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High-Yield Debt Covenants and Their Real Effects*

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Abstract

High-yield debt, including leveraged loans, features incurrence financial covenants or "cov-lite" provisions. These covenants differ from traditional loans' maintenance covenants, as they preserve equity control rights but impose specific restrictions on the borrower after crossing the covenant threshold. Contrary to the prevailing belief that incurrence covenants offer limited protection for creditors, our research reveals a significant and sudden decline in investment upon triggering these covenants. This evidence highlights a novel propagation mechanism for economic shocks, wherein contractual restrictions play a crucial role in the highly-leveraged corporate sector, becoming binding well before default or bankruptcy occurs.

Keywords: High-yield debt; corporate debt; covenants; incurrence covenants; cov-lite; amplification mechanisms; contracts; contingent contracting

JEL Codes: G31, G33, G21, G32

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I. INTRODUCTION

The rise in high-yield corporate leverage following the Great Financial Crisis (GFC) has been a source of increasing concern in the United States and Europe. For example, according to S&P's Global Market Intelligence, the U.S. leveraged (that is, high-yield) loan market more than doubled in size in the decade following the GFC, growing to nearly $1.2 trillion in outstanding debt by 2019, up from $400 billion in 2006 (an 8.8 percent compound annual growth).[1] According to Bank of America, the numbers are very similar in the high-yield bond market and dwarf the annual GDP growth rate of about 3.5 percent for the same period. Not surprisingly, the associated rise in leverage has become a frequent topic of discussion for central bankers and other policymakers, and these concerns have been voiced in other developed markets.[2]

Taking a step back, the problem with *high corporate leverage* is the effects of financial insolvency. For example, a negative demand shock can leave a firm with an oversized debt burden with consequences that can be amplified though multiple channels, thus intensifying the initial impact. One such channel is the debt overhang problem as in Myers (1977). As an alternative channel, in the context of the widespread economic shutdown resulting from the 2020 pandemic, other studies have raised alarms about potential amplification of economic distress due to higher bankruptcy costs related to potential concentration of bankruptcies (e.g., Greenwood, Iverson, and Thesmar 2020; Group of Thirty 2020; and Ellias, Iverson, and Roe 2021). As another channel, in

[1] According to Leveraged Commentary & Data (LCD) Research, on a net-of-cash basis, total leverage of firms borrowing in the leveraged-loan market at issuance increased from 4.4x EBITDA in 2006 to 5.2x in 2019 for large corporate loans, and from 4.4x to 5.3x in the middle market.

[2] See, for example, "Warren Presses Regulators on Risks in Leveraged Lending Market," November 15, 2018, https://www.warren.senate.gov/oversight/letters/warren-presses-regulators-on-risks-in-leveraged-lending-market; and "Warren Raises Concerns that Leveraged Lending Market Could Escalate Risks to Financial System as Coronavirus Outbreak Continues to Rattle Markets," March 20, 2020, https://www.warren.senate.gov/oversight/letters/warren-raises-concerns-that-leveraged-lending-market-could-escalate-risks-to-financial-system-as-coronavirus-outbreak-continues-to-rattle-markets. Also see OECD (2020). More recently, see Americans for Financial Reform (2023).

the aftermath of the GFC, Giroud and Mueller (2017), Kalemli-Özcan, Laeven, and Moreno (2020), and Chodorow-Reich and Falato (2020) studied the role of corporate leverage and financial covenant violations in propagating the collapse of the financial system.

We propose a new mechanism which builds on the insight that high-yield debt has a financial covenant structure that is different from the one discussed in the existing literature. In particular, high-yield debt is characterized by *incurrence* covenants, which do not shift control rights to creditors, but instead restrict prespecified actions of the borrower if the financial covenant threshold is crossed. Such covenants earned high-yield loans the moniker "cov-lite." The cov-lite share of the leveraged-loan market increased from 17 percent in 2007 to more than 86 percent of total outstanding debt as of Q3 2021 (Figure 1).[3] In contrast, traditional/bank-funded loans have *maintenance* covenants, which require the borrower's continuous compliance with the covenant threshold every quarter under the threat of transferring control rights to lenders.[4]

A large literature has identified a variety of corporate responses to covenant violations. However, this evidence has focused almost exclusively on bank-funded loans and, therefore, on maintenance covenants which work through ex-post bargaining. Instead, the leveraged loan market significantly relies on ex-ante contracting as a creditor governance mechanism.[5] Does this market

[3] See Goodison and Wagner (2019) and Prilmeier and Stulz (2020) for more details on similarities between cov-lite loans and high-yield bonds that include financial covenants.

[4] As an example, suppose that two otherwise identical companies, A and B, have a $100 loan containing an indebtedness covenant that prohibits the net debt/EBITDA ratio from exceeding 5x. Company A has a maintenance covenant, and it will be verified every quarter. Company B has an incurrence covenant that ties verification of indebtedness to the firm's engagement in restricted actions, such as distributions to equity holders, capital expenditures, or acquisitions. A significant drop in EBITDA would put Company A in technical default (the mechanism in Chodorow-Reich and Falato 2020), leading to a shift in control rights to creditors. Company B will remain in compliance as long as it does not incur "restricted actions" specified in its loan agreement. We further elaborate on the differences between incurrence and maintenance covenants in the context of empirical methodology in Section III.

[5] To emphasize, leveraged loan market—just as its name indicates—is a separate market in that it attracts and caters to a completely different creditor base although it is syndicated.

and its alternative approach to addressing incentive conflicts through incurrence covenants have similar implications for borrower behavior? We elaborate on this in the next sections, but in short, it is not clear ex-ante, and it certainly does not appear to be the prevailing view. Cov-lite credit agreements are commonly interpreted as being borrower-friendly as they are commonly said to put "fewer restriction[s] on a borrower than do traditional structured credits" and "reduce the ability of lenders to take actions if borrowers' credit quality deteriorates," as pointed out in LCD's Quarterly Leverage Lending Review 2019. In fact, LCD has stopped tracking financial covenants, deeming this information largely irrelevant: "since more than 90% of the new-issue market is covenant-lite, LCD will not update these charts [that is, charts concerning financial covenants] after 2019."[6] Accordingly, in 2019, former Fed Chair Janet Yellen has stated "I have concerns about the deterioration in lending standards that we have seen. […] A large share of it is covenant-lite and some of the explicit ways in which covenants have weakened are a concern to me."[7]

Central to the mechanism proposed in this paper is that incurrence covenant triggers activate a set of contractual constraints on a firm's actions ("restricted actions"). We show that, once triggered, these constraints have a strong effect on a firm's investment policy. While not all restricted actions directly limit investment, they tend to be costly for equity holders, and as a result, they indirectly influence the firm's capital expenditures. For example, consider a borrower that exceeds a cap on leverage (Debt/EBITDA), which is, by far, the most prominent type of financial covenant in the leveraged-loan space. To lift the restrictions and get into the "green zone," the borrower has to lower its Debt/EBITDA. To do so, the borrower might engage in some cost-cutting

[6] For example, see LCD's Quarterly Leveraged Lending Review: 4Q 2022. Nevertheless, the 90% referenced here was not reached until after 2019.
[7] https://www.reuters.com/article/us-yellen-distressed/yellen-warns-of-corporate-distress-economic-fallout-idUSKCN1QG2CZ

to boost EBITDA. Another evident channel is to reduce net debt, which can be achieved by selling some assets or curtailing capital expenditures that require financing.

Our empirical identification of these effects exploits novel, hand-collected, loan-level data on covenant information in conjunction with a regression discontinuity design that builds on Chava and Roberts (2008).[8] Our key empirical results are as follows. First, the investment rate drops about 1.83 percentage points when incurrence covenant restrictions are triggered. This effect compares to a drop of 1 percentage point when a maintenance covenant is violated over the same sample period. Consistent with this channel, we also find that other investment activities that require funding, such as inventory or research and development, drop as well. Second, after triggering incurrence covenant restrictions, firms significantly deleverage as they would after violating a maintenance covenant. In our sample, we find that the debt-to-assets ratio decreases by about 1.89 percentage points when a firm violates a maintenance covenant. We also find that triggering incurrence covenant restrictions leads to a reduction in the debt-to-assets ratio of about 1.64 percentage points. Moreover, these effects are as sudden for incurrence covenant triggers as they are for maintenance covenant violations, indicating that the propagation of shocks in an economy with a highly levered corporate sector characterized by incurrence covenants occurs quickly.

The regression discontinuity design (RDD) enables us to credibly isolate the real effects that stem from triggering incurrence covenants. We show that our main findings are robust to focusing on narrow subsamples of observations that are close to the covenant threshold (including optimal bandwidth sample as in Calonico et al., 2014). RDD enables us to measure the impact of incurrence

[8] Chava and Roberts (2008) show that capital expenditures drop significantly following a covenant violation in a typical loan agreement and attribute this pattern to the shift in control rights. We will show that our results are not subsumed by the findings in previous studies.

covenants *on a given firm*. Cross-sectional comparison, and specifically comparison of loans with incurrence covenants to loans with maintenance covenants, is harder to interpret due to sample selection concerns. However, about 40% of the loan contracts in our sample include both incurrence and maintenance covenants, with incurrence covenants set at a laxer level. This setting allows us to test effectiveness of the contingent contractual restriction relative to contingent shift in control rights.

One potential concern could be that our results are driven by changes in firms' investment demand rather than covenant triggers, because our sample covers the COVID-19 crisis. We focus intentionally on this period because of the importance of cov-lite loans and the high number of binding covenants during this period. However, the pandemic was a major shock that led to a drop in demand and therefore a shift in investment opportunities and potentially a debt overhang problem (Myers 1977), while at the same time leading to poor financial performance and increasing the likelihood of covenant triggers. The regression discontinuity design as well as our rich set of controls (including loan-type-specific time fixed effects) convincingly mitigate such concerns, but we also provide separate evidence (for example, within-industry estimation or using only data prior to the COVID shock) that our findings are not driven by this particular macroeconomic event.

Our work contributes to several strands of the literature. We add to the research that outlines and measures the mechanisms for propagation of negative shocks through the economy, specifically those mechanisms that operate through debt on firms' balance sheets. This includes the effects of debt overhang articulated in the seminal paper by Myers (1977) and its recent applications (e.g., Giroud and Mueller 2017). It also includes the zombie lending literature (e.g.,

Caballero, Hoshi, and Kashyap 2008; or more recently, Acharya et al. 2019) as well as the literature on costly bankruptcy referenced earlier.

In contrast to this literature, we specifically focus on the mechanisms at play for companies with high levels of leverage and point out that these firms can become constrained without an imminent threat of technical default or bankruptcy. Although bankruptcy as an amplification mechanism has attracted attention in the context of the COVID-19 shock, for a firm to be in default or file for bankruptcy protection there has to be a *trigger*. But most companies were far removed from such triggers in 2020. Because leveraged loans have no pre-payment penalty, they are typically refinanced as credit conditions ease, and an average loan maturity is five years. As a result, there were few pressing maturities when the negative COVID-19 shock hit.[9] While these factors (and several others) can significantly reduce defaults and, therefore, bankruptcy filings, we show that restricted action triggered under incurrence covenants have strong effects on real activity even absent default or bankruptcy.

Our paper relates most closely to the work that examines constraints tied to the debt covenant structure, including Chava and Roberts (2008), Roberts and Sufi (2009), Nini, Smith, and Sufi (2012), Matvos (2013), Falato and Liang (2016), Greenwald (2019), Chodorow-Reich and Falato (2020), and Becher, Griffin, and Nini (2021). These papers, however, focus on traditional (investment-grade-like) bank debt and emphasize the *contingent shift in control rights* and the role of this mechanism in incomplete contract setting. In contrast, high leverage is, almost by definition, tied to nonbank high-yield markets, where the central governance mechanism is contractual (that is, it operates through restricted actions specified in the loan agreement as opposed to through the

[9] For example, according to S&P's Global Market Intelligence, in 2019, 37 percent of all new issuance in the leveraged-loan market was refinancing. This is an even larger share of past loans given that loan volume was growing at 8.8 percent annually in the years leading up to 2019.

shift in control rights). Therefore, as we will elaborate in the next section, what we know about the effects of maintenance covenants does not necessarily allow us to derive implications for incurrence covenants.

As a side point, because of the novelty of our data, our paper also provides a unique insight into the type of preferred actions used by creditors upon activation of incurrence covenants. In the literature focused on maintenance covenants this is largely a "black box". We show that the type of restricted actions used under incurrence covenant mainly fall into three broad categories: (i) diversion of cash flows to more junior claims; (ii) anti-dilution of senior debt; (iii) mergers and acquisitions activity and other investments. We hope that our detailed and novel micro evidence into the form and consequence of incurrence covenants fosters new theory work in this field.

Despite the prevalence of incurrence covenants in the high-yield space, where consequences of debt are most immediate, few studies look at their use and real consequences. Most closely, Berlin, Nini, and Yu (2020) find that a significant fraction of "cov-lite" loan facilities are associated with revolving facilities that carry maintenance covenants. Similar to their study, we will show that maintenance covenants often are included along-side incurrence covenants. Our contribution is to show that incurrence covenants have a substantial binding force of their own. They are set up at a tighter level than maintenance covenants and—when triggered—can have significant economic effect on firms' investments, ahead of the maintenance covenants' impact.

Our work also informs the theoretical literature on contingent contracting including Williamson (1985), Grossman and Hart (1986), Hart and Moore (1990), Aghion and Tirole (1994), and Klein, Crawford, and Alchian (2009). The premise behind this literature is that contractual terms can stretch only so far, and ultimately, contingent control rights reallocation is the optimal form of contracting. Our empirical results provide insight into the extent to which simple

restrictions on borrowers' actions can realign the incentives among borrowers and creditors when financial conditions deteriorate.

The rest of the paper is divided in four sections. The next section (Section II) provides theoretical background and develops hypotheses, Section III introduces the data used in the analysis. Section IV presents the analysis, and Section V concludes.

II. Theoretical Background and Hypotheses Development

Financial covenants play an important economic role in mediating the conflict between equity and debt. Conceptually, stricter covenants increase firms' income pledgeability and, therefore, reduce the cost of debt (Tirole, 2006). As mentioned earlier, the focus of the existing empirical literature has been on economic consequences of maintenance covenant violations.[10] A violation of financial maintenance covenants triggers a shift in control rights from equity holders to creditors. According to Aghion and Bolton (1992) and Dewatripont and Tirole (1994), this contingent transfer of control rights is key to addressing contractual incompleteness and reducing the cost of debt as—upon default—a creditor can "choose her most preferred action or get the entrepreneur to bribe her into choosing the first-best action." In both cases, it is plausible that the investment path will be affected as a result of a control right transfer, and this is the central hypothesis tested in Chava and Roberts (2008).

The question and mechanism tested in our paper is different. Effectiveness of the shift in control rights is predicated on creditors' ability to coordinate. However, like high-yield bonds, leveraged loans (the segment of the credit market characterized by incurrence covenants) are widely syndicated to institutional investors. According to Leveraged Commentary and Data

[10] The existing studies do not explicitly state that they focus maintenance covenants, but—as we will show in the data section—their sample is effectively limited to maintenance covenants.

(LCD), as of the end of 2019, about 86% of any given loan was syndicated to non-bank financial institutions already in the primary market. Overall, there were 315 different institutional investors participating in this segment, with the starting institutional lending group, on average, comprising of 32 different entities for loans below $500 million and 68 for loans of $500 million or above. While a significant fraction of these institutional lenders were collateralized loan obligation (CLOs), given the CLO covenants, lifecycle, and heterogeneity among their managers, it is very likely that their incentives as a group are not well aligned making ex-post bargaining difficult. In sum, the coordination cost among creditors in the leveraged loan market is likely to be large, leading to suboptimal liquidations.[11] In line with this observation, Bolton and Scharfstein (1996) and, more recently, Austin (2022) formalize the idea that firms with high default probability would stay away from types of debt that—due to coordination cost—are expensive when default is beyond a manager's control.[12] Becker and Ivashina (2016) articulate this as a core explanation for prevalence of incurrence covenants in the leveraged loan market.

