The Costs of Corporate Debt Overhang

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Abstract

We make use of rich U.S. data to show that debt overhang significantly reduces firm asset-, capex-, and employee-growth. These contractions are likely driven by management/owner decisions rather than the result of credit supply constraints for individual firms. Our measure of overhang – liabilities to cash flow – focuses on the importance of a firm's debt servicing capacity and is a crucial measure of debt overhang. It further allows us to capitalize on the COVID-19 shock as a quasi natural experiment and confirm the impact of overhang on firm investment and growth.

JEL: G20, G28, G30, G32

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1 Introduction

How do high levels of debt overhang in U.S. firms affect their growth and investment – especially if such overhang arises suddenly and unexpectedly? Aggregate corporate overhang shot up substantially during the COVID-19 outbreak, as firms borrowed against falling revenues. As a result, an unprecedented number of firms now find themselves operating with historically high levels of overhang. These rapid developments were completely exogenous to both individual borrower business models and their (pre-pandemic) funding decisions. Consequently, understanding the impact of high debt overhang on firm growth is now crucial for both policymakers and academics.

Debt overhang can loosely be described as over-indebtedness. In seminal work by Myers (1977), it was shown to distort investment incentives and lead firms to under-invest in future growth. This is because managers may wish to avoid having to divert all future payouts from positive NPV investments to existing debt holders. In the extreme, debt overhang can lead to strategic defaults.[1]

The measure of debt overhang we employ in this paper is rooted in the traditional understanding of the concept as well as recent advances in studies of the mortgage market. We make use of borrowing to cash flow – after controlling for leverage – to define overhang. Such measures accurately track the burden of a firm supporting great amounts of borrowing with limited returns. Specifically, we make use of liabilities to EBITDA; low EBITDA in the face of high debt may discourage owners or managers from necessary future investment. Future firm value will not be significantly enhanced because profits will flow to lenders.

We pay particular attention trying to isolate the effect of actual debt overhang from any credit supply effect. It is possible, after all, that over-indebted firms cannot borrow. Lenders may see their debt levels as an indicator of risk. We capitalize on our access to a number of data sets, including Compustat, DealScan, the Shared National Credit (SNC) program, and the Y14 Q database. We use both historical data as well as data from the ongoing COVID-crisis. While a study of long time horizons are useful to understanding the (long-term) effects of overhang, the COVID-19 shock represents a quasi-natural experiment. The period saw many firms experience a growth in debt overhang that was largely unrelated to their pre-pandemic business decisions. Firms saw EBITDA decrease rapidly and borrowing rise sharply as the economy was temporarily shut down. During this time, effort was made to keep lending channels open and we are able to use supervisory data to identify firm-level access to

[1] This phenomenon is relatively well documented for the mortgage market, where over-indebted households are liable to strategically default. See for instance Melzer (2017) or Guiso et al. (2013).

credit.

[Figure 1 about here]

As we can see from panel (a) of Figure 1, the share of firms operating with 'high' levels of debt overhang – which we define as levels of liabilities to EBITDA that lie one standard deviation above mean levels for that firm– rises sharply in 2020. This mirrors a rise in aggregate overhang that can be seen in Panel (b).[2] While this trend has been reversing in 2021, the aggregate levels of overhang still remain far above historical levels.

Debt overhang has important implications for firm growth. In panel (c) of Figure 1 we plot the average (de-trended) growth of firms between 2010 and 2021. We split our sample into those firms that jumped to "high" levels of overhang in 2020 and those that did not. The two sets of firms followed roughly similar patterns of asset growth over the years. However, in 2020 and 2021 the growth-rates diverge substantially, with firms that jumped to high overhang in 2020 experiencing a significant contraction in asset growth. The same pattern holds for growth in employees and capex. From Panel (d) we can see that the relationship between asset growth and overhang growth is relatively linear. That is, our results are not driven by a few outlier institutions.

In this paper we report a large array of results related to the costs of debt overhang in firms. These results can broadly be broken into three groups covering: (i) the cost of overhang/jumping to high levels of overhang, (ii) accounting for the supply of credit at the firm level, to ensure our findings are not picking up the effects of credit constraints, and (iii) utilizing the quasi natural experiment of the COVID-19 period for understanding overhang.

We find that, during times of generous lending conditions, firms with a one standard deviation higher overhang – measured as total borrowing to cash flow – experience 4% lower asset growth relative to comparable firms without overhang. This is a sizeable effect, as it represents a decline of over 50%, relative to unconditional firm growth in our sample. We find similar patterns when we consider a firm's growth of capital expenditures and employment. The largest impact, however, comes from a firm suddenly shifting into 'high' debt overhang for the first time. Such a shift is associated with a significant asset contraction – not merely reduced asset growth.

We show that these results are unaffected by the ability of the borrower to refinance credit, have slack in credit lines, pay low rates for loans due to attractive investment propositions, or a host of other

[2]Here we exclude firms with negative liabilities to EBITDA, which we would otherwise count as being in the 'high' overhang bucket. These figures would otherwise reduce our aggregate overhang measure.

borrower specific measures that would signal credit constraint. We further show that the effects are most pronounced when equity markets view the overhang unfavourably. As such, we can be reasonably assured that our effect is owner/management- rather than lender-driven.[3]

Finally, we make use of early data to confirm the costs of debt overhang following the COVID-19 outbreak. The COVID-19 crisis has seen an unprecedented number of firms fall into a category of "historically high" debt overhang (as shown above). This jump was unrelated to individual firm financing decisions going into the crisis and occurred as (perhaps due to) lending remaining generous. We again make use of supervisory information about individual loan contracts as well as the lending behaviour of individual banks to showcase that our results are not lender-driven.

The effects of debt overhang have been explored theoretically as well as empirically. In early theoretical work, Myers (1977) and Myers and Majluf (1984) highlight the conflict that arises between various existing and potential new stakeholders of a company with extremely high levels of debt. Once the face value of a firm's debt exceeds its payoff, so the theory argues, the firm is unlikely to invest in new projects with a positive NPV. Potential debtors cannot accurately evaluate a company's investment opportunities (Fazzari et al., 1988), while equity holders are averse to financing projects whose benefits accrue only to existing debt holders. This theoretical work was expanded upon by Lamont (1995), Hennessey (2005), Hennessy et al. (2007), and Occhino (2010). [4]

Early empirical work by Lang et al. (1996) shows a negative relationship between leverage and future firm growth. Sharpe (1994) shows that firms with high debt to assets are more sensitive to macroeconomic changes in consumer demand, a finding corroborated by Giroud and Mueller (2016). Empirical work on the effects of debt overhang have become more numerous since the Great Recession. Kalemli-Ozcan et al. (2020), using European micro data, show that debt overhang reduced firm investment after the recession particularly for firms borrowing from banks more exposed to sovereign risk. Using another large data-set of European firms, Popov et al. (2018) document a positive correlation between investment efficiency and debt overhang, which reverses during banking crises and when corporate debt levels are extremely high. Giroud and Mueller (2020), in turn, show – using

[3]We naturally find that overhang can bind more or affect firm growth in concert with tighter lending conditions – consider Benmelech et al. (2019) – but the effect is not limited to such periods.

[4]A rich literature models firm values in the face of debt-agency issues. Parrino and Weisbach (1999) model stock-holder and bond-holder conflicts using monte-carlo simulations. They show that wealth transfers from equity claimants to debt claimants arise from the adoption of low-risk positive NPV projects and vis-versa. Mello and Parsons (1992) model the value of a firm reflecting on the agency consequences of debt, using a real-options framework. Mella-Barral and Perraudin (1997) highlight that firms can extract concessions from debt holders by acting strategically and that strategic debt service may account for a portion of the premium on corporate debt.

U.S. data – that an increase in firm leverage results in a subsequent reduction in firm-growth and employment.[5]

There is also a set of studies that have investigated the effects of debt overhang from a macroeconomic perspective. For example, Mian et al. (2017) show that higher household debt-to-GDP predicts slower economic growth, and Mian et al. (2020) document that large debt burdens by corporations have a drag effect on the economy. Jorda et al. (2014a) and Jorda et al. (2014b), in turn, show that mortgage credit growth can predict financial crises while Jorda et al. (2013) highlight that recessions, which follow credit expansions, are deeper and persist longer.[6]

Our paper is closer to existing studies of debt overhang that rely on firm level data, but it differs from them in at least two important ways, allowing us to contribute to the existing literature in a meaningful way. First, in contrast to the bulk of the existing literature on debt overhang, which focuses on the ratio of a firm's total debt to assets, we make use of liabilities/EBITDA (or debt/EBITDA) as our primary criteria for measuring debt overhang, while also controlling for measures of traditional leverage and firm size.[7] Our results help highlight that a purely leveraged based view of overhang is incomplete. Our measure more accurately reflects the idea behind debt overhang – as levels of borrowing too large for the firms cash flow – for distorting owner/manager incentives. Another advantage of relying on cash flow based measures is that they are less endogenous to firm funding choices. They are ideally suited to the COVID-period as large parts of the economy were shuttered in 2020 and EBITDA contracted significantly.

Second, we make use of uniquely detailed of supervisory information to help rule out the possibility that we are picking up the effects of an aggregate down-turn or the effects of firms with high levels of debt simply being credit constrained. This is crucial to our understanding of overhang as affecting the incentives of managers and owners. The COVID -period, in combination with our supervisory data, helps us make this case most convincingly.

The rest of the paper is organized as follows. The next section presents our data sources, characterizes our sample, and describes our methodology. Section 3 presents our baseline findings on the effects of debt overhang. It also accounts for a variety of firm-specific data on access to funding. Section 4 makes

[5] Campello et al. (2010) find, based on interviews of C-suite executives from around the world, that credit constrained firms are more likely to cut investment and employment as obtaining new credit becomes more difficult in crisis periods.

[6] An older literature, including Krugman (1988), Borensztein (1990) and Manzano and Rigobon (2001), has documented an adverse relationships between overhang and investment at the country level.

[7] Lawless et al. (2015), also argue that **debt-turnover** may be the more apt measure. This also follows some of the measures discussed in the housing literature mentioned above. See also crucial work: Mian and Sufi (2010); Mian and Sufi (2011); Dynan et al. (2012).

use of data from the COVID-recession. Section 5 offers some robustness. Section 6 concludes with some final remarks.

2 Data, Sample Selection and Methodology

2.1 Data

The data for this project comes from Compustat, the Shared National Credit (SNC) program, Dealscan, the Senior Loan Officer Opinion Survey (SLOOS), and the Y14Q database of C&I lending (schedule H1).

We make use of annual firm data from Compustat. We use annual frequency because it most accurately tracks those variables that are of interest to this study and does not require seasonal adjustments. We exclude finance and insurance firms, firms that do not report EBITDA, revenue, assets, and liabilities as well as firms whose liabilities exceed their assets by more than 20%. We exclude the latter because firms whose liabilities exceed their assets by a significant amount are the result of some data error or otherwise will likely default and leave the sample within a short period of time. This leaves us with a sample of approximately 5,000 firms per year over our sample period from 2000 to 2021, though we observe more firms in the early period as opposed to the later part of our sample.

We first merge Compustat data with syndicated loan level data from the SNC program and Dealscan. The SNC program, run by the Federal Deposit Insurance Corporation, the Federal Reserve, and the Office of the Comptroller of the Currency, tracks – at the end of each year – confidential information on all syndicated credits – new as well as credits originated in previous years – that exceed $20 million and are held by three or more federally supervised institutions.[8] For each loan, the program reports the identity of the borrower, the credit type, its purpose, origination amount, origination date, maturity date, and amount drawn-down on credit lines as well as the stakes held by syndicate participants.[9] We rely on SNC data to create several measures of funding available to borrowers, including whether the borrower has a credit line, the portion of the credit line that is still undrawn, and the share of the credit line held by the lead bank in the syndicate.

Given that SNC covers only syndicated loan above $20 million originated by banks (leaving out smaller loans and loans arranged by nonbanks) and does not gather information on loan spreads, we also merge Compustat with Dealscan. Dealscan gathers information on all syndicated credits. However,

[8] In January of 2018 this cutoff was raised from $20 to $100 million. This reduced the volume of loans supervised by the SNC program. For this reason, we limit our sample period to 2018 when we use the SNC data.

