School of Accounting and Finance

Essays on Accounting and Environmental Covenants in US Private Lending Agreements

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Abstract

The thesis addresses the issue of verifiability in debt covenants, with the aim of extending our understanding of clauses and covenants that lenders incorporate into debt contracts to protect their interests. It consists of three essays presented as separate chapters.

The first essay (Chapter 2 in this thesis) examines how debt contracting design is affected by fair value accounting, through modification of covenant definitions in private debt contracts. Fair value accounting has come under fire for being unsuitable for contracting both in the measurement of assets and liabilities. In the US lenders have been found to remove fair value measurements via clauses that exclude the effects of certain accounting standards (i.e., SFAS 159/ASC 825). We refer to these clauses fair value exclusion clauses (FVCs). We examine the incidence of FVCs in private lending agreements after the introduction of SFAS 159 and use an independently collected sample to replicate the results of prior research over an extended time period. We find that FVCs are significantly more prevalent than prior research indicates. Our results also suggest that fair value exclusions are positively associated with agency problems in fair value accounting, but negatively associated with benefits attributed to fair value accounting. Additional analysis suggests that lenders are more concerned about the effects of fair value estimates on earnings rather than the quantity of unreliable fair value estimates. Despite widespread concern that a lack of reliability makes fair value accounting problematic for contracting, our results indicate that lenders often find it useful, even when borrowers have only level three inputs in their fair value figures.

The second essay (i.e., Chapter 3) studies the extent to which lenders monitor corporate environmental compliance by studying environmental covenants in private lending agreements. Lenders include such covenants via environmental law compliance clauses in the representation and warranties section of debt contracts. Lenders can also intensify environmental monitoring by increasing the number of environmental laws they require borrowers to comply with. Despite the widespread increase in attention to corporate environmental responsibilities in the last 20 years, we document a fall in both the number of contracts with environmental covenants and in environmental covenant intensity over time. In cross sectional analysis, we find evidence that environmental monitoring is associated with borrowers' characteristics, including credit risk, collateral risk and environmental information asymmetries between lenders and borrowers.

The third essay (Chapter 4) explores the consequences of breaching environmental covenant thresholds using a novel dataset collected directly from companies' regulatory disclosure. My findings suggest that borrowers who violate environmental laws when having

debt contracts without an environmental covenant experience higher environmental intensity in their subsequent contracts; I also document that environmental covenant intensity decreases in subsequent contracts following a violation of current contracts' environmental covenants. Furthermore, environmental covenant violations are not associated with changes in financial covenant intensity, nor the cost of debt, suggesting that lenders are not punishing borrowers who fall below a minimum level of environmental performance. Lastly, in terms of changes in corporate behaviour, I show that within four and eight quarters of environmental covenant violation, there is a positive change in borrower's capital expenditure while controlling for CAPEX restrictions. This change in investment behaviour, which contrasts with prior research into breaches of financial covenants, is not observed for borrowers that breach federal environmental law but have debt contracts without environmental covenants. I interpret this finding as evidence that the contractual characteristics of debt are important in shaping companies' environmental investment policy.

Declaration

I declare that the work in this thesis was carried out in accordance with the requirements of the University's *Regulations and Code of Practice for Research Degree Programmes* and that it has not been submitted for any other academic award. Except where indicated by specific reference in the text, the work is the candidate's own work. Chapters 2 and 3 are joint work in collaboration with, and with the assistance of, Professor Mark Clatworthy and Doctor Mariano Scapin.

SIGNED: DATE:

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Chapter 1 Introduction

1.1 Motivation

In the United States, as in most market economies, debt is a primary source of capital for large and small companies. On average, 95% of capital raised by US corporations is from debt financing (Armstrong 2010). As is the case for equity markets, where there is a separation of ownership and control, the prior literature points to important agency costs in debt markets. In particular, managers and owners have incentives to pursue self-interest at the expense of outside capital providers (Jensen and Meckling 1976). Outside providers anticipate such actions and as a consequence, they 'price protect' themselves. Managers and owners anticipate this price protection from lenders and then become willing to subject themselves to various monitoring and bonding costs (Myers 1977).

In one of the principal such monitoring devices, lenders typically include explicit and formal covenants to prevent borrowers from shifting risk back to lenders through asset substitution (Smith and Warner 1977). Financial covenants, which are ratios (such as debt/EBITDA) or figures (such as dividends or levels of debt) based on borrowers' accounting information, are the most common type of covenant. In this context, the key attribute of accounting information that debt contracts rely upon is verifiability, due to the fact that these covenants act as triggers for control: once breached, lenders may impose significant costs on borrowers, such as higher interest rates or shorter maturity.

For accounting-based covenants, lenders typically require borrowers to supply audited financial statements. Lenders demand the most reliable information about borrowers because they are more sensitive to downside risk (they are less concerned about upside potential because upside gains are confined to interest payments). If the information on which contracts are based becomes unreliable, it is more difficult for lenders to assess the firm's credit quality

and risk, making it more difficult for lenders to assume control when appropriate and, subsequently, for borrowers to access the debt market.

The key themes in this thesis are (i) the implications of fair value accounting for debt contracting (ii) the determinants of debt contract design, with a particular (and novel) focus on non-financial based covenants and (ii) the consequences of breaching these covenants. Prior literature on private debt contracting primarily examines financial terms in debt contracts such as loan spread, maturity, and amount. In contrast, research on non-financial terms is comparatively underdeveloped. This thesis aims to expand the private debt literature and the understanding of clauses and covenants that lenders incorporate into debt contracts to protect their interests. It covers three broad issues: (i) how lenders exclude fair value accounting figures from financial covenants; (ii) how lenders ensure minimum environmental performance through the use of environmental covenants; (iii) the consequences for borrowers of breaching environmental covenants.

The second chapter, "Fair value exclusion clauses in US private debt contracts" examines how lenders and borrowers react to an increase in the use of fair value accounting. We do this via an empirical study of fair value opt-outs in debt contracts, using data collected via Python code and adapting the approach of Nini et al. (2009) to identify debt contracts among SEC regulatory filings. More specifically, we re-examine and extend the findings of clauses in debt contracts that remove the effects of SFAS 159 (now ASC 825) from the definition of accounting figures used in financial covenants. We refer to these 'opt-outs' as *fair value clauses* (hereafter FVCs). Demerjian et al. (2016) examined FVCs four years subsequent to the adoption of SFAS 159, hence the longer term effects on debt contracting practice are unclear. Furthermore, Demerjian et al. (2016) collected their FVC level data using MorningStar 10K Wizard, which was discontinued in 2015. Therefore, the second motivation of this chapter is to provide a data collection method that is replicable. We first reassess the

descriptive findings of Demerjian et al. (2016), who find that only 14.5% of lending agreements contain opt-outs of fair value accounting. This relatively low figure stands in contrast to the widespread reports in the literature that fair value accounting is unsuitable for contracting due to a lack of reliability and verifiability and problems arising from the fair value of liabilities (e.g., Ball et al. 2015). Our evidence indicates that the incidence of fair value opt outs has increased significantly since the initial examination of Demerjian et al. (2016).

We then reproduce the analysis of the determinants of FVCs of Demerjian et al. (2016). Controlling for lead-lender and time effects, we find that firms that are more likely to engage in hedge accounting and to have contracts with liquidity covenants are less likely to have FVCs incorporated into their lending agreements. In contrast, contracts with a revolving line of credit are more likely to opt out of fair value accounting via a FVC. These results suggest that FVCs are more likely to occur when agency problems associated with fair value accounting are higher, whereas FVCs are negatively associated with benefits attributed to fair value accounting. Overall, these conclusions support those of Demerjian et al. (2016). In contrast, we do not find a higher incidence of FVCs when level 2 and level 3 fair value figures are higher, or when debt contracts include performance pricing provisions. Additional analysis suggests that lenders are more concerned about the effects of fair value accounting figures on earnings rather than the quantity of unreliable fair value figures.

In chapter 3, “Environmental covenant in US debt contracts”, we study the potential determinants of the inclusion of environmental covenants in private lending agreements. The backdrop to this analysis is an increasing expectation that financial markets and financial intermediaries are important in reinforcing corporate and social environmental priorities. Green bonds are an example of recent innovations that illustrate the important developments in the links between financial markets and corporate environmental performance.

Environmental covenants are an understudied mechanism for the potential of lenders to influence borrowers' impact on the environment. These are clauses that typically include a diverse set of environmental laws that borrowers must comply with, which in turn sets a minimum level of corporate environmental performance. Lenders include such covenants via environmental law compliance clauses in the 'Representation and Warranties' section of debt contracts. Lenders can intensify environmental monitoring by increasing the number of environmental laws they require borrowers to comply with.

Despite the widespread increase in attention being paid to corporate environmental responsibilities in the last 20 years, as well as policy documents such as the Equator Principles (Etsy et al. 2005) suggesting that environmental covenants should be increasing over time, we document a decline in both the number of contracts with environmental covenants and in environmental covenant intensity over time. In cross-sectional analysis, we find evidence that environmental monitoring is associated with borrowers' characteristics, including credit risk, collateral risk and environmental information asymmetries between lenders and borrowers.

Finally, in the penultimate chapter, "Consequences of environmental covenant violation in the US", I examine whether environmental covenants lead to changes in the structure of debt contracts and borrowers' corporate behaviour. More specifically, I find no evidence that environmental covenant violations lead to changes in borrowers' cost of debt or financial covenant intensity. In the absence of environmental covenants, I find that borrowers which experience an environmental violation are more likely to see an increase in environmental covenant intensity in their subsequent contracts. However, for contracts that already contain environmental covenants, I find that environmental violations are negatively associated with environmental covenant intensity.

The prior corporate finance literature indicates that accounting-based covenant violation leads to a decrease in capital expenditures, indicating that lenders exert informal

influence over borrowers' corporate governance outside of default states (Nini et al. 2012). It is likely that increasing financial based restrictions worsens borrowers' environmental performance, given that capital expenditure is typically associated with environmental investment that benefits future performance. Controlling for capital expenditure restrictions in lending agreements, I find that capital expenditure increases in the subsequent four and eight quarters following environmental covenant violations. In contrast, borrowers without environmental covenants do not experience such an increase. My results indicate that environmental covenants provide a potential channel through which lenders can exert influence over borrowers' investment patterns and environmental compliance.

1.2 Contribution

This thesis adds to three streams of literature. Chapter 2 contributes to the fair value accounting debate in the context of debt contracting. Opponents of fair value accounting suggest it is unsuitable for contracting because assets and gains are often unverifiable and due to own credit risk, fair value liabilities decrease when borrowers' credit risk deteriorates or when the economy is in recession, thereby making it more difficult for lenders to assess borrowers' credit quality (Kothari et al. 2010; Ball et al. 2015). Proponents of fair value accounting suggest that it is not procyclical and it was regulatory requirements that explained leverage procyclicality during the crisis (Mora et al. 2019). Prior research suggests that contracting parties rarely opt out of fair value. We extend the sample period of Demerjian et al. (2016) and reassess the conditions under which fair value accounting is potentially useful for lenders. Over time, fair value opt-outs have become much more common.

Secondly, chapter 3 contributes to the non-financial covenant literature. The majority of prior debt contracting research focuses on accounting-based covenants and negative covenants, such as capital expenditure restrictions and sweep covenants. The prior literature

also relies on ESG ratings from different data providers to examine the links between financial markets and environmental performance. However, ESG ratings for the same borrower can be diverse and heavily dependent on the subjective view of the "values" of the respective data provider. To date, the extent to which private lenders influence borrowers' environmental performance via environmental covenants has been unexplored. We provide evidence that lenders have used environmental covenants since at least 1995. An interesting feature of these covenants is that they overcome problems associated with verifying borrowers' environmental performance by using the rulings of the US Environmental Protection Agency to determine covenant compliance.

Lastly, chapter 4 contributes to the recent line of finance literature on the consequences of covenant violation (e.g. Nini et al. 2009). Due to the lack of availability of environmental covenant data, the majority of the prior literature focuses on the consequences of accounting-based covenants. I find that the involvement of regulatory agencies can enhance the verifiability of environmental compliance in private credit agreements. In particular, the United States Environmental Protection Agency (henceforth, EPA) helps ensure borrowers' compliance with relevant environmental laws and investigates potential environmental contamination of responsible parties.

Overall, this thesis provides an analysis of how lenders can circumvent characteristics of potentially unreliable measures in debt contracts, either by removing the effects of fair value accounting or use by referring to more objective measures of environmental performance, such as rulings of the EPA.

1.3 Thesis Structure

The remainder of the thesis is organised as follows. Chapter 2 examines fair value exclusion clauses in US private lending agreements, reproducing and extending the empirical work of

Demerjian et al. (2016). Chapter 3 investigates the determinants of environmental covenants in US lending agreements. Chapter 4 studies the consequences for borrowers of environmental covenant violations. Chapter 5 concludes with a summary of the results, limitations of the research and potential directions for future research.

Chapter 2: Fair Value Accounting and Debt Contracting: Further Evidence

2.1 Introduction

The usefulness of fair value accounting (FVA) has been a topic of significant debate and discussion amongst standard setters and academics for at least four decades (e.g., see Gjesdal 1980). The 2008 Global Financial Crisis drew attention not only from accounting regulators such as the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB), but also from politicians in the US Congress and the European Commission (Laux and Leuz 2009). Advocates of fair value accounting suggest that it is useful for equity valuation, as changes are recognised in a timelier manner, thus providing more useful information for investors (e.g. Penman 2007). By contrast, critics of FVA argue that it lacks conservatism, verifiability and reliability - critical features of accounting information used for contracting and stewardship purposes (e.g., Holthausen and Watts 2001; Kothari et al. 2010).

The objective of this chapter is to examine empirically how the recently expanded use of FVA affects debt contracting practices. In particular, it revisits and extends prior research by Demerjian et al. (2016), henceforth DDL, on the relationship between accounting-based debt covenants and opt-outs of the fair value accounting requirements laid out in SFAS 159 (now ASC 825). This important standard allows entities to apply fair value accounting to an expanded set of balance sheet items.

Fair value accounting can be problematic in financial contracting (such as debt contracts and executive compensation contracts) because although fair value-based estimates can be highly relevant to equity investors, they can be difficult to verify and may lack reliability for contracting purposes, particularly when mark-to-market is not available (i.e., where level 2 and level 3 inputs are required). Verifiability is regarded as a critical component of information in incomplete contracting theory when accounting-based covenants act as

triggers for a shift in control rights from borrowers to lenders (Watts 2003). Since different 'states of the world' are difficult to contract upon, accounting numbers can be valuable since they are typically independently verified by auditors, prepared according to agreed-upon measurement rules in advance, and thus help capture the current state and/or performance of the firm for deciding where control rights lie.

Christensen et al. (2016) suggest that making the allocation of control rights contingent on highly subjective measures such as fair value estimates is tantamount to not contracting on accounting information. For instance, if fair value-based asset values are inflated, this may lead to inflated measures of performance and a failure for covenants to be breached when they should. Consistent with this view, Demerjian (2011) reports a sharp decline in the use of balance sheet-based covenants between 1996 and 2007. Over the same period, income statement-based covenant usage remained almost unchanged. He argues that this is due to standard setters' shift towards the "balance sheet approach" and increased use of fair value, which has led the balance sheet to be less useful for contracting. In contrast, around the same time, Christensen and Nikolaev (2012) reported a similar trend, but they then find a sharp *reversal* of capital (i.e., balance sheet-based) covenants between 2008 and 2010. One possible explanation for this change is that fair value estimates can easily be excluded from covenant calculations through tailored non-GAAP numbers being used as the accounting inputs to the covenant calculations.

DDL report that 14.5% of loan contracts exclude fair value figures after the introduction of SFAS 159, although interestingly, these related almost entirely to fair value accounting for liabilities – a finding attributable to the problems created by the problems induced by own credit risk in this context. What is unclear, however, is the extent to which these results change over time as lenders get the chance to adapt to the change in accounting measurement created by SFAS 159. Day and Taylor (1995) found that accounting definition in debt contracts is

strongly legalistic and highly standardised rather than economic, which suggest that contracting mechanism can be slow in adaptation. DDL used four years of sample subsequent to the passage of SFAS 159, an extension of sample period provides insight on how contracting mechanism evolve over a longer period of time.

In this chapter, we aim first to replicate, and then, to extend the analysis of DDL. We conduct a series of analyses. The first examines whether financial covenant usage changes systematically after the introduction of the fair value standard, SFAS 159. The assumption is that if the expanded use of FVA reduced the usefulness of accounting numbers for contracting, we should observe a decline in debt covenant usage after SFAS 159 adoption. Although this question has been examined by DDL, their sample ceases in 2012, only 4 years after the introduction of SFAS 159. Because the typical duration of a loan is around 4-5 years, it is possible that the full effects of the new standard had not been felt at the time of the analysis of DDL.

Using a sample of private lending agreements collected and analysed via a Python script applied to the US SEC EDGAR database for the period 2005-2012, we observe a decline in overall financial covenant usage. However, our evidence does not point to fair value accounting as a likely culprit for this change. In particular, for 'affected covenants', i.e., those largely based on balance sheet numbers, we observe no statistically significant change following the introduction of more fair value accounting numbers into financial statements, consistent with DDL.

Descriptively, we find that 25% of debt contracts include fair value exclusion clauses (FVC) between 2008 and 2012. This is substantially higher than documented in prior research, particularly the 14.5% reported by DDL. However, this average masks important changes over time. We document an increasing trend in FVC over the duration of our sample period. This suggests that contracting parties adapt over time to accounting standards changes. An

alternative explanation for this finding is an increase in overall covenant usage. However, we find a decreasing trend in both debt contracts with covenants and the average number of covenants in debt contracts. We also find very few instances where the borrower enters into a debt contract with a FVC but does not then have one in the following contract. This evidence points to a 'stickiness' or inertia effect.

In our second analyses, we re-examine the factors associated with the inclusion of a FVC in debt contracts over the period between 2008 and 2012. Consistent with DDL, we find partial support for the idea that borrowers with more opportunity to manipulate their fair value estimates are more likely to have a FVC. Debt contracts featuring a revolving credit facility are 6% to 10% more likely to have FVC, as borrowers can time their fair value election by drawing on the revolving line of credit. Revolving line of credit is different from term loans, as term loans meets the cash flow characteristics of financial instrument at initiation, while revolver does not meet unless used upon.

The evidence of Dermerjian et al. (2016) suggests that there are circumstances where the expanded use of fair value accounting can provide useful information in debt contracting. One of the main objectives of SFAS 159 is to simplify hedge accounting and we also find that borrowers in industries that engage in hedging activities, are 4% to 6% less likely to include a FVC in their debt contracts, consistent with DDL. Fair value accounting can also provide useful information on borrowers' liquidity positions, by revealing the exit value for short-term assets and liabilities. We find that borrowers with debt contracts with liquidity covenants are less likely to opt out of fair value accounting via a FVC, consistent with DDL. Importantly, despite the significant concerns about fair value accounting being unsuitable for debt contracting due to a lack of reliability and/or verifiability (Holthausen and Watts 2001), we do not find that borrowers with above median unreliable fair value estimates are more likely to receive FVC. We also find no evidence that contracts with performance pricing provisions

are more likely to exclude fair value accounting.

In addition to DDL's hypotheses, we expect lenders to be more concerned for potential effects on earnings from fair value estimates rather than the quantity of level 2 and level 3 fair values. This is because of the paradoxical impact of negative shocks to borrowers sometimes manifesting themselves in increases in their equity. This arises where negative credit shocks increase borrowers' discount rates, which - ceteris paribus - reduces borrowers' liabilities and increases their equity. In principle, this should not be problematic because the effects of negative shocks on discount rates for fair values for assets and liabilities should offset each other. The important assumption that both fair value assets and liabilities are equal and have the same discount rate. When borrower credit quality worsens, the loss in earnings from impaired fair value assets should neutralise the gain in earnings from impaired fair value liability. We find that borrowers with high levels of fair value assets compared to liabilities are less likely to include FVC in the contract. This may suggest that lenders are less concerned with the fair value effect on earnings if the potential loss from impaired assets is larger than potential gain from impaired liability. Lastly, prior fair value literature also suggest that lenders are concerned with the reliability of fair value. We examine this issue by examining borrowers with only level three fair value assets and/or liability and we do not find that this is the case.

Overall, our additional analysis suggests that there are instances when fair value accounting can be harmful to the debt contracting process i.e. potential effects on earnings. Removing the flexibility of fair value accounting in covenant calculations suggest that lenders may be concerned with the quality of borrowers' accounting signals (Christensen et al. 2016). In other instances, our level 3 fair value results also support the view that fair value accounting provides useful information to lenders.

This chapter contributes to the accounting literature in two important ways. First, by

focusing on a unique feature (FVC) in debt contracts, this chapter contributes to the line of literature on the implication of FVA. Second, we contribute to the covenant modification literature by providing further evidence of lenders removing accounting characteristics that is undesirable for contracting. We complement Demerjian et al. (2016) by replicating and extending their findings, by examining systematic time effects and lead lender effects, as well as providing a reproducible data collection method. Our findings reinforce the view that contracting parties can adapt to potentially adverse changes in accounting measurement rules, consistent with Frankel et al. (2008). The fact that a majority of firms still choose to include fair value accounting estimates suggests it can both be beneficial and harmful to the contracting process. We also show that fair value exclusion clauses are potentially sticky, but that it takes time for lenders to include the effects of new accounting standards changes in their contracts.

2.2 Prior Literature

2.2.1 Debt Covenants and Corporate Governance

The link between accounting information and financial contracting originates in agency theory. When firms are in need of extra capital, there are two principal sources of outside financing: equity or debt. Equity investors have unlimited upside gains, whereas downside losses are limited to their original capital contribution. However, debt holders have fixed upside potential (i.e., the principal loan amount and interest), while sharing the same potential downside losses as equity investors. The 'archetypal' agency costs are seen in equity financing, where shareholders provide the majority of funds and where management may engage in inefficient activities. These costs can be ameliorated by performance-linked managerial compensation packages, designed to align the interest between shareholders and managers (Jenson and Meckling 1976; Lambert 2001; 2010). In the context of agency costs

involved in debt financing, debt holders are vulnerable to the risk that managers and shareholders expropriate creditors' wealth. These 'agency costs of debt' include overpayment of dividends; asset substitution, where borrowers use less risky assets to receive favourable credit terms, but use the proceeds to engage in risky projects for higher returns; and claim dilution, where borrowers grant additional claims to the existing pool of assets, without sufficient assets to support it (Smith and Warner 1979; Armstrong et al. 2010). The main assumption in these analyses is that capital providers are also rational investors, who are aware of these conflicts of interest, and who protect themselves against these agency costs via higher prices and more stringent non-price contractual terms. According to this theoretical perspective, borrowers subject themselves to covenants in debt contracts in order to benefit from more favourable terms when they limit their own opportunistic actions and align incentives with lenders through lending agreements.

An important limitation of agency theory is that it assumes that the decision power and opportunism always lie with the borrower. It also takes the capital structure – the balance of equity and debt - as given and does not consider lender opportunism or the role of renegotiation (Christensen et al. 2016). The more recent theory of incomplete contracting extends the literature by addressing these issues and thus helping to explain the demand more fully for, and nature of, accounting based covenants (Roberts and Sufi 2009). The main assumption here is that contracts are incomplete at initiation since it is costly and difficult to include all states of nature and all possible contingencies. Future states are also uncertain, can be difficult to verify and are not easily enforceable in a court of law (Watts 2003). But the lack of specificity at contract initiation creates scope for the so-called 'holdup problem', where borrowers are aware that the commitment to contracts could lead to increased bargaining power of the lender, which in turn, may lead to underinvestment (Hart 2017). One possible solution to this problem is for cash flow rights and control rights to be treated as

separate contracting instruments (Aghion and Bolton 1992). Owners can use cash flow rights (i.e., dividends and/or interest) to attract capital investors, and since it is difficult to align incentives *ex ante*, the allocation of decision rights then becomes a key part of the contracting process.

To resolve the hold-up problem, Grossman and Hart (1986) suggest allocating control rights to the contracting party with the most firm-value maximising incentives. Accordingly, when the borrowing firm is performing well, management should remain in control. This is because, firstly, lenders are only concerned with maximising the value of fixed claims instead of firm value, and when given control rights in this state, they may choose to liquidate the project when continuation is more efficient. Secondly, under US corporate law, when a creditor exercises control over a firm, it loses its limited liability (Bratton 2006). This liability risk means that creditors are unlikely to seek direct control when the firm is performing well. However, if the firm is performing sub-optimally, control rights should be assigned to creditors, since they are entitled to a portion of future cash flow, they have an incentive to maximise firm value. This transfer in control rights is dependent on contractible signals that summarise non-contractible future states and Aghion and Bolton (1992) suggested that future profitability measured by expected future cash flow is the natural signal. They argue that debt financing with accounting-based covenants represents the optimal contract design with state contingent allocation of control rights. This allows owners to enjoy monetary and non-monetary benefits while offering adequate protection to debt investors. Since contracts are incomplete *ex ante*, and thus inefficient at contract initiation, accounting based covenants establish the point of disagreement. Renegotiation *ex post* can help restore efficiency by incorporating into the new information in the original contract.

There are two main types of covenants: affirmative and negative (e.g., Bratton 2006). Affirmative covenants set out the actions that the borrower must take, such as provide notice

of material events and deliver certificates of compliance. On the other hand, negative covenants are the actions that the borrower must avoid taking, such as a negative pledge, which prevents the borrower from any taking additional debt that could threaten the original priority claim (Wight, Cooke and Gray 2009). Negative covenants directly constrain managers' actions and protect lenders from agency costs. In addition, financial covenants (also referred to as "maintenance covenants") require the borrower to maintain a predetermined level of performance, measured by a particular financial ratio, over the duration of the loan (Christensen et al. 2016).

Consistent with incomplete contracting theory, Roberts and Sufi (2009) find that in 82% of private credit agreements, renegotiation occurs without covenant violation or payment default. Renegotiations are often triggered by changes in macro-economic conditions, changes in credit and equity market conditions, and both improvement and decline in borrower credit quality. Nini et al. (2012) also suggest that creditors exert influence over management in anticipation of a state of default. They report that after covenant violations, creditors' interference improves operating performance and equity valuation. This is consistent with incomplete contract theory, where covenant violation is the point of renegotiation and represents the signal for an optimal shift in control rights. When a firm's performance is suboptimal, creditors impose even stricter control over governance of the borrower, as it is here that they have the most incentive to monitor, which in turn benefits shareholders. Similarly, Nini et al. (2009) report that lenders are more likely to impose capital expenditure restrictions when borrowers' credit quality deteriorates, and this in turn yields positive effects on borrowers' equity valuations.

An important feature of the use of accounting information in debt covenants is that accounting measurement rules often differ from GAAP measurement. For instance, definitions of accounting variables and ratios in covenants are typically modified to restrict

management's scope to avoid covenant violation through inappropriate accounting methods. Citron (1992a) found that UK private debt contracts frequently modify the definition of net worth, borrowing and interests to a more conservative manner, by restricting opportunistic changes of accounting methods. Li (2016) also reports that in debt contracts, profits are often measured in a way that excludes the effects of investment.

As discussed above, a major reason for excluding certain measurement rules is because GAAP numbers may include figures that are difficult to verify, with intangibles being a good example. Watts (2006) suggests that because goodwill is less verifiable, lenders tend to exclude it since allowing goodwill changes may affect covenant compliance and thus increase agency costs. Alternatively, Frankel et al. (2008) found that if allowing goodwill changes trigger or relax covenant compliance, contracts use *tangible* net worth covenants instead of (total, or GAAP) net worth covenants, since tangible net worth bypasses, or avoid, goodwill adjustments. Nevertheless, Frankel et al. (2008) still find many instances where goodwill is included in net worth definitions, suggesting that there are some cases where the lack of verifiability is offset by the informativeness of intangibles in capturing future profits and cash flows.

In sum, prior literature shows that accounting-based covenants represent an important contracting device to resolve conflicts between debt and equity capital providers. However, over time, this important role for accounting information has been emphasised less by accounting standard setters. The following section discusses this issue in more detail.

2.2.2 Fair value, past and present

2.2.2.1 Balance sheet approach

The origins of fair value accounting can be traced back at least as far as the Savings and Loan crisis in the US in the 1980s, where market values of banks' assets fell below their

liabilities (Ball 2008). Yet these banks continued to operate since their assets were recognised in historical cost, and thus were solvent according to their reported numbers. By the mid-1990s, $500 billion of assets had failed and cost US taxpayers an estimated $124 billion - a situation aggravated by untimely impairment recognition (Curry and Shibut 2000). Between 1978 and 2000, the US Financial Accounting Standards Board (FASB) placed more emphasis on setting the conceptual foundation of accounting measurement by releasing seven concept statements, which provided important guidance in shaping accounting standards (Dichev 2017). Within its conceptual foundation, the FASB had set the primary objective of financial reporting as equity investment and the main users as equity investors (e.g., Barth et al. 2001). Since a primary use of accounting numbers was to provide inputs to equity valuation models, the valuation of assets and liabilities became the principal focus of accounting standards (e.g. Cascino et al. 2014).

This trend is referred as the "balance sheet" approach, where determination of assets, changes to them and claims on those resources became the key element, while income statement subsequently became the secondary concern (Penman 2007; Dichev 2017). In the extreme form of the balance sheet approach, market prices are used as benchmark for value in company accounting, and the income statement captures the net changes in fair value gains and losses. Valuation under historical cost requires estimation of future earnings as well as required return. On the other hand, valuation under 'ideal' fair value accounting assumes that the book value of both assets and liabilities are measured at market price, hence estimation of future earnings is not required (Scott 2003). However, US GAAP, like IFRS, sometimes permits 'dirty surplus' accounting flows which allow balance sheet adjustments to bypass the income statement directly to equity through recognition in other comprehensive income. Demerjian (2011) suggests that the exclusion of dirty surplus item allows the income statement to better represent the current performance of the firm. He further indicates that

because the stewardship function often lies with the balance sheet, dirty surplus items are reported in the balance sheet as they could be informative about the net asset value of the firm.

2.2.2.2 The introduction of SFAS 159

The FASB issued Statement of Financial Accounting Standards No 157 (SFAS 157) "Fair Value Measurement" in September 2006, and it set the framework and increased the disclosure requirement for recognising assets and liabilities at fair value. SFAS 157 classifies fair value measurement in three levels, ranging from quoted prices from active market (level 1) to measurement using significant unobservable inputs (level 3). Level 1 and 2 are considered 'marked to market accounting' whereas level 3 is considered 'marked to model accounting', as it is based on managerial assumptions, and internal valuation models. Within six months of SFAS 157 being issued, FASB issued SFAS 159 "The Fair Value Option for Financial Assets and Financial Liabilities", which permits entities to choose to measure an expanded set of financial instruments at fair value, effective from November 2007. This fair value option only applies to individual financial instruments and once elected, the decision is irrevocable, unless there is a change in business combination or significant modification of debt. In 2009, the FASB renamed SFAS 157 and 159 ASC 820 and ASC 825 respectively.

2.2.2.3 Fair Value and Valuation

Proponents of fair value accounting argue that it is more timely, since prices can provide the most up to date information about the value of assets and liabilities (Barth 1994, Penman 2007). This timeliness makes FVA more relevant in assessing firms' current performance, compared with historical cost accounting. FVA is also in line with the FASB's move towards a more principles-based standard. When applied to financial instruments, fair value

accounting reduces the complexity of financial reporting, such as hedge accounting (Landsman 2007). Barth (1994) finds that the fair value of banks' investment securities is more relevant to investors compared with historical cost. Barth (2006) argues that the purpose of financial reporting is not earnings prediction, but its ability to predict future cash flows. She further contends that incorporating more relevant estimates provides more useful information to users for that exact purpose.

Fair value accounting can increase transparency and encourage users to make more timely decisions. Laux and Leuz (2009) argue that HCA could have made the global financial crisis potentially worse by incentivising 'gains trading'. Since a decline in value is not recognised unless sold under HCA, financial institutions have no incentives to sell undervalued assets and liabilities, as this would affect their statutory equity capital. Financial institutions would instead sell assets with the largest unrealised gains to raise their net income; such gains trading could continue for many periods and may worsen the transparency problem (Ryan 2008).

Banks and financial institutions, in theory, stand to benefit most from fair value accounting, since the majority of their balance sheet is composed of investment securities, financial instruments and derivatives. Prior to FAS 115 in 1993, assets generally could not be revalued upwards. FVA allows changes in the underlying marketable investment securities to be recognised and since these securities trade in secondary markets, market value is a better measure of liquidation value than HCA (Kothari et al. 2010). Barth (1994) finds that the average difference between book value and fair value is around 56% of the market value of equity, suggesting that fair value has additional explanatory power beyond what is provided by historical costs. Nissim and Penman (2007) find that financial instruments are approximately 90% of reported assets and almost all reported liabilities for bank holding companies. They also conclude that the expanded application of FVA is unlikely to improve

accounting quality, as it does not fully account for economic assets and liabilities due to errors and biases in measurement.

Critics of FVA suggests that it caused excessive write downs during the financial crisis. Banks are alleged to have been forced to sell their assets in illiquid markets below their fundamental price; these prices in turn becomes relevant for other banks and financial institutions, causing them to also write down similar assets (Laux and Leuz 2010). However, Ball (2008) argues that FVA is not to blame. He suggests two fundamental factors that led to undervalued balance sheet: uncertainty and the decline in credit quality, which subsequently led to a reduction in expected future cash flow and sharp increase in discount rates. He concluded that managers of financial institutions were to blame, since it was them who invested heavily in mortgage-backed securities in exchange for high leverage, creating a risk that ultimately did not pay off.

2.2.3 Fair Value and Debt Contracting

Verifiability is a key element in incomplete contract theory since the incompleteness at contract initiation is due to future states being difficult to verify and describe in a way for the contract to be enforceable in a court of law. Contract efficiency is improved through the use of accounting-based measures because accounting information is verifiable and therefore the signals it provides are contractible. Note that the value of accounting information here does not arise because of its information content (Christensen et al. 2016). Christensen et al. (2016) indicate that if control allocation is based on highly subjective accounting measures, then the purpose of accounting-based covenants is lost. This is consistent with the principles of conservatism, which require more verification for recognising gains than losses (Watts, 2003). Watts (2003) further states that the demand for conservatism is due to managers having limited tenure and liability, so a lack of verifiability in estimates presents an opportunity for

exploitation. Kothari et al. (2010) suggest that the unconditional conservativism in accounting standards originates from debt holder demands that balance sheets should reflect the liquidation value of assets. Nini et al. (2012) find that firms have more conservative financial policy and investment policy after breaching accounting covenants, confirming the idea of strong demand for accounting conservatism by lenders.

Under agency theory, the quality of accounting measures depends on its ability to capture managers' effort, as managerial compensation can align incentives *ex ante*. Under incomplete contract theory, quality of accounting signal also depends on how well it captures future states *ex post*. The main concern with FVA is over its potential lack of reliability in measurement for assets and liabilities in illiquid markets, i.e.: level 2 and 3 fair value. Managers are best placed to estimate the 'true' economic value of the underlying financial asset or liability, and in the absence of a secondary market, they are the ones charged with making such estimates. But as a consequence of this, fair values based on internal measurement models may be prone to manipulation, leading to increased information asymmetry between contracting parties. Landsman (2007) suggests that the solution to this problem is to require extensive disclosure of the underlying assumptions. However, the level of aggregation in many large companies' financial statements is likely to make this prohibitive. Aside from managerial manipulation, Barth (2004) also suggest that measurement error in the fair value of assets and liabilities can lead to fair value deviating from its true economic value, while Landsman (2007) – usually a proponent of fair value – concedes that when estimates are incorporated into fair values, informativeness declines.

Another of the main criticisms of fair value accounting is that it merely reflects the transitory shocks to the financial statements (Holthausen and Watts, 2001). Dichev (2008) suggests that market prices are unpredictable, hence mark to market earnings will also be volatile. He further indicates that the balance sheet approach leads to less informative

earnings, as its predictive power declines. He argues that predicting future changes in net assets is less useful than recurring earnings and simply reflects noise. In support of this, the survey conducted by Graham et al. (2005) shows that earnings is the most important metric reported to outside investors; moreover, managers prefer smooth and persistent earnings because (a) it is more useful to predict future earnings, and (b) outside investors might (mis)interpret volatile earnings as risk. Ball (2016) echoes this view, suggesting that a reduction in earnings usefulness renders it a poor predictor for future debt servicing capacity, especially for longer-term debt. Interestingly, Li (2016) finds that EBITDA, not net income (or GAAP earnings) is the typical performance measure used in earnings-based covenants, although it is less useful than EBIT or bottom-line earnings in explaining changes in credit risk. He suggests that EBITDA is used by lender in contracts in order to focus on operating activities, rather than on investing activities.