Consistent with theory, we see that the covenant structure in the leveraged loan market has shifted away from maintenance covenants. However, the covenants are not simply dropped or loosened, instead, they migrate to incurrence covenants, which have a purely contractual mechanism for moderating the conflict between debt and equity and no-longer depend on creditors' coordination. This leads to several questions: What is the degree of incompleteness in the leveraged loan market? Can the outcome of the bargaining process between borrower and creditors triggered by a maintenance covenant be replicated through contingent restricted actions set at the contract inception? If so, which restricted actions should the contract specify? If not, how binding are incurrence covenants? The goal in this paper is to shed light on these questions.

[11] Ivashina and Vrattos (2023) provide a window into complexity of renegotiation of a leveraged loan.
[12] Austin (2022) specifically tied the theory to the setting of leveraged loans and covenant-lite debt.

Although we know a lot about maintenance covenants, it is ex-ante not clear how consequential incurrence covenants are. There are three possibilities: First, if actions of the creditors could be contracted, then we would expect that incurrence covenants would have roughly the same bite as maintenance covenants. This view, however, contrasts with the assumptions in the existing literature and evidence in Matvos (2013) who finds that the economic value of contractual completeness achieved by adding covenants that trigger shift in control rights is substantial.[13]

The second possibility is "weak covenants hypothesis." Say, the contracts in the leveraged loan market are indeed incomplete; after all, incurrence covenants are written on imprecise information and the exact actions and demands of creditors are hard to anticipate and contract. (Yet, inclusion of maintenance covenants is problematic due to creditor coordination costs in the leveraged loan market.) If transfer of control rights is valuable because of contractual incompleteness this would mean that incurrence covenants (contractual governance) should not be effective in moderating debtor-creditor conflicts. One possibility, is that incurrence covenants would be looser than maintenance covenants. This "weak incurrence covenants" hypothesis is certainly in line with the popular perception that cov-lite phenomenon is borrower-friendly.[14] This hypothesis would also be consistent with evidence in Schwert (2020) that noninvestment-grade firms (i.e., leveraged

[13] The dataset in Matvos (2013) is exactly as in Chava and Roberts (2008) which we discuss extensively in the Data section.

[14] For example, the letter of U.S. Senator Elizabeth Warren to Financial Stability Oversight Council (FSOC) from March 19, 2020 points out that "Underwriting standards [for leveraged loans] are poor, and there are few protections for lenders and investors." Similarly, the senator's letter to FSOC from November 14, 2018 indicates that "These loans are generally poorly underwritten and include few protections for lenders and investors." The letter also suggests that increasing prevalence of "covenant-light" loans has to be part of formal NRSRO ratings of leveraged loans. In 2019, former Fed Chair Janet Yellen has stated "I have concerns about the deterioration in lending standards that we have seen. […] A large share of it is covenant-lite and some of the explicit ways in which covenants have weakened are a concern to me."
https://www.reuters.com/article/us-yellen-distressed/yellen-warns-of-corporate-distress-economic-fallout-idUSKCN1QG2CZ. Also Demerjian et al. (2020) highlight the benefits of maintenance covenants over cov-lite loans.

loans) carry a significant premium as weak covenants would be associated with a higher cost of credit. Finally, for the 40% of loans with both incurrence and maintenance covenants, "weak incurrence covenants" would also imply that the binding covenant is the maintenance covenant while incurrence covenants would not have a significant impact on the firm's behavior.

Third, it could also be the case that—because of incomplete contracting and high coordination costs—incurrence covenants are ineffective but are instead very punishing to the borrower (above and beyond maintenance covenants). Nevertheless, this is hard to imagine given the size and growth of the leverage loan market, and the fact that many firms prefer to use the leveraged loan market over the bond market even though these loans are rated and sizable suggests that bonds are a close substitute.[15]

Which of three possibilities dominates is far from trivial. If we are to believe in significant contractual incompleteness, which is what the existing literature has been implying so far, then the evidence on maintenance covenant cannot be generalized to the leveraged loans market. There is also a lot at stake, as for several years leveraged loan market has been at the center of financial stability discussions. To the best of our knowledge, there has not been pushback on the "weak incurrence covenants" hypothesis that has been the dominant view among the top policymakers.

As already previewed in the introduction, we find that incurrence covenants are central and significantly binding even in a setting where both incurrence and maintenance covenants are present. This settles different conceptual possibilities, and contrasts with the existing evidence. To the first degree, our findings put to rest "weak incurrence covenants hypothesis." That said, we cannot fully disentangle whether economic consequences of incurrence covenants are a product of

[15] For example, according to LCD, in 2022, conditional of firms using leveraged loan market, it represented about 90% of the total debt.

(quasi) complete contracts, or a product of blunt tools that creditors have to use in incomplete contracting setting.

III. Data and Descriptive Statistics

A. Data source

The covenant data for our study are largely novel and hand collected. Chava and Roberts (2008), Roberts and Sufi (2009), Nini, Smith, and Sufi (2012), and Greenwald (2019) rely primarily on Thompson Reuter's DealScan covenants data. The analyses in these studies only extend to the Great Financial Crisis (GFC), and— as Figure 1 shows—incurrence covenants were not prevalent then even among the leveraged loans. The growth of the leveraged-loan market and cov-lite phenomenon have accelerated since the GFC, but the DealScan coverage of financial covenants in this segment has precipitously dropped, which we illustrate in Table I. Therefore, we would not be able to do this study without collecting additional covenant information.

[Table I]

Large corporate loans are typically split in tranches, or "facilities". For example, most ubiquitous is the split between revolving and term-loan facilities. We should clarify upfront that, throughout this study, we follow the industry practice and treat the loan package as an individual loan; that is, for our purpose a set of credit facilities covered by the same credit agreement constitutes one observation. (This is also consistent with the methodology in Berlin, Nina and Yu, 2020.) We collect information about all leverage and coverage covenants in the loan contract, that is, we record incurrence and maintenance covenants. About 18 percent of the loans in our sample have maintenance covenants concentrated on only select facilities (typically, revolvers); this is the "split-control" or—in the industry parlance—"quasi cov-lite" phenomenon studied by Berlin, Nini, and Yu (2020). We will consider robustness of our findings to the exclusion of these loans

in the results sections. Regardless, these two types of covenants bind at different levels, with incurrence covenants (through restricted actions) binding first.

In the upper panel of Table I (rows [a] through [d]), we show statistics for the 1994–2005 period, which is the sample period covered in Chava and Roberts (2008). Rows (e) though (h) correspond to 2017 through 2019, the period covered in our sample. Column (1) shows all loans in DealScan that can be mapped to Compustat, which is the source of financial information in our paper and in other studies. The first takeaway is that DealScan includes financial covenant information for about 42 percent of the loans in the 1994–2005 period, but for only 26 percent of the loans originated more recently.

Incurrence covenants are primarily a leveraged-loan market phenomenon, which ties back to the wide institutional creditor base for these loans (e.g., Becker and Ivashina 2016). To zoom in on leveraged loans, we rely on the Standard & Poor's Leveraged Commentary & Data (LCD) database, a leading source of data and analytics in the leveraged-loan market. Like DealScan, LCD reports information on each individual loan. In particular, LCD indicates whether a facility of a loan is cov-lite.[16] (We call a loan cov-lite if any of the term-loan facilities is identified as such in LCD data.) The leveraged loan sample is reported in column (2). Previous studies, including Chava and Roberts (2008), look at the corporate syndicated loan market as a whole and do not differentiate between safer loans and leveraged loans. Conditional on the sample with financial covenant data in DealScan, it appears that about 35 percent (=1,246/3,598) of the 1994-2005 sample corresponds to leveraged loans. But the share of cov-lite loans in this sample is negligent with only 6 loans falling in this category (column 3). So, we should think about Chava and Roberts

[16] S&P's LCD pioneered the systematic coverage of cov-lite loan originations and was tracking them even before the GFC, which enables us to look at the composition of the sample for the 1994–2005 period.

(2008), Roberts and Sufi (2009), Nini, Smith, and Sufi (2012), and Greenwald (2019) as studies of maintenance covenants.

Consistent with the rise of the cov-lite phenomenon after the GFC, column (3) shows that 62 percent for the loans in our 2017–19 sample are cov-lite. But, unfortunately, DealScan financial covenants coverage drops for this period. In particular, 64 percent of leveraged loans have financial covenants reported in DealScan during the 1994–2005 period, and only 22.4 percent have this information reported in the 2017–19 sample.[17]

It is difficult to conclude that there was a bias in DealScan financial covenant reporting for cov-lite loans in the early period of the syndicated loan market, but we can see that during the 2017–19 period, only 11 percent (=52/483) of cov-lite loans have financial covenant information in DealScan compared with 41 percent (=124/301) for "cov-strong" loans. In sum, concerning the covenant data coverage in DealScan, we find that (i) the coverage of financial covenants is significantly scarcer for the more recent sample than for the pre-GFC sample, and (ii) the coverage of incurrence financial covenants is much worse than that of maintenance covenants. These observations are in line with data coverage issues raised by Berlin, Nini, and Yu (2020) who also rely on hand-collected covenant information.

B. Methodology for data collection

To overcome the data limitations in DealScan, we hand-collect detailed maintenance and incurrence covenant information from individual leveraged loan agreements filed with the Security and Exchange Commission (SEC). Part of the challenge of the data-collection exercise is that the format of the loan contracts is not standardized, rendering an automated data extraction infeasible. Given the intensity of the manual data collection, we focus on the most recent period in which

[17] Note that this number is based on the loan count and the numbers in Figure 1 is based on the loan volume.

cov-lite loans play a significant role in the leveraged-loan market (thus ruling out the GFC, when most loan contracts had maintenance covenants). Our sample includes, but is not limited to, the 2020 COVID-19 breakout, for which it is particularly important to understand the propagation mechanism of the economic shock. This shock initiated a strong exogenous drop in income, leading to an increase in the leverage ratio and a drop in the interest coverage ratio, thereby widespread triggering binding covenants (Appendix, Figure A.1).

Our data-collection process can be summarized as follows. To get covenant information, we need to look at actual credit agreements, which is an exercise that requires time and discretion. So, we start by narrowing down the sample of loans we want to examine. In particular, we consider all leveraged loans originated from 2017 through 2019 as recorded in the LCD data set.[18] The three years of loans origination (contracts) is a manageable data-collection task, it is characterized by significant incidence of incurrence covenants, and, given the recency of the loans, most of these loans were outstanding at the onset of the COVID-19 shock which is an important period. Second, we focus on loans taken out by firms that we can match to Compustat, as, ultimately, we need financial information to estimate the effect of contractual restrictions on firms' actions. For this sample of loans, we then read each individual credit agreement and record the thresholds for the leverage ratio and interest-coverage ratio that pertain, as specified in the Financial Covenant section, Restricted Action section, or other parts of the loan agreement. (Appendix A shows an example of how covenant information is collected and coded.) We also complement these hand-collected leveraged-loan data with leveraged loans with maintenance covenants from DealScan. (Recall that DealScan was not helpful with incurrence covenants, but it was reasonable for maintenance covenants.)

[18] That is, the loans in our sample are originated between 2017 and 2019. However, we will follow the covenant violations and financial performance of the borrowers through 2020:Q4.

We focus on covenants restricting the leverage ratio or the interest-coverage ratio due to their dominance in the leveraged-loan market.[19] As illustrated in Figure 2, Panel A, while leveraged-loan contracts featured different types of covenants a decade ago, more recently, the leverage ratio (measured as total debt, net of cash and cash equivalents, expressed as a ratio of EBITDA) is the single most important type of maintenance covenant, with about 76 percent of loans with maintenance covenants having caps on the leverage ratio in 2018. About 11 percent of leveraged loans feature interest-coverage covenants. Other covenant types are less important. Moreover, Figure 2, Panel B, shows that the number of different covenants in a given loan contract has decreased over the past decade at least in the leveraged loan market, and now the majority of loans has at most only two types of financial covenants.

[FIGURE 2]

Table II shows the summary statistics on our data collection. Overall, the sample includes 277 loans, 221 of which we had to hand-collect and code the covenant information. For the majority of the hand-collected covenants, either the loan or the covenant information is missing in DealScan. For the subset of hand-collected loans that also have covenant information in DealScan, Appendix Table A.I benchmarks the hand-collected covenant threshold information with the information provided by DealScan. These numbers are very close to each other, confirming the accuracy of our data collection methodology.

C. Descriptive statistics

Our data collection exercise summarized in Table II renders an interesting fact: many loans with incurrence covenants also include maintenance covenants (for exactly the same financial covenant). Out of 193 (=221-28) loans with incurrence covenants, 83 (or 43 percent) only include

[19] The leverage ratio and interest-coverage ratio are also common types of covenants in the broader corporate loan market (e.g., Chava and Roberts 2008, Greenwald 2019).

incurrence covenants, that is, these contracts purely rely on ex-ante contracting for creditor governance.[20] However, more than half of them include both incurrence and maintenance covenants which are just set at a higher threshold. As an example, take Debt/EBITDA financial covenants, and let's use the average levels of covenant thresholds summarized in Table III. Having both incurrence and maintenance covenants means that if—in a given quarter—borrower's Debt/EBITDA exceeds 3.6x but is below 4.4x then borrower is constrained by the restricted actions specified in its credit agreement. When Debt/EBITDA crosses 4.4x the borrower is in technical default and control rights shift to the creditors.

Table III shows detailed information on the collected data at the covenant level. In Panel A, we see that for maintenance covenants, 144 covenants restrict the borrower's leverage (Debt/EBITDA) ratio, with an average threshold of 4.4x. Our sample also includes 119 maintenance covenants that require the borrower to maintain an interest coverage ratio (EBITDA/Interest Expense) above 2.6x, on average. This is as compared to 3.6x and 2.0x thresholds on incurrence covenants for Debt/EBITDA and EBITDA/Interest Expense, respectively. Thus, we find that incurrence covenants generally incorporate tighter thresholds compared with maintenance covenants, which is intuitive. Table A.II in the Appendix confirms this argument by focusing on firms subject to both maintenance and incurrence covenants. When

[20] There is a discrepancy between Berlin, Nini, and Yu (2020) and our sample. They conclude that toward the end of their sample in 2014 the share of incurrence covenants only among cov-lite loans was about 5% (vs. 43% in our sample). Although we cannot explain this difference completely, this appears to be in part due to different sample periods (our sample covers loans originated between 2017-2019). Another contributing factor could be different approach to identifying "leveraged loans." As an independent observation, S&P LCD data plotted in Figure 1 indicates that, in 2014, about 60% was covenant-lite. LCD also provides, by facility, a covenant-lite indicator in their database. According to this data, in 2014, 55% of all covenant-lite loans were incurrence only. This number is about 68% for 2017-2019. Both hand-collected samples depend on availability of public filings through EDGAR, whereas S&P data is at least partly collected through contributing banks. If loans with incurrence only covenants are likely to be missed in EDGAR (e.g., buyouts), this could explain why our and Berlin et al. numbers are smaller. Overall, our incurrence-only statistic appears to be reasonable.

such a firm triggers an incurrence covenant, it takes, on average, another 3.9 quarters before it also violates the maintenance covenant for the same loan if it ever does so. This lag is important to disentangle the effects for the firms that are bound by both incurrence and maintenance covenants.

In line with the dominance of the leverage ratio among financial covenants highlighted in Figure 2, Panel A, the vast majority of incurrence covenants in our sample restrict certain actions if the leverage ratio exceeds a threshold. Table III, Panel A, indicates that there are 463 restricted actions under the leverage ratio incurrence covenant, and only 53 under the coverage ratio incurrence covenant. In the same panel, we also disaggregate incurrence covenants by the type of restricted actions; note that these are not mutually exclusive. For loans with an incurrence leverage ratio covenant, 184 are tied to restrictions on payments which includes restrictions on dividends and other payments to equity, 151 include restrictions on additional indebtedness, and 119 include restrictions on investments (capital expenditures and acquisitions).