[9] The confidential data was processed solely within the Federal Reserve System for the analysis presented in this paper.

in contrast to the SNC program it contains information only at the time of their origination.[10] We use Dealscan to compute additional proxies of borrowers' access to funding, including whether they took out a new loan, whether they where able to refinance an existing loan, and whether they were able to borrow at rates "comparable" to their peers.

We also use the Federal Reserve Y14 Q database to gather information on loans (and their borrowers). Y14 data is used in the stress testing of major financial institutions. As such, it includes a variety of details on the loans of every bank that has ever been subject to the stress tests. We make use of the sub-database "H.1", which contains detailed quarterly information on the C&I loans of reporting banks. Reporting institutions must file all loans with a total balance sheet commitment of more than 1 million USD each quarter. The data tracks a number of important facts about the borrower, including EBITDA and other balance sheet components, and relevant loan information, including amount, maturity date, interest rate, and draw-down amounts in the case of credit lines. We rely on Y14 to compute our measures of firms' access to bank funding when we focus on the COVID-19 because it gathers information on all loans not just syndicated loans. Further, given that Y14 reports information throughout the life of the loan we can use it to compute our measure of borrowers' access to un-drawn funds in their credit lines post 2018, the year when the definition of a SNC credit changed. We do not consider the Y14 data in the earlier part of our analysis because it started to be collected only in 2012 while SNC and Dealscan go back to the late 1980s.

Finally, we use the SLOOS data to capture banks' lending standards over time. The SLOOS is administered by the Federal Reserve Banks to gather information – usually four times a year – from a sample of 80 banks and several hundred loan officers. It contains a set of approximately 25 questions designed to measure changes in credit standards and terms on bank loans and perceived changes in the demand for bank credit. We consider the aggregate information obtained from banks' responses to the question pertaining to their lending standards and terms on C&I loans to firms of all sizes.

2.2 Sample Characterization

Table 1 depicts summary statistics for the key firm-level dependent variables we consider in this study (log growth of assets, capital expenditures, and employment) as well as our measures of debt overhang. Growth rates and debt overhang measures are winsorized at the 2 and 98 percent thresholds. Firm growth in the sample is nevertheless driven in part by survivorship bias and could constitute an

[10] See Bord and Santos (2012) or Blickle et al. (2020) for a comparison between the SNC and Dealscan databases.

upper-estimate of total firm growth. Panel A of the table reports statistics computed for our entire sample period: 2000-2021. Average annual asset growth during the sample period is nearly 7% while employees and capital expenditures at the average firm grow by around 3% and 2%, respectively.

[Table 1 about here]

Our key independent variable is debt overhang. We define debt overhang as firm borrowing relative to cash flow, which we proxy with *Liabilities/EBITDA*. Liabilities are a broad measure of "indebtedness". They reflect all of the borrowing (including trade credit) a firm may have undertaken to support its operations.[11] EBITDA, in turn, can be considered a proxy of cash flow. As discussed in the introduction, cash flow can be more volatile than a firm's balance sheet structure as it depends on macroeconomic conditions, unrelated to the firm's business model. Using a debt overhang measure that relates borrowing to a proxy for cash flow removes some of the endogeneity associated with the financing decisions of the firm because overhang can arise when a firm is less profitable than investors and lenders expected. This is particularly relevant in the Covid-19 era because EBITDA was negatively affected in many sectors of the economy following the lock downs. It is for these reasons that we rely on *Liabilities/EBITDA*, which is equal to 3.5 for the average firm in our sample, with the 25th and 75th percentiles – for firms with non-negative EBITDA – being 0.55 and 6.44, respectively.

To further reduce concerns with endogeneity, we focus on instances when the firm's liabilities to EBITDA ratio experiences a significant increase. Specifically, we identify instances when the firm has "High Debt Overhand" in year t but not in year $t-1$. We classify firms as having "High Debt Overhand" if their liabilities to EBITDA are one-standard deviation above their own sample mean. Looking at Table 1 we see that 36% of our firm-year observations are associated with firms having "High Debt Overhand." with 9% of the firm-year observations being associated with instances when the firm's debt overhang jumped to high levels.

Even though in our analysis we focus on liabilities to EBITDA, we also investigate two often used alternative measures of debt overhang: Debt/EBITDA and *EBITDA/Interest payments* to highlight the stability of our results. *Debt/EBITDA* does not include trade credit and is a narrower measure of the debt a company has taken on from borrowers to finance its operations. It is equal to 0.9 for the average firm, with the 25th and 75th percentiles being 0 and 1.42, respectively. With regards to EBITDA relative

[11] Any lender considering the financing of a firm will have to reflect upon the chances of receiving a payout in bankruptcy. This is made less likely if the firm has a large number of outstanding creditors, relative to its earnings. This is compounded if the trade credit has been secured with a company's assets or inventory, as is a common case in SMEs.

to interest payments, it is equal to 20.4 for the average firm, with the 25th and 75th percentiles being 1.69 and 19.34, respectively. This measure accounts for the cost of debt as opposed to its actual level. However, the sample is somewhat smaller and biased towards larger firms that report interest payments. Moreover, the interpretation of debt overhang must be reversed for this variable. Additionally, in all of our regressions we control for the traditional accounting measure of leverage, which is equal to 0.56 for the average firm with the 25th and 75th percentiles being 0.31 and 0.69, respectively.

Panel B of Table 1 focuses on the last two years of our sample period (2020-21), which we consider to investigate the effects of debt overhang during the Covid-19 outbreak. A quick comparison of the two panels confirms that the Covid-19 outbreak was a significant shock to the indebtedness of US corporations. Looking at our measures of debt overhang, we see that the average *Liabilities/EBITDA* went from 3.5 to 4.13, and the percentage of observations with "High Debt Overhand" went from 36% to 53% (if we include firms with negative EBITDA in the category of 'high' overhang firms, this value is just over 30% if we do not). Similarly, our variable capturing the firms that jump to "High Debt Overhand" rose by two percentage points. A similar picture emerges when we consider the other proxies of debt overhang, particularly those that account for the firm's cashflow. For example, the average *Debt/EBITDA* rose from 0.9 to 1.16 while the average *EBITDA/Interest Expenses* declined from 20.4 to -5.0. Traditional leverage also increased, although, by not as much; it went from 0.54 to 0.55. It is worth noting that while these changes denote a significant rise in debt overhang, the effect is even more striking when we consider the first year of the outbreak (2020) alone. There, the percentage of firms that jumped to "High Debt Overhand" exceeded 20. These figures confirm that the shutdown of the economy that followed the Covid-19 outbreak implied a substantial increase in the debt burden of a large portion of US corporate sector. Assuming we are able to account for credit supply, it provides a good opportunity to investigate the costs of corporate debt overhang.

2.3 Methodology

Our baseline specification correlates lagged debt overhang in firm "c", measured by the firm's liabilities to EBITDA, with that firm's subsequent asset, investment, and employment growth. Our dependent variables of interest are therefore annual log change in assets, investment, and employees. We control for a number of factors, in addition to debt overhang, which may impact firm growth. These include total liabilities to assets (i.e. traditional leverage), and lagged assets (which accounts for firm size). Given that some potentially important factors, including trade credit and leverage, are industry specific, we make use of industry*year as well as firm fixed effects in our specifications. Our baseline specification, for firm "c" at time "t" in industry "i" therefore takes the following form:

$$\begin{aligned}\Delta Y_{c,t} =& \beta_0 + \beta_l DebtOverhang_{c,t-1} + \\ & \theta_{c,t-1} + I * t_c + c + \epsilon_{c,t}\end{aligned} \tag{1}$$

Here θ captures lagged firm-specific controls, and *I*t* are industry-year fixed effects for firm c and c are firm fixed effects. Given that our baseline specification makes use of log-changes as dependent variables, which remove time in-varying firm characteristics, adding firm fixed effects makes our specification rather restrictive (nonetheless, we include them in our regressions to showcase result validity).

As we discussed above, to further reduce concerns with the endogeneity of the financing decisions of the firm, we focus on instances when the firm liabilities to EBITDA experiences a substantial increase. To that end, we re-estimate our base model replacing $DebtOverhang_{c,t-1}$ with $JumpToHighOverhang_{c,t-1}$, a dummy variable which takes the value 1 if the firm has "High Debt Overhand" in year $t-1$ but not in year $t-2$. We classify firms as having "High Debt Overhand" if their *Liabilities/EBITDA* are one-standard deviation above their own sample mean. Given that we control for leverage, this variable will capture the effect of a substantial increase in the firm's liabilities to EBITDA ratio, most likely induced by a negative shock to the firm's cashflows.

2.3.1 Accounting for credit availability

An important challenge in identifying the costs of debt overhang is that credit availability varies over time. Further, periods of tighter lending conditions tend to disproportionately affect more indebted firms, thereby possibly exacerbating the costs of debt overhang. In the second part of our study, we carry out a set of tests which aim at isolating the costs of debt overhang from the confounding effects associated with credit availability. All of the tests rely on our baseline regression estimated with the dummy variable $JumpToHighOverhang$, because this is the measure of debt overhang that is more immune to the firm's financing decisions. However, in the robustness tests we show that our results hold for various measures, definitions or transformations of debt overhang.

Our first test of lending-conditions simply accounts for aggregate lending conditions in the market place. To that end, we expand our baseline regression to include the interaction term between our measure of debt overhang and banks' lending standards. In this case, we consider the following model:

$$\Delta Y_{c,t} = \beta_0 + \beta_l JumpToHighOverhang_{c,t-1} + \beta_2 JumpToHighOverhang_{c,t-1} * LendStandards_t + \theta_{c,t-1} + I * t_c + \epsilon_{c,t}, \tag{2}$$

where $LendStandards_t$ are banks' lending standards according to SLOOS. A potential concern with this test is that our measure of bank lending standards does not vary across firms. For this reason, our next set of tests attempts to address the credit supply confounding concern by investigating the costs of debt overhang among firms that are likely to have access to funding at the time when their liabilities to EBITDA experiences a significant increase. The idea being that if our results are solely driven by credit constraints, then we should not expect to find evidence of debt overhang costs among firms with access to funding.

Our first set of proxies for firms' access to funding come from Dealscan. One proxy identifies firms that borrowed from banks in the year they experience the negative shock on its liabilities to EBITDA ratio. Access to funding implies they have not been severed from the credit market. Another test identifies firms that refinanced their loans during (or immediately following) the year they experienced a jump to high overhang. The ability to refinance existing loans again implies access to lenders who are still willing to re-engage with the borrower.[12] Finally, we devise an analysis that identifies firms that were able to borrow at "low" rates in the syndicated loan market even as they experienced a negative shock on their liabilities to EBITDA ratio. "Low" rates are identified as those that are below the historical rate paid by the firm, when accounting for firm, time, and loan purpose fixed effects. Arguably, the reductions in firm-growth that follow a sharp rise in liabilities to EBITDA ratio are less likely to be driven by credit constraints among firms that were able to access bank loans, firms that were able to refinance their debt, and firms that were able to borrow at "low" rates in the period immediately before experiencing that rise.

Our next set of proxies for firms' access to funding come from the SNC program database. Recall that an important difference between SNC and Dealscan is that the former tracks information on loans during their life, not just at the time of origination. Using that information, we create a proxy for access to funding depending on whether the firm had a credit line at the time it experiences the sharp rise in

[12] Mian and Santos (2018), for example, show that firms, particularly those with higher credit quality, systematically renegotiate their loans to extend their maturity in good times to reduce the risk of having to refinance them during crises periods.

its liabilities to EBITDA ratio.[13] Because some firms may already have utilized most of their credit lines, we create a second proxy which identifies those firms that still have a substantial amount of undrawn funds in their credit lines at the time of that rise. Given that the average credit line utilization in SNC data is below 20%, we define low credit line utilization as having drawn less than 10% of the amount. Further, given the fact that additional loan covenants usually take effect at a credit line utilization above 33%, we make use of a 33% utilization rate as an alternate definition to identify firms with relatively "low" credit line utilization. Our last proxy identifies firms with more access to funding by using the share the lead bank held (weighted by outstanding loan(s)) in the year in which the firm moved to high overhang. To the extent that a larger lead share is associated with higher monitoring incentives and more information on the borrower, it should help the firm access additional funding if it needs to do so.[14]

2.3.2 Building on shareholders' response

The previous set of tests should ease concerns that our evidence on the costs of debt overhang could be entirely driven by credit constraints rather than the result of firms' decisions to forgo discretionary investment opportunities. While credit availability is arguably among the biggest threats to identifying an effect of debt overhang emanating from firms' discretionary decisions, we cannot yet conclusively argue our results are shareholder-decision driven. For this reason, we designed an additional test building on shareholders' response to the shock to the firm's liabilities to EBITDA ratio.