A less appreciated criticism of fair value accounting in the context of its use in debt contracting is the effect of recognition in changes in the fair value of liabilities, as highlighted in the case study of (Lipe 2002). When a firm experiences negative shocks, discount rates increase, and as a consequence, *ceteris paribus*, the fair value of its liabilities *decreases*, since lenders may become wary of the firm's ability to meet its obligations. All else equal, this decline in liabilities (which, recall, originates in a *negative* shock) *improves* the firm's leverage and leads to an *increase* in firm's earnings. Users of financial statements would typically interpret this as a positive signal, when in fact it is very much a negative one. In the event that an interest coverage or leverage covenant is written on such information, this would have the counterintuitive – and problematic – effect that negative shocks will reduce the likelihood of firms breaching covenants. Ball (2016) emphasises that debt is not an agreement to repay at fair value, but at the historically contracted rate. He suggests that accounting-based covenants that act as trip wires becomes less effective if liabilities can be recognised at fair

value when credit quality declines.

So far, there have been few empirical studies of the effects of standard setters' changes in accounting measurement on debt contracting. In an influential study, Demerjian (2011) examines covenant use in debt contracts arising from the increased emphasis by standard setters on the balance sheet, rather than the income statement. He reports a substantial decline in balance sheet-based covenants from 80% of lending agreements to 32%, between 1996 and 2007. Using a volatility measure consisting of book value and net earnings, he finds that borrowers with greater volatility are less likely have balance sheet-based covenants. However, during the same time period, the usage of income sheet-based covenants remained constant. Demerjian (2011) attributes this to the fact that balance sheet changes are recognised in other comprehensive income, suggesting that the balance sheet has become less useful for debt contracting parties.

2.2.4 Covenant Modification

One way of contracting parties adapting to changes in accounting standards that are inconvenient for contracting is to adapt the accounting measurement rules in response. Definitions are seen as the fundamental building block of covenants in credit agreements (Wight, Cooke and Gray 2009) and they are often modified to enhance the precision of accounting signals, as well as removing discretionary items that distort the state of the firm (Christensen et al. 2016). El Gazzar and Pastena (1990) find that lenders often tailor income-based covenants to convert equity-based income to cost based, since non-cash GAAP income does not reflect borrower's solvency risk. They also found that 62% of the sample tailors shareholders equity to exclude intangibles and goodwill, which is consistent with lender's accounting demand to be closer to a cash flow basis and more reliable.

On the other hand, the benefits from using standardised or "boiler plate" provisions

include time and cost savings, as well as lower contracting costs (Kahan and Klausner 1997, Day and Taylor 1998). This is because the validity and meaning of prior covenants had been interpreted and enforced by judicial courts, new covenants need to be reviewed and approved by the underwriter and its legal counsels which takes time and legal fees (Choi and Triantis 2012).

De Franco (2013) suggest the quality of legal counsel is lower due to the lack of familiarity and the uncertainty in regard to judicial opinion on the new provision. De Franco et al. (2011) also found that increased comparability reduces information acquisition cost of bond securities analyst. Using a sample of US public bonds, De Franco (2013) shows that covenant restrictiveness is explained largely by the borrower's prior use of the same underwriter and legal counsels. Similarly, private debt contracts in the Europe exhibit similar properties. Using a sample of private debt contracts of the 200 of the largest firms in UK, Moir and Sudarsanam (2007) show that choice of covenant inclusion only depends on the size and covenants are not tailored based on borrower's characteristics. They hypothesise that size as a measure financial strength and negotiating power while using the reputation of borrower to address for potential agency problems. Based on interviews with UK bank officers, Day and Taylor (1997) suggest the reduced contracting costs from standardisation is due to drafting efficiency and even for non-standard contract, they are sourced from a common basis. Their results echo this hypothesis where 70% of their sample exhibit some degree of standardisation. In sum, the covenants in the current corporate debt contracts have survived and are expected to be the "fittest", as prior literature suggest there is a systematic tendency to keep efficient contracting terms.

In response to an increased reliance by standard setters on the balance sheet, rather than the income statement, lenders are able to exclude some earnings and balance sheet components from contractual definitions. Li (2010) finds that no covenants use

comprehensive income in place of earnings, and when net income is used in covenants, it generally excludes transitory components. This is consistent with efficient contract theory, where debt contracting parties chooses more efficient variables depending on their usefulness for the contracting task.

More recently, and directly relevant to our study, Demerjian et al. (2016) examine the effects of an important US fair value accounting standard - SFAS 159 - on debt contract design. They observe that if contracting parties find fair value accounting to be problematic for contracting, then they should modify the definition of the accounting information to exclude it. For instance, if equity or profits are artificially inflated by increases in unverifiable and imprudent fair values, contracting parties should modify the measurement bases for assets and profits to remove fair values. In their analysis of contracts issued in the four years after the introduction of SFAS 159, however, they find that only a limited number of contracts exclude assets measured at fair value. In contrast, they find numerous examples of contracts excluding fair value effects in liabilities.

2.3 Research Objectives

2.3.1 Demerjian et al. (2016) Replication and Extension

In order to reassess the response of contracting parties to fair value accounting, our first aim is to re-examine the study of Demerjian et al. (2016) (henceforth DDL). using the same approach to measuring fair value exclusion clauses. We denote their measurement FVC_{DDL} and the aim of this measure is to get as close as possible to their results. We also compare their results using an expanded vocabulary for capturing FVCs, which we denote $FVC_{CLS.}$[2] In this analysis, we use the same sample period as DDL, i.e., from 2008 to 2012.

Although we attempt to employ exactly the same vocabulary in our replication exercise,

[2] The regular expressions we use and the differences in vocabulary we search for appear in Appendix A.

we note that the method of data collection is very different, hence we expect some differences.[3] Secondly, we also re-examine the same model using a extended sample period between 2008 and 2017. If fair value exclusion clauses are efficient for contracting, we expect them to remain in contracts in future periods – and to be increasingly adopted over time. We therefore expect year effects to be significant and increasing over time.

The three main hypotheses tested by Demerjian et al. (2016) are:

H1$_{DDL}$: Debt contracts are more likely to exclude the effects of SFAS 159 if borrowers have greater opportunities to exploit the effects of fair value accounting.

H2 $_{DDL}$: Debt contracts are more like to exclude the effects of SFAS 159 if borrowers have greater incentives to manipulate fair value estimates.

H3 $_{DDL}$: Borrowers who are more likely to be engaged in hedging activities or have debt contracts with liquidity covenants are less likely to have SFAS 159 effects excluded from their covenants.

The idea behind $H1_{DDL}$ is that revolving lines of credit must meet the contractual cash flow characteristics criteria and the probability of exercise is deemed not remote in order to be elected fair value. This means that the timing of fair value election for revolving line of credit can be exploited, unlike other types of loan commitment, such as term loan, where fair value election must be at initiation. Secondly, level 2 and 3 fair value estimates are less reliable that market-based level 1 fair value and also because model inputs are only known internally within the firm.

In respect of $H2_{DDL,}$ performance pricing provisions (PPPs) are often used in conjunction with accounting-based covenants, with the same accounting ratio as the basis for determining the interest rate. The idea behind PPPs is to incentivise credit improvements via the possibility of lower interest rates when accounting ratios improve; accounting based covenants then handle the credit risk deteriorations (Beatty et al. 2002). SFAS 159 has the

[3] Difference in data collection method is explained in section 4.1.

potential to affect the denominator of the typical PP measure, i.e., debt/EBITDA.

Finally, in the case of $H3_{DDL}$, the objective of SFAS 159 is to achieve consistent accounting, without the application of complex hedge accounting provision. The previous accounting standard, FAS 133, "Accounting for Derivative Instruments and Hedging Activities", required entities to identify fair value hedging relationships and only derivatives could be used as hedging instruments (FASB 2007). SFAS 159 allows entities to elect the fair value option to the hedged item at its inception, providing greater simplicity in the application of accounting guidance. Guay and Kothari (2002) find that risk management activities such as operational hedges substantially increase firm value. This suggests that fair value accounting could improve accounting numbers in reflecting firm risk, which would be of interest to capital providers, especially debt providers. Furthermore, fair value accounting could improve the information content of accounting number in reflecting borrowers' liquidity by providing information on exit values of both assets and liabilities.

2.3.2 Extending Demerjian et al. (2016)

In this sub-section, we develop additional hypothesis to further complement the findings of DDL. DDL (2016) argue that, if borrowers have an above median value of level 2 and 3 fair value assets (as a proportion of total fair value), they are more likely to include a FVC due to lenders' reliability concerns. However, we expect lenders to be more concerned with how fair value affects earnings, proxied by the (net) sum of fair value assets and liabilities. Assuming that a borrower has an equal amount of fair value assets and liabilities and the same discount rate for both assets and liabilities, when its credit quality worsens, the amount of both fair valued assets and liability should decline in a way that one perfectly offsets the other (Vanderhoof and Altman 1998). Impaired fair value assets cause a loss in the income statement when discount rates increase, and this should offset any gain from impaired

liabilities. If the borrower has more fair value assets than liabilities, the loss caused by impaired FV assets will be greater than the gain caused by impaired FV liabilities.

Prior literature suggests that lenders are mainly concerned with the gain in earnings associated with impaired liabilities (Lipe 2002). This does not mean if the borrower has no fair value liabilities prior to contract initiation, they will not opt out of fair value accounting via a FVC. This is because FVCs prevent current and future uses of fair value in covenant calculations. The lender cannot anticipate whether the borrower will exercise the fair value option in the future, such as via engaging in interest rate swaps agreement (level 2). The argument is that even if the borrower has marginally net positive fair value prior to contract initiation, the borrower may exercise the fair value option on new liabilities, resulting in net negative fair values within the maturity of the contract and hence increasing earnings in the case of borrower credit deterioration.

On the other hand, if the borrower has high levels of net positive fair value, any future fair value deterioration in liabilities would be neutralised by existing fair value assets. The main assumption is that the discount rate for both liabilities and assets would increase. In other words, if the borrower's credit quality worsens after contract initiation, the loss by impaired assets will always offset the gain in current or future impaired liabilities. Therefore, our first hypothesis is:

Hypothesis 1: *Borrowers with high level of **net** positive level 1, 2 and 3 fair value are less likely to have a FVC in their lending agreements.*

Secondly, SFAS 157 (now, ASC 820) was adopted in 2007, which sets out the framework for the three levels of fair value hierarchy. DDL argue that because fair value levels 2 and 3 are unreliable, managers can manipulate fair value based figures via their valuation assumptions. They further indicate that if borrowers have high levels of unreliable

fair values, this can provide borrowers with greater opportunities to manipulate their accounting figures. If lenders are concerned about the reliability of fair value accounting data, they are likely to be most concerned about level 3 fair values, which are based on unobservable inputs where management has considerable discretion (e.g. Laux and Leuz 2010). Therefore level 3 data are less verifiable than level 2 fair values. Borrowers with 100% level 3 fair values are where there would seem to be the highest risk of manipulation. We therefore develop the following hypothesis.

Hypothesis 2: *Borrowers with 100% level 3 fair values on their balance sheet are more likely to have a FVC in their lending agreements.*

Finally, we examine the impact of syndicate structure on the use of FVC. When syndicate size is large, the lead arranger is more likely to suffer from the free riding problem. This is when the informed lender is responsible for monitoring the borrower, while uninformed creditors just participate by committing capital but without participating in monitoring. In this case, a lack of effort from uninformed lenders could lead to underinvestment. Rajan and Winton (1995) suggests that adding additional covenants gives monitoring incentives to the lead arranger. Prilmeier (2017) further indicates borrowing from one bank lender mitigates the free rider problem and the need for covenants diminishes. If there is a sole lender rather than a syndicate of lenders, the lending relationship is less likely to suffer from free riding problems and thus, the need for contracting mechanism such as FVC diminishes. This prediction is not uncontentious, however. Etsy and Meggin (2005) indicate that more concentrated syndicates facilitate lower costs of renegotiation in the event of default. Therefore, our third and final hypothesis is:

Hypothesis 3: *Syndicate size is associated with the use of FVC in lending agreements.*

DDL (2016) report that the use of affected covenants, which are financial covenants that could be impacted by the adoption of ASC 825, did not change after the adoption. They found that the results for their three hypothesises are stronger when the sample is restricted to contracts with affected covenants. However, they did not directly test whether debt contracts with affected financial covenants are more likely to include FVC. This provides an opportunity to do so.

In the following section, we set out the data collection and analyses methods we use to test the above hypotheses.

2.4 Data

2.4.1 Data sources and sample construction

We employ three main datasets to address our hypotheses and research questions. The first involves the collection of data on whether firms choose to opt out of fair value measurement in their debt contracting. Since such data is not available from standard databases, we do this by searching for references in private lending agreements in SEC EDGAR to the US accounting standard on fair value: SFAS 159, relabelled ASC 825.

Material financial contracts such as credit agreements are available in 'exhibit 10' of Securities Exchange Commission (SEC) filings, particularly 10K annual reports, 10Q quarterly reports and 8K current reports for corporate material events (and their amendments), respectively. We develop a Python script to examine these filings to find the loan contracts themselves, the SFAS 159 exclusions within them, as well as the contract initiation date. Since it is necessary to download all filings (circa 1.5 million text files) in order to search for the contracts and terms within them, we employ the University of Bristol Advanced Computing Research Centre facilities.

We initially codify fair value exclusion clauses using the five key terms used by DDL

(2016). However, in our attempt to reproduce their study, we must use a different way of retrieving the filings. This is because DDL (2016) employed *10-K Wizard*,[5] also called *Morning Star Document Search*, which was discontinued in 2015.

After we download all Forms 10K, 10Q and 8K using a Python script to remove HTML and XBRL tags,[6] we design and use a series of regular expressions to search for the desired key terms. FVC_{DDL} is a binary variable that equals one if it matches any of the original 5 key terms.[7] After inspecting a sample of contracts manually, we then expanded the potential key terms used to identify FVCs, generating a more inclusive measure denoted FVC_{CLS}. This measure is based on a more comprehensive vocabulary list. For example, the following extracts is taken from a debt contract that includes a FVC.

> "*Notwithstanding any other provision contained herein, all terms of an accounting or financial nature used herein shall be construed, and all computations of amounts and ratios referred to herein shall be made (i) without giving effect to any election under* ***Accounting Standards Codification 825-10-25 (previously referred to as Statement of Financial Accounting Standards 159)*** *(or any other Accounting Standards Codification or Financial Accounting Standard having a similar result or effect) to value any Indebtedness or other liabilities of the Borrower or any Subsidiary at "fair value", as defined therein…"*[8]

For our second data set, we obtain details of credit agreements through Thomson Reuters Loan Pricing Corporation (LPC) Dealscan database. In this database, credit agreements are referred as "packages" and can contain one or more tranches, i.e., "facilities".

[5] Note that the 10-K Wizard also allows searches for Forms 8K and 10Q.
[6] We gratefully acknowledge Andy Leone for providing the original code in Perl, and Ties de Kok for Python guides, as well as colleagues in the University of Bristol Advanced Computing Research Centre for excellent research software support.
[7] Both regular expressions and the key terms they search for are given in Appendix A.
[8] Example from SECTION 1.04. Accounting Terms; GAAP; ProForma Calculations, pp.22. See: https://www.sec.gov/Archives/edgar/data/62234/000114420416117722/v445647_ex4-1.htm

Details of financial covenants and net worth covenants are merged through "packageid", while lender information and performance pricing information are merged through "facilityid". Ultimately, all variables are constructed on the package level.

Finally, we obtain borrowers' firm level accounting data from Standard and Poor's (S&P) COMPUSTAT. We merge firm data with loan contract data using the Chava and Roberts (2008) linking table. We merge SFAS 159 data and contract data using the SEC Central Index Key (CIK) and contract initiation date, with the latter being retrieved from the first page of the lending agreement. The final sample contains 4,785 private credit agreements and 2,175 unique borrowers between 2008 and August 2017.

2.4.2 Empirical Models

To examine DDL's first test of whether financial covenant usage is affected by the adoption of SFAS 159, covenants based on balance sheet items are the most likely to be affected. Although earnings-based covenants are the most common financial covenant in syndicated loans (Li 2016), no earnings-based covenants use comprehensive income as an earnings concept and contracts often remove transitory components when defining income, by using measures such as EBITDA (Li 2010). Thus, the income statement may be less affected by fair value accounting since prior contracting features were already in place to focus on operating earnings and remove non-recurring components. Therefore, *AFFECTED* is a binary variable equal to one if the debt contract contains any of the following financial covenants: debt-to-EBITDA, senior debt-to-EBITDA, debt-to-assets, senior debt-to-assets, debt-to-equity, debt-to tangible net worth, net worth, tangible net worth, current ratio, and quick ratio covenants.

The change in financial covenant usage and affected covenant usage is tested using a similar probit regression model to Demerjian et al. (2016). The dependent variable is either *Financial Covenant* or *Affected Covenant*, where the former equals one if the debt contract

includes any financial covenants, while and the latter is explained above. The primary variable is *Post*, which is a binary variable equal to one if the debt contract initiated after SFAS 159 adoption date, 15th November 2007, and zero otherwise. We interpret a positive coefficient as an increase in covenant usage following SFAS 159 adoption, and *vice versa*. Consistent with DDL, we control for various firm characteristics including the size of balance sheet items eligible for fair value option, firm size, leverage, ROA, magnitude of firm's discounted future lease payments and whether a credit rating is available at contract initiation.

We also control for various contract characteristics, including nine binary variables for contractual features such as whether the contract contains a performance pricing grid, whether it includes a revolving loan, capital expenditure restriction, institutional tranche for contracts that include a term loan b or higher, any sweep covenant, dividend restriction, collateral (indicating whether the contract is secured) and the class of financial covenant used in the prior deal (balance sheet or income statement, Demerjian 2011). Syndicate size is measured as the number of unique lenders in the contract[9] and debt size is the deal (package) amount.

$$
\begin{aligned}
Covenant_{it+1} = \quad & \alpha_0 + \beta_1 Post + \beta_2 Eligible\ FV\ Instrument_{it} + \\
& \beta_3 Performance\ Pricing_i + \beta_4 Revolver_i + \beta_5 Size_{it} + \\
& \beta_6 Leverage_{it} + \beta_7 ROA_{it} + \beta_8 Rating\ Available_{it} + \\
& \beta_9 Lease_{it} + \beta_{10} BS\ Covenant\ Prior\ Deal_i + \\
& \beta_{11} IS\ Covenant\ Prior\ Deal_i + \beta_{12} Syndicate\ Size_i + \\
& \beta_{13} Capex\ Restriction_i + \beta_{14} Institutional\ Tranche_i + \\
& \beta_{15} Sweep\ Covenant_i + \beta_{16} Dividend\ Restriction_i + \\
& \beta_{17} Colleteral_i + \beta_{18} Debt\ Size_i + \varepsilon_{t+1}
\end{aligned}
\qquad \textbf{(1)}
$$

The initial sample is restricted to borrowers who are engaged in debt contracts one and three years prior to and after the adoption of SFAS 159. This is to ensure changes in debt contracting practice are independent of changes in borrower markets and sample composition (Costello and Wittingberg-Moerman 2009). Standard errors are adjusted for the clustering of

[9] Package may contain multiple facilities, lenders may choose to participle in certain facility but not others.

yearly observations across a given company, since residuals tend to be correlated over time and magnitude of t-statistics might be overstated (Petersen, 2009).

The likelihood of fair value exclusions in debt contracts is estimated using a probit regression model based on Dermerjian et al. (2016):

$$
\begin{aligned}
FVC_{t+1} = \; & \alpha_0 + \beta_1 Revolver_i + \beta_2 Unreliable\ FV_{it} + \beta_3 PP_i + \beta_4 Hedge\ Industry_{it} + \\
& \beta_5 Liquidity\ Covenant_i + \beta_6 Eligible\ FV\ Instrument_{it} + \\
& \beta_7 Debt\ Restriction\ Covenant_i + \beta_8 Networth\ Covenant_i + \\
& \beta_9 Earnings\ Covenant_i + \beta_{10} Size_{it} + \beta_{11} Leverage_{it} + \beta_{12} ROA_{it} + \\
& \beta_{13} Rating\ Available_{it} + \beta_{14} Lease_{it} + \beta_{15} Contingent\ Liability_{it} + \\
& \beta_{16} Unrealised\ Gains/Losses_{it} + \beta_{17} Institutional\ Tranche_i + \\
& \beta_{18} Sweep\ Covenant_i + \beta_{19} Dividend\ Rrestriction_i + \beta_{20} Colleteral_i + \\
& \beta_{21} Debt\ Size_i + \varepsilon_{t+1}
\end{aligned}
\qquad \textbf{(2)}
$$

For DDL's hypothesis two, two proxies are used to measure borrower opportunism. First, *REVOLVER*, a binary variable equal to one if the debt contract features a revolving line of credit, as discussed in the previous section; second, *UNRELIABLEFV_EST*, which measures the magnitude of unreliable estimates over all fair value estimates. Level two and three fair value estimates for assets and liabilities in illiquid markets are unlike level one fair value estimates, which have observable market prices as a reference. Only managers know the true economic value and the assumptions that underlie the valuation models for level two and three FV estimates. This may create opportunities to manage accounting numbers to be within covenant thresholds due to the increased information asymmetry between managers and market participants. For the purpose of marginal effects interpretation, *UNRELIABLEFV_EST*, a continuous variable is converted to a binary variable, *UNRELIABLEFV*, which equals 1 if the borrower is above the sample median and zero otherwise. This median value is limited to post SFAS 159 observations.

The presence of an accounting-based performance pricing grid (*PP*) in a debt contract provides incentives to manage the typical measure for PP, debt to EBITDA. Although interest

decreasing PP is the most commonly used method to incentivise better performance, it can also give managers the incentive to manage the size of debt in order to obtain and stay at lower interest rate ranges. This incentive leads to an increase in moral hazard, which results in wealth transfer from lenders to shareholders (Asquith et al. 2005). Consistent with DDL, we test hypothesis three, *PP* is a binary variable equal to one if debt contract features a performance pricing grid.

Finally, the last two hypotheses predict that fair value accounting may potentially be harmful for debt contracting. However, the main objective for SFAS 159 is to simplify hedge accounting, thus firms that engage the most in hedging activities may benefit most from the fair value changes. Bartrum et al. (2009) found that derivatives usage rate is highest in chemical (foreign exchange derivatives) and utility industries (interest rate derivatives), while commodity price derivatives are also used extensively by oil, mining and steel industries. *HEDGE*, a binary variable, equals one if the firm is in the chemical, utility, oil, mining and steel industries under the 48 Fama-French industry classification. Fair value can also provide useful information on the entity's liquidity position as it reflects the exit price for existing short-term assets and liability. We therefore test the impact of *LIQUIDITYCOV*, a binary variable that equals one if the debt contract contains a liquidity covenant, such as the current or quick ratio.

2.4.3 Descriptive Statistics

Table 2.1 presents summary statistics for both 2008-2012 (DDL's sample period) and 2008-2017 (full sample). We identify 753 FVC_{DDL}, which uses DDL's dictionary, in 2,532 private debt contracts (29.7%) between 2008 and 2012, which is significantly more than Demerjian et al. (2016)'s sample, where they identify FVCs in 380 of 2,615 private debt contracts (a rate of 14.5%, roughly half the rate we find). To ensure FVCs are correctly classified, 100 random

contracts are examined against the original EDGAR filing and were found to be 100% accurate. Furthermore, in FVC_{CLS}, which uses our expanded dictionary, we identified 837 in 2,532 contracts (32.8%) between 2008 and 2012. This increased significantly to 41.6% (1,984) in the 4,774 contracts we identify between 2008 and 2017. Consistent with Demerjian (2011), the average usage of *AFFECTED* covenants, which are financial covenants largely based on balance sheet numbers, fell when the sample period was extended by 5 years. Table 2.2 presents correlation matrix.

Table 2. 1 Descriptive Statistics

	Descriptive Statistics between 2008-2012						Descriptive Statistics between 2008-2017					
Variable	N	Mean	p25	Median	p75	SD	N	Mean	p25	Median	p75	SD
Dependent												
AFFECTED	2540	0.641	0.000	1.000	1.000	0.480	4784	0.605	0.000	1.000	1.000	0.489
FVC_DDC	2540	0.297	0.000	0.000	1.000	0.457	4784	0.381	0.000	0.000	1.000	0.486
FVC_CLS	2540	0.329	0.000	0.000	1.000	0.470	4784	0.416	0.000	0.000	1.000	0.493
Treatment Variable												
REVOLVER	2540	0.809	1.000	1.000	1.000	0.393	4784	0.788	1.000	1.000	1.000	0.409
UNRELIABLE_EST	2540	0.508	0.000	0.539	1.000	0.442	4784	0.499	0.000	0.501	1.000	0.439
NETFV	2540	2617.415	-0.410	0.202	93.791	31142.640	4784	2353.177	-0.300	0.117	105.672	28386.530
JUSTLVL3	2540	0.027	0.000	0.000	0.000	0.162	4784	0.025	0.000	0.000	0.000	0.157
PP	2540	0.590	0.000	1.000	1.000	0.492	4784	0.542	0.000	1.000	1.000	0.498
ACCOUNTINGPP	2540	0.266	0.000	0.000	1.000	0.442	4784	0.243	0.000	0.000	0.000	0.429
RATINGPP	2540	0.217	0.000	0.000	0.000	0.412	4784	0.208	0.000	0.000	0.000	0.406
HEDGE	2540	0.160	0.000	0.000	0.000	0.367	4784	0.152	0.000	0.000	0.000	0.359
LIQUIDITYCOV	2540	0.037	0.000	0.000	0.000	0.189	4784	0.028	0.000	0.000	0.000	0.164
ELIGFVINSTRU	2540	0.506	0.186	0.452	0.679	0.439	4784	0.520	0.203	0.470	0.704	0.443
DEBTRESTRICTION	2540	0.639	0.000	1.000	1.000	0.480	4784	0.605	0.000	1.000	1.000	0.489
NETWORTH	2540	0.136	0.000	0.000	0.000	0.343	4784	0.110	0.000	0.000	0.000	0.312
EARNINGSCOV	2540	0.553	0.000	1.000	1.000	0.497	4784	0.488	0.000	0.000	1.000	0.500
AT	2540	10181.580	709.381	2016.465	6155.844	49190.290	4784	11378.580	887.947	2575.889	7707.000	45200.610
SIZE	2540	7.252	6.141	7.315	8.376	1.663	4784	7.585	6.463	7.621	8.703	1.690
LEV	2540	0.279	0.109	0.246	0.398	0.230	4784	0.304	0.139	0.278	0.430	0.230
ROA	2540	0.007	0.001	0.010	0.020	0.042	4784	0.006	0.001	0.009	0.019	0.060
RATING_AVAIL	2540	0.461	0.000	0.000	1.000	0.499	4784	0.476	0.000	0.000	1.000	0.499
LEASE	2540	0.052	0.005	0.018	0.046	0.104	4784	0.048	0.005	0.017	0.042	0.100
CONTINGENTLIAB	2540	0.168	0.000	0.000	0.000	0.374	4784	0.154	0.000	0.000	0.000	0.361
UNREALISEDGL	2540	0.000	0.000	0.000	0.000	0.002	4784	0.000	0.000	0.000	0.000	0.003
LN1SYNSIZE	2540	2.018	1.609	2.079	2.565	0.751	4784	2.081	1.609	2.197	2.639	0.730
CAPEX	2540	0.119	0.000	0.000	0.000	0.324	4784	0.085	0.000	0.000	0.000	0.279
INSTIT	2540	0.077	0.000	0.000	0.000	0.266	4784	0.094	0.000	0.000	0.000	0.292
SWEEPVAR	2540	0.247	0.000	0.000	0.000	0.431	4784	0.225	0.000	0.000	0.000	0.417
DIVRESTRICITION	2540	0.485	0.000	0.000	1.000	0.500	4784	0.398	0.000	0.000	1.000	0.490
COLLATERAL	2540	0.491	0.000	0.000	1.000	0.500	4784	0.463	0.000	0.000	1.000	0.499
DEBTSIZE	2540	19.541	18.746	19.519	20.436	1.260	4784	19.794	18.980	19.807	20.723	1.270

This table presents descriptive statistics (mean, standard deviation, 25th, 50th, and 75th percentile) for the sample included in our main regression models. The sample includes lending agreements identified by a Python text search program from the SEC EDGAR archives for 2,175 firms between 2008 and 2017 with data in Dealscan and Compustat. Variable description is in appendix B.

Table 2. 2 Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)_	(9)
(1) *AFFECTED*	1								
(2) *FVC_CLS*	**0.050**	1							
	0.001								
(3) *UNRELIABLEFV*	**-0.009**	**-0.001**	1						
	0.528	0.931							
(4) *PP*	**0.490**	**0.005**	**-0.021**	1					
	0.000	0.751	0.150						
(5) *REVOLVER*	**0.085**	**0.087**	**-0.048**	**0.135**	1				
	0.000	0.000	0.001	0.000					
(6) *HEDGE*	**0.040**	**-0.102**	**0.061**	**0.012**	**-0.060**	1			
	0.006	0.000	0.000	0.392	0.000				
(7) *LIQUIDITYCOV*	**0.137**	**-0.091**	**0.053**	**0.053**	**0.044**	**0.233**	1		
	0.000	0.000	0.000	0.000	0.002	0.000			
(8) *NETFV_HIGH*	**-0.004**	**-0.022**	**0.038**	**0.000**	**-0.049**	**-0.009**	**-0.034**	1	
	0.780	0.127	0.009	0.983	0.001	0.543	0.018		
(9) *JUSTLVL3*	**0.004**	**0.030**	**0.159**	**-0.057**	**0.008**	**-0.023**	**0.005**	**-0.071**	1
	0.801	0.037	0.000	0.000	0.570	0.105	0.712	0.000	

This table reports correlation coefficients and p-values for all sample firms. The sample includes lending agreements identified by a Python text search program from the SEC EDGAR archives for 2,175 firms between 2008 and 2017 with data in Dealscan and Compustat. Variable description is in appendix B.

Figure 2.1 shows the percentage of debt contracts with FVCs. It indicates that there is a dramatic increase usage of FVC between 2008 and 2012, then a broad stabilisation at around 45%. A regression of FVC on an annual time trend shows that there is a significant increase in FVCs over time. As noted above, SFAS 159 was introduced in November 2007 and debt contracts initiated in 2008 began to include clauses removing the effects of SFAS 159 for several years after. The proportion of contracts found by Demerjian et al. (2016) of 14.5% is thus substantially lower than our estimates. Moreover, this statistic is clearly time-varying.

One explanation of the increased exclusion of fair value could be due to an increase in the usage of financial covenants. However, figure 2.2 shows that the average number of financial covenants in debt contracts has also been decreasing over time. Similarly, figure 2.3 shows that there is also a decreasing trend of debt contracts with at least one financial covenant between 2005 and 2017. Therefore, it is unlikely that increased usage of FVC is due to increased usage of financial covenants. A second possible explanation for the increase in FVCs is the effect of diffusion, where a new phenomenon becomes the "norm" by a social system (Bass 1969). This means that if a practice is deemed useful for debt contracting practice, others will follow (knowingly or unknowingly) and the trend will continue to increase. Although Bass's (1969) model is based on consumer durables, which includes the initial cost of purchase, the same logic still applies in the form of additional monitoring cost. Unlike consumer durables where demand eventually falls due to other innovations, innovation of contracting practice tends to be slow and useful contracting features such as debt restriction clauses tends to stay. Figure 2.1 shows that the usage of FVCs peaked in 2015 and stabilised (with a variance) after this.

Figure 2. 1 Time trend in FVC usage between 2008 and 2017

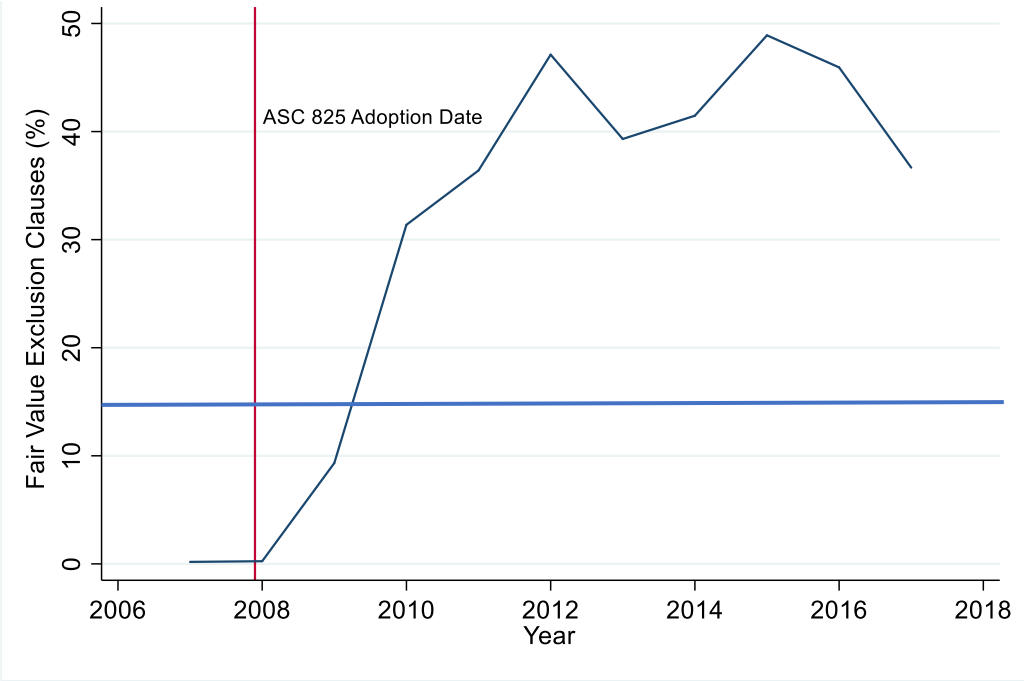


Figure 2.1 presents the percentage of debt contracts with a fair value opt-out clause (FVC) between 2006 and 2017. The red vertical line represents the time when ASC 825 was adopted. The blue horizontal line represents of the findings of Demerjian et al. (2016) where they found, on average, 14.5% contains clauses to remove fair value effects from covenant compliance calculations.

Figure 2. 2 Average number of Financial covenants in Debt Contracts

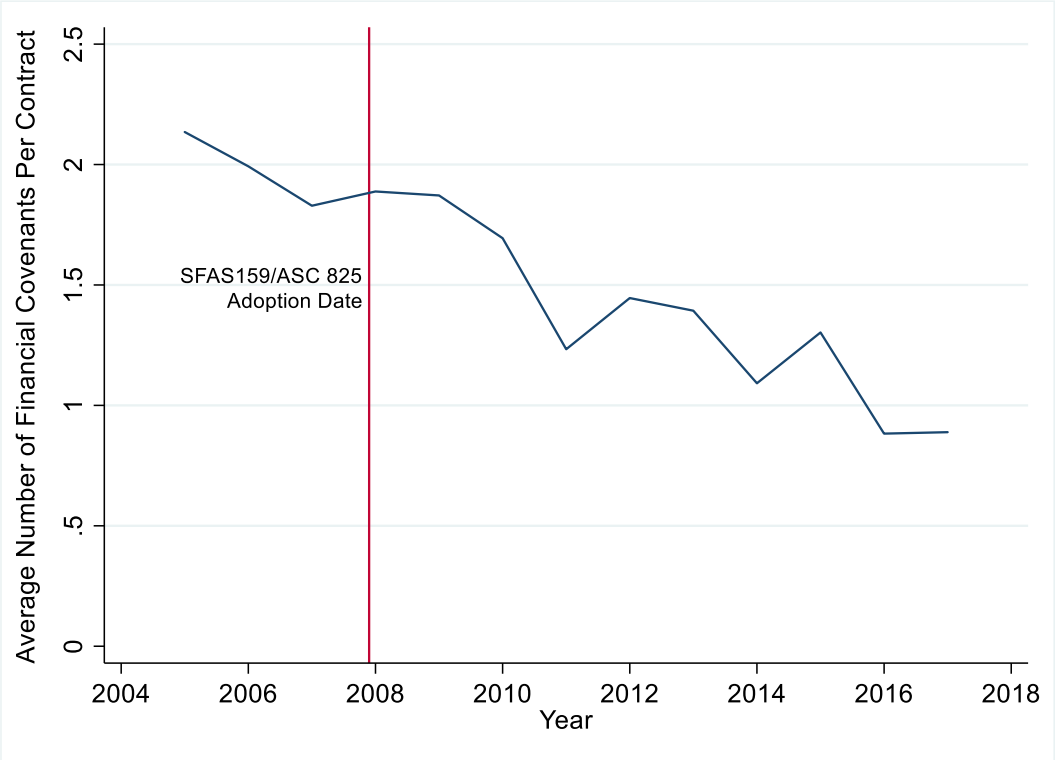


Figure 2.2 shows the average number of financial covenants in debt contracts between 2005 and 2017. The vertical line represents the time when ASC 825 was adopted.