[TABLES II & III]

While the types of incurrence financial covenants are somewhat standard, the restricted actions tied to these covenants are more customized. (Appendix B provides some examples of these restrictions.) In Table III, Panel B we focus on these statistics at the loan level rather than the covenant level (that is, 193 loans with incurrence covenants) and show that, among loans with incurrence covenants, restrictions on payments to shareholders are the most common, but many loans restrict more than one type of action. About 71 percent of contracts with restricted payments (101 out of 142) include a restriction on indebtedness, and about 62 percent (88 out of 142) include restrictions on investment. Overall, these numbers map into the conceptual framework of

covenants in Tirole (2006), which points out that the restricted actions are intended to realign incentives of shareholders with those of their creditors as financial performance deteriorates.[21]

[TABLE IV]

Table IV shows the statistics for loans in our sample that have either a maintenance covenant violation or a triggered restricted action (from exceeding the incurrence covenant threshold).[22] In the case where a loan has multiple maintenance or incurrence covenants, we look at the tightest financial covenant. Since incurrence covenants are typically tighter than maintenance covenants, a loan can have active restrictions without having a maintenance covenant violation. As Table IV shows, throughout our sample period, which extends through 2020:Q4, we observe that about 64 percent of loans, 152 (=51+33+68 in row 2) out of 237 (=68+71+98 in row 1), have a covenant triggered at some point; the triggers most frequently involve the maximum permitted leverage ratio. Focusing on loans with only incurrence covenants, about 75 percent (=51/68) trigger restricted actions tied to the incurrence covenant. On the other hand, focusing on loans with only maintenance covenants, 46 percent (=33/71) have a violation. This difference is consistent with the information in Table III, which shows that restricted actions coded in incurrence covenants—a purely contractual creditor governance mechanism—have a more tightly set trigger than the trigger for the shift in control rights associated with the maintenance covenants.

[21] See Tirole (2006), Section 2.3.3, "Writing of Debt Agreement Covenants." To reiterate, for our empirical methodology, what is relevant is that the trigger is an activated restriction specified in the financial covenant. Although there is variation with restricted actions in incurrence covenants—and arguably infinite possibilities for the course of creditor actions with maintenance covenants studied by Chava and Roberts (2008)—this does not invalidate our approach.

[22] Table IV summary statistics, unlike Table II summary statistics, are reported for our core estimation sample (Table VI). Therefore, we drop borrowers for which we do not have financial information in Compustat. Moreover, to estimate changes in investments before and after a violation, we drop loans that have a violation of a maintenance covenant during the first quarter of origination. The latter choice has no qualitative effect on our results.

One interesting aspect about incurrence covenants and contractual governance is that a company could be under binding restrictions already at the loan origination. Table IV indicates that out of the 119 (=68+51) loans with binding restricted actions under incurrence covenants, 56 loans (47 percent) are binding in the quarter of loan origination. Why exactly financial thresholds would be set up this way is beyond the scope of our paper. For us, this is an important observation given that our main motivation is to highlight borrower constraints on firms' actions as a novel mechanism for propagation of adverse economic shocks like 2020. In a scenario where binding incurrence covenants is the norm, the incremental effect of binding restricted action in economic downturns might not be so large. However, firms can quickly lift those restrictions as their financial ratios improve.[23] Indeed, financial covenants schedules (maintenance or incurrence) are written with the expectation that the company will continuously improve its financial standing as covenant thresholds often become less strict over the life cycle of the loan. This can be seen in the example provided in Appendix A where at loan origination leverage ratio is set at 3.25x, but in the second year of the loan this ratio is 3.00x, and in the third year and thereafter it is 2.75x. Together, this evidence points to the fact that restricted actions are unlikely to be binding as a norm in regular economic times.

Table IV also reports the number of firms and firm-quarters, the ultimate unit of observation in most of our analysis. Most firms are bound by covenants from only one contract. In the few cases where we observe more than one loan outstanding per firm, we consider the tightest covenant among all of the firm's outstanding loans. Overall, we observe 196 firms (=50+59+87 in row 4)

[23] In Section III, we will show robustness of our main findings to the removal of the loans that are originated under constraint. That is, we focus in robustness on the set of incurrence covenants that are not binding at loan originations to confirm that moving from a non-binding to a binding state affects investments.

with a total of 2,191 firm-quarters (=584+638+969 in row 6) in which they are constrained by the triggering of restrictions or a violation of a covenant at some point during our sample period. About 39 percent of firm-quarter observations (316+133+413 in row 7 out of 2,191) show a restrictions trigger or a violation of a covenant threshold. This share is larger than the 15 percent reported in Chava and Roberts (2008). The difference is driven by the COVID-19 shock (which led to substantial income loss and related covenants triggers), by our focus on the leveraged-loan market, and by the fact that our analysis also includes incurrence covenants, which are generally tighter than maintenance covenants.

IV. Main Results

A. Identification strategy

To identify the real consequences of triggering incurrence covenants, we build on the empirical approach in Chava and Roberts (2008) which allows us to address the concern that investment opportunities and the distance between the financial ratios and the covenant threshold may be jointly determined. Suppose the covenant constrains the maximum leverage ratio. In the case of maintenance covenants, the instant that the firm's leverage ratio violates this threshold, regardless of the amount, control rights shift to the lender which can then take various actions that may affect the firm's investment. In the case of incurrence covenants, the instant that the firm's financial ratio exceeds the allowed threshold, regardless of the amount, the firm is prevented from taking certain actions (for example, making payments to equity holders, going further into indebtedness, or substituting assets by undertaking certain investments), although the terms of the

loan do not change. The firm can have the restrictions lifted by improving its financial ratio and complying with the incurrence threshold.[24]

Similar to the previous literature, we focus on firms' investment as a measure of real effects. So, as in Chava and Roberts (2008), the binding state is a binary variable that captures whether the firm has crossed a financial-ratio threshold (thus making restricted actions binding), and the outcome variable (investment rate) is continuous. We focus on capital expenditures as in Chava and Roberts (2008) in our baseline analysis, but also provide additional supporting analysis using research and development (R&D) spending and inventory investment.

Formally, our binary treatment variable, $Bind_{it}$, is defined as

$$Bind_{it} = \begin{cases} 1 \; if \; d_{it} \equiv \; z_{it} - z_{it}^{0} > 0 \\ \\ 0 \; otherwise, \end{cases}$$

where i and t index firm and year-quarter observations, z_{it} is the observed financial ratio, z_{it}^{0} is the corresponding threshold specified by the covenant, and the difference between the two is the distance to covenant threshold, d_{it}. For the leverage ratio, covenants become binding if the leverage ratio is above the threshold specified in the loan agreement. For interest coverage covenants, the inequality sign is reversed, as contracts specify a *minimum* interest-coverage ratio.[25]

As discussed in Section II, we focus on leverage (Total Net Debt/EBITDA) and interest coverage (EBITDA/Interest Expense) financial covenants because these have been the relevant

[24] In practical terms, to have the constraint lifted, the goal is to lower net debt/EBITDA, the most common type of incurrence covenant. There might be some cost-cutting and/or equity cure to boost EBITDA. Another way to achieve this goal is to reduce net debt and constrain investments that requires financing.

[25] If, for a given covenant type (i.e., maintenance or incurrence), the loan agreement specifies covenants based on both interest coverage and leverage, we compute the distance to default as the minimum between the two or adjust for different scales in the two ratios using the same formula as in Chava and Roberts (2008).

financial covenants in the leveraged loan market in the recent years. The sample in Chava and Roberts (2008) allows them to follow Dichev and Skinner (2002) and look at minimum tangible net worth (current assets plus net physical plant, property, and equipment plus other assets minus total liabilities) and minimum current ratio (the ratio of current assets to current liabilities) covenants. As Dichev and Skinner (2002) emphasize, "[they] choose the current ratio and net worth covenants because these are the ratios about which there is the least definitional ambiguity." As emphasized by the authors, this ambiguity is not zero, so, measurement of covenant violations using Compustat has always been noisy.[26] But arguably we should be extra careful using EBITDA-based covenants for which discrepancies from the GAAP definition are well documented.[27] In Section C, we will elaborate how we tackle this problem.

In our core analysis, we employ a parametric estimation of the regression discontinuity following Chava and Roberts (2008). This approach allows us to isolate the effect of covenant triggers on investments (or other firm responses) by controlling for potential confounding factors, such as firm heterogeneity. In order to study the differential impact of maintenance covenant violations and incurrence covenant triggers, we also estimate separate response coefficients for the two covenant types and test for their equality.

Accordingly, our empirical model is given by:

$$Investment_{i,t} = \alpha + \beta_0\, Incurrence\ Bind_{i,t-1} + \beta_1\, Maintenance\ Bind_{i,t-1} + f(d_{it}) + \gamma\, X_{i,t-1} + \epsilon_{i,t},$$

[26] As a separate point, Dichev and Skinner (2002) sample stops in 1999 when the leveraged loan market was in its inception. It is not so clear that if net worth and current ration covenants would have been still widely used in this market, we could just assume that these would have small/smaller measurement error. There has been substantial erosion of contracting terms once the leveraged loan market took off. E.g., see Lawler (2007) for pre-GFC evidence, and Ivashina and Vallee (2020) for more recent state of the market. Without additional research, one should be careful generalizing earlier findings in the loan contracting to the leveraged loan market.

[27] Most recently, see Dyreng, Ferracuti, Hills, and Kubic (2022).

where $Investment_{i,t}$ is capital expenditures as a percentage of beginning-of-the-quarter capital stock, $Incurrence\ Bind_{i,t-1}$ is a dummy variable that equals 1 if an incurrence covenant restriction is binding in the previous quarter and 0 otherwise, and $Maintenance\ Bind_{i,t-1}$ is an analogous dummy variable for a maintenance covenant violation. As discussed earlier, firms can be subject to both types of covenants simultaneously. Our parameters of interest are β_0 and β_1, which measure the impact of a covenant trigger on investment for each of the two classes of covenants.

Most importantly, for the validity of the parametric estimation of the discontinuity (e.g., Lee and Lemieux 2010), we also include polynomials of order two in the distance to the covenant threshold, $f(d_{it})$, in our baseline analysis. (The results are robust to controls of higher order polynomials.) Inclusion of the smooth functions in the distance to default allows us to isolate the discontinuity effect of a covenant trigger on investments, while controlling for the general impact of financial ratios. For example, investments could be generally declining for more levered firms for reasons unrelated to covenants. The presence of such general relationship will be accounted for with the inclusion of a smooth function of the distance to the covenant threshold. More broadly, this approach helps us mitigate concerns that the distance to the covenant threshold contains information about future investment opportunities.

The validity of the regression discontinuity approach requires that firms are not able to accurately manipulate financial ratios (distance relative to the covenant threshold) to avoid a covenant trigger. While the management of financial ratios by the firms is to be expected, standard econometric tests put forward by, e.g., McCrary (2008) and Cattaneo, Jansen, and Ma (2020) allow us to estimate whether the distribution of the distance to covenant trigger at the threshold is sufficiently continuous for the regression discontinuity approach to be valid. The test results

presented in Figure 3 suggest that the assumption of no perfect manipulation at the threshold is valid for both the incurrence and maintenance covenants.

In addition to the polynomial in the distance to covenant threshold, the vector of control variables, $X_{i,t-1}$, also includes the same baseline controls used in Chava and Roberts (2008). These variables include cash flow, log total assets, and macro q, as defined in the notes for Table V. The vector $X_{i,t-1}$ also includes firm fixed effects and quarter fixed effects. Thus, identification of our key parameters comes from changes in investments before and after covenant triggers net of any time trends. Given the reported heterogeneity across firms with incurrence and maintenance covenants, in our tightest specification, we also interact all control variables and time fixed effects with the covenant type dummy variable.

Our inference is based on standard errors that are two-way clustered at the firm and quarter levels, thereby allowing for arbitrary correlation of errors within a firm and across time. We trim the top and bottom 1 percent of all financial ratios entering the regression and discard influential observations that, if removed from the regressions, change the estimated coefficients of interest (β_0 and β_1) by more than three standard deviations as in Bernanke and Kuttner (2005). This methodology helps us estimate robust effects, but they do not qualitatively affect our conclusions.

B. Investment Response

We start by replicating the core specifications in Chava and Roberts (2008), who focus on violations of maintenance covenants, given their sample. This exercise is valuable because our focus is on a different, non-overlapping time window, and we zoom in on the leveraged-loan segment of the loan market. We also use a different data source. So, we want to illustrate that our main results are not driven by the differences in the data. The replication result is reported in Figure

4, Panel A.[28] On the horizontal axis, zero is the quarter of the first covenant trigger for a given loan (either leverage or coverage ratio). The vertical axis depicts capital expenditures (as a fraction of capital stock at the beginning of the quarter) in the one-year window before and after this trigger event. (Note that this unconditional analysis is not controlling for firm heterogeneity or other variables.) In line with the magnitudes in Chava and Roberts (2008), the average investment rate before the covenant trigger is close to 6 percent, but it drops significantly to values below 4 percent following the quarters when the covenant is triggered for the first time.

[FIGURE 4]

In Panel B of Figure 4, we show average investment rates around the first triggering of restrictions under the incurrence covenant. The figure previews the main result of this paper: Once an incurrence covenant becomes binding, restricted actions lead to a substantial reduction in investments.[29]

In the following empirical analysis, we tightly identify and quantify the impact of maintenance covenant violations versus incurrence covenant constraints by accounting for potential confounding factors that may be present in the raw data. The regression discontinuity design helps us measure real effects of contractual constraints stemming from incurrence covenants for a given

[28] This corresponds to Figure 1 in Chava and Roberts (2008). Their figure looks at the current ratio and net worth ratio covenants separately, although the conclusion is the same across the two metrics. As explained earlier, the prevalence of financial covenants has changed over time, which is why we focus on a different metric.

[29] Appendix Figure A.2 provides a different representation of the discontinuity in the raw data to show the impact of covenant trigger on investment. Again, we plot the investment rate on the vertical axis, but this time against the distance to the covenant threshold (i.e., the "running variable" in the terminology of the RDD literature), instead of time to covenant trigger. We also overlay in the graph a nonparametric estimate of the treatment effect (fitted local polynomial) that highlights the discontinuous change in the outcome variable once the covenant threshold is crossed. The figure confirms the basic insight of this paper: Incurrence covenants, just like maintenance covenants, have significant real effects on firms' investment behavior. We next move to conditional analysis to further isolate the main effect.

firm. As mentioned earlier, the cross-sectional analysis—specifically, the comparison of incurrence versus maintenance covenants—however, is subject to sample selection concerns. That is, the choice between contracts that feature maintenance covenants and those that feature incurrence covenants could be endogenous to firm characteristics. We mitigate this selection concern by including a large set of fixed effects and controls in our regression, and by looking at contracts that feature both types of covenants, as we will discuss in more detail below. But we start by examining, in Table V, a range of financial ratios (at loan origination) for firms that have maintenance versus incurrence covenants.

[TABLE V]

There are some differences between firms that have a loan with a maintenance covenant and those that have a loan with an incurrence covenant, although an overwhelming majority of the characteristics are quite similar. For example, while on average, firms with only maintenance covenants appear to have a larger asset size compared with firms that have only incurrence covenants, this difference seems to be driven by extreme observations, as the median asset size across groups are quite similar. Cash flow also seems to be higher (although not significantly) for firms with only maintenance covenants, on average, but the medians again are very similar. Other variables, such as return on assets and investment rates are roughly comparable across firms with different types of covenants. Consistent with the observations in Tables III and V, the financial ratio triggers of incurrence covenants tend to be set tighter than the triggers of maintenance covenants. Although ex ante it might not be fully clear that this would be the case, this finding is consistent with the observation that a shift in control rights is a more serious action for the borrower, and as such it requires a substantially larger deterioration in financial performance.[30]

[30] For example, it could expose a borrower with temporary financial problems to a negative balance sheet shock at the lender level (Roberts and Sahlman, 2011). Alternatively, losing control rights could deprive

[TABLE VI]

To account for such firm heterogeneity and other potential confounders, we strengthen our identification and next present results of the parametric regression discontinuity estimation. Table VI reports coefficient estimates for our key variables of interest. Column (1) reports pooled effects for all covenants becoming binding, without differentiating between incurrence and maintenance covenants. We estimate a highly significant, negative coefficient, indicating that investment contracts by 1.75 percentage points after a covenant trigger. Column (2) shows that investment contracts by 1.80 percentage points after the triggering of incurrence covenant restrictions, and column (3) shows that the effect is the same for those firms without maintenance covenants, alleviating concerns that firms' self-selection into covenant types can affect our estimates. Column (4) shows that investment contracts by 0.94 percentage point after a maintenance covenant violation, and column (5) shows that the effect is similar for those firms without incurrence covenants, again mitigating concerns that firms' self-selection into covenant types affects our estimates.

