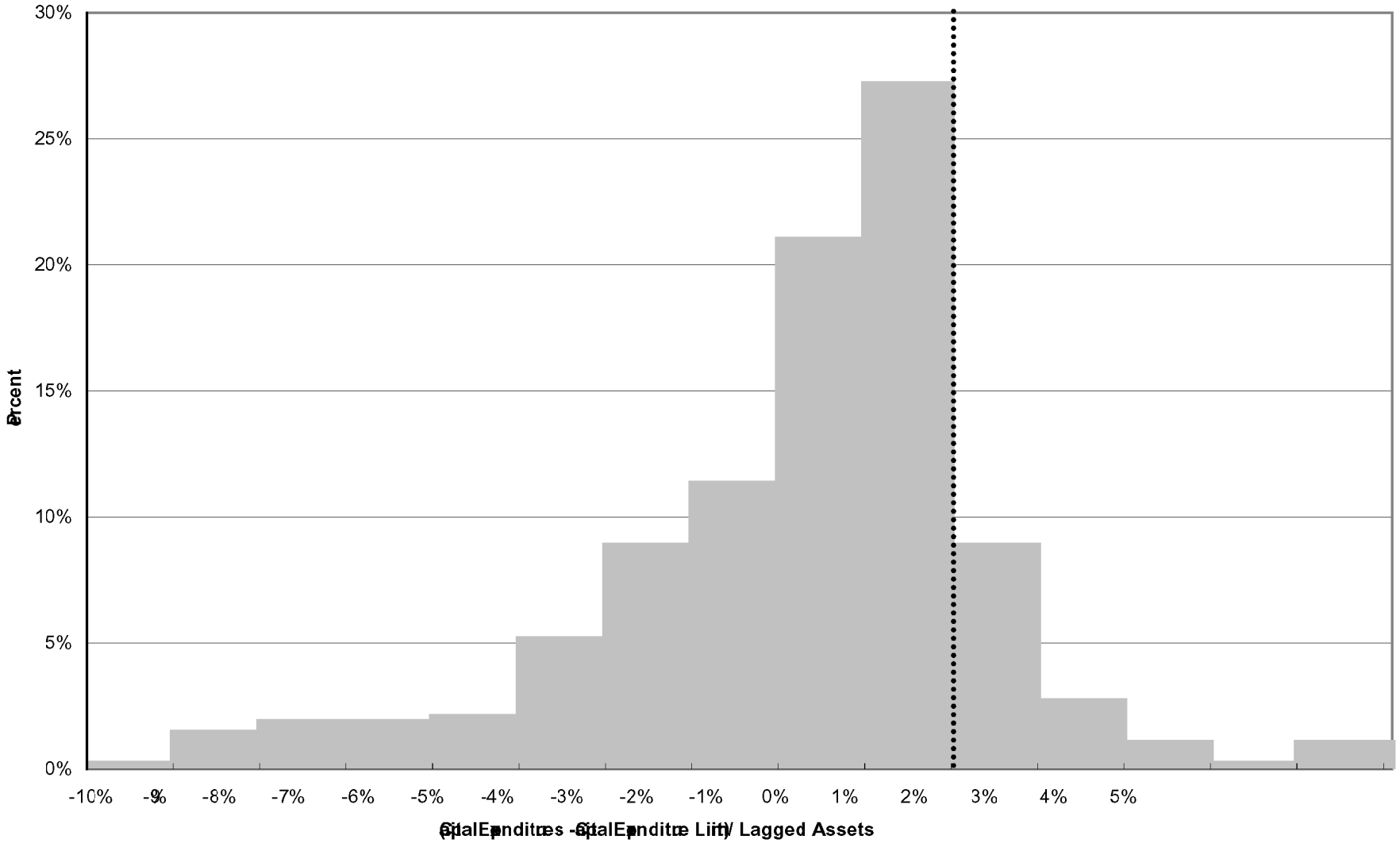

Figure 5: Capital Expenditures - Contractual Limit, Year Before and Year of Contract

This figure presents a histogram of the difference between actual capital expenditures and the capital expenditure limit, where year of the loan contract (solid black) and for the fiscal year immediately preceding the year in which the contract is signed (striped). For the year before the contract, the figure presents the difference between actual capital expenditures and the yet to be imposed restriction. Differences are scaled by lagged assets. The sample includes the 81 loans where the prior sample loan did not include a capital expenditure restriction.