Figure 2. 3 Debt Contracts with Minimum of One Financial Covenant between 2005 and 2017

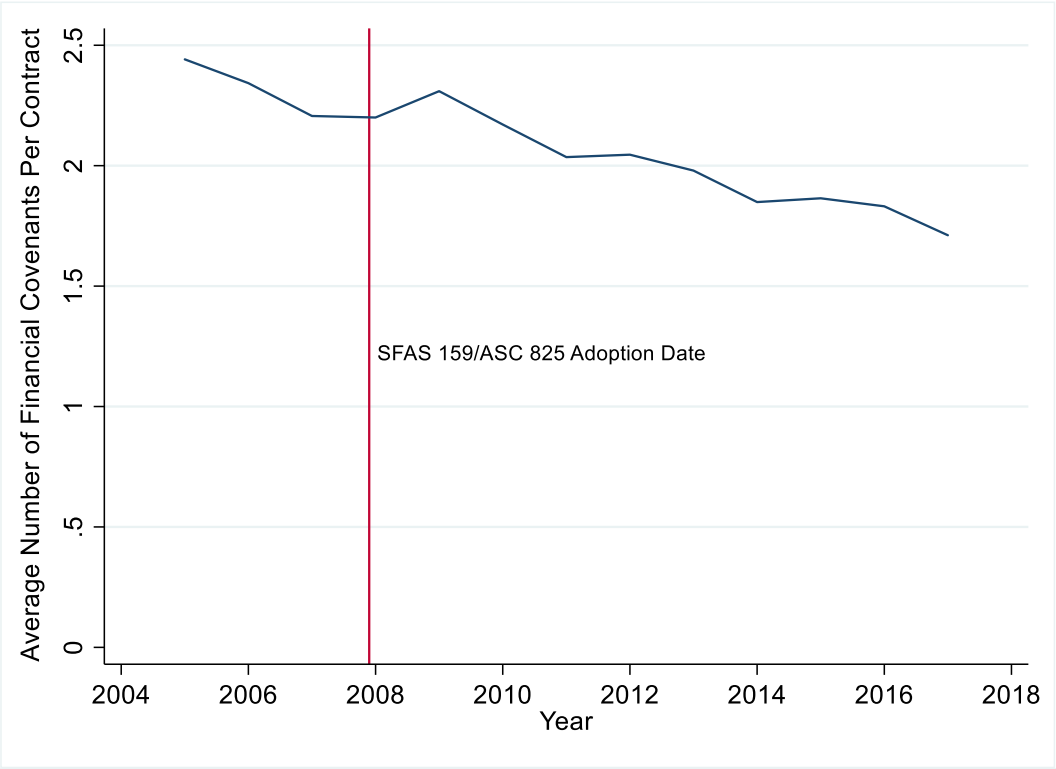


Figure 2.3 shows debt contracts with a minimum of one financial covenant between 2005 and 2017. The vertical line represents the time when ASC 825 was introduced.

Untabulated results show that out of 1,880 FVCs, there are 79 (4%) occasions where the borrower obtained a debt contract with an exclusion followed by one without.[10] This suggests that for the majority of borrowers, once they obtain a debt contract with a FVC, subsequent contracts will almost inevitably have a FVC, causing it to exhibit 'stickiness' properties. Table 2.3 shows the distribution of FVC across 12 Fama-French industries. FVCs are least concentrated in chemicals and oil, gas and coal extraction (3.2% respectively). This is consistent with Bartrum et al. (2009)'s findings, where those are among the industries that use derivatives to hedge the most (foreign exchange derivatives and commodity price derivatives respectively). On the other hand, FVCs are most concentrated in the finance industry (~19%), which is expected as they largely consist of financial assets and liabilities

[10] These 79 occasions contain 75 unique borrowers; subsequent contracts vary from the same and different year, as well as same and different lead lenders.

(Landsman 2007). These two findings coincide with the two main objective of SFAS 159, i.e., expanded use of fair valuation of assets and liabilities, as well as to simplify the use of hedge accounting.

The previous section focuses on borrower and contract characteristics, showing that the time trend of FVC is significant. Prior literature suggests that certain clauses in debt contracts could be due to 'boilerplate contracts' written by a particular bank (e.g., Baylis et al. 2017). Table 2.4 shows the distribution of FVCs by the top 10 lead lenders as defined in Ball et al. (2008), ranked by aggregate funds arranged between 2008 and 2017. JP Morgan and Bank of America are the top two lead lenders, and together represent around 52% of the total loan sample. Wells Fargo included the highest percentage of bank loans issued with FVCs (46%), marginally above Bank of America (45%). In addition, it can be seen that FVC are not concentrated among particular lead lenders and there is clear variation in usage within each lead lender. Therefore, it is unlikely that the use of FVC is due to boilerplate effects by one or two banks. Furthermore, the top 10 lead lenders' FVC usage represents 85.4% of all FVC usage, while the top 10 lead lenders represent 84% of the total loans arranged. Consistent with prior research (e.g., Beatty et al. 2007), fixed effects for each of the top two lead lenders (52% of the sample) as well as year fixed effect are therefore included in the regressions, unless stated otherwise.

Table 2. 3 FVC by 12 Fama French Industries Between 2008 and 2017

Industries	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Finance	0	4	31	57	64	47	33	73	38	8	355
Business Equipment - Computers, Software, and Electronic Equipment	0	3	31	37	42	48	22	57	48	10	298
Other - Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment	1	4	25	37	32	37	27	45	36	2	246
Manufacturing	0	2	16	33	43	21	16	47	29	2	209
Wholesale, Retail, and Some Services (Laundries, Repair Shops)	0	2	14	39	31	27	19	35	38	3	208
Healthcare, Medical Equipment, and Drugs	0	1	12	15	14	13	15	26	24	0	120
Consumer Non-Durables	0	4	14	16	14	11	11	17	17	1	105
Utilities	0	3	5	13	11	18	6	16	12	1	85
Telephone and Television Transmission	0	2	8	8	10	9	8	13	7	5	70
Consumer Durables	0	5	6	6	17	4	6	10	9	0	63
Chemicals and Allied Products	0	1	7	9	10	7	4	15	5	3	61
Oil, Gas, and Coal Extraction and Products	0	3	4	8	11	9	6	8	10	1	60
Total	1	34	173	278	299	251	173	362	273	36	1,880

This table presents the distribution of FVC across Fama-French 12 industries for 2,175 unique firms between 1996-2017. The sample includes 4,785 leading agreements from SEC 10-K, 10-Q and 8-K filings. Other industries include Mines, Construction, Building materials, Transportation, Hotels, Bus Service, Entertainment.

Table 2. 4 Distribution of FVC by top 10 lead arranger between 2008 and 2017

Lead arranger	Contracts with FVC		Contracts without FVC		Total
	Obs	%	Obs	%	Obs
Bank of America	514	44.89%	631	55.11%	1,145
BNP Paribas SA	10	13.89%	62	86.11%	72
Citi	46	18.93%	197	81.07%	243
Credit Suisse AG	29	25.44%	85	74.56%	114
Deutsche Bank AG	34	25.56%	99	74.44%	133
JP Morgan	568	41.70%	794	58.30%	1,362
Sun Trust	60	42.55%	81	57.45%	141
US Bank NA	31	38.75%	49	61.25%	80
Wachovia Bank	1	2.50%	39	97.50%	40
Wells Fargo	314	46.18%	366	53.82%	680
Total by 10 lead arrangers	1607	40.07%	2403	59.93%	4010
N. Whole sample	1880		2905		4785
As % of whole sample	85.48%		82.72%		83.80%

This table shows the distribution of FVCs across the top 10 lead lenders in the syndicated loan market, where the lead lender is ranked by the total aggregate amount loaned between 2008 and 2017. Lead lenders are identified by "lead arranger credit" provided by Dealscan or as the only lender in the loan

2.5 Results

2.5.1 Replication of Demerjian et al. (2016)

Table 2.5 shows the replication results for the change in financial covenant use one and three years surrounding the adoption of SFAS 159 in 2008. Consistent with DDL, we find no statistically significant change in the use of financial covenants. Table 2.6 and 2.7 show the replication results for the 2008-2012 and 2008-2017 sample periods respectively. Firstly, column one of table 2.6 presents probit regression for FVC based on DDL's regular expression (*FVC_DDL*) while column three shows FVC based on expanded FVC regular expressions (*FVC_CLS*). Secondly, table 2.7 uses *FVC_CLS* exclusively with year and industry fixed effects. Although the amount of *FVC_CLS* is greater than *FVC_DDL*, both table 2.6 and 2.7 shows that the results do not differ significantly. Consistent with DDL's findings, *REVOLVER* is positive and significant, which suggests that borrowers with a revolving credit facility are 12% more likely to receive a fair value exclusion clause in their credit agreements. Secondly, *HEDGE* and *LIQUIDITYCOV* are negative and significant,

which suggests that lenders recognise that FVA is useful for borrowers that tend to engage in hedging activities and that FVA provides useful information on the liquidation value of borrowers' assets and liabilities. Marginal effect shows that *HEDGE* lowers the probability by around 11% while the presence of a liquidity covenant lowers the probability by ~32%. All three results are economically significant, especially *LIQUIDITYCOV*, which suggest that lenders value the liquidation value of financial assets and liabilities.

Table 2.7 examines the same model with 4 addition years of data and the inclusion of industry and year fixed effects in column 3, 5 and 7. Results are largely consistent with the findings of table 2.6. *UNRELIABLEFV* is positive but insignificant, which suggests that the borrower is not more likely to receive a FVC if they have above average (i.e., median) values of level 2 and 3 compared to their total fair value. This suggests that lenders are not concerned with the reliability of fair value and are aware of the useful benefits of level 2 and 3 fair value estimates. Secondly, *PP* is insignificant which suggest that contracts with performance pricing provisions are no more likely to have a FVC than those without. Lastly, the majority of the increase in adjusted R-square originates in the year fixed effects, which indicates that the times trends in FVC usage are significant.

Among the control variables, we find that borrowers with debt restriction covenants have a positive and statistically significant relationship with the main dependent variable FVC, consistent with DDL. Moreover, we observe a negative relationship between FVC and borrower size, and between FVC and borrowers with a contingent liability as in DDL. Although we do not find a statistically significant relationship between debt size and FVC, we document a negative and statistically significant association between FVC and borrowers with a net worth covenant, borrowes with credit ratings and borrowesr with collateral requirements for their debt contracts.

Table 2. 5 Changes in financial covenant usage after the introduction of SFAS 159/ASC 825

VARIABLES	(1) Financial Covenant/ 1year	(2) Marginal Effect	(3) Financial Covenant/ 3year	(4) Marginal Effect	(5) Affected Covenant/ 1year	(6) Marginal Effect	(7) Affected Covenant/ 3year	(8) Marginal Effect
POST	-0.0379	-0.00612	0.0365	0.00619	-0.0991	-0.0225	-0.0863	-0.0200
	(0.0763)	(0.0123)	(0.0998)	(0.0169)	(0.0633)	(0.0144)	(0.0837)	(0.0194)
ELIGFVINSTRU	0.104		-0.000260		0.0619		-0.185*	
	(0.0926)		(0.122)		(0.0420)		(0.0974)	
PP	1.596***		1.451***		1.240***		1.184***	
	(0.0933)		(0.120)		(0.0787)		(0.102)	
REVOLVER	0.164		0.130		0.0316		0.0860	
	(0.112)		(0.124)		(0.0996)		(0.120)	
SIZE	0.148***		0.220***		0.0924**		0.194***	
	(0.0471)		(0.0579)		(0.0409)		(0.0501)	
LEV	0.163		0.303		0.0323		0.497**	
	(0.211)		(0.281)		(0.172)		(0.236)	
ROA	0.606		-0.421		1.172		1.139	
	(1.185)		(1.383)		(0.902)		(1.149)	
RATING_AVAIL	-0.0840		-0.141		-0.329***		-0.392***	
	(0.0910)		(0.119)		(0.0827)		(0.105)	
LEASE	-0.657		-0.357		-0.858		-0.328	
	(0.464)		(0.511)		(0.523)		(0.515)	
PRIORBS	0.260***		0.316***		0.494***		0.569***	
	(0.0862)		(0.111)		(0.0790)		(0.102)	
PRIORIS	0.367***		0.303***		0.150**		0.120	
	(0.0828)		(0.105)		(0.0708)		(0.0942)	
LN1SYNSIZE	0.277***		0.333***		0.357***		0.340***	
	(0.0875)		(0.107)		(0.0755)		(0.0952)	
CAPEX	0.863***		0.875***		0.401***		0.355**	
	(0.201)		(0.255)		(0.138)		(0.163)	
INSTIT	-0.298*		-0.269		0.365***		0.344**	
	(0.161)		(0.193)		(0.132)		(0.167)	
SWEEPVAR	0.191		0.167		-0.0369		-0.0300	
	(0.130)		(0.153)		(0.104)		(0.128)	
DIVRESTR	0.977***		0.980***		0.774***		0.714***	
	(0.102)		(0.126)		(0.0840)		(0.106)	
COLLATERAL	0.222*		0.329**		-0.178*		-0.0810	
	(0.115)		(0.139)		(0.0970)		(0.123)	
DEBTSIZE	-0.263***		-0.296***		-0.213***		-0.261***	
	(0.0650)		(0.0782)		(0.0561)		(0.0697)	
Constant	2.468**		2.495**		2.184**		2.365**	
	(1.005)		(1.225)		(0.872)		(1.092)	
Observations	2,675	2,675	1,629	1,629	2,675	2,675	1,629	1,629
Pseudo R2	0.447		0.429		0.323		0.316	

The table reports probit regression model examining the likelihood of including a financial covenants/affected covenants in debt contracts in the one/three-year period surrounding the adoption of ASC 825 on 15th November 2007. The sample is restricted to firms with at least one contract before and after the adoption of SFAS 159/ASC 825. In Column 1&3 (5&7), the dependent binary variable which equals one if debt contracts available on DEALSCAN contains financial covenant (affected covenant), and zero otherwise. Column 2, 4, 5 and 8 presents marginal effect. *FINANCIAL COVENANT*: binary variable equal to one if the debt contract available on Dealscan includes a leverage ratio, debt-to-equity ratio, net worth, current ratio, quick ratio covenant, interest coverage ratio, fixed charge, debt service, minimum EBITDA, or debt-to-earnings covenant and zero otherwise. *AFFECTED COVENANT*: binary variable equal to one if the debt contract available on Dealscan includes a leverage, debt-to-equity, debtto- earnings, net worth, current ratio, or quick ratio covenant, and zero otherwise. *POST*: binary variable equal to one for all debt contracts on Dealscan initiated following the adoption of SFAS 159 on 15th November 2007, and zero otherwise. *ELIGIBLE FV* Instruments: total financial instruments on the balance sheet eligible for the fair value option (Compustat rect + ivst + ivaeq + ivao + ap + dlc + dltt), scaled by total assets. *PP*: binary variable equal to one if the debt contract available on Dealscan includes a performance-pricing provision, and zero otherwise. *REVOLVER*: binary variable equal to one if the debt contract available on Dealscan is a revolving credit facility, and zero otherwise. All other control variables are defined in Appendix 1. Robust standard error is clustered by firm in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

Table 2. 6 Replication of Demerjian et al. (2016): Likelihood of Excluding Fair Value from Covenant Definitions Between 2008 and 2012

	(1)	(2)	(3)	(4)
Dependent Variable	*FVC_DEMER*	Marginal Effect	*FVC_CLS*	Marginal Effect
REVOLVER	0.362***	0.117***	0.616***	0.120***
	(0.0817)	(0.0262)	(0.141)	(0.0271)
UNRELIABLEFV	0.0692	0.0224	0.108	0.0210
	(0.0625)	(0.0202)	(0.104)	(0.0203)
PP	-0.0313	-0.0102	-0.0513	-0.00996
	(0.0676)	(0.0219)	(0.113)	(0.0219)
HEDGE	-0.345***	-0.112***	-0.571***	-0.111***
	(0.107)	(0.0343)	(0.185)	(0.0356)
LIQUIDITYCOV	-0.995***	-0.322***	-1.842***	-0.358***
	(0.261)	(0.0841)	(0.553)	(0.107)
ELIGFVINSTRU	0.227**		0.383**	
	(0.0898)		(0.150)	
DEBTRESTR	0.231***		0.383***	
	(0.0854)		(0.143)	
NETWORTH	-0.158		-0.255	
	(0.0985)		(0.164)	
EARNINGSCOV	-0.0339		-0.0584	
	(0.0803)		(0.134)	
SIZE	-0.0417		-0.0724	
	(0.0352)		(0.0593)	
LEV	-0.235		-0.393	
	(0.169)		(0.282)	
ROA	1.253		2.487	
	(0.992)		(1.855)	
RATING_AVAIL	-0.240***		-0.405***	
	(0.0775)		(0.131)	
LEASE	-0.617*		-1.062*	
	(0.356)		(0.631)	
CONTINGENTLIAB	-0.276***		-0.484***	
	(0.0923)		(0.159)	
UNREALISED	1.437		1.169	
	(12.93)		(21.23)	
LN1SYNSIZE	0.0744		0.117	
	(0.0648)		(0.108)	
CAPEX	0.105		0.176	
	(0.103)		(0.172)	
INSTIT	0.292**		0.459**	
	(0.124)		(0.208)	
SWEEPVAR	-0.0836		-0.140	
	(0.0824)		(0.140)	
DIVRESTR	-0.0628		-0.0970	
	(0.0699)		(0.117)	
COLLATERAL	-0.224***		-0.380***	
	(0.0768)		(0.129)	
DEBTSIZE	0.0798		0.138	
	(0.0500)		(0.0837)	
Constant	-2.056***		-3.469***	
	(0.764)		(1.271)	
Observations	2,532	2,532	2,532	2,532
Pseudo R2	0.0622		0.0622	

The table reports probit regression model examining the likelihood of including a fair value exclusion clauses (FVC) in debt contracts between 2008 and 2012. In Column 1&3, the dependent binary variable which equals one if debt contracts contain FVC, and zero otherwise. Column 2 and 4 presents marginal effect. *REVOLVER*: binary variable equal to one if the debt contract available on Dealscan includes a revolving credit facility, and zero otherwise. *UNRELIABLE FV*: binary variable equal to one if a firm's ratio of the Level 2 and 3 SFAS 157 fair value assets and liabilities to total fair value assets and liabilities ([Compustat (aol2 + aul3 + lol2 + lul3)/(aqpl1 + aol2 + aul3 + lqpl1 + lol2 + lul3)]) is above sample median, and zero otherwise; missing fair value estimates are set to zero. *PP*: binary variable equal to one if the debt contract available on Dealscan includes a performance-pricing provision, and zero otherwise. *HEDGE*: binary variable equal to one if the firm is in the chemicals, gas and oil, mining, or utilities industry (Fama–French industries 14, 28, 30, 31), and zero otherwise. *LIQUIDITYCOV*: binary variable equal to one if the debt contract available on Dealscan includes a current ratio or quick ratio covenant, and zero otherwise. Robust standard error is clustered by firm in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

Table 2. 7 Likelihood of Excluding Fair Value Estimates from Covenant Definitions Between 2008 to 2017

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
REVOLVER	0.242***	0.0899***	0.273***	0.0552***	0.376***	0.0855***	0.249**	0.0499**
	(0.055)	(0.021)	(0.102)	(0.020)	(0.092)	(0.020)	(0.10)	(0.020)
UNRELIABLEFV	0.0200	0.00743	-0.0384	-0.00777	0.0532	0.0121	-0.0125	-0.00249
	(0.049)	(0.0183)	(0.085)	(0.0173)	(0.080)	(0.018)	(0.087)	(0.017)
PP	-0.0611	-0.0228	0.0478	0.00966	-0.102	-0.0231	0.0441	0.00881
	(0.049)	(0.0184)	(0.086)	(0.017)	(0.080)	(0.018)	(0.087)	(0.017)
HEDGE	-0.318***	-0.119***	-0.466***	-0.0941***				
	(0.095)	(0.0348)	(0.166)	(0.033)				
LIQUIDITYCOV	-0.733***	-0.273***	-0.981***	-0.198***	-0.959***	-0.218***	-0.731**	-0.146**
	(0.184)	(0.0681)	(0.347)	(0.069)	(0.342)	(0.0775)	(0.350)	(0.0698
ELIGFVINSTRU	0.190**		0.310**		0.326**		0.352**	
	(0.074)		(0.133)		(0.128)		(0.139)	
DEBTRESTR	0.236***		0.364***		0.376***		0.361***	
	(0.067)		(0.118)		(0.109)		(0.118)	
NETWORTH	-0.292***		-0.356**		-0.419***		-0.271*	
	(0.084)		(0.157)		(0.142)		(0.162)	
EARNINGSCOV	-0.0526		-0.0485		-0.107		-0.0830	
	(0.066)		(0.119)		(0.109)		(0.120)	
SIZE	-0.0468*		-0.144***		-0.0921**		-0.164***	
	(0.025)		(0.0460)		(0.042)		(0.0472)	
LEV	-0.331**		-0.857***		-0.494**		-0.815***	
	(0.13)		(0.247)		(0.220)		(0.250)	
ROA	-0.147		-0.249		-0.258		-0.280	
	(0.39)		(0.695)		(0.837)		(0.737)	
RATING_AVAIL	-0.237***		-0.276**		-0.388***		-0.275**	
	(0.063)		(0.112)		(0.106)		(0.113)	
LEASE	-0.517**		-0.901**		-0.816*		-0.916*	
	(0.25)		(0.439)		(0.464)		(0.491)	
CONTINGENTLIAB	-0.225***		-0.298**		-0.372***		-0.309**	
	(0.077)		(0.135)		(0.127)		(0.135)	
UNREALISED	13.94**		14.53		23.56*		15.87	
	(6.92)		(11.71)		(12.40)		(12.37)	
LN1SYNSIZE	0.0213		0.0932		0.0577		0.131	
	(0.046)		(0.081)		(0.076)		(0.081)	
CAPEX	0.0204		0.435***		0.0253		0.440***	
	(0.087)		(0.163)		(0.145)		(0.164)	
INSTIT	0.142		0.228		0.177		0.167	
	(0.086)		(0.152)		(0.143)		(0.154)	
SWEEPVAR	0.0218		-0.0333		0.0193		-0.0589	
	(0.062)		(0.112)		(0.102)		(0.113)	
DIVRESTR	-0.0376		0.252**		-0.0580		0.263**	
	(0.056)		(0.105)		(0.094)		(0.106)	
COLLATERAL	-0.232***		-0.508***		-0.371***		-0.509***	
	(0.059)		(0.110)		(0.098)		(0.112)	
DEBTSIZE	0.0816**		0.0167		0.145***		0.0218	
	(0.034)		(0.061)		(0.056)		(0.061)	
Constant	-1.439***		-5.564***		-2.501***		-5.497***	
	(0.554)		(1.39)		(0.92)		(1.40)	
Observations	4,774	4,774	4,774	4,774	4,774	4,774	4,774	4,774
Pseudo R2	0.0424		0.149		0.0493		0.156	
Industry FE	NO		NO		YES		YES	
Year FE	NO		YES		NO		YES	

The table reports logit regression model examining the likelihood of including a fair value exclusion clause (FVC) in debt contracts between 2008 and 2017. In Column 1&3, the dependent binary variable which equals one if debt contracts contain FVC, and zero otherwise. Column 2 and 4 presents marginal effect. *REVOLVER*: binary variable equal to one if the debt contract available on Dealscan includes a revolving credit facility, and zero otherwise. *UNRELIABLE FV*: binary variable equal to one if a firm's ratio of the Level 2 and 3 SFAS 157 fair value assets and liabilities to total fair value assets and liabilities ([Compustat (aol2 + aul3 + lol2 + lul3)/(aqpl1 + aol2 + aul3 + lqpl1 + lol2 + lul3)]) is above sample median, and zero otherwise; missing fair value estimates are set to zero. *PP*: binary variable equal to one if the debt contract available on Dealscan includes a performance-pricing provision, and zero otherwise. *HEDGE*: binary variable equal to one if the firm is in the chemicals, gas

and oil, mining, or utilities industry (Fama–French industries 14, 28, 30, 31), and zero otherwise. *LIQUIDITYCOV*: binary variable equal to one if the debt contract available on Dealscan includes a current ratio or quick ratio covenant, and zero otherwise. Robust standard error is clustered by firm in parentheses. Year and industry fixed are included unless stated otherwise. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

2.5.2 Remodelling Results

Table 2.8 presents results for our modified logit model. Column 1 includes year fixed effects, column 2 includes additional lead lender fixed effects and column 3 includes additional industry fixed effects. Our main variable of interest, *NETFVPOS_HIGH* equals 1 if borrower has net positive fair value and represents top 30% of that sample. Our results show *NETFVPOS_HIGH* is negative and significant which suggests that if borrowers have high level of positive net fair value are less likely to receive FVC. Marginal effects suggest that borrowers who have high level of net positive fair value are 5 to 6% less likely to receive FVC. This finding is consistent with our first hypothesis that lenders are less concerned with earnings effects when fair value assets are much greater than liabilities, arising from potential fair value adjustments if/when borrower credit quality worsens.

To address lenders' reliability concerns about fair value accounting in our second hypothesis, we examine the influence of the most unreliable fair value, level 3, on the propensity to include a FVC. Table 2.9 column 1 shows that the coefficient for *JUSTLVL3*, which equals one if borrowers only have both level 3 assets and liabilities, is positive but insignificant. Columns 2 and 3 show that if the borrower has only level 3 assets or level 3 liabilities is also positive but insignificant. This suggests that borrowers with only level 3 fair value estimates, asset or liability, the most unverifiable and therefore provides manager the most opportunity to manipulate, are not more likely to receive FVC. Results suggest that level 3 fair value estimates are not completely detrimental in the contracting setting. In some respects, these results resemble the conclusions of Frankel et al. (2008) on intangibles.

Lastly, in our final hypothesis on lenders' monitoring, *SOLELENDER*, which equals

one if the lending is by one single lender, are less likely (marginal effect= -13%) to receive a FVC. This is consistent with our third and final hypothesis which suggests the lack of participants results in less monitoring demands. Thirdly, debt contracts with financial covenants which could be affected by the adoption of ASC 825, *AFFECTED*, are more likely to receive a FVC. The estimated marginal effects suggests they are 32% to 36% more likely, which is economically significant. This result complements the results of DDL. Un-tabulated results show that financial covenants, in general, are not associated with the use of FVC.

To summarise our replication, extension and additional analysis, at the borrower level, we find that firms that have high levels of net positive fair value and those in industries more likely to hedge are less likely to opt out of fair value accounting via the inclusion of a FVC in their debt contracts. We do not find that high levels of unreliable (level 2 and 3) fair value estimates are associated with the use of FVCs. Secondly, at the contract level, contracts with affected covenants and a revolving line of credit increases the likelihood of FVC, while liquidity covenant and contracts with a single lender are less likely to receive FVC. The use of performance pricing provisions is not associated with the use of FVC.

Our findings are consistent with prior literature that lenders' concern with the effect of fair value accounting is principally on earnings. It also complements the results of Demerjian (2011), who reports declining use of balance sheet covenants around the introduction of a balance sheet emphasis. We show that affected covenants are still used in contracting practice but the effects of fair value accounting sometimes tend to be removed from covenant calculations. We also show that fair value accounting is not completely detrimental in the context of contracting since borrowers with only level 3 fair value are *not* more likely to receive FVC. This also confirms that lenders recognise the benefits of fair value accounting in some cases, e.g. where it provides information on liquidation value.

Table 2. 8 Likelihood of Excluding Fair Value Estimates from Covenant Definitions Between 2008 to 2017

	(1)	(2)	(3)	(4)	(5)	(6)
NETFVPOS_HIGH	-0.245**	-0.0492**	-0.257**	-0.0510**	-0.296***	-0.0581***
	(0.103)	(0.0206)	(0.104)	(0.0204)	(0.108)	(0.0210)
SOLELENDER	-0.657***	-0.132***	-0.626***	-0.124***	-0.646***	-0.127***
	(0.168)	(0.0335)	(0.168)	(0.0332)	(0.169)	(0.0331)
AFFECTED	1.773***	0.356***	1.711***	0.339***	1.619***	0.318***
	(0.474)	(0.0946)	(0.469)	(0.0922)	(0.473)	(0.0923)
REVOLVER	0.331***	0.0666***	0.319***	0.0632***	0.315***	0.0618***
	(0.0980)	(0.0195)	(0.0987)	(0.0194)	(0.0990)	(0.0193)
UNRELIABLEFV	-0.0275	-0.00552	-0.00641	-0.00127	0.0115	0.00226
	(0.0871)	(0.0175)	(0.0872)	(0.0173)	(0.0889)	(0.0175)
PP	0.0534	0.0107	0.0554	0.0110	0.0544	0.0107
	(0.0880)	(0.0177)	(0.0886)	(0.0175)	(0.0888)	(0.0174)
HEDGE	-0.470***	-0.0944***	-0.395**	-0.0782**		
	(0.167)	(0.0333)	(0.169)	(0.0332)		
LIQUIDITYCOV	-1.239***	-0.249***	-1.182***	-0.234***	-0.936**	-0.184**
	(0.375)	(0.0749)	(0.373)	(0.0735)	(0.378)	(0.0740)
ELIGFVINSTRU	0.325**		0.388***		0.392***	
	(0.133)		(0.138)		(0.143)	
DEBTRESTR	-1.375***		-1.297***		-1.215***	
	(0.470)		(0.465)		(0.469)	
NETWORTH	-0.339**		-0.299*		-0.257	
	(0.156)		(0.158)		(0.163)	
EARNINGSCOV	-0.0764		-0.0787		-0.110	
	(0.121)		(0.123)		(0.124)	
LEV	-0.799***		-0.769***		-0.738***	
	(0.246)		(0.246)		(0.248)	
ROA	-0.686		-0.713		-0.826	
	(0.577)		(0.560)		(0.576)	
RATING_AVAIL	-0.308***		-0.343***		-0.342***	
	(0.111)		(0.111)		(0.112)	
LEASE	-0.936**		-0.891*		-0.872*	
	(0.456)		(0.468)		(0.521)	
CONTINGENTLIAB	-0.305**		-0.332**		-0.339**	
	(0.135)		(0.136)		(0.136)	
UNREALISED	15.20		13.08		14.56	
	(11.87)		(12.52)		(13.19)	
LN1SYNSIZE	-0.0785		-0.116		-0.0926	
	(0.0929)		(0.0944)		(0.0951)	
CAPEX	0.447***		0.466***		0.478***	
	(0.161)		(0.163)		(0.163)	
INSTIT	0.233		0.206		0.156	
	(0.153)		(0.154)		(0.156)	
SWEEPVAR	0.00684		0.0370		0.0179	
	(0.112)		(0.112)		(0.113)	
DIVRESTR	0.245**		0.199*		0.216**	
	(0.105)		(0.106)		(0.108)	
COLLATERAL	-0.410***		-0.398***		-0.383***	
	(0.108)		(0.108)		(0.111)	
DEBTSIZE	-0.0708		-0.102*		-0.104*	
	(0.0554)		(0.0567)		(0.0556)	
Observations	4,774	4,774	4,774	4,774	4,774	4,774
Year FE	YES		YES		YES	
Lead Lender FE	NO		YES		YES	
Industry FE	NO		NO		YES	
Pseudo R2	0.153		0.163		0.169	

The table reports logit regression model examining the likelihood of including a fair value exclusion clauses (FVC) in debt contracts between 2008 and 2017. In Column 1,3 and 5, the dependent binary variable which equals one if debt contracts contain FVC, and zero otherwise. Column 2, 4 and 6 presents marginal effect. *NETFVPOS_HIGH*: binary variable equal to one if a borrower has net positive fair value estimates (total fair value assets- total fair value liabilities) and among the highest 30% of net fair value, and zero otherwise. *SOLELENDER*: binary variable which equals one if the lending syndicate for debt contract available on Dealscan consist of one, and zero otherwise. *AFFECTED*: binary variable equal to one if the debt contract available on Dealscan includes a leverage, debt-to-equity, debtto- earnings, net worth, current ratio, or quick ratio covenant, and zero otherwise. *REVOLVER*: binary variable equal to one if the debt contract available on Dealscan includes a revolving credit facility, and zero otherwise. *UNRELIABLE FV*: binary variable equal to one if a firm's ratio of the Level 2 and 3 SFAS 157 fair value assets and liabilities to total fair value assets and liabilities ([Compustat (aol2 + aul3 + lol2 + lul3)/(aqpl1 + aol2 + aul3 + lqpl1 + lol2 + lul3)]) is above sample median, and zero otherwise; missing fair value estimates are set to zero. *PP*: binary variable equal to one if the debt contract available on Dealscan includes a performance-pricing provision, and zero otherwise. *HEDGE*: binary variable equal to one if the firm is in the chemicals, gas and oil, mining, or utilities industry (Fama–French industries 14, 28, 30, 31), and zero otherwise. *LIQUIDITYCOV*: binary variable equal to one if the debt contract available on Dealscan includes a current ratio or quick ratio covenant, and zero otherwise. Robust standard error is clustered by firm in parentheses. Year and industry fixed are included unless stated otherwise. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

Table 2. 9 Level 3 Reliability Concern, Likelihood of Excluding Fair Value Estimates from Covenant Definitions Between 2008 and 2017

	(1)	(2)	(3)	(4)	(5)	(6)
REVOLVER	0.343***	0.0681***	0.344***	0.0682***	0.344***	0.0682***
	(0.0988)	(0.0194)	(0.0989)	(0.0194)	(0.0989)	(0.0194)
JUSTLVL3	0.200	0.0397				
	(0.241)	(0.0477)				
JUSTLVL3ASSETS			0.300	0.0594		
			(0.412)	(0.0816)		
JUSTLVL3LIABS					0.142	0.0282
					(0.292)	(0.0579)
PP	0.0364	0.00721	0.0355	0.00704	0.0335	0.00665
	(0.0882)	(0.0175)	(0.0881)	(0.0175)	(0.0881)	(0.0175)
LIQUIDITYCOV	-0.685**	-0.136**	-0.682**	-0.135**	-0.688**	-0.136**
	(0.335)	(0.0663)	(0.336)	(0.0666)	(0.335)	(0.0664)
ELIGFVINSTRU	0.397***		0.399***		0.398***	
	(0.143)		(0.143)		(0.143)	
DEBTRESTR	0.343***		0.344***		0.343***	
	(0.120)		(0.120)		(0.120)	
NETWORTH	-0.247		-0.250		-0.245	
	(0.165)		(0.165)		(0.165)	
EARNINGSCOV	-0.0730		-0.0729		-0.0706	
	(0.123)		(0.123)		(0.123)	
LEV	-0.662***		-0.661***		-0.661***	
	(0.248)		(0.248)		(0.248)	
ROA	-0.614		-0.639		-0.616	
	(0.577)		(0.572)		(0.576)	
RATING_AVAIL	-0.370***		-0.372***		-0.371***	
	(0.112)		(0.112)		(0.112)	
LEASE	-0.835		-0.828		-0.835	
	(0.508)		(0.506)		(0.508)	
CONTINGENTLIAB	-0.340**		-0.342**		-0.341**	
	(0.136)		(0.135)		(0.135)	
UNREALISED	13.43		13.38		13.37	
	(12.39)		(12.40)		(12.38)	
LN1SYNSIZE	0.0754		0.0753		0.0755	
	(0.0836)		(0.0835)		(0.0835)	
CAPEX	0.470***		0.474***		0.473***	
	(0.161)		(0.161)		(0.161)	
INSTIT	0.247		0.249		0.247	
	(0.155)		(0.155)		(0.155)	
SWEEPVAR	0.0352		0.0336		0.0354	
	(0.112)		(0.112)		(0.112)	
DIVRESTR	0.229**		0.230**		0.229**	
	(0.107)		(0.107)		(0.106)	
COLLATERAL	-0.406***		-0.407***		-0.406***	
	(0.111)		(0.111)		(0.111)	
DEBTSIZE	-0.140**		-0.141**		-0.141**	
	(0.0556)		(0.0556)		(0.0556)	
Observations	4,774	4,774	4,774	4,774	4,774	4,774
Year FE	YES		YES		YES	
Industry FE	YES		YES		YES	
Lead Lender FE	YES		YES		YES	
Pseudo R2	0.162		0.162		0.162	

The table reports logit regression models examining the likelihood of including a fair value exclusion clauses (FVC) in debt contracts between 2008 and 2017. In Columns 1, 3 and 5, the dependent binary variable which equals one if debt contracts contain FVC, and zero otherwise. Column 2, 4 and 6 presents marginal effect. *REVOLVER*: binary variable equal to one if the debt contract available on Dealscan includes a revolving credit facility, and zero otherwise. *JUSTLVL3*: binary variable equal to one if borrower only has both level 3 assets and liability, and zero otherwise. *JUSTLVL3ASSETS*: binary variable equal to one if borrower only has level 3 assets, and zero otherwise. *JUSTLVL3LIAB*: binary variable equal to one if borrower only has level 3 liability, and zero otherwise. *PP*: binary variable equal to one if the debt contract available on Dealscan includes a performance-pricing provision, and zero otherwise. *HEDGE*: binary variable equal to one if the firm is in the chemicals, gas and oil, mining, or utilities industry (Fama–French industries 14, 28, 30, 31), and zero otherwise. *LIQUIDITYCOV*: binary variable equal to one if the debt contract available on Dealscan includes a current ratio or quick ratio covenant, and zero otherwise. Robust standard error is clustered by firm in parentheses. Year and industry fixed are included unless stated otherwise. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively.