In column (6), we include the trigger of both maintenance and incurrence covenants. While we find negative and highly significant effects for triggers of both types of covenants, our estimates confirm that the effect for incurrence covenants (–1.83) is significantly larger than the effect for maintenance covenants (–1.00).[31] A test of coefficient equality rejects the null that the effects are equal with a *p*-value of 0.08. Column (7) shows the robustness of these core results to the inclusion

the borrower of much of the optionality by limiting its liquid assets and forcing it to divest in a short period of time, a set of actions that CEOs often describe as creditors "breathing down their neck" (Ivashina, Dionne, and Boyar 2017).

[31] Note that the sample for this specification includes loans with incurrence violations. However, the estimated effect of maintenance covenant violations is similar to that of the sample where we use only loans with maintenance covenant violations. Maintenance covenant violations are always preceded by latent violations.

of additional interaction terms, where we interact all control variables and time fixed effects with dummy variables for each covenant type. The coefficient estimates and differential effects between triggering of incurrence and maintenance covenants remain quantitatively similar and strongly significant.

[FIGURE 5]

Because our identification depends on the discontinuity of investment around the covenant threshold, we re-estimate our model using the subsample of firm-quarter observations that are close to the threshold. Figure 5 shows the coefficient of the incurrence covenants, our main parameter of interest, from column (2) for subsamples that correspond to different bandwidths around the threshold. It is reassuring that the coefficient estimate remains very similar across different subsamples, including the optimal bandwidth based on Calonico et al. (2014) where we lose almost half of the observations. Figure A.3 in the Appendix presents the analogous analysis for the regression in column (7) leading to the same conclusion, providing additional support to the validity of the regression discontinuity design.

Finally, column (8) shows that our results remain practically the same for those firms with both types of covenants. Thus, we confirm again that our results are unlikely to be driven by firms' self-selection into covenant types. It is important to highlight that in the column (8) sample, for a given loan, incurrence covenants always have tighter constraints compared with maintenance covenants. As a result, the coefficient on Incurrence Bind in column (8) is identified from observations in which the incurrence covenant threshold has been crossed but the maintenance covenant threshold had not yet been crossed. This means that in column (8), the coefficient on maintenance covenants can be interpreted as incremental. In Appendix Table A.II, we show that, on average, a loan in the column (8) sample spends about 3.9 quarters with binding restricted actions under incurrence

covenant before also violating the maintenance covenant (if it ever does) and about 2.8 quarters before moving from a binding incurrence covenant to no binding constraint (if it ever does). These seem like reasonable horizons for real effects to take place and for us to be confident we are detecting effects that can be attributed to the triggering of incurrence covenants.

One potential concern with our analysis could be that many of the binding covenants in our sample are from the period of the COVID-19 crisis, a major shock that led to a drop in demand. As discussed in the data section, while we focus intentionally on this period, we provide additional evidence that our findings are not driven by this particular macro shock. In fact, our identification strategy controls for quarter*covenant-type fixed effects and focuses on the discontinuous effect at the covenant threshold, substantially mitigating concerns about demand driven confounders. Moreover, Appendix Figure A.1 shows that our sample includes a substantial share of covenant triggered before 2020:Q1, and triggered during the COVID-19 period are spread over several quarters. In addition, in Appendix Table A.III, we directly control for industry-specific time fixed effects, for example, those related to differential exposure to demand shocks (services, travel, etc.), in addition to our baseline set of controls and fixed effects. Our results remain robust to the inclusion of these additional controls, showing that the covenant triggers are not driven by firms in certain industries that were hit hardest by the pandemic. This pattern highlights the broader implications of our findings. Finally, Appendix Table A.III also shows results for the covenants triggers before the COVID-19 shock; the results remain robust.

For completeness, Table A.V in the appendix presents the same regressions as Table VI but allows for different effects of first-time and subsequent covenant triggers. The coefficient estimates are very similar to those in Table VI, both for first-time and subsequent covenant triggers

with the exception of maintenance covenants where the subsequent covenant triggers lose their statistical significance in all specifications.

C. Robustness to Measurement Error

So far, we have followed the existing literature in using GAAP financial variables to assess whether the covenant trigger has been crossed. However, credit agreements typically do not use GAAP financial variables. Instead, EBITDA, net debt, interest expense, and other accounting variables are defined in the credit agreement. The basic idea for such adjusted definitions is to remove any non-core or non-recurrent items from the GAAP accounting. Other adjustments may involve income generated by unrestricted subsidiaries. Add-backs of non-operating expenses such as stock compensation or pension expenses could inflate income measures used in loan contracts relative to the standard accounting measures obtained from Compustat. In addition, the credit agreement could allow firms to use pro-forma EBITDA. For example, in the context of buyout, it is common to include pro-forma cost savings to compute EBITDA. As a result, our analysis could mismeasure true covenant slack and, therefore, timing of when restricted actions are triggered.

To address these concerns, we take two approaches. First, we follow the literature on mismeasured treatment effects (Calvi, Lewbel, and Tommasi, 2018) and perform a sensitivity analysis to our main results, which allows us to bound the effects of covenant triggers on investment by allowing EBITDA to vary in a reasonable range of values. Second, following Dyreng, Ferracuti, Hills, and Kubic (2022), we explicitly adjust Compustat EBITDA and verify the robustness of our results to such adjustments.

[FIGURE 6 & TABLE VII]

Figure 6 shows the results of the sensitivity analysis. Zero in this figure corresponds to the GAAP financial ratios, that is, the case with no adjustments. As in Table VI, the trigger could be

Debt/EBITDA ratio or interest coverage ratio. We then evaluate the investment change if EBITDA used in the covenant threshold would be up to 50% lower or up to 50% higher. For example, if Debt/EBITDA trigger is set up at 5x, by inflating/deflating EBITDA by 50% we are effectively resetting the covenant limit at 5/1.5= 3.3x and 5*1.5=7.5x.[32] Without a measurement error, the discontinuity effect should be only detectable at zero. With a measurement error, within a reasonable range, we should detect the effect around zero, but for large EBITDA adjustments (large deviations from zero) we would not expect finding any effects given the discontinuity design. This is exactly what we observe in Figure 6: our estimated effects are largest when EBITDA is measured using Compustat variables, with roughly similar quantitative result for adjustments from [-10%; +10%]. (Changing EBITDA within that range leads to about 15% more/less covenant triggers, for incurrence covenants, and about 37% more and 22% less covenant violations for maintenance covenants.) On the other hand, larger EBITDA adjustments and resulting financial ratios lead to very different frequency of covenant triggers, and small and insignificant point estimates of the investment effect supporting the validity of the discontinuity design.

In Table VII, we take a different approach to address concerns that measurement error could bias our estimates by explicitly adding to EBITDA stock-based compensation expenses and pension expenses as in Dyreng, Ferracuti, Hills, and Kubic (2022). Results of this analysis suggest very similar effects to our baseline estimates, lending additional credibility to our analysis.

C. Response of Inventory and R&D Investments

As additional evidence for the importance of incurrence covenant violation on companies' investment activities, we also study the reaction of inventory and R&D investments to covenant

[32] As a reference point for magnitudes, a typical covenant "cushion" is about 25% of EBITDA. (Roberts and Sahlman (2011) describe a common lender practice in the context of leveraged buyouts.)

triggering. Although inventory investment has not been the focus of the literature on financial covenants, the relation of inventory investment to credit conditions has long been studied in the previous literature because inventories account for large fluctuations in GDP (Kashyap, Lamont, and Stein 1994). One would expect that a company would sell its inventories at a faster rate as a way to improve its financial ratios that can trigger a covenant.

As an alternative action, the company can alter its R&D spending. In particular, the company can reduce its R&D investments to free up some cash-flow in an effort to deleverage. Nevertheless, the impact of covenants on R&D may be limited by the fact that debt is not a favored source of finance for R&D investment (Hall and Lerner, 2010).

Table VIII presents results, which confirm the intuition above. In particular, we see that both inventory and R&D investment decline after a covenant is triggered, regardless of the type of covenant, and that inventory investment is more responsive than R&D expenditures.

IV. Economic Mechanism

A. Type of Restricted Actions and Other Consideration

In Table IX, columns (1) and (2), we show that the adverse investment effect from an incurrence covenant becoming biding is not a mechanical effect driven by direct restrictions on investments. (Recall that a large number of incurrence covenants directly restrict capital expenditures or acquisitions.) Instead, we find very similar results if we focus on loans with incurrence covenants that do *not* have any restrictions on investments, but instead constrain equity distributions or indebtedness. Hence, the contractional government mechanism operates through incentives structures that indirectly restrict spending and creditor value preservations, similar to what would be achieved by a shift in control rights.

[TABLE IX]

In Table IX, we also refine our baseline results by considering that maintenance covenants may not apply to all credit facilities in a given loan package. For about 18 percent of the loans in our sample with a maintenance covenant, the covenant applies not to all facilities but only to the revolving credit facility (and potentially other facilities). Such maintenance covenants may be "springing covenants," meaning that they are activated only under certain conditions, such as when the share of utilized credit (relative to the volume of the credit line) is above a certain threshold. This opens the possibility that firms use their credit lines strategically to avoid binding maintenance covenants, which would reduce the measured effect of maintenance covenant violations. In Table VIII, columns (3) and (4), we therefore drop those firm-quarters in which the firm has an outstanding loan contract with a maintenance covenant that does not apply to all facilities and re-estimate the main specifications of Table VI (columns 6 and 7). The results remain qualitatively robust, but we obtain a somewhat larger effect of a maintenance covenant violation on investment.

As another refinement of our analysis, we consider loan amendments. Especially during the COVID-19 period, loans may have been amended as borrower performance deteriorated. In particular, maintenance covenants could have been waived. If we record such cases as covenant triggers in our data set, they would be incorrect, because the waivers actually would have voided the covenants. These amendments, if not accounted for in the empirical analysis, would downward bias our estimated effect of a maintenance covenant violation on investment. LCD data record loan-level amendments, although it is hard for us to quantify the cost at which these amendments take place. That said, in columns (5) and (6), we drop firm-quarters in which the firm has a loan

with a maintenance covenant that has been amended.[33] Consistent with our hypothesis on the nature of the bias, the estimated coefficients increase somewhat. In Appendix Table A.IV, we also verify that our results hold when we exclude loans with incurrence covenant triggers in the quarter of origination. As discussed above, this highlights that borrower constraints on firms' actions embedded in incurrence covenants as a novel mechanism for propagation of adverse economic shocks like 2020.

B. Debt and Leverage

Overall, our results suggest that the investment rate drops significantly after incurrence covenant restrictions are triggered. How exactly do the restricted actions specified in the loan agreement tie to the impact on investments? Although the mechanism is different, the intuition is similar to the way we would think about it in the context of traditional maintenance covenants. Once the control rights shift to the creditors, why they would be interested in cutting investments is somewhat of an unknown. Arguably, reducing investments would be consistent with creditors' desire to limit indebtedness and control actions that increase the firm's risk—ones that are similar to those specified in the restricted actions of an incurrence covenant. Importantly, we might have greater visibility into the exact tie to the investment decisions in the context of incurrence covenants since the control rights stay in the hands of shareholders. Whatever the restricted actions might be, to the degree that they are binding and stand in the way of maximizing equity value (as we just saw in Table IV), relieving this constraint requires improving financial ratios.[34] The great majority of firms trying to get in the "green zone" need to lower their net debt/EBITDA,

[33] About a quarter of loans and firm-quarters in the estimation sample have an amendment.
[34] As discussed above, the impact on investments might be a direct consequence of restricted actions, as opposed to actions that lead to improvements of financial ratios used in incurrence covenants. In fact, in Table VII, we showed that the effect on investments holds when we exclude loans that have incurrence covenants directly restricting investments.

irrespective of the nature of the restricted actions.[35] One way to do so is to boost EBITDA by cost-cutting and/or equity injection, which often is counted toward EBITDA in private-equity-sponsored deals. But another evident channel is to reduce net debt, and constraining investment that requires financing (with moderately growing EBITDA in the background) can offer covenant relief.

[TABLE X]

In Table X, we zoom in on the net-debt-reduction channel by studying the impact of covenant triggers on a firm's debt financing. The regression design follows that of the previous subsection. In columns (1) through (3) we show the change in the debt-to-assets ratio in response to a covenant trigger. The pooled coefficient in column (1) is negative, indicating a drop in the growth of debt of about 2.81 percentage points. When we analyze the trigger of incurrence and maintenance covenants separately in column (2), we find that the trigger of an incurrence covenant leads to a decline in debt growth similar to a violation of a maintenance covenant, about 1.89 percentage points versus 4.43 percentage points.

Finally, in columns (4) through (6), we look at the firm's leverage ratio (net debt/EBITDA) after the covenant trigger, which is the predominant financial ratio constrained by either type of covenant. A maintenance covenant violation would lead to a reduction in this ratio due to the transfer of control rights to the lender, which in turn engages in actions that increase the likelihood of recuperating its funds, such as accelerating debt or cutting costs. Similarly, a firm bound by incurrence covenant triggers ought to improve this ratio to get back into the green zone and not be bound by restrictions. Accordingly, column (4) shows that the leverage ratio decreases, on average,

[35] In the case of maintenance covenants, there is no clear rule for what shifts the control rights back to the shareholders. The specific conditions are the result of negotiation, and—as we noted—they can be overreaching and inflexible.

by about 2x after either type of covenant trigger. The reduction in debt after restricted actions become binding leads to a lower leverage ratio of about 1.6x, whereas we find somewhat stronger effects of deleveraging after a maintenance covenant violation, with a reduction of about 3.3x (column 5). The results presented in column (6) show similar effects when we restrict the sample to loans with both types of covenants. Overall, the debt reduction and deleveraging are consistent with the restrictions affecting investment through a reduction in debt that is similar to the debt reduction that occurs following a shift in control rights.

V. CONCLUSIONS

The US leveraged (that is, high-yield) loan market more than doubled in size following the Great Financial Crisis, growing to nearly $1.2 trillion in outstanding debt by 2019 (Standard & Poor's Leveraged Commentary & Data) and becoming a frequent subject of discussion of central bankers and other policymakers. Leveraged loans—similar to high-yield bonds—are characterized by incurrence, or "cov-lite," financial covenants. A traditional loan agreement requires continuous compliance with financial covenants, and their violation—in the absence of a waiver or amendment granted by creditors—shifts the control rights to the creditors with some severe consequences. Incurrence covenants, instead, include triggers that activate a set of restrictions on the borrower that are pre-specified in the loan agreement. Incurrence covenants therefore do not immediately lead to defaults and do not shift control rights, but as we show in this paper, their triggers nevertheless impose significant constraints on investments indirectly: The drop in investments is as sudden as the decline associated with the shift of control rights to creditors, and it is economically large.

The deleveraging and drop in market value associated with the contractual constraints under the incurrence covenants point to a novel shock propagation mechanism in a highly leveraged

economy. This mechanism is essential for understanding the propagation of demand shocks such as the COVID-19 pandemic, and it is independent of whether the firms eventually file for bankruptcy.

REFERENCES

Acharya, V., T. Eisert, C. Eufinger, and C. Hirsch, 2019, "Whatever It Takes: The Real Effects of Unconventional Monetary Policy," *Review of Financial Studies*, 32: 3366–3411.

Aghion P., and P. Bolton, 1992, "An Incomplete Contracts Approach to Financial Contracting," *Review of Economic Studies* 59 (3), 473-494.

Aghion, P. and J. Tirole, 1994, "The Management of Innovation," *The Quarterly Journal of Economics*, 109(4): 1185–1209.

Americans for Financial Reform, 2023, "Subprime Corporate Debt: A Giant in the Shadows" https://ourfinancialsecurity.org/wp-content/uploads/2023/01/1.6.23-Subprime-Corporate-Debt-A-Giant-in-the-Shadows.pdf.

Austin, N., 2022, "Heterogeneous Creditors and Covenant-Lite Loans," Working Paper.

Becher, D., T. Griffin, and G. Nini, 2021, "Creditor Control of Corporate Acquisitions," Working Paper.

