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Hidden Leverage in Nonfinancial Corporations

Cody Kallen*

Federal Reserve Board of Governors

July 5, 2026

Abstract

A substantial portion of corporate debt remains hidden from balance sheets. I document two forms of off-balance-sheet leverage in nonfinancial corporations: operating leases (pre-2019) and intra-period borrowing—short-term debt issued and repaid within reporting periods, which I am the first to study in nonfinancial firms. Approximately 29 percent of publicly traded firms used substantial operating leases and 12 percent show evidence of substantial intra-period borrowing, with a disproportionate subset using both types of hidden debt. Firms using substantial hidden leverage are generally smaller, more reliant on short-term funding, are less monitored by sophisticated market participants, and report lower leverage, suggesting they use off-balance-sheet debt to project false leverage profiles. When accounting changes in 2019 revealed substantial operating leases, affected firms subsequently cut capital expenditures by 25 percent and R&D by 14 percent, faced heightened risks of executive turnover and stakeholder scrutiny, and experienced more frequent accounting problems. Critically, revelation of substantial operating leases caused these exposed firms to curtail their intra-period borrowing and to raise their reported non-lease leverage.

Keywords: Off-balance-sheet; Lease financing; Capital structure; Disclosure of off-balance-sheet financing

JEL classifications: G14; G32; M48

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I. Introduction

In December 2001, Enron filed for bankruptcy, revealing substantial off-the-books debt far exceeding its previously reported liabilities (Zellner & Forest, 2001). Over the following months, news investigations revealed the widespread use of off-the-books debt (McBride, 2002; Elstein, 2002). In response, governments and accounting boards around the world imposed corporate governance reforms and improved accounting standards, intending to curtail or end the use of off-balance sheet borrowing and financial reporting fraud.

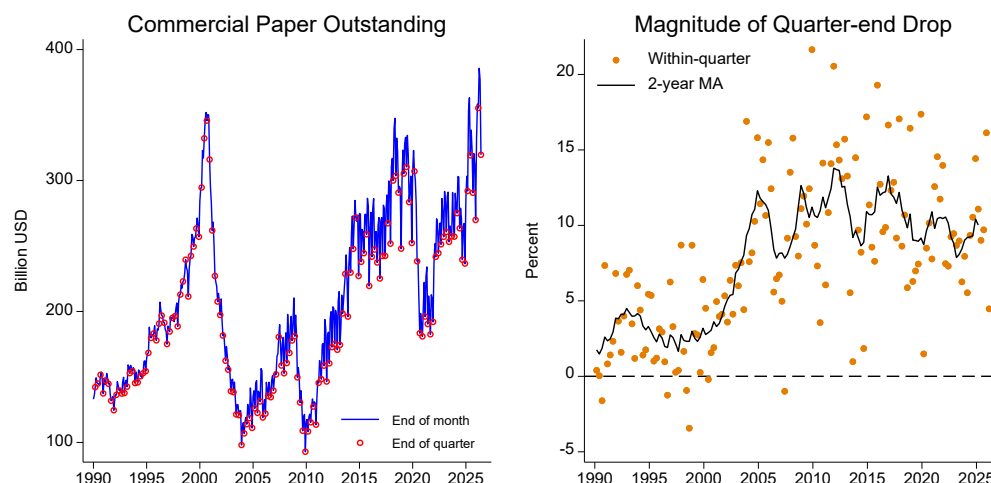
In September 2025, First Brands filed for bankruptcy, revealing billions of dollars of not-previously-reported liabilities. In December 2025, investigative reporting revealed that the construction of data centers as part of the AI boom involved over \$120 billion of off-balance-sheet debt (Weil, 2025; Kinder, 2025).

Off-the-books debt—also known as hidden leverage—has not disappeared, but its structures and forms have changed. This paper documents and analyzes two forms of hidden leverage: intra-period borrowing—borrowing within a reporting period and repaying before period-end, documented in the financial sector but previously unexplored in non-financial firms—and operating leases (prior to 2019). Despite being omitted from firms' balance sheets, I detect and quantify these forms of hidden debt. Using these measures, I assess how hidden leverage has changed over time, what types of firms hide leverage, why firms hide leverage, and the consequences of revealing hidden leverage.

Figure 1 presents a striking example of intra-period borrowing in commercial paper markets, showing outstanding commercial paper issued by nonfinancial corporations. The left panel depicts amounts outstanding at month-end, with quarter-end values circled in red. Beginning in the early 2000s, quarter-end commercial paper began to fall substantially below amounts outstanding during the quarter. The right panel shows the magnitude of the quarter-end drop relative to interpolating around quarter-ends. Since 2005, quarter-end nonfinancial commercial paper outstanding has understated within-quarter commercial paper by approximately 10 percent.

Alternative supply-side explanations are insufficient: these patterns emerged well before any effects of the Great Financial Crisis and the Dodd-Frank regulations (e.g., dealer balance sheet constraints), do not appear in asset-backed commercial paper markets (see Appendix Figure A1), cannot explain the cross-sectional variation in intra-period borrowing documented in this paper, and do not justify the shifts in intra-period borrowing around changes to disclosure rules.

Figure 1. Hidden Debt through Intra-quarter Commercial Paper



Source: Federal Reserve Board, Nonfinancial Commercial Paper Outstanding. Outstanding amount at month-end and quarter-end, percent difference between interpolated and actual amounts at quarter-ends.

This paper makes three key contributions to understanding corporate leverage opacity and its consequences. First, I document and measure intra-period borrowing by nonfinancial corporations, a form of hidden debt not previously studied outside the financial sector. Second, I provide the first evidence of negative real effects from revealing hidden debt. Third, I identify complementarities between different forms of hidden debt.

Approximately 29 percent of firms used substantial operating leases and 12 percent exhibit substantial intra-period borrowing, with disproportionate overlap. These firms are generally smaller and more reliant on short-term funding, yet report low leverage, suggesting these firms use hidden debt to project false low-leverage profiles. Consistent with this explanation, substantial hidden leverage is more common among firms with less effective oversight by institutional investors (especially banks), with junk ratings or no rating from S&P, and with less analyst coverage.

Beginning in 2019, ASC 842 required that operating leases be included in debt on the balance sheet, creating a natural experiment to identify the consequences of revealing substantial operating leases to less sophisticated investors. Firms revealed to have substantial operating leases subsequently reduced their investments. These firms also began facing governance consequences, with higher probabilities of CEO or CFO turnover, greater risk of adverse actions by external stakeholders, and more likely accounting problems.

The revelation of substantial operating leases also led firms to restructure their other forms of borrowing. Prior to 2019, firms with substantial operating leases had lower on-balance-sheet reported leverage and made greater use of intra-period borrowing, using multiple forms of hidden debt to reduce their reported leverage. After revelation, these firms increased their

reported non-lease leverage to match other firms, and they similarly reduced their use of intra-period borrowing.

Section II describes the institutional background of hidden leverage, the related literature, and how this paper contributes relative to prior research. In section III, we empirically detect and measure hidden leverage. Section IV explores which types of firms use hidden leverage and potential reasons for it. Section V assesses the causal effects of the revelation of substantial operating leases, and section VI concludes.

II. Background, Related Literature, and Hypotheses

Much of the research on off-balance sheet debt has focused on banks and other financial sector firms, especially in the context of the Great Financial Crisis. The focus of this paper, however, is on hidden debt for nonfinancial firms.

II.A. Why Firms Use Hidden Debt

The potential for off-balance-sheet borrowing has long been recognized. Ronen, Saunders and Ashwinpaul (1990) documented the use of off-balance-sheet financing in banking and finance, especially through securitized lending. Laibstain, Stout and Bailey (1988) documented other early forms using separate entities and innovative financing arrangements. More recent work has identified partnerships, joint ventures, investments in associated companies, and operating leases (Al-saedi, 2023).

Research has also identified potential explanations for why firms use off-balance sheet debt. Laibstain, Stout and Bailey (1988) attributed the use of off-balance sheet debt to the goal of improving reported leverage, which in turn would expand borrowing capacity, reduce interest rates, and meet managerial compensation targets. Off-balance sheet borrowing can also raise the reported return on assets (Altamuro, Johnston, Pandit & Zhang, 2013), distort measures of firm risk (Cornaggia, Franzen, & Simin, 2013), and help firms avoid violating debt covenants (Mills & Newberry, 2005).

Hidden debt may be particularly relevant for deceiving less informed market participants. While sophisticated lenders and credit rating agencies adjust for off-balance sheet debt (Altamuro et al., 2013), other investors and boards may accept leverage ratios as reported. Consistent with this, I find that hidden debt is more prevalent among firms with weaker monitoring: less institutional ownership by banks and insurers, no credit rating from S&P, and less analyst coverage.

II.B. Operating Leases

Prior to 2019, operating leases functioned as another form of off-balance sheet debt. In principle, leasing capital can be a reasonable alternative to borrowing to purchase it, offering additional flexibility, tax advantages, and risk sharing (SEC, 2005). Leasing capital could also serve as a form of ultra-collateralized lending, allowing constrained firms to increase their borrowing capacity compared to owning the leased assets (Rampini & Viswanathan, 2013; Eisfeldt & Rampini, 2009).

Historically, leases were classified as either capital leases—appearing on the asset and liability sides of the balance sheet—or operating leases, which were excluded from the balance sheet but had to be disclosed in accompanying notes. A lease was considered a capital lease if any of the following were true: (1) ownership would eventually transfer to the lessee; (2) the agreement contained a bargain purchase option; (3) the lease term was at least 75% of the expected life of the capital; (4) the present value of lease payments were at least 90% of fair value of the leased assets.

To avoid recognizing the liabilities associated with leases, firms may have structured lease contracts to ensure their classification as operating leases. SEC (2005) estimated that 63 percent of publicly traded firms in the U.S. had operating leases, compared to only 22 percent with capital leases. Cornaggia, Franzen & Simin (2013) document the immense growth of operating leases over time, leading to mismeasurement of firm risk and performance.

The evidence in prior research is ambiguous on the effectiveness of using operating leases to hide leverage. Altamuro, Johnston, Pandit & Zhang (2013) showed that large banks and credit rating agencies treated operating leases like capital leases in their ratings and loan spreads. Caskey & Ozel (2019) find no evidence of firms using operating leases for window dressing, in contrast to standard hidden debt motives. However, other market participants do not fully incorporate accounting information conveyed in footnotes (Cornaggia, Franzen & Simin, 2013). Imhoff, Lipe & Wright (1993) found that equity prices at least partially incorporate this information, but executive compensation structures do not.

Following Accounting Standards Update 2016-02 (ASU 2016-02) and Accounting Standards Codification 842 (ASC 842), operating leases began receiving the same on-balance-sheet treatment as capital leases beginning in 2019 or 2020 (depending on fiscal year timing). Although these leases had previously been disclosed in footnotes, they now appear in debt liabilities, as well as gross property, plant and equipment assets.

Recent research has explored some of the early consequences of the inclusion of operating leases on the balance sheet. Milian & Lee (2023) found that firms with significant operating leases experienced negative stock returns around initial recognition, suggesting that some equity investors reacted to reported leverage without correcting for disclosed but off-balance sheet leverage. Using data through 2019, Ma & Thomas (2023) find that lessees shifted from long-

term to short-term leases after the announcement in 2016, but they found no other negative effects through 2019. Kim & Xie (2023) found that firms with operating leases adjusted to new leverage targets, with under-levered firms reacting after the 2016 announcement and over-levered firms reacting after the 2019 implementation. In subsequent work, Kim & Xie (2025) found that firms with operating leases responded to ASC 842 by improving their financial reporting quality, and those that improved reporting quality then used more debt financing.

II.C. Intra-period Borrowing

Firms can also conceal debt through intra-period borrowing—borrowing on a short-term basis within a period and repaying the debt before the end-of-period balance sheet snapshot. This phenomenon has been well documented among financial institutions, especially banks.¹

However, the potential for intra-period borrowing by nonfinancial firms is almost entirely unexplored by prior research. Khokar, Qiu & Rahaman (2024) found that firms report more cash at fiscal year-ends than at other quarter-ends, and Frankel, Levy & Shalev (2016) document the opposite result for working capital. These papers document fiscal year-end window dressing in other balance sheet components, suggesting firms manipulate period-end snapshots more generally.

Although academic research has not studied intra-period borrowing by nonfinancial firms, practitioners may implicitly recognize it. As documented in this paper, intra-period borrowing should appear as abnormally high interest expenses relative to reported debt. Consistent with this, when Moody's provides credit ratings, they use interest expense as an input to construct adjusted estimates of leverage, with these adjusted estimates often much higher than financial statement leverage (Kraft, 2015). This also justifies the value of the interest coverage ratio (ICR) as a measure of debt sustainability, and ICR anomalies have been used to flag financial stress (McCoy et al., 2020).

II.D. Hypotheses

In principle, there exist reasonable justifications for using short-term within-quarter borrowing or operating leases even if these are not hidden from investors. Extremely short-term borrowing—through commercial paper, repo, credit lines, letters of credit, or promissory notes—may be used for regular working capital management to deal with timing mismatches from lumpy expenses

¹ Intra-period borrowing by U.S. banks has been documented by Allen & Saunders (1993), Owens & Wu (2015), and Kotomin & Winters (2006). This has also been documented for foreign banks by Munyan (2015) and by Bassi, Behn, Grill & Waibel (2024). Mispricing in short-term financial markets because of this behavior has been documented by Musto (1997) and by Griffiths & Winters (2005).

and payroll timing. Operating leases can be justified for tax reasons or as a type of ultra-collateralized borrowing.

If, alternatively, firms use these to deceive less sophisticated investors about their true leverage, monitoring by sophisticated market participants should deter these activities. We can test this using firm ownership by different types of institutional investors, using banking relationships, and using external oversight by S&P credit ratings and analyst coverage.

Second, if “hidden” debt is already known and fully priced in, then accounting changes from ASC 842 should have no effects. If instead it revealed liabilities previously hidden from less sophisticated investors and market participants, revelation should cause governance problems and tighten financial constraints, which in turn would reduce investment.

The potential effects on debt policies from operating lease revelation are not clearly signed ex ante. This could raise their cost of borrowing, leading affected firms to reduce their (non-lease) leverage. Or, with no remaining advantage to keeping lease liabilities off their balance sheets, they could raise their reported non-lease leverage. It is similarly unclear ex ante how operating lease revelation would affect intra-period borrowing. Loss of one form of hidden debt could prompt firms to substitute into a different form. Alternatively, it could subject the firm to scrutiny (revelation of hidden type), reducing the advantage of hiding short-term borrowing. But if hidden leverage was not actually hidden and was fully priced in, then “revelation” of substantial operating leases should have no effects.

III. Detecting Hidden Debt and Its Properties

Although hidden debt remains off the balance sheet, intra-period borrowing and operating leases can be observed elsewhere in financial statements. We can detect intra-period borrowing using suspiciously high interest expenses relative to reported debt. The schedule of payments for operating leases must be disclosed, and these are collected by Compustat.

III.A. Data and Variable Construction

Our analysis mainly relies on data from Compustat North America Fundamentals, at both quarterly and annual frequencies.

Although operating leases were not included in debt on the balance sheet before 2019, they still reported the schedule of payments for these leases in each of the next five years, in total over the next five years, and total payments beyond five years.² To make these comparable to debt, we compute the present value of these payments, discounting using Moody’s Baa corporate bond

² These variables are *MRC1*, *MRC2*, *MRC3*, *MRC4*, *MRC5*, *MRCT*, and *MRCTA*. Operating lease payments beyond five years are only available beginning in 1994/1995.

yield (within-year average). For firms that report total payments over the first five years but not the annual breakdown, we discount this assuming amortization over those five years. To discount payments beyond the first five years, we assume this is equally amortized over years 6 through 10. This approach resembles that of Cornaggia, Franzen and Simin (2013), but with two distinctions. First, their measure omits lease payments beyond five years, whereas we impose amortization assumptions to include these amounts. Second, they discount using an assumed constant 10 percent rate, whereas we use Moody's Baa corporate bond yield to adjust for the gradual decline of interest rates over the sample and for the relatively safe (collateralized) nature of this borrowing.