2.6 Conclusion

The overall objective of this chapter is to study how the use of fair value accounting influences debt contracting practices. More specifically, we re-examine and extend the available evidence on how contracting parties adapt their accounting-based debt covenants following SFAS 159/ASC 825, which allows entities to apply fair value accounting to an expanded set of balance sheet items.

We first re-assess Demerjian et al. (2016)'s hypotheses using the same sample period as their study (i.e., 2008-2012). The fact that the 10-K Wizard used by Demerjian et al., (2016) has been discontinued provides an opportunity to re-examine the important issue of fair value effects on debt contracting using a novel and reproducible dataset collected by Python. We initially re-examine whether financial covenant usage changed after the SFAS 159 introduction date. Using a sample period from 2005 to 2012, we do not observe any material changes in financial covenant usage. Alternatively, for affected covenants, which are covenants largely based on balance sheet numbers, there is also no statistically significant change, consistent with Demerjian et al. (2016). Although covenant usage did not change, there are numerous instances where fair value accounting figures are excluded from covenant calculations. Specifically, there were 438 fair value exclusion clauses (FVC) in our final sample of 1775 debt contracts (25%) between 2008 and 2012. This is almost twice the level (14.5%) identified by Demerjian et al. (2014).

We also report an increasing trend in the use of FVCs over the duration of our sample period. One explanation is that there is also an increase in covenant usage. However, we observed a decreasing trend in both debt contracts with covenant and the average number of covenants in debt contracts, which suggest this is not the case. We also find that FVCs exhibit a "stickiness effect", where once a borrower obtains a contract including a FVC, this clause will tend to stay on into their subsequent contracts.

Our second analysis re-examine the probability of including FVC in debt contracts using the same model as Demerjian et al. (2016). We find support for the notion that borrowers with more opportunity to manipulate accounting figures, proxied by *REVOLVER*, are more likely to include a FVC. Furthermore, two circumstances that are considered where expanded use of fair value accounting could provide useful information. One of the main objectives of SFAS 159 is to simplify hedge accounting and there was support for where borrowers that are in industries that engage in hedging activities, FVCs are less likely to be included in their debt contracts. Fair value accounting could also provide useful information in regard to borrowers' liquidity position, as it reveals the exit value for short term assets and liabilities. We found that borrowers with debt contracts with liquidity covenant have a lower probability of containing a FVC. On the other hand, we do not find that borrowers with above median unreliable fair value estimates (*UNRELIABLEFV*) or contracts with performance pricing provision (*PP*) are more likely to include FVCs.

Univariate comparisons showed that when each level of fair value scaled by assets, there is no statistical difference between borrower with FVC and those do not. Similarly, there is also no statistical difference in PP between borrowers with FVC and those without. We hypothesise that lenders will be more concerned about potential effects on earnings from fair value estimates rather than the quantity of level 2 and 3 fair values.

The important assumption here is that both fair value assets and liabilities are equal and have the same discount rate. When borrowers' credit quality worsens, the loss in earnings from impaired fair value assets should neutralise the gain in earnings from impaired fair value liabilities. We find that borrowers with large amounts of fair value assets compared to liabilities, lenders are less likely to include FVCs in the contract. This suggests that lenders are less concerned with the fair value effect on earnings if the potential loss from impaired assets is larger than potential gain from impaired liability. Prior fair value literature suggests

that lenders are concerned with the reliability of fair value. We examine this issue by examining borrowers with only level three fair value assets and/or liability and we do not find that this is not the case. Lastly, we hypothesise and find that debt contracts with one lender are less likely to have FVC due to less monitoring demands from participant lenders.

Overall, our replication using a different data collection method for an extended sample period shows support for three out of five hypotheses of Demerjian et al. (2016). However, our descriptive analysis reveals that the incidence of fair value opt outs is of the order of 2-3 times the estimates of Demerjian et al. (2016). They conclude (p. 1070) that there is "a small but significant number of contracts that modify covenant definitions to exclude the effects of SFAS 159 fair values. After allowing time for contracts to fully adapt to the new accounting measurement basis, we find it now exceeds 40%. In line with Demerjian et al. (2016), however, the vast majority of cases relate to liabilities, not to assets.

Although lenders are concerned with the potential impact of FVA on earnings, our evidence suggests that they find fair value accounting useful in debt contracting. This chapter has potential important policy implications for standard-setters and regulators with regards to future fair value accounting and disclosure development. We recognise several limitations in this chapter, and thus our results should be interpreted with caution. First, there are other possible underlying mechanisms that link fair value accounting with debt contracting structure other than FVCs. Second, consistent with DDL, our study does not fully observe the factors that drive firms to elect fair value, which could potentially limit this chapter's conclusions. Third, the result of this chapter is limited to the US sample, since majority of the world uses IFRS 5 in terms of fair value, it limits the generalisability of our findings. Future research can investigate other clauses that are associated with covenant calculation modifications. For instance, we observe that in some cases, lenders also exclude the effect of ASC 470-20 with respect to convertible debt instruments. It would therefore be of interest to

examine how various debt contract clauses may potentially interact with both accounting and non-accounting-based covenants.

Appendices of Chapter 2

Appendix A - Regular expression

FVC_{DDL}	(?:(?:SFAS|ASC|Statement of Financial Accounting Standards|Accounting Standards Codification)\s(159|825(?:-10-25)?))|(the fair value option)
Which looks for:	SFAS 159 Statement of Financial Accounting Standards 159 ASC 825 Accounting Standards Codification 825-10-25 The fair value option

FVC_{CLS}	((?:FAS|SFAS|(?:FASB\s)?ASC(?:\s(?:sub)?Topic)?|Statement of Financial Accounting Standards|Accounting Standard(?:s)? Codification(?:\sSection|\sSubtopic)?)\s(?:(?:No.)?\s?159|825(?:[-|\s]10[-|\s]25|[-|\s]10)?)|(the fair value option))
Which looks for:	FAS 159 FASB ASC 825 FASB ASC Topic 825 ASC Subtopic 825 ASC 825-10-25 ASC 825 10 25 ASC 825-10 ASC 825 10 ASC 825 SFAS No. 159 SFAS 159 Statement of Financial Accounting Standards No. 159 Statement of Financial Accounting Standards 159 Accounting Standards Codification 825 Accounting Standards Codification 825-10 Accounting Standards Codification 825-10-25 Accounting Standards Codification 825 10 25 Accounting Standards Codification Subtopic 825-10 Accounting Standards Codification Subtopic 825 10 Accounting Standards Codification Section 825-10-25 Accounting Standards Codification Section 825 10 25 Accounting Standards Codification Section 825 10 Accounting Standards Codification Section 825-10 Accounting Standards Codification Section 825 The fair value option

Appendix A shows the respective regular expressions we used for both FVC_{DDL} and FVC_{CLS}, as well as the vocabulary we search for.

Appendix B - Variable Definitions

Variables	Definitions
Dependent Variables	
FINCOV	=1 if debt contract on Dealscan (financialcovenant and networthcovenant) contains leverage ratio, debt-to-equity ratio, net worth, current ratio, quick ratio covenant, interest coverage ratio, fixed charge, debt service, minimum EBITDA, or debt-to-earnings covenant and zero otherwise
AFFCOV	=1 if debt contract on Dealscan (financialcovenant and networthcovenant) contains a leverage, debt-to-equity, debt to EBITDA, net worth, current ratio, or quick ratio covenant and zero other wise
FVC	=1 if debt contract contains on Fair Value Exclusion Clauses
Treatment Variables	
POST	=1 of debt contract on Dealscan (dealactivedate in package) initiated after 15th November 2007
REVOLVER	=1 if debt contract contains a revolving credit facility on Dealscan (facility), and zero otherwise
UNRELIABLE_EST	Ratio of a firm's Level 2 and 3 SFAS 157 fair value assets and liabilities to the total sum of SFAS 157 fair value assets and liabilities [Compustat (aol2 + aul3 + lol2 + lul3)/(aqpl1 + aol2 + aul3 + lqpl1 + lol2 + lul3)].
UNRELIABLEFV	=1 if firm's *Unreliable_est* is above the sample median, 0 other wise
NETFV	A firms' total fair value assets minus total fair value liabilities [Compustat (aqpl1 + aol2 + aul3 - lqpl1 - lol2 - lul3)]
NETFVPOS_HIGH	=1 if top 30% of *netfv*, and zero otherwise
PP	=1 if debt contract on Dealscan (performance pricing) contains a revolving credit facility and zero otherwise
ACCOUNTINGPP	=1 if performance pricing type on Dealscan (performance pricing) contains Debt to Cashflow or Senior Debt to Cashflow, and zero otherwise *Note: debt to cashflow = debt to EBITDA (Beatty et al. 2002)
RATINGPP	=1 if performance pricing type on Dealscan (performance pricing) is ratings based and zero otherwise
HEDGE	=1 if the firm is in the chemicals, gas and oil, mining, or utilities industry (Fama–French industries 14, 28, 30, 31), and zero otherwise.
LIQUIDITYCOV	=1 of debt contract on Dealscan (financialcovenant) contains current ratio or quick ratio covenant, and zero otherwise
Control Variables	
ELIGIBLE FAIR VALUE INSTRUMENT	Total financial instruments on the balance sheet eligible for the fair value option scaled by total assets. [Compustat (rect + ivst + ivaeq + ivao + ap + dlc + dltt)/at]
DEBT RESTRICTION COVENANT	=1 one if the debt contract available on Dealscan (financialcovenant) includes a leverage, debt-to-equity, debt-to-earnings, or debt-to-tangible net worth covenant, and zero otherwise.
NETWORTH COVENENT	=1 one if the debt contract available on Dealscan (networth) includes tangible net worth or net worth covenant, and zero otherwise.
EARNINGS COVENANT	=1 one if the debt contract available on Dealscan (financialcovenant) an interest coverage ratio, fixed charge, debt service, or minimum EBITDA covenant, and zero otherwise.
TOTAL ASSETS	On Compustat (at)

SIZE(BORROWER)	Natural logarithm of the market value of equity. [Compustat: ln(csho* prcc_f)]
LEVERAGE	Total debt scaled by total asset [Compustat: dltt / at]
ROA	Income before extraordinary items scaled by total assets [Compustat: ib/ at]
RATINGS AVAILABLE	=1 if a firm has an S&P credit rating available on Compustat, and zero otherwise.[Compustat: splticrm spsdrm spsticrm]
LEASE	Sum of a firm's discounted future lease payments with 10% discount rate , scaled by total assets, [Compustat (mrc1+mrc2+mrc3+mrc4+mrc5)/at]
CONTINGENT LIABILITY	=1 if a firm has nonzero Compustat forward and future contracts (clfc), foreign exchange commitments (clfx), letters of credit (cll), guarantees (clg), interest rate swaps (clis), or loan commitments (cllc), and zero otherwise.
UNREALISEDGL	Total unrealized securities gain/loss on investment securities recognized in other comprehensive income scaled by total assets.[Compustat: cisecgl/at]
LN1SYNSIZE	Natural log of one plus number of unique lenders in a debt contract on Dealscan (lender and package)
CAPEX RESTRICTION	=1 if debt contract where its covenant type states Max. Capex on Dealscan (financialcovenent), and zero otherwise
INSTITUTIONAL TRANCHE	=1 if debt contract where its loan type states term loan B, C or D on Dealscan (facility), and zero otherwise
SWEEP COVENANT	=1 if debt contract contains excess cash flow sweep, asset sales sweep, debt issuance sweep, equity issuance sweep, or insurance proceeds sweep on Dealscan (package), and zero otherwise
DIVIDEND RESTRICTION	=1 if debt contract contains dividend restriction on Dealscan (package), and zero otherwise
COLLATERAL	=1 if debt contract is secured by collateral on Dealscan (facility), and zero otherwise
DEBT SIZE	Natural log of the deal amount of the debt contract on Dealscan (package)

Chapter 3: Environmental Covenants in US Private Lending Agreements

3.1 Introduction

Capital providers are increasingly focused on how to influence borrowers' environmental performance.[11] Similarly, scholars and NGOs suggest that large financiers should take legal and moral responsibility for the social and environmental damage caused by projects they finance (Etsy et al. 2005). This chapter examines how lenders use debt contracts to address this issue, namely, to ensure borrowers have a baseline level of environmental performance using environmental covenants. Lenders in the US may require borrowers to declare compliance with state, federal and/or international environmental laws in the representation and warranties section of the debt contract. The lack of compliance with aforementioned environmental laws results in "misrepresentation" where lenders may recall the loan. We term these environmental representations 'environmental covenants'. Research on socially responsible investment over the past few decades has been dominated by an equity-holder perspective (Heinkel et al. 2001; Johnsen 2003). Increasingly, creditors also consider environmental and social risks "real" factors that could significantly affect borrowers' performance and credit risk (Menz, 2010). For example, a critical issue arises when borrowers become insolvent after acquiring long term assets with environmental legacies: the obligation to remove the assets, clean up and restore the site remains attached to the asset which, if unsold, lies with taxpayers (Michelon et al. 2020).

Increasing attention being paid to creditors' responsibility for the environmental performance of the assets financed by their loans led to the creation of the Equator Principles (hereafter EP, 2006), which follow the guidelines of International Financial Corporation (IFC) safeguard policies and the World Bank's Pollution Prevention and Abatement guidelines.

[11] Investors urge Brazil to use green bonds to save the Amazon. See: https://www.ft.com/content/e1d37f89-9cb6-48f6-8930-8c464c272adf

These voluntary principles aim to ensure that projects financed by banks are socially responsible and underpinned by sound environmental management practices (Etsy et al. 2005). EP guidelines recommend adopters categorise projects into high, medium and low environmental and social risks prior to the financing decision (EP 2006). An example of an EP adopter is the ING Group, which integrates EP guidelines into their Environmental and Social Risk Framework. Subsequent to the initial client screening, ING's ESR framework allows business engagements with low and medium environmental risk client groups; these risk assessments should be reviewed every five years. On the other hand, engagement with clients in high-risk groups are 'potentially permitted', but should be reviewed annually, and additional environmental loan covenants may be involved (ING, 2019).

Given the increasing attention paid to the role of creditors as monitors of lenders' environmental performance, in this chapter we examine the demand for environmental protection from lenders. To this end we examine the determinants of environmental covenants included in debt contracts. We interpret environmental covenants in private lending agreements as protection for lenders when borrowers face environmental liabilities and risks. Such covenants are typically included in the definition and representation sections of the lending agreement.

Generally, the definition of environmental laws in contracts outlines the required compliance with federal, state, and sometimes foreign environmental laws. In the representation and warranties section, some contracts include a subsection on environmental matters. This section generally requires borrowers to confirm there has been no violation or potential liabilities regarding environmental laws that are expected to have a material adverse effect. At any time during the maturity of the loan, a breach in representation will translate into an event of default and will provide the basis for the lender to accelerate the loan repayment by the borrower (Wight et al. 2009).

However, our research reveals that there are also instances where loan agreements do not include environmental covenants. Public companies governed by the Securities Exchange Commission (SEC) are required to disclose any material contingent environmental liabilities under rule 10b-5 targeting security frauds. Public borrowers may argue that SEC disclosures should provide sufficient protection to lenders. On the other hand, since loans are not classed as securities (LSTA, 2011), loan participation is not protected by the SEC and lenders may want details and protection beyond SEC requirements, especially for non-investment grade, non-public or environmentally sensitive borrowers (Wight et al. 2009).

On a more fundamental level, different stakeholders have different risk profiles. Lenders are more sensitive to downside risk since they have limited upside gains, being at most the original loan principal plus interest payment. Therefore, creditors have strong incentives to pressure corporations to disclose information regarding environmental performance. Perceived negligence towards the environment is also likely to result in a negative brand reputation with customers and suppliers, regulatory intervention, and lower attractiveness for current as well as potential employees (Dhaliwal et al. 2012), increasing firms' downside risk. Therefore, by focusing on the stakeholder group that is more sensitive to downside environmental risk, we can directly observe a direct mechanism that lenders use to protect their interests, namely, debt covenants.

Clarkson et al. (2008) suggest that future environment disclosure research should move the focus beyond the level of disclosure. This chapter aims to answer this call by studying environmental monitoring via debt contracting. Specifically, this chapter examines how lenders include environmental covenants on debt contracts to ensure borrowers have a baseline level of environmental performance. First, we investigate why debt contracts contain environmental covenants. To that end, we conduct a cross-sectional analysis using a large sample of private lending agreements retrieved directly from the SEC EDGAR archive.

Clean-up responsibility for environmental liabilities can impose a significant financial cost on the borrower, which, in turn, could impair borrowers' ability to repay the loan. Therefore, we first hypothesise that borrowers with high levels of credit risk are more likely to receive an environmental covenant in their loan agreements. Our results support this hypothesis.

Furthermore, environmental contamination in collateral security, which typically comprises real estate, could compromise the liquidation value of collateral, potentially making it worthless. This would leave lenders in an unsecured position if a borrower's equity has been diminished (US EPA, 1992). Therefore, our second set of analyses investigates whether contracts with a collateral requirement are more likely to include an environmental covenant. Our evidence suggests they are.

Finally, we expect debt contracts with greater environmental information asymmetry, proxied by the inclusion of an environmental audit clause, are more likely to receive environmental covenants. The two frequently used types of environmental audits in debt contracts are phase I and phase II. The EPA (1992) indicates that a phase I environmental assessment report can cost up to $12,000 per facility and can be very time-consuming (Wight et al. 2009). Phase II can be significantly more costly and time-consuming, as it requires extensive sampling of soil, surface and groundwater. Our analysis shows that only 8.3% of debt contracts contain a phase I report requirement while even fewer contracts (4.6% of contracts in our sample) contain phase II report requirements. Therefore, we hypothesize that environmental audits are reserved for borrowers that suffer from environmental information asymmetry. Consistent with this assumption, our results show that borrowers with environmental audit requirements are more likely to receive environmental covenant. We acknowledge, however, the possibility that cross-sectional tests limit our ability to draw causal inferences.

Overall, we present novel evidence on the determinants and use of environmental

covenants in debt contracts as a potential mechanism to influence lenders' environmental performance. We document that, despite increasing calls for stakeholder engagement with firm environmental performance, there exists a decreasing trend in the average use of environmental covenant for the period between 1996 and 2016. Also, an examination of industry and lead lender effects suggests that there is widespread variation in the use of environmental covenants across different industries and lead lenders. Therefore, environmental covenants are not concentrated among particular financial institution or industries as there is significant variation in their usage within industries and banks.

This chapter makes several contributions to the literature. First, we provide evidence on the use of an alternate channel of creditors monitoring through examining the use of environmental covenants. Although there is extensive evidence on the use of financial covenants in debt contracting (Armstrong, 2010; Christensen et al, 2016; Roberts and Sufi, 2009b) and the monitoring role of shareholders on firms' environmental performance (Dimson et al, 2015; Doidge et al, 2019) little is known about the use of covenants in debt contracting as a mechanism to foster corporate environmental performance. Second, we provide evidence that, despite increasing attention being paid to stakeholders monitoring of corporate environmental performance (Chava, 2014; Dai et al. 2020), our findings show that lenders are less likely to include environmental covenants in debt contracts over time. This is relevant because covenants appear to have a low cost of implementation and are potentially powerful mechanisms to monitor lenders' environmental performance. Our findings are consistent with recent evidence that the number of financial covenants in debt contracts is diminishing (Demerjian 2011); our study provides evidence that this reduction in the number of covenants is not limited to the financial type.

This chapter also makes a methodological contribution. Prior literature relies heavily on environmental performance measures from commercial sources such as Bloomberg ESG

scores (Giannarakis, 2013; Stellner et al. 2015), Thomson Reuters Asset4 (Cheng et al. 2013), SAM (Menz, 2010) and KLD (Goss and Roberts, 2011 ; Bauer and Hann, 2010). Our study directly examines environmental monitoring in borrowers' debt contracts from Forms 10-K, 8-K and 10-Q. This enables us to shed light on the mechanism by which lenders protect their interests by enforcing a baseline level on borrowers' environmental performance. In addition, we develop a measure of environmental covenant intensity by recording the number of federal environmental laws mentioned in the contractual definitions.

The remainder of the chapter is structured as follows. Section 2 provides the background of the lenders' concern over borrower's environmental liability while section 3 discusses the hypothesis development. Section 4 describes our data and sample construction. Section 5 presents the main findings and relevant discussion. Section 6 concludes the chapter.

3.2 Background

3.2.1 Purpose of Debt Covenants

Jensen and Meckling (1976) posit that the role of accounting information is to reduce agency costs between firm insiders and outsiders providing financing. Incomplete contract theory suggests that since contracts cannot fully anticipate all future states of the world, renegotiations of debt contracts may suffer from either borrowers or lenders behaving opportunistically to attempt to extract rents from the opposing side (Christensen et al. 2016). This issue, commonly known as the 'hold-up problem', can be mitigated with the inclusion of state-contingent allocation of control rights in contracts. To the extent that accounting-based covenants reflect the underling economics of the borrower, they provide a signal which to determine where control rights lie. Should the borrower breach any of the predetermined covenants, control rights are transferred to the lender, who in turn may threaten borrower with the prospect of immediate repayment of the loan. The renegotiation of contracts provides

lenders with an opportunity to extract surpluses from borrowers and to restore the control rights back to them, which also acts as an ex-ante incentive for borrowers to not breach covenants (Hart 2017). The literature on debt contracting covers both affirmative and negative covenants, which specify actions that borrowers can and cannot take, respectively. Examples of financial covenants are maximum capital expenditure requirements, and dividend and debt issuance restrictions. Also, maintenance covenants can be referred as financial covenants, which are predetermined financial ratios that reflect the accounting performance of the borrower (Christensen et al. 2016).

There is a large body of literature that examines the association between the contracting value of accounting numbers and the design of debt contracts. Agency theory suggests that contract efficiency is based on the ability to reduce managerial opportunistic behaviour through incentives, such as interest decreasing performance pricing provision and/or restrictions, such as dividend restriction. The incomplete contract theory suggests that contract efficiency is based on the ability of borrowers' accounting numbers to reflect firm's present state, thereby facilitating control rights allocation to the party that has value maximising incentives.

Wittenberg-Moerman (2008) finds that conservative accounting lowers information asymmetry through timely loss recognition, thereby increasing the efficiency of covenants, which results in lower cost of debt. She also finds that transparency is enhanced through public disclosure and credit ratings. Ball et al. (2008) conceptualize debt contracting value (DCV), which measures the ability of accounting numbers to capture credit quality deterioration. They find that accounting-based performance pricing provisions are more likely to occur when borrowers' DCV is high, as opposed to credit rating-based performance pricing provisions. In sum, lenders include accounting-based covenants to dissuade borrowers from engaging in risky or opportunistic actions at the expense of lenders. Covenants allow an

efficient transfer of control to the party with firm value-maximising incentives. However, certain risks are not directly reflected in borrowers' accounting numbers, such as environmental risks; therefore, lenders should rely on alternative contracting mechanism to address this.

3.2.2 Institutional Background for Environmental Liabilities and Creditor Risk

Environmental liabilities are of concern to lenders because they may impose significant costs on borrowers, and hence jeopardise their ability to repay loans (Thompson 1998). Therefore, borrowers' environmental liabilities may negatively affect the present value of the loan portfolio of the lender (Smith 1994). In the US, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA 1980) provides the legal framework to impose liabilities and obligations on the *potential responsible parties* for the remediation of environmental contamination. Prior to CERCLA, pollution was often inadequately compensated, either because responsible parties were not able to be identified, or due to invalid insurance or limited liability (Boyer and Laffont 1997).

CERCLA states that both present and past operators of the physical facility are responsible for clean-up costs if contamination is identified. Operators are not limited to owners, as lenders who supervise and monitors borrower's activities can also be considered as an operator and may therefore be exposed to the same environmental liability (Boyer and Laffont 1997). Most notably, the court case US v. Fleet Factors Corporation in 1990-1991 found that lenders are liable for borrowers' environmental liabilities. In this case, sufficient involvement with the financial management of the borrower gave the lender the ability to influence operation which includes the treatment of hazardous waste, regardless of whether the lender has participated in management. Boyer and Laffont (1997) suggest that the ruling indicates that lenders can have more influence over the management of the firm than

regulators. The judge in this case argued that it is more effective to make the lenders liable for the environmental cost if the borrower cannot bear the cost. The judge further noted that the ruling gives lenders incentives to avoid financing borrowers with underlying environmental problems, which also provides borrowers with incentives to improve their operation to reduce environmental risk, as well as improve the ease of borrowing (Robb and Sheehey, 1992). In the UK, the Environmental Act of 1995 enforces a similar system (Thompson 1995).

Since lenders in general have the capacity to influence a borrower's financial affairs and operation decisions, the Congress enacted the Asset Conservation, Lender Liability and Deposit Insurance Protection Act of 1996 as an amendment to CERCLA. This aimed to provide further clarification and protection for the secured lender. First, the amendment states that lenders' "capacity to influence" does not constitute as "participate in management" and that actual conduct is necessary to assign liability to the lenders (section 3: CERCLA Amendment, p.23). Second, a lender cannot be classified as an owner or operator of a polluted site if it exercises financial or administrative functions over the borrower's operations. However, the lender could be subjected to a CERCLA liability if they exercise decision-making control or have responsibility for environmental matters, as well as control the operational function of the facility. Finally, lenders can retain a senior creditor exemption after foreclosure on contaminated property, as long as they have made commercially reasonable efforts to sell the property at the earliest commercially reasonable time and terms; current EPA guidance suggests within 12 months of foreclosure (Ahrens and Langer 2008). Prior to this amendment, a lender was classified as an owner of the contaminated property after foreclosure, thereby exposing itself to the borrower's environmental liability.

3.2.3 Limitation of secured creditor exemption and borrowers' limited liability

Although the lender liability amendment provided clearer guidelines to what qualifies as "participate in management", there are still cases when lenders are left vulnerable to borrower's environmental liability. In the case of *New York v. HSBC USA, N.A.*, the lender obtained control over the borrower's operational funds, which allegedly resulted in the borrower's inability to meet its environmental obligation.[12] The State of New York argued that the lender's refusal of funds for the disposal of hazardous material which allegedly led to spills and contamination, means that it no longer qualified for senior creditor exemption even though it only exercised financial functions. However, the case was ultimately settled for an estimated amount of $1 million outside of court and therefore no judicial precedent was set (Ahrens and Langer, 2008).

The environmental liabilities of subsidiaries can also be extended to the parent company. In *United States v. Kayser-Roth Corp*, the United States District Court for the District of Rhode Island found that a subsidiary of Kayser-Roth had violated CERCLA. The associated liability was extended to the parent company since the court "*fail to observe corporate formalities and separateness*", as well as "*extensive or pervasive control by the shareholders*". The court further explained that "a corporate entity may be disregarded in the interest of public convenience, fairness and equity".[13] In a similar case, *United States v. Bushey & Sons, Inc*, the subsidiary was found in violation of the Clean Water Act.[14] The liabilities were extended to the parent corporation since the court found that the parent wholly owned the subsidiaries. The District Court for the District of Vermont explained that the subsidiaries were "*merely corporate shells established for purposes of avoiding tort liability to the parent for the acts of the subsidiaries which are the alter egos of [the parent*

[12] New York v. HSBC USA, N.A., (S.D.N.Y. No. 07-3160, 2007).
[13] United States v. Kayser-Roth Corp., 724 F. Supp. 15 (D.R.I. 1989)
[14] United States v. Ira S. Bushey & Sons, Inc., 363 F. Supp. 110 (D. Vt. 1973), aff'd mem., 487 F.2d 1393 (2d Cir. 1973).

corporation]". These cases suggest that CERCLA places no special importance on corporate structure (Cadwalader LLP 2010).

In sum, lenders could potentially be exposed to borrowers' liability due to the CERCLA, thereby giving an increased incentive to monitor borrowers' environmental performance. Although the amendment to CERCLA enhanced lenders' protection, they still could be exposed to borrowers' liability by exercising their operational rights over borrowers' financial functions or by the environmental liabilities of borrowers' subsidiaries.

3.2.4 Corporate and Social Responsibility Reporting

3.2.4.1 CSR research from the perspective of equity providers

So far, we have discussed the role of environmental performance in debt contracting. In this section, we briefly turn to review the role of environmental performance in firm valuation from an equity perspective, with special focus on Corporate and Social Responsibility (CSR) performance. This is the case as the rapid of growth in the demand for environmentally friendly assets is originated from the fear that climate change will lead to long term wealth erosion (Liang and Renneboog, 2020). Clarkson et al. (2008) suggests that there are three main areas of environmental accounting research: the value relevance of disclosure, the reason and method of disclosure choice and the relationship between disclosure and environmental performance.

The value relevance of disclosure suggests that market participants rely on environmental reporting, as well as firm attributes, to assess the stock market value of a firm. Additional environmental information allows investors to better evaluate their exposure and better assess firm's earnings prospect and revise earnings valuation multiples which in turn affects the cost of equity (Kothari and Zimmerman, 1995). In line with these arguments, Cormier and Magnan (2007) show that the value relevance of environmental issues is affected

by local activism in green movements. They find that voluntary environmental information has a moderate impact on the stock valuation of firms' earnings in Germany where attention towards environmental issues is more prevalent, while they find no significant impact on valuation of firms located in Canada and France, which are characterized by lower levels of green activism.

The second line of environmental accounting research relates to the motivation of environmental disclosure with two conflicting views. The substantive approach suggests that changes in corporate actions can lead to an effective commitment to CSR. The symbolic approach suggests that managers engage in actions to positively influence stakeholder perceptions, leading key stakeholders to believe the company is committed to expectations. Michelon et al. (2015) examine three CSR reporting practices: stand-alone CSR reports, adoption of the Global Reporting Initiative (GRI) framework and the assurance of CSR information. They investigate whether these practices are associated with enhancing disclosure quality or are simply tools used to construct an image of commitment with the intention to positively influence stakeholder perceptions. They compare firms that adopt these three practices with a benchmark sample of firms that have not adopted them. Their results indicate that standalone reports provide a greater quantity of disclosure information compared to those who incorporate CSR information into annual reports, while the quality of information does not differ. Furthermore, Michelon et al. (2015) find that assurance and the use of GRI guidelines are not associated with quality or quantity disclosure. They interpret these results as evidence that the three reporting practices are simply undertaken as a symbolic approach to CSR.

The third area of environmental research considers the relationship between the level of environmental disclosure and environmental performance. The literature has offered two competing views (Clarkson et al. 2008): first, the economics-based voluntary disclosure

theory suggests that environmentally superior firms will attempt to differentiate themselves by using objective environmental performance indicators. This would have a positive association between environmental performance and the level of discretionary environmental disclosure. On the other hand, the socio-political theory suggests that CSR disclosure is a function of social and political pressure from various stakeholder groups against the corporation. Since poor environmental performers face more social and political pressure, they will attempt to voluntarily increase disclosure to alter stakeholder perception. This view predicts a negative association between environmental performance and the level of discretionary disclosure. Clackson et al. (2008) examine the top five most polluting industries in the US, using a content analysis index based on GRI guidelines. They find a positive association between environmental performance and the level of discretionary disclosure. Their results are consistent with voluntary disclosure theory, where superior environmental firms are more forthcoming with their environmental performance.

3.2.4.2 CSR research from the perspective of debt investors

The literature on environmental disclosure has predominantly focus on CSR performance from an equity perspective. Therefore, comparatively little is known about the effect of environmental disclosure on creditors. The link between corporate social performance and credit risk generally suggests that positive CSR leads to reduced risk, which includes less legal, reputational and regulatory risks (Bauer and Hann, 2010). Orlitzky and Benjamin (2001) find a negative association between corporate social performance and financial risk, which in turn makes the financial performance more predictable and stable, thereby lowering the cost of debt. Similarly, Menz (2010) uses data from the Corporate Sustainability Assessment of Sustainable Asset Management Research (SAM), to show that the risk premium of socially responsible firms' bonds does not significantly differ from non-

socially responsible firms. He interprets this result as evidence that credit investors are sceptical of the positive impact of social, ethical and environmental factors when making investment decisions.

In addition to the CSR and risk literature, there are also studies that examine the relationship between CSR performance and the cost of debt. Bauer and Hann (2010) examined the link between bond yields and environmental management performance. They find that borrowers with environmental concerns experience a higher cost of debt and lower credit ratings, while borrowers with active environmental engagement benefit from a lower cost of debt, although weakly linked with higher credit ratings. They interpret these results as evidence that credit agencies do not fully impound positive environmental engagement into credit ratings, consistent with the argument that credit agencies/lenders are more sensitive to the risk of environmental performance-related losses. Similarly, Oikonomou et al. (2014) show that good CSR performance is rewarded with lower corporate bond yields.

In contrast to corporate bonds, Zerbib (2019) examine green bonds directly, which are issued for specific projects that are labelled environmentally friendly, such as renewable energy and adaptation to climate change. These bonds must comply with the Green Bond Principle, which are voluntary guidelines that ensures credibility through the transparent disclosures (Liang and Renneboog, 2020). Through matching both green bonds and conventional bond characteristics, Zerbib (2019) found that the yield of a green bond is lower and suggest that this is attributed to high investor appetite to fund environmental projects, while also enabling issuers to lower their cost of debt by around 2 basis points.

3.2.4.3 Impact of environmental liabilities on the solvency of borrowers

Environmental liabilities can lead to a large financial obligation to firms who have been identified as a potential responsible party (PRP) by the US Environmental Protection Agency

(EPA). Graham et al. (2001) observe that being named PRP is associated with bond rating deterioration. This suggests that environmental obligations undermine future economic benefits as they are linked with potential litigation, clean up and compliance costs. One important distinction between public and private debt regarding environmental liabilities is that bondholders cannot be held responsible for the environmental liability of borrowers, unlike banks (Wight et al. 2009). Within the context of private debt contracting and CSR research, one of the very few studies that examines the relationship between private debt and CSR performance is that of Goss and Roberts (2011). They document that borrowers with CSR concerns have higher loan pricing compared to the more responsible borrowers. They also found that banks are able to recognise and punish "greenwashing" initiatives that do not add value, since "greenwashing" can be seen as an attempt to improve shareholder value at the expense of lenders.

In sum, prior CSR literature heavily focus on equity holders, such as shareholder activism, as well as the public debt market, such as green bonds, where companies are driven towards better CSR performance due to associated benefits from the capital market. Little is known about how financial markets and capital providers incentivise better environmental performance from the firm. More specifically, how lenders protect their interest from borrowers' potential environmental liabilities through the use of private debt covenant remains unexplored. This chapter aims to address this issue.

3.3. Hypothesis development

In a survey conducted by the EPA in 1992 on the indirect effects of CERCLA, lending institutions expressed their concerns regarding two financial risks related to borrowers' environmental liabilities (EPA 1992). The first identified risk was the repayment ability of the borrower, as remediation for environmental liabilities typically involves large fines, which

could compromise cash flows. Bank loans typically consist of multiple tranches, including a revolving line of credit and term loans. There are two types of term loans, Term Loan A (TLA), also called Bank Term Loans and Term Loan B (TLB), also referred to as Institutional Term Loans (S&P 2011). Ivashina and Sun (2011) suggest that the revolving line of credit and TLAs are typically funded by banks, while TLBs are funded by institutional investors, such as hedge funds, mutual funds and collateralized debt obligations (CDOs). These authors also indicate that TLBs tend to be concentrated in the leveraged loan market, where borrowers are either non-rated or non-investment grade, with high existing leverage and typically associated with low credit quality. Given that TLBs are associated with poorer quality borrowers, the repayment ability of these borrowers are more likely to be compromised due to potential environmental liabilities. Therefore, we develop the following hypotheses:

Hypothesis 1: *Borrowers with lower credit quality are more likely to receive an environmental covenant*

The second concern that lending institutions expressed on the survey conducted by EPA in 1992 was the liquidation value of the loan's collateral. For example, real estate is the most frequently used type of security as collateral in a lending transaction and banks view real estate as the most important type, regardless of firm size (Beck et al. 2008). At the same time, real estate is also prone to be linked to environmental liabilities. Contamination of collateral would leave lenders in an unsecured position since the value of collateral would be heavily discounted, if not worthless (EPA, 1992). In addition, when borrowers become insolvent, the clean-up liability remains attached to contaminated assets, which could make the assets less attractive to potential buyers, and lenders may not recover the full loan amount (Michelon et al. 2020). Therefore, lenders may impose environmental provisions on contracts that include a collateral requirement to ensure that the value of the physical asset is preserved (Bellon

2021). Following this line of argument, we develop our second hypothesis:

Hypothesis 2: *Contracts with a collateral requirement are more likely to include an environmental covenant*

Our final hypothesis relates to environmental information asymmetry as proxied by environmental audit clauses. Environmental audit clauses typically state the lenders can appoint an agent to conduct an environmental assessment with a reasonable notice period, or can request a provision of an environmental review prior to contract initiation (Wight et al. 2009). In the context of environmental liability, the private information provided in a debt contract does not eliminate the information asymmetry problem about borrower's environmental liability that the lender is exposed to. Since environmental audits can be costly, it is reasonable to assume that lenders would not include such clauses if the borrower is environmentally transparent.