Our premise is that among the firms that experience the shock from jumping to 'high' overhang, those whose sharedolders respond more negatively should experience a larger adverse effect on their future prospects. By contrast, those that do not trigger a large shareholder' reaction, possibly because they view it as having only transitory effects or because it is part of the firm's "normal" business model, should not experience substantial adverse effects on their future prospects. In other words, if the adverse performance effects we identify are indeed evidence of the costs of debt overhang *a la* Myers (1977) then they should be aligned with shareholders' response to the shock. After all, shareholders' stock value is derived from an estimation of the NPV of future payouts. A drop in such values, because shareholders estimate that future earnings will accrue to debtors, is the very definition of debt overhang. To test that hypothesis, we estimate the following model

[13]See Santos and Viswanathan (2020) for evidence on the liquidity role of credit lines.

[14]See, for example, Ivashina (2009) or Sufi (2007) for a discussion on the importance of the share of the loan that the lead bank retains.

$$
\begin{aligned}
\Delta Y_{f,t} = &\beta_0 + \beta_l JumpToHighOverhang_{f,t-1} + \beta_2 LowStockReturns_{f,t-1} \\
&+ \beta_3 JumpToHighOverhang_{c,t-1} * LowStockReturns_{f,t-1} \\
&+ \beta_4 \mathbf{X}_{f,t-1} + \theta_{i*t} + \xi_f + \epsilon_{f,t}.
\end{aligned} \tag{3}
$$

where $JumpToHighOverhang_{c,t-1}$ is defined as before, a dummy variable which takes the value 1 if the firm has "High Debt Overhand" in year $t-1$ but not in year $t-2$. $LowStockReturns_{f,t-1}$ is a dummy variable equal to one for years where a firm's stock has under-performed other firms in its industry. The key variable of interest is the interaction term, which allows us to compare – among the firms that experience a large shock to their debt overhang – the future growth of those whose shareholders respond more negatively with those whose shareholders do not view the rise in overhang to adversely affect their long-term share values. If our findings on the costs of debt overhang are indeed shareholder/manager driven then we would expect that interaction term to be negative.

3 The Cost of Debt Overhang – Baseline Effects

In this section we demonstrate the costs of having and – more importantly – suddenly jumping to high levels of overhang. We show that our findings are independent of funding available to the firm and are – most likely – the result of firms' own discretionary decisions.

3.1 Effects of Debt Overhang

We begin by exploring the general effects of high overhang using our baseline Model (1). The results reported in Table 2 show that overhang in the previous year, as measured by liabilities to EBITDA, is associated with lower growth in assets (columns (1) and (4)), capital expenditures (columns (2) and (5)) and employees (columns (3) and (6)) in the subsequent year. In columns (1-3) we make use of industry*time fixed effects as well as controls for firm indebtedness (assets relative to liabilities) and size (log assets). We add firm-fixed effects in columns (4-6) to account for any firm-level time invariant characteristics. This will account, for example, for business models that generally rely on high levels of overhang. We standardize all our variables, so as to make the impact of debt overhang easily interpretable. Finally, we exclude any firms with negative EBITDA. These firms would naturally be operating with high levels of overhang, though the interpretation of coefficients would be inverted.

[Table 2 about here]

As we can see from column (1), a one standard deviation increase in debt overhang results in a 4.3% slower asset firm growth in the subsequent period. This pattern holds for growth in capex (4.7% reduced growth) as well as employees (1.7% reduced growth). The effects are more pronounced if we account for firm fixed effects, indicating that some firms may be more comfortable with operating at higher levels of debt overhang. Also, the effect of high overhang is more pronounced than the standard effect of leverage on firm growth. Furthermore, the effect of overhang works in both changes as well as levels. Specifically, in the Appendix Table A.3, we show that firms are smaller, with lower capital expenditures and smaller employee bases after experiencing high overhang, when compared to similar firms that are unaffected by overhang (this is discussed further in the robustness section).

[Table 2 about here]

From Panel (a) of Figure 2 we relate asset growth to overhang (we again exclude firms with negative EBITDA). We can see that high overhang relates relatively linearly to asset growth. Our results are not driven by extreme levels of overhang or other outliers. In fact, if anything, extreme levels of overhang attenuate the effect somewhat as there is a natural floor to asset growth. The relationship is more pronounced if we relate lag changes in overhang (i.e. the change in firm overhang between t-2 and t-1) to changes in assets (i.e. the log change in assets between t-1 and t). We show this relationship in Panel (b) of Figure 2. Here, we see a stable linear relationship between changes in overhang and changes in asset growth. The trend is, again, not driven by outlier observations.

Given the nature of overhang as something that can befall a firm due to lower than expected revenues, we are particularly interested in observing the effect of a firm suddenly finding itself operating with high overhang. Therefore, we analyze the impact of a firm moving into the "high" overhang bracket.

To this end, we modify our baseline specification (Model (1), replacing our measure of debt overhand (*Liabilities/EBITDA*) with a dummy variable that takes the value of 1, if a firm is suddenly operating at overhang levels that are one standard deviation above typical mean overhang (see previous section for detailed discussion). In this analysis, we are able to include all firms – even those with negative EBITDA. Such firms are considered to automatically jump to the "high" bracket in the year in which their cash-flow (first) drops below 0, given the difficulties of supporting any levels of debt with negative cash flow.

[Table 3 about here]

As we can see from Panel A of Table 3, the effects of moving to high overhang are highly pronounced. A firm experiences a nearly 10% decrease in asset growth (or 17% decrease in capex- and 5% decrease in employee-growth) after jumping to high levels of overhang in the previous year. Again, these results seem somewhat unrelated to whether we include firm-level fixed effects or not. Moreover, as we can see from Panel B, the effects of jumping to high overhang outweigh the baseline effects of operating with high levels of overhang for several years, which naturally has a negative impact on firm growth too. However, it seems the transition to high overhang changes management's assessment, leading to a sharp drop in subsequent investment.

Importantly, the effects of moving to high levels of overhang appear to have long-lasting implications for firm growth. So far, we have focused on the effect of jumping to high overhang on firm growth in the subsequent year. However, the importance of the effect will depend on whether it reverses immediately or persists over time. In Figure 3 we relate firm growth to whether a firm jumped to high overhang. We run the regression repeatedly for several lags of "jumping" to high overhang. In these regressions, we naturally account for contemporaneous overhang. As such, we can determine the degree to which a jump to high overhang – several years ago – is still impacting firm growth.

[Table 3 about here]

In panel A, we can see that firm growth (in assets) is depressed at least five years after the firm jumps to high levels of overhang, no matter the firm's current overhang. We can see that that this is only slightly attenuated if we include firm fixed effects, which we do in Panel (b). As seen above, if a firm persists in high overhang, growth may be further reduced. Here, we are merely depicting the lagged effect of a firm having jumped to high overhang. Taken together results suggest that a great number of firms jumping to high levels of overhang have long lasting effects and could substantially slow aggregate growth in the economy for several years.

3.2 Accounting for Credit Supply

The primary concern with identifying the impact of debt overhang is the issue of credit supply. A firm with high levels of liabilities to EBITDA may be considered a poor quality borrower. As such, these firms may face restrictions on their ability to obtain credit, forcing them to forego growth in spite of attempts by owners and management to invest. In this subsection, we attempt to show that our results are not driven by credit availability with a host of different tests.

Aggregate Lending Conditions First, we account for aggregate lending conditions. We do so using data from the survey of loan officers, provided the federal reserve. We use averages across banks and surveyed loan officers to define periods of tighter lending conditions. In times of tighter lending, loans are generally harder to obtain. If the the channel through which our measure of debt overhang operated was via the supply of loans, we would assume that firms with overhang would be particularly constrained during such periods. Changes to aggregate loan supply should be felt first amongst marginal borrowers. We investigate this hypothesis using the modified version of our baseline model that focuses on firms that jump to high debt overhang after we extend it to account for banks' lending standards (Model (2)).

[Table 4 about here]

The results of this exercise, reported in Panel A of Table 4, show that the impact of jumping to high levels of overhang (or the impact of operating at high levels of overhang – not reported for brevity) are only marginally affected by aggregate bank lending conditions. It does not appear that firms operating with high levels of liabilities to EBITDA are necessarily marginal borrowers from the view of lenders. Instead, such firms continue to demonstrate much the same aggregate response to high overhang as in ordinary periods.

Firm-Level Access to Credit The previous test attempts to account for the ability of a firm to access funding in the face of high levels of overhang by controlling for the overall bank lending conditions. We can control for firms' access to funding more directly using Dealscan or SNC data. Looking first at Dealscan data, which tracks newly originated loans, we can (i) account for whether a firm with overhang is able to borrow, (ii) account for whether such a firm can refinance existing debt and (iii) account for the rates paid by firms with overhang as a proxy for access to finance.

Looking first at (i): a firm with the ability to obtain new loans in the year in which it jumps to high overhang is unlikely to be credit constrained. If it continues to borrow but still experiences a reduction in investment and growth, this is likely to be a consequence of management/owner decisions. In Panel A of Table 5, we split firms into those that received new loans after jumping to high overhang (columns (1)-(3)) and those that did not (columns (4)-(6)). We are not interested in showing off a clear difference in the two groups. We are instead trying to highlight that the effect of debt overhang is visible even among firms that have demonstrated an access to credit markets. In all specifications, we make use of our more restrictive regression setup, which includes firm and industry-year fixed effects as well as controls for firm size and indebtedness.

From columns (4) - (6) we can see that the effect of high debt overhang among firms that access new credit is only marginally different from the baseline effect, discussed above. The assets of firms that jumped to high overhang grow 7%-pts more slowly than for the same firm in periods in which it did not face high overhang. The same pattern holds for CAPEX (10%-pts slower growth) and employees (2%-pts slower growth).

[Table 5 about here]

An argument could be made that the above analysis takes too broad a view of 'access to credit'. Loans can have several different purposes, after all, and some could be made for the purpose of restructuring firms that are in distress. We can either remove such loans, or attempt to account for credit access in a different measure. In panel B of Table 5, we therefore focus on firms that are able to take out loans to refinance existing debt. We make use of information in Dealscan to identify loans that are taken out for the purpose of refinancing existing debt. We focus on refinancing loans taken out in the year a firm jumps to high overhang or the year after it experiences a jump to high overhang. In other words, these firms are *still* able to access bank credit for the purpose of refinance existing loans, even as high overhang issues become apparent.

In columns (4)-(6), we show that access to credit again does not substantially alter our baseline results for a firm jumping to high overhang. Asset growth is still 6.8%-pts lower among firms that experienced a jump, even as they refinance existing loans. The only statistically significant difference, it could be argued, can be seen in employee growth. By comparing the unconditional mean of employee growth to our coefficient, we can infer that – all else equal – firms with access to credit grow their employee base more slowly if they face a jump to high overhang, though they do not actively shrink.

Thus far, we have made use of access to credit as a binary variable. However, it is possible that while firms are able to access credit per se, they pay a lot more for such access. This would be a soft restriction on a firm's ability to borrow. We are able to make use of the all-in-drawn spread in Dealscan data, which measures the total cost of the loan to the borrower, to account for this possibility. We make use of all loans obtained by the firm within the last year that have all-in-drawn spread data available. We regress the all-in-drawn spread on firm, year * loan purpose, and industry*year fixed effects. The residuals from this regression express the rate a firm pays that lies above (or below) its own historic rate, the average rate currently paid by firms in its industry, and rates paid for loans with the same purpose. If a firm is paying a much higher rate than could be expected, given its historic rates and its purpose/industry, one could argue that the firm is somewhat credit constrained. Conversely, if the residual is negative, a firm is experiencing good credit conditions.