Prior to 2019, firms reported capital leases in their debt and in gross leased property, plant and equipment. Under ASC 842, operating leases should be brought onto firms' balance sheets in fiscal year 2019 for firms whose fiscal years end in December, and in 2020 for all other firms.

Using these measures of the present value of operating leases and indicators for whether these are reflected on a firm's balance sheet, we construct a measure of the firm's total debt as reported debt plus the present value of off-balance sheet operating leases. We also construct non-lease debt as total debt minus capital leases and minus the present value of operating leases (after these are brought onto the balance sheet). Scaling by assets, these in turn translate into total leverage, reported leverage, hidden leverage, and non-lease leverage. We also compute the hidden share of total debt.

We construct three measures of lease exposure: total on-balance-sheet leased capital (in assets) scaled by gross property, plant and equipment; capital leases liabilities scaled by total debt (reported and not); and operating leases liabilities scaled by total debt. We winsorize all these measures at the 1st and 99th percentiles.

While detecting operating leases is straightforward, detecting intra-period borrowing requires additional structure. Balance sheet debt reflects amounts outstanding at the of the quarter, so short-term borrowing repaid before quarter-end would not appear on the balance sheet. Nevertheless, the interest expenses paid on intra-quarter borrowing should still appear in firms' income statements. Accordingly, we construct implied interest rates as interest expense divided by the prior quarter's end-of-period reported debt (short- plus long-term) and linearly annualized, excluding cases with negative debt or negative interest expense. Note that the annualization is not compounding; implied interest rates reflect a combination of actual interest rates (which should be compounded when annualizing) and interest paid on unreported debt (which should not be compounded).

$$ImpliedIntRate_{j,t} = \frac{IntExpense_{j,t}}{Debt_{j,t-1}} * 4 * 100$$

As shown in the following subsections, we use the suspicious right tail of the distribution of implied interest rates to detect intra-period borrowing, adjusting for potentially high interest due

to financial distress. In the quarterly dataset, we winsorize this measure at the 1st and 99th percentiles. In the annual data, we compute a similar version by dividing interest expense during the year by the average of beginning and end-of-year reported debt, winsorized at the 5th and 95th percentiles (or at the 1st and 99th percentiles, for a robustness check in the appendix).

For other firm characteristics—quarterly and annually—we use the log of total assets as a measure of size, the ratio of net property, plant and equipment to total assets to measure asset tangibility, the ratio of cash and cash equivalents to total assets, and reported leverage as the ratio of total reported debt to assets, all winsorized at the 1st and 99th percentiles. We also compute the current share of liabilities and accounts payable as a share of total liabilities. We measure gross profitability using the ratio of operating income before depreciation to total assets, winsorized at the 5th and 95th percentiles.

We also construct measures of financial constraints—the index from Kaplan and Zingales (1997) using the implementation in Lamont, Polk and Saá-Requejo (2001), as well as the index from Whited and Wu (2006)—and of default risk—the O-score measure of default risk from Ohlson (1980), and the distance to default measure from Bharath and Shumway (2008).

In the analysis of the effects of operating lease revelation, we will explore three types of outcomes. We measure investment using the ratio of capital expenditures to lagged net PPE and using R&D expenditures scaled by lagged assets, replacing missing R&D values with zeros. We winsorize both measures at the 1st and 99th percentiles.

Second, we explore effects on leverage decisions, specifically the responses of non-lease leverage and intra-period borrowing.

Third, we collect three types of adverse outcomes from Capital IQ’s Key Developments dataset. We identify executive turnover as any fiscal year in which the CEO or CFO changed. We identify adverse external actions as any fiscal year in which external stakeholders took actions with negative implications for the firm: stock delistings, index constituent drops, lawsuits and legal issues; or enforcement actions by a regulatory authority. We also identify fiscal years with accounting problems: delayed SEC filings, delayed earnings announcements, inquiries by a regulatory agency (typically the SEC), restatements of operating results, auditor changes, or the auditor expressing going concern doubts.

We construct firms’ S&P entity ratings using the entity ratings events file from Capital IQ, using each firm’s last observed rating in each quarter for our quarterly dataset and the rating of the firm’s first fiscal quarter for the annual data. We group firms into three buckets: those with investment grade long-term S&P entity ratings (BBB and above), those with sub-investment grade S&P ratings, and those with no S&P ratings.

We collect data on institutional holdings from 13F filings and on analyst coverage, both available from LSEG. We split institutional holdings shares of common stock into ownership by LSEG’s separately identified types of institutions: banks; insurers; mutual funds, closed-end funds, ETFs

and trusts (“funds”); investment advisors, private wealth management, and some hedge funds (“advisors”); and pension funds, endowments, and some hedge funds (“other”). We measure analyst coverage using the number of analysts forecasting a firm’s net debt.³ These measures are available quarterly; for the annual dataset, we use the values at the end of the fiscal year.

To further investigate the role of banks, we flag firms that report having a credit line within the last 12 quarters.

To focus on nonfinancial corporations, we exclude any firms in the financial sector broadly defined (NAICS code beginning with 52 or SIC code beginning with 6).⁴

For the annual data, we also exclude firms using non-GAAP accounting. The FASB designed ASC 842 with the intention of maintaining backward compatibility between measures of operating leases and capital leases. However, IFRS did not follow this approach, creating complications in measuring lease activities around the concurrent implementation of IFRS changes.

The quarterly sample runs from 1980 through 2025q3, although many key measures are only available beginning in 1984. The annual sample covers 1995-2024, as operating lease liabilities beyond five years are not available before then. For the analysis of the effects of revelation, we further restrict the sample period to 2011-2024.

Table 1 reports the summary statistics, with separate panels for quarterly and annual data.

Table 1. Summary Statistics

Quarterly data, 1984-2025						
	Obs	Mean	SD	Min	Median	Max
Implied interest rate	279305	10.739	22.157	0.00	6.25	177.44
Moody's Baa bond yield	279304	6.197	1.986	3.24	5.92	14.71
log(Assets)	275919	6.289	3.052	-6.91	6.77	14.02
PPE/Assets	275374	0.328	0.269	0.00	0.25	0.91
Cash/Assets	275605	0.162	0.222	0.00	0.07	0.97
Reported leverage	273094	0.450	0.864	0.00	0.29	6.44
Current liability share	272428	0.481	0.279	0.06	0.43	1.00
Accounts payable/Liabilities	273328	0.166	0.158	0.00	0.12	0.99
Kaplan-Zingales index	117595	-1.247	9.092	-43.43	0.26	31.00
Whited-Wu index	236095	-0.278	0.130	-0.51	-0.30	0.22
Ohlson O-score	248887	0.133	4.016	-8.22	-0.93	18.90
Distance to default	189591	6.244	8.301	-18.07	5.29	2853.65
Has IG entity rating	279305	0.183	0.387	0	0	1
Has HY entity rating	279305	0.112	0.316	0	0	1

³ While the standard approach to analyst coverage uses the number of analysts forecasting earnings per share, using coverage of net debt specifically is more appropriate in the context of this paper.

⁴ Unlike many corporate finance papers, we do not exclude utilities here. This industry can also use these forms of hidden debt, although they use them to a lesser extent than other nonfinancial industries.

No entity rating	279305	0.705	0.456	0	1	1
Bank ownership share	279305	0.026	0.041	0	0	0.202831
Insurer ownership share	279305	0.005	0.012	0	0	0.072597
Fund ownership share	279305	0.003	0.007	0	0	0.050014
Advisor ownership share	279305	0.058	0.095	0	0	0.681893
Other institutional ownership share	279305	0.189	0.259	0	0	0.877247
Recent credit line access	279305	0.576	0.494	0	1	1
Analyst debt coverage	279305	0.310	0.729	0	0	10.88889

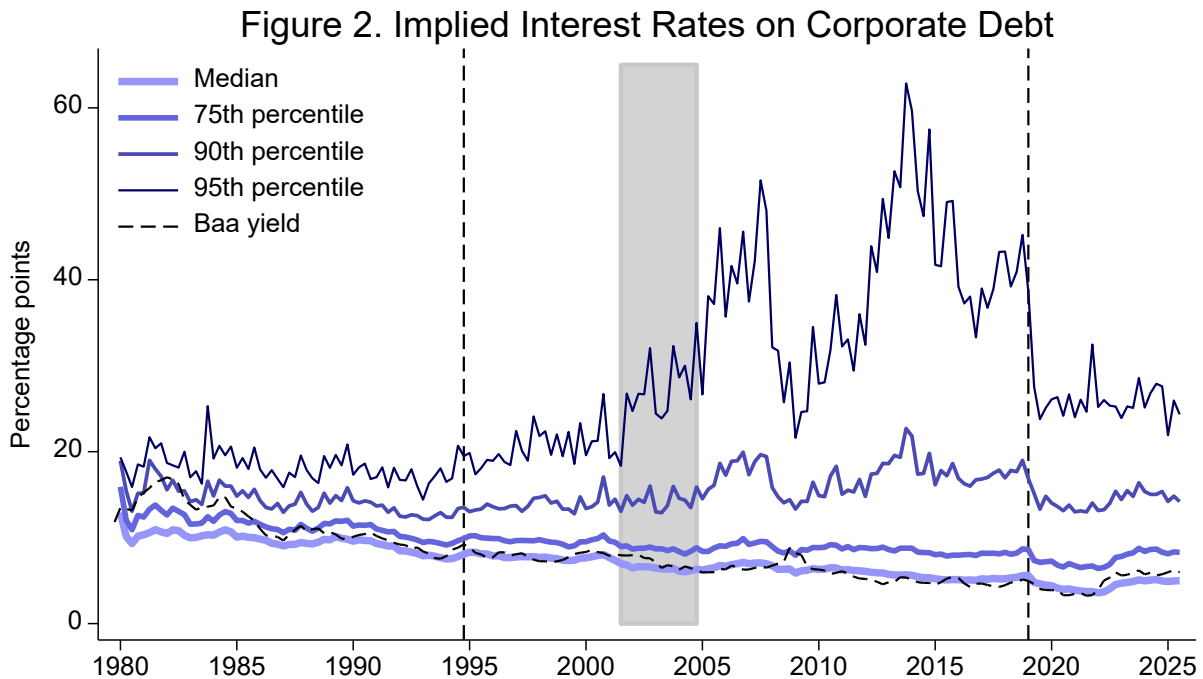
Annual data, 1995-2024

Variable	Obs	Mean	SD	Min	Median	Max
Has operating leases	82276	0.770	0.421	0	1	1
Operating leases / Total debt	75784	0.428	0.479	0	0.180	1.890
On-BS leased PPE / Gross PPE	54531	0.177	0.226	0	0.075	0.890
Off-BS lease share of debt	75784	0.250	0.366	0	0.037	1
log(Assets)	82094	5.697	3.148	-6.908	6.043	13.959
PPE / Assets	82029	0.271	0.259	0	0.176	0.913
Cash / Assets	82084	0.232	0.269	0.000	0.117	0.974
Gross profitability	81751	-0.064	0.370	-1.092	0.083	0.268
Non-lease leverage	78368	0.241	0.310	0	0.171	1.849
Current liability share	80643	0.563	0.303	0.000	0.539	1.072
CapEx / PPE	74697	0.342	0.604	0	0.170	4.333
R&D / Assets	78028	0.098	0.246	0	0.000598	1.496
Kaplan-Zingales index	66195	-3.491	11.244	-45.68225	-0.872379	32.094
Whited-Wu index	71776	-0.277	0.157	-0.571197	-0.297381	0.223
Ohlson O-score	75430	0.334	4.535	-7.750634	-0.910457	19.310
Distance to default	48183	6.443	12.176	-18.06939	5.262142	2364.748
Has IG entity rating	84554	0.131	0.337	0	0	1
Has HY entity rating	84554	0.090	0.287	0	0	1
No entity rating	84554	0.779	0.415	0	1	1
Bank ownership share	84554	0.025	0.040	0	0	0.202831
Insurer ownership share	84554	0.005	0.012	0	0	0.072597
Fund ownership share	84554	0.003	0.007	0	0	0.050014
Advisor ownership share	84554	0.058	0.095	0	0	0.681893
Other institutional ownership share	84554	0.191	0.256	0	0	0.877247
Analyst debt coverage	84554	0.311	0.768	0	0	10.63636
CEO/CFO turnover flag	84554	0.209	0.407	0	0	1
External adverse action flag	84554	0.259	0.438	0	0	1
Accounting problem flag	84554	0.219	0.414	0	0	1
Implied interest rate	65829	7.695	6.327	0.628	6.069	26.567

Moody's Baa bond yield is from FRED. Entity ratings are S&P long-term entity ratings at quarter-end, grouped into investment grade (BBB and above), high yield (below BBB) and unrated. Indicators for CEO/CFO turnover, external adverse actions, and accounting problems comes from Capital IQ's Key Developments dataset, taking values of 1 its at least one of the criteria events occur during the fiscal year. Institutional ownership and analyst coverage data come from LSEG. All other series are from the Compustat North America Fundamentals Annual and Quarterly datasets. All balance sheet ratio variables have been winsorized at the 1st and 99th percentiles, as has the quarterly implied interest rate. Gross profitability and the implied interest rate in annual data have been winsorized at the 5th and 95th percentiles.

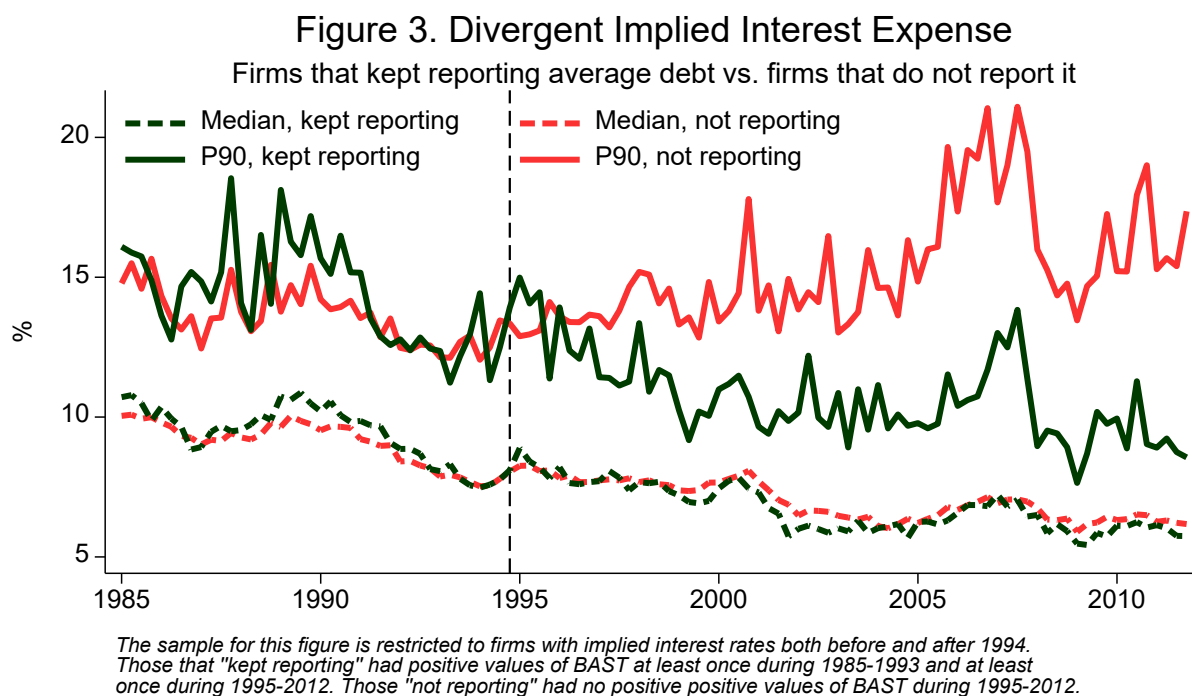
III.B. Hidden Debt Over Time

Figure 2 plots key quantiles of the distribution of implied interest rates over time, with Moody's Baa corporate bond yield as a comparison. The median and 75th percentiles of implied interest rates have closely tracked each other, as well as tracking corporate bond rates. Through the mid-1990s, the right tail of the distribution also tracked these interest rates, before eventually diverging.