The two frequently used types of environmental audits in debt contracts are phase I and phase II. EPA (1992) indicate that the cost of a phase I environmental assessment report can be up to $12,000 per facility and is time-consuming (Wight et al. 2009). Phase 2 can be significantly more costly and time-consuming as it requires extensive sampling of soil, surface, and groundwater. For example, the following extracts from actual debt contracts discuss this type of environmental audit clauses.

> *"The Borrower will, and will cause each of its Subsidiaries to, permit any representatives designated by the Administrative Agent or any Lender, upon reasonable prior notice, to visit and inspect its properties, to examine and make extracts from its books and records, including environmental assessment reports and* ***Phase I or Phase II*** *studies, and to discuss its affairs, finances and condition with its officers and independent accountants, all at reasonable times and during*

normal business hours; provided that so long as no Event of Default exists the Administrative Agent and Lenders shall not be entitled to visit and inspect the Borrower and its Subsidiaries more than one (1) time per year"[15]

"Environmental Reports. Agent shall have ***received Phase I Environmental Site Assessment Reports****, consistent with American Society of Testing and Materials (ASTM) Standard E 1527-00 (or the current ASTM standard for Phase I environmental site assessment reports), and applicable state requirements, on all of the Real Estate, prepared by environmental engineers reasonably satisfactory to Agent, all in form and substance reasonably satisfactory to Agent, in its sole discretion; and Agent shall have further received such environmental review and audit reports, including* ***Phase II reports,*** *with respect to the Real Estate of any Credit Party as Agent shall have requested, and Agent shall be satisfied, in its sole discretion, with the contents of all such environmental reports. Agent shall have received letters executed by the environmental firms preparing such environmental reports, in form and substance reasonably satisfactory to Agent, authorizing Agent and Lenders to rely on such reports."*[16]

One of the main assumptions in this hypothesis is that lenders would not deal with borrowers with existing liabilities prior to contract initiation since environmental liabilities would compromise borrowers' repayment ability. Therefore, lenders rely on both public and private information to assess borrowers' environmental risk. However, unlike borrowers' credit risk, which could be summarised by accounting numbers, environmental risk is more

[15] Example from SECTION 5.06. Books and Records; Inspection Rights, pp.54. See: https://www.sec.gov/Archives/edgar/data/84748/000115752311000998/a6614574ex10-73.htm
[16] Example from SECTION 2.1a. CLOSING CHECKLIST, pp.D-2. See: https://www.sec.gov/Archives/edgar/data/1169277/000119312505066484/dex1047.htm

complex and difficult to measure and contract upon. Moreover, there could be environmental liabilities that even the borrower is unaware of. Moral hazard problems can be solved by lenders' demand for environmental audits, which can be, if deemed necessary by the lender, performed annually. The second assumption is that a lender would not request an environmental audit if the borrower is sufficiently transparent about its environmental risk. Therefore, we assume that each type of environmental audit, phase one and phase two, are proxies for the level of environmental information asymmetry. Thus, we develop our final hypothesis as follows:

Hypothesis 3: *Borrowers that are less environmentally transparent [as proxied by them having an environmental audit] are more likely to receive an environmental covenant.*

3.4 Data

3.4.1 Sample Construction

We employ three main data sources. First, data on syndicated loans and lenders are obtained from Loan Pricing Corporation's (LPC) Dealscan database. Dealscan reports financial covenant, maturity, interest spread and other loan characteristics of the US syndicated loan market. Loans are labelled as packages and there can be multiple facilities within one package. Since covenants are applied across all facilities, data are aggregated at the package level. Second, we obtain borrowers' accounting and stock market information from Compustat and the Center for Research in Security Prices (CRSP), respectively. Dealscan and Compustat data are merged using the linking table provided by Chava and Roberts (2008). Lastly, we directly extract data on lenders' demand for borrowers' environmental compliance from SEC's EDGAR filings using a Python script. Material contracts can usually be found in exhibit 10 from regulatory filings such as 10Ks, 10Qs and

8Ks. Nikolaev (2018) indicates that some amendments may appear in exhibits 1, 2, 4, 9 and 99 so we also included them in our search. Dates are extracted and flagged using regular expressions following the detailed description of the debt contract identification method in Nini et al. (2009). Finally, Python data and Dealscan are merged using "dealactivedate" and "gvkey" from Compustat.

Within those identified debt contracts, environmental covenants are flagged using regular expressions for each one of 31 federal environmental laws (see Appendix C). Lenders sometimes also require borrowers to comply with state environmental laws. For instance, the state of Illinois enacted their own version of CERCLA in 1983, namely the Illinois Environmental Protection Act or the Illinois Act. CERCLA imposes joint liability, which means two or more entities will be held equally liable, whereas the Illinois Act imposes proportionate share liability, where each liable party is responsible for its respective obligation (Sigel and Cane 2007). State environmental laws are generally more adaptable and responsive to changes compared to federal laws. They are also more tailored for each state due to the difference in geographical characteristics, such as air pollution in New York and wildlife conservation in Alaska. This study focuses solely on federal laws as it applies uniformly across different states and represents the baseline level of compliance for all firms in the US.

We define environmental covenants to be debt contracts containing obligations for the borrower to comply with federal environmental laws. The purpose of such environmental covenants is to set the minimum level of environmental performance, i.e., compliance with the EPA. Second, we also define environmental covenant intensity as the number of US Federal environmental laws mentioned in the debt contract.[17] There are occasions that laws are removed and added during the maturity of the loan; in these circumstances we use the

[17] The list of environmental laws is presented in Appendix B

maximum number of environmental laws over the life of the loan.

3.4.2 Empirical Model

Our main regression model for testing the hypotheses is as follows:

$$EnvCov_{it} = \alpha_0 + \beta_1 MainVariable_{it} + \beta_2 Debtsize_{it} + \beta_3 Synsize_{it} + \beta_4 SIZE_{it} + \beta_5 Lev_{it} + \beta_6 Tang_{it} + \beta_7 Current_{it} + \beta_8 Coverage_{it} + \beta_9 Lt\_Rating_{it} + \beta_{10} MTB_{it} + \beta_{11} SNP_{it} + \beta_{12} DividendRest_{it} + \beta_{13} Sweep_{it} + \beta_{14} Num\_fincov_{it} + yearFE + industryFE + loanpurposeFE + loantypeFE + \varepsilon_{it}$$

where $MainVariable_{it}$ is either *INSTIT* which is a binary variable that equals one if the debt contract contains term loan b, c or d; *COLLATERAL*, which is a binary variable that equals one if the debt contract is secured; and *PHASE I* (*PHASE II*) which is a binary variable if the debt contract contains a *PHASE I* (*PHASE II*) environmental assessment report requirement. We also include numerous control variables for both firm and loan characteristics. Firm characteristics include borrower size, leverage, asset tangibility, current ratio, coverage ratio, credit rating index; indicator variables for borrowers in the S&P 500 and those with no credit ratings. Debt contract characteristics include the size of the loan, the number of unique lenders participating in the loan and number of financial covenants; and an indicator variable for dividend restriction or sweep covenant. Consistent with Prilmeier (2017), industry, year, loan purpose and loan type fixed effects are included unless stated otherwise.

3.5 Results

3.5.1 Descriptive Statistics

Figure 3.1 shows the time trend of environmental covenants and financial covenants between

1996 and 2016. Consistent with prior literature, we find that the use of financial covenants declined over our sample period (Demerjian 2011). Similarly, we also find the use of environmental covenants fell over the same sample period, except for a spike in 2009, which coincides with the BP Deepwater Horizon incident. Demerjian (2011) suggests that the balance-sheet approach for financial reporting meant that the balance sheet is less useful for contracting purposes. He found that the overall use of balance sheet-based covenants has declined, while income statement-based covenants have remained constant over time. Our observation suggests that there could be an alternate explanation as to why the overall use of financial covenants and environmental covenants has both declined since environmental covenants are based on accounting numbers. Although it is beyond the scope of this study to examine why this phenomenon has occurred, we include the federal fund rate to suggest excess liquidity could potentially have led to lenders requiring less protection from borrowers.

Figure 3. 1 Time trend of Financial Covenants, Environmental Covenants and the Federal Reserve Rate

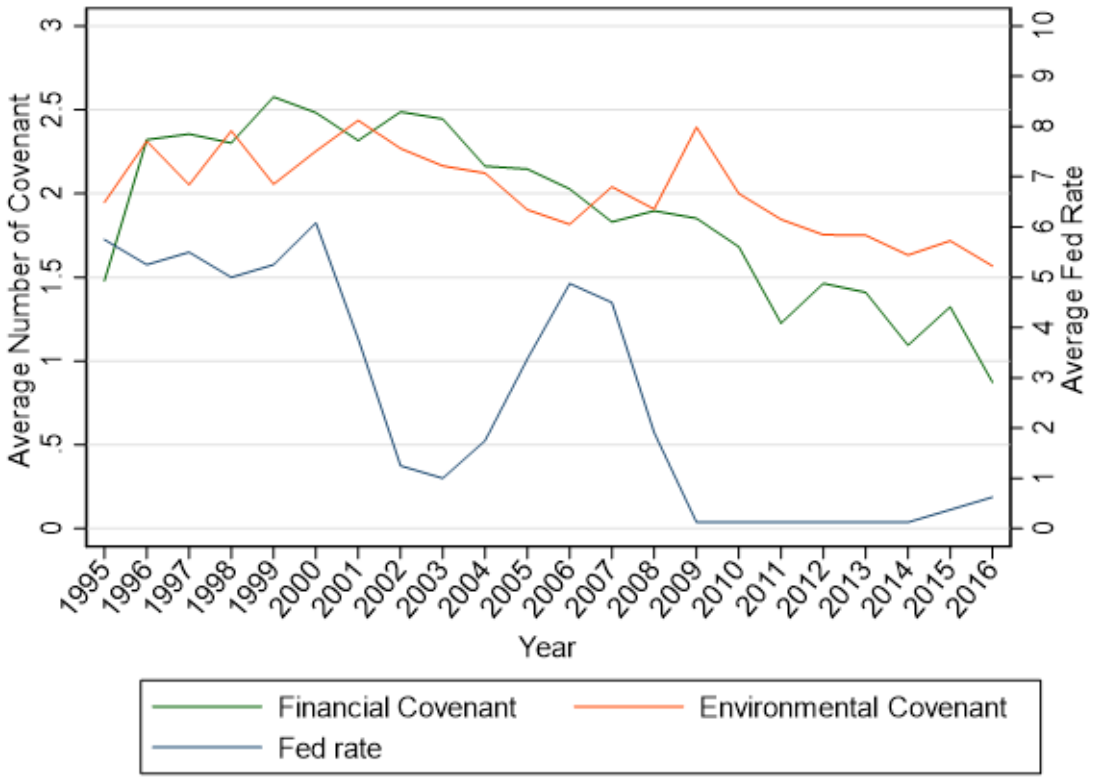


Figure 3.1 shows the changes of the average number of financial covenant and environmental covenant between 1995 and 2016. It also shows the average federal reserve rate for the same period.

Figure 3.2 presents the eight most common environmental laws that appear in debt contracts between 1996 and 2016.[18] Consistent with Figure 1, all eight environmental laws show a decreasing trend during the sample period, except for the Oil Pollution Act (OPA). The use of OPA in debt contracts is stable between 1995 to 2005 and began rising post 2005. The rise in the use of OPA in 2005 is simultaneous with Hurricane Katrina and Rita, which affected the state of Louisiana. Davis (2006) suggests that the two Hurricanes were, at the time, led to the second-largest oil spill, behind the Exxon Valdez oil spill in 1989. The spike in all eight most used environmental laws in 2009 coincides with the Deepwater Horizon incident.[19]

Figure 3.2 Top 8 Federal Environmental laws that are used in debt contract between 1995 and 2016

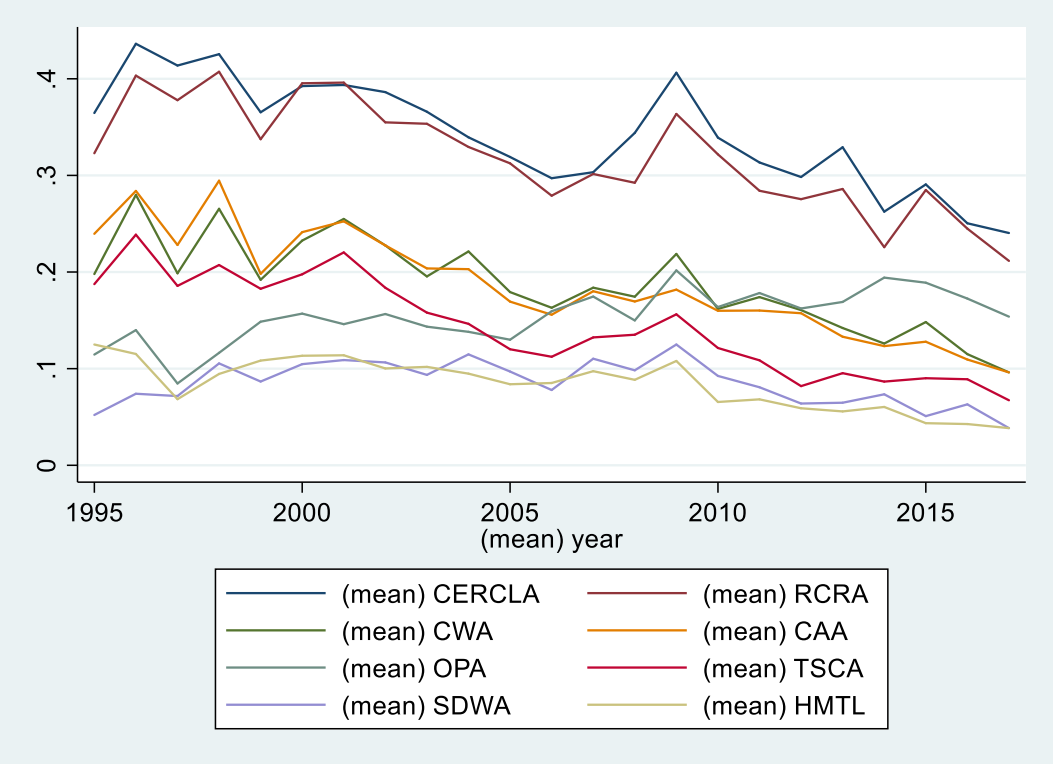


Figure 3.2 shows the time trend of the top 8 most used federal environmental laws in US debt contract between 1995 and 2017.

[18] Appendix B presents the full list of 31 federal environmental laws that we analyse in this study.
[19] The BP Deepwater Horizon occurred in April 2010, which is the end of the 2009 financial year.

One potential explanation for the declining trend in the use of environmental covenants is that they are ineffective. We examine the federal environmental laws gained within the debt contract amendments. Figure 3.3 shows the number of amendments against the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and OPA, with respective to amendment filing year. OPA, which is most relevant to oil spills, experienced significant spikes in amendments in 2006 and 2009. In contrast, the gain in FIFRA remained marginal over the sample period.

Figure 3.3 Total Number of Amendments vs Number for OPA and FIFRA between 1996-2016

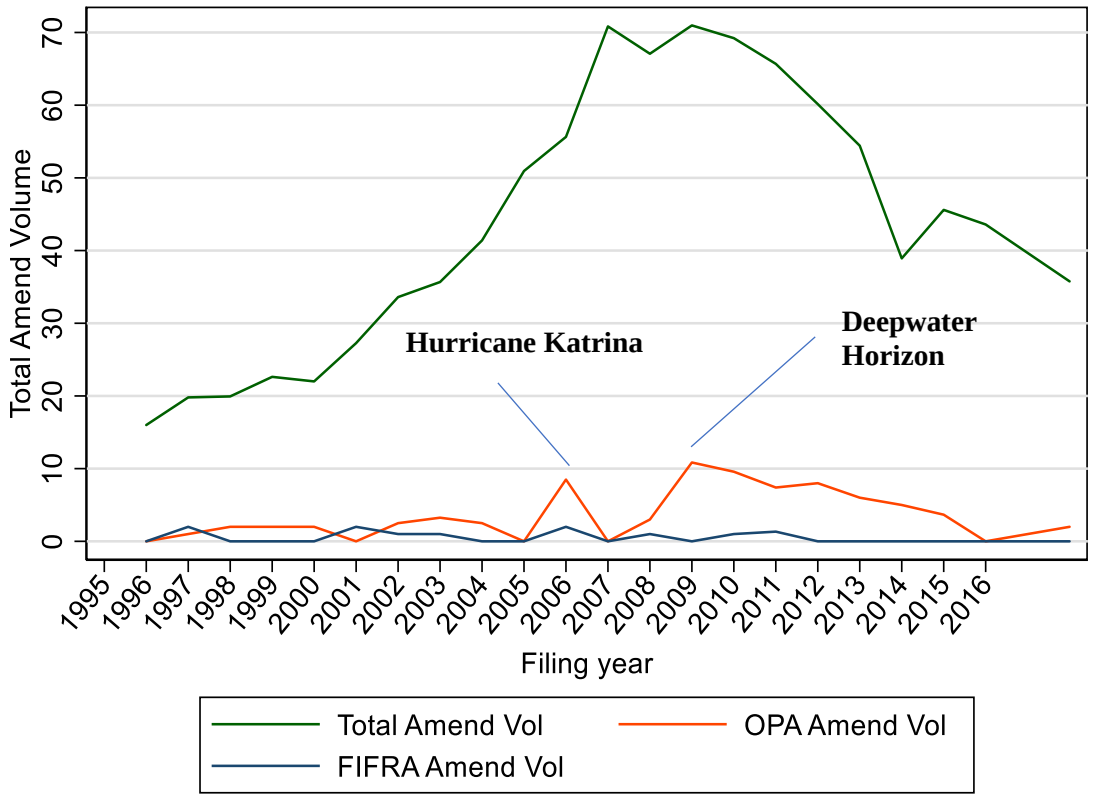


Figure 3.3 shows the total amendment volume in my sample based on the **filing date of the amendment**. It also includes the amendments for Oil Pollution Act (OPA) and Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).

Figure 3.4 presents amendments from the perspective of the original contract initiation date. It shows that contracts initiated in 2006 experienced gains in OPA amendment and peaked in 2010. Descriptive statistics show that the average maturity of debt contracts over

our sample period is around 5 years, consistent with other studies (e.g. Baylis et al. 2017). The gain in OPA amendment suggests that environmental events lead to a material change to the original contract, specifically the definition of environmental laws. This is also consistent with incomplete contract theory where debt contracts are initially incomplete as it is inefficient to contract all possible future states in the world. Firms that triggered the financial covenant threshold allow lenders to insert additional environmental protection through renegotiations.

Figure 3. 4 Total Number of Amendments vs Number of OPA/FIFRA gained between 1995-2016

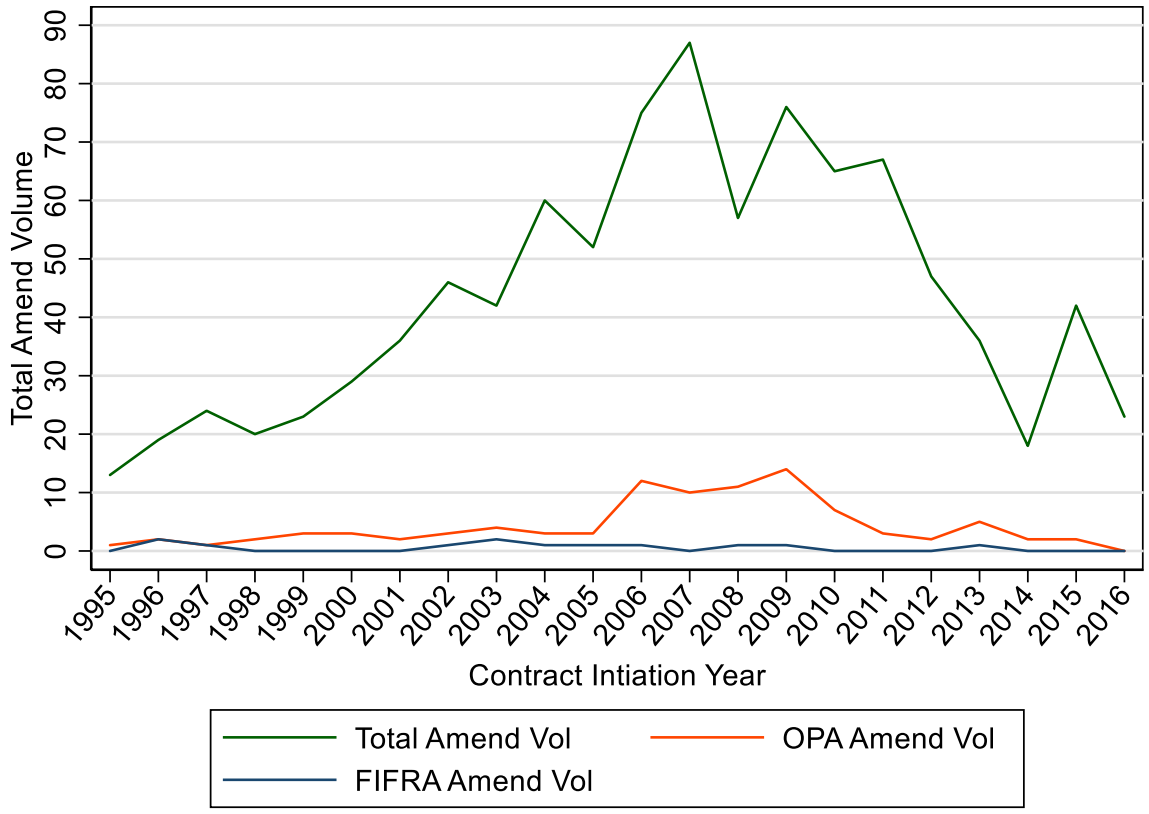


Figure 3.4 shows the total amendment volume in my sample based on **the original contract initiation** year. It also includes the amendment volume for Oil Pollution Act (OPA) and Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).

Based on our manual inspection, there are a total of 39 federal environmental laws that appear in debt contracts. However, amendments in federal laws mean that old laws are

continuously updated and replaced, which resulted in 31 federal environmental laws presently that are effective. For example, the Federal Air Pollution Control Act (FAPCA) was enacted in 1955. It was eventually completely replaced by the Clean Air Act (CAA) in 1970. Although CAA covers the jurisdiction of FAPCA, the FAPCA is still used in debt contracts, and last appeared in 2017. This practice may suggest that lenders prefer maximum protection. However, it remains unclear how much additional protection the lender receives for including an outdated law. An alternative explanation is that debt contracts are boilerplate, where the contents of debt contracts are standardized. For the purpose of this study, only active federal laws are used as part of the sample which resulted in 31 environmental laws.

The most frequently used environmental laws included debt contract is the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), followed by the Resource Conservation and Recovery Act (RCRA). The least frequently use is the Wild Scenic Rivers Act (WSRA) and the Radon Gas and Indoor Air Quality Research Act (RGIAQRA)[20]. US federal laws are part of the United States Code which has 53 titles. The majority of the environmental laws that appear in debt contracts are in USC Title 42, which governs public health and social welfare. It is followed by USC 16 which governs conservation.

Table 3.1 and 3.2 provides summary statistics and correlation matrix for our sample. Approximately 58% of debt contracts contain an environmental covenant that requires a borrower to comply with at least one federal environmental law. Among contracts with an environmental covenant, there are on average 3.3 federal laws that are within the definition of environmental law. Borrowers that are in environmentally sensitive industries, *ESI*, make up 14% of sample loan packages, while 11% of the packages include institutional tranche,

[20] Although FAPCA is outdated, it is used more frequently than WSRA and RGIAQRA, both of which are active federal laws.

INSTIT. Environmental audits are also uncommon, where seven percent of the sample contains Phase I report while four percent includes Phase II reports. Wight et al. (2009) indicate that Phase I reports are for general assessment for risk of material environmental liabilities while Phase II reports are to quantify the costs and liabilities. Given the lack of occurrence of environmental reports, it is reasonable to assume that environmental audits are reserved for borrowers with greater environmental asymmetry.

Table 3. 1 Descriptive statistics

	N	Mean	Std. Dev.	p25	p50	p75
ENVCOV	8027	0.58	0.49	0.00	1.00	1.00
ENVCOV_INTENSITY	8027	1.96	2.86	0.00	1.00	2.00
ESI	8027	0.14	0.35	0.00	0.00	0.00
INSTIT	8027	0.11	0.32	0.00	0.00	0.00
PHASE_I	8027	0.07	0.26	0.00	0.00	0.00
PHASE_II	8027	0.04	0.20	0.00	0.00	0.00
COLLATERAL	8027	0.51	0.50	0.00	1.00	1.00
Debt contract controls						
DEBT_SIZE ($BIL)	8027	0.72	1.51	0.13	0.30	0.80
DEBT_SIZE (LOG)	8027	19.52	1.39	18.64	19.52	20.50
MATURITY	8027	50.73	20.91	36.00	60.00	60.00
MATURITY (LOG)	8027	3.79	0.62	3.58	4.09	4.09
SYN_SIZE	8027	9.62	8.70	4.00	7.00	13.00
SYN_SIZE (LOG)	8027	1.86	0.98	1.39	1.95	2.56
N_FINCOV	8027	1.82	1.33	1.00	2.00	3.00
SWEEP	8027	0.35	0.48	0.00	0.00	1.00
DIV_REST	8027	0.58	0.49	0.00	1.00	1.00
CAPEX	8027	0.15	0.36	0.00	0.00	0.00
Firm controls						
SIZE ($BIL)	8027	6.20	16.83	0.49	1.56	4.74
SIZE (LOG)	8027	7.36	1.69	6.19	7.35	8.46
LEV	8027	0.30	0.23	0.15	0.27	0.40
TANG	8027	0.33	0.25	0.12	0.26	0.51
CURRENT	8027	1.94	4.87	1.10	1.60	2.27
LT_RATING	8027	5.88	5.72	0.00	7.00	11.00
UNRATED	8027	0.44	0.50	0.00	0.00	1.00
MTB	8027	0.53	0.53	0.27	0.44	0.70
SNP	8027	0.22	0.42	0.00	0.00	0.00
COVERAGE	8027	19.66	59.91	2.01	4.75	12.40

This table presents descriptive statistics of my sample (mean, standard deviation, 25th, 50th, and 75th percentile) for the sample included in our main regression models. The sample includes lending agreements identified by a Python text search program from the SEC Edgar archives for 2,244 firms between 1996 and 2016 with data in Dealscan and Compustat. *ENVCOV* is a binary variable equal to one if debt contract contains an environmental covenant, and zero otherwise. *DEBT_SIZE* is the deal amount of the package

from DealScan. *MATURITY* is the maturity in the number of months from DealScan. *SYN_SIZE* is the maximum number of lenders across all facility in a package. *N_FINCOV* equals the number of financial covenants in a debt contract. *SWEEP* is a binary variable equal to one if debt contract contains any sweep covenant. *DIV_REST* is a binary variable equal to one if debt contract contains dividend restriction covenant. *CAPEX* is a binary variable equal to one if the debt contract contains a capital restriction covenant. *SIZE* equals the borrower's total assets. *LEV* is the ratio of long term and current debt to total assets. *TANG* equals property, plant and equipment divided by total assets. *CURRENT* equals current assets divided current liabilities. *LT_RATING* is a categorical variable that equal to zero if the firm has no S&P long term rating, 1, 2, 3 if borrower has AAA, AA+, AA, and so on. *UNRATED* is a binary variable that equals one if borrower does not have a S&P long term rating. *MTB* equals stockholders' equity divided by the number of shares and closing price. *SNP* is a binary variable equal to one if borrower is part of the S&P 500. *COVERAGE* equals earnings before interest and tax divided by interest expense, winsorized at 1st and 99th percentile.

Table 3. 2 Correlation matrix

	ENVCOV (1)	*ENVCOV_INTENSITY* (2)	*DEBT_SIZE (BIL)* (3)	*DEBT_SIZE (LOG)* (4)	*MATURITY* (5)	*MATURITY (LOG)* (6)	*SYN_SIZE* (7)	*SYN_SIZE (LOG)* (8)	*N_FINCOV* (9)	*SWEEP* (10)	*DIV_REST* (11)	*CAPEX* (12)	*SIZE (BIL)* (13)	*SIZE (LOG)* (14)	*LEV* (15)	*TANG* (16)	*CURRENT* (17)	*LT RATING* (18)	*UNRATED* (19)	*MTB* (20)	*SNP* (21)	*COVERAGE* (22)
(1)	1																					
(2)	**0.59**	1																				
(3)	**-0.10**	**-0.09**	1																			
(4)	**-0.11**	**-0.11**	**0.58**	1																		
(5)	**0.10**	0.02	**0.06**	**0.23**	1																	
(6)	**0.11**	**0.04**	**0.04**	**0.20**	**0.91**	1																
(7)	**-0.07**	**-0.08**	**0.38**	**0.63**	**0.17**	**0.17**	1															
(8)	**-0.07**	**-0.08**	**0.33**	**0.74**	**0.21**	**0.24**	**0.85**	1														
(9)	**0.11**	**0.10**	**-0.15**	**-0.19**	0	**0.05**	0.03	0	1													
(10)	**0.15**	**0.10**	-0.01	**-0.04**	0.10	0.05	-0.01	**-0.05**	**0.29**	1												
(11)	**0.15**	**0.10**	**-0.14**	**-0.20**	**0.04**	**0.06**	**-0.04**	**-0.07**	**0.45**	**0.37**	1											
(12)	**0.11**	**0.09**	**-0.09**	**-0.17**	0.02	**0.04**	**-0.09**	**-0.13**	**0.44**	**0.30**	**0.28**	1										
(13)	**-0.13**	**-0.09**	**0.35**	**0.27**	**-0.03**	**-0.04**	**0.19**	**0.17**	**-0.12**	**-0.09**	**-0.14**	**-0.07**	1									
(14)	**-0.21**	**-0.18**	**0.45**	**0.75**	-0.02	**-0.05**	**0.47**	**0.55**	**-0.31**	**-0.23**	**-0.32**	**-0.24**	**0.43**	1								
(15)	**0.09**	**0.11**	**0.05**	**0.11**	**0.04**	0.01	**0.06**	**0.05**	0.01	**0.09**	**-0.04**	**0.04**	**-0.04**	**0.08**	1							
(16)	**0.08**	**0.14**	-0.01	0.03	0	-0.01	0.03	0.03	**-0.04**	0	-0.01	**-0.04**	**-0.04**	**0.04**	**0.24**	1						
(17)	0.02	0.01	**-0.04**	**-0.06**	0.01	0	**-0.05**	**-0.07**	0.01	0.03	0.02	0.01	**-0.05**	**-0.09**	**-0.08**	**-0.08**	1					
(18)	0	-0.01	**0.16**	**0.38**	**0.09**	**0.05**	**0.25**	**0.29**	**-0.11**	0.03	**-0.05**	-0.01	**0.08**	**0.45**	**0.33**	**0.14**	**-0.07**	1				
(19)	**0.10**	**0.07**	**-0.25**	**-0.49**	-0.02	0.01	**-0.35**	**-0.39**	**0.17**	**0.07**	**0.16**	**0.10**	**-0.17**	**-0.61**	**-0.24**	**-0.11**	**0.08**	**-0.92**	1			
(20)	**0.04**	**0.06**	**-0.07**	**-0.15**	**-0.09**	**-0.05**	**-0.08**	**-0.10**	**0.04**	0	**0.04**	**0.06**	**0.08**	-0.02	**-0.13**	**0.04**	0.02	-0.02	**0.04**	1		
(21)	**-0.22**	**-0.16**	**0.34**	**0.45**	**-0.07**	**-0.08**	**0.32**	**0.32**	**-0.22**	**-0.19**	**-0.27**	**-0.16**	**0.29**	**0.58**	**-0.07**	-0.02	**-0.05**	**0.17**	**-0.36**	**-0.12**	1	
(22)	**-0.05**	**-0.06**	-0.03	**-0.05**	0.02	0.03	**-0.07**	**-0.06**	0	**-0.04**	0	0	**-0.03**	**-0.09**	**-0.31**	**-0.12**	**0.05**	**-0.20**	**0.19**	**-0.10**	0	1

This table presents correlation matrix of contract-level and firm-level variables. All variables are defined in in Appendix A. Boldness denotes statistical significance at 1% level respectively.

3.5.2 Lead Lender and Industry Analysis

Table 3.3 presents the use of environmental laws in debt contracts by the top 20 lead lenders, ranked by total aggregate funds arranged between 1996 and 2016. Lead lenders are identified by either "lead arranger credit" in the Dealscan database or by loans arranged by a single lender. Besides GE Capital–where 90% of their loans contain environmental covenant--there is significant variation in environmental law usage within banks in our sample. Our evidence reveals that Sumitomo Bank issued the least amount of loans with environmental covenants (39%). Based on loans with at least one environmental law stated in contracts, GE Capital had the most environmental laws stated in their environmental covenants (5.5 laws) while MUFG bank has the least (2.2 laws).

Table 3. 3 Lead Lender Analysis

	Contracts with at least one environmental law			Contracts without laws		
Lead Lenders	N	%	Average Count	N	%	Total Loans
Bank of America	166	55%	2.747	56	45%	125
Barclays	29	54%	3.172	137	45%	303
BNP Paribas	34	51%	2.971	73	39%	189
Citi	46	52%	3.174	36	34%	105
Commerzbank	12	60%	2.833	33	49%	67
Credit Suisse	69	66%	3.406	34	52%	66
Deutsche Bank	69	55%	2.971	42	48%	88
GE Capital	47	90%	5.511	25	48%	52
HSBC	32	48%	4.25	32	43%	75
JP Morgan	116	61%	2.94	25	46%	54
Mizuho	12	46%	3.667	15	43%	35
Morgan Stanley	43	57%	3.326	88	43%	207
MUFG Bank	27	52%	2.185	31	41%	75
RBS	20	57%	3.2	13	57%	23
Societe Generale	10	43%	4.2	14	54%	26
Sumitomo Bank	7	39%	3.714	8	40%	20
Suntrust	44	59%	3.455	11	61%	18
U.S. Bank	20	67%	4.65	10	33%	30
Wachovia Bank	35	66%	4.143	18	34%	53
Wells Fargo	119	57%	3.387	5	10%	52
Total	957	58%	3.495	706	42%	1,663

This table shows the distribution of environmental laws across the top 20 lead lenders in the syndicated loan market, where the lead lender is ranked by the total aggregate amount loaned between 1996 and 2016. Lead lenders are identified by "lead arranger credit" provided by Dealscan or the only lender in the loan.

Table 3.4 presents the use of environmental laws across the 12 Fama-French industries. The Oil and Gas industry has the highest proportion of loans with an environmental covenant (71%) while consumer durables and telecom industries have the least (52%). When focusing on loans with an environmental covenant, loans for the oil and gas industry contained the most environmental laws (4.85) while business industry contained the least (2.75). We examine industry variation more closely by examining within four digits SIC codes. Untabulated results show that within the oil and gas industry, 57% of the loans with environmental covenants are in crude petroleum and natural gas (SIC code: 1311). This was closely followed by the finance industry, where 54% of the loans with an environmental covenant lies in real estate investment trusts (SIC code: 7990; also known as REITs). Since REITs own and typically operate in income-producing real estates, these tangible assets could expose lenders to potential environmental liabilities.

We further examine industry-linked environmental risk in perceived environmental-sensitive industries (ESI) (Cho and Patten 2007). Summary statistics indicate that the average environmental covenant intensity is around two federal environmental laws per contract for all industries in our sample. In untabulated tests we focus on the five ESI[21] and find evidence that only contracts on the *oil and gas extraction* (SIC code 13) industry include a number of environmental laws per contract in consistently above the sample average. This suggests that the reason for including an environmental covenant could be beyond environmental risk. The top 5 industries (defined based on 2-digit SIC) with the most intense environmental covenant differ from perceived ESI, except for *Oil and Gas Extraction* which appeared in both lists. Among the rest of industries with intense environmental covenants, two of them arguably have clear environmental risks-SIC code 12 (Coal Mining), 13 and 17 (Construction). On the

[21] ESI industries are SIC 13 Oil And Gas Extraction, 26 Paper And Allied Products, 28 Chemicals And Allied Products, 29 Petroleum Refining And Related Industries and 33 Primary Metal Industries (Cho and Patten 2007)

other hand, the remaining two industries with intense environmental covenants the environmental risks involved are less obvious. These industries are Hotels, Rooming Houses, Camps, and Other Lodging Places & Automotive Repair, Services and Parking (SIC code 70 and 75). The majority of environmental covenants are assigned to loans in Hotels and Motels and Auto Rental and Leasing (4-digit SIC code 7011 and 7510, respectively).

In our hypothesis development section, we consider why debt contracts contain environmental covenants and collateral risk. In particular, our second hypothesis is based on the argument that environmental contamination to borrower's collateral would leave lenders unprotected should the borrower fail to meet its environmental obligations. The finding for Real Estate Investment Trust, Hotels, and Motels as well as Auto Rental companies provides suggestive evidence consistent with our argument that lenders are concerned with collateral risk related to debt contracts. This is the case as companies with high level of tangible assets are more likely to pledge real estates as security and these assets are prone to environmental liabilities.