In columns (4)-(6) of Panel C of Table 5, we show that firms paying low rates – relatively speaking – still reduce their growth if faced with a jump to high debt overhang. In fact, the growth in assets, CAPEX and employees are not statistically different from our baseline results, described above. Nor are they very different from firms facing more expensive credit (columns (1) -(3)). Taken together, the results of Table 5 all offer indicative evidence that credit supply does not drive our results.

In addition to controlling for new credit – using Dealscan data – we are able to account for slack in the firm's existing credit lines using supervisory information. Using data from the SNC, we are able to determine (i) whether firms have access to credit via a credit line (ii) the degree to which the firm has un-drawn credit lines when jumping to high overhang and (iii) the stake held by the lead bank in the syndicate (aka: the lead arranger). Larger stakes may imply more confidence in the borrower on the part of the most informed lender.

In Panel A of Table 6, we show that having access to a credit line in the year in which a firm jumps to high overhang is still associated with subsequent reduced growth. In fact, the effect we measure is insubstantially different from the baseline effect of a firm jumping to high levels of overhang, which we describe above. From columns (4)-(6) we see that assets grow 6%-pts more slowly while CAPEX (employees) grows 9%-pts (2%) more slowly. The effect of overhang on credit constrained firms is slightly larger. However, the effect is not driven by these constraints.

One may argue that merely having access to a credit line is insufficient. The ability to *draw down credit* when needed is the important determinant when identifying "credit un-constrained" firms. As such, we split firms by whether they have slack in their credit line and firms that have no slack in their credit line. We determine a firm to have "slack" if it has drawn less than 10% of its credit line(s).

In columns (4) - (6) of Panel B of Table 6 we show that the effect of a firm jumping to high overhang is still associated with a significant reduction in growth. In aggregate, the magnitudes are somewhat – though perhaps not meaningfully – smaller than our baseline effect: asset growth is reduced by 6%-pts (CAPEX-growth is reduced by nearly 7%-pts and employee growth by nearly 2%-pts). When compared to the unconditional mean growth of the sample, however, we find that our results are still broadly in line with our baseline results. It should, of course, be noted that the subset of firms for whom we can identify credit-line access is somewhat distinct from our baseline sample, skewing slightly larger.

Finally, in Panel C, we show that larger lead stakes – i.e. stakes above 20% taken by the lead arranger of a syndicate – do not significantly impact our results. Jumping to high overhang is still associated with a contraction in assets, CAPEX and employees. This implies that the positive opinion of the most informed lender – and the likely access to credit that this could be associated with – does not affect the impact of overhang. Taken together, the results of Table 6 again show that, while limited access to credit *can* increase the detrimental effects of jumping to high overhang, this access to credit does not drive our results.

3.3 Building on Shareholders' Responses

The previous set of results provide evidence that the costs of debt overhang we identify are not driven by credit constraints and therefore are likely associated with firms' own decisions. In this section, we discuss the results of a more direct test using stock price information to further tease out whether our results are driven by firm decisions. High overhang, as we measure it above, may in some cases be the result of restructuring undertaken by the firm. This may lead to temporary levels of high overhang that revert as the restructuring/new investment/etc. pays off. However, low returns – i.e. a firm under-performing its industry – may instead be a symptom of diminished future prospects. High overhang linked to low returns may be a clear symptom of overhang as envisioned by Myers (1977); i.e. low returns to managers and owners as a result of future payouts accruing to debt holders accurately reflect the distorted investment decision issue at play.

We investigate this idea using Model (3), which is an extension of our baseline model, to account for shareholders' responses to their firm's jumping into the high overhang category. We find that just over half of all cases in which a firm jumps to high overhang between 2000 and 2019 are associated with stock under-performance – relative to the industry – in that year. This number grows somewhat if we include the COVID crisis, though our results hold regardless of how we structure our sample time-horizon. Our sample is diminished somewhat, as we do not have stock data for all the firms in our COMPUSTAT data set.

[Table 7 about here]

The results of this exercise are reported in Table 7. They show that a firm jumping to – or operating with (not reported for brevity) – high levels of overhang, while also under-performing from a return perspective, shrinks. This holds for assets, capex and employees. In fact, our results are particularly large. Firms that experience a jump to high levels of overhang it and underperform their industry peers experience a 20% contraction in assets. This is not necessarily true for the firms that experience a jump to high overhang while still experiencing good stock performance. Such firms, in which owners still have faith despite relatively high debt levels, do not shrink. In other words, for these firms the jump to high levels of debt overhand did not distort shareholders/managers' investment decisions.

4 Natural Experiment: Debt Overhang after COVID-19

4.1 Overhang in COVID-19

2020 was characterized by a large number of firms experiencing contractions to their Cash flow – as the economy was shut down – while being forced to borrow to stay afloat. As such, a large number of firms moved into the bracket of 'high' overhang for the first time. Given that this shock was – as discussed above – largely exogenous to the business models of individual firms, the period offers a unique opportunity to study the costs of overhang. Not least because aggregate lending conditions remained generous and firms were encouraged to borrow – if they so chose.

In Panel A Table 8 we make use of data for 2020 and 2021. We show that firms, which experienced a jump to high overhang in 2020 saw reduced growth in 2021. Asset growth was 5.5%-pts lower. CAPEX growth dropped substantially more, experiencing a 9%-pt reduction. Finally, employee growth for firms that experience a jump to high overhang fell by 2%-pts. Given that the sample is comprised of only two years, we make use of industry*year but not firm fixed effects.

These reductions in growth are remarkable, but they become even more striking when we place them in the context of each firm's long-term growth. To that end, we first de-trend firm growth – by absorbing the long-term average growth of each of our dependent variables – and then rerun the above regression. The results are depicted in Panel B of Table 8. We see that the shock of moving to high Overhang in 2020 reduces firm growth by 3%-pts, after we remove the long-term average within-firm growth. This is a substantial reduction, given the effort – and resources – expended to prevent a significant contraction of the economy. CAPEX shrank even more, experiencing a 7%-pt reduction. Only employee growth reduction was moderate, with employee growth falling only 0.4% (after accounting for a firm's long term trend). This finding is in keeping with the fact that significant effort was expended to protect workers.

Finally, in Panel C of Table 8 we make use of a slightly modified data set. Specifically, we consider all firms that either have high levels of overhang in 2018 or 2019 and 2020 and firms that jump to high overhang in 2020 for the first time. As such, we are comparing the effect of jumping to high overhang for firms, which may not have been used to operating in this way in the past. As can be seen, the effect of jumping to high overhang is particularly pronounced. It outweighs the effect of operating with already high levels of overhang. This result again lends credence to the notion that management decisions may drive our findings. After all, if credit constraints drove our results, we should not see a significant difference using this test. Banks should be weary of firms with high overhang, no matter what. Our results are more in line with management foregoing investment, following a re-evaluation of long-term potential after the shock of jumping to high levels of overhang.

4.2 Accounting for Credit Supply

Again, we are concerned about the influence of credit supply affecting our results during the Covid-19 outbreak. We can use supervisory Y14 data to account for the ability of certain firms to obtain credit. Like the SNC program, Y14 also tracks credits over their life. In contrast to that program, however, it includes both syndicated and non-syndicated credits. This gives us the opportunity to identify a wider set of firms with access to bank funding. Further, given Y14 is dominated by large banks, we are able to identify a set of firms that are less likely to be credit constrained and ascertain whether our results hold in that sample.

In a first test, we investigate whether a firm is borrowing from a bank with an history of lending to firms with high overhang. Such a lender would be less likely to cut funding to firms that suddenly experience a sharp rise in their levels of debt overhang. To implement this test, we begin by identifying the primary lender to a firm in our Y14 data. Next, we determine whether the bank has extended credit (not for restructuring purposes) to firms with high overhang in the same industry as the borrower in 2019 or 2018. We consider a lender that has made loans to firms with high overhang in a given industry as being 'comfortable' with high overhang.

For some firms, we are either unable to identify their lender in Y14 or we can see that the lender has not extended loans to firms with high overhang. The results for this analysis are depicted in Panel A of Table 9. In columns (4)-(6), we show the effect of a firm jumping to high overhang in 2020. However, we restrict the sample to firms that borrow from a lender that is 'comfortable' with high overhang.

The new results are indistinguishable from our baseline results, discussed above. Assets are liable to grow 5%-pts slower while CAPEX contracts by 10%-pts and employees do not grow, experiencing a 2.5%-pts reduction over an equally sized unconditional mean rate of growth. Overall, we argue this is further evidence against the likelihood that lender's contracting funding was the cause of reduced growth for those firms that experienced a jump to high overhang.

Finally, in Panel B, we make use of credit line slack, as discussed above. If we are able to identify a firm lender in 2019, we can ascertain whether the borrower has un-drawn credit lines outstanding. In principle, that firm could draw down on its credit line during the 2020-2021 time period and avoid a contraction in growth, should it otherwise fail to obtain funding. It was well documented that many firms did draw down on their credit lines during COVID. We define a firm as having slack in it's credit line if it has drawn down less than 10% and the remaining maturity, in 2019 is at least 18 months.

In columns (4)- (6) we show that borrowers with credit line slack still experience almost the same contraction in assets as firms with no credit line slack. Surprisingly, the contraction in CAPEX was even larger for firms with no borrowing limits. This may relate, however, to sample sizes, given that the vast majority of firms we are able to match to our Y14 data do have at least some un-drawn credit lines outstanding.

Overall, the results from the COVID period – with its rapid increase in overhang for many firms – are in line with our previous finding. For those firms that jumped to high overhang for the first time, the transition came with a significant reduction in growth. This was unlikely driven by constraints in credit availability and instead most likely driven by management decisions related to their view of the firm's future prospects. The Covid-19 period, therefore, confirms that debt overhang is costly.

4.3 Additional complications of the COVID crisis

The evidence we unveiled in the Covid-19 period focuses on the short-term effects of debt overhang because it has been only two years since pandemic started in the US. However, as we documented in the previous section, debt overhang can have long lasting effects. There is at least one additional factor that is likely to increase the costs of debt overhang we identified following the Covid-19 outbreak: the ownership structure of debt. There is limited evidence on the optimal mechanisms to resolve the issue of debt overhang. But, Kurtzman and Zeke (2015) show, theoretically, that debt forgiveness can lead to large aggregate gains in times of aggregate distress. Giroud et al. (2012) use a natural experiment to show that debt forgiveness can lead to renewed healthy growth in firms previously affected by debt overhang. However, renegotiation is complicated, in practice, by the ownership structure of debt. Debt forgiveness by any one party presents a free rider problem if no other debt holders follow suit (see Corden (2006) or Krugman (1988)). This problem is compounded when loan ownership is dominated by many investors owning small loan shares as in the leveraged loan market. For example, at the end of 2019, the average number of CLOs in Ba and B rated loans was 203 and 160, respectively. Their average loan share was 0.24% and 0.42% respectively. Further, CLO managers will likely be reluctant to agree to any concessions involving the conversion of debt into equity because the latter carry little to no value in CLO tests.

Of course in instances when voluntary debt forgiveness is not feasible, the Chapter 11 bankruptcy process may be a viable option. Bankruptcy courts can help enforce a debt renegotiation and debtor-in-possession (DIP) loans can help a firm circumvent some of the aforementioned challenges of out-of-court reorganizations. This may be an option for large firms provided that the bankruptcy courts are not overburdened and DIP financing is still available.[15].

However, small private firms may not be able to reorganize in bankruptcy. Brunnermeier and Krishnamurthy (2020) compare small firms to the over-indebted households of 2007-2009. These firms are opaque to potential lenders and, in many cases, have relied heavily on non-bank intermediaries.

The liquidation or simply reduced long-term growth prospects of small firms represents a sizeable risk for the economy because this segment of the economy collectively account for a large portion of employment and economic growth.

5 Robustness

So far we have made use of overhang that is defined as liabilities to EBITDA. The intuition behind this variable is to highlight the burden of maintaining a certain level of borrowing with a reduced cash flow. To ensure that our variable is capturing the desired effect – and we are not instead picking up something mechanical in the data – we attempt alternate definitions of 'overhang'.