The graph highlights three key developments that seem to align with shifts of the right tail of implied interest rates. The first date, in December 1994, marks when the SEC removed the requirement (under Rule 12-10 of Regulation S-X) to report annual average debt, allowing firms to only report end-of-year debt; this also marks approximately when the right tail of implied interest rates began to diverge from actual interest rates. The timing of this divergence is not coincidental; Figure 3 plots the median and 90th percentile implied interest rates among firms

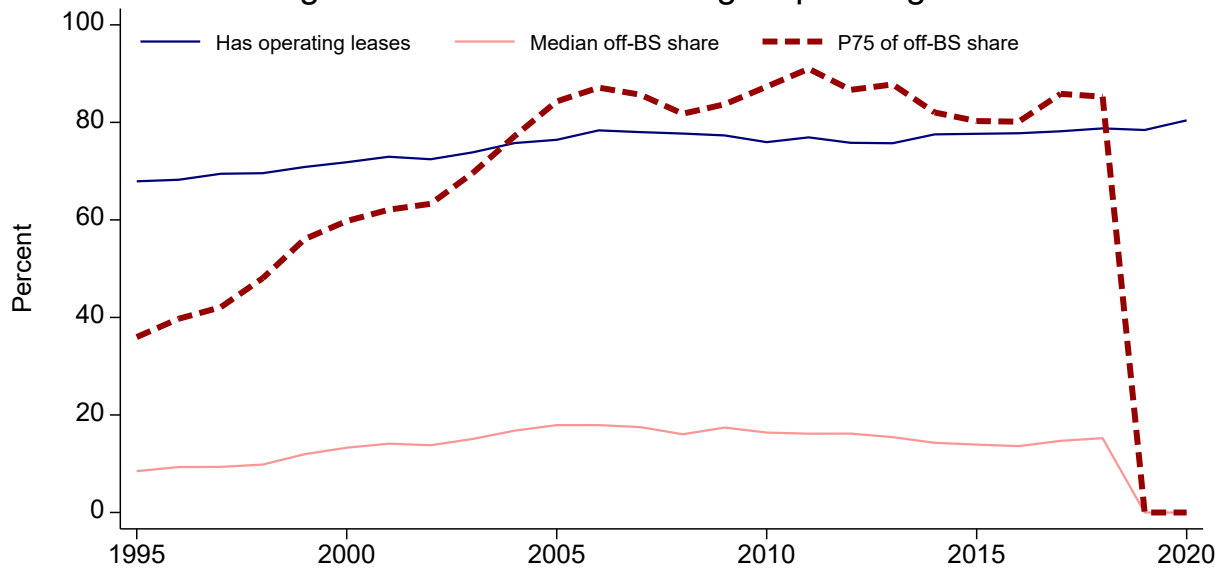
that chose to continue reporting average debt against those that stopped (restricted to firms in the sample before and after 1994). For firms that continued reporting average debt, their implied interest rates trended down over time, tracking median implied interest rates and actual corporate bond yields. Among firms that did not continue reporting average debt, the 90th percentile of implied interest rates diverged after the policy change.



The second key development highlighted in Figure 2 in the gray shaded region, covering 2001q3 to 2004q4, marks the period over which rose the magnitude of the quarter-end drop in commercial paper outstanding. This coincides with an upward shift in the 95th percentile of implied interest rates. We observe additional fluctuations in the Great Financial Crisis and around money market reforms in 2015, which could represent changes to the supply of capital. Finally, a sharp drop in the right tail of implied interest rates occurs in 2019, coinciding with ASC 842 revealing off-balance sheet operating leases; in section V, we explore the causal relationship between these developments.

The time series of implied interest rates displays substantial growth of intra-period borrowing, starting in the mid-1990s and taking off in the early 2000s. By contrast, the use of operating leases to hide debt has been around for longer and has received attention from market participants, regulators, and academics. Figure 4 highlights the magnitude of hidden debt through operating leases. Most firms in Compustat use operating leases, but for most firms these were modest relative to their reported debt, with the median off-balance-sheet share less than 20 percent.

Figure 4. Hidden Debt through Operating Leases



Source: Compustat, and author's calculations.

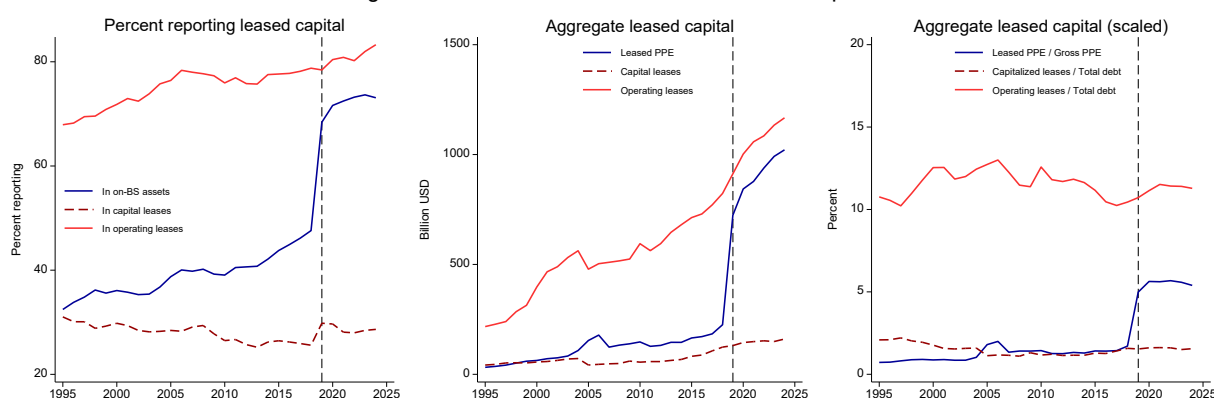
The share measures represent the firm-year ratio of the present value of off-balance-sheet operating leases, to total debt adjusted to include these off-balance sheet leases.

However, a subset of firms had substantial operating leases relative to their total (reported and off-balance-sheet) debt. The 75th percentile of the off-balance-sheet share of debt consistently exceeded 50 percent between 1999 and 2018; for more than a quarter of Compustat firms, operating lease liabilities exceeded their total reported debt.

Figure 5 explores several methods of tracking the use of leased capital over time. The left panel displays the share of firms reporting any leased capital in on-balance-sheet assets (blue line), in on-balance-sheet capital leases (dark red line), and in operating leases (bright red line). Historically, operating leases were much more common than capital leases. In 2019, when these operating leases were brought onto the balance sheet, the share of firms reporting having leased capital in PPE spiked by approximately 20 percentage points.

The middle panel presents aggregate leased capital, and the right panel presents these scaled by appropriately related balance sheet items—leased PPE in assets is scaled by gross PPE, and capital leases and operating leases (in present value) are scaled by total debt (adjusted to include the present value of off-balance-sheet operating leases before ASC 842). Despite the growth of the share of firms using operating leases and their aggregate dollar values, as documented by Cornaggia, Franzen and Simin (2013), their share of total debt did not meaningfully rise over time. In 2019, leased on-balance-sheet PPE spiked by approximately \$500 billion, a shift from less than 2 percent of gross PPE to over 5 percent.

Figure 5. On- and Off-Balance Sheet Leased Capital



Note that aggregate (gross) leased PPE on firms' balance sheets remains below the present value of remaining operating lease payments (plus capital leases). This discrepancy occurs because firms can choose the discount rate to use when converting the schedule of payments to their present value. Choosing a higher discount rate reduces the magnitude of the liabilities that must be reported; consistent with this incentive, firms often use implicit discount rates at or above 10 percent. However, leases are a form of collateralized borrowing and should be discounted at a lower rate consistent with this, as is done by major lessors of equipment for whom these leases are assets. My approach of using Moody's Baa corporate bond yield is intermediate between the approaches of lessors and lessees. Comparing the implications of these different approaches in aggregated Compustat data, the present value of operating lease liabilities was \$823 billion in 2018 when discounted by Moody's Baa yield, whereas asset-side leased capital rose by \$499 billion from 2018 to 2019.

III.C. Identifying Substantial Hidden Debt

We want to flag firms making substantial use of hidden leverage at any point in time.

For operating leases, we define substantial use based on whether including the firm's operating leases on its balance sheet would raise its leverage by any of the following three criteria: more than its actual leverage; relative to other firms' leverage, defined as more than one standard deviation of reported leverage in the cross-section of firms; or relative to the firm's history, defined as more than two standard deviations of that firm's reported leverage.

To construct a similar measure for suspiciously high interest expenses, we need to assess whether these are high relative to a counterfactual interest expense, computed using reported debt and a counterfactual yield on the firm's debt that adjusts for the price of risk and the firm's default risk. We use a simple model to estimate a counterfactual yield, using a proxy for the risk-free rate—the 25th percentile of the distribution of implied interest rates, to account for the slow adjustment of interest paid to changes in interest rates—Moody's Baa corporate bond spread to proxy for the

price of risk, the firm's default risk implied by the Ohlson O-score (quantity of risk), and the interaction between the bond spread and default risk. The logit transformation of the O-score reflects its estimation through a logit model, converting the O-score into the implied probability of default. This adjustment for default risk and the price of risk helps to avoid mistakenly deeming as suspicious cases of high interest expense attributable to default risk. We estimate the following regression, using the predicted values as the counterfactual, and the residual as the gap between actual and expected interest. Note that the coefficient on log debt is 1 by assumption, to avoid circular endogeneity from the relationship between implied interest rates and leverage.

$$\begin{aligned} \log IntExpense_{j,t} &= 0.354 + \log Debt_{j,t-1} + 0.766 * IntRate_t + 0.004 * BondSpread_t + 0.854 \\ &\quad * \frac{1}{1 + e^{-Oscore_{j,t-1}}} + 0.021 * \frac{BondSpread_t}{1 + e^{-Oscore_{j,t-1}}} + \epsilon_{j,t} \end{aligned}$$

Using the log gap between actual and predicted interest, we define suspiciously high interest expenses using the following criteria: interest paid is more than double its predicted value; the log gap between actual and predicted interest is large relative to other firms, defined as exceeding one (period-specific) standard deviation of log implied interest rates; or the log gap between actual and predicted interest is large relative to the firm's own history, defined as exceeding two (firm-specific) standard deviations of log implied interest rates. In addition to these criteria designed to mirror those for operating leases, we also flag firms reporting zero debt but interest expense that is positive and nontrivial (greater than 0.1% of revenue); this includes firms for which we cannot measure an implied interest rate. We also retain the log gap between actual and predicted interest as an intensive margin measure of the extent of intra-period borrowing.

Table 2 presents the shares of firms flagged for substantial operating leases, for suspiciously high interest expenses, or for both, over different periods. Over 1995-2018, 29.2 percent of firms were flagged for suspiciously high hidden leverage via operating leases. Over 1984-2025, 12 percent of firms were flagged for suspiciously high interest expenses, with a lower share before 1994 and a higher share after. Over 1995-2018, 8.2 percent of firms were flagged for both, significantly and substantially higher than would be implied by independence. Overall, the substantial use of hidden leverage appears confined to a minority of publicly traded firms.

Table 2. Shares of Firms with Suspicious Use of Hidden Debt

Flagged for high...	Period	Frequency	Percentage
Operating leases	1995-2018	Annual	29.2
Interest expenses	1984-2025	Quarterly	12.0
Interest expenses	1984-1993	Quarterly	6.0
Interest expenses	1995-2024	Quarterly	12.7
Interest expenses	1995-2018	Quarterly	11.5
Operating leases & interest expenses	1995-2018	Annual	8.2

IV. Who Hides Debt and Why?

We are also interested in understanding what types of firms use hidden leverage, noting that the analysis in this section is not causal. We analyze this in three parts. First, we assess what balance sheet measures correlate with the use of hidden leverage. We then further investigate the relationship between reported leverage and hidden leverage, as well as the role of financial constraints and financial distress. Finally, we turn to the role of governance and oversight, to determine whether monitoring by sophisticated investors may deter the use of hidden leverage.

IV.A. Balance Sheet Correlates of Hidden Leverage

We begin by assessing what balance sheet characteristics predict a firm being flagged as having excessive interest expense relative to reported debt, using logit regressions in the first two columns of Table 3. The remaining columns use OLS regressions on the magnitude of excessive interest—defined as the log gap between actual and predicted interest—conditional on being flagged as excessive or suspicious.

Table 3. Balance Sheet Predictors of Excessive Interest Expenses

Dependent variable	Has suspicious interest expenses		Log excess interest		
log(Assets)	-0.146*** (0.009)	-0.128*** (0.010)	-0.068*** (0.007)	-0.068*** (0.007)	-0.074*** (0.016)
PPE/Assets	0.260*** (0.099)	-0.290** (0.124)	-0.025 (0.059)	-0.106 (0.067)	-0.312*** (0.085)
Cash/Assets	-0.026 (0.079)	-0.137 (0.085)	0.286*** (0.057)	0.295*** (0.058)	0.236*** (0.065)
Reported leverage	-0.107*** (0.022)	-0.094*** (0.022)	-0.115*** (0.011)	-0.115*** (0.011)	-0.120*** (0.016)
Current liability share	0.942*** (0.096)	0.927*** (0.094)	0.572*** (0.064)	0.572*** (0.064)	0.128** (0.061)
Accounts payable/Liabilities	0.587*** (0.123)	0.605*** (0.126)	0.152 (0.102)	0.184* (0.104)	0.223* (0.114)
Method	Logit	Logit	OLS	OLS	OLS
Group fixed effects	No	Industry	No	Industry	Firm
Time fixed effect	Year-quarter		Year-quarter		
Observations	266,966	266,966	28,881	28,881	28,194
R ²	0.082	0.098	0.131	0.136	0.487

*These present panel regressions for the probability and magnitude of implied interest expense relative to the predicted counterfactual. The dependent variable in the first two columns is the indicator for suspiciously high interest expense. In the remaining columns, the dependent variable is the log difference between the implied interest rate and the counterfactual, with the sample restricted to those flagged for suspicious interest expenses. Industry fixed effects are implemented using the 2-digit NAICS code. Standard errors clustered by firm are reported in parentheses, and *, ** and *** denote statistical significance at the 10, 5 and 1 percent confidence levels. R² shown is the pseudo-R² for logit regressions and adjusted R² for OLS regressions.*

Firm size is consistently negatively correlated with firms having excessive interest expenses and their magnitude. Asset tangibility and the cash-to-asset ratio are not robustly related to firms having excessive interest expenses, while the current share of (reported) liabilities is positively and strongly correlated. These results suggest that the use of intra-period borrowing is likely (though not entirely) concentrated in smaller firms that already make greater use of short-term debt.

One concern about the validity of this excessive interest measure is the potential for interest expenses to come from implicit financing through overdue accounts payable. Consistent with this (although not dispositively), reliance on accounts payable is positively correlated with having suspiciously high implied interest rates and with more excessive interest expense. However, it has limited explanatory power,⁵ and the results are robust to restricting the sample to firms with low accounts payable or to including accounts payable in the model in section III.C. Overdue accounts payable as a primary driver of high implied interest rates is also inconsistent with the time series of implied interest rates around disclosure rule changes.

Notably, reported leverage is negatively correlated with being flagged for excessive interest expense and with its magnitude. This suggests the use of intra-period borrowing to report lower leverage, which we explore further in section IV.B.