Table 3. 4 Distribution of environmental laws in debt contracts across industries (N=8027)

Fama-French 12 Industries	N	%	n	% with *ENVCOV*	Average Count
Consumer Non-Durables	597	7.44	335	56.11	3.08
Consumer Durables	250	3.11	132	52.80	3.39
Manufacturing	1,202	14.97	727	60.48	3.14
Oil, Gas, and Coal Extraction and Products	663	8.26	473	71.34	4.85
Chemicals and Allied Products	289	3.60	161	55.71	3.37
Business Equipment	984	12.26	537	54.57	2.64
Telephone and Television Transmission	314	3.91	162	51.59	3.33
Utilities	531	6.62	235	44.26	3.83
Wholesale, Retail, and Some Services	1,157	14.41	706	61.02	3.20
Healthcare, Medical Equipment & Drugs	511	6.37	291	56.95	3.11
Finance	291	3.63	156	53.61	2.35
Other	1,238	15.42	775	62.60	3.57
Total	*8,027*	*100*	*4,690*	*58.43*	*3.32*

This table presents the distribution of environmental laws across Fama-French 12 industries for 2,244 unique firms between 1996-2016. The sample includes 8,027 leading agreements identified by regular expression using Python from SEC 10-K, 10-Q and 8-K filings. Other industries include Mines, Construction, Building material, Transportation, Hotels, Bus Service, Entertainment.

3.5.3 Multivariate Analysis Results

Columns 1 and 2 of Table 3.5 report the results of our model (1) to test the likelihood of a borrower receiving an environmental covenant. Using a logit specification, we set the dependent variable to one for debt contracts with at least one environmental covenant. In our first hypothesis, we contend that borrowers with higher levels of credit risks are likely to include an environmental covenant on their loans. Results in Table 3.5 column 2 show that institutional term loans—our proxy for credit risk—are strongly and positively associated with lenders' demand for environmental compliance. Institutional term loans have an average marginal effect of almost three times higher likelihood of receiving an environmental covenant, suggesting lenders are concerned with the impact of environmental liability for relatively risky borrowers with speculative-grade ratings (Ivashina and Sun, 2011). Similarly, institutional term loans are typically purchased by a non-bank institutional investor to repackage these loans into CLOs. Within the CLOs, loan defaults lower the income-generating ability of the vehicle and increases overall risk, similar to the mortgage-backed security crisis in 2008. Therefore, lenders have incentives to shield themselves from credit risk originated in environmental liabilities. In line with these findings, the coefficients on *LT_RATING* and *UNRATED* are both positive and significant, providing additional support to our hypothesis that lenders are concern with the impact of environmental liability on borrower's repayment ability.

Regarding our second hypothesis - the collateral hypothesis - we formally test the likelihood of a borrower receiving an environmental covenant as shown by the results in Columns 3, 4 and 5 of Table 3.4. The significantly positive estimated coefficient of COLLATERAL in Column 3 suggests that debt contracts that are secured are 12% more likely to receive an environmental covenant. Overall, our tests indicate that creditors include environmental covenants when the perceived risk of the borrower is higher and when the loan

includes a collateral. These findings support our first two hypotheses.

A potential argument against our findings is that this effect is limited to companies in environmentally sensitive industries. To further explore this assumption, we focus on the observed within industry variation of the number of environmental covenants included in loans. We examine this issue further by using an environmental sensitive industry (ESI) measure consistent with Cho and Patten (2007). Interestingly, results presented in column 1 of Table 3.4 indicate that ESIs are not more likely to receive an environmental covenant, suggesting that an environmental covenant is not industry sensitive. One possible reason is that the use of environmental covenants is consistent with the identity of the lender and borrowers with higher credit risk.

We then split our sample into ESI and non-ESI borrowers. Both estimated coefficients of collateral are positive and statistically significant, with the marginal effect of 11.97 % and 11.86% for ESI borrowers and non ESI borrowers, respectively. Overall, our findings support the view that lenders are concerned with the prospect of environmental liability risks on collateral that would essentially leave lenders unprotected, irrespective of the industry where the borrower operates.

Our final set of tests focus on the role of information asymmetries between lenders and borrowers. In our hypothesis development section, we argue that lenders would not request an environmental audit if borrowers are sufficiently transparent about their environmental risk. Therefore, we expect that loans including requests for environmental audits are more likely to include environmental covenants, as audits are required when the level of environmental risk is uncertain. Consistent with our hypothesis 3, results in column (1) and (2) of Table 3.6 show that ESI borrowers with phase I (phase II) environmental audit in their debt contract is 27% (30%) more likely to receive an environmental covenant. In contrast, column 3 and 4 shows that non ESI with phase I (phase II) environmental audit is 10.4%

(23%) more likely to receive an environmental covenant. In untabulated tests, we show that contracts with no environmental audit requirement are less likely (12.8%) to receive an environmental covenant, marginal effects are stronger for ESI borrowers compared to non ESI borrowers. Thus, our findings suggest that borrowers with more severe environmental information asymmetry are more likely to receive an environmental covenant. Furthermore, borrowers with a higher level of environmental information asymmetry in high environmental risk industries are even more likely to receive an environmental covenant.

Among the control variables, we find that *SIZE* and *SNP* are negative and statistically significant, with the exception of ESI borrowers, which suggest that larger borrowers are less likely to receive environmental monitoring unless the borrower is in an industry with high environmental risk. The coefficient for *LT_RATING* and *UNRATED* is positive and significant, partially supporting our first hypothesis where the credit risk of the borrower is potentially important in the determinants of environmental covenants. Finally, the coefficient on the number of financial covenants *N_FINCOV* (Sweep covenant *SWEEP*) is negative (positive) which suggest there are potentially substitution (complimentary) effects with environmental covenants. However, the effects of the number of financial covenants on environmental covenant disappear when focusing on ESI borrowers, which suggests that when borrowers' environmental risk is more pronounced, financial based monitoring cannot be substituted with environmental monitoring.

Table 3. 5 Determinants of Environmental Covenants

	Full sample			ESI sample	Non-ESI
	(1)	(2)	(3)	(4)	(5)
ESI	0.030				
	(0.23)				
INSTIT		13.856***			
		(8.62)			
COLLATERAL			0.602***	0.681***	0.580***
			(7.34)	(2.77)	(6.62)
DEBT_SIZE (LOG)	0.110**	0.089*	0.085	0.050	0.096*
	(2.11)	(1.70)	(1.62)	(0.36)	(1.67)
MATURITY (LOG)	0.108	0.121	0.124	0.284	0.114
	(1.40)	(1.60)	(1.63)	(1.37)	(1.38)
SYN_SIZE (LOG)	0.006	-0.000	0.027	0.000	0.042
	(0.13)	(-0.01)	(0.57)	(0.00)	(0.81)
SIZE (LOG)	-0.257***	-0.236***	-0.203***	-0.206	-0.211***
	(-5.38)	(-4.84)	(-4.10)	(-1.58)	(-4.03)
LEV	0.191	0.265	0.168	-0.599	0.155
	(1.03)	(1.37)	(0.88)	(-1.06)	(0.75)
TANG	0.540***	0.279	0.314	1.399**	0.395*
	(2.70)	(1.22)	(1.38)	(2.42)	(1.82)
CURRENT	0.005	0.005	0.005	-0.014	0.025
	(0.66)	(0.77)	(0.66)	(-0.80)	(0.92)
COVERAGE	-0.001**	-0.001**	-0.001**	-0.001	-0.001**
	(-2.57)	(-2.42)	(-2.12)	(-0.62)	(-2.23)
LT_RATING	0.107***	0.103***	0.072***	0.170***	0.060**
	(4.72)	(4.43)	(3.07)	(2.61)	(2.45)
UNRATED	1.049***	1.002***	0.664**	2.018**	0.490
	(3.59)	(3.34)	(2.21)	(2.42)	(1.56)
MTB	0.125*	0.119*	0.082	-0.105	0.095
	(1.87)	(1.78)	(1.24)	(-0.62)	(1.31)
N_FINCOV	-0.059**	-0.060**	-0.072***	-0.096	-0.069**
	(-2.14)	(-2.18)	(-2.58)	(-1.19)	(-2.29)
SWEEP	0.271***	0.281***	0.167**	0.491**	0.144*
	(3.52)	(3.63)	(2.12)	(2.18)	(1.69)
DIV_REST	0.345***	0.338***	0.237***	0.347	0.217***
	(4.60)	(4.50)	(3.10)	(1.57)	(2.68)
SNP	-0.259*	-0.273*	-0.273*	-0.077	-0.305**
	(-1.83)	(-1.91)	(-1.91)	(-0.21)	(-2.01)
Year FE	YES	YES	YES	YES	YES
Industry FE	NO	YES	YES	NO	NO
Loan-type FE	YES	YES	YES	YES	YES
Loan-purpose FE	YES	YES	YES	YES	YES
Observations	7,818	7,818	7,818	1,118	6,694
Pseudo R-squared	0.0912	0.0955	0.104	0.176	0.0928

This table reports logistic regressions of environmental covenant with borrower and debt contract control variables for the sample of loans for nonfinancial US borrowers between 1996-2016. Dependent variable is *ENV_COV*, a binary variable equal to one if debt contract contains at least one federal environmental law, and zero otherwise. Definitions of other control variables are specified in Appendix A. All regressions include industry fixed effects, year fixed effects at the respective loan's origination date, as well as loan purpose and loan type fixed effects, unless specified. Robust z-statistics in parentheses and firm-level clustering are included. ***, ** and * denotes significance at 0.01, 0.05 and 0.10 respectively.

Table 3. 6 Determinants of Environmental Covenants

	ESI		non ESI	
	(1)	(2)	(3)	(4)
PHASE_I	1.642***		0.491***	
	(3.30)		(2.81)	
PHASE_II		1.619**		1.030***
		(2.26)		(4.00)
DEBT_SIZE (LOG)	0.043	0.072	0.094*	0.093
	(0.31)	(0.52)	(1.65)	(1.62)
MATURITY (LOG)	0.255	0.239	0.109	0.115
	(1.25)	(1.18)	(1.34)	(1.40)
SYN_SIZE (LOG)	-0.019	-0.012	0.019	0.015
	(-0.16)	(-0.10)	(0.36)	(0.29)
SIZE (LOG)	-0.225	-0.272**	-0.233***	-0.232***
	(-1.64)	(-2.01)	(-4.52)	(-4.51)
LEV	-0.451	-0.429	0.214	0.216
	(-0.79)	(-0.76)	(1.05)	(1.06)
TANG	1.457**	1.499***	0.317	0.334
	(2.55)	(2.62)	(1.44)	(1.52)
CURRENT	-0.016	-0.010	0.021	0.019
	(-0.89)	(-0.63)	(0.81)	(0.73)
COVERAGE	-0.001	-0.001	-0.001**	-0.001**
	(-0.88)	(-0.77)	(-2.32)	(-2.28)
UNRATED	2.370***	2.425***	0.766**	0.752**
	(2.91)	(2.97)	(2.45)	(2.41)
LT_RATING	0.202***	0.208***	0.087***	0.086***
	(3.16)	(3.24)	(3.56)	(3.51)
MTB	-0.093	-0.047	0.131*	0.137*
	(-0.52)	(-0.27)	(1.79)	(1.87)
N_FINCOV	-0.049	-0.053	-0.057*	-0.052*
	(-0.62)	(-0.67)	(-1.91)	(-1.75)
SWEEP	0.606***	0.575***	0.233***	0.234***
	(2.77)	(2.60)	(2.78)	(2.78)
DIV_REST	0.459**	0.455**	0.310***	0.307***
	(2.13)	(2.09)	(3.87)	(3.83)
SNP	-0.055	-0.032	-0.313**	-0.315**
	(-0.15)	(-0.09)	(-2.05)	(-2.05)
Year FE	YES	YES	YES	YES
Industry FE	NO	NO	NO	NO
Loan type FE	YES	YES	YES	YES
Loan Purpose FE	YES	YES	YES	YES
Observations	1,118	1,118	6,694	6,694
Pseudo R-squared	0.184	0.174	0.0870	0.0897

This table reports logistic regression of environmental covenant with borrower and debt contract control variables for the sample of loans for nonfinancial US borrower between 1996-2016. Dependent variable is *ENV_COV*, a binary variable equal to one if debt contract contains at least one federal environmental law, and zero otherwise. *PHASE_I* is a binary variable equal to one if debt contract contains phase one environmental assessment report requirement, and zero otherwise. *PHASE_II* is a binary variable equal to one if debt contract contains phase two environmental assessment report requirement, and zero otherwise. Institutional term loan is a binary variable equal to one if debt package contains term loan B, C or D. Definitions of other control variables are specified in Appendix B. All regressions include year fixed effects at the respective loan's origination date, as well as loan purpose and loan type fixed effects, unless specified. Z-statistics in parentheses and firm-level clustering are included. ***, ** and * denotes significance at 0.01, 0.05 and 0.10 respectively.

3.6 Conclusion

In this chapter, we examine whether and why debt contracts include environmental covenants. We first identified the mechanism by which lenders includes environmental covenants by including environmental law compliance clauses in the representation and warranties section of debt contracts. Second, lenders define the intensity of environmental covenants by the number of environmental laws stated in the definition of the term, environmental law. For the purpose of this study, we limit laws to the federal level as it applies uniformly across the whole of the United States. To investigate why debt contracts contain environmental covenants, we conduct a cross-sectional analysis using a large sample of private lending agreements retrieved directly from the SEC EDGAR archive. We hypothesise and find that borrowers with high credit risk are more likely to receive an environmental covenant. Furthermore, borrowers with higher credit risk in greater environmental risk industries receive a more intense environmental covenant.

Clean-up costs for environmental liabilities can significantly impair the borrowers' ability to repay the loan. Furthermore, environmental contamination in collateral security, which is typically real estate, would compromise the liquidation value of collateral, if not make it worthless (or even a liability). This would leave lenders in an unsecured position when an owner whose equity investment has been diminished (US EPA, 1992). We hypothesise and find that contracts with a collateral requirement are more likely to receive an environmental covenant. Lastly, we expect debt contracts with an environmental audit clause are more likely to receive environmental covenants.

The main limitation of this chapter arises from the focus in environmental law on the federal level as this study is purely exploratory. By examining contractual outcomes, our evidence is necessary descriptive as we cannot observe the underlying mechanism that links federal environmental law and contracting. Our cross-sectional analysis limits our ability to

draw causal inferences, particularly in the case of environmental audits, which may be determined jointly with environmental covenants by correlated omitted variables. Future research could examine state and/or international level environmental laws that also reside in the definition of "environmental laws" in US debt contracts. Furthermore, future studies could examine how various contracting mechanisms such as financial covenants and other non-accounting-based covenant complement or substitute one another to further incentivise better corporate environmental performance.

Appendices of Chapter 3

Appendix A: Variable description

Variable	Definition	Source
ENV_COV	Binary variable that equals one amount if the debt contract contains at least one federal environmental law	SEC
ENVCOV_INTENSITY	Count variable that equals the number of federal environmental laws stated in the debt contract	SEC
ESI	Binary variable that equals one if borrower with primary SIC code of 13,26,28,29 and 33	Compustat
INSTIT	Binary variable that equals one if the debt contract contains term loan b, c or d	Dealscan
COLLATERAL	Binary variable that equals one if the debt contract is secured	Dealscan
PHASE I & II	Binary variable that equals one if the debt contract contains Phase 1 and/or Phase 2 environmental assessment report requirement	SEC
SYN_SIZE (LOG)	Natural log of the number of lenders in a syndicated loan	Dealscan
DEBT_SIZE (LOG)	Natural log of deal amount	Dealscan
MATURITY (LOG)	Natural log of contract maturity in months	Dealscan
NUM_FINCOV	Number of financial covenant(s) in debt contract	Dealscan
SWEEP	Binary variable equals one if debt contract contains cashflow, asset, debt, equity, insurance sweep covenant	Dealscan
DIV_REST	Binary variable equals one if debt contract contains dividend restriction covenant	Dealscan
CAPEX	Binary variable equals one if debt contract contains capital expenditure covenant	Dealscan
SIZE	Natural log of borrower's total assets	Compustat
LEV	Book value of debt divided by total assets	Compustat
TANG	Ratio of PPE to total assets	Compustat
CURRENT	Ratio of borrower current assets to current liabilities	Compustat
COVERAGE	Ratio of borrower EBITDA divided by interest expense	Compustat
LT_RATING_ENCODE	Equals zero if borrower does not have S&P long term issuer credit rating. Equals 1, 2, 3 and 4 if credit rating equals to AAA, AA+, AA, AA- etc.	Compustat
UNRATED	Binary variable equals one if borrower does not have an S&P long term issuer credit rating	Compustat
MTB	Ratio of market value over book value of borrower	Compustat
SNP	Binary variable equals one if borrower is part of the SNP 500 index	Compustat

Appendix B: List of Federal Environmental laws that are included in US debt contracts

#	Abbreviation	Full name	USC	USC description
1	AEA	Atomic Energy Act	42	Public Health and Social Welfare
2	CAA*	Clean Air Act	42	Public Health and Social Welfare
3	CERCLA **	Comprehensive Environmental Response, Compensation and Liability Act	42	Public Health and Social Welfare
4	CWA ***	Clean Water Act	33	Navigable Waters
5	CZMA	Coastal Zone Management Act	16	Conservation
6	EPCR2KA	Emergency Planning and Community Right-to-Know Act	42	Public Health and Social Welfare
7	ESA	Endangered Species Act	16	Conservation
8	FIFRA	Federal Insecticide, Fungicide and Rodenticide Act	7	Agriculture
9	FLSA	Fair Labor Standards Act	29	Labor Regulations
10	HMTL	Hazardous Materials Transportation	49	Transportation
11	MMPA	Marine Mammal Protection Act	16	Conservation
12	MPRSA	Marine Protection, Research and Sanctuaries Act	33	Navigable Waters *****
13	MSHA	Mine Safety and Health Act	30	Mineral Lands and Mining
14	NANPCA	Nonindigenous Aquatic Nuisance Prevention and Control Act	16	Conservation
15	NCA	Noise Control Act	42	Public Health and Social Welfare
16	NEPA	National Environmental Policy Act	42	Public Health and Social Welfare
17	NHPA	National Historic Preservation Act	16	Conservation
18	NWPA	Nuclear Waste Policy Act	42	Public Health and Social Welfare
19	OPA	Oil Pollution and Hazardous Substances Control Act	33	Navigable Waters
20	OSHA	Occupational Safety and Health Act	29	Labor Regulations
21	PPA	Pollution Prevention Act	42	Public Health and Social Welfare
22	RCRA****	Resource Conservation and Recovery Act	42	Public Health and Social Welfare
23	RGIAQRA	Radon Gas and Indoor Air Quality Research Act	42	Public Health and Social Welfare
24	RHAA	Rivers and Harbors Appropriation Act	33	Navigable Waters
25	SDWA	Safe Drinking Water Act	42	Public Health and Social Welfare
26	SMCRA	Surface Mining Control and Reclamation Act	30	Mineral Lands and Mining
27	SWRCA	Soil and Water Resources Conservation Act	16	Conservation
28	TSCA	Toxic Substances Control Act	15	Commerce and Trade
29	UMTRCA	Uranium Mill Tailings Radiation Control Act	42	Public Health and Social Welfare
30	USPVMWADA	United States Public Vessel Medical Waste Anti-Dumping Act	33	Navigable Waters
31	WSRA	Wild and Scenic Rivers Act	16	Conservation

This table reports all federal laws that is listed under the definition of environmental law in US private contracts, sorted alphabetically. USC stands for United States Code.
* includes Federal Air pollution control Act (FAPCA)
** includes Superfund Amendments and Reauthorisation Act (SARA)
*** includes Federal Water Pollution Control Act (FWPCA), Water Quality Act (WPA)
**** includes Solid Waste Disposal Act (SWDA), Hazardous and Solid Waste Amendments (HSWA), Used Oil Recycling Act (UORA)
***** Also classified as 16 U.S.C. - Conservation.

Chapter 4: Consequences of Environmental Covenant Violations

4.1 Introduction

This chapter examines the consequences of violations of environmental covenants in private lending agreements. As organizations increasingly embrace environmental, social and governance (ESG) policies, borrowers and lenders have begun to incorporate environmental-based features into financial contracts and instruments (Liang and Renneboog 2020). A recent example of such ESG integration in debt financing is the Italian utility company Enel. In September 2019, Enel issued the first bond for ordinary financing needs tired to the UN Sustainable Development Goals (SDG) (UN, 2019). The aim of SDG such bonds is to direct financing towards more sustainable investments. In the case of Enel, their SDG bonds are tied to environmental commitments and pledges, such as increasing renewable energy generation and achieving sustainability targets that align with SDG values, such as reductions in direct greenhouse-gas emissions. A failure to achieve the targets in the contract automatically increases their annual coupon rate by 25 basis points.[22]

The pricing mechanics of the Enel bond resemble performance pricing provisions in standard loan agreements, where interest rates are directly linked to accounting-based performance measures or credit ratings (e.g. Asquith et al. 2005; Armstrong et al. 2010). The idea of both is to incentivise borrowers to improve their (environmental or financial) performance through potential reductions in the cost of debt when performance improves. As shown in the previous chapter, unlike bonds, private lending agreements do not contain environmental target-based covenants that set upper bound objectives. Instead, they sometimes contain lower bound objectives-based covenants, which aim to ensure that the environmental performance of borrowers does not fall below a certain threshold. In general, the minimum level of environmental performance required by lenders is to ensure borrowers

[22] Enel's performance is certified by an assurance report issued by an independent auditor (Enel, 2019).

do not breach environmental laws and regulations.

An important feature of information used in contracting is verifiability (Christensen et al., 2016). Rather than relying on an assurance report by auditors to confirm compliance with environmental bond covenants, the involvement of regulatory agencies can enhance the verifiability of environmental compliance in private credit agreements. In particular, the United States Environmental Protection Agency (henceforth, EPA) ensures compliance with relevant environmental laws and investigates potential environmental contamination of responsible parties. Rather than introduce their own environmental measurement and assurance system into contracting arrangements, by relying on the EPA, lenders and borrowers can rely on (and, effectively, augment) a 'ready-made' system of environmental compliance.

Prior literature suggests that the purpose of financial covenants is to reduce agency costs of debt by alleviating value-destroying actions by the borrower, such as asset substitution and claim dilution (Jensen and Meckling, 1976; Smith and Warner, 1979; Armstrong et al. 2010). Lenders use accounting-based ratios in the design of debt contracts to improve contracting efficiency by enhancing the state-contingent allocation of control rights (Christensen et al. 2016). Financial covenants act as an accounting threshold, aiming to motivate borrowers to stay above a certain level of accounting performance (or below a given level of risk), limiting the scope for opportunistic behaviour.

Although there is typically no direct reference to 'environmental covenants' in credit agreements, clauses in the "representation and warranties" section of a debt contract may require borrowers to confirm no violations of any applicable environmental laws. Within the maturity of the loan, any violations of environmental laws result in "misrepresentation", and hence lead to the default of the loan.[23] I label these environmental representations as

[23] Environmental representations are essentially affirmative covenants, which are conditions that the borrowers

environmental covenants since they act as affirmative covenants where the borrower must adhere to certain terms and conditions. The results in the previous chapter show that around 57% of private debt contracts contain environmental covenants. This rate has fallen over the last 20 years and the use of environmental covenants appears to be associated with borrowers' credit and collateral risk.

Nini et al. (2012) examined the active role of lenders in the governance of corporations outside of payment default states. They find that about 10% to 20% of US credit agreements report a financial covenant violation in any given year. They report that financial covenant violations are often followed by a decline in capital expenditure and a sharp reduction in leverage and shareholder pay-outs, which could be attributed to governance interventions by lenders. What is unclear from existing research is whether a similar pattern is evident in the event of borrowers' failure to comply with environmental covenants. Against a background of increasing attention by stakeholders and regulators to how capital providers can influence environmental and financial performance, lenders have publicly declared their support for reducing exposure towards the most carbon-intensive parts of the natural resources sector, by restricting lending and bond underwriting to such industries.[24] Such actions from lenders aims to incentivize borrowers to improve their environmental performance.

With the objective of exploring these dynamics between the governance role of creditors conditional in influencing borrowers' environmental performance, this chapter examines the consequences of environmental covenant violations using a novel dataset of environmental covenants in US private lending agreements between 1996 and 2016. I find that, on average, 11% of environmental covenants included in private lending agreements are violated per year. Compared to the average of about 20% of financial covenant violations per

must adhere to in order to protect lenders' interests. Therefore, when examining breaches in environmental covenants, one must 'infer' the breach as there is no direct mention in any SEC filings.

[24] Biggest banks sustain coal financing despite defunding drive. See: https://www.ft.com/content/38d0daf6-17a4-4280-8293-d07eb6f20d02

year (Nini et al. 2012), environmental covenant violations are less common. Among borrowers that violate a covenant, the median firm has a market-to-book ratio well above one and has sufficient liquidity to cover its current liabilities. This suggests that violators are rarely in danger of payment default. Although the previous chapter showed that there is variation in the use of environmental covenants across industries, as well as within lending banks, I find that the majority of environmental violations are concentrated in environmentally sensitive industries. I also find that the number of environmental violations has remained stable over time, even though the number of environmental covenants has consistently declined.

Next, I investigate the potential channel through which lenders could influence borrowers' environmental performance through the use of covenants. I find that environmental covenant intensity increases in the subsequent contract for borrowers who negotiated debt contracts without an environmental covenant, but violated an environmental law within the duration of the contracts. This suggests lenders are concerned about borrowers' declining level of environmental performance and thus place an environmental covenant in the subsequent contract to incentivise better environmental performance. However, I also find evidence that environmental covenant intensity declines in the subsequent contract following an environmental covenant violation. Further examination reveals that this decline is limited to borrowers with low information asymmetry with respect to lead lenders.

In contrast, the number of financial covenants and interest rates do not typically change for subsequent contracts, regardless of the performance level or the level of information asymmetry. These findings suggest that even though lenders declare that they are engaging in green lending, they are not consistently using this mechanism to incentivise borrowers to stay above a minimum level of environmental performance. [25] One potential explanation is

[25] Green loans catch on in push for companies to clean up. See: https://www.ft.com/content/d649cf78-35f8-11ea-a6d3-9a26f8c3cba4

that it does not pay for lenders to recall their loans prematurely, as the competition between banks means that additional costs for borrowers would have ramifications for lenders, such as a loss of business (Dichev and Skinner 2002).

In addition to examining changes to the structure of private lending agreements after environmental covenant violations, I also examine changes to borrowers' investment policy. Nini et al. (2012) find that capital expenditure falls following a financial covenant violation; they suggest that capital expenditure restriction covenants provide lenders with a contractual mechanism to curtail investment. In contrast, I contend that following an environmental covenant violation, capital expenditure needs to *increase* due to the lender's pressure to increase investment in environmental compliance. Although most companies do not disclose the amount they invest in environmental compliance, those that do so, often associate the cost of compliance with capital expenditure, as it mitigates or prevents environmental contamination and benefits future operations.[26] The extract below is one of the few examples where the firm discloses the amount they spent on environmental compliance.[27]

> *"We may incur future costs for capital improvements and general compliance under EHS (Environmental, Health and Safety) laws, including costs to acquire, maintain and repair pollution control equipment. For the years ended December 31, 2014, 2013 and 2012, our capital expenditures for EHS matters totalled $125 million, $92 million, and $105 million, respectively. Because* ***capital expenditures*** *for these matters are subject to evolving regulatory requirements and depend, in part, on the timing, promulgation and enforcement of specific requirements, our capital expenditures for EHS matters have varied significantly*

[26] See Part 1, item 1, Environmental Compliance.
https://stepan.gcs-web.com/static-files/3ac1b60d-27aa-4411-8034-fe108a1693fd
[27] Example from EHS Capital Expenditures, pp.33. See:
https://www.sec.gov/Archives/edgar/data/1089748/000104746915000900/a2222928z10-k.htm

from year to year and we cannot provide assurance that our recent expenditures are indicative of future amounts we may spend related to EHS and other applicable laws."

A higher level of environmental compliance potentially reduces borrowers' future expected financial risk, including litigation and regulatory penalties from environmental contamination, as well as collateral risk. I find that within four and eight quarters of environmental violations, borrowers with environmental covenants are associated with an increase in capital expenditure, while controlling for capital expenditure restrictions in debt contracts. In contrast, borrowers without covenants are not associated with changes in capital expenditure which suggests that covenants provide a potential channel for lenders to exert influence over borrowers' environmental performance. My results are consistent with the stakeholder theory, where creditors view CSR investment as a risk mitigation tool and encourage such investment when borrowers breach environmental covenants.

The prior literature predominantly focuses on how covenants are used in influencing financial—rather than non-financial—performance (Chava and Roberts 2008, Nini et al. 2012) and principally examines the influence of disclosure to corporate environmental performance, rather than contracting mechanisms (Clackson et al. 2008). This chapter examines how lenders use contractual features to augment environmental regulations by further penalising poor environmental performance--either through subsequent financial or non-financial actions. Despite the apparent potential of environmental covenants in private lending agreements, my findings suggest that environmental covenant violations are not typically punished by lenders, either through covenant intensity or increased cost of debt. Unlike the public debt market, the use of contracting devices to enhance environmental performance does not appear to be increasing over time in private debt markets (Liang and Renneboog 2020).

My study extends the academic literature in two important ways. First, it explores the relationship between debt contracting structure and environmental covenants, as a mechanism for lenders to exert control on the environmental performance of the borrowers. Therefore, this study contributes to literature on debt covenants as a mechanism of state-contingent allocation of control rights. Second, this chapter also provides evidence of the empirical link between corporate behaviour and breaches in environmental covenants. I show that violations of environmental covenants lead to higher levels of investment to remediate the potential negative effects of environmental risks. This contrasts with the evidence on breaches of financial covenants, which are typically followed by a decline in capital investment.

The remainder of this chapter is organised as follows: Section 2 outlines relevant prior literature, while Section 3 outlines my hypothesis development. Section 4 outlines my empirical approach and data collection methods. Section 5 includes my results and discussion. Section 6 concludes.

4.2 Prior literature

4.2.1 Consequences of financial covenant violation

Although it is generally accepted that accounting-based covenants are a mechanism used by lenders to exercise control rights over borrowers, what is less appreciated (until relatively recently, at least) is their important role in borrowers' corporate governance. Chava and Roberts (2008) show that accounting-based covenant violations lead to a significant decline in investment activity, suggesting that lenders attempt to curb borrowers' inefficient investment. Consistent with lenders using the threat of payment acceleration and termination rights, Roberts and Sufi (2009) find that net debt issues fall sharply following debt covenant violations, and the effect is more pronounced when the borrower's alternative source of finance is costly. Nini et al. (2012) complement this finding by showing that covenant

violations lead to a reduction in leverage and an increase in CEO turnover. They also show that these actions lead to an improvement in borrowers' financial and operating performance. This suggests that firm behaviour can be altered by more restrictive covenants following a financial covenant violation, and supports the notion that financial intermediaries such as lenders are valuable as delegated monitors.

Beneish and Press (1992) examine the cost of technical violation of accounting-based covenants in the US. They find that—following a violation—lenders typically raise interest costs; they also find that lenders increase their control over borrowers through the use of non-accounting-based covenants, such as restrictions on further investment and financing. Dichev and Skinner (2002) report that a large number of borrowers meet or just beat their covenant threshold prior to their first financial covenant violation. They interpret this evidence that managers take actions to prevent debt covenant violations, which suggests initial violations are more costly than subsequent violations. Their results also indicate that financial covenant violations are common, and most are not related to financial distress. Dichev and Skinner (2002) also report that lenders use debt covenants as a monitoring device and violations are often waived without any serious consequences for the borrower.

4.2.2 Environmental Covenants

Environmental covenants, similar to financial covenants, can be viewed as a contracting mechanism that determines the allocation of control rights between lenders and borrowers outside of payment default states. The two general types of covenants are *Affirmative* and *Negative* covenants (Nini et al. 2012). *Affirmative* covenants are actions that borrowers must perform, such as timely delivery of audited financial statements. *Negative* covenants relate to actions that borrowers must *not* perform or undertake (Nini et al. 2012). Violating either type of covenants results in technical default, meaning that lenders have the right to take punitive

action, such as shortening loan maturity or increasing interest rates (Wight et al. 2009).

Although there is typically no direct reference to the term "environmental covenant" in debt contracts, as shown in the previous chapter, many contracts include conditions relating to borrowers' "compliance with environmental laws" in the 'representation and warranties' section of the lending agreement. Representations and warranties are factual statements that borrowers declare prior to the contract initiation and aim to maintain throughout until the maturity (Wight et al. 2009). Borrowers must state that they are in compliance with certain federal environmental laws. A breach in the representation and warranty by the borrower would result in technical default since it is classified as "misrepresentation". This mechanism essentially represents a negative covenant, i.e. it is a condition that the borrower must not violate federal environmental law. Therefore, I classify representation and warranties that specify compliance with environmental laws as environmental covenants. Furthermore, environmental covenants can also apply to environmental laws at the state and/or international level, however these are beyond the scope of this chapter.

In a survey by the EPA (1992), banks monitor borrowers' environmental activities for two main reasons: financial risk and collateral risk. Firstly, environmental liabilities faced by borrowers potentially jeopardise the repayment ability of the interest and principal, which in turn transfers default risk to the lender's loan portfolio. Secondly, real estate is one of the most widely used form of security (i.e. collateral) in loan agreements (Beck et al. 2008). Environmental breaches, such as contamination of the site of the underlying loan security, leave lenders with limited protection in the event of default. The main purpose of environmental covenants is therefore to ensure the borrower's environmental performance does not fall below a minimum level.

Although environment-related covenants are not a new phenomenon in the private debt market, they have been neglected by prior literature which focuses more on the effects

of environmental disclosures and performance on various economic outcomes, such as the cost of capital and firm valuation. For instance, Dhaliwal et al. (2011) and Ghoul et al. (2011), using the KLD database, show that US firms with superior CSR disclosure and better CSR performance enjoy a lower cost of equity. They contend that firms with socially responsible practices have higher valuations and lower risk. With regards to the relationship between environmental performance and public debt, Menz (2010) finds that CSR quality is not fully impounded into the price of European bonds. More recently, Oikonomou et al. (2014) examine the same issue using US data. Using measures from KLD Research and Analytics, these authors found that strong CSR performance is rewarded with lower corporate bond yield spreads and vice versa. This suggests that lenders view higher levels of CSR performance as indicative of higher credit quality and lower risk.

Goss and Roberts (2011) examine the impact of CSR performance on the cost of debt in US private loan agreements. Using CSR data sourced from KLD ESG, they find that borrowers with below-average ESG scores have a high cost of borrowing. They also find that lenders are more sensitive to borrowers' CSR concerns and respond with less favourable terms. Their results suggest that lenders view CSR concerns as risk indicators and in turn provide incentives to reduce these concerns by linking subpar CSR performance with higher interest rates.

Prior literature relies heavily on ESG/CSR ratings from ratings agencies. Li and Raghunandan (2019) suggest that data sourced directly from the SEC are more transparent, objective, and timely when reflecting a firm's negative environmental performance. They argue that commercially available ESG ratings agencies rely on proprietary algorithms that reflect vendors' subjective biases on what matters in ESG performance. Furthermore, given that lenders are more concerned with borrowers' downside risk, by examining environmental covenant violations, it can provide an insight into the potential channel through which lenders

could influence managers' environmental performance via the threat of immediate repayment of loans.

4.2.3 Environmental covenant violations in the United States

While the prior debt covenant literature has examined the consequences of financial covenant violations, little is known about the consequences of environmental covenant violations. When combined with appropriate levels of regulatory enforcement and disclosure requirements, these underexplored contractual devices have the potential to change firms' environmental behaviour and to improve corporate environmental performance by augmenting the penalties applied to firms that fail to comply with environmental regulations. Enforcing environmental laws at the federal level is the main purpose of the US Environmental Protection Agency (US EPA) to protect human health and the environment that is affected by pollution and contamination.

The process which the US EPA uses to identify Potential Responsible Parties (thereafter PRP) is as follows.[28] First, the EPA reviews federal and state files of the entity for information of contaminated site history. The EPA then issues information request letters to all relevant parties for information on the material that has been generated, the nature or extent of the release of hazardous substances and the ability for the entity to pay or perform a clean-up. The third step is to conduct interviews to identify additional PRPs and gather evidence for liability determination, especially if site documentation does not exist. The EPA then performs a title search to identify former and current owners of the site, as well as owners and operators at the time of contamination. Once sufficient evidence has been gathered to establish liability, the EPA will notify PRPs using general or special notice letters. The former is to notify PRP status while the latter signals the EPA's intention to take immediate site action.

[28] https://www.epa.gov/sites/production/files/2017-10/documents/prp-search-man-cmp-17_0.pdf

Special notice letters are significant because EPA would not issue such letters if settlement is unlikely or that PRPs cannot be reasonably identified. Unfortunately, the EPA does not release the process for how they identify the potential responsible parties, possibly due to whistle blower protection.