We first make use of debt as opposed to liabilities as a measure of borrowing. Debt to EBITDA more acutely captures the degree to which the firm has loans and/or bonds outstanding. Although we forego trade credit (and similar sources of financing that can be vital for some firms), debt does reflect a reasonable alternate definition of firm borrowing. In Appendix Table A.1 we show that our baseline results from Table 2 hold if we make use of *Debt/EBITDA*. Firms with overhang are less likely to grow

[15]See Brunnermeier and Krishnamurthy (2020) for a hypothetical discussion of this issue

in the subsequent year. We again make use of a continuous variable and do not include firms with negative EBITDA. Coefficients are standardized for ease of interpretation to represent the effect of a one-standard deviation increase in the variable in question.

Another measure of indebtedness could relate the actual funds required to maintain the firm's borrowing to its cash flow. To this end, we make use of interest payments to EBITDA. Interest payments are a good proxy of the actual burden that firms have to bear for their borrowing. In the traditional definition of overhang, managers and owners may be unwilling to invest if all cash flow is diverted to make payments on existing debt. Unfortunately, we lose some observations because not all firms report their interest burden.

In Appendix Table A.2 we are again able to show that our baseline results hold if overhang is measured as EBITDA/Interest Payments. Firms, which direct a large share of their funds to interest payments, grow more slowly. It should be noted that the interpretation of the coefficients is inverted in these cases, as having high levels of EBITDA relative to interest payments are a positive for firms. We again exclude firms with negative EBITDA for convenience. As discussed above, we show that our approach is not functional form dependent. Especially for CAPEX, which can be considered a flow variable, it is crucial to show a negative relationship between high rates of overhang and subsequent CAPEX. Results for this specification can be found in Appendix Table A.3. High overhang is associated with generally smaller firms, investing less in CAPEX and having fewer employees, compared with both similar firms in the same industry and past observations of the firm itself.

In Appendix Tables A.4 and A.5, we make use of our continuous measure of overhang and a specification that includes industry*year as well as firm fixed effects. We then split our sample along two dimensions that measure a firm's access to credit: whether it refinances a loan (using Dealscan data) and whether it has slack in its credit line (using SNC data). Our aim is to showcase that our results, discussed above, are not driven by our definition of 'jumping to high overhang'. We again exclude firms with negative EBITDA for ease of interpretation.

We actually see a pronounced negative effect; having relatively high overhang reduces firm growth along all three dimensions (assets, CAPEX, and employees). The effect is actually slightly more pronounced for firms with access to financing than for firms without access to financing. This is somewhat related to our sample composition and the fact that we are excluding firms with negative EBITDA. We can conclude, however, that our results above are not driven by our definition of overhang. Using continuous overhang measures yields the same results: access to finance does not mitigate the adverse growth effects of having high overhang.

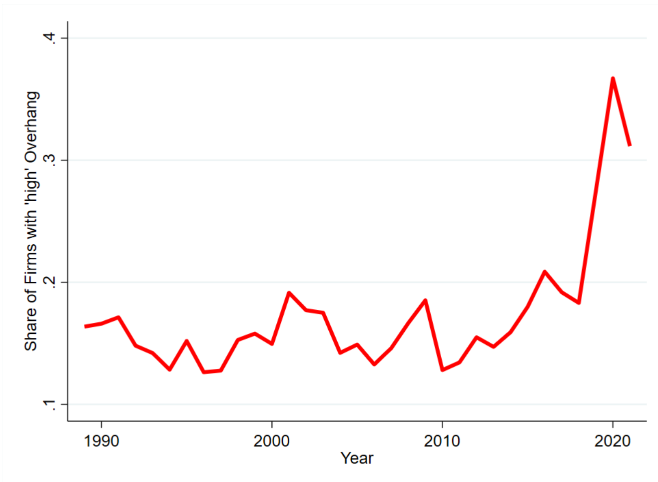
Finally, in Appendix TableA.6 we account for firm rating as an additional control. We absorb rating fixed effects using S&P ratings we were able to merge to our sample of COMPUSTAT firms. Ratings may reflect a firm's prospects to some degree. This specification is akin to our attempts to account for stock prices, though using a different information set. Accounting for rating when analyzing the impact of overhang could be meaningful. We show, however, that our baseline results are unaffected by accounting for firm rating.

6 Conclusion

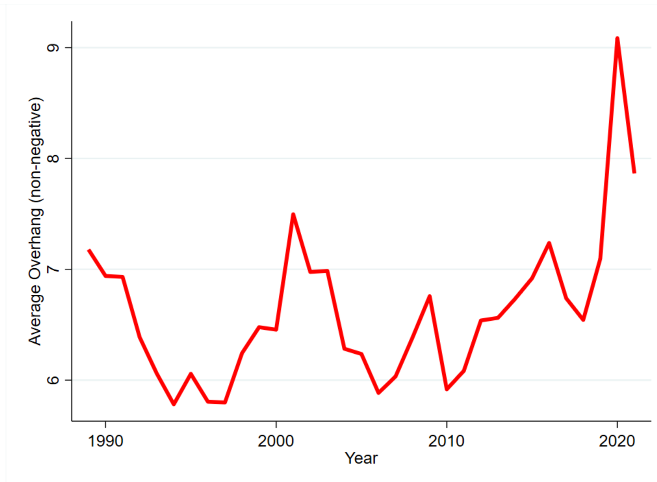
We combine public firm level data and supervisory loan level data to show that debt overhang, as measured by total borrowing to cash flow, limits firm growth as measured by assets, capital expenditures, or employees. While our results hold both among firms that operate with high levels of debt overhang and following shocks that substantially increase the firm's liabilities to cashflow ratio, we focus on the latter measure because it is more immune to the endogeneity concerns that affect traditional measures of leverage. Our results continue to hold when we control for banks' lending standards and among firms that retained access to bank funding. We use a large number of different tests and measures to capture access to funding, which – if taken together – offer a broad indicative picture. Further, we find that among the firms that experience the shock to debt overhang, those whose sharedolders respond more negatively experience a larger adverse effect on their future prospects. Together, these findings suggest that the costs of debt overhang we identify do not arise from a reduction in credit availability but are instead the result at least in part of firms' forgoing discretionary decisions *a la* Myers (1977).

Our focus on liabilities to cashflow allows us to capitalise on the Covid-19 shock as a quasi natural experiment. The outbreak was arguably unexpected and it triggered lock-downs that led to a significant reduction in many firms' cashflows, while these firms borrowed to stay in business, increasing their levels of debt overhang. Notwithstanding all of the measures to support the economy, firms whose debt overhang significantly increased following the outbreak, experience larger declines in subsequent growth. This finding, which continues to hold when we focus on firms that retained access to funding, suggests the effects are driven by management/owner decisions, thereby, adding important support to our evidence on the costs of corporate debt overhang.

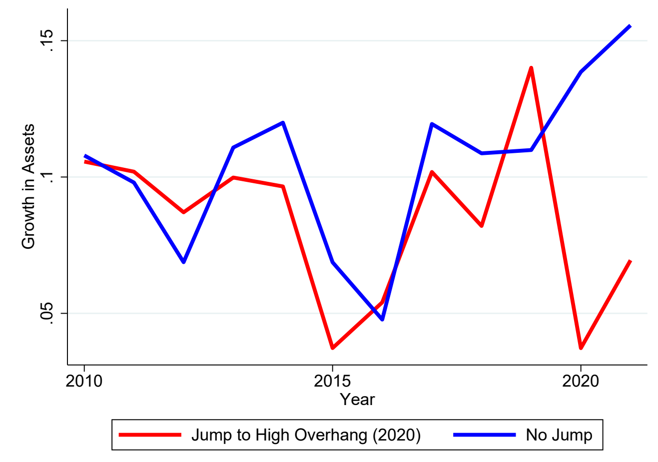
7 Figures



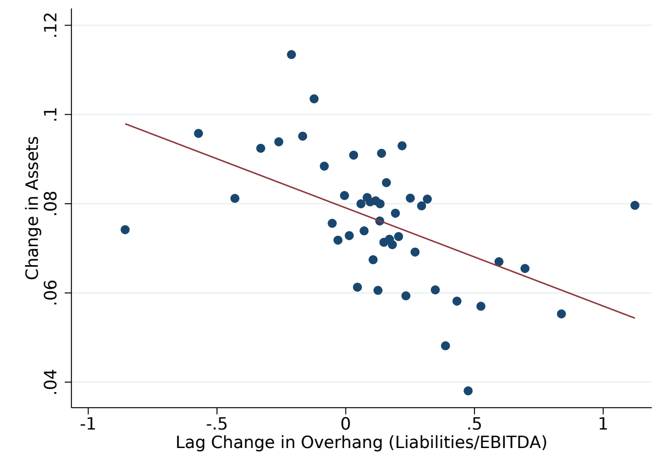
(a) *Share of Firms with High Overhang*



(b) *Average Overhang*

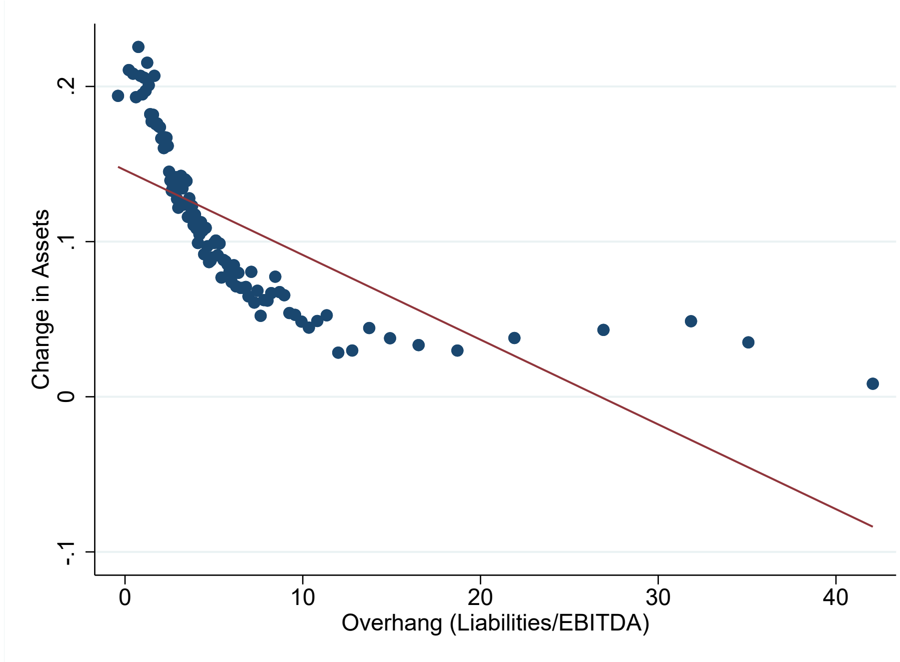


(c) *The Effect of Jumping to High Overhang – Asset Growth*

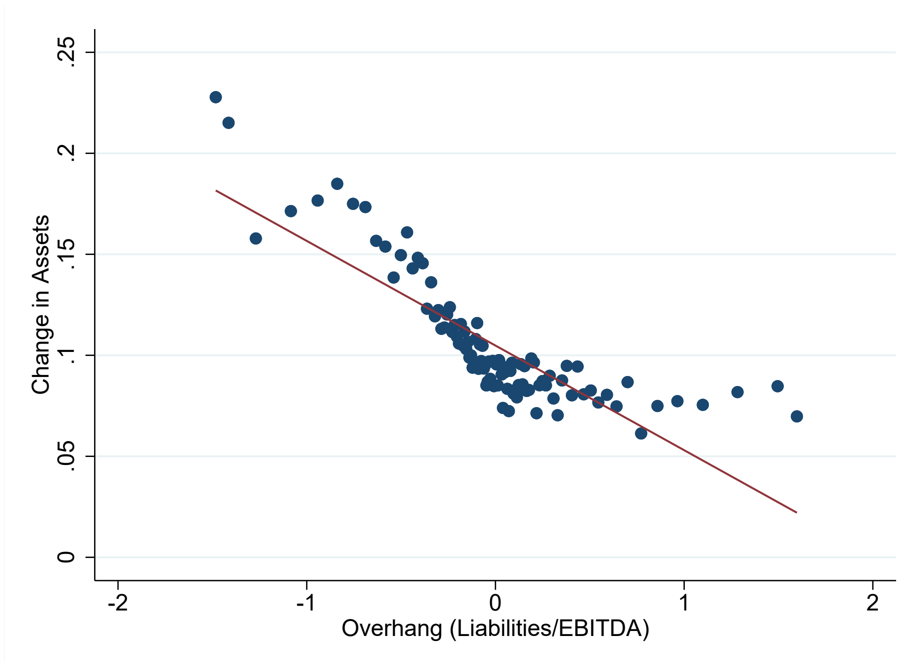


(d) *Change in Firm Growth During COVID*

Figure 1: ***The Cost of Overhang***. *Panel (a) shows the share of all firms in COMPUSTAT operating with 'high' levels of debt overhang. For a given firm, we define high overhang as levels of liabilities to EBITDA that are one standard deviation above mean historical overhang. Firms with negative EBITDA are automatically included in this sample. Panel (b) showcases the average overhang for all firms with non-negative EBITDA in any given year. Panel (c) shows the growth rate (de-trended for firm and year) of firms that jump into the category of having "high" overhang in 2020 and those that do not. Finally, panel (d) shows the relationship between (lag) changes in overhang and firm growth.*