We also explore predictors of the use and magnitude of hidden debt through operating leases, for the period before their revelation in 2019 and 2020. In Table 4, the first two columns explore predictors for a firm being flagged for substantial operating leases—as defined in section III.C—and the last three columns explore predictors for the share of debt kept off the firm’s balance sheet using operating leases, adding successively stronger fixed effects.

Across these regressions, the current share of reported liabilities is positively correlated, as in the results for excessive interest expense in Table 3. Non-lease leverage is consistently negatively correlated with the use of operating leases, again suggesting their role by firms pretending to have lower leverage, explored further in section IV.B.

Notably, asset tangibility is generally negatively related to firms being flagged for substantial operating leases and to the magnitude of hidden debt across firms, and the cash-to-asset ratio is positively related.

⁵ An analysis of covariance reveals the important correlates for the suspicious interest flag (other than fixed effects) are size and the current share of liabilities, with the explanatory power of firm size 8 times that of accounts payable. On the intensive margin, the important correlates are size, reported leverage, and the current share of liabilities.

Table 4. Balance Sheet Predictors of Operating Leases

Measure of hidden debt	Has substantial operating leases		Hidden debt share		
log(Assets)	0.065*** (0.011)	0.045*** (0.011)	-0.013*** (0.002)	-0.015*** (0.001)	-0.016*** (0.003)
Reported PPE/Assets	-0.261* (0.144)	-0.292* (0.166)	-0.048*** (0.014)	-0.078*** (0.017)	0.011 (0.020)
Cash/Assets	1.032*** (0.105)	1.143*** (0.110)	0.294*** (0.014)	0.301*** (0.014)	0.204*** (0.016)
Nonlease leverage	-3.132*** (0.475)	-3.447*** (0.500)	-0.408*** (0.012)	-0.421*** (0.012)	-0.392*** (0.011)
Current liability share	2.679*** (0.171)	2.622*** (0.183)	0.487*** (0.015)	0.466*** (0.014)	0.493*** (0.014)
Method	Logit	Logit	OLS	OLS	OLS
Group fixed effects	No	Industry	No	Industry	Firm
Time fixed effects	Year	Year	Year	Year	Year
Observations	57,134	57,134	52,988	52,988	52,696
R ² (pseudo)	0.234	0.289	0.523	0.557	0.750

*The first two columns present panel logit and probit regressions for firms flagged for having high off-balance-sheet operating lease debt. The remaining columns use operating lease debt as a share of total debt as the dependent variable. All regressions use fiscal year fixed effects. Industry fixed effects are implemented using the 2-digit NAICS. The regression sample is restricted to the period before ASC 842 takes effect (2019 or 2020). Standard errors clustered by firm are reported in parentheses, and *, ** and *** denote statistical significance at the 10, 5 and 1 percent confidence levels. R² shown is the pseudo-R² for logit regressions and adjusted R² for OLS regressions.*

IV.B. Hidden Debt, Reported Debt, and Financial Distress

The (non-causal) regression results above show a negative relationship between hidden and reported debt, which we now explore further.

There are many potential drivers for a relationship between hidden and reported debt. The negative relationship above suggests that firms may use hidden debt to pretend to be low-leverage types. Or perhaps these firms lack access to traditional debt markets and must thus resort to non-traditional forms of financing.

Alternatively, firms facing risk of default or tight financial constraints could resort to leasing capital. Rampini and Viswanathan (2013) suggested that distressed or constrained firms may lease capital as a version of ultra-collateralized lending, where the lessor fully recovers the assets if the lessee defaults. Risk of default could also explain very high implied interest rates as actually high interest rates, although the adjustment for default risk in the counterfactual measure should incorporate this information when flagging suspiciously high interest expense.

In this section, we assess these alternative explanations: whether high implied interest rates reflect financial distress; whether operating leases reflect limited access to conventional debt; and whether intra-period borrowing and operating leases were used by firms facing tighter financial constraints or financial distress.

Figure 6 explores the relationship between implied interest rates and reported leverage. In the left panel, median implied interest rates are generally increasing with reported leverage, but the deviation of the right tail quantiles has a nonmonotonic relationship with reported leverage. Although implied interest rates are high for the top decile of leverage—which could be due to actually high interest rates—the right tail divergence is more severe for firms reporting very low leverage, consistent with the use of intra-period borrowing to avoid reporting debt. The right panel reports the probability of being flagged for suspiciously high interest rates and the 90th percentile of the excess interest ratio (the log excess interest, exponentiated). The excess interest measure largely removes the high implied interest for firms with high leverage, as much of their interest expenses are attributable to actually high interest rates for firms at imminent risk of default. Nevertheless, some of these firms are also flagged for suspiciously large gaps between reported and expected interest expenses.

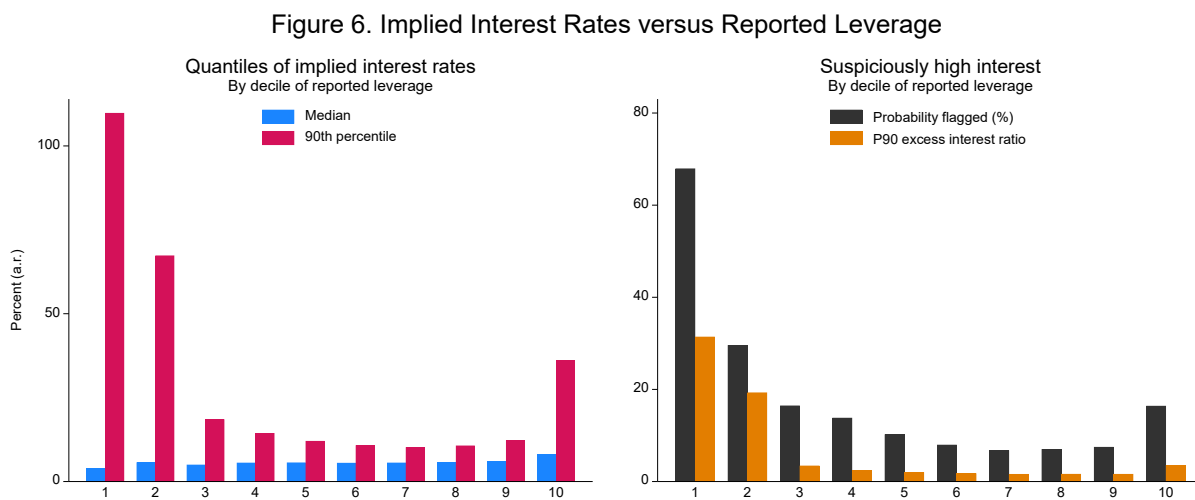
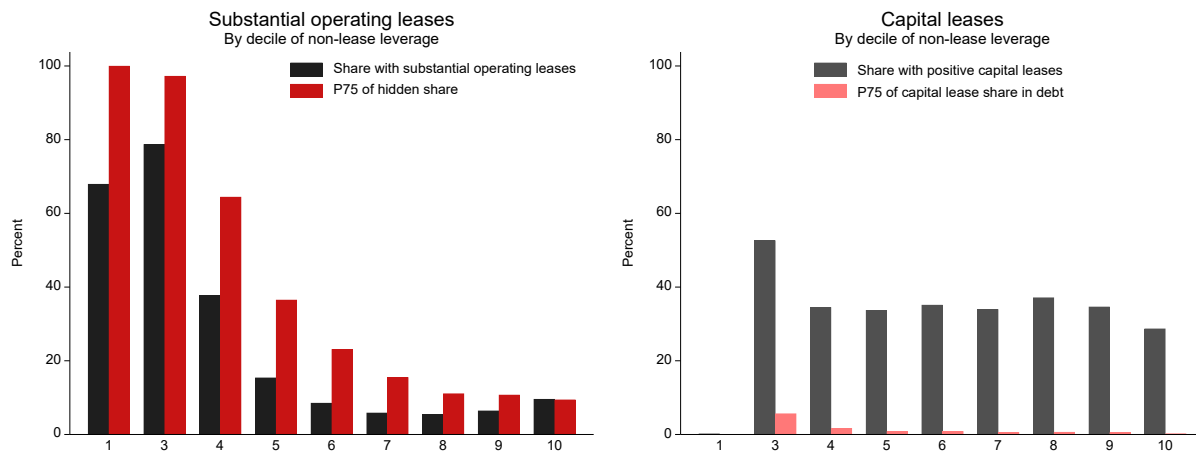


Figure 7 extends this analysis to the use of leases over 1995-2018. The left panel compares the share of firms flagged for substantial operating leases and the 75th percentile of the hidden share of leases against deciles of non-lease leverage, showing a clear negative relationship between substantial use of operating leases and reported non-lease leverage.⁶ Notably, this negative relationship is absent for capital leases, in the right panel; the share of firms with any capital leases and the 75th percentile of capital leases in debt are only weakly related to reported non-

⁶ A substantial share of firms reported no debt or only capital leases in debt. Thus the bottom two “deciles” of non-lease leverage are zero, and combined into a single group in Figure 7.

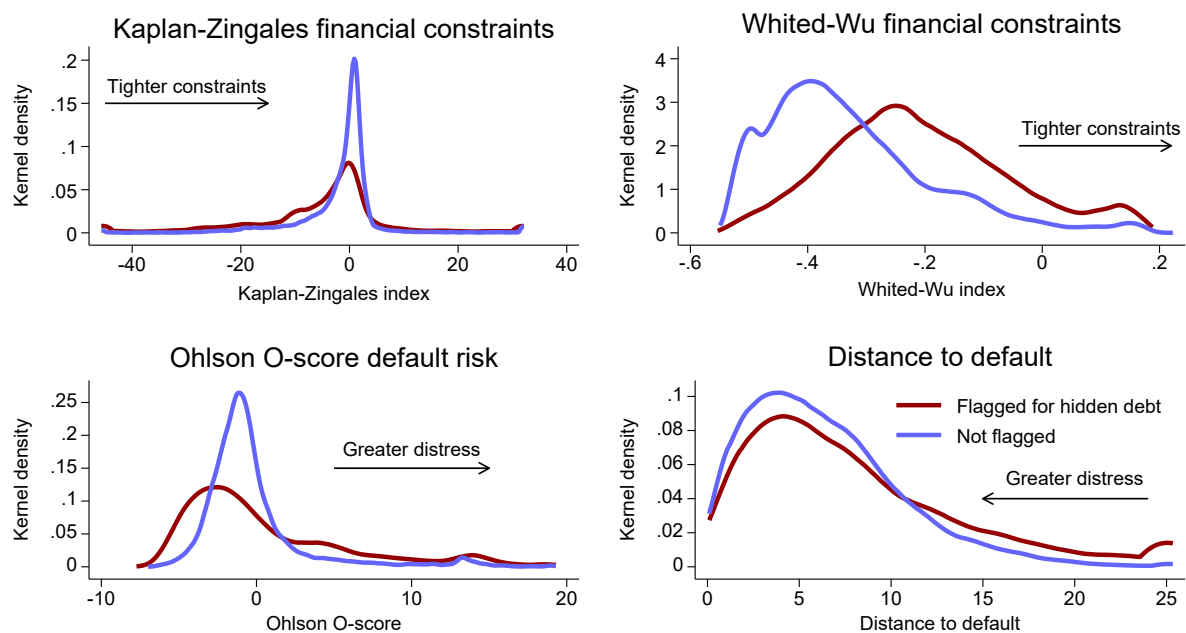
lease leverage. The weak relationship between capital leases and non-lease leverage is not consistent with firms needing to rely on leases because of limited access to traditional debt.

Figure 7. Operating and Capital Leases versus Non-lease Leverage



Finally, we explore the relationships between use of hidden debt—being flagged for substantial operating leases or suspiciously high interest expenses—and financial constraints and distress. Figure 8 plots the distributions of two measures of financial constraints—the Kaplan-Zingales and Whited-Wu indexes—and two measures of default risk—the Ohlman O-score and distance to default—splitting the sample into firms flagged for using hidden debt and those not flagged.

Figure 8. Financial Constraints, Default Risk, and Hidden Debt



Under the Whited-Wu measure of financial constraint tightness, firms using hidden debt are more constrained, but the heavier tails of the Kaplan-Zingales measure suggests that some firms with hidden debt are more constrained but more firms are less constrained. The Ohlson O-score also suggests that those using hidden debt are more at risk of default or less at risk of default (heavier tails), while the distance to default measure suggests that firms using hidden debt are less at risk of default. Potentially due to endogeneity and mismeasurement, the data show no clear, robust relationship between reliance on hidden debt, financial constraint tightness, or risk of default.

IV.C. Governance and Monitoring of Hidden Leverage

If firms use hidden leverage to deceive less sophisticated investors, we can test this by considering the role of more sophisticated market participants. Table 5 augments the regressions of Table 3, to explore how institutional ownership and monitoring correlate with the probability of being flagged for suspiciously high interest expenses. All columns use industry and time fixed effects and retain the balance sheet predictors from Table 3.

The first column uses institutional ownership, split into types of institutions. Greater ownership by banks and insurers is negatively related to intra-period borrowing, consistent with sophisticated, risk-averse financiers conducting appropriate monitoring and due diligence. In contrast, the positive coefficient on fund ownership share suggests the opposite, as many of these funds may be passive investors or may use stock selection tools that do not fully investigate firm leverage (e.g., momentum ETFs). These coefficient estimates are robust; the coefficients on the ownership shares for insurers, investment advisors and other institutional investors are not.

The second column explores the special role of banks in providing oversight. As noted above, the bank ownership share is negatively correlated with intra-period borrowing, as is credit line access. These results suggest that banks monitor firms when their claim is junior, either equity or through credit lines.

The third column focuses on the role of external monitors, either S&P as a credit rating agency or through analyst coverage of the firm's net debt. Intra-period borrowing is positively related to having a junk entity rating from S&P, showing their ability to detect intra-period borrowing. The larger coefficient on not having a rating from S&P suggests that their ability to detect intra-period borrowing also serves as a deterrent to seeking a rating from them or from engaging in intra-period borrowing while being monitored by S&P. Analyst coverage of the firm's net debt is also negatively related to intra-period borrowing. Overall, these results demonstrate the importance of monitoring by sophisticated market participants to deter intra-period borrowing, especially by banks and external monitors.

In Table 6, we extend this analysis to whether firms are flagged for substantial operating lease liabilities. The first column also demonstrates the role of ownership by banks and insurers in

reducing hidden debt via operating leases. The second column corroborates the ability of S&P to detect and to deter hidden leverage via operating leases. Analyst coverage, however, is not statistically significant.