Becker, B. and V. Ivashina, 2016, "Covenant-Light Contracts and Creditor Coordination," Working Paper.

Berlin, M., G. Nini, and E.G. Yu, 2020. "Concentration of Control Rights in Leveraged Loan Syndicates," *Journal of Financial Economics*, 137(1): 249–271.

Bernanke, B. and K. Kuttner, 2005, "What Explains the Stock Market's Reaction to Federal Reserve Policy?" *Journal of Finance*, 60(3): 1221–1257.

Bolton, P., and D. Scharfstein, 1996, "Optimal Debt Structure and the Number of Creditors," *Journal of Political Economy* 104(1), 1-25.

Caballero, R., T. Hoshi and A. Kashyap, 2008, "Zombie Lending and Depressed Restructuring in Japan," *American Economic Review*, 98(5): 1943-1977.

Calonico, S., M.D. Cattaneo, and R. Titiunik, 2014, "Robust Data-Driven Inference in the Regression-Discontinuity Design," *Stata Journal* 14(4): 909–949.

Calvi R., A. Lewbel, and D. Tommasi, 2018, "Women's Empowerment and Family Health: Estimating LATE with Mismeasured Treatment," Working Paper.

Cattaneo, M.D., M. Jansson, and X. Ma, 2020, "Simple Local Polynomial Density Estimator," *Journal of the American Statistical Association* 115(531): 1449-1455.

Chava, S. and M. Roberts, 2008, "How Does Financing Impact Investment? The Role of Debt Covenants," *Journal of Finance* 63(5): 2085–2121.

Chodorow-Reich, G. and A. Falato, 2020, "The Loan Covenant Channel: How Bank Health Transmits to the Real Economy," Working Paper.

Demerjian, P.R., Horne, E., and K. Moon, 2020, "Consequences of Cov-Lite Loans," working paper

Dewatripont, M., and J. Tirole, 1994, "A theory of debt and equity: Diversity of securities and manager-shareholder congruence," *Quarterly Journal of Economics* 109, 1027–1054.

Dichev, I., and D. Skinner, 2002, "Large-Sample Evidence on the Debt Covenant Hypothesis," *Journal of Accounting Research*, 40 (4): 1091-1123.

Dyreng, S., E. Ferracuti, R. Hills, and M. Kubic, 2022, "Measurement Error when Estimating Covenant Violations," Working Paper.

Ellias, J.A., B. Iverson, and M. Roe, 2021, "Estimating the Need for Additional Bankruptcy Judges in Light of the COVID-19 Pandemic," *Harvard Business Law Review*, 11 (online issue).

Falato, A. and N. Liang, 2016, Do Creditor Rights Increase Employment Risk? Evidence from Loan Covenants, *Journal of Finance*, 71(6): 2545–2590.

Goodison, E. and M. Wagner, 2019, "Covenant-Lite Loans: Overview," *Practical Law*. Available at https://www.paulweiss.com/media/3978887/goodison_wagner_practicallaw_aug2019_update.pdf

Giroud, X. and H.M. Mueller, 2017, "Firm Leverage, Consumer Demand, and Employment Losses during the Great Recession," *Quarterly Journal of Economics*, 132(1): 271–316.

Greenwald, D., 2019, "Firm Debt Covenants and the Macroeconomy: The Interest Coverage Channel," MIT Sloan Research Paper No. 5909-19.

Greenwood, R., B. Iverson, and D. Thesmar, 2020, "Sizing Up Corporate Restructuring in the COVID Crisis," NBER Working Paper 28104.

Grossman, S. J. and O.D. Hart, 1986, "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," *The Journal of Political Economy*, 94(4): 691–719.

Group of Thirty, 2020, "Revitalizing and Restructuring Corporate Sector Post-Covid," https://group30.org/publications/detail/4820.

Hall, B., and J. Lerner, 2010, "The Financing of R&D and Innovation," Handbook of the Economics of Innovation 1, Chapter 14, 609-639.

Hart, O., and J. Moore, 1990, "Property Rights and the Nature of the Firm," *The Journal of Political Economy*, 98(6): 1119–1158.

Ivashina, V., J. Dionne, and J. Boyar, 2017, "Blackstone's GSO Capital: Crosstex Investment," Harvard Business School Case 218-008.

Ivashina, V., and W. Vrattos, 2023, "York Capital CLOs and World Strides International," HBS Case Study 9-223-034.

Ivashina, V., and B. Vallee, 2020, "Weak Covenants," NBER Working Paper No. 27316.

Kayshap, A.K., O. A. Lamont, and Jeremy C. Stein, 1994, "Credit Conditions and the Cyclical Behavior of Inventories," *The Quarterly Journal of Economics* 109 (3), 565-592.

Kalemli-Özcan, S., L. Leaven, and D. Moreno, 2020, "Debt Overhang, Rollover Risk, and Corporate Invesment: Evidence from the European Crisis," Working Paper.

Klein, B., R. Crawford, and A. Alchian, 2009, "Vertical Integration, Appropriable Rents, and the Competitive Contracting Process," in *The Economic Nature of the Firm*, edited by R. S. Kroszner and L. Putterman, 96–115, Cambridge University Press.

Lawler, P., 2007, "What Private Equity Firms Want in a Lender," *Commercial Lending Review* 22 (1): 9-17.

Lee, D. S. and T. Lemieux, 2010, "Regression Discontinuity Designs in Economics," *Journal of Economic Literature* 48 (June 2010): 281-355.

Matvos, G., 2013, "Estimating the Benefits of Contractual Completeness," *The Review of Financial Studies* 26 (11), 2798–2844.

McCrary, J., 2008, "Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test," *Journal of Econometrics*, 142(2): 698-714.

Myers, S., 1977, "Determinants of Corporate Borrowing," *Journal of Financial Economics*, 5: 147–175.

Nini, G., D.C. Smith, and A. Sufi, 2012, "Creditor Control Rights, Corporate Governance, and Firm Value," *Review of Financial Studies*, 25(6): 1713–1761.

OECD, 2020, "Corporate Bond Market Trends, Emerging Risks and Monetary Policy, 2020," *OECD Capital Market Series*.

Prilmeier, R., and R.N. Stulz, 2020, "Securities Laws, Bank Monitoring, and the Choice Between Cov-Lite Loans and Bonds for Highly Levered Firms,", working paper.

Roberts, M. J., and W. Sahlman, 2011, "AXA Private Equity: The Diana Investment," Harvard Business School Case 812-042.

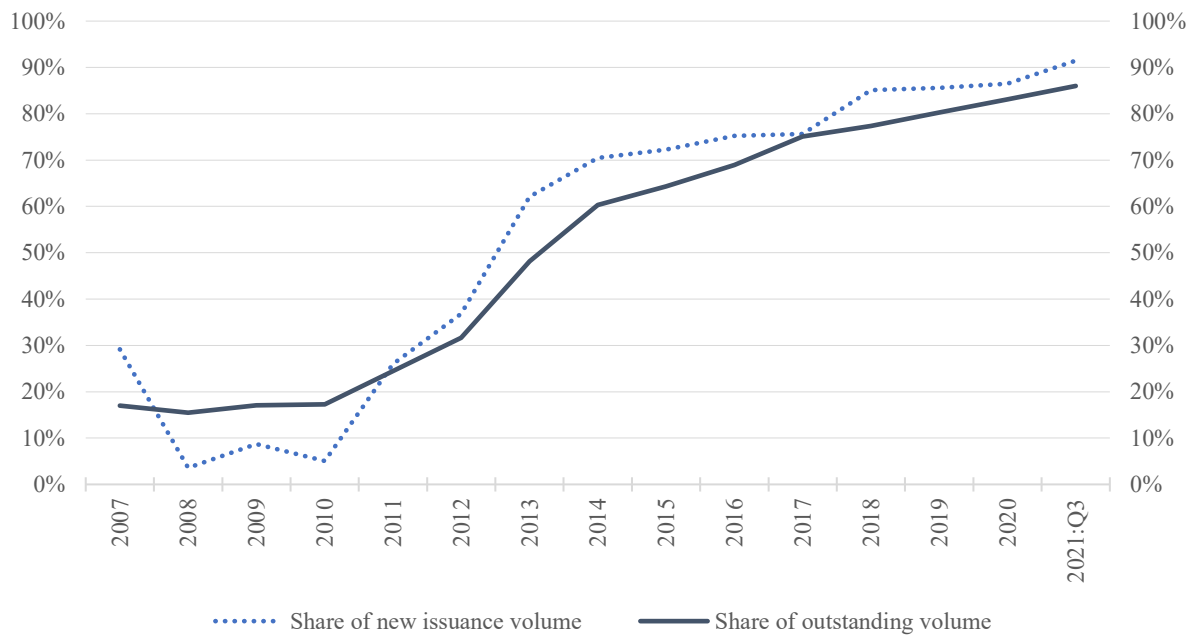
Roberts, M. R. and A. Sufi, 2009, "Control Rights and Capital Structure: An Empirical Investigation," *Journal of Finance*, 64(4): 1657–1695.

Schwert, M., 2020, "Does Borrowing from Banks Cost More than Borrowing from the Market?" *Journal of Finance*, 75(2), 905-947.

Tirole, J., 2006, *The Theory of Corporate Finance*, Princeton University Press.

Williamson, O. E., 1985, "Assessing Contract," *Journal of Law, Economics, and Organization*, 1(1): 177–208.

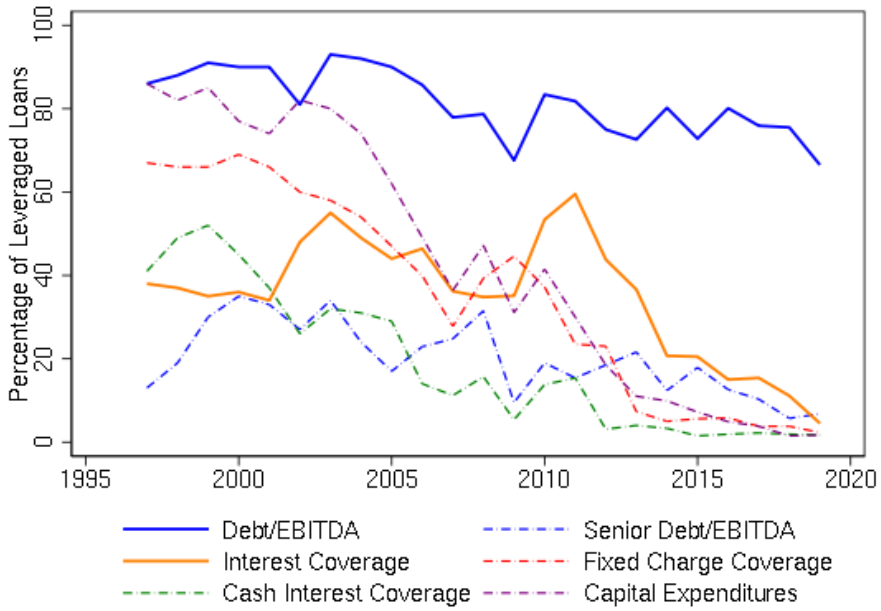
FIGURE 1 – RISE OF COV-LITE LENDING IN THE U.S. LEVERAGED-LOAN MARKET



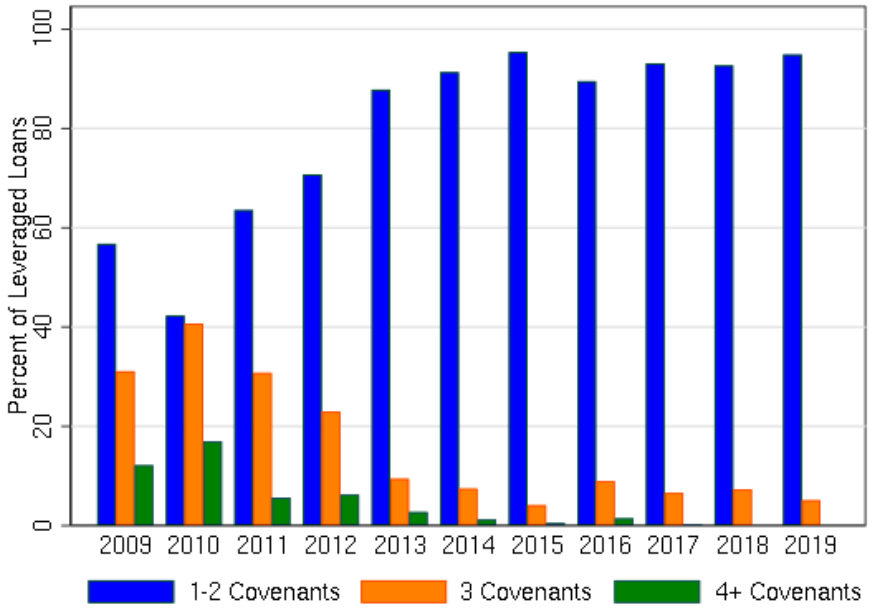
Notes: The figure is compiled from S&P LCD and shows cov-lite share of total new issuance and outstanding U.S. leveraged loans volume that are cov-lite loans. For outstanding volume, we do not have exact data for 2019 and 2020.

FIGURE 2 – FINANCIAL COVENANTS IN THE LEVERAGED-LOAN MARKET

PANEL A: TYPES OF COVENANTS



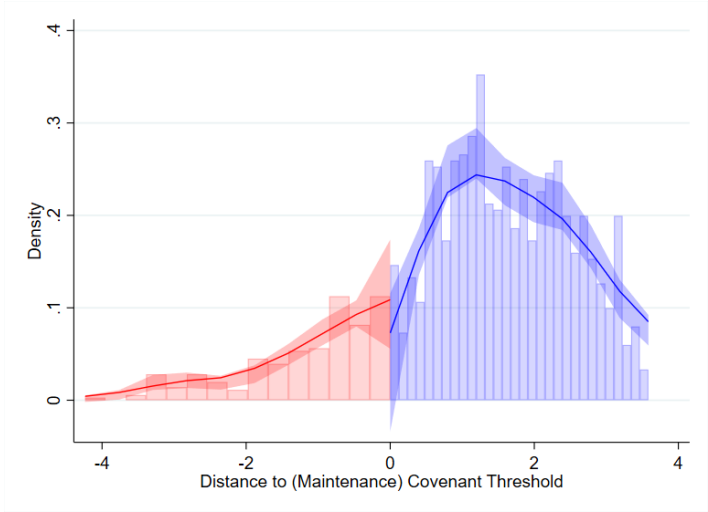
PANEL B: NUMBER OF COVENANTS



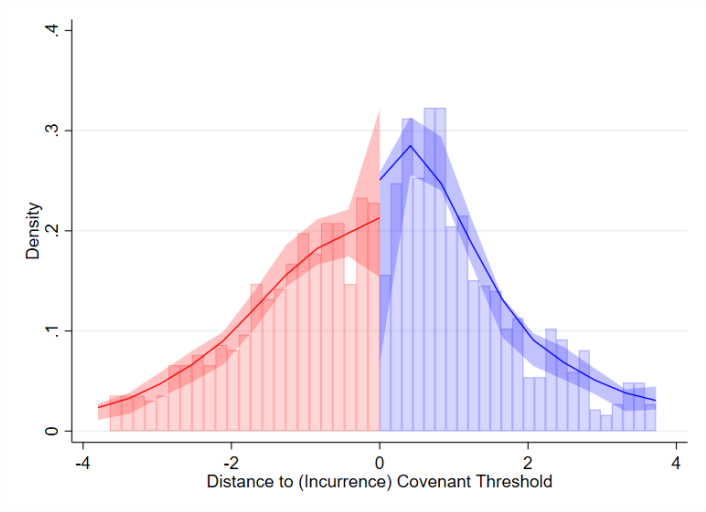
Note: Types of covenants (Panel A) and number of covenants (Panel B) in cov-strong loans. Data are compiled from S&P LCD.

