Does High Leverage Render Businesses Vulnerable to the COVID-19 Shock?

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November 8, 2021

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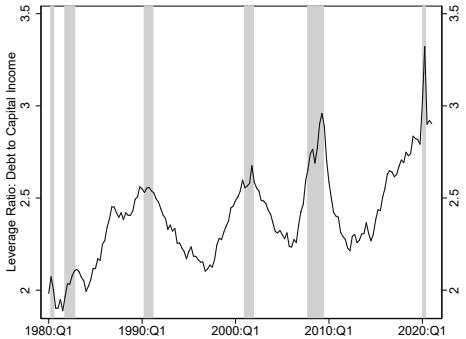
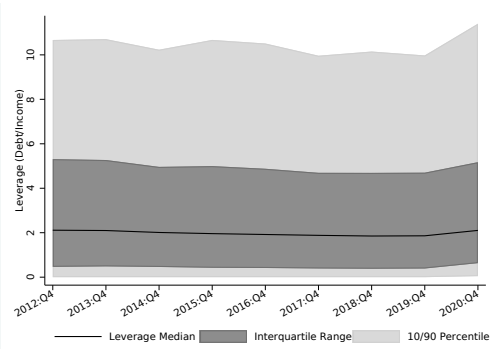
Historically High Corporate Leverage on the Eve of COVID-19...

(a) Leverage of US Nonfinancial Business Sector



Note: Debt to capital income ($\approx$ EBITDA)
Source: Financial Accounts of the US

(b) Range of Leverage in Y-14Q Data



Note: Debt to EBITDA of nonfinancial firms in Y-14Q
Source: FR Y-14Q

Overview of Analysis and Findings

- Nonfinancial sector entered the COVID-19 crisis with historically high leverage.
- We use data on nonfinancial firms borrowing from Y-14Q banks to study how pre-COVID leverage affected firms' ability to access bank loans and their investment during COVID.
  - Focus on disparate experience of large vs. small firms (sales up to $50M) and mid-sized firms (sales from $50M up to $250M).
- Leverage constrained SMEs', especially small firms', access to bank credit along some margins after the pandemic hit:
  - Reduced size of newly originated loans to SMEs;
  - Lowered small firms' probability of borrowing from a bank without prior relationships.
- Banks with more capital cushion appear more willing to lend to higher-leverage customers during COVID, but only if they already had prior relationships.
- Some evidence of higher