Table 5. Oversight Predictors of Excessive Interest Expenses

Dependent variable	Has suspicious interest expenses		
Bank ownership share	-8.262*** (1.224)	-9.375*** (0.867)	
Insurance ownership share	-4.829** (2.280)		
Fund ownership share	4.678* (2.779)		
Advisor ownership share	-0.151 (0.330)		
Other institutional owner share	-0.139 (0.156)		
Has credit line access		-0.291*** (0.052)	
Has S&P HY rating			0.855*** (0.148)
No S&P rating			1.459*** (0.152)
Analyst coverage			-0.160*** (0.035)
log(Assets)	-0.080*** (0.010)	-0.067*** (0.010)	-0.067*** (0.011)
PPE/Assets	-0.427*** (0.120)	-0.436*** (0.119)	-0.353*** (0.119)
Cash/Assets	-0.137 (0.084)	-0.290*** (0.088)	-0.196** (0.084)
Reported leverage	-0.064*** (0.021)	-0.062*** (0.021)	-0.030 (0.021)
Current liability share	0.847*** (0.093)	0.829*** (0.092)	0.829*** (0.092)
Accounts payable/Liabilities	0.630*** (0.128)	0.670*** (0.127)	0.669*** (0.125)
Method	Logit	Logit	Logit
Group fixed effects	Industry	Industry	Industry
Time fixed effect		Year-quarter	
Observations	266,966	266,966	266,966
Pseudo R ²	0.108	0.11	0.112

*The dependent variable flag for suspiciously high interest expense relative to the predicted counterfactual. All columns use year-quarter time fixed effects and industry fixed effects implemented using the 2-digit NAICS code. Standard errors clustered by firm are reported in parentheses, and *, ** and *** denote statistical significance at the 10, 5 and 1 percent confidence levels.*

Table 6. Oversight Predictors of Substantial Operating Leases

Measure of hidden debt	Has substantial operating leases		
Bank ownership share	-5.595*** (0.955)		
Insurance ownership share	-5.180*** (1.868)		
Fund ownership share	-5.543* (3.127)		
Advisor ownership share	0.700** (0.287)		
Other institutional owner share	1.334*** (0.158)		
Has S&P HY rating		0.874*** (0.186)	
No S&P rating		1.025*** (0.144)	
Analyst coverage		-0.024 (0.038)	
Flagged for suspicious interest			0.569*** (0.052)
log(Assets)	0.039*** (0.012)	0.076*** (0.012)	0.021 (0.014)
Reported PPE/Assets	-0.255 (0.166)	-0.328** (0.166)	-0.005 (0.210)
Cash/Assets	1.126*** (0.110)	1.098*** (0.109)	1.033*** (0.142)
Nonlease leverage	-3.402*** (0.501)	-3.363*** (0.497)	-2.009*** (0.339)
Current liability share	2.700*** (0.187)	2.597*** (0.178)	3.082*** (0.191)
Method	Logit	Logit	Logit
Group fixed effects	Industry	Industry	Industry
Time fixed effects	Year	Year	Year
Observations	57,134	57,134	40,226
Pseudo R ²	0.294	0.296	0.2805

*The dependent variable is the flag for having high off-balance-sheet operating lease debt relative to reported debt. All regressions use fiscal year fixed effects and industry fixed effects implemented using the 2-digit NAICS. The regression sample is restricted to the period before ASC 842 takes effect (2019 or 2020). Standard errors clustered by firm are reported in parentheses, and *, ** and *** denote statistical significance at the 10, 5 and 1 percent confidence levels.*

The third column of Table 6 shows that being flagged for suspiciously high interest expenses also predicts being flagged for substantial operating leases. This holds both unconditionally in Table 2 and conditional on firm characteristics in Table 6. Although not shown, this also holds on the intensive margin, with greater use of intra-period borrowing predictive of greater use of operating leases. Together, these results demonstrate the complementary approaches of different forms of hidden debt. And although these regressions are not causal, the analysis in section V identifies a causal relationship between these forms of hidden debt.

V. Consequences of Revealing Hidden Leverage

ASC 842 required that firms bring their operating leases onto their balance sheets beginning in 2019 or 2020 (for those with fiscal years not ending in December). We use this as a natural experiment to assess the effects of balance sheet revelation on firm outcomes, specifically investment, the probability of adverse events, and debt policy.

V.A. Natural Experiment Structure and Specification

The closest analysis to this comes from Ma and Thomas (2023), who reported a shift in lease durations but no other negative effects. The analysis below differs from theirs in two key respects. First, Ma and Thomas (2023) explored the effects of the announcement of the policy change; their “post” period only covered 2016 through 2019. In contrast, my analysis focuses on the effects of the revelation in 2019 and 2020, so my “post” period covers 2019 through 2024 (with the initial year adjusted for when revelation would occur), compared to a “pre” period of 2011 to 2018 (or 2019). I find significant and meaningful effects of revelation, but these occur after ASC 842 takes effect, not in the intermediate period between its announcement and implementation. Appendix Table A3 explores this further.

Consistent with assessing different questions, we also take different approaches to measuring which firms are affected by the policy. Ma and Thomas (2023) identify those affected as any firms with gross operating lease commitments (scaled by lagged assets) exceeding the median in 2014. My specifications focus on firms with substantial operating leases revealed through large balance sheet impacts.

I take two approaches to identifying these firms. First, I flag any firms reporting suspiciously large jumps in their on-balance-sheet leased PPE in 2019 or 2020, defined as follows: compute the ratio of leased PPE to gross PPE; compute year-over-year changes in this ratio; compute pre-revelation means and standard deviations of these changes; flag firms with changes exceeding three standard deviations above the mean (using pre-revelation moments) in 2019 or 2020. This captures firms with large impacts on the asset side of their balance sheets.

Second, I flag any firms reporting suspiciously large changes in their reported leverage around the implementation of ASC 842 (2019 or 2020, depending on fiscal year timing), defined as follows: compute year-over-year changes in reported leverage; compute means and standard deviations of these changes pre-revelation; flag firms with changes in reported leverage in 2019 or 2020 (depending on revelation timing) exceeding two standard deviations above the mean (using pre-revelation moments); restrict this to firms flagged for having substantial operating leases in any year between 2011 and 2018. This measure captures firms with large impacts on the liability side of their balance sheets that are attributable to operating lease revelation. The appendix provides a time series of these measures and their unusually large jumps in 2019 and 2020.

My motivation for focusing on balance sheet impact rather than having substantial operating leases is twofold. First, prior research and the results in section IV.C suggest that sophisticated capital market participants take operating leases into account, but less sophisticated agents may not; Compustat provided the measures necessary to adjust leverage ratios for off-balance-sheet operating leases, but many investors did not use this information. Consequently, I consider the impact on their balance sheets of revelation to be what would surprise these less informed investors. Second, firms had time to prepare for this accounting change. The debate about bringing operating leases onto balance sheets reaches back decades, and ASC 842 was announced in 2016.

Table 7 presents a tabulation of how firms are flagged for this analysis. Overall, close to half of the firms in the final sample for the regressions had substantial operating leases at some point between 2011 and 2018. However, when these operating leases were brought onto their balance sheets in 2019 and 2020, only 17 percent had substantial changes to key balance sheet variables.

Table 7. Tabulation of Operating Lease Exposure and Impact

		Had substantial operating leases		
		No	Yes	Total
Substantial BS impact from revelation	No	47.6	35.2	82.8
	Yes	4.9	12.3	17.2
	Total	52.5	47.5	100.0

In practice, using the flag for firms with substantial operating leases instead of those with substantial balance sheet impacts has limited implications. Appendix Table A2 decomposes the effects based on having substantial operating leases versus having a substantial balance sheet impact from revelation.

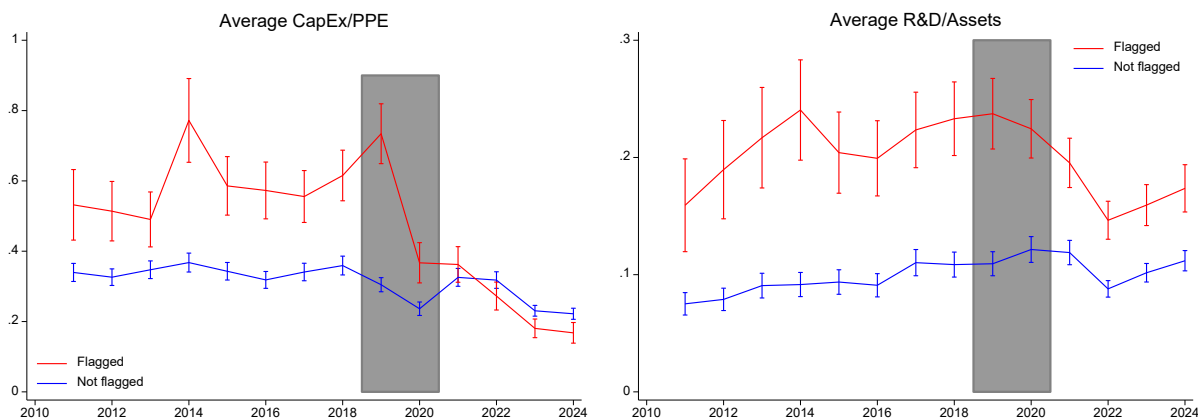
V.B. Effects of Hidden Debt Revelation on Investment

We first investigate the effects of balance sheet revelation of hidden debt on investment, measured using the ratio of capital expenditures to lagged PPE and of R&D to lagged assets. Figure 9 presents the trends in each investment measure for firms flagged as having substantial balance sheet impacts from revelation (in red) compared to the control group of those not flagged (in blue). Prior to ASC 842, firms making substantial use of operating leases had higher on-balance sheet capital investments, as well as higher R&D rates. After revelation, however, their capital expenditures dropped to match the control group, and their R&D dropped as well.

Table 8 presents the regression results, showing the effects of balance sheet revelation of hidden debt in ASC 842 on investment. The first and third columns use industry and year fixed effects, and the second and fourth columns use firm and year fixed effects. The first row identifies the

causal effects. All the regressions use firm-level controls lagged by one year. Consistent with the graphical results on average, the affected firms initially had higher investment rates, and revelation of hidden debt reduced their investment.

Figure 9. Investment Comparison



Compared to the average investment rates of affected firms in the pre-revelation period, columns 1 and 3 imply that revelation reduced the capital expenditures of affected firms by 25.2 percent and their R&D by 13.7 percent.

V.C. Effects of Hidden Debt Revelation on Governance Consequences

We now consider the effects of hidden debt revelation on governance consequences for firms. Figure 10 shows the average probabilities of these events for firms with eventual substantial balance sheet effects from ASC 842 against the control group. After revelation, the unconditional probability of CEO or CFO turnover rose for those affected, shown in the left panel. Adverse external actions—delistings, index constituent drops, lawsuits and legal issues, and enforcement actions by regulatory authorities—were initially less frequent but became more frequent after revelation. The unconditional probability of accounting problems, in the right panel, was consistently higher for firms eventually impacted by ASC 842, but without a clearly visible unconditional change.

Table 9 presents the regression results, using logit regressions. The first column shows that revelation from ASC 842 increased the probability of CEO or CFO turnover. The second and third columns show positive causal effects of hidden debt revelation on the probabilities of adverse external actions and on the probabilities of accounting problems, even though the latter showed no unconditional average effect in Figure 10.

Table 8. Effects of Hidden Debt Revelation on Investment

Outcome variable:	CapEx/PPE		R&D/Assets	
Has hidden debt x Post	-0.147*** (0.022)	-0.118*** (0.025)	-0.028*** (0.009)	-0.015* (0.009)
Has hidden debt	0.109*** (0.019)		0.036*** (0.010)	
log(Assets)	-0.017*** (0.002)	-0.150*** (0.010)	0.005*** (0.001)	-0.062*** (0.004)
Nonlease leverage	0.005 (0.018)	-0.066** (0.029)	0.020 (0.012)	0.027** (0.011)
Cash/Assets	0.496*** (0.025)	0.590*** (0.046)	0.182*** (0.012)	-0.079*** (0.016)
Current liability share	0.144*** (0.021)	0.100*** (0.034)	-0.005 (0.009)	0.015 (0.010)
Profitability	-0.013 (0.020)	0.275*** (0.036)	-0.339*** (0.011)	-0.173*** (0.012)
Time FE	Year	Year	Year	Year
Group FE	Industry	Firm	Industry	Firm
Observations	39,195	38,716	40,984	40,523
Adjusted R ²	0.109	0.251	0.437	0.736

*Capital expenditures are scaled by lagged PPE, and R&D is scaled by lagged assets, with missing values of R&D recoded as zero, and both measures winsorized at the 1st and 99th percentiles. The measure identifying if the firm has hidden debt is an indicator for whether the firm's change in reported leased PPE as a share of gross PPE in 2019 or 2020 exceeded 3 standard deviations above the mean (with these calculated using the median and standard deviation of changes in this ratio between 1995 and 2018), or if reported leverage rose by more than two standard deviations above the mean (using the mean and standard deviation for changes before ASC 842) for firms that also had high operating leases relative to reported debt. The sample runs from 2011 through 2024, split into the pre- and post-periods around 2019 and 2020 depending on when ASC 842 took effect for the firm. The log of assets, reported leverage, cash/assets, current liability share, and profitability have all been lagged by one year. All regressions use fiscal year fixed effects. The first and third columns use 2-digit NAICS industry fixed effects, and the second and fourth columns use firm fixed effects. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% levels.*

The regressions in Table 9 imply average marginal treatment effects of 3.4 percentage points on the probability of executive turnover, 5.0 percentage points on the probability of external adverse actions, and 4.4 percentage points on the probability of accounting problems.

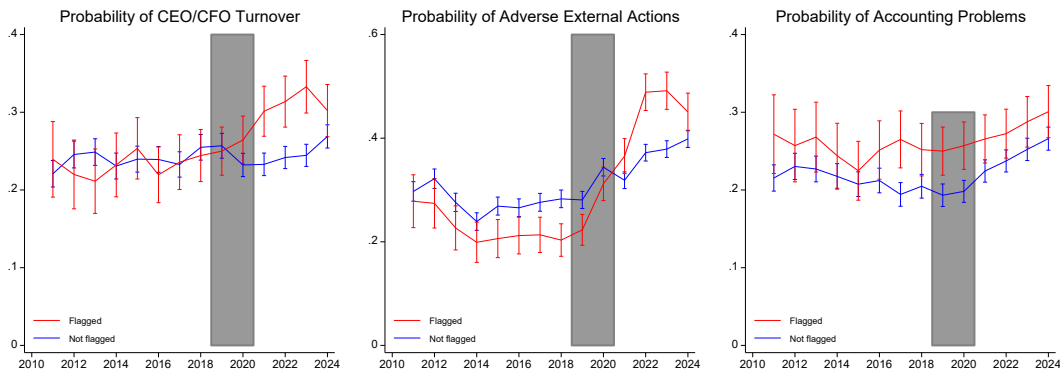
Figure 10. Adverse Event Comparison

Table 9. Effects of Hidden Debt Revelation on Adverse Events

Outcome variable:	Executive turnover	External adverse action	Accounting problem
Has hidden debt x Post	0.182*** (0.066)	0.244*** (0.073)	0.391*** (0.091)
Has hidden debt	-0.020 (0.054)	-0.162*** (0.059)	-0.263*** (0.082)
log(Assets)	0.084*** (0.007)	0.255*** (0.008)	-0.323*** (0.012)
Nonlease leverage	-0.121** (0.052)	-0.067 (0.055)	0.346*** (0.078)
Cash/Assets	-0.206*** (0.060)	0.108* (0.063)	-1.773*** (0.100)
Short-term liability share	0.016 (0.066)	0.191*** (0.068)	0.779*** (0.095)
Profitability	-0.703*** (0.053)	-1.154*** (0.058)	-1.742*** (0.076)
Time FE	Year	Year	Year
Group FE	Industry	Industry	Industry
Observations	41,749	41,749	41,749
Pseudo R ²	0.011	0.061	0.315

*All outcome variables are indicators from Capital IQ's Key Developments, aggregated by the firm's fiscal year. Executive turnover reports if the firm has a change of CEO or CFO. External adverse action reports if the firm is delisted, dropped from an index, faces lawsuits or legal issues, or faces regulatory enforcement actions. Accounting problem reports if the firm has delayed filings or earnings announcements, restatements of operating income, faces regulatory inquiries, experiences an auditor change, or has their auditor report going concern doubts. The measure identifying if the firm has hidden debt is an indicator for whether the firm's change in reported leased PPE as a share of gross PPE in 2019 or 2020 exceeded 3 standard deviations above the mean (with these calculated using the median and standard deviation of changes in this ratio between 1995 and 2018), or if reported leverage rose by more than two standard deviations above the mean (using the mean and standard deviation for changes before ASC 842) for firms that also had high operating leases relative to reported debt. The sample runs from 2011 through 2024, split into the pre- and post-periods around 2019 and 2020 depending on when ASC 842 took effect for the firm. The log of assets, reported leverage, cash/assets, current liability share, and profitability have all been lagged by one year. All regressions use fiscal year and industry fixed effects using the 2-digit NAICS code. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% levels.*

Overall, these results demonstrate that revelation of substantial operating leases caused affected firms to face governance consequences, whether imposed internally by boards (executive turnover), by external stakeholders, or by auditors.