The SEC regulation that governs the disclosure requirements for public companies is Regulation S-K. Two items directly address the disclosure of environmental liabilities (Soehle, 1995). First, item 101 requires companies to disclose material estimated and actual capital expenditure associated with environmental compliance. Second, item 103 requires public companies to report any material pending legal proceedings that is other than ordinary routine litigation. Instruction 5 of item 103 provides three thresholds for disclosure for environmental proceedings. Public companies must disclose if: (a) the proceeding is material to the business or financial condition of the business; (b) proceedings involve claims over 10% of current consolidated assets; (c) proceedings involve a governmental authority, unless the monetary sanctions will not exceed USD $100,000. Lastly, although it does not directly address environmental matters, item 303 requires companies to disclose any uncertainties in their MD&A. Any impact on liquidity, capital resources or operating results must be disclosed unless management does not determine that it is reasonably likely to occur. It should also be noted that the borrower is not required to disclose the litigation outcome and must be manually searched within EPA enforcement history.

4.3 Hypothesis development

4.3.1 Covenant Intensity Hypothesis

There is currently a lack of theoretical guidance on the consequences of covenant violation on CSR investment. On the one hand, CSR investment may drop after a financial covenant violation, because lenders may prefer to retain their interest in the borrower. Control rights

are transferred to the lender should the borrower violate their covenant and lenders may exercise this right to increase financial constraints, where the aim is to reduce managerial opportunism through the borrower's financial resources. The idea here is based on a shareholder dominated view, where CSR activities may be seen as an inefficient use of shareholder resources (Michelon et al. 2015). Reduction in borrowers' financial performance would be of concern to lenders because the borrower will have a reduced ability to repay interest and the principal to the lender. In contrast, according to stakeholder theory, which views CSR investment as a risk management tool, such activities could be beneficial since they potentially reduce the cost of equity. Shareholders may encourage borrowers' CSR activities as they may reduce both perceived and actual social, environmental and litigation risk (Hong and Pacperczyk, 2009). Lenders stand to benefit from borrowers' reduced level of risk since they are more sensitive to downside risk given that lenders have an asymmetric payoff function.

With the growing interest in ESG in debt markets, an empirical examination of private lending agreements provides a novel setting to examine banks' influence over borrowers' environmental performance following an environmental covenant violation. However, given the limited theoretical guidance on the effects of environmental covenant violations on firm policies, this chapter is necessarily exploratory.

I first examine whether violation of federal environmental law as disclosed in borrowers' 10K regulatory filings leads to changes in the structure of debt covenants. Murfin (2012) indicates there are two main dimensions of a package's financial covenant portfolio, covenant intensity (measured by number of financial covenant) and covenant slack (first quarter difference between borrower observed ratio and the pre-determined minimum allowable ratio). However, environmental covenants do not have slack as they simply require the borrower to be either in or out of compliance with a federal law. Therefore, the overall

covenant protection is estimated using as a proxy covenant intensity, for both environmental and financial covenants. Further, there is a fundamental difference between financial covenants and environmental covenants. Financial covenants are also called maintenance covenants, where borrowers have to maintain a pre-determined set of financial ratios over the duration of the loan (Christensen et al. 2016). Environmental covenants, in contrast, are essentially a negative covenant, which aims to prevent borrowers from breaking pre-determined set of environmental law(s).

Prior literature suggests that the purpose of accounting-based covenants is to ensure borrowers do not fall below a certain level of financial performance. Lenders are entitled to obtain control rights should the borrower breach this accounting-based threshold and in turn tighten covenant protection through covenant intensity, slack or cost of debt. Based on the same logic, I expect that a breach in environmental covenants indicates a decline in borrowers' environmental performance. In the case of financial covenant violations, the aim of tightening financial constraints through accounting-based covenants is to curb managers' opportunism (Nikolaev 2010). Freudentberg et al. (2017) also found that subsequent to financial covenant violations, accounting-based thresholds are tighter, which leads to more frequent violatiosn and renegotiation in the form of closer lender monitoring, However, in the context of environmental law violations, increasing financial constraints through more restrictive financial covenants could potentially worsen borrowers' environmental performance, since the borrower must incur expenditures to comply with environmental regulation. For example, in 2007 HSBC inherited an environmental liability from the borrower, as the transfer of control over borrower's cash operations led to the borrower's inability to comply with relevant environmental laws.[29] This leads to my first and second

[29] For further details, see https://ag.ny.gov/press-release/2007/attorney-general-cuomo-reaches-historic-environmental-finereimbursement.
For the case law, see *New York v. HSBC USA, N.A.,* (S.D.N.Y. No. 07-3160, 2007)

hypotheses:

Hypothesis 1a: *Environmental violations do not lead to more intense financial covenant intensity in the subsequent contract.*

Hypothesis 1b: *Environmental violations do not lead to a higher cost of debt in the subsequent contract.*

Prior literature only provides separate guidance on the consequences of financial covenant violations and covenant structure. Chava and Roberts (2008) found that creditors intervene to curtail management's inefficient activities following financial covenant violations through increments on the interest rate and further restriction on investing and financing activities. Although the literature does not offer guidance on how violations may affect the direction of change in covenant intensity, I expect lenders to restrict borrowers by increasing the overall covenant protection. Therefore, my third hypothesis is:

Hypothesis 1c: *Environmental covenant violations lead to higher levels of environmental covenant intensity in the subsequent contract.*

4.3.2 Corporate Behaviour Hypotheses.

I next examine the effect of environmental covenant violation on corporate behaviour, more specifically capital expenditure. In 10-K regulatory filings, some companies state the amount of capital expenditure required for environmental compliance, as well as the potential increase in financial pressure of new regulation and compliance. To illustrate, below are two extracts from Stepan Co's regulatory filing from 2005:

"ENVIRONMENTAL COMPLIANCE

Compliance with applicable federal, state and local regulations regarding the discharge of materials into the environment, or otherwise relating to the

protection of the environment, resulted in ***capital expenditures*** *by the Company of approximately $1.3 million during 2005."*

"The Company currently expects increased future environmental compliance obligations in its European facilities as a result of European Union Council Directive 96/61/EC of September 24, 1996, concerning Integrated Pollution Prevention and Control, or IPPC. […] The Company's environmental ***capital expenditures****, costs and operating expenses will be subject to evolving regulatory requirements and will depend on the timing of the effectiveness of requirements in these various jurisdictions. As a result of the IPPC directive, the Company may be subject to an increased regulatory burden, and the Company expects increased future environmental compliance obligations in its European facilities."*[30]

Furthermore, companies also explain the different accounting treatment for environmental expenditure. For example, in p.47 of the same filing, it mentions:

*"Environmental expenditures that relate to current operations are expensed in cost of sales or capitalized as appropriate****. Expenditures that mitigate or prevent environmental contamination and that benefit future operations are capitalized****."*

Nini et al. (2012) find that capital expenditure scaled by total assets falls when a financial covenant threshold is triggered. The main argument is that lenders limit borrowers' inefficient capital outflow to improve financial performance. Based on a manual inspection, environmental expenditure that benefits future operation is linked to capital expenditure. Limiting borrowers' capital expenditure could potentially exacerbate the current level of environmental performance. For borrowers who violate environmental covenant, capital

[30] https://stepan.gcs-web.com/static-files/3ac1b60d-27aa-4411-8034-fe108a1693fd

expenditure is likely to be viewed as a "necessary" expenditure under the presence of lender monitoring. Therefore, I state my second hypothesis as:

> **Hypothesis 2:** *Bank monitoring leads to an increase in borrower's capital expenditure following an environmental covenant violation.*

4.4 Data

4.4.1 Research Design

Prior literature mainly focuses on accounting-based covenant violations, triggered by breaching predetermined financial ratios. This breach in covenant is known as a technical default and results in a switch in control rights from borrower to lenders. However, in this chapter, I examine technical default cause by misrepresentation. I follow Roberts and Sufi's (2009a) methodology to identify any type of violations. For financial covenant violations, Roberts and Sufi (2009a)'s searched for violations, non-compliance or obtained a waiver for financial covenant breaches. I search for violations and non-compliance that directly refers to federal environmental law.[31]

The rationale behind this approach is that if the firm currently has a private debt agreement containing environmental covenants, a breach in those stated environmental laws during the maturity of the loan must mean a breach of their environmental covenants. Alternatively, due to the variation in the wording of SEC filings, I also search for mentions of 'potentially responsible parties'. Potentially responsible parties (PRPs) are individuals or entities that have been identified by the Environmental Protection Agency (EPA) to be responsible for environmental contamination. Being designated as a PRP by the EPA is considered as litigation with a government authority, which, according to SEC disclosure

[31] Note that, based on my examination, unlike financial covenants, environmental law violations are never waived.

Regulation S-K, must be reported. Below is an extract by Stepan Co's regulatory filing from 2005 to show an example of this:

> *"Regarding the D'Imperio Superfund Site, USEPA previously indicated it would seek penalty claims against the Company based on the Company's alleged noncompliance with the modified Unilateral Administrative Order (Order). In December 2004, the Company entered into a Consent Decree with USEPA, which resolves all claims asserted against the Company for the alleged noncompliance with the Order."*[32]

I explore the effect of environmental covenant violation on several contracting and firm outcomes, including changes in the cost of debt, as well as both environmental and financial covenant intensity. Secondly, I also examine changes in capital expenditure. To examine contracting outcomes, I focus on the differences in covenant structure between the violated contract, i, and the subsequent contract, i+1. Secondly, in terms of examining changes in corporate behaviour, I focus on the 8 quarters difference post violation, (t+8)-t, to capture the lender's influence over a relatively long period of time. Prior literature also suggests that changes to the ESG process and CSR engagement focus more on longer-term financial performance impact (Burke and Logsdon 1996). Improvement in environmental performance also requires continuous investment over time, captured by capital expenditure. Lastly, prior literature suggested that covenants are included in contracts to mitigate the conflicts of interest between creditors and equity holders (Jenson and Meckling, 1976). Nini et al. (2009) suggest that these conflicts of interest are worse when firms are performing poorly, and are more likely to limit investment in response to deterioration of firms' credit

[32] The United States Environmental Protection Agency (USEPA) defines a consent decree as the final phase of the clean-up recovery that requires approval by the court. This occurs when the EPA has found the alleged polluter(s) guilty of the site contamination.

quality detected by financial covenants.

In my case, environmental covenant violation provides lenders with a signal for deteriorating environmental performance, thereby providing a basis for lenders to exert influence over borrowers' investment policy. Therefore, environmental covenants can be seen as a potential monitoring device for borrowers' environmental performance and violation can be seen as a potential channel for which lenders can exert influence over borrowers' behaviour.

$$CHANGES\_CONTRACTUAL_{(i+1)-i} = \alpha_i + \beta VIONOENVCOV_{i,t} + control\ variables + F.E. + \varepsilon \quad (1)$$

$$CHANGES\_CONTRACTUAL_{(i+1)-i} = \alpha_i + \beta ENVCOVVIO_{i,t} + control\ variables + F.E. + \varepsilon \quad (2)$$

$$CHANGES\_CORP\_BEHAVE_{(t+8)-t} = \alpha_i + \beta ENVCOVVIO_{i,t} + control\ variables + F.E. + \varepsilon \quad (3)$$

The main variable of interest is *ENVCOVVIO (VIONOENVCOV)*, which is a binary variable, equal to one if the lending agreement contains (does not contain) an environmental covenant and the borrower disclosed their EPA litigation within the duration of the loan. Control variables are included at the contract and firm-level. *CHANGES_CONTRACTUAL* is defined as the difference in environmental covenant intensity, financial covenant intensity and cost of debt between the subsequent contract and the violating contract. *CHANGES_CORP_BEHAVE* is defined as the four and eight quarters difference in capital expenditure the subsequent to the violating quarter. *LN(DEBTSIZE)* is defined as the natural logarithm of the dollar size of the whole package. *LN(MATURITY)*, is the natural logarithm of maturity of the credit agreement in months. *LN(SYNSIZE)*, is the natural logarithm of the maximum number of lenders across all facilities in a package. *LN(TA)* is defined as the national logarithm of total assets in $millions. *LEVERAGE* is the ratio of total liabilities to total assets. *TANG* equals property plant equipment divided by total assets. *CURRENT* equals current assets divided by current liabilities. *LT_RATING*, is a categorical variable that equals zero if the firm has no S&P long term rating, 1, 2, 3 if the borrower has AAA, AA+, AA, and

so on. *UNRATED* is a binary variable that equals one if the borrower does not have a S&P long-term rating. *MTB* equals shareholder equity divided by number of shares multiplied by price at end of the fiscal quarter. *N_FINCOV* equals the number of financial covenants in a debt contract. *SWEEP* is a binary variable equal to one if the debt contract contains any sweep covenant. *DIVREST* is a binary variable equal to one if the debt contract contains a dividend restriction. *SNP* is a binary variable equal to one if the borrower is part of the S&P 500. *CAPEX* is a binary variable equal to one if the debt contract contains a capital expenditure restriction covenant. Consistent with prior literature, all regressions include year, 12 Fama-French industry, loan purpose and loan type fixed effects, as well as firm-level clustering of standard errors.

4.4.2 Descriptive Statistics

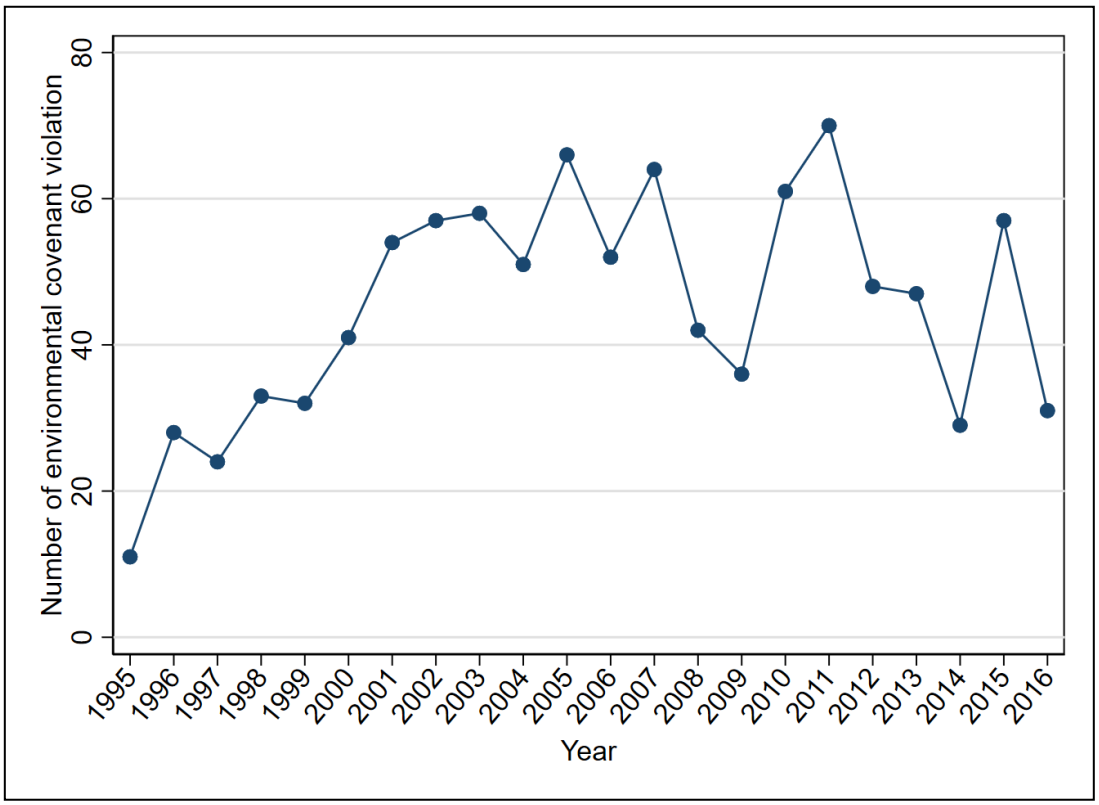
Table 4.1 presents full sample descriptive statistics. Among debt contracts initiated between 1996 and 2016, 57% (5,495) of contracts contain environmental covenants. On average, debt contracts with environmental covenants contain at least two environmental laws that borrowers must comply with. *ENVCOVVIO* shows that, on average, 12.6% (1,025) of debt contracts violate an environmental covenant. This contrasts with 10-20% for financial covenants (Nini et al. 2012)

Table 4. 1 Descriptive statistics

	N	Mean	Std. Dev.	25th	50th	75th
ENVCOV	7153	0.58	0.49	0.00	1.00	1.00
ENVCOV_INTENSITY	7153	1.84	2.63	0.00	1.00	2.00
ENVCOVVIO	7153	0.13	0.34	0.00	0.00	0.00
VIONOENVCOV	7153	0.12	0.32	0.00	0.00	0.00
ENVCOVDIFF	5062	-0.03	1.99	0.00	0.00	0.00
FINCOVDIFF	5062	-0.14	1.34	-1.00	0.00	0.00
INTERESTDIFF	4649	11.33	161.41	-50.00	0.00	50.00
CAPX_DIFF_4	7831	0.0003	0.04	-0.01	0.00	0.01
CAPX_DIFF_8	7831	-0.002	0.04	-0.01	0.00	0.01
Debt Contract Controls						
DEALAMOUNT ($BILLION)	7153	0.74	1.57	0.14	0.32	0.80
DEBT_SIZE (LOG)	7153	19.57	1.37	18.72	19.60	20.50
MATURITY (MONTHS)	7153	51.44	20.94	36.00	60.00	60.00
MATURITY (LOG)	7153	3.81	0.60	3.58	4.09	4.09
SYN_SIZE	7153	10.00	8.94	4.00	8.00	14.00
SYN_SIZE (LOG)	7153	1.90	0.97	1.39	2.08	2.64
N_FINCOV	7153	1.85	1.32	1.00	2.00	3.00
SWEEP	7153	0.35	0.48	0.00	0.00	1.00
DIV_REST	7153	0.58	0.49	0.00	1.00	1.00
CAPEX	7153	0.15	0.35	0.00	0.00	0.00
Firm Controls						
SIZE ($BILLION)	7153	6.54	18.37	0.52	1.64	4.99
SIZE (LOG)	7153	7.41	1.67	6.26	7.40	8.51
LEV	7153	0.30	0.22	0.16	0.27	0.40
TANG	7153	0.33	0.25	0.12	0.26	0.52
CURRENT	7153	1.88	1.46	1.11	1.60	2.27
LT_RATING	7153	5.99	5.67	0.00	7.00	11.00
UNRATED	7153	0.43	0.49	0.00	0.00	1.00
MTB	7153	0.53	0.51	0.27	0.44	0.68
SNP	7153	0.23	0.42	0.00	0.00	0.00
COVERAGE	7153	89.85	293.36	8.55	20.44	52.06

This table presents descriptive statistics (mean, standard deviation, 25th, 50th, and 75th percentile) for the sample included in our main regression models. The sample includes lending agreements identified by a Python text search program from the SEC Edgar archives for 2,755 firms between 1996 and 2016 with data in Dealscan and Compustat. *ENVCOV* is a binary variable equal to one if debt contract contains an environmental covenant, and zero otherwise. *ENVCOV_INTENSITY* is a count variable that counts the number of federal level environmental laws in the definition of environmental covenant in a debt contract. *ENVCOVVIO* is a binary variable equal to one if the borrower's 10-K filing discloses a violation, non-compliance of federal environmental laws, received a special notice letter or confirmed to be a potentially responsible party and the borrower's debt contract contains an environmental covenant. *VIONOENVCOV* is a binary variable equal to one if the borrower's 10-K filing discloses a violation, non-compliance of federal environmental laws, received a special notice letter or confirmed to be a potentially responsible party and the borrower's debt contract does not contain an environmental covenant. *ENVCOVDIFF* equals the difference in environmental covenant intensity between the current contract i and the subsequent contract, i+1. *FINCOVDIFF* equals the difference in financial covenant intensity between the current contract i and the subsequent contract, i+1. *INTERESTDIFF* equals the difference in *ALLINDRAWN* between the current contract i and the subsequent contract, i+1. *DEBT_SIZE* is the deal amount of the package from DealScan. *MATURITY* is the maturity in the number of months from DealScan. *SYN_SIZE* is the maximum number of lenders across all facility in a package. *N_FINCOV* equals the number of financial covenants in a debt contract. *SWEEP* is a binary variable equal to one if the debt contract contains any sweep covenant. *DIV_REST* is a binary variable equal to one if debt contract contains dividend restriction covenant. *CAPEX* is a binary variable equal to one if the debt contract contains a capital restriction covenant. *SIZE* equals the borrower's total assets. *LEV* is the ratio of long term and current debt to total assets. *TANG* equals property, plant and equipment divided by total assets. *CURRENT* equals current assets divided current liabilities. *LT_RATING* is a categorical variable that equals zero if the firm has no S&P long term rating, 1, 2, 3 if borrower has AAA, AA+, AA, and so on. *UNRATED* is a binary variable that equals one if borrower does not have a S&P long term rating. *MTB* equals stockholders' equity divided by the number of shares and closing price. *SNP* is a binary variable equal to one if borrower is part of the S&P 500. *COVERAGE* equals earnings before interest and tax divided by interest expense, winsorized at 1^{st} and 99^{th} percentiles.

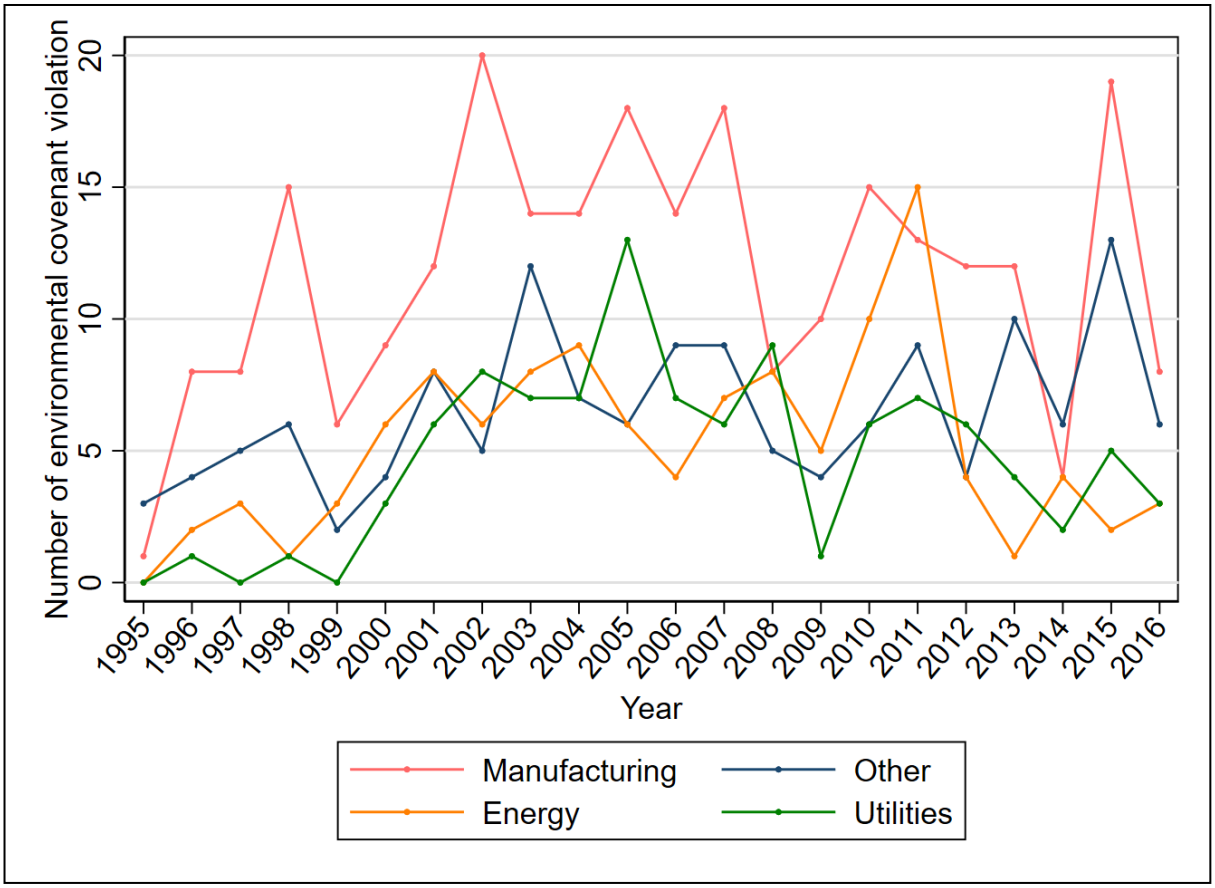
Figure 4. 1 Number of Environmental Covenant Violations between 1996 to 2016



This figure presents the time trend of environmental covenant violations between 1996 to 2016. Covenant data is collected from borrowers' debt contracts and violation data is collected from borrowers' regulatory filings: 10K, 10Q and 8K.

Figure 4.1 presents the time trend of environmental covenant violations between 1995 and 2016. It shows that although the number of environmental covenant violations rose between 1995 and 2003, the level of violations has largely remained stable - with some time-series variation - for the rest of the sample period. A possible explanation is that the proportion of debt contracts with environmental covenants has declined during the same sample period (Chapter 3). This could potentially explain that the stable rate of covenant violation may be due to the declining level of environmental covenants in debt contracts.

Figure 4. 2 Top four Fama-French industries with the most environmental covenant violation between 1996 to 2016



This figure presents the time trend of environmental covenant violations in the top 4 Fama-French industry between 1996 to 2016. Covenant data is collected from borrowers' debt contracts and violation data is collected from borrowers' regulatory filings 10K, 10Q and 8K.

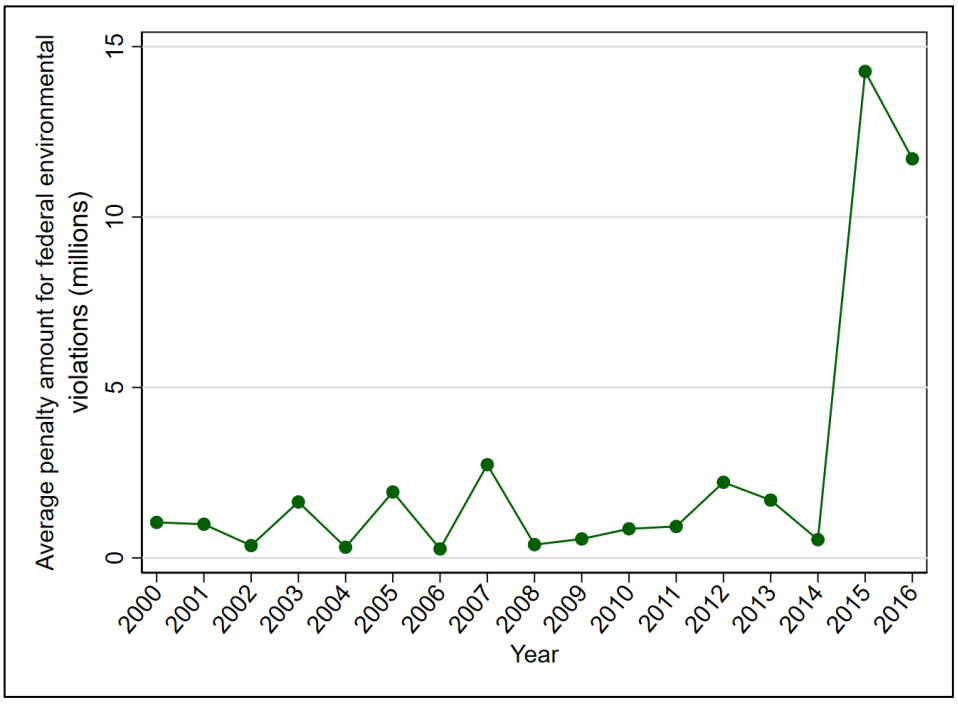
Figure 4.2 presents the six Fama-French industries with the most environmental covenant violations. The top are manufacturing industries, more specifically, paper mills (SIC: 2621, 18 counts) followed by structural metal product and steel works (SIC: 3440 & 3312, 11 counts). Secondly, in Other Industries, 18% of covenant violations are in the refuse systems industry (SIC: 4953, 27 counts), followed by the trucking industry (SIC: 4213, 16 counts). Furthermore, the four-digit SIC code with the most environmental covenant violations is crude and petroleum and natural gas (SIC: 1311, 62 counts), followed by electric

and other services (SIC: 4931, 41 counts) and electric services (SIC: 4911, 38 counts).[33] This suggests that although environmental covenants are not restricted to environmentally sensitive industries (ESI), environmental covenant violations are largely concentrated around them. My results reinforce the finding of Li and Raghunandan (2019), where they also find environmental violations are concentrated in specific industries, using data from *Violation Tracker*. This finding also complements those of Chapter 3, that environmental covenants in ESI remained at a constant level while they declined for non ESI industries. Even though environmental covenants appear in debt contracts due to credit and collateral risks of the borrower, one potential explanation for the decline of environmental covenants may be the lack of environmental covenant violations in non ESI industries.

To ensure the consistency of my data, I compare my findings on environmental violations with federal environmental violations in the *Violation Tracker* dataset, published by a non-profit organisation, *Good Job First*. Figure 4.3 (4.4) shows the average penalty amount (number of incidences of federal environmental violations) between 2000 and 2016. It also shows the number of federal environmental violations also remained stable over time which is consistent with my own findings, while the average penalty amount also remained stable until 2014. The large increase in penalties in 2015 is caused by the ruling of BP Deep Water Horizon, at $20.8 Billion.

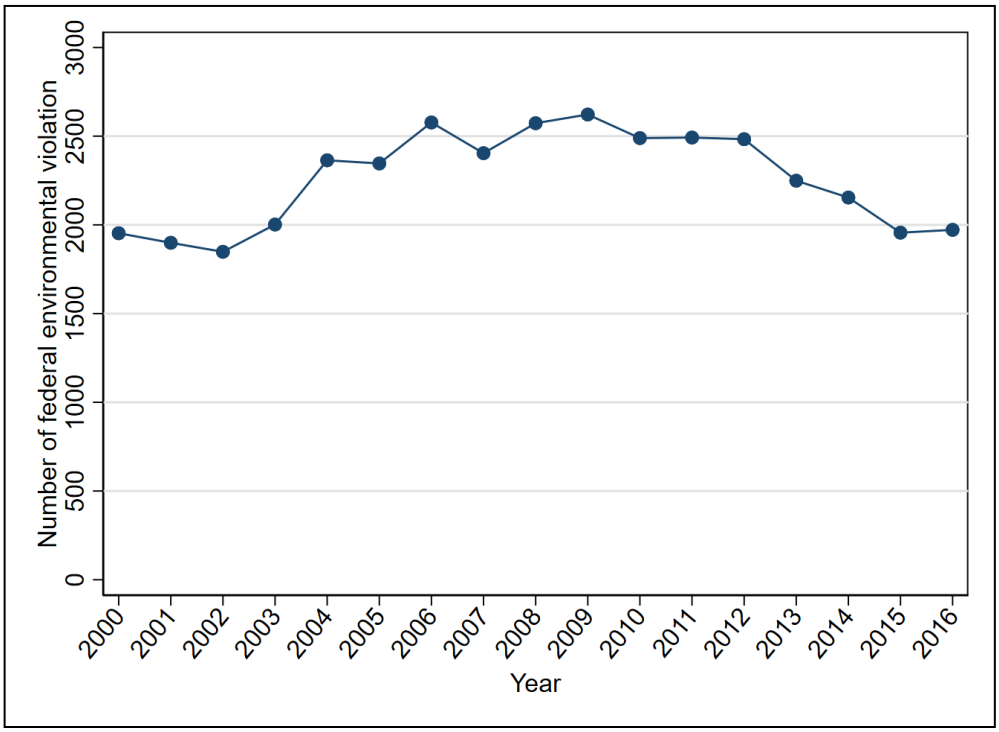
[33] Industry Group 493: Combination Electric and Gas, and Other Utility

Figure 4. 3 Average penalty amount of federal environmental violation in millions of US dollars between 2000 to 2016 (Violation Tracker)



This figure presents the average penalty amount of federal environmental covenant violations between 2000 to 2016. Data is collected from Violation tracker.

Figure 4. 4 Number of federal environmental violation incidences between 2000 and 2016 (Violation Tracker)



This figure presents the number of incidences of federal environmental violations between 2000 and 2016. Data are collected from Violation tracker.

4.5 Results

4.5.1 Contractual changes

I first examine the changes in debt contracts characteristic that aim to restrict financial flexibility between contracts with a violation and the subsequent contract for the same firm. Specifically, I test whether violations of federal environmental laws led to changes in financial covenant intensity (hypothesis 1a) and cost of debt (hypothesis 1b) for borrowers with and without environmental covenants. Tables 4.3 and 4.5 (4.4 and 4.6) present my results for borrowers with (without) environmental covenants to test environmental monitoring as a potential channel. I don't find significance evidence that after environmental covenant violation, lenders impose changes in terms of financial covenant intensity nor cost of debt for the full set of firms in my sample. Next, I split my sample in two groups based on performance (above and below sample median Return on Assets, ROA) and borrower-lender information asymmetry, measured as the relationship duration between the lead lender and the borrower. Low information asymmetry is defined as the top 30% in terms of length of relationship duration whereas high information asymmetry represents the bottom 30. Again, I fail to find evidence that environmental covenant violation triggers changes in financial covenants.

Overall, consistent with my hypotheses 1a and 1b, I interpret these results as evidence violations of environmental laws—and their associated covenants—that signal poor environmental performance by the borrower are not penalized by lenders in terms of price, nor do they impose more intense financial performance thresholds.

Table 4. 2 Change in financial covenant intensity after a federal environmental law violation for contracts without environmental covenants in the US between 1996-2016

Dependent variable: Difference in financial covenant intensity between contract i, and its subsequent contract i+1, for the same violating borrower.					
VARIABLES	Full sample	High ROA	Low ROA	Low Info_asym	High Info_asym
	(1)	(2)	(3)	(4)	(5)
VIONOENVCOV	-0.009	-0.052	0.049	-0.031	-0.062
	(-0.20)	(-0.85)	(0.65)	(-0.40)	(-0.53)
DEBT_SIZE	-0.005	-0.002	-0.006	0.016	-0.004
	(-0.20)	(-0.04)	(-0.16)	(0.37)	(-0.06)
MATURITY	-0.005	0.050	-0.070	-0.113	0.016
	(-0.10)	(0.74)	(-1.06)	(-1.47)	(0.14)
SYN_SIZE	-0.012	0.017	-0.048	0.049	-0.056
	(-0.43)	(0.42)	(-1.25)	(1.08)	(-0.82)
SIZE	-0.083***	-0.093***	-0.072**	-0.110***	-0.093*
	(-3.62)	(-2.83)	(-2.13)	(-2.69)	(-1.92)
LEV	0.192	-0.045	0.433**	0.000	0.418*
	(1.63)	(-0.28)	(2.48)	(0.00)	(1.75)
TANG	-0.219**	-0.204*	-0.209	-0.275*	-0.215
	(-2.33)	(-1.66)	(-1.42)	(-1.65)	(-1.06)
CURRENT	-0.006	0.005	-0.020	-0.018	0.015
	(-0.34)	(0.22)	(-0.93)	(-0.56)	(0.38)
COVERAGE	-0.000	-0.000	0.000	-0.000	-0.000
	(-0.15)	(-1.15)	(1.07)	(-0.61)	(-1.29)
LT_RATING	0.036***	0.062***	0.021	0.048***	0.024
	(3.79)	(4.54)	(1.47)	(3.35)	(0.92)
UNRATED	0.447***	0.682***	0.302*	0.668***	0.256
	(4.09)	(4.48)	(1.75)	(3.72)	(0.86)
MTB	0.104**	0.203**	0.093*	0.215***	0.132
	(2.45)	(2.17)	(1.84)	(3.26)	(1.40)
N_FINCOV	-0.668***	-0.714***	-0.633***	-0.652***	-0.739***
	(-30.94)	(-24.67)	(-19.93)	(-18.30)	(-16.07)
SWEEP	-0.182***	-0.128**	-0.212***	-0.166**	-0.092
	(-3.62)	(-1.99)	(-2.87)	(-2.09)	(-0.78)
DIV_REST	-0.092**	-0.066	-0.096	-0.084	-0.128
	(-2.31)	(-1.25)	(-1.50)	(-1.17)	(-1.26)
SNP	-0.033	-0.023	0.001	0.039	-0.164
	(-0.67)	(-0.37)	(0.01)	(0.49)	(-1.30)
CAPEX	-0.036	-0.046	-0.033	0.109	-0.331**
	(-0.55)	(-0.48)	(-0.36)	(0.98)	(-2.38)
Observations	4,397	2,418	1,979	1,530	911
R-squared	0.388	0.399	0.400	0.380	0.470
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Loan type FE	YES	YES	YES	YES	YES
Loan Purpose FE	YES	YES	YES	YES	YES

This table presents OLS regression results for the difference in financial covenant intensity between contracts without environmental covenant and its subsequent contract for the same borrower with environmental violation. High (Low) ROA are borrowers with above (below) median level of ROA by year. Low (High) information asymmetry are borrowers with top (bottom) 30% relationship duration by year. *VIONOENVCOV* is a binary variable equal to one if the borrower's 10-K filing discloses a violation or non-compliance of federal environmental laws without an environmental covenant in their contract. All other control variables are defined in table 4.1.