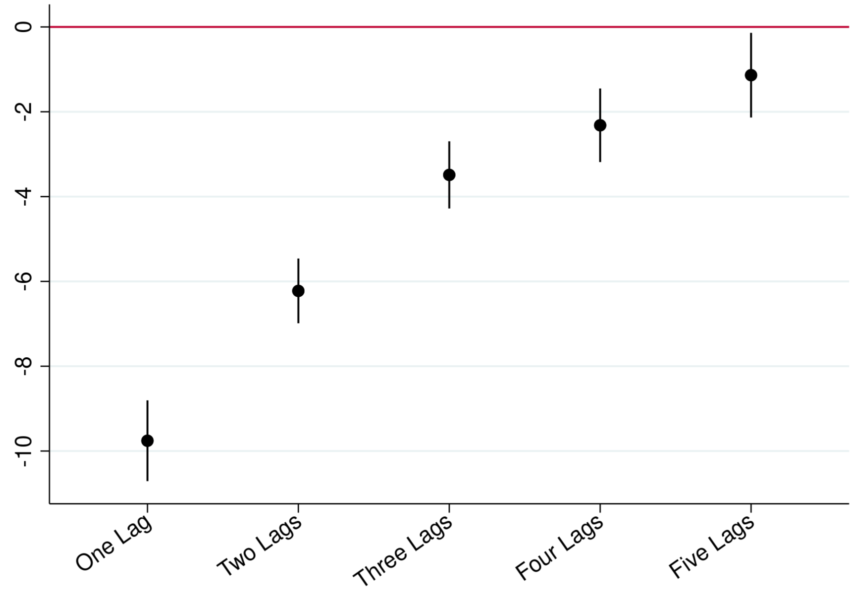


(a) *Lag Overhang vs. Asset Growth*

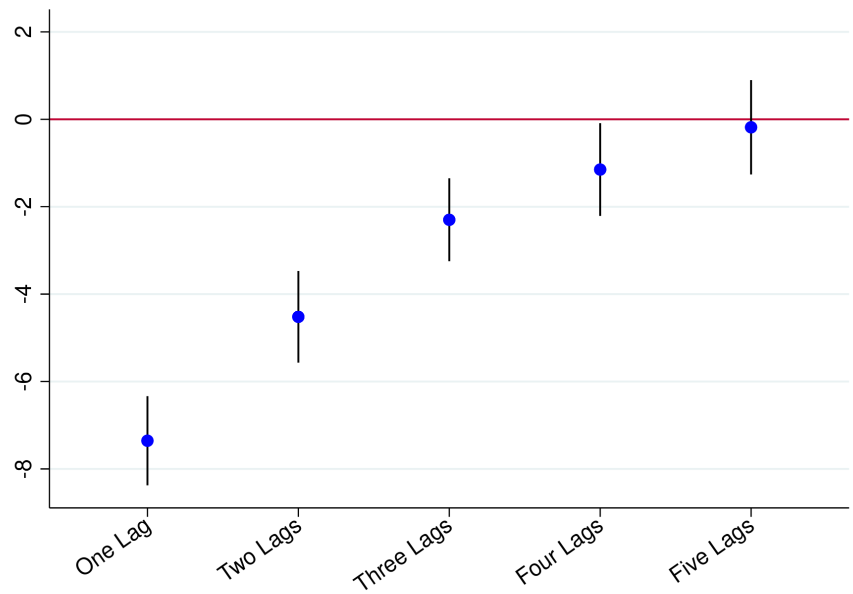


(b) *Lag Change in Overhang vs. Asset Growth*

Figure 2: ***The effects of Overhang***. *Panel (a) shows the relationship between levels of overhang (measures as liabilities to EBITDA and subsequent growth in assets. Panel (b) shows the relationship between lagged growth in overhang and subsequent growth in assets. In both figures, we absorb industry*year fixed effects to account for industry wide variations.*



(a) *Jump to High Overhang – Lags*



(b) *Jump to High Overhang – Lags w/ Firm FE*

Figure 3: ***The Long-Run Effects of Overhang****. Panel (a) and (b) both show the effects of jumping to high overhang in a given period and the subsequent firm growth in later periods. For a given firm, we define high overhang as levels of liabilities to EBITDA that are one standard deviation above mean historical overhang. The coefficient of interest is therefore a dummy that takes the value of 1 if a firm jumped to having high overhang. We make use of 5 lags, while controlling for contemporaneous changes to overhang itself.*

8 Tables

Table 1: *Summay Statistics*

	N	Mean	StDev.	P25	P75
Panel A: Full Sample					
Log Change in Assets	82,939	6.8	31	-5.86	15.37
Log Change in Capex	82,939	1.7	79.4	-32.89	38.57
Log Change in Employees	82,939	3.3	24	-5.23	11.31
Liabilities to EBITDA	82,939	3.5	9	0.55	6.44
High Liabilities to EBITDA	82,939	0.36	0.48	0	1
Jump to High Liabilities to EBITDA	82,939	0.09	0.29	0	0
Leverage (Liabilities to Assets)	82,939	0.54	0.30	0.31	0.69
Assets - Total	82,939	5,730	22,131	76	2,508
Employees	82,939	12.6	50.5	0.2	6.7
Capex	82,939	325	1,578	1.6	106
Liabilities - Total	82,939	3,573	14,152	24	1,491
EBITDA to Interest	74,019	20.4	105.46	1.69	19.34
Debt to EBITDA	82,939	0.924	2.44	0	1.42
Panel B: COVID Period					
Log Change in Assets	6,446	11.98	31.37	-2.29	19.2
Log Change in Capex	6,446	0.70	78.70	-35.86	34.9
Log Change in Employees	6,446	4.08	23.7	-5.15	12.4
Liabilities to EBITDA	6,446	4.13	11.9	-0.315	7.55
High Liabilities to EBITDA	6,446	0.53	0.499	0	1
Jump to High Liabilities to EBITDA	6,446	0.11	0.312	0	0
Leverage (Liabilities to Assets)	6,446	0.55	0.285	0.353	0.72
Assets - Total	6,446	10,902	35,355	236	6,389
Employees	6,446	16	67.1	.27	9.9
Capex	6,446	458	206	2.9	183
Liabilities - Total	6,446	7030	23144	84	4025
EBITDA to Interest	5,379	-5.0	238	1.13	18.6
Debt to EBITDA	6,022	1.16	3.7	-.01	1.7

Note: Summary Statistics for key variables used in the analyses in this paper. Panel A shows statistics for the full sample. Panel B shows statistics for the COVID Period (2020 and 2021)

8.1 Overhang and Firm Growth

Table 2: ***Baseline Results - Standardized***

	(1) Δ Assets	(2) Δ CAPEX	(3) Δ Employees	(4) Δ Assets	(5) Δ CAPEX	(6) Δ Employees
Standardized values of Overhang$_{t-1}$	-4.256***	-4.719***	-1.707***	-5.207***	-6.384***	-1.938***
	[0.209]	[0.535]	[0.163]	[0.257]	[0.670]	[0.199]
Standardized values of Leverage Debt$_{t-1}$	-1.863***	-2.087***	-2.303***	-0.461	-2.357***	-2.469***
	[0.166]	[0.402]	[0.130]	[0.304]	[0.684]	[0.202]
Standardized values of Assets$_{t-1}$	-0.689***	-0.509***	-0.466***	-2.328***	-1.701***	-0.923***
	[0.0615]	[0.118]	[0.0462]	[0.185]	[0.305]	[0.122]
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes
Mean	7.928	4.964	3.572	7.928	4.964	3.572
R^2	0.079	0.069	0.065	0.325	0.191	0.296
N	67934	67934	67934	67934	67934	67934

Note: This table shows the coefficients of interest for equation:

$$Y_{f,t} = \beta_0 + \beta_l Overhang_{f,t-1} + \beta_2 \mathbf{X}_{f,t-1} + \theta_{t*i} + \xi_f + \epsilon_{f,t}$$

Where Y represents the growth of firm "f" along the dimension of either: assets, capital expenditures or employees between t and t-1. We include industry* year as well as firm fixed effects (columns (4-6)). The variable of interest is the firm's overhang in t-1. Overhang is measured as Liabilities to EBITDA. For ease of interpretation, we standardize all coefficients. We exclude all observations with negative liabilities to EBITDA, given that these would reverse the interpretation. Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3: ***Jump to High Debt Overhang***

Panel A: Jump to High Overhang

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Jump to High Debt Overhang$_{t-1}$	-9.525***	-17.57***	-4.919***	-8.348***	-16.66***	-3.838***
	[0.414]	[1.171]	[0.350]	[0.400]	[1.197]	[0.355]
Mean	6.778	1.680	3.310	6.778	1.680	3.310
R^2	0.059	0.060	0.055	0.303	0.175	0.295
N	82939	82939	82939	82939	82939	82939

Panel B: Jump vs. existing High Overhang

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Jump to High Debt Overhang$_{t-1}$	-7.908***	-14.26***	-4.178***	-7.019***	-13.14***	-2.945***
	[0.430]	[1.087]	[0.350]	[0.385]	[1.102]	[0.330]
High Overhang	-4.869***	-14.09***	-2.697***	-5.047***	-14.06***	-2.334***
	[0.822]	[1.385]	[0.522]	[0.610]	[1.071]	[0.397]
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Mean	7.154	1.609	3.366	7.154	1.609	3.366
R^2	0.064	0.067	0.060	0.293	0.172	0.291
N	89385	89385	89385	89385	89385	89385

Note: This table shows the coefficients of interest for equation:

$$Y_{f,t} = \beta_0 + \beta_l JumptoHighOverhang_{f,t-1} + \beta_2 \mathbf{X}_{f,t-1} + \theta_{t*i} + \xi_f + \epsilon_{f,t}$$

Where Y represents the growth of firm "f" along the dimensions of either: either assets, Capital expenditures or employees between t and t-1. We include industry* year as well as firm fixed effects (columns (4-6)). The variable of interest is whether the firm jumped to having "high" overhang between t-2 and t-1. For a given firm, we define high overhang as levels of liabilities to EBITDA that are one standard deviation above mean historical overhang. The coefficient of interest is therefore a dummy that takes the value of 1 if a firm jumped to having high overhang. Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

8.2 Accounting For Loan Supply

Table 4: *Lending Conditions*

Panel A: Tighter Lending Conditions

	(1) Δ Assets	(2) Δ CAPEX	(3) Δ Employees	(4) Δ Assets	(5) Δ CAPEX	(6) Δ Employees
Jump to High Debt Overhang$_{t-1}$	-9.049***	-15.78***	-4.856***	-6.317***	-13.30***	-3.189***
	[0.440]	[1.241]	[0.387]	[0.413]	[1.317]	[0.390]
Jump to High Debt Overhang$_{t-1}$ x Tighter Lending Cond.	1.123	-2.936	0.606	1.408*	-2.471	1.107*
	[0.885]	[2.371]	[0.730]	[0.754]	[2.321]	[0.670]
Mean	7.154	1.609	3.366	7.154	1.609	3.366
R^2	0.064	0.060	0.057	0.377	0.177	0.305
N	89385	89385	89385	89385	89385	89385