FIGURE 3 – ASSESSING POTENTIAL MANIPULATION AT COVENANT THRESHOLD

PANEL A: MAINTENANCE



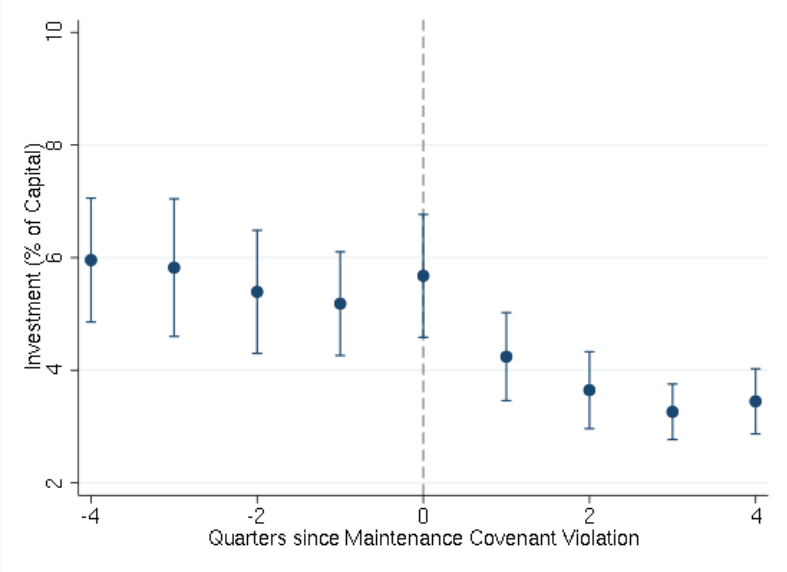
PANEL B: INCURRENCE



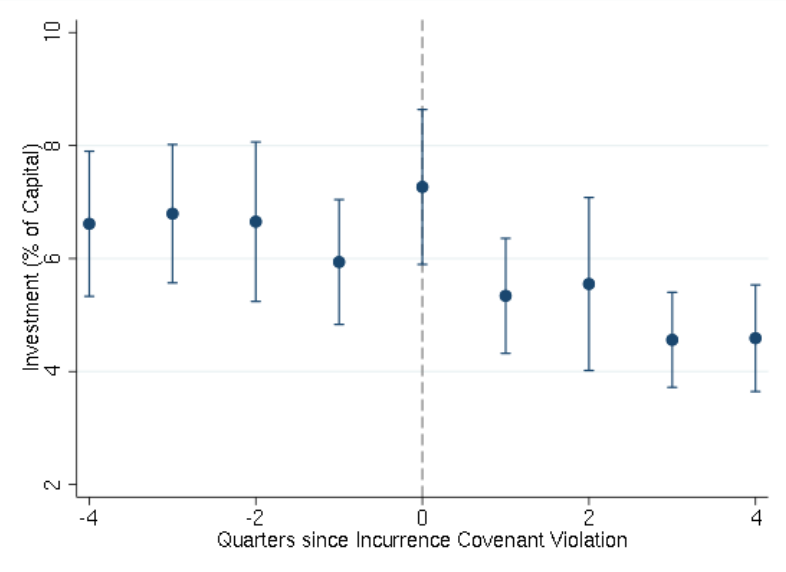
Notes: Following Cattaneo, Janssen, and Ma (2020), the figure shows the estimated density of the running variable, distance to covenant threshold. If the borrowers were able to precisely manipulate financial ratios at the covenant threshold, the density would exhibit a discontinuity at the threshold. The underlying null hypothesis of the test is no manipulation of the running variable and a smooth density at the threshold. Based on the results, we cannot reject the null hypothesis. For maintenance covenants (panel A) the test delivers a statistic of -1.15 (p-value = 0.13) and for incurrence a statistic of -1.51 (p-value = 0.26), suggesting no significant manipulation and sufficiently smooth density of running variable around threshold.

FIGURE 4 – INVESTMENT RESPONSE TO (LATENT) COVENANT VIOLATION

PANEL A: MAINTENANCE

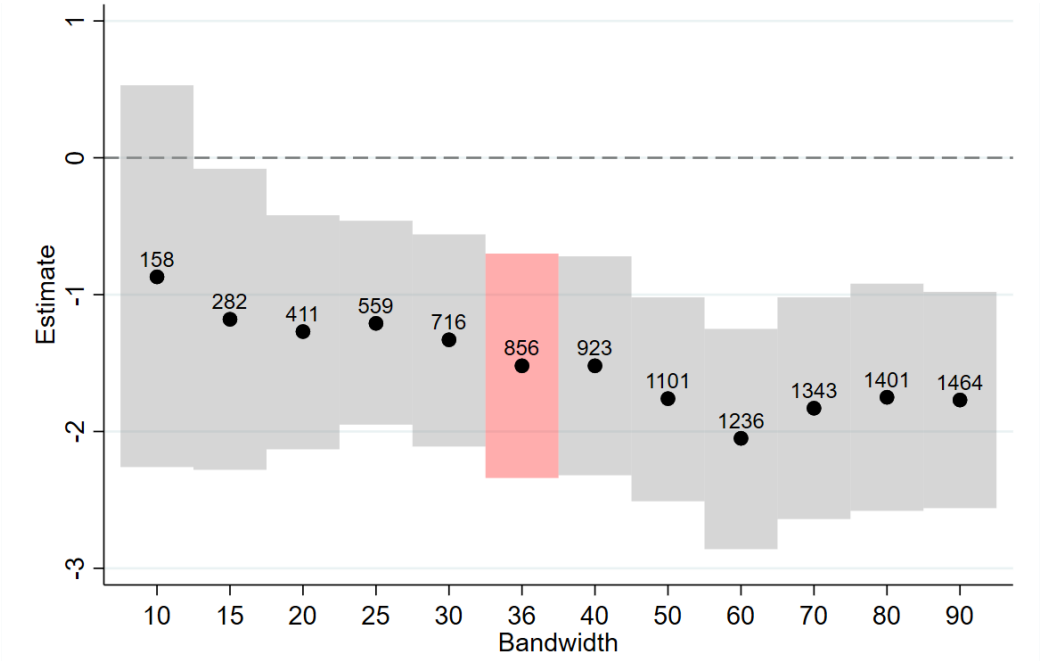


PANEL B: INCURRENCE



Notes: Average investment rates, defined as capital expenditures (investment) as a percentage of beginning-of-quarter property, plants, and equipment (capital), and 90% confidence intervals relative to the quarter of the first (latent) covenant violation.

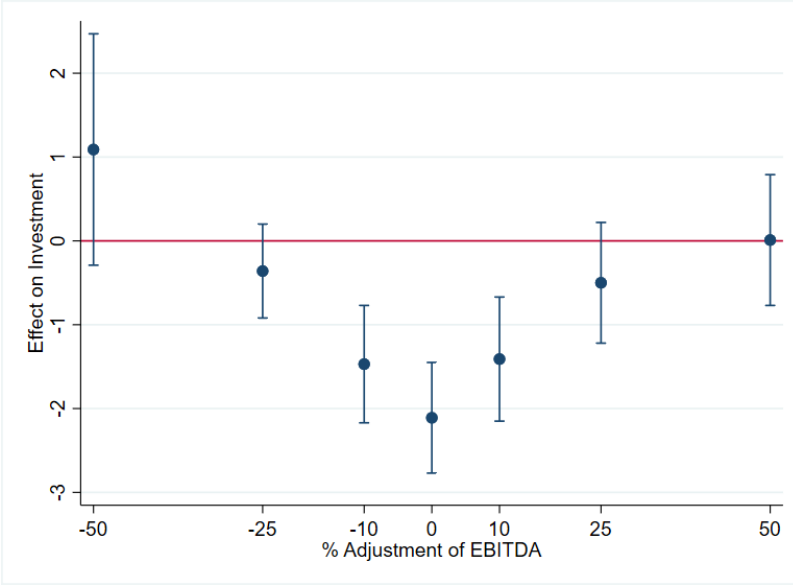
FIGURE 5 – ROBUSTNESS TO THRESHOLDS FOR DISCONTINUITY SAMPLE



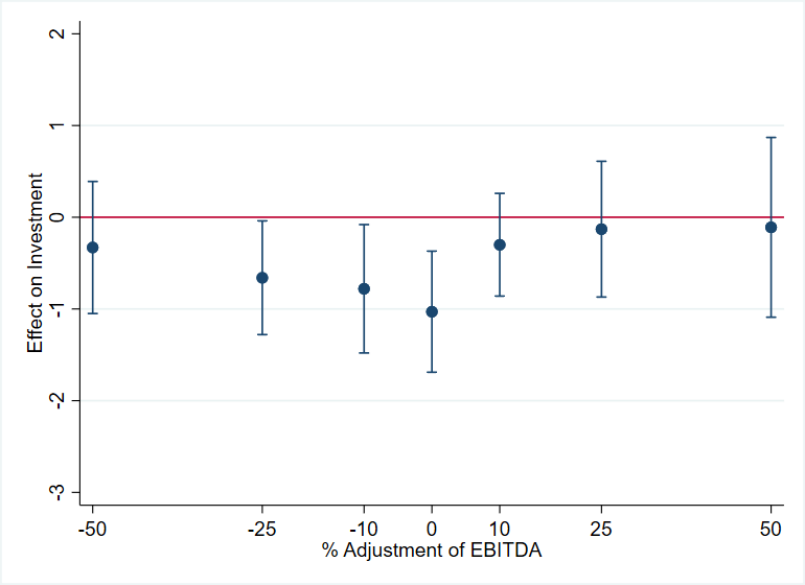
Notes: The figure shows our main results reported in Table VI, column 2, (i.e., the effect of incurrence covenant trigger) for different discontinuity samples around the covenant threshold. Table VI uses the full sample, and here we show results when we include in the regression only observations where the leverage/coverage ratio is at most X percent around the covenant threshold, X = 10, …, 90. The red estimate is obtained by applying the optimal threshold based on the procedure outlined in Calonico et al. (2014). Numbers displayed above the point estimates indicate the sample size of each discontinuity sample. Grey areas indicate 90% confidence intervals.

FIGURE 6 – SENSITIVITY ANALYSIS TO EBITDA ADJUSTMENTS

PANEL A: INCURRENCE



PANEL B: MAINTENANCE



Notes: The figure shows a sensitivity analysis to our main results reported in Table VI to assess the impact of potential mismeasurement of financial ratios on our estimates. Specifically, we inflate/deflate GAAP-based financial ratio by up to 50% and recompute the distance-to-threshold variable and covenant violation dummy, using the adjusted EBITDA. We then re-estimate column 6 of Table VI, see text for details. The results show that in the close vicinity to the GAAP financial ratios, estimates are quantitatively similar to our baseline results, in line with small measurement errors in the financial ratios. Once adjustments become larger effects become close to zero. Point estimates are reported along 90 percent confidence bounds.

TABLE I – DATA COVERAGE IN DEALSCAN

	Sample:	DealScan, all	DealScan and LCD	Cov-lite (LCD flag)	Cov-strong (LCD flag)
		(1)	(2)	(3)	(4)
(a)	1994-2005 (Chava and Roberts 2008)	8,626	1,946	16	1,930
			22.6% *=(2)/(1)*	*0.8%* *=(3)/(2)*	*99.2%* *=(4)/(2)*
(b)	1994-2005, with covenant data in DealScan	3,598	1,246	6	1,240
		41.7% *=(b)/(a)*	*64.0%* *=(b)/(a)*	*0.5%* *=(3)/(2)*	*99.5%* *=(4)/(2)*
(c)	1994-2005, with indebtedness covenant in DealScan	3,037	1,167	6	1,161
		35.2% *=(c)/(a)*	*60.0%* *=(c)/(a)*	*0.5%* *=(3)/(2)*	*99.5%* *=(4)/(2)*
(d)	1994-2005, with interest coverage covenant in DealScan	2,250	843	3	840
		26.1% *=(d)/(a)*	*43.3%* *=(d)/(a)*	*0.4%* *=(3)/(2)*	*99.6%* *=(4)/(2)*
(e)	2017-2019	1,879	784	483	301
			41.7% *=(2)/(1)*	*61.6%* *=(3)/(2)*	*38.4%* *=(4)/(2)*
(f)	2017-2019, with covenant data in DealScan	488	176	52	124
		26.0% *(f)/(e)*	*22.4%* *=(f)/(e)*	*29.5%* *=(3)/(2)*	*70.5%* *=(4)/(2)*
(g)	2017-2019, with indebtedness covenant in DealScan	434	170	51	119
		23.1% *=(g)/(e)*	*21.7%* *=(g)/(e)*	*30.0%* *=(3)/(2)*	*70.0%* *=(4)/(2)*
(h)	2017-2019, with interest coverage covenant in DealScan	258	85	17	68
		13.7% *=(h)/(e)*	*10.8%* *=(h)/(e)*	*20.0%* *=(3)/(2)*	*80.0%* *=(4)/(2)*

Notes: For each period, the sample includes all DealScan loans that we can map to Compustat.

TABLE II – SUMMARY STATISTICS ON LOAN DATA COLLECTION

Number of Loans	Total		Incurrence Only	Maintenance Only	Both
With hand-collected information	221		83	28	110
not in DealScan	35	*(15.8%)*	15	3	17
in DealScan, without covenant info	118	*(53.4%)*	60	18	40
in DealScan, with covenant info	68	*(30.8%)*	8	7	53
Covenant information from DealScan	56		0	56	0
Total	277		83	84	110
Incurrence covenants, total	193				
Maintenance covenants, total	194				

Notes: This table shows the source of covenant information for the loans use in this paper. Each observation is a loan. The sample is restricted to loans by firms with financial information in Compustat and loans that have either a leverage or interest-coverage ratio covenant. The column labeled *Both* refers to loans that have both incurrence and maintenance covenants.

TABLE III –TYPES OF FINANCIAL COVENANTS AND RESTRICTED ACTIONS

Panel A: Number and level of covenants by category

	Total Obs.	Leverage			Interest Coverage		
		Obs.	Mean	Median	Obs.	Mean	Median
Maintenance Covenants	169	144	4.39	4.25	119	2.63	3
Incurrence Covenants	500	463	3.61	3.5	53	1.98	2
Restricted Payments	194	184	3.35	3.3	16	2.11	2
Indebtedness	172	151	3.91	3.75	31	2.01	2
Investments	122	119	3.59	3.5	3	2	2
Other	12	9	3.89	3.75	3	1	1

Panel B: Comparison of pairwise occurrences of restricted actions in loans with incurrence covenants

	All loans	Loans with single restricted action	Restricted Payments	Indebtedness	Investments	Ohter
Restricted Payments	142	23	-	101	88	3
Indebtedness	122	14	101	-	74	6
Investments	95	3	88	74	-	3
Other	6	0	3	6	3	-

Notes: Panel A provides a breakdown of the covenant information used in this paper for the sample of loan in our main regressions (Table VI). Each observation is a covenant. Restricted actions related to incurrence covenants are grouped as follows: (i) restricted payments (typically dividends and other payments to equity), (ii) additional indebtedness (for example, incurring indebtedness and modifying junior debt), (iii) investments (for example, capital expenditures and acquisitions), and (iv) other. Some loans have different incurrence covenants related to the same type of restricted actions; that is, within the same cov-lite loan, a leverage ratio and a coverage ratio covenant could be tied up to the same restricted actions. In Panel B the goal is to look at the co-incidence of different restricted actions within cov-lite loans. In particular, the last four columns present a matrix that indicates how frequently different types of restricted actions appear in the same loan contract.

TABLE IV –INCIDENCE OF COVENANT TRIGGERS

	Incurrence Only			Maintenance Only			Both		
	Leverage	Int Cov.	Either	Leverage	Int Cov.	Either	Leverage	Int Cov.	Either
Number of Loans	64	29	68	59	45	71	98	80	98
Number of Violating Loans	50	8	51	31	7	33	68	14	68
Number of Violating (at origination) Loans	29	4	30	0	0	0	26	0	26
Number of Firms	47	21	50	51	36	59	87	73	87
Number of Violating Firms	38	5	39	25	5	26	61	14	61
Number of Firm-Quarters	545	248	584	538	407	638	969	803	969
Number of Violating Firm-Quarters	302	32	316	119	19	133	406	40	413

Notes: Note that these numbers count only triggers of the strictest loan covenant a firm is under in a given quarter. The sample is restricted to loans that are used in our main regression analysis in Table VI.