Table 4. 3 Change in financial covenant intensity after a federal environmental law violation for contracts with environmental covenants in the US between 1996-2016

Dependent variable: Difference in financial covenant intensity between contract i, and its subsequent contract i+1, for the same violating borrower.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Full sample	Good firms	Bad firms	Low Info_asym	High Info_asym
ENVCOVVIO	-0.010	-0.000	-0.029	0.037	-0.033
	(-0.23)	(-0.01)	(-0.44)	(0.54)	(-0.28)
DEBT_SIZE	-0.006	-0.002	-0.007	0.016	-0.005
	(-0.20)	(-0.05)	(-0.18)	(0.38)	(-0.08)
MATURITY	-0.005	0.051	-0.070	-0.112	0.019
	(-0.09)	(0.76)	(-1.07)	(-1.46)	(0.16)
SYN_SIZE	-0.012	0.017	-0.048	0.048	-0.054
	(-0.43)	(0.42)	(-1.25)	(1.06)	(-0.79)
SIZE	-0.083***	-0.094***	-0.069**	-0.111***	-0.094*
	(-3.64)	(-2.88)	(-2.04)	(-2.74)	(-1.93)
LEV	0.191	-0.043	0.434**	0.004	0.418*
	(1.62)	(-0.26)	(2.49)	(0.02)	(1.75)
TANG	-0.219**	-0.202	-0.214	-0.275	-0.210
	(-2.33)	(-1.65)	(-1.46)	(-1.65)	(-1.03)
CURRENT	-0.006	0.005	-0.020	-0.018	0.015
	(-0.35)	(0.20)	(-0.93)	(-0.56)	(0.38)
COVERAGE	-0.000	-0.000	0.000	-0.000	-0.000
	(-0.16)	(-1.12)	(1.05)	(-0.57)	(-1.28)
LT_RATING	0.036***	0.062***	0.020	0.048***	0.025
	(3.81)	(4.58)	(1.44)	(3.35)	(0.96)
UNRATED	0.448***	0.690***	0.294*	0.670***	0.268
	(4.10)	(4.53)	(1.71)	(3.74)	(0.90)
MTB	0.103**	0.202**	0.092*	0.218***	0.131
	(2.45)	(2.16)	(1.82)	(3.26)	(1.40)
N_FINCOV	-0.668***	-0.714***	-0.633***	-0.652***	-0.739***
	(-30.94)	(-24.67)	(-19.93)	(-18.32)	(-16.05)
SWEEP	-0.182***	-0.129**	-0.210***	-0.166**	-0.093
	(-3.62)	(-2.02)	(-2.84)	(-2.09)	(-0.79)
DIV_REST	-0.092**	-0.064	-0.098	-0.084	-0.127
	(-2.30)	(-1.22)	(-1.53)	(-1.16)	(-1.25)
SNP	-0.033	-0.023	0.002	0.041	-0.167
	(-0.68)	(-0.36)	(0.03)	(0.52)	(-1.32)
CAPEX	-0.036	-0.046	-0.034	0.110	-0.325**
	(-0.55)	(-0.48)	(-0.37)	(0.99)	(-2.34)
Observations	4,397	2,418	1,979	1,530	911
R-squared	0.388	0.399	0.400	0.380	0.470
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	NO	NO	NO	NO
Loan type FE	YES	YES	YES	YES	YES
Loan Purpose FE	YES	YES	YES	YES	YES

This table presents OLS regression results for the difference in financial covenant intensity between contracts with environmental covenant and its subsequent contract for the same borrower with environmental violation. High (Low) ROA are borrowers with above (below) median level of ROA by year. Low (High) information asymmetry are borrowers with top (bottom) 30% relationship duration by year. *ENVCOVVIO* is a binary variable equal to one if the borrower's 10-K filing discloses a violation or non-compliance of federal environmental laws with an environmental covenant in their contract. All other control variables are defined in table 4.1.

Table 4. 4 Change in cost of debt after a federal environmental law violation for contracts without environmental covenants in the US between 1996-2016

Dependent variable: Difference in interest rate between contract i, and its subsequent contract i+1, for the same violating borrower.

VARIABLES	(1) Full sample	(2) High ROA	(3) Low ROA	(4) Low Info_asym	(5) High Info_asym
VIONOENVCOV	8.767	-2.611	21.637*	9.805	13.567
	(1.38)	(-0.42)	(1.73)	(0.71)	(1.12)
DEBT_SIZE	4.328	5.024	4.230	2.724	12.568
	(1.03)	(1.02)	(0.62)	(0.36)	(1.12)
MATURITY	-8.073	-8.514	-10.729	-13.554	-11.510
	(-1.13)	(-0.89)	(-1.02)	(-1.30)	(-0.57)
SYN_SIZE	7.872**	1.055	14.241**	4.847	2.483
	(1.97)	(0.20)	(2.26)	(0.78)	(0.28)
SIZE	1.191	-1.737	5.988	2.095	-8.575
	(0.34)	(-0.39)	(0.99)	(0.28)	(-1.01)
LEV	-21.383	-25.508	-14.259	-29.413	-29.059
	(-1.19)	(-1.01)	(-0.51)	(-0.69)	(-0.81)
TANG	7.987	-4.042	16.825	54.395**	-57.980*
	(0.63)	(-0.24)	(0.80)	(2.37)	(-1.68)
CURRENT	4.225**	0.185	7.808**	6.770**	4.037
	(2.03)	(0.08)	(2.02)	(2.05)	(0.94)
COVERAGE	-0.004	-0.002	-0.031	-0.010	-0.013
	(-0.44)	(-0.19)	(-0.76)	(-0.68)	(-0.74)
LT_RATING	4.265***	5.280**	3.521*	5.654**	4.201
	(3.15)	(2.29)	(1.69)	(2.02)	(1.30)
UNRATED	55.321***	64.428***	50.257**	61.051**	49.999
	(3.97)	(2.79)	(2.04)	(2.16)	(1.44)
MTB	-8.375	-10.992	-6.287	-27.493**	-8.991
	(-1.15)	(-0.67)	(-0.68)	(-1.98)	(-0.59)
N_FINCOV	3.586	-0.342	6.086	6.326	4.643
	(1.32)	(-0.12)	(1.38)	(1.36)	(0.71)
SWEEP	-5.444	-0.972	-8.068	4.322	-4.487
	(-0.73)	(-0.11)	(-0.62)	(0.34)	(-0.26)
DIV_REST	2.152	7.337	-5.073	-6.167	2.615
	(0.40)	(1.25)	(-0.52)	(-0.68)	(0.21)
SNP	-16.169***	-1.344	-37.161***	-18.177*	-25.287**
	(-2.99)	(-0.19)	(-3.48)	(-1.69)	(-1.97)
CAPEX	-32.274***	-21.442**	-33.010**	-45.489***	-44.948**
	(-3.44)	(-1.97)	(-2.26)	(-2.65)	(-2.27)
Observations	4,040	2,220	1,820	1,383	863
R-squared	0.148	0.160	0.173	0.171	0.195
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Loan type FE	YES	YES	YES	YES	YES
Loan Purpose FE	YES	YES	YES	YES	YES

This table presents OLS regression results for the difference in interest rate between contracts without environmental covenant and its subsequent contract for the same borrower with environmental violation. High (Low) ROA are borrowers with above (below) median level of ROA by year. Low (High) information asymmetry are borrowers with top (bottom) 30% relationship duration by year. *VIONOENVCOV* is a binary variable equal to one if the borrower's 10-K filing discloses a violation or non-compliance of federal environmental laws without an environmental covenant in their contract. All other control variables are defined in table 4.1.

Table 4. 5 Change in cost of debt after a federal environmental law violation for contracts with environmental covenants in the US between 1996-2016

Dependent variable: Difference in interest rate between contract i, and its subsequent contract i+1, for the same violating borrower.

VARIABLES	(1) Full sample	(2) High ROA	(3) Low ROA	(4) Low Info_asym	(5) High Info_asym
ENVCOVVIO	-4.313	0.421	-8.460	-5.028	-16.735
	(-0.75)	(0.06)	(-0.81)	(-0.38)	(-1.25)
DEBT_SIZE	4.298	4.990	3.985	2.827	12.950
	(1.02)	(1.02)	(0.58)	(0.37)	(1.16)
MATURITY	-8.157	-8.450	-10.576	-13.716	-11.215
	(-1.14)	(-0.89)	(-1.00)	(-1.32)	(-0.55)
SYN_SIZE	7.842**	1.075	14.279**	4.963	1.625
	(1.97)	(0.20)	(2.28)	(0.79)	(0.18)
SIZE	1.644	-1.794	7.235	2.440	-7.410
	(0.48)	(-0.40)	(1.23)	(0.33)	(-0.88)
LEV	-21.260	-25.408	-13.417	-30.037	-26.895
	(-1.18)	(-1.00)	(-0.48)	(-0.71)	(-0.75)
TANG	7.528	-3.952	14.869	54.801**	-59.237*
	(0.59)	(-0.24)	(0.70)	(2.36)	(-1.73)
CURRENT	4.233**	0.162	7.781**	6.804**	4.003
	(2.03)	(0.07)	(2.01)	(2.05)	(0.92)
COVERAGE	-0.004	-0.001	-0.033	-0.010	-0.013
	(-0.48)	(-0.18)	(-0.82)	(-0.74)	(-0.74)
LT_RATING	4.205***	5.312**	3.285	5.567**	4.039
	(3.12)	(2.33)	(1.58)	(2.02)	(1.24)
UNRATED	54.490***	64.886***	47.594*	59.766**	48.185
	(3.92)	(2.85)	(1.92)	(2.14)	(1.37)
MTB	-8.405	-11.014	-6.535	-27.965**	-8.632
	(-1.15)	(-0.67)	(-0.70)	(-2.05)	(-0.57)
N_FINCOV	3.595	-0.340	6.050	6.226	5.107
	(1.32)	(-0.12)	(1.37)	(1.33)	(0.77)
SWEEP	-5.174	-1.016	-7.058	4.575	-4.328
	(-0.70)	(-0.12)	(-0.55)	(0.36)	(-0.25)
DIV_REST	1.845	7.424	-5.962	-6.682	1.595
	(0.34)	(1.27)	(-0.61)	(-0.73)	(0.13)
SNP	-16.237***	-1.301	-36.278***	-18.636*	-27.027**
	(-3.01)	(-0.19)	(-3.44)	(-1.76)	(-2.08)
CAPEX	-32.434***	-21.432**	-33.598**	-45.502***	-45.614**
	(-3.45)	(-1.97)	(-2.29)	(-2.65)	(-2.33)
Observations	4,040	2,220	1,820	1,383	863
R-squared	0.148	0.160	0.172	0.171	0.195
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Loan type FE	YES	YES	YES	YES	YES
Loan Purpose FE	YES	YES	YES	YES	YES

This table presents OLS regression results for the difference in interest rate between contracts with environmental covenant and its subsequent contract for the same borrower with environmental violation. High (Low) ROA are borrowers with above (below) median level of ROA by year. Low (High) information asymmetry are borrowers with top (bottom) 30% relationship duration by year. *ENVCOVVIO* is a binary variable equal to one if the borrower's 10-K filing discloses a violation or non-compliance of federal environmental laws with an environmental covenant in their contract. All other control variables are defined in table 4.1.

However, I find significant evidence that violations of federal environmental laws affect the characteristics of environmental covenants embedded in future debt contracts. Specifically, for firms with debt contracts without an environmental covenant, I find evidence that they are more likely to have this type of covenant in future contracts after a violation of federal environmental laws. This is the case regardless of firms' performance and information asymmetry between borrowers and lenders.

Column (1) of Table 4.7 shows that in the event of an environmental law violation in the absence of environmental covenant—*VIONOENVCOV*—environmental covenant intensity increases in the subsequent contract. I then split my sample in two separate subgroups: High ROA and Low ROA, based on the median level of financial performance by year. I find that *VIONOENVCOV* is positively associated with changes in environmental intensity for both good (Table 4.7 column 2) and bad firms (column 3). I find similar results when splitting the sample between high and low information asymmetries between lenders and borrowers. This result is consistent with hypothesis 1c, which suggest that violation of environmental laws, which indicates poor environmental performance, lenders include environmental covenant in subsequent contract to more closely monitor borrower's environmental performance.

Table 4. 6 Change in environmental covenant intensity after a federal environmental violation for contracts without environmental covenants in the US between 1996-2016

Dependent variable: Difference in environmental covenant intensity between contracts, i, and its subsequent contract, i+1, for the same violating borrower.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Full sample	High ROA	Low ROA	Low Info_asym	High Info_asym
VIONOENVCOV	0.465***	0.341***	0.591***	0.454***	0.603***
	(6.09)	(4.29)	(4.31)	(3.31)	(3.22)
DEBT_SIZE	-0.059	-0.009	-0.108	-0.088	-0.044
	(-1.12)	(-0.14)	(-1.29)	(-0.97)	(-0.35)
MATURITY	0.000	0.137	-0.124	-0.150	0.433*
	(0.01)	(1.07)	(-1.12)	(-1.18)	(1.89)
SYN_SIZE	0.066	0.003	0.134*	0.085	-0.202*
	(1.38)	(0.04)	(1.83)	(1.04)	(-1.79)
SIZE	0.062*	0.070	0.021	0.109	0.116
	(1.69)	(1.35)	(0.33)	(1.53)	(1.20)
LEV	0.042	0.217	-0.079	-0.174	0.411
	(0.19)	(0.67)	(-0.24)	(-0.40)	(0.77)
TANG	-0.068	0.179	-0.328	-0.318	0.167
	(-0.52)	(0.90)	(-1.47)	(-1.25)	(0.48)
CURRENT	-0.049*	0.012	-0.106**	-0.071	-0.064
	(-1.82)	(0.31)	(-2.56)	(-1.34)	(-1.02)
COVERAGE	0.000**	0.000*	0.000	0.000	0.000*
	(2.52)	(1.82)	(1.19)	(0.72)	(1.79)
LT_RATING	0.033**	0.035	0.013	0.056**	0.020
	(2.24)	(1.57)	(0.59)	(2.27)	(0.46)
UNRATED	0.491***	0.578**	0.145	0.732**	0.398
	(2.98)	(2.40)	(0.52)	(2.43)	(0.79)
MTB	0.051	0.025	0.044	0.139	0.270
	(0.75)	(0.16)	(0.49)	(1.09)	(1.55)
N_FINCOV	-0.054	-0.024	-0.065	-0.094	0.059
	(-1.54)	(-0.49)	(-1.27)	(-1.47)	(0.69)
SWEEP	-0.104	-0.068	-0.124	-0.239	0.360*
	(-1.14)	(-0.52)	(-0.96)	(-1.49)	(1.75)
DIV_REST	0.024	0.012	0.001	-0.008	0.004
	(0.33)	(0.14)	(0.01)	(-0.06)	(0.02)
SNP	-0.003	-0.025	0.044	0.024	-0.031
	(-0.06)	(-0.31)	(0.39)	(0.19)	(-0.17)
CAPEX	0.057	-0.083	0.139	0.281	-0.252
	(0.50)	(-0.46)	(0.88)	(1.48)	(-0.94)
Observations	4,397	2,418	1,979	1,530	911
R-squared	0.031	0.048	0.047	0.064	0.095
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Loan type FE	YES	YES	YES	YES	YES
Loan Purpose FE	YES	YES	YES	YES	YES

This table presents OLS regression results for the difference in environmental covenant intensity between contracts without environmental covenant and its subsequent contract for the same borrower with environmental violation. High (Low) ROA are borrowers with above (below) median level of ROA by year. Low (High) information asymmetry are borrowers with top (bottom) 30% relationship duration by year. *VIONOENVCOV* is a binary variable equal to one if the borrower's 10-K filing discloses a violation or non-compliance of federal environmental laws without an environmental covenant in their contract. All other control variables are defined in table 4.1.

Table 4. 7 Change in environmental covenant intensity after a federal environmental law violation for contracts with environmental covenants in the US between 1996-2016

Dependent variable: Difference in environmental covenant intensity between contract i, and its subsequent contract i+1, for the same violating borrower.

VARIABLES	(1) Full sample	(2) High ROA	(3) Low ROA	(4) Low Info_asym	(5) High Info_asym
ENVCOVVIO	-0.281***	-0.337***	-0.259**	-0.466***	-0.389
	(-3.77)	(-2.91)	(-2.02)	(-3.78)	(-1.37)
DEBT_SIZE	-0.064	-0.010	-0.116	-0.092	-0.033
	(-1.21)	(-0.16)	(-1.40)	(-1.02)	(-0.26)
MATURITY	-0.007	0.128	-0.128	-0.160	0.436*
	(-0.09)	(1.01)	(-1.15)	(-1.27)	(1.93)
SYN_SIZE	0.069	0.006	0.138*	0.100	-0.229**
	(1.44)	(0.08)	(1.88)	(1.21)	(-2.00)
SIZE	0.087**	0.088*	0.053	0.131*	0.153
	(2.41)	(1.68)	(0.86)	(1.84)	(1.59)
LEV	0.041	0.197	-0.057	-0.226	0.485
	(0.19)	(0.60)	(-0.17)	(-0.52)	(0.91)
TANG	-0.092	0.186	-0.380*	-0.318	0.107
	(-0.70)	(0.94)	(-1.73)	(-1.24)	(0.31)
CURRENT	-0.048*	0.013	-0.105**	-0.069	-0.065
	(-1.80)	(0.32)	(-2.52)	(-1.33)	(-1.03)
COVERAGE	0.000**	0.000	0.000	0.000	0.000*
	(2.24)	(1.61)	(0.93)	(0.38)	(1.80)
LT_RATING	0.031**	0.037	0.006	0.055**	0.012
	(2.09)	(1.64)	(0.27)	(2.21)	(0.27)
UNRATED	0.456***	0.580**	0.058	0.693**	0.297
	(2.79)	(2.41)	(0.21)	(2.29)	(0.60)
MTB	0.049	0.028	0.037	0.104	0.290*
	(0.71)	(0.17)	(0.41)	(0.81)	(1.67)
N_FINCOV	-0.054	-0.024	-0.066	-0.100	0.071
	(-1.52)	(-0.50)	(-1.27)	(-1.57)	(0.82)
SWEEP	-0.089	-0.065	-0.096	-0.236	0.370*
	(-0.98)	(-0.50)	(-0.74)	(-1.47)	(1.78)
DIV_REST	0.008	0.002	-0.025	-0.023	-0.020
	(0.12)	(0.03)	(-0.20)	(-0.18)	(-0.10)
SNP	-0.010	-0.041	0.064	-0.006	-0.073
	(-0.17)	(-0.50)	(0.56)	(-0.05)	(-0.40)
CAPEX	0.049	-0.088	0.124	0.274	-0.290
	(0.42)	(-0.49)	(0.78)	(1.43)	(-1.09)
Observations	4,397	2,418	1,979	1,530	911
R-squared	0.027	0.049	0.041	0.066	0.092
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Loan type FE	YES	YES	YES	YES	YES
Loan Purpose FE	YES	YES	YES	YES	YES

This table presents OLS regression results for the difference in environmental covenant intensity between contracts with environmental covenant and its subsequent contract for the same borrower with environmental violation. High (Low) ROA are borrowers with above (below) median level of ROA by year. Low (High) information asymmetry are borrowers with top (bottom) 30% relationship duration by year. *ENVCOVVIO* is a binary variable equal to one if the borrower's 10-K filing discloses a violation or non-compliance of federal environmental laws with an environmental covenant in their contract. All other control variables are defined in table 4.1.

Finally, Table 4.8 presents regression results for equation two, which examines changes in environmental covenant intensity in the subsequent contract following federal environmental law violation for firms with environmental covenants. Column (1) shows that in the event of environmental covenant violation, *ENVCOVVIO*¸ environmental covenant intensity declines in the subsequent contract. Columns (2) and (3) divides the sample into firms with high and low performance. I find that the lenders relax environmental covenant intensity subsequent to environmental covenant violation for borrowers regardless of performance level. Similarly, I find lenders also relax environmental covenant intensity for relationships with low information asymmetry proxied by longer-term relationship duration. In contrast, column (5) shows that for borrowers with short lending relationship duration (mean: 5 months), covenant violations do not lead to changes in environmental covenant intensity in their subsequent contract. The results is not consistent with hypothesis 1c, as the results suggest that in general, lenders do not punish poor environmental performance and places value in lending relationship, which is reflected in the structure of environmental covenants.

Among the control variables, I find borrower size *SIZE* and the number of financial covenants *N_FINCOV* are negative and significantly associated with changes in financial covenant intensity. Second, when the dependent variable is the change in the cost of debt, I observe a negative and significant relation with borrowers belonging to the S&P 500 *SNP* and borrowers with capital expenditure requirements *CAPEX*. With regards to changes in environmental covenant intensity, I do not document any borrower level or contract level control variables that is consistently significant.

4.5.2 Corporate behaviour results

In my final set of tests for hypothesis 2, I examine how environmental covenant violation

leads to changes in corporate behaviour. A close examination of 10-K filings indicates that compliance with the federal environmental laws tends to be associated with capital expenditure. I hypothesize that borrowers who violate the environmental covenant led to an increase in capital expenditure in the long run, more specifically, eight quarters after the violation. Nini et al. (2012) report that capital expenditures fall four quarters after triggering the financial covenant threshold. Since environmental performance is associated with a longer run measure, it is more appropriate to examine a longer-term horizon for the context of environmental covenants. Columns (1) and (2) of Table 4.9 show that for firms which violated an environmental covenant, the level of capital expenditure increases after 4 and 8 quarters following an environmental covenant violation. Given that in my econometric specification I control for borrowers' financial leverage, credit rating and capital expenditure restriction, my findings are consistent with lenders monitoring and exerting influence outside of payment default or financial distress. Moreover, Columns (3) and (4) show that firms with no environmental covenants do not experience an increase in capital expenditure. Overall, these results suggest that the presence of lender monitoring is important in shaping borrowers' environmental investment policy through the use of environmental covenants. This result is also consistent with stakeholder theory where financial institutions exert influence over firms to invest in their own environmental performance improvement, through covenant violation as a potential channel.

Further, among the control variables, I find that the coefficient on debt maturity *MATURITY* and borrowers' current ratio *CURRENT* is positive and significantly associated with changes in capital expenditure. On the other hand, I observe borrowers' level of tangible asset *TANG* is negative and statistically significant, suggesting borrowers with more tangible asset see a reduction in capital expenditure.

Table 4. 8 Change in borrower capital expenditure after a federal environmental law violation for contracts with and without environmental covenants in the US between 1996-2016

Dependent variable: Difference in capital expenditure scaled by total assets between quarter t and quarter t+4 as well as t+8 for the same violating borrower.				
	(1)	(2)	(3)	(4)
VARIABLES	Quarter t+4	Quarter t+8	Quarter t+4	Quarter t+8
ENVCOVVIO	0.004**	0.004**		
	(2.14)	(2.40)		
VIONOENVCOV			-0.000	0.001
			(-0.15)	(0.51)
DEBT_SIZE (LOG)	0.001	0.000	0.001	0.000
	(0.66)	(0.10)	(0.63)	(0.08)
MATURITY (LOG)	0.005***	0.007***	0.005***	0.007***
	(2.78)	(3.24)	(2.76)	(3.22)
SYN_SIZE (LOG)	-0.001	-0.002	-0.001	-0.002
	(-1.24)	(-1.37)	(-1.20)	(-1.33)
SIZE (LOG)	-0.000	0.001	0.000	0.001
	(-0.04)	(1.34)	(0.06)	(1.40)
LEV	0.000	-0.001	0.000	-0.001
	(0.05)	(-0.23)	(0.05)	(-0.23)
TANG	-0.008**	-0.021***	-0.008**	-0.021***
	(-2.22)	(-5.08)	(-2.23)	(-5.08)
CURRENT	0.001**	0.001**	0.001**	0.001**
	(2.34)	(2.10)	(2.30)	(2.05)
COVERAGE	-0.000	-0.000	-0.000	-0.000
	(-1.54)	(-0.90)	(-1.62)	(-0.96)
LT_RATING	-0.000	0.000	-0.000	0.000
	(-0.41)	(0.11)	(-0.36)	(0.19)
UNRATED	-0.001	-0.000	-0.001	-0.000
	(-0.40)	(-0.14)	(-0.38)	(-0.10)
MTB	-0.001	-0.000	-0.001	-0.000
	(-0.55)	(-0.20)	(-0.63)	(-0.25)
N_FINCOV	-0.001	-0.001	-0.001	-0.001
	(-1.29)	(-1.22)	(-1.30)	(-1.22)
SWEEP	-0.001	-0.000	-0.001	-0.000
	(-0.83)	(-0.20)	(-0.80)	(-0.19)
DIV_REST	0.003**	0.002	0.003**	0.002
	(2.27)	(1.23)	(2.32)	(1.30)
SNP	0.003**	0.002	0.003**	0.002
	(2.40)	(1.60)	(2.27)	(1.46)
CAPEX	-0.000	0.002	-0.000	0.002
	(-0.19)	(0.85)	(-0.19)	(0.85)
Observations	6,890	6,768	6,890	6,768
R-squared	0.028	0.044	0.027	0.043
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Loan type FE	YES	YES	YES	YES
Loan Purpose FE	YES	YES	YES	YES

This table table presents OLS regression results for the sample period 1996 to 2016. The dependent variable for column (1, 3) and (2, 4) is the capital expenditure scaled by total assets difference between quarter t and quarter t+4; quarter t and quarter t+8 respectively. *ENVCOVVIO* is a binary variable equal to one if the borrower's 10-K filing discloses a violation or non-compliance of federal environmental laws and debt contract contains an environmental covenant. *VIONOENVCOV* is a binary variable equal to one if the borrower's 10-K filing discloses a violation or non-compliance of federal environmental laws without an environmental covenant in their contract. All other control variables are defined in table 4.1.

4.6 Conclusions

In recent times, the world of public debt financing has begun incorporating environmental metrics into the structure of bonds, with the aim of incentivizing borrowers to improve their environmental performance. Private debt agreements have incorporated environmental covenants into the structure of loans for at least the past twenty years. They aim to incentivize borrowers to not fall below a predetermined level of environmental performance. In most cases, the minimum level of environmental performance required by the lenders, is remaining in compliance with a predetermined set of federal environmental laws.

I provide a novel dataset to examine the relationship between environmental covenant violations and changes in covenant structure in the subsequent contract. Prior literature suggest that covenant slack becomes tighter, while investing and financing activities are also further restricted subsequent to financial covenant violation (Chava and Roberts, 2008). Secondly, given that environmental compliance is a binary outcome and therefore does not have slack nor variance in the underlying measure (Murfin 2012), covenant intensity (number of covenant) is used as proxy for overall covenant protection.

My results show that on average, environmental covenant intensity increase in subsequent contract following an federal environmental law violation in the absence of environmental covenant. This is consistent with my hypothesis where lenders would increase the level of protection following a covenant violation. However, for contracts with environmental covenant, I find that environmental covenant intensity in the subsequent contract fell following a violation, the effect is more pronounce for borrower with relationship of lower information asymmetry. One potential explanation to why overall protection fell, would be that these environmental covenant violations are waived, in the form of not including environmental covenant. Roberts and Sufi (2009) found that accounting-based covenants violations are often waived by lenders, and are typically triggered outside of

payment default risk. Since environmental covenants are not technically a covenant, therefore waiver does not have to be disclosed. Lenders may decide to remove the violated law from covenant definition as a form of waiver. Secondly, the duration of rectifying the original contamination are never disclosed based on my manual examination. The initiation date of the subsequent contract may overlap with rectifying period of the original contamination. The overall covenant protection fell because the lender may not include violated federal law because the borrower is still in violation of that federal law. These are new sets of issues that the current literature does not address.

I also examine changes in borrower characteristics following environmental covenant violations. Nini et al (2012) examined four quarter difference in borrower characteristics following financial covenant violation. They found that firms reduced the level of investing activities following a financial covenant violation. Since environmental investment aims to improve firm value over a longer horizon, I examine eight quarter difference in order capture investment over time. I manually inspect borrowers' regulatory filings and found that capital expenditure is typically associated with investment with expected future benefits. Prior literature suggest lenders would increase the number of restrictions on borrower following a violation, as the violation suggest declining level of financial performance. The aim of further restrictions is to limit borrowers' inefficient activities. Controlling for capital expenditure restriction, I hypothesize and find that environmental covenant violation is positively associated with capital expenditure, both four and eight quarters post violation. In contrast, I do not change in capital expenditure for violating firms without environmental covenant. My finding resonates with real life case in 2007, where HSBC inherited borrower's environmental liability as the HSBC had control over borrowers operational funds, which means the borrower did not have the capital to comply with relevant environmental law. This suggest that under the presence of lender, borrower increase their capital expenditure in order to

comply with relevant federal environmental law, following violation raised by US EPA, which indicate borrower's declining level of environmental performance. This result is also consistent with stakeholder theory where financial institutions views CSR investment as a potential risk mitigation tool. Creditors exert influence over borrowers to invest in their own environmental performance improvement, through covenant violation as a potential channel.

I recognise there are several limitations to this chapter. First, I cannot fully observe or model the determinants to why lenders lower environmental covenant intensity subsequent to a violation. Firms may take undisclosed amount of time to rectify their environmental violation. Therefore, the firm potentially cannot declare that they are in compliance of such environmental law in their representation of their subsequent contract. Second, the generalisation of this chapter results is also limited given that the sample is limited in the US. Future research could focus on examining how cross-country or cross-state differences in environmental enforcement of compliance may potentially affect the extent of improvement in borrower's environmental performance. There are cases where lenders include state- or country-specific environmental laws in definition of environmental covenant. It would also be of interest to investigate how covenant violation may lead to improvement in objective measures such as carbon emission, as opposed to improvements in ESG ratings that current dominate the ESG literature.

Appendix A: Extracts from firms' filings in our sample

Extracts from Clean Harbors, INC from year 2004: Example of Violation

'Chicago Facility. By letter dated January 16, 2004, Region V of the EPA ("EPA Region V") in Chicago, Illinois notified us that EPA Region V believes our Chicago, Illinois facility may be in violation of the National Emission Standard for Benzene Waste Operations Subpart FF regulations promulgated under the Clean Air Act and that EPA Region V may seek injunctive relief and civil penalties for these alleged violations. The alleged violations pertain to total annual benzene quantity determinations and reporting, provisions of individual waste stream identification and emissions control information, and treatment and control requirements for the benzene waste streams. EPA Region V is seeking a fine of $325 thousand. We believe that our Chicago facility complies in all material respects with these regulations and has engaged in ongoing settlement discussions with EPA Region V to resolve the issues described in the letter from EPA Region V without litigation. We believe that the cost of resolving this matter will not be material to our results of operations or financial position'[34]

Extracts from Huntsman Corporation from year 2014: Example of environmental capital expenditure disclosure

We may incur future costs for capital improvements and general compliance under EHS laws, including costs to acquire, maintain and repair pollution control equipment. For the years ended December 31, 2014, 2013 and 2012, our capital expenditures for EHS matters totaled $125 million, $92 million, and $105 million, respectively. Because capital expenditures for these matters are subject to evolving regulatory requirements and depend, in part, on the timing, promulgation and enforcement of specific requirements, our capital expenditures for EHS matters have varied significantly from year to year and we cannot provide assurance that our recent expenditures are indicative of future amounts we may spend related to EHS and other applicable laws.[35]

[34] Example from EPA Enforcement Actions section, pp.34. See: https://www.sec.gov/Archives/edgar/data/822818/000104746905012345/a2157059z10-ka.htm
[35] Example from EHS Capital Expenditures section, pp.33. See: https://www.sec.gov/Archives/edgar/data/0001307954/000104746915000900/a2222928z10-k.htm

Chapter 5: Conclusions

5.1 Summary of Findings

The thesis addresses the issue of verifiability in debt covenants, with the aim of expanding the private debt literature and the understanding of clauses and covenants that lenders incorporating into debt contracts to protect their interest. It starts by re-examining how lenders exclude fair value accounting figures when assessing the compliance of financial covenants (Chapter 2). Chapter 3 investigates the ways in which lenders ensure minimum environmental performance through the use of environmental covenants. Finally, I study the consequences of breaching environmental covenants, both at the contract level and the borrower level, in Chapter 4.

We re-examine the Demerjian et al. (2016) hypotheses using an extended sample period of five years. Given that 10-K wizard is discontinued, I re-examine the important issue of the usefulness of FVA in contracting using a novel (and reproducible) dataset collected by Python. Our estimates suggest that lenders opt out of fair value accounting much more than Ddemerjian et al. (2016) report. We find support for three out of five hypotheses of Demerjian et al. (2016), where results suggest that FVCs are positively associated with agency problems in fair value accounting (*REVOLVER*) but negatively associated with benefits attributed to fair value accounting (*HEDGE* and *LIQUIDITYCOV*), consistent with Demerjian et al. (2016).

We do not find a higher incidence of FVC when level 2 and 3 estimates are higher, nor when contracts include performance pricing provisions. Our results suggest that lenders are more concerned about the effects of fair value estimates on accounting figures rather than the quantity of unreliable fair value estimates. Further analysis suggests lenders are not concern by the unreliability of level 3 fair value estimates. Overall, despite widespread concern that a lack of reliability makes fair value accounting problematic for contracting, our results indicate

that lenders often find it useful.

Chapter 3 studies the extent to which lenders monitor corporate environmental compliance by studying environmental covenants in private lending agreements. Lenders include such covenants via environmental law compliance clauses in the representation and warranties section of debt contracts. Also, lenders can intensify environmental monitoring by increasing the number of environmental laws they require borrowers to comply with. Despite the widespread increase in attention to corporate environmental responsibilities in the last 20 years, we document a fall in both the number of contracts with environmental covenants and in environmental covenant intensity over time. In cross sectional analysis, we find evidence that environmental monitoring is associated with borrowers' characteristics, including credit risk, collateral risk and environmental information asymmetries between lenders and borrowers.

Chapter 4 examines the consequences of breaching environmental covenants thresholds using a novel dataset collected directly from companies' regulatory disclosures. My findings suggest that borrowers who violate environmental laws when having debt contracts without an environmental covenant experience higher environmental intensity in the subsequent contracts; I also document that environmental covenant intensity decreases in subsequent contracts following a violation of current contracts' environmental covenants. Furthermore, environmental covenant violations are not associated with changes in financial covenant intensity, nor the cost of debt, suggesting that lenders are not punishing borrowers who fall below a minimum level of environmental performance. Lastly, in terms of changes in corporate behaviour, I show that within four and eight quarters of an environmental covenant violation, there is a positive change in borrowers' capital expenditure while controlling for CAPEX restrictions. This change in investment behaviour is not observed for borrowers that breach federal environmental laws but have debt contracts without environmental covenants.

I interpret this finding as evidence that the contractual characteristic of debt is an important factor shaping companies' environmental investment policy.

5.2 Limitations and Recommendation for Future Research

This thesis is subject to a number of limitations and thus my results should be interpreted with caution. First, in Chapter 2, there are other possible underlying mechanisms that link fair value accounting with debt contracting structure other than FVC. Second, consistent with DDL, this chapter does not fully observe the factors that drive firms to elect fair value, which could potentially limit this chapter's conclusion in terms of fair value accounting. Third, the results of this chapter are limited to a US sample, and since the majority of the world uses IFRS in terms of fair value, it limits the generalisability of our findings. Future research can investigate other clauses that are associated with covenant calculation modification. We also observe that in some cases, lenders exclude the effects of ASC 470-20 with respect to convertible debt instruments. It would be of interest to examine how various debt contract clauses may potentially interact with both accounting and non-accounting based covenants.

Secondly, similarly in Chapter 3, the sample is limited to the US and by examining contractual outcomes, our evidence is necessarily descriptive as we cannot observe the underlying mechanisms that link federal environmental law and contracting. Future research could examine state and/or international level environmental laws that also reside in the definition of "environmental law" in US debt contracts. Furthermore, future studies could examine how various contracting mechanism such as financial covenants and other non accounting-based covenant compliments or substitutes with one another to further incentivise better environmental performance.

Lastly, in chapter 4, I cannot fully observe or model the determinants to why lenders lower environmental covenant intensity subsequent to a covenant violation. Firms may take

undisclosed amount of time to rectify their environmental violation. Therefore, the firm potentially cannot declare that they are in compliance of such environmental law in their representation of their subsequent contract. Second, the generalisation of this chapter results is also limited given that the sample is limited to the US. Future research could focus on examining how cross-country or cross-state differences in environmental enforcement of compliance may potentially affect the extent of improvement in borrowers' environmental performance. There are cases where lenders include state- or country-specific environmental laws in definition of environmental covenant. It would also be of interest to investigate how covenant violation may lead to improvement in objective measures such as carbon emission, as opposed to improvements in ESG ratings that current dominate the ESG literature.

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