V.D. Effects of Hidden Debt Revelation on Other Forms of Debt

Finally, we assess the effects of hidden lease revelation on other forms of borrowing. Shown in the left panel of Figure 11, firms that eventually had substantial hidden debt revealed initially reported lower non-lease leverage, having used this off-the-books debt to pretend to have lower leverage. Once these firms were revealed to have substantial hidden debt, they raised their non-lease leveraged to essentially the same as all other firms. This positive effect on non-lease leverage is confirmed by the first two columns of Table 8, and the symmetry post-revelation is confirmed by comparing the coefficient estimates of the first two variables in the first column of Table 8. Note that this effect on non-lease leverage is not mechanical (as I subtracted off the present value of operating leases from total debt), but rather reflects actual substitution to other forms of on-balance-sheet debt.

The middle panel of Figure 11 displays the impact of ASC 842 on intra-period borrowing as measured by implied interest rates. Prior to revelation, firms with substantial hidden debt via operating leases also had higher implied interest rates, suggesting that they also used intra-period borrowing to hide their debt (as previously shown). After revelation, their implied interest rates fell sharply, matching or falling below those of other firms, confirmed by the coefficient estimates in the third and fourth columns of Table 10.

The negative impact on implied interest rates is a remarkable result. The revelation that a certain firm had been using hidden debt should have raised its borrowing costs. However, because these firms were also more likely to have suspiciously high interest expenses (incurred through intra-period borrowing), this revelation of firm types may have reduced or eliminated their ability to pretend to be low leverage, leading these firms to curtail their use of other forms of hidden leverage.

Consistent with this explanation, the right panel of Figure 11 and the last column of Table 10 show that firms that would eventually be revealed to have substantial operating leases had previously also been more likely flagged for suspiciously high interest expenses, and that this differential disappeared post-revelation.

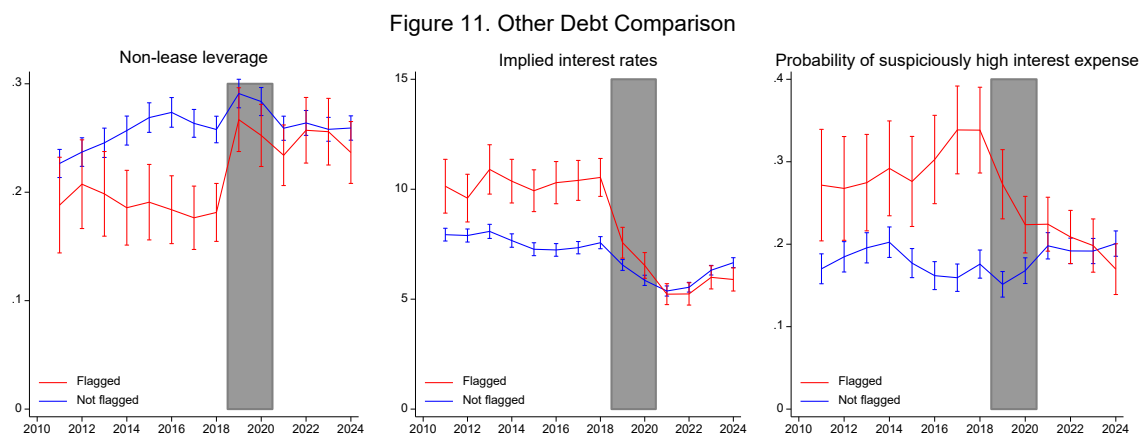


Table 10. Effects of Hidden Debt Revelation on Debt Policy

Outcome variable:	Non-lease leverage		Implied interest rates		Suspiciously high interest expense
Has hidden debt x Post	0.027** (0.012)	0.030** (0.013)	-1.568*** (0.274)	-2.119*** (0.287)	-0.298*** (0.104)
Has hidden debt	-0.038*** (0.011)		1.160*** (0.257)		0.336*** (0.092)
log(Assets)	-0.011*** (0.002)	-0.014*** (0.004)	-0.414*** (0.028)	-0.334*** (0.088)	-0.152*** (0.012)
Nonlease leverage			1.334*** (0.245)	0.177 (0.235)	-0.288*** (0.070)
Cash/Assets	-0.168*** (0.016)	-0.074*** (0.017)	-3.361*** (0.308)	-3.066*** (0.406)	-0.441*** (0.107)
Short-term liability share	-0.527*** (0.015)	-0.367*** (0.016)	0.975*** (0.287)	0.683** (0.344)	0.747*** (0.115)
Profitability	-0.216*** (0.014)	-0.091*** (0.014)	-5.827*** (0.270)	-2.572*** (0.324)	-0.487*** (0.084)
Method	OLS	OLS	OLS	OLS	logit
Time FE	Year	Year	Year	Year	Year
Group FE	Industry	Firm	Industry	Firm	Industry
Observations	40,392	39,957	35,032	34,472	32,043
R ²	0.235	0.609	0.271	0.563	0.121

*Non-lease leverage is total debt less capital leases in debt (and operating leases, post-revelation), divided by total assets, and winsorized at the 1st and 99th percentiles. The implied interest rate is computed as interest expense divided by the average of total debt in the current and previous year, multiplied by 100, and winsorized at the 5th and 95th percentiles. The measure identifying if the firm has hidden debt is an indicator for whether the firm's change in reported leased PPE as a share of gross PPE in 2019 or 2020 exceeded 3 standard deviations above the mean (with these calculated using the median and standard deviation of changes in this ratio between 1995 and 2018), or if reported leverage rose by more than two standard deviations above the mean (using the mean and standard deviation for changes before ASC 842) for firms that also had high operating leases relative to reported debt. The sample runs from 2011 through 2024, split into the pre- and post-periods around 2019 and 2020 depending on when ASC 842 took effect for the firm. The log of assets, reported leverage, cash/assets, current liability share, and profitability have all been lagged by one year. All regressions use fiscal year fixed effects. The first, third and fifth columns use 2-digit NAICS industry fixed effects, and the second and fourth columns use firm fixed effects. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% levels. The last regression reports a pseudo R².*

V.E. Robustness and Alternative Specifications

We briefly discuss potential alternative specifications and the sensitivities of the results. The associated tables are in the appendix.

The appendix first assesses whether pre-trends are present. All measures except for investment satisfy the tests for pre-trends; the failures of the investment measures reflect developments early in the pre-sample period, specifically between 2011 and 2014.

In our main analysis, we measured “exposure” using the balance sheet impact, as this is the information being revealed to less sophisticated investors. However, we could instead use the flag for whether a firm had substantial operating leases during the pre-period, shown in Appendix Table A2. We generally find effects for firms with substantial operating leases at all during 2011-2018 and larger effects for firms with balance sheet impacts from revelation. However, for the executive turnover result, the effect comes entirely from balance sheet impacts, not from having used operating leases, suggesting that boards were unaware of this form of hidden debt prior to revelation.

Another potential caveat to this analysis comes from the gap between the announcement of changes to the treatment of operating leases in 2016 and these changes taking effect in 2019 and 2020. To address this gap and the possibility of firms taking action before revelation, we split the “pre” period into 2011-2015 and 2016 to the last year before revelation, which we refer to as the “transition” period. Table A3 presents the regression results; the coefficients reveal that most of the effects began after revelation, but the shift in intra-period borrowing may have begun earlier.

Third, instead of sorting firms into those affected versus not affected, we can use their hidden lease debt share before revelation as a continuous treatment measure; this does not meaningfully change the results.

Fourth, we can explore the role of governance and oversight in driving potentially heterogeneous responses. Based on the results in Table 5, we flag firms as subject to sophisticated monitoring if they have a rating from S&P in 2018 or if their bank ownership share was at least 10 percent in 2018, covering 25.3 percent of firms in 2018. Interacting this indicator with the other balance sheet indicator in Table A5, we find that the effects appear concentrated among firms not subject to sophisticated monitoring. However, the set of firms subject to sophisticated monitoring and that had substantial balance sheet impacts from revelation was small (only 58 firms), so effects on this cohort may not be well identified.

Finally, we explore potential concerns about the effects on intra-period borrowing. Consistent with the problems being in the right tail of the distribution, the estimated effects are much larger with less severe winsorizing. We also find significant effects on the log excess interest measure. One potential concern with the implied interest rate measure comes from the mechanical increase in the denominator from including operating leases in debt. To address this, we find similarly signed coefficients (although less precisely estimated) on a measure of short-term implied interest rates (only available for about 10 percent of the sample). We also find that firms revealed to have substantial operating leases increased their reported use of short-term notes payable (which have no mechanical effect from operating leases, and are used for short-term borrowing) and became less likely to report zero notes payable, consistent with the declining effort to hide the use of short-term debt through intra-period borrowing.

VI. Conclusion

In this paper, I documented the use of two forms of hidden debt by nonfinancial corporations, through intra-period borrowing and operating leases. Although these did not appear on firms' balance sheets, they could still be detected via other variables reported in their financial statements.

Across firms, these forms of hidden debt are most used by firms that are more reliant on short-term financing, that do not have credit ratings from S&P, and that generally use this hidden debt to pretend to have low leverage.

The lesser use of these forms of hidden debt by firms with better monitoring by banks and S&P suggests that sophisticated credit market participants can detect hidden debt, and it is mainly used to fool less sophisticated investors and boards. The existing literature on whether investors account for operating leases is conflicted on whether asset prices and lending properly incorporate this information.

ASC 842 brought operating leases onto firms' balance sheets, with negative implications for firms revealed to have substantial hidden debt. These firms' or executives' types were revealed, causing them to reduce their investment, raising the risk of negative governance consequences, and causing them to shift from hidden debt toward on-the-books debt.

Different forms of hidden debt are not independent. Firms using one type are more likely to use another, and exposing one type of hidden debt may prevent these firms from using other types. However, this is not costless; if this hidden debt is used to fuel investment, exposing or curtailing hidden debt could reduce investment as well.

Hidden leverage may be a problem for both less-informed investors and for the macroeconomy. The substantial growth in the right tails of hidden debt via operating leases and of implied interest rates suggest a boom in hidden leverage that could have exacerbated the severity of the GFC. However, the reduction in multiple forms of hidden leverage caused by ASC 842 that preceded the Covid pandemic may have ameliorated its effects.

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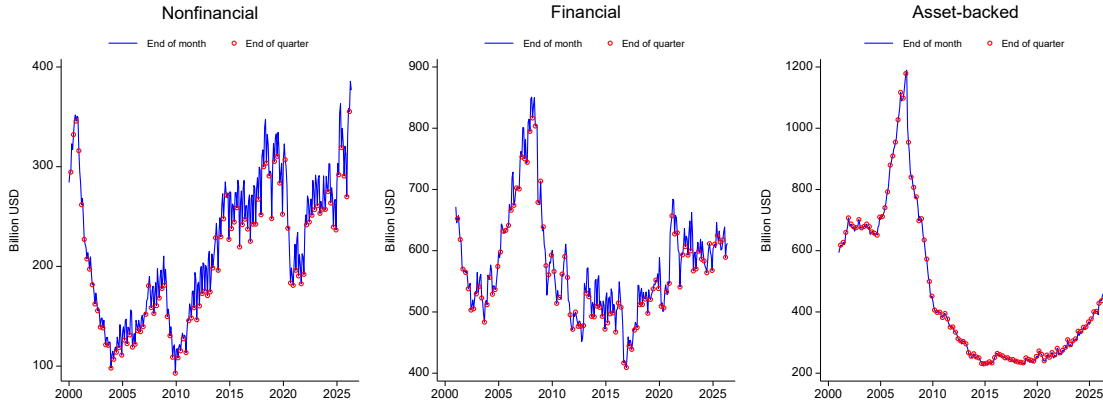
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Appendix. Additional Results

Additional Commercial Paper Results

The commercial paper chart in the introduction reveals quarter-end patterns in nonfinancial commercial paper outstanding beginning in the early 2000s. Figure A1 extends this to commercial paper issued by financial institutions and to asset-backed commercial paper. These are plotted for 2000-2025. The quarter-end patterns also appear for financial commercial paper, but not for asset-backed commercial paper.

Figure A1. Commercial Paper Outstanding by Type



Additional Specification Information for Effects of Revelation

We first assess the potential for pre-trends and for post-trends. We modify the main estimation in section V to estimate coefficients by year relative to revelation, excluding the year of revelation ($\tau_i = 0$), using industry (j) and fiscal year fixed effects.

$$E[g(y_{i,j,t})|X_{i,t-1}] = \sum_{h \neq 0} \beta_h 1\{t - h = \tau_i\} HadHiddenDebt_i + \delta' X_{i,t-1} + \alpha_j + \gamma_t + \epsilon_{i,j,t}$$

Figure A2 displays the resulting coefficients specific to the year relative to revelation. The standard pre-trends test assesses whether $\beta_h = \beta_{-1}$ for all $h \leq -2$. Because the pre-period in this specification is unusually long (extending back to 2011), we can also conduct a more recent pre-trends test. In the context of this paper, we can also consider the possibility of a post-trends test; if revelation exposed previously hidden information to less sophisticated investors, then after revelation these firms may no longer have an information differential compared to firms without substantial hidden debt.

Figure A2. Parallel Trends

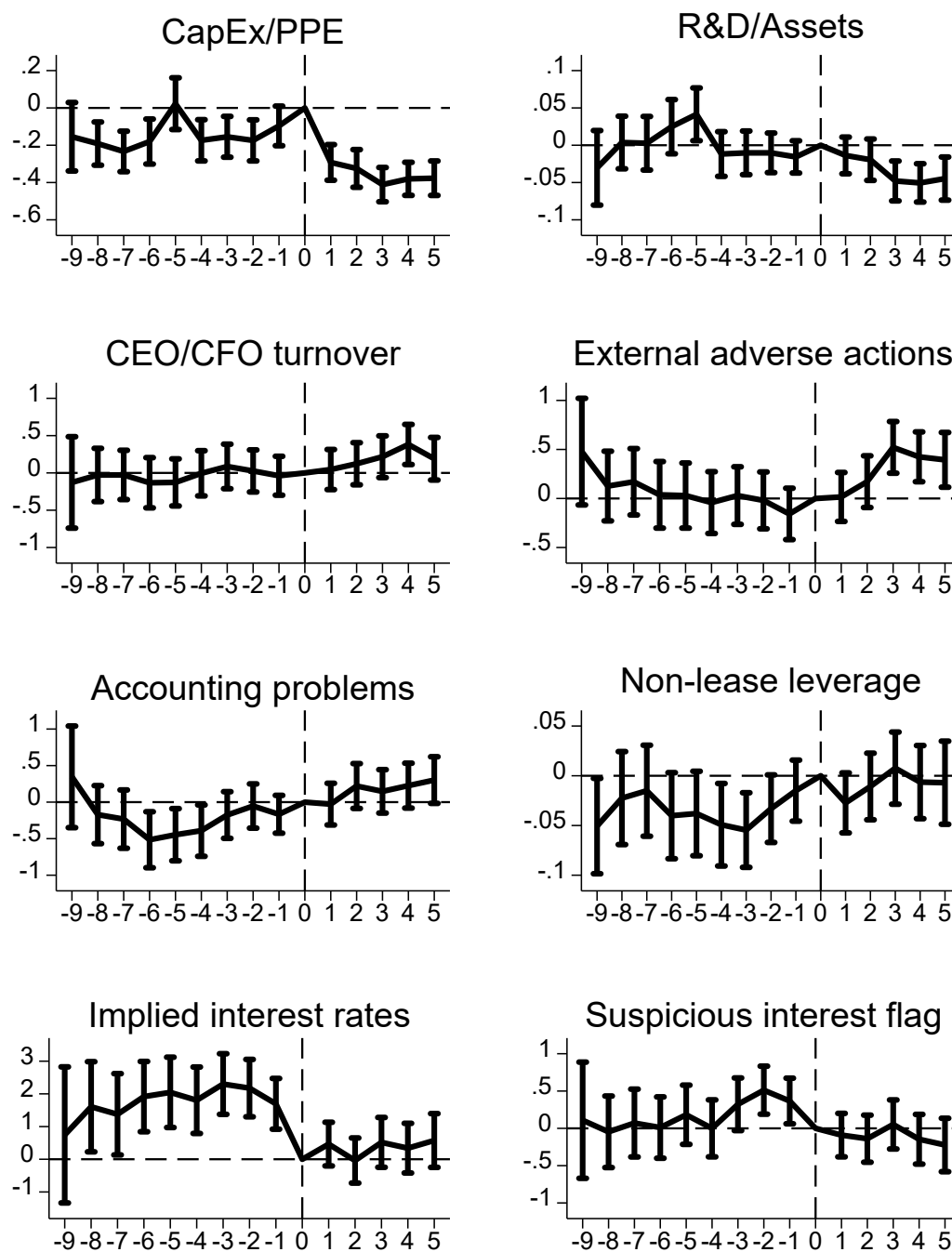


Table A1 presents the results of these tests, with F-statistics for the OLS regressions and chi-square statistics for the logit regressions. For the full pre-trends test, we use years -8 through -1, excluding year -9 (which is only included for firms with revelation in 2020 rather than 2019).