Panel B: Unanticipated Debt Overhang

	(1) Δ Assets	(2) Δ CAPEX	(3) Δ Employees	(4) Δ Assets	(5) Δ CAPEX	(6) Δ Employees
Below Industry Ret. x Jump to High Overhang$_{t-1}$	-11.65***	-32.39***	-9.774***	-8.226***	-30.41***	-7.422***
	[0.679]	[1.680]	[0.613]	[0.588]	[1.782]	[0.531]
Jump to High Debt Overhang$_{t-1}$	-1.468**	5.700***	3.111***	-4.049***	5.343***	1.248***
	[0.710]	[1.356]	[0.626]	[0.411]	[1.324]	[0.400]
Below Industry Return	-8.100***	-6.162***	-3.757***	-5.395***	-4.165***	-2.543***
	[0.503]	[0.730]	[0.287]	[0.370]	[0.757]	[0.235]
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes
Mean	7.067	2.188	3.985	7.067	2.188	3.985
R^2	0.108	0.087	0.090	0.351	0.181	0.313
N	52793	52793	52793	52793	52793	52793

Note: This table shows the coefficients of interest for equations:

$$Y_{f,t} = \beta_0 + \beta_l JumpHigh.Overhang_{f,t-1} + \beta_2 Jump.HighOverhang * LoanConditions f,t - 1\beta_4 \mathbf{X}_{f,t-1} + \theta_{i*t} + \xi_f + \epsilon_{f,t}$$

Where we are interested in (i) relating the effects of overhang on firm growth during times tighter lending conditions and. We identify tighter lending conditions as periods in which the SLOOS identifies lending as being somewhat more restrictive (>30). For a given firm, we define high overhang as levels of liabilities to EBITDA that are one standard deviation above mean historical overhang. The "jump" to high overhang occurs in the year in which the firm moves to high overhang. We include industry* year as well as firm fixed effects (columns (4-6)). We additionally include measures of firm indebtedness and firm size (log assets). Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 5: ***Accounting for Credit Supply with Dealscan Data***

Panel A: Firm Borrows – DS Sample

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Jump to High Debt Overhang$_{t-1}$	-7.681***	-16.85***	-3.194***	-7.224***	-10.87***	-2.190***
	[0.534]	[1.748]	[0.466]	[0.631]	[2.016]	[0.549]
Subsample:	Does Not Receive New Loan			Does Receive New Loan		
Mean	5.233	0.186	1.604	5.874	2.665	1.849
R^2	0.298	0.194	0.291	0.471	0.459	0.468
N	30461	30461	30461	13785	13785	13785

Panel B: Firm Refinances Loan (in t or t-1)

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Jump to High Debt Overhang$_{t-1}$	-7.017***	-16.63***	-3.490***	-6.793***	-10.15***	-1.532**
	[0.482]	[1.546]	[0.410]	[0.728]	[2.383]	[0.655]
Subsample:	No Loan Refinancing			Loan Refinanced in t-1		
Mean	5.167	-0.190	1.485	6.359	4.968	2.363
R^2	0.289	0.184	0.285	0.455	0.484	0.461
N	34389	34389	34389	9857	9857	9857

Panel C: Expensive Credit

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Jump to High Debt Overhang$_{t-1}$	-7.460***	-15.37***	-3.216***	-7.413***	-13.08***	-2.328**
	[1.230]	[3.619]	[1.172]	[1.279]	[3.276]	[1.035]
Subsample:	High Cost Credit			Low Cost Credit		
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Mean	8.471	2.813	2.874	9.484	7.398	4.191
R^2	0.667	0.658	0.664	0.580	0.596	0.588
N	6325	6325	6325	6901	6901	6901

Note: This table shows the coefficients of interest for equation:

$$Y_{f,t} = \beta_0 + \beta_l JumptoHighOverhang_{f,t-1} + \beta_2 \mathbf{X}_{f,t-1} + \theta_{t*i} + \xi_f + \epsilon_{f,t}$$

We make use of COMPUSTAT data merged with Dealscan loans. We split our sample into those firms that receive and those that do not receive new loans in t-1 (panel a) and firms that renegotiate existing loans or do not renegotiate existing loans in t or t-1 (panel b). For Panel (c), we detrend the allindrawn spread paid for loans in t-1 by the firm, by purpose, industry, and year fixed effects. We then split the sample into firms paying spreads above their de-trended average or below for new loans. The variable of interest is whether the firm jumped to having "high" overhang between t-2 and t-1. For a given firm, we define high overhang as levels of liabilities to EBITDA that are one standard deviation above mean historical overhang. The coefficient of interest is therefore a dummy that takes the value of 1 if a firm jumped to having high overhang. We include industry*year as well as firm fixed effects and account for firm indebtedness (leverage) and log assets. Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 6: ***Accounting for Credit Supply with SNC Data***

Panel A: Firm receives new Credit Line

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Jump to High Debt Overhang$_{t-1}$	-6.927***	-15.87***	-3.585***	-6.321***	-9.155***	-1.914***
	[0.708]	[1.993]	[0.605]	[0.771]	[2.059]	[0.646]
Subsample:	No New Credit Line			Receives New Credit Line		
Mean	7.238	3.025	2.878	6.884	4.214	3.341
R^2	0.326	0.217	0.323	0.396	0.307	0.394
N	15459	15459	15459	12310	12310	12310

Panel B: Firm has slack in Credit Line

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Jump to High Debt Overhang$_{t-1}$	-5.658***	-10.26***	-1.216	-5.913***	-6.558***	-1.876**
	[0.913]	[2.666]	[0.748]	[0.794]	[2.088]	[0.744]
Subsample:	No Slack in Credit Line			Slack in Credit Line		
Mean	6.917	3.659	3.570	6.557	4.710	2.268
R^2	0.459	0.359	0.446	0.452	0.376	0.456
N	7679	7679	7679	7828	7828	7828

Panel C: Large vs. Small Lead Agent Shares

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Jump to High Debt Overhang$_{t-1}$	-6.941***	-9.603***	-1.797*	-5.573***	-6.448***	-1.494**
	[1.231]	[2.938]	[1.025]	[0.760]	[2.302]	[0.680]
Subsample:	Small Lead Share			Large Lead Share		
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean	7.176	4.331	2.378	6.743	4.788	3.217
R^2	0.459	0.447	0.466	0.412	0.305	0.404
N	4051	4051	4051	11136	11136	11136

Note: This table shows the coefficients of interest for equation:

$$Y_{f,t} = \beta_0 + \beta_l JumptoHighOverhang_{f,t-1} + \beta_2 \mathbf{X}_{f,t-1} + \theta_{t*i} + \xi_f + \epsilon_{f,t}$$

We make use of COMPUSTAT data merged with SNC loans. We split our sample into those that have access to a credit line and those that do not (in Panel A), firms that have less than a 10% of their credit line(s) drawn down and firms that have more drawn down (panel B), and firms that see the lead bank take a large stake in a loan and firms that see the lead bank in a syndicate take a small stake (less than 20 %) in a loan (panel C). Larger stakes may be a sign of the most informed party being willing to extend credit. The variable of interest is whether the firm jumped to having "high" overhang between t-2 and t-1. For a given firm, we define high overhang as levels of liabilities to EBITDA that are one standard deviation above mean historical overhang. The coefficient of interest is therefore a dummy that takes the value of 1 if a firm jumped to having high overhang. We include industry*year as well as firm fixed effects and account for firm indebtedness (leverage) and log assets. Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 7: ***Lending Conditions***

	Unanticipated Debt Overhang					
	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Below Industry Ret. x Jump to High Overhang$_{t-1}$	-11.65***	-32.39***	-9.774***	-8.226***	-30.41***	-7.422***
	[0.679]	[1.680]	[0.613]	[0.588]	[1.782]	[0.531]
Jump to High Debt Overhang$_{t-1}$	-1.468**	5.700***	3.111***	-4.049***	5.343***	1.248***
	[0.710]	[1.356]	[0.626]	[0.411]	[1.324]	[0.400]
Below Industry Return	-8.100***	-6.162***	-3.757***	-5.395***	-4.165***	-2.543***
	[0.503]	[0.730]	[0.287]	[0.370]	[0.757]	[0.235]
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes
Mean	7.067	2.188	3.985	7.067	2.188	3.985
R^2	0.108	0.087	0.090	0.351	0.181	0.313
N	52793	52793	52793	52793	52793	52793

Note: This table shows the coefficients of interest for equations:

$$Y_{f,t} = \beta_0 + \beta_l HighUnexp.Overhang_{f,t-1} + \beta_2 HighOverhang_{f,t-1} + \beta_3 LowStockReturns_{f,t-1} + \beta_4 \mathbf{X}_{f,t-1} + \theta_{i*t} + \xi_f + \epsilon_{f,t}$$

Where we are interested in the effects of unanticipated overhang. We define "unexpected overhang" as overhang that is 'high' in years the firm's stock has under-performed other firms in its industry. As such, the equity market is valuing the firm's prospects more negatively than comparable firms with high overhang but good stock performance. For a given firm, we define high overhang as levels of liabilities to EBITDA that are one standard deviation above mean historical overhang. We include industry* year as well as firm fixed effects (columns (4-6)). We additionally include measures of firm indebtedness and firm size (log assets). Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

8.3 The COVID Shock

Table 8: *The Covid Shock*

Panel A: Baseline Results during the COVID Period

	(1)	(2)	(3)
	Δ Assets	Δ CAPEX	Δ Employees
Jump to High Debt Overhang$_{t-1}$	-5.433***	-9.196***	-2.138**
	[1.001]	[2.480]	[1.037]
Mean	11.991	0.695	4.080
R^2	0.069	0.064	0.095
N	6446	6446	6446

Panel B: COVID Period – de-trended firm growth

	(1)	(2)	(3)
	Δ Assets	Δ CAPEX	Δ Employees
Jump to High Debt Overhang$_{t-1}$	-3.058***	-7.010***	-0.350
	[0.878]	[2.426]	[0.718]
Mean	-0.310	-0.569	-0.151
R^2	0.055	0.024	0.036
N	6387	6373	6360

Panel C: COVID Period – Jump vs Previous High Overhang

	(1)	(2)	(3)
	Δ Assets	Δ CAPEX	Δ Employees
Jump to vs High Level Overhang$_{t-1}$	-4.293***	-8.395***	-2.859**
	[1.538]	[2.907]	[1.258]
Industry*Year FE	Yes	Yes	Yes
Mean	12.663	1.439	4.950
R^2	0.079	0.056	0.111
N	4030	4030	4030

Note: This table shows the coefficients of interest for equation:

$$Y_{f,t} = \beta_0 + \beta_l JumptoHighOverhang_{f,t-1} + \beta_2 \mathbf{X}_{f,t-1} + \theta_{t*i} + \xi_f + \epsilon_{f,t}$$

We make use of the COVID period – the years 2020 and 2021. We relate the growth in firms to whether they experienced a jump to high levels of overhang in 2020. We de-trend the growth for firm and year fixed effects in panel (b) to make the change relative to past firm growth. Panel (c) makes use of all firms that have either had high overhang for for the year immediately prior to the crisis and firms that jumped to high overhang in the crisis. The variable of interest in all casesvis again whether the firm in question jumped to having "high" overhang. For a given firm, we define high overhang as levels of liabilities to EBITDA that are one standard deviation above mean historical overhang. The coefficient of interest is therefore a dummy that takes the value of 1 if a firm jumped to having high overhang. We include industry*year as well as firm fixed effects and account for firm indebtedness (leverage) and log assets. Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 9: ***Accounting for Lending in the Covid Shock***

Panel A: Firm Borrows from Banks who lend to High Overhang Firms

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Jump to High Debt Overhang$_{t-1}$	-7.016***	-9.687*	-4.067***	-5.097***	-9.822***	-2.577***
	[1.760]	[4.933]	[1.448]	[0.887]	[1.928]	[0.802]
Subsample:	Lender Unknown in 2020/ Not Experienced w. Overhang			Lender Experienced with Overhang		
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean	15.053	4.417	6.969	9.879	-0.355	2.352
R^2	0.055	0.032	0.076	0.079	0.087	0.097
N	3647	3647	3647	2953	2953	2953

Panel B: Accounting for Credit Line Utilization

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Jump to High Debt Overhang$_{t-1}$	-4.805**	-5.970	-2.665	-4.780***	-7.693***	-2.434**
	[1.812]	[6.772]	[1.945]	[0.885]	[2.499]	[0.950]
Subsample:	Borrower has no Slack in CL			Borrower has Slack in CL		
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean	9.166	-4.869	1.581	9.137	-1.016	1.722
R^2	0.133	0.176	0.216	0.092	0.125	0.106
N	734	734	734	3493	3493	3493