TABLE V – LOAN SUMMARY STATISTICS AND FIRM FINANCIALS

	Incurrence Only (A)		Maintenance Only (B)		Both (C)		p-value for difference in means		
	I-Mean	I-Median	M-Mean	M-Median	B-Mean	B-Median	M vs I	Both vs I	M vs Both
Assets (Billions USD)	3.074	2.318	3.841	2.362	4.285	2.431	0.246	0.058	0.582
Market to Book Ratio	1.686	1.582	1.737	1.541	1.781	1.567	0.731	0.489	0.772
Macro Q	21.634	12.641	14.509	8.316	20.542	11.576	0.070	0.870	0.142
ROA	0.034	0.033	0.031	0.032	0.036	0.033	0.426	0.579	0.072
Capital/Assets	0.155	0.115	0.242	0.157	0.164	0.112	0.005	0.646	0.011
Investment/Capital	0.066	0.065	0.058	0.042	0.068	0.049	0.267	0.813	0.253
Cash Flow	0.267	0.143	0.461	0.130	0.362	0.171	0.352	0.462	0.672
Loan Size ($ Billion)	1.089	0.775	0.832	0.650	1.174	0.958	0.085	0.591	0.005
Loan Size/ Assets	0.439	0.373	0.312	0.267	0.421	0.387	0.008	0.715	0.004
Initial Leverage Covenant	3.377	3.375	4.470	4.250	4.346	4.250	0.000	0.000	0.447
Initial Leverage Tightness	-0.086	0.414	1.908	1.697	2.049	1.793	0.000	0.000	0.551
Initial Interest Coverage Covenant	2.009	2.000	2.357	2.500	2.759	3.000	0.031	0.000	0.019
Initial Interest Coverage Tightness	3.668	3.393	6.452	4.583	4.501	3.974	0.006	0.328	0.233
Number of Loans	68		71		98				

Notes: All firm financials are reported as of the originating quarter of the loan. *Market-to-Book Ratio* is the market value of assets to book total assets, where the numerator is defined as the sum of market equity, total debt, and preferred stock liquidation value less deferred taxes and investment tax credits. *Macro Q* is the sum of total book debt and market equity less total inventories divided by the start-of-period capital stock measured by net property, plant, and equipment. *ROA* is the ratio of operating income before depreciation to total assets. *Capital/Assets* is the ratio of total property, plant, and equipment to total assets. *Investment/Capital* is the ratio of capital expenditures to the start-of-period property, plant, and equipment. *Cash Flow* is the ratio of income before extraordinary items plus depreciation and amortization to start-of-period property, plant, and equipment. Covenant *Tightness* is measured as the difference between the threshold value for the financial ratio specified in the covenant and the firm's actual financial ratio in the quarter of origination. The sample is restricted to loans that are used in our main regression analysis in Table VI.

TABLE VI – INVESTMENT AND (LATENT) COVENANT VIOLATION

	Investment (% Capital)							
			Only incurrence		Only maintenance			Both types
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bind	-1.75***							
	(0.30)							
Incurrence Bind		-1.80***	-2.17***			-1.83***	-2.11***	-2.11***
		(0.34)	(0.71)			(0.34)	(0.33)	(0.37)
Maintenance Bind				-0.94**	-1.00*	-1.00**	-1.03***	-0.99**
				(0.38)	(0.51)	(0.39)	(0.33)	(0.45)
Observations	1,752	1,752	481	1,752	496	1,752	1,752	768
R-Squared	0.73	0.73	0.71	0.72	0.67	0.73	0.74	0.77
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls*Cov-Type	No	No	No	No	No	No	Yes	Yes
Quarter*Cov-Type FE	No	No	No	No	No	No	Yes	Yes
H0: Incurrence=Maintenance						0.823	1.074	1.119
p-value						0.0813	0.0122	0.0149

Note: The table reports the effect of covenant violations on investment using data at the firm-quarter level. The dependent variable *Investment* is defined as capital expenditures as a percentage of beginning-of-quarter net property, plants, and equipment. *Bind* is a dummy variable that equals 1 if the firm is in (latent) violation of a financial covenant and 0 otherwise. *Incurrence Bind* is a dummy variable that equals 1 if the firm is in (latent) violation of an incurrence covenant. *Maintenance Bind* is a dummy variable that equals 1 if the firm is in violation of a maintenance covenant. All columns include the same baseline controls from Chava and Roberts (2008): log(assets), cash flow, macro q, and a polynomial of order two in the distance to default. All variables except cash flow are lagged by one period. The sample period includes all firm-quarters from 2017:Q1 through 2020:Q4, where the firm was restricted by a covenant of a leveraged loan originated from 2017 through 2019. Columns (3), (5), and (8) restrict the sample to firms with loan that have only incurrence covenants, only maintenance covenants, or both incurrence and maintenance covenants, respectively. Standard errors, reported in parentheses, are two-way clustered at the firm and time level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

TABLE VII – ROBUSTNESS ANALYSIS TO EBITDA ADJUSTMENTS

	Add stock-based compensation expense		Add stock-based compensation and pension expenses	
	(1)	(2)	(3)	(4)
Incurrence Covenant Violation	-1.27***	-1.40***	-1.16***	-1.28***
	(0.34)	(0.36)	(0.38)	(0.39)
Maintenance Covenant Violation	-0.94**	-0.86**	-0.81*	-0.59
	(0.39)	(0.32)	(0.41)	(0.41)
Observations	1,543	1,543	1,548	1,548
R-Squared	0.73	0.74	0.74	0.75
Firm FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Controls*Cov-Type	No	Yes	No	Yes
Quarter FE*Cov-Type	No	Yes	No	Yes
H0: Maintenance = Incurrence	0.322	0.540	0.350	0.687
p-val	0.572	0.324	0.606	0.307

Notes: The table shows the robustness of our main results in Table VI, columns 6 and 7, to adjusting EBITDA for stock-based compensation and pension expenses.

TABLE VIII – R&D INVESTMENT AND INVENTORY CHANGES IN RESPONSE TO COVENANT TRIGGER

	Δ Inventory (% Assets)			R&D Expenditures (% Assets)		
			Both types			Both types
	(1)	(2)	(3)	(4)	(5)	(6)
Bind	-0.68***			-0.08		
	(0.16)			(0.05)		
Incurrence Bind		-0.76**	-0.71**		-0.08*	-0.08*
		(0.26)	(0.31)		(0.04)	(0.04)
Maintenance Bind		-0.77***	-0.80*		-0.12**	-0.12**
		(0.23)	(0.41)		(0.06)	(0.05)
Observations	1,231	1,763	782	926	926	453
R-Squared	0.08	0.19	0.20	0.96	0.96	0.97
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls*Cov-Type	No	Yes	Yes	No	Yes	Yes
Quarter FE*Cov-Type	No	Yes	Yes	No	Yes	Yes
H0: Incurrence=Maintenance		-0.005	-0.082		0.097	-0.045
p-value		0.9863	0.8355		0.3581	0.4950

Note: This tables shows the effect of covenant violation on investment into research and development and the change in inventory at the firm-quarter level. In columns (1) through (3), the dependent variable, *Δ Inventory,* is defined as the change in inventory (as a percentage of total assets). In columns (4) through (6), the dependent variable, *R&D Expenditures,* is defined as the total expenditures in research and development (as a percentage of total assets). *Bind* is a dummy variable that equals 1 if the firm is in (latent) violation of a financial covenant and 0 otherwise. *Incurrence Bind* is a dummy variable that equals 1 if the firm is in (latent) violation of an incurrence covenant. *Maintenance Bind* is a dummy variable that equals 1 if the firm is in violation of a maintenance covenant. All columns include the same baseline controls from Chava and Roberts (2008): log(assets), cash flow, macro q, and a polynomial of order two in the distance to default. All variables except cash flow are lagged by one period. The sample period includes all firm-quarters from 2017:Q1 through 2020:Q4, where the firm was restricted by a covenant of a leveraged loan originated from 2017 through 2019. Standard errors, reported in parentheses, are two-way clustered at the firm and time level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

TABLE IX – THE ROLE OF DIRECT RESTRICTIONS ON INVESTMENT, QUASI-COV-LITE LOANS AND AMENDED CONTRACTS

	Investment (% Capital)					
	Excl. Incurrence w/ Investment Restrictions		Excl. Maintenance on Revolving Line		Excl. Contracts w/ Amendments	
	(1)	(2)	(3)	(4)	(5)	(6)
Incurrence Bind	-2.00***	-2.48***	-2.05***	-2.24***	-1.95***	-2.19***
	(0.39)	(0.42)	(0.46)	(0.53)	(0.40)	(0.40)
Maintenance Bind	-0.71	-1.13**	-1.07**	-1.12**	-1.06**	-1.13***
	(0.45)	(0.51)	(0.44)	(0.45)	(0.42)	(0.37)
Observations	1,021	1,021	1,034	1,032	1,561	1,561
R-Squared	0.73	0.75	0.71	0.72	0.71	0.72
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls*Cov-Type	No	Yes	No	Yes	No	Yes
Quarter*Cov-Type FE	No	Yes	No	Yes	No	Yes
H0: Incurrence=Maintenance	1.286	1.343	0.974	1.116	0.886	1.057
p-value	0.0200	0.0175	0.0637	0.0434	0.0581	0.0276

Note: The table reports the effect of covenant violations on investment using data at the firm-quarter level, similar to the baseline results in Table VI, columns (6) and (7). However, columns (1) and (2) drop loans that have incurrence covenants that directly restrict investments once the covenant threshold is crossed. Column (3) and (4) drop loans from the sample that have a maintenance covenant restricted to the revolving credit line facility. Columns (5) and (6) drop loans after they have been amended.

TABLE X – DEBT RESPONSE TO COVENANT TRIGGER

	Δ Debt/Asset (ppt)			Δ Leverage Ratio		
			Both types			Both types
	(1)	(2)	(3)	(4)	(5)	(6)
Bind	-2.81***			-2.02**		
	(0.48)			(0.73)		
Incurrence Bind		-1.89***	-1.72***		-1.64**	-1.60**
		(0.47)	(0.49)		(0.61)	(0.63)
Maintenance Bind		-4.43***	-3.90***		-3.27**	-3.73**
		(0.54)	(0.57)		(1.30)	(1.74)
Observations	1,130	1,130	691	1,231	1,231	763
R-Squared	0.38	0.43	0.41	0.08	0.14	0.17
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls*Cov-Type	No	Yes	Yes	No	Yes	Yes
Quarter FE*Cov-Type	No	Yes	Yes	No	Yes	Yes
H0: Incurrence=Maintenance		-2.539	-2.186		-1.636	-2.130
p-value		0.001	0.001		0.096	0.115

Note: This tables shows the effect of covenant violation on quantity and cost of debt at the firm-quarter level. In columns (1) through (3), the dependent variable, *Δ Debt/Asset,* is defined as the change in total debt over assets (as a percentage). In columns (4) through (6), the dependent variable, *Δ Leverage Ratio,* is defined as the change in net debt over EBITDA. *Bind* is a dummy variable that equals 1 if the firm is in (latent) violation of a financial covenant and 0 otherwise. *Incurrence Bind* is a dummy variable that equals 1 if the firm is in (latent) violation of an incurrence covenant. *Maintenance Bind* is a dummy variable that equals 1 if the firm is in violation of a maintenance covenant. All columns include the same baseline controls from Chava and Roberts (2008): log(assets), cash flow, macro q, and a polynomial of order two in the distance to default. All variables except cash flow are lagged by one period. The sample period includes all firm-quarters from 2017:Q1 through 2020:Q4, where the firm was restricted by a covenant of a leveraged loan originated from 2017 through 2019. Standard errors, reported in parentheses, are two-way clustered at the firm and time level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

APPENDIX

A. – Example of Financial Covenants Data Collection

The following excerpt shows an example of a covenant in our data-collection process. The passage comes from the loan agreement entered by Lattice Semiconductor Corp (LCD Loan ID 9087) and can be found on pages 90 and 105 (97 and 112 in the PDF):

> *"ARTICLE IX*
>
> *NEGATIVE COVENANTS*
>
> *Until all of the Obligations (other than contingent indemnification obligations and expense reimbursement obligations not then due and payable) have been paid and satisfied in full in cash, all Letters of Credit have been terminated or expired (or been Cash Collateralized) and the Commitments terminated, the Credit Parties will not, and will not permit any of their respective Subsidiaries to:*
>
> *(…)*
>
> *Section 9.12 Financial Covenants*
>
> *(a) Consolidated Total Leverage Ratio. As of the last day of any fiscal quarter ending during the periods specified below (which dates shall be deemed to correspond to the fiscal quarter ending on or about such applicable date), permit the Consolidated Total Leverage Ratio to be greater than the corresponding ratio set forth below:*

Period	*Maximum Ratio*
June 30, 2019 through June 30, 2020	*3.25 to 1.00*
September 30, 2020 through June 30, 2021	*3.00 to 1.00*
September 30, 2021 and thereafter	*2.75 to 1.00*

> *"*

Thus, this contract restricts the permitted leverage ratio to at or below the maximum ratio defined in the table. The example was chosen to highlight that the maximum ratios can vary over time, and we incorporate this feature to some extent in our data-collection process as follows: We take the maximum leverage ratio at loan origination and at loan maturity and interpolate the values for the quarters in between.

B. – Examples of Incurrence Covenants

1. Ashland Inc, RC/TLa 6/17

"Restricted Payment" means any dividend or other distribution (whether in cash, securities or other property) with respect to any capital stock or other Equity Interest of any Person or any of its Subsidiaries, or any payment (whether in cash, securities or other property), including any sinking fund or similar deposit, on account of the purchase, redemption, retirement, defeasance, acquisition, cancellation or termination of any such capital stock or other Equity Interest, or on account of any return of capital to any Person's stockholders, partners or members (or the equivalent of any thereof).

…

the Borrower … shall not, nor shall it permit any Subsidiary to, directly or indirectly:

…

7.06 Restricted Payments. Declare or make, directly or indirectly, any Restricted Payment, or incur any obligation (contingent or otherwise) to do so, except that, so long as no Event of Default shall have occurred and be continuing at the time of any action described below or would result therefrom: …

---

2. Synchronoss Technologies, TL 2/17

10.6 Limitation on Investments. The Borrower will not, and will not permit any of its Restricted Subsidiaries to, make, purchase, or acquire any Investments, except (each, a "Permitted Investment"):

…

(y) so long as no Event of Default shall have occurred and be continuing at the time of such Investment, the Borrower or any Restricted Subsidiary may make additional Investments so long as, after giving effect thereto on a Pro Forma Basis, the Consolidated Total Debt to Consolidated EBITDA Ratio is not greater than 2.75:1.00;"

---

3. Cohu, TL 10/18

"Restricted Equity Payment" means (a) any dividend or other distribution, direct or indirect, on account of any shares of any class of stock of the Borrower now or hereafter outstanding, except a dividend payable solely in Capital Stock of the Borrower (other than Disqualified Capital Stock); (b) any redemption, retirement, sinking fund or similar payment, purchase or other acquisition for value, direct or indirect, of any shares of any class of stock of the Borrower now or hereafter outstanding, other than in exchange for Capital Stock of the Borrower (other than Disqualified Capital Stock); and (c) any payment made to retire, or to obtain the surrender of, any outstanding warrants, options or other rights to acquire shares of any class of stock of the Borrower now or hereafter outstanding, other than in exchange for Capital Stock of the Borrower (other than Disqualified Capital Stock).

"Restricted Junior Payment" means any Restricted Equity Payment and any Restricted Debt Payment.