For the recent pre-trends test, we use years -4 through -1. For the post-trends test, we use years 2 through 5, to allow some time for effects to occur.

For the full pre-trends test, both investment measures fail the test, although all the other measures pass. However, these failures reflect developments early in the sample; both investment measure pass the more recent pre-trends test. All of the measures except investment also satisfy post-trends, consistent with the loss of an information differential relative to other firms, and the post-trends for the investment measure appear to reflect a slower post-revelation adjustment of investment relative to other outcomes and firm decisions.

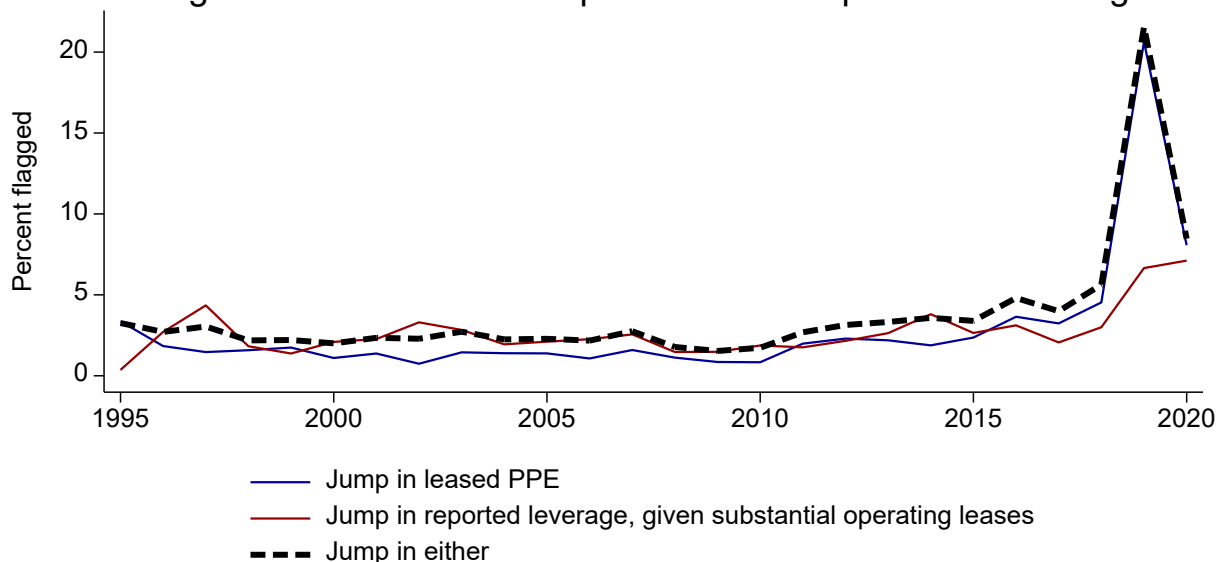
Table A1. Parallel Trends Test

Outcome variable	Pre-trends test		Recent pre-trends test		Post-trends test	
	F-statistic	chi-square	F-statistic	chi-square	F-statistic	chi-square
CapEx / PPE	3.08***		1.08		2.40*	
R&D / Assets	2.66***		0.08		2.80**	
Executive turnover		2.36		0.80		3.97
External adverse action		4.65		1.63		7.57
Accounting problem		8.91		4.01		1.04
Nonlease leverage	1.66		2.60*		1.31	
Implied interest rate	0.58		0.89		1.55	
Suspicious interest flag		11.13		7.57*		3.92

*For pre-trends, we test whether the coefficients for $h=-8$ through $h=-1$ are equal. For more recent pre-trends, we test this for $h=-4$ through $h=-1$. For post-trends, we test whether the coefficients for $h=2$ through $h=5$ are equal. Standard errors are clustered by firm. *, ** and *** denote statistical significance at 10, 5 and 1 percent.*

We also consider the validity of the method for flagging firms with substantial balance sheet impacts from revelation. Our flag of firms with substantial asset-side impacts comes from computing annual changes in the ratio of leased PPE to gross PPE, and flagging changes exceeding three standard deviations above the mean (using pre-revelation statistics). Our flag of liability-side impacts comes from computing annual changes in the ratio of reported debt to assets, and flagging changes exceeding two standard deviations above the mean (using pre-revelation statistics), conditional on having substantial operating leases during 2011-2018 (at least one year). These flags are specifically applied around revelation, but we can also assess them more generally (modifying the substantial lease flag to the current or prior year instead of 2011-2018). Figure A3 presents the annual percentages of firms flagged under these measures, as well as the percent flagged under either measure. Prior to revelation, this approach flagged a small number of firms, less than 5 percent of the sample (reflecting that lease initiation or debt issuance can be lumpy), and these measures rose substantially in 2019 and 2020.

Figure A3. Firms with Jumps in Leased Capital or in Leverage



Jumps in leased PPE are identified by computing year-over-year changes in the ratio of leased PPE to gross PPE, computing pre-revelation moments, and flagging firms with changes more than 3 standard deviations above the mean. Jumps in reported leverage are identified by computing year-over-year changes in reported leverage, computing pre-revelation moments, and flagging firms with changes more than 3 standard deviations above the mean, conditional on being flagged for substantial operating leases in the current or preceding fiscal year.

Robustness and Alternative Specifications for Effects of Revelation

We consider four potential alternative specifications for the effects of operating lease revelation on firm decisions and outcomes.

In our main analysis in section V, we identified firms “exposed” to the treatment as those with substantial changes to key balance sheet items attributable to operating lease revelation. Alternatively, we could also measure whether a firm has substantial exposure to operating leases over 2011 to 2018. To assess which of these drives the results, Table A2 presents regressions including both measures, as well as their interactions with the pre-post indicator. The first two rows identify the relevant effects.

In the first two columns, the significant negative coefficients on both interactions reveal that firms with substantial operating leases reduced their investments after revelation, and that firms whose balance sheets had large revelation-induced changes also significantly reduced their investments. The set of firms with substantial balance sheet effects is mostly a subset of firms using substantial operating leases, so the balance sheet impact comes in addition to having operating leases. We obtain similar results for the effects on the probability of adverse external actions, the probability of accounting problems, and implied interest rates.

Table A2. Alternate Specification: Effects of Hidden Debt and Revelation

Dependent variable:	CapEx / PPE	R&D / Assets	Executive turnover	External adverse action	Accounting problem	Nonlease leverage	Implied interest rate	Suspicious interest flag
BS impact x Post	-0.10*** (0.02)	-0.02** (0.01)	0.20*** (0.07)	0.17** (0.08)	0.31*** (0.10)	0.01 (0.01)	-0.75*** (0.29)	0.02 (0.11)
Substantial OPL x Post	-0.11*** (0.01)	-0.03*** (0.01)	-0.06 (0.05)	0.22*** (0.05)	0.26*** (0.07)	0.03*** (0.01)	-2.09*** (0.19)	-0.79*** (0.09)
BS impact	0.10*** (0.02)	0.02** (0.01)	-0.06 (0.06)	-0.17*** (0.06)	-0.22** (0.08)	-0.02 (0.01)	0.59** (0.27)	0.13 (0.10)
Substantial OPL	0.04*** (0.01)	0.05*** (0.01)	0.16*** (0.04)	0.09* (0.05)	-0.27*** (0.07)	-0.10*** (0.01)	1.32*** (0.18)	0.61*** (0.07)
log(Assets)	-0.02*** (0.00)	0.01*** (0.00)	0.08*** (0.01)	0.26*** (0.01)	-0.34*** (0.01)	-0.01*** (0.00)	-0.40*** (0.03)	-0.15*** (0.01)
Nonlease leverage	-0.01 (0.02)	0.02 (0.01)	-0.08 (0.05)	0.00 (0.06)	0.41*** (0.09)		1.42*** (0.27)	-0.26*** (0.08)
Cash / Assets	0.48*** (0.03)	0.17*** (0.01)	-0.26*** (0.06)	0.12* (0.07)	-1.72*** (0.11)	-0.15*** (0.02)	-3.03*** (0.34)	-0.37*** (0.12)
Current liability share	0.13*** (0.02)	-0.02** (0.01)	-0.00 (0.07)	0.18** (0.07)	0.95*** (0.11)	-0.49*** (0.02)	0.86*** (0.31)	0.75*** (0.12)
Profitability	-0.03 (0.02)	-0.35*** (0.01)	-0.68*** (0.06)	-1.10*** (0.06)	-1.67*** (0.08)	-0.21*** (0.02)	-5.80*** (0.30)	-0.51*** (0.09)
Fixed effects	Industry, Fiscal year							
Method	OLS	OLS	logit	logit	logit	OLS	OLS	logit
Observations	36,689	38,201	38,201	38,201	38,201	37,686	32,658	30,337
R ²	0.12	0.44	0.011	0.063	0.323	0.25	0.29	0.134

Capital expenditures are scaled by lagged PPE, and R&D is scaled by lagged assets, with missing values of R&D recoded as zero, and both measures winsorized at the 1st and 99th percentiles. The event variables are indicators from Capital IQ's Key Developments, aggregated by the firm's fiscal year. Executive turnover reports if the firm has a change of CEO or CFO. External adverse action reports if the firm is delisted, dropped from an index, faces lawsuits or legal issues, or faces regulatory enforcement actions. Accounting problem reports if the firm has delayed filings or earnings announcements, restatements of operating income, faces regulatory inquiries, experiences an auditor change, or has their auditor report going concern doubts. The non-lease leverage is total debt less capital leases in debt, divided by total assets, and winsorized at the 1st and 99th percentiles. The implied interest rate is computed as interest expense divided by the average of total debt in the current and previous year, multiplied by 100, and winsorized at the 5th and 95th percentiles. The measure identifying if the firm has a balance sheet impact from operating lease revelation is an indicator for whether the firm's change in reported leased PPE as a share of gross PPE in 2019 or 2020 exceeded 3 standard deviations above the mean (with these calculated using the median and standard deviation of changes in this ratio between 1995 and 2018), or if reported leverage rose by more than two standard deviations above the mean (using the mean and standard deviation for changes before ASC 842) for firms that also had high operating leases relative to reported debt. The sample runs from 2011 through 2024, split into the pre- and post-periods around 2019 and 2020 depending on when ASC 842 took effect for the firm. The log of assets, reported leverage, cash/assets, current liability share, and profitability have all been lagged by one year. All regressions use fiscal year fixed effects and 2-digit NAICS industry fixed effects. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% levels. R² shown is the pseudo-R² for logit regressions and adjusted R² for OLS regressions.

There are three exceptions to this narrative. For executive turnover, the effect comes entirely from balance sheet impacts, not from having used operating leases. And for non-lease leverage and the probability of being flagged for suspicious high interest, the effect comes from firms that had previously made substantial use of operating leases, not from the balance sheet effect.

Another potential caveat to this analysis comes from the gap between the announcement of changes to the treatment of operating leases in 2016 and these changes taking effect in 2019 and

2020. To address this gap and the possibility of firms taking action before revelation, we split the “pre” period into 2011-2015 and 2016 to the last year before revelation, which we refer to as the “transition” period. Table A3 presents the regression results, adding an interaction between our measure of having hidden debt (based on the eventual balance sheet impact) with the transition period dummy.

Table A3. Alternate Specification: Effects during the Transition Period

Dependent variable:	CapEx / PPE	R&D / Assets	Executive turnover	External adverse action	Accounting problem	Nonlease leverage	Implied interest rate	Suspicious interest flag
Had hidden debt x Post	-0.15*** (0.03)	-0.04*** (0.01)	0.20** (0.08)	0.17* (0.09)	0.46*** (0.11)	0.03* (0.01)	-1.45*** (0.36)	-0.12 (0.13)
Had hidden debt x Transition	-0.01 (0.03)	-0.03** (0.01)	0.03 (0.09)	-0.15 (0.10)	0.15 (0.12)	-0.00 (0.01)	0.25 (0.40)	0.37*** (0.13)
Had hidden debt	0.11*** (0.03)	0.05*** (0.01)	-0.04 (0.07)	-0.09 (0.08)	-0.33*** (0.10)	-0.04*** (0.01)	1.04*** (0.33)	0.16 (0.12)
log(Assets)	-0.02*** (0.00)	0.00*** (0.00)	0.08*** (0.01)	0.25*** (0.01)	-0.32*** (0.01)	-0.01*** (0.00)	-0.41*** (0.03)	-0.15*** (0.01)
Nonlease leverage	0.01 (0.02)	0.02 (0.01)	-0.12** (0.05)	-0.07 (0.06)	0.35*** (0.08)		1.34*** (0.24)	-0.29*** (0.07)
Cash / Assets	0.50*** (0.03)	0.18*** (0.01)	-0.21*** (0.06)	0.11* (0.06)	-1.77*** (0.10)	-0.17*** (0.02)	-3.36*** (0.31)	-0.44*** (0.11)
Current liability share	0.14*** (0.02)	-0.01 (0.01)	0.02 (0.07)	0.19*** (0.07)	0.78*** (0.09)	-0.53*** (0.02)	0.97*** (0.29)	0.75*** (0.12)
Profitability	-0.01 (0.02)	-0.34*** (0.01)	-0.70*** (0.05)	-1.15*** (0.06)	-1.74*** (0.08)	-0.22*** (0.01)	-5.83*** (0.27)	-0.49*** (0.08)
Fixed effects	Industry, Fiscal year							
Method	OLS	OLS	logit	logit	logit	OLS	OLS	logit
Observations	39,195	40,984	40,984	40,984	40,984	40,392	35,032	32,043
R ²	0.11	0.44	0.01	0.06	0.32	0.23	0.27	0.12

*Capital expenditures are scaled by lagged PPE, and R&D is scaled by lagged assets, with missing values of R&D recoded as zero, and both measures winsorized at the 1st and 99th percentiles. The event variables are indicators from Capital IQ's Key Developments, aggregated by the firm's fiscal year. Executive turnover reports if the firm has a change of CEO or CFO. External adverse action reports if the firm is delisted, dropped from an index, faces lawsuits or legal issues, or faces regulatory enforcement actions. Accounting problem reports if the firm has delayed filings or earnings announcements, restatements of operating income, faces regulatory inquiries, experiences an auditor change, or has their auditor report going concern doubts. The non-lease leverage is total debt less capital leases in debt, divided by total assets, and winsorized at the 1st and 99th percentiles. The implied interest rate is computed as interest expense divided by the average of total debt in the current and previous year, multiplied by 100, and winsorized at the 5th and 95th percentiles. The measure identifying if the firm has hidden debt is an indicator for whether the firm's change in reported leased PPE as a share of gross PPE in 2019 or 2020 exceeded 3 standard deviations above the mean (with these calculated using the median and standard deviation of changes in this ratio between 1995 and 2018), or if reported leverage rose by more than two standard deviations above the mean (using the mean and standard deviation for changes before ASC 842) for firms that also had high operating leases relative to reported debt. The sample runs from 2011 through 2024, split into the pre-period of 2011-2015, the post-period after 2019 or 2020 depending on when ASC 842 took effect for the firm, and the transition period between them. The log of assets, reported leverage, cash/assets, current liability share, and profitability have all been lagged by one year. All regressions use fiscal year fixed effects and 2-digit NAICS industry fixed effects. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% levels. R² shown is the pseudo-R² for logit regressions and adjusted R² for OLS regressions.*

The coefficient estimates for the interaction post-revelation remain significant and little-changed. For the transition period, all but two of the coefficient estimates are insignificant, showing that

these firm decisions and outcomes did not significantly adjust during the period between announcement and implementation. However, R&D may have begun declining earlier, and the probability of being flagged for suspicious interest expenses initially rose during the transition period before falling after revelation, suggesting shifting dynamics around revelation in the relationship between operating leases and intra-period borrowing.