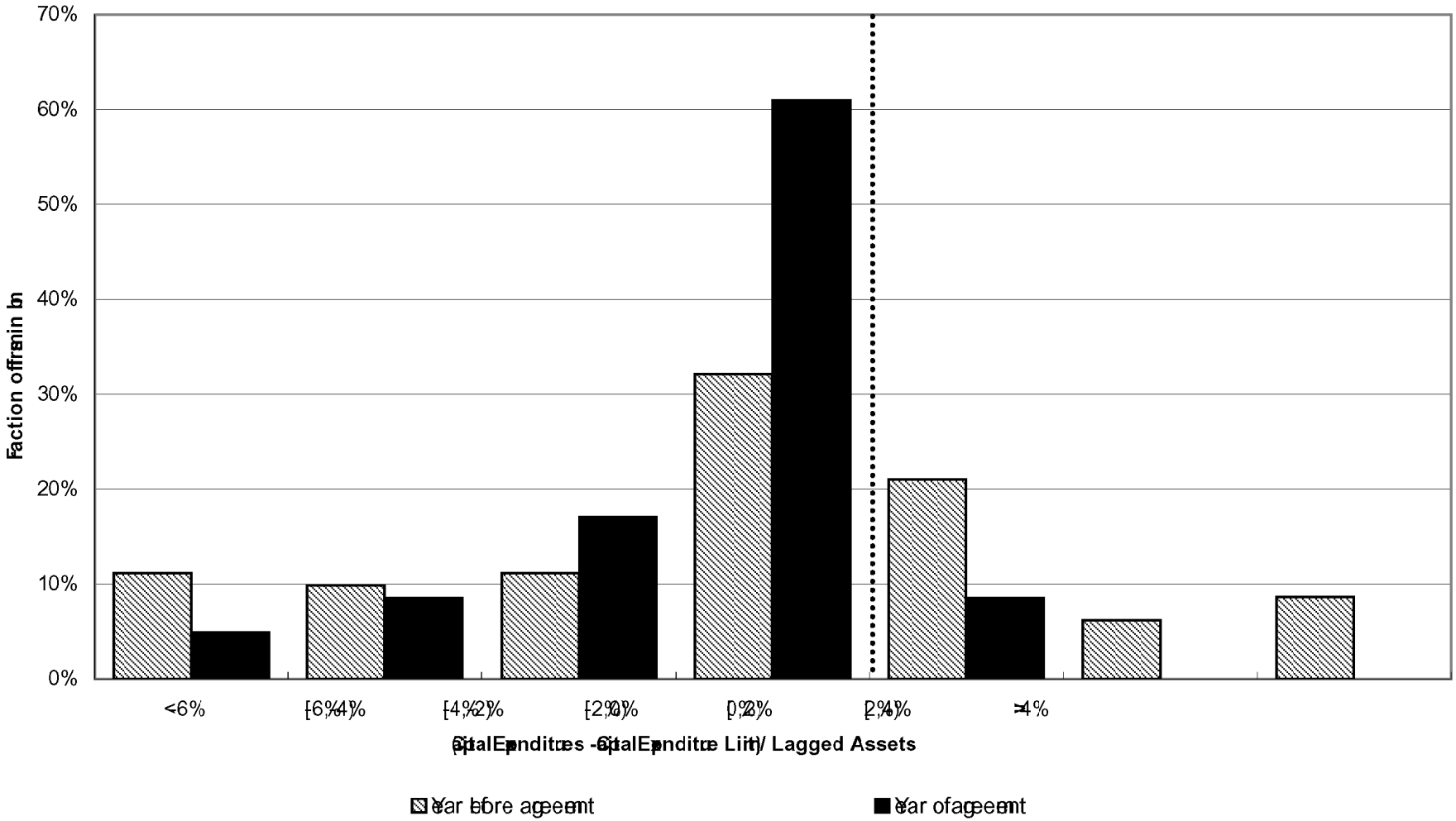

Figure 6
Value and Operating Performance, By Whether Contract Contains Restriction