…

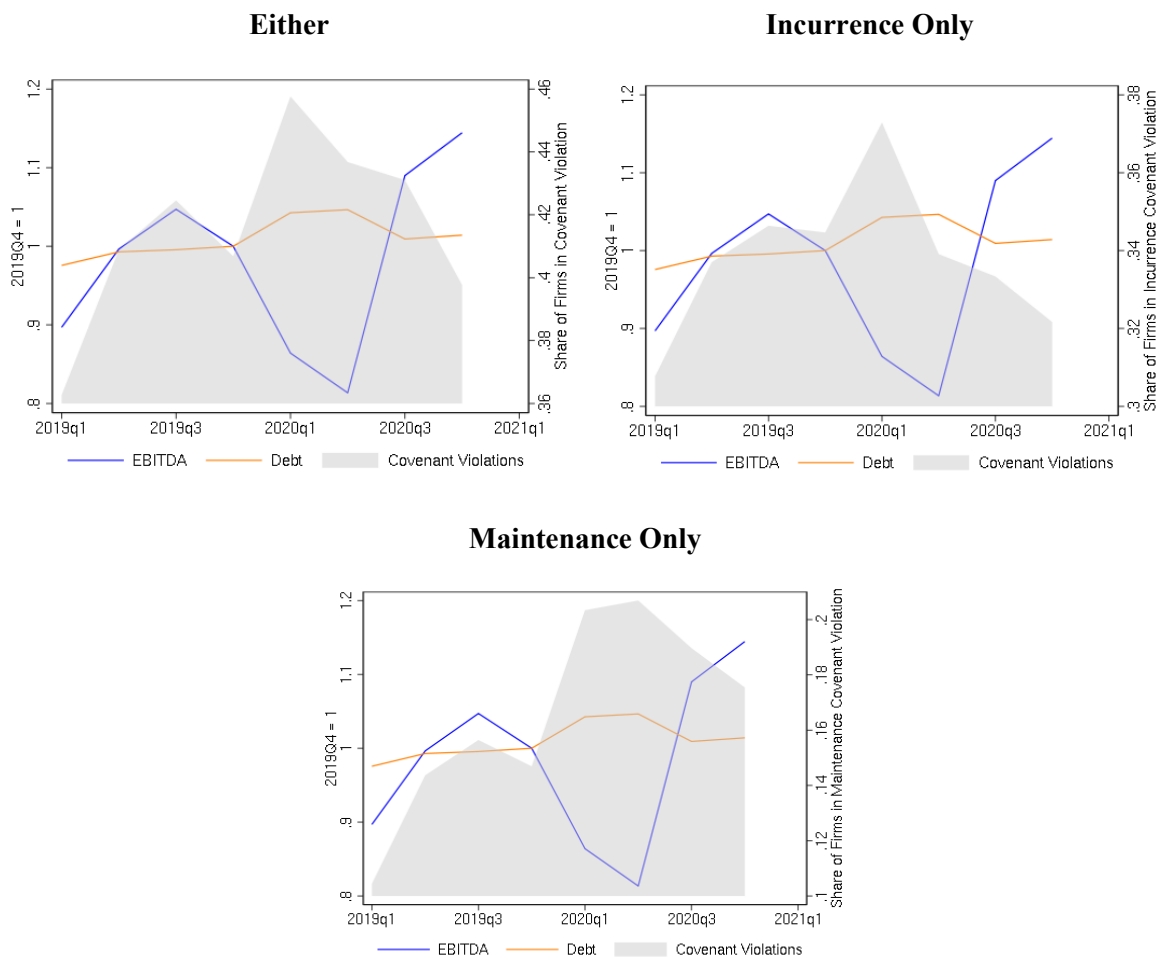
6.4 Restricted Junior Payments. The Borrower will not, nor will it permit any Subsidiary to, directly or indirectly, pay or make any Restricted Junior Payment except:

…

(g) Restricted Junior Payments in an aggregate amount not to exceed the Available Amount as in effect immediately before such Restricted Junior Payment; provided that (i) no Event of Default has occurred and is continuing or would result therefrom and (ii) the Total Net Leverage Ratio on a Pro Forma Basis would be less than or equal to 3.50:1.00;

(h) Restricted Equity Payments and Restricted Debt Payments, so long as (i) no Event of Default has occurred and is continuing at such time or would result from the making of such Restricted Junior Payment, (ii) the Total Net Leverage Ratio on a Pro Forma Basis would be less than or equal to 1.75:1.00."

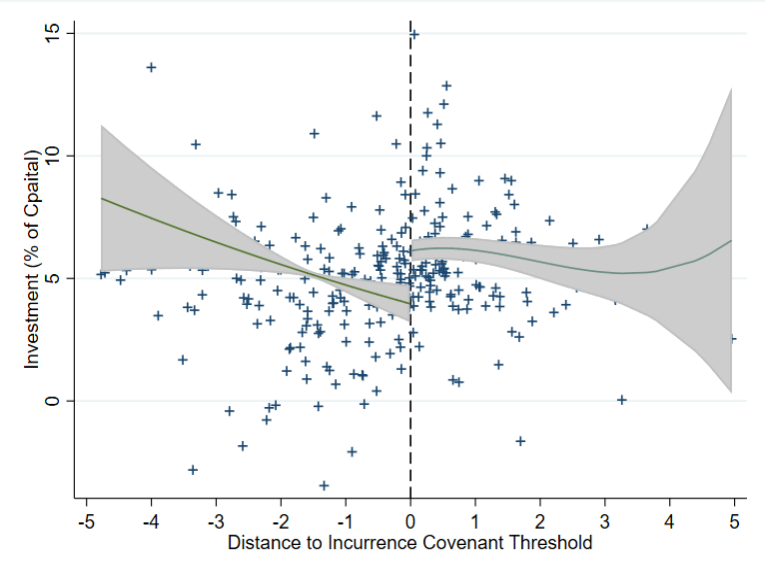
FIGURE A.1 – EARNING, DEBT, AND COVENANT VIOLATIONS AROUND COVID-19 CRISIS



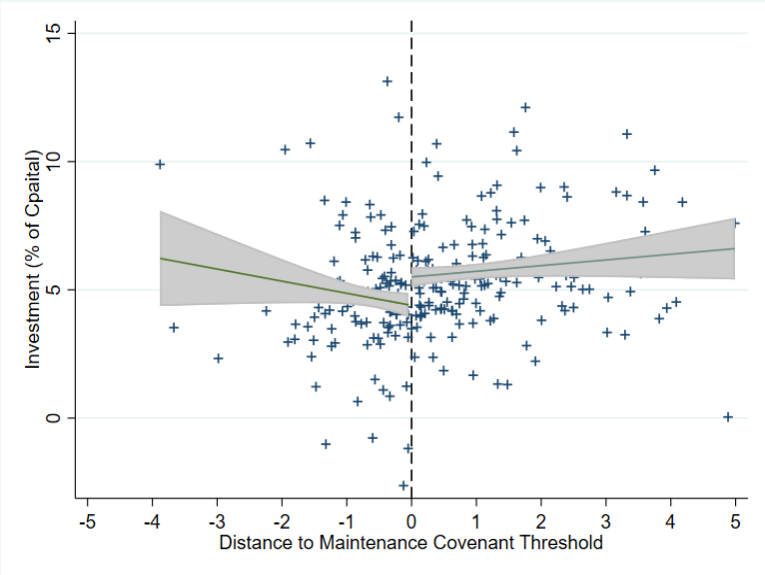
Note: Average earnings and debt of firms in our sample, normalized to value 1 in 2019:Q4 on the left scale, and the share of firms in violation of a covenant on the right scale. The sample uses all firm-quarters entered in our main regression.

FIGURE A.2 –NON-PARAMETRIC ESTIMATE OF THE REGRESSION DISCONTINUITY

PANEL A: INCURRENCE

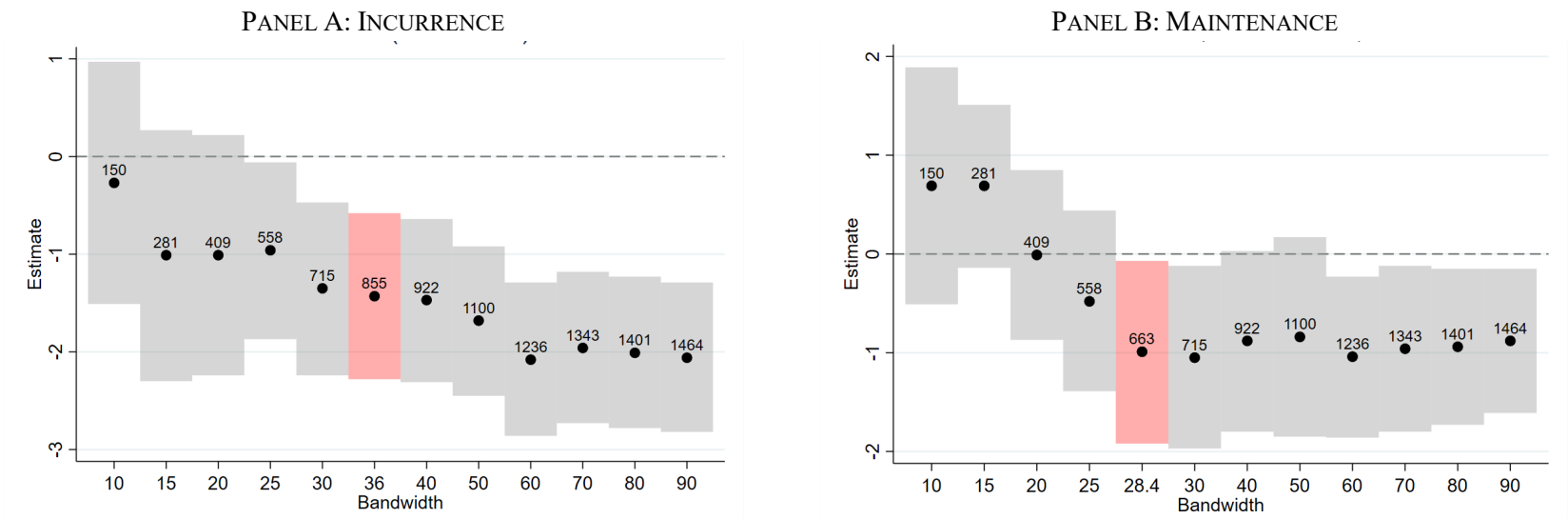


PANEL B: MAINTENANCE



Notes: The figure shows a non-parametric estimate of the regression discontinuity at the covenant thresholds based on a polynomial of order 3. The gray area corresponds to 90% confidence intervals.

FIGURE A.3 – ADDITIONAL ROBUSTNESS TO THRESHOLDS FOR DISCONTINUITY SAMPLE



Notes: The figure shows our main results reported in Table VI, column 7, (i.e., the effect of incurrence covenant trigger) for different discontinuity samples around the covenant threshold. Table VI uses the full sample, and here we show results when we include in the regression only observations where the leverage/coverage ratio is at most X percent around the covenant threshold, X = 10, …, 90. Estimates in Panel A and Panel B come from separate regressions applying the bandwidth to either the incurrence (panel A) or maintenance (panel B) threshold. The red estimates are obtained by applying the optimal threshold based on the procedure outlined in Calonico et al. (2014). Numbers displayed above the point estimates indicate the sample size of each discontinuity sample. Grey areas indicate 90% confidence intervals.

TABLE A.I – COMPARISON OF COVENANTS: DEALSCAN VERSUS HAND-COLLECTED SAMPLE

		Hand Collected		DealScan			
Covenant	Obs.	Mean	Median	Mean	Median	Diff. (by loan)	RMSE
Leverage	61	4.1	4.0	4.2	4.0	-0.03	0.45
Interest coverage	31	3.1	3.0	3.1	3.0	0.00	0.11

Note: This table looks at the financial-covenants threshold for the sample where we have both hand-collected and DealScan data. The legal language in the credit agreements is very complex, thus, the purpose of this table is to validate our approach by showing that our methodology is very close, if not identical, to the one used by Reuters DealScan.

TABLE A.II– TIME IN EACH STATE FOR LOANS WITH BOTH MAINTENANCE AND INCURRENCE COVENANTS

			Quarters between events				
	# Loans	# Instances	Mean	Std Dev.	p25	p50	p75
No Bind to Incurrence Bind	35	40	4.43	3.76	1	3	6.5
No Bind to Maintenance Bind	21	22	3.41	3.35	1	2	6
Incurrence Bind to No Bind	33	41	2.85	2.6	1	2	3
Incurrence Bind to Maintenance Bind	24	26	3.88	3.34	1	3	5
Maintenance Bind to No Bind	3	3	4	1	3	4	5
Maintenance Bind to Incurrence Bind	21	23	2	1.21	1	1	3

Note: Displayed is the time (in quarters) spend in each state (no covenants binds, incurrence covenant binds, or maintenance covenant binds) before transitioning to another state. The sample is restricted to the loans with both maintenance and incurrence covenants (those entering the regression in Table VI, column 8). Hence, maintenance binds means that incurrence binds as well, given that constraints on incurrence covenants are always tighter.

TABLE A.III – ROBUSTNESS TO COVID-19 SHOCK

	Investment/Capital (%)		
	(1)	(2)	Excl. COVID Period (3)
Incurrence Bind	-1.90***	-2.14***	-2.48***
	(0.33)	(0.34)	(0.59)
Maintenance Bind	-0.90**	-0.87**	-1.24*
	(0.31)	(0.37)	(0.64)
Observations	1,739	1,702	1,101
R-Squared	0.76	0.77	0.77
Firm FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Controls*Cov-Type	Yes	Yes	Yes
Quarter*Cov-Type FE	Yes	Yes	Yes
Quarter*COVID-affected Industry FE	Yes	No	No
Quarter*NAICS Industry FE	No	Yes	No
H0: Incurrence=Maintenance	1.004	1.261	1.236
p-value	0.0112	0.0110	0.1159

Notes: Results presented in this table are similar to the analysis in Table VI but controls for COVID-affected-industries fixed effects. This classification is based on the one used by the Federal Reserve Bank of Chicago and categorizes NAICS industries into severely, substantially, moderately, or supply-chain-affected industries. The second column controls for NAICS two-digit industry fixed effects instead. The third column restricts the sample to firm-quarters before 2020q1.

TABLE A.IV – MAIN RESULTS WHEN EXCLUDING LOANS WITH BINDING INCURRENCE TRIGGER AT ORIGINATION

	Investment (% Capital)							
			Only incurrence		Only maintenance			Both types
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bind	-2.08***							
	(0.40)							
Incurrence Bind		-2.12***	-3.22***			-2.17***	-2.68***	-2.47***
		(0.48)	(0.76)			(0.48)	(0.50)	(0.52)
Maintenance Bind				-1.04*	-1.04*	-1.15**	-1.12**	-1.21
				(0.50)	(0.51)	(0.53)	(0.39)	(0.70)
Observations	1,327	1,327	263	1,327	492	1,327	1,327	567
R-Squared	0.71	0.71	0.71	0.70	0.67	0.71	0.72	0.73
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls*Cov-Type	No	No	No	No	No	No	Yes	Yes
Quarter*Cov-Type FE	No	No	No	No	No	No	Yes	Yes
H0: Incurrence=Maintenance						1.022	1.556	1.263
p-value						0.1067	0.0045	0.0523

Notes: This table is similar to our main Table VI but excludes loans that have a triggered restricted action right at the quarter of origination. Thus, identification comes from firms that enter into a binding state. Estimates are robust and similar to our baseline results.

TABLE A.V – MAIN RESULTS SPLIT INTO FIRST-TIME VS FOLLOWING COVENANT TRIGGERS

	Investment (% Capital)							
			Only incurrence		Only maintenance			Both types
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(First) Bind	-1.20***							
	(0.24)							
(Following) Bind	-1.77*							
	(0.91)							
(First) Incurrence Bind		-1.74***	-2.19***			-1.77***	-2.03***	-2.02***
		(0.34)	(0.72)			(0.34)	(0.35)	(0.38)
(Following) Incurrence Bind		-2.07***	-2.07**			-2.06***	-2.41***	-2.41***
		(0.60)	(0.89)			(0.55)	(0.56)	(0.62)
(First) Maintenance Bind				-0.97**	-1.12*	-1.04**	-1.06***	-0.91**
				(0.40)	(0.54)	(0.41)	(0.31)	(0.38)
(Following) Maintenance Bind				-0.77	0.08	-0.79	-0.80	-1.12
				(0.84)	(0.34)	(0.69)	(0.77)	(0.98)
Observations	1,753	1,753	481	1,753	497	1,753	1,753	768
R-Squared	0.73	0.73	0.71	0.72	0.68	0.73	0.74	0.77
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls*Cov-Type	No	No	No	No	No	No	No	No
Quarter*Cov-Type FE	No	No	No	No	No	No	No	No
H0: Incurrence=Maintenance						0.738	0.969	1.111
p-value						0.1564	0.0263	0.0171

Notes: This table is similar to our main Table VI but allows for separate effects depending on whether it was the first-time covenant trigger or following covenant trigger. First time vs following definitions are applied to incurrence and maintenance separately.