Third, instead of using an indicator for whether a firm had substantial operating leases revealed in 2019 or 2020, we can replace this with an intensive margin measure of exposure: the share of debt hidden through operating leases. Table A4 presents these regression results.

The coefficients on the interaction retain the same signs and significance, except for the effect on executive turnover. However, as already noted in Table A2, having substantial operating leases did not raise the probability of being fired; that effect came from balance sheet revelation instead.

Table A4. Alternate Specification: Hidden Debt Exposure

Dependent variable:	CapEx / PPE	R&D / Assets	Executive turnover	External adverse action	Accounting problem	Nonlease leverage	Implied interest rate	Suspicious interest flag
Hidden debt share x Post	-0.18*** (0.02)	-0.05*** (0.01)	-0.05 (0.07)	0.40*** (0.08)	0.64*** (0.10)	0.10*** (0.01)	-4.56*** (0.35)	-1.39*** (0.14)
Hidden debt share	0.03 (0.02)	0.08*** (0.01)	0.09 (0.07)	-0.05 (0.07)	-0.74*** (0.10)	-0.30*** (0.01)	2.03*** (0.38)	0.72*** (0.13)
log(Assets)	-0.02*** (0.00)	0.00*** (0.00)	0.07*** (0.01)	0.25*** (0.01)	-0.35*** (0.01)	-0.02*** (0.00)	-0.44*** (0.03)	-0.17*** (0.01)
Nonlease leverage	-0.02 (0.02)	0.02* (0.01)	-0.11** (0.06)	-0.03 (0.06)	0.30*** (0.09)		1.18*** (0.27)	-0.35*** (0.08)
Cash / Assets	0.50*** (0.03)	0.17*** (0.01)	-0.21*** (0.07)	0.14* (0.07)	-1.69*** (0.12)	-0.09*** (0.02)	-2.60*** (0.35)	-0.21* (0.13)
Current liability share	0.14*** (0.02)	-0.03*** (0.01)	0.03 (0.07)	0.21*** (0.08)	1.03*** (0.11)	-0.41*** (0.02)	0.93*** (0.32)	0.83*** (0.13)
Profitability	-0.03 (0.02)	-0.35*** (0.01)	-0.66*** (0.06)	-1.07*** (0.07)	-1.75*** (0.09)	-0.20*** (0.02)	-5.90*** (0.31)	-0.50*** (0.10)
Fixed effects	Industry, Fiscal year							
Method	OLS	OLS	logit	logit	logit	OLS	OLS	logit
Observations	35,655	36,673	36,673	36,673	36,673	36,226	31,681	29,478
R ²	0.12	0.46	0.01	0.06	0.31	0.30	0.30	0.14

*Capital expenditures are scaled by lagged PPE, and R&D is scaled by lagged assets, with missing values of R&D recoded as zero, and both measures winsorized at the 1st and 99th percentiles. The event variables are indicators from Capital IQ's Key Developments, aggregated by the firm's fiscal year. Executive turnover reports if the firm has a change of CEO or CFO. External adverse action reports if the firm is delisted, dropped from an index, faces lawsuits or legal issues, or faces regulatory enforcement actions. Accounting problem reports if the firm has delayed filings or earnings announcements, restatements of operating income, faces regulatory inquiries, experiences an auditor change, or has their auditor report going concern doubts. The non-lease leverage is total debt less capital leases in debt, divided by total assets, and winsorized at the 1st and 99th percentiles. The implied interest rate is computed as interest expense divided by the average of total debt in the current and previous year, multiplied by 100, and winsorized at the 5th and 95th percentiles. The hidden debt measure is the present value of operating lease payments, divided by reported debt plus this operating lease debt, and averaged over 2011-2018. The sample runs from 2011 through 2024. The log of assets, reported leverage, cash/assets, current liability share, and profitability have all been lagged by one year. All regressions use fiscal year fixed effects and 2-digit NAICS industry fixed effects. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% levels. R² shown is the pseudo-R² for logit regressions and adjusted R² for OLS regressions.*

Next, we test for heterogeneity in the effects of revelation across firms subject to sophisticated monitoring versus those without. Based on the governance results in Table 5, we flag firms that were monitored as those with an entity rating from S&P in 2018 or with bank ownership share exceeding 10 percent in 2018. Table A5 shows the regression results with interactions with this indicator. This analysis reveals that the effects of the revelation of substantial operating leases are generally driven by firms that lacked sophisticated monitoring. However, the set of firms subject to sophisticated monitoring and that had substantial balance sheet impacts from revelation is small, with only 58 firms in this joint group in 2018; those results may not be well identified.

Table A5. Alternate Specification: Oversight and Monitoring

Dependent variable:	CapEx / PPE	R&D / Assets	Executive turnover	External adverse action	Accounting problem	Nonlease leverage	Implied interest rate	Suspicious interest flag
Had hidden debt x Unmonitored x Post	-0.15*** (0.03)	-0.03*** (0.01)	0.15** (0.07)	0.26*** (0.08)	0.36*** (0.10)	0.03** (0.01)	-2.15*** (0.32)	-0.38*** (0.12)
Had hidden debt x Monitored x Post	-0.06** (0.03)	-0.01 (0.01)	0.14 (0.19)	0.06 (0.17)	0.16 (0.26)	-0.06*** (0.02)	0.17 (0.38)	0.09 (0.32)
Had hidden debt x Unmonitored	0.12*** (0.02)	0.04*** (0.01)	0.02 (0.06)	-0.18*** (0.06)	-0.24*** (0.09)	-0.04*** (0.01)	1.61*** (0.31)	0.44*** (0.10)
Had hidden debt x Monitored	0.07*** (0.03)	0.02* (0.01)	-0.16 (0.13)	0.06 (0.14)	-0.38 (0.30)	0.02 (0.01)	-0.40 (0.25)	-0.17 (0.25)
log(Assets)	-0.01*** (0.00)	0.01*** (0.00)	0.08*** (0.01)	0.26*** (0.01)	-0.34*** (0.01)	-0.01*** (0.00)	-0.40*** (0.03)	-0.15*** (0.01)
Nonlease leverage	-0.01 (0.02)	0.01 (0.01)	-0.08 (0.06)	-0.05 (0.06)	0.46*** (0.09)		1.52*** (0.27)	-0.30*** (0.08)
Cash / Assets	0.47*** (0.03)	0.18*** (0.01)	-0.21*** (0.07)	0.21*** (0.07)	-1.77*** (0.11)	-0.17*** (0.02)	-2.92*** (0.34)	-0.33*** (0.12)
Current liability share	0.13*** (0.02)	-0.01 (0.01)	0.03 (0.07)	0.19** (0.08)	0.86*** (0.11)	-0.52*** (0.02)	1.20*** (0.32)	0.88*** (0.13)
Profitability	-0.03 (0.02)	-0.35*** (0.01)	-0.66*** (0.06)	-1.07*** (0.07)	-1.70*** (0.09)	-0.22*** (0.02)	-5.67*** (0.31)	-0.47*** (0.10)
Fixed effects	Industry, Fiscal year							
Method	OLS	OLS	logit	logit	logit	OLS	OLS	logit
Observations	35,354	36,683	36,683	36,683	36,683	36,198	31,344	29,156
Adjusted R ²	0.12	0.45	0.01	0.06	0.32	0.25	0.28	0.13

Capital expenditures are scaled by lagged PPE, and R&D is scaled by lagged assets, with missing values of R&D recoded as zero, and both measures winsorized at the 1st and 99th percentiles. The event variables are indicators from Capital IQ's Key Developments, aggregated by the firm's fiscal year. Executive turnover reports if the firm has a change of CEO or CFO. External adverse action reports if the firm is delisted, dropped from an index, faces lawsuits or legal issues, or faces regulatory enforcement actions. Accounting problem reports if the firm has delayed filings or earnings announcements, restatements of operating income, faces regulatory inquiries, experiences an auditor change, or has their auditor report going concern doubts. Non-lease leverage is total debt less capital leases in debt, divided by total assets, and winsorized at the 1st and 99th percentiles. The implied interest rate is computed as interest expense divided by the average of total debt in the current and previous year, multiplied by 100, and winsorized at the 5th and 95th percentiles. The measure identifying if the firm has a balance sheet impact from operating lease revelation is an indicator for whether the firm's change in reported leased PPE as a share of gross PPE in 2019 or 2020 exceeded 3 standard deviations above the mean (with these calculated using the median and standard deviation of changes in this ratio between 1995 and 2018), or if reported leverage rose by more than two standard deviations above the mean (using the mean and standard deviation for changes before ASC 842) for firms that also had high operating leases relative to reported debt. A firm is

*considered monitored if as of 2018 it had a credit rating from S&P or had a bank ownership share exceeding 10 percent. The sample runs from 2011 through 2024, split into the pre- and post-periods around 2019 and 2020 depending on when ASC 842 took effect for the firm. The log of assets, reported leverage, cash/assets, current liability share, and profitability have all been lagged by one year. All regressions use fiscal year fixed effects and 2-digit NAICS industry fixed effects. Standard errors clustered by firm are reported in parentheses. ***, ** and * denote significance at the 1, 5 and 10% levels. R² shown is the pseudo-R² for logit regressions and adjusted R² for OLS regressions.*

Finally, we explore potential alternative approaches to testing for an effect on intra-period borrowing. In Table A6, the first column is the same as in Table 10, winsorizing the implied interest rate at the 5th and 95th percentiles. The second column relaxes this winsorizing, using the 1st and 99th percentiles instead. Consistent with the problems being in the right tail of the distribution of implied interest rates, the coefficient estimates become substantially larger. The third column considers the log excess interest computed in section III.C, which adjusts for actual interest rates, risk spreads, and firm-specific default risk, with a similar effect.

One potential concern for the effect on implied interest rates comes from a mechanical change, as reported debt (used in the denominator of this measure) rose when operating leases were included in debt. We address this by focusing on the role of notes payable, the component of current debt liabilities that is relevant to intra-period borrowing and that has no mechanical effects from including operating leases in liabilities.⁷ First, we construct an implied interest rate on short-term borrowing, using short-term interest expense (total interest expense less interest expense on long-term debt) divided by average notes payable (short-term notes) from the current and previous fiscal years, and multiplied by 100. Due to limited reporting of interest on long-term debt, this approach loses about 90 percent of the sample, but the resulting coefficient estimates are large and share the same sign (although not estimated with precision).

Second, we test for whether firms changed their reported use of notes payable or the probability of reporting zero notes payable, shown in the last two columns of Table A6. The coefficient estimates show that firms which were revealed in 2019 and 2020 to have substantial operating leases had previously reported lower notes payable or been more likely to report zero notes payable, and these tendencies were partly undone following operating lease revelation. These results are consistent with firms having previously engaged in intra-period borrowing to reduce their reported use of notes payable, but stopped or reduced their use of intra-period borrowing after revelation. Notably, repeating this exercise for longer-term debt instruments not mechanically affected by operating lease inclusion—long-term debt notes, debentures, or convertible debt liabilities—showed insignificant differences before 2019 and insignificant effects from operating lease revelation, consistent with the adjustment occurring through intra-period borrowing, not through other forms of debt.

⁷ In Compustat, this variable (*np*) is short-term notes, including bank acceptances and overdrafts; short-term loans payable to officers or related parties, to stockholders, to banks and others; brokerage houses' drafts payable; telephone companies' interim notes payable; and commercial paper. It explicitly excludes the current portion of long-term debt, which could include operating leases after ASC 842.

Table A6. Alternative Tests for Effects on Intra-period Borrowing

Outcome variable:	Implied interest rate, 5% winsorized	Implied interest rate, 1% winsorized	Log excess interest	Short-term implied interest rate	Reported zero notes payable	Notes payable / Assets
Has hidden debt x Post	-1.57*** (0.27)	-5.29*** (1.00)	-0.37*** (0.05)	-6.54 (6.70)	-0.24** (0.10)	0.04** (0.01)
Has hidden debt	1.16*** (0.26)	3.19*** (1.02)	0.14*** (0.04)	7.54* (4.24)	0.43*** (0.10)	-0.11*** (0.02)
log(Assets)	-0.41*** (0.03)	-0.79*** (0.08)	-0.04*** (0.01)	0.67 (0.54)	-0.11*** (0.02)	-0.04*** (0.00)
Nonlease leverage	1.33*** (0.24)	-0.86 (0.87)	-0.13*** (0.03)	18.17*** (4.43)	-0.39*** (0.09)	
Cash / Assets	-3.36*** (0.31)	-8.99*** (1.02)	-0.30*** (0.05)	-1.98 (4.47)	3.03*** (0.12)	-0.32*** (0.03)
Current liability share	0.98*** (0.29)	5.16*** (0.94)	0.03 (0.05)	-7.56 (6.32)	-2.34*** (0.12)	0.10*** (0.02)
Profitability	-5.83*** (0.27)	-19.17*** (1.07)	-0.45*** (0.05)	-35.94*** (3.49)	1.39*** (0.10)	-0.39*** (0.03)
Fixed effects	Industry, Fiscal year					
Method	OLS	OLS	OLS	OLS	logit	OLS
Observations	35,018	35,018	29,213	3,036	40,870	43,736
R ²	0.27	0.19	0.10	0.12	0.1466	0.21

The implied interest rate is computed as interest expense divided by the average of reported debt in the current and previous year, multiplied by 100, and winsorized. Log excess interest is computed as in section III.C. The short-term implied interest rate is computed as interest expense less interest expense on long-term debt (if the firm had long-term debt), divided by the average of notes payable in the current and previous year, multiplied by 100, and winsorized at the 5th and 95th percentiles. Notes payable divided by assets is winsorized at the 1st and 99th percentiles. The measure identifying if the firm has a balance sheet impact from operating lease revelation is an indicator for whether the firm's change in reported leased PPE as a share of gross PPE in 2019 or 2020 exceeded 3 standard deviations above the mean (with these calculated using the median and standard deviation of changes in this ratio between 1995 and 2018), or if reported leverage rose by more than two standard deviations above the mean (using the mean and standard deviation for changes before ASC 842) for firms that also had high operating leases relative to reported debt. The sample runs from 2011 through 2024, split into the pre- and post-periods around 2019 and 2020 depending on when ASC 842 took effect for the firm. The log of assets, nonlease leverage, cash/assets, current liability share, and profitability have all been lagged by one year. All regressions use fiscal year fixed effects and 2-digit NAICS industry fixed effects. Standard errors clustered by firm are reported in parentheses, except for the short-term implied interest rate regression, which has too few observations per firm and thus uses robust standard errors instead. ***, ** and * denote significance at the 1, 5 and 10% levels. R² shown is the pseudo-R² for logit regressions and adjusted R² for OLS regressions.