Note: This table shows the coefficients of interest for equation:

$$Y_{f,t} = \beta_0 + \beta_l JumptoHighOverhang_{f,t-1} + \beta_2 \mathbf{X}_{f,t-1} + \theta_{t*i} + \xi_f + \epsilon_{f,t}$$

We make use of the COVID period – the years 2020 and 2021. We relate the growth in firms to whether they experienced a jump to high levels of overhang in 2020. In Panel (a), we make use of Firms we are ever able to match to Y14 data. We then difference this sample into (i) firms that are borrowing from lenders which lent to firms with high overhang in 2019 and 2020 and (ii) firms that could not be matched to Y14 in 2020 or that borrow from lenders that do not lend significant sums to borrowers with overhang. In Pannel (b) we make use of all firms that have a Credit Line with a Y14 bank in 2020. We split our sample into borrowers with Credit Line slack (i.e. whose CL utilization is below 30%) and those with higher CL utilization. The variable of interest in all cases is again whether the firm in question jumped to having "high" overhang. For a given firm, we define high overhang as levels of liabilities to EBITDA that are one standard deviation above mean historical overhang. The coefficient of interest is therefore a dummy that takes the value of 1 if a firm jumped to having high overhang. We include industry*year as well as firm fixed effects and account for firm indebtedness (leverage) and log assets. Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

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Internet Appendix for "The Costs of Corporate Debt Overhang"

Table A.1: ***High Debt Overhang – Debt to EBITDA***

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Standardized values of (Debt / EBITDA)$_{t-1}$	-3.016***	-4.061***	-1.312***	-3.675***	-5.318***	-1.649***
	[0.170]	[0.425]	[0.143]	[0.203]	[0.481]	[0.155]
Standardized values of Leverage$_{t-1}$	-1.960***	-1.925***	-2.300***	-0.618**	-2.154***	-2.416***
	[0.160]	[0.428]	[0.129]	[0.310]	[0.699]	[0.209]
Standardized values of Assets$_{t-1}$	-0.668***	-0.410***	-0.448***	-2.616***	-1.924***	-1.042***
	[0.0683]	[0.135]	[0.0527]	[0.206]	[0.348]	[0.141]
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes
Mean	8.167	4.954	3.910	8.167	4.954	3.910
R^2	0.077	0.070	0.063	0.324	0.193	0.298
N	62567	62567	62567	62567	62567	62567

Note: This table shows the coefficients of interest for equation:

$$Y_{f,t} = \beta_0 + \beta_l Overhang_{f,t-1} + \beta_2 \mathbf{X}_{f,t-1} + \theta_{t*i} + \xi_f + \epsilon_{f,t}$$

Where Y represents the growth of firm "f" along the dimension of either: assets, capital expenditures or employees between t and t-1. We include industry* year as well as firm fixed effects (columns (4-6)). The variable of interest is the firm's overhang in t-1. Overhang is measured as Debt to EBITDA. For ease of interpretation, we standardize all coefficients. We exclude all observations with negative liabilities to EBITDA, given that these would reverse the interpretation. Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table A.2: ***High Debt Overhang – EBITDA to INTEREST***

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Assets	Δ CAPEX	Δ Employees	Δ Assets	Δ CAPEX	Δ Employees
Standardized values of (EBITDA/Interest)$_{t-1}$	1.217***	1.100***	0.768***	0.897***	1.391***	0.580***
	[0.133]	[0.246]	[0.108]	[0.143]	[0.354]	[0.133]
Standardized values of Leverage$_{t-1}$	-2.891***	-3.282***	-2.562***	-2.862***	-4.877***	-3.209***
	[0.166]	[0.432]	[0.125]	[0.313]	[0.717]	[0.215]
Standardized values of Assets$_{t-1}$	-0.608***	-0.411***	-0.433***	-2.906***	-2.133***	-1.264***
	[0.0607]	[0.122]	[0.0464]	[0.267]	[0.368]	[0.164]
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes
Mean	7.443	4.466	3.164	7.443	4.466	3.164
R^2	0.072	0.072	0.065	0.324	0.205	0.301
N	59248	59248	59248	59248	59248	59248

Note: This table shows the coefficients of interest for equation:

$$Y_{f,t} = \beta_0 + \beta_l Overhang_{f,t-1} + \beta_2 \mathbf{X}_{f,t-1} + \theta_{t*i} + \xi_f + \epsilon_{f,t}$$

Where Y represents the growth of firm "f" along the dimension of either: assets, capital expenditures or employees between t and t-1. We include industry* year as well as firm fixed effects (columns (4-6)). The variable of interest is the firm's overhang in t-1. Overhang is measured as EBITDA to Interest Payments. For ease of interpretation, we standardize all coefficients. We exclude all observations with negative liabilities to EBITDA, given that these would reverse the interpretation. Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table A.3: ***High Debt Overhang – Levels***

	(1) Log Assets	(2) Log CAPEX	(3) Log Employees	(4) Log Assets	(5) Log CAPEX	(6) Log Employees
Standardized values of Overhang	-0.346***	-0.597***	-0.428***	-0.0156***	-0.137***	-0.0262***
	[0.0178]	[0.0227]	[0.0174]	[0.00554]	[0.00946]	[0.00457]
Standardized values of Leverage	0.571***	0.680***	0.622***	-0.0845***	-0.134***	0.00599
	[0.0203]	[0.0235]	[0.0240]	[0.00677]	[0.00895]	[0.00699]
Standardized values of Firm Size	0.667***	0.709***	0.550***	0.127***	0.115***	0.0789***
	[0.0239]	[0.0241]	[0.0210]	[0.00616]	[0.00651]	[0.00537]
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes
Mean	6.840	3.415	0.936	6.840	3.415	0.936
R^2	0.388	0.379	0.311	0.969	0.938	0.966
N	67934	67934	67934	67934	67934	67934

Note: This table shows the coefficients of interest for equation:

$$Y_{f,t} = \beta_0 + \beta_l Overhang_{f,t-1} + \beta_2 \mathbf{X}_{f,t-1} + \theta_{t*i} + \xi_f + \epsilon_{f,t}$$

Where Y represents the log levels of firm "f" along the dimension of either: assets, capital expenditures or employees between t and t-1. We include industry* year as well as firm fixed effects (columns (4-6)). The variable of interest is the firm's overhang in t-1. Overhang is measured as Liabilities to EBITDA. For ease of interpretation, we standardize all coefficients. We exclude all observations with negative liabilities to EBITDA, given that these would reverse the interpretation. Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table A.4: *Firm Refinances Loan (in t or t-1)*

	(1) Δ Assets	(2) Δ CAPEX	(3) Δ Employees	(4) Δ Assets	(5) Δ CAPEX	(6) Δ Employees
Standardized values of (Liabilities/EBITDA)$_{t-1}$	-4.144***	-5.756***	-1.622***	-6.944***	-7.840***	-2.666***
	[0.385]	[1.101]	[0.295]	[0.568]	[1.426]	[0.409]
Standardized values of Leverage	-2.118***	-2.563**	-2.323***	-2.779***	-2.503*	-3.996***
	[0.451]	[1.282]	[0.317]	[0.683]	[1.315]	[0.465]
Standardized values of Assets$_{t-1}$	-2.212***	-2.113***	-1.053***	-3.278***	-1.402***	-1.620***
	[0.326]	[0.469]	[0.207]	[0.450]	[0.532]	[0.304]
Subsample:	Deal not Refinanced			Deal Refinanced in t or t-1		
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean	5.754	2.269	1.862	7.747	6.180	3.122
R^2	0.335	0.224	0.319	0.353	0.290	0.346
N	23336	23336	23336	15918	15918	15918

Note: This table shows the coefficients of interest for equation:

$$Y_{f,t} = \beta_0 + \beta_l Overhang_{f,t-1} + \beta_2 \mathbf{X}_{f,t-1} + \theta_{t*i} + \xi_f + \epsilon_{f,t}$$

Where Y represents the growth of firm "f" along the dimension of either: assets, capital expenditures or employees between t and t-1. We include industry* year as well as firm fixed effects (columns (4-6)). The variable of interest is the firm's overhang in t-1. Overhang is measured as Liabilities to EBITDA. We split our sample into firms that refinance a loan in t or t-1 and those that do not. For ease of interpretation, we standardize all coefficients. We exclude all observations with negative liabilities to EBITDA, given that these would reverse the interpretation. Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table A.5: ***Firm has slack in Credit Line***

	(1) Δ Assets	(2) Δ CAPEX	(3) Δ Employees	(4) Δ Assets	(5) Δ CAPEX	(6) Δ Employees
Standardized values of (Liabilities/EBITDA)$_{t-1}$	-6.355***	-4.913	-3.232***	-6.104***	-4.363***	-1.508***
	[1.579]	[3.523]	[0.953]	[0.764]	[1.711]	[0.518]
Standardized values of Leverage$_{t-1}$	-7.624***	-8.666**	-6.258***	-3.117***	-2.668	-3.825***
	[1.730]	[3.413]	[1.174]	[0.886]	[1.790]	[0.566]
Standardized values of Assets$_{t-1}$	-8.974***	-8.014**	-4.251**	-4.867***	-3.450***	-3.094***
	[2.945]	[3.661]	[1.827]	[0.762]	[0.800]	[0.501]
Subsample:	No Slack in Credit Line			Credit Line Slack		
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean	7.782	4.110	3.840	6.447	4.885	2.621
R^2	0.558	0.457	0.549	0.407	0.319	0.396
N	4488	4488	4488	10669	10669	10669

Note: This table shows the coefficients of interest for equation:

$$Y_{f,t} = \beta_0 + \beta_l Overhang_{f,t-1} + \beta_2 \mathbf{X}_{f,t-1} + \theta_{t*i} + \xi_f + \epsilon_{f,t}$$

Where Y represents the growth of firm "f" along the dimension of either: assets, capital expenditures or employees between t and t-1. We include industry* year as well as firm fixed effects (columns (4-6)). The variable of interest is the firm's overhang in t-1. Overhang is measured as Liabilities to EBITDA. We split our sample into firms that have slack (less than 10% drawn) in their credit line and those that do not. For ease of interpretation, we standardize all coefficients. We exclude all observations with negative liabilities to EBITDA, given that these would reverse the interpretation. Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table A.6: ***Controlling For Firm Rating***

	(1) Δ Assets	(2) Δ CAPEX	(3) Δ Employees	(4) Δ Assets	(5) Δ CAPEX	(6) Δ Employees
Standardized values of (Liabilities/EBITDA)$_{t-1}$	-5.118***	-5.588***	-2.195***	-6.898***	-7.148***	-2.456***
	[0.393]	[0.841]	[0.298]	[0.552]	[1.098]	[0.418]
Standardized values of Leverage$_{t-1}$	-2.213***	-2.569***	-2.648***	-2.106***	-4.026***	-3.295***
	[0.359]	[0.683]	[0.248]	[0.661]	[1.103]	[0.446]
Standardized values of Assets$_{t-1}$	-0.459***	-0.251*	-0.326***	-3.068***	-2.382***	-1.318***
	[0.0853]	[0.143]	[0.0589]	[0.309]	[0.415]	[0.173]
Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes
Mean	5.843	4.026	1.887	5.843	4.026	1.887
R^2	0.104	0.121	0.082	0.304	0.236	0.276
N	22563	22563	22563	22563	22563	22563

Note: This table shows the coefficients of interest for equation:

$$Y_{f,t} = \beta_0 + \beta_l Overhang_{f,t-1} + \beta_2 \mathbf{X}_{f,t-1} + \theta_{t*i} + \xi_f + \epsilon_{f,t}$$

Where Y represents the growth of firm "f" along the dimension of either: assets, capital expenditures or employees between t and t-1. We include industry* year as well as firm fixed effects (columns (4-6)). The variable of interest is the firm's overhang in t-1. Overhang is measured as Liabilities to EBITDA. For ease of interpretation, we standardize all coefficients. We exclude all observations with negative liabilities to EBITDA, given that these would reverse the interpretation. Our regressions include Rating fixed effects. Standard errors are clustered at the firm-year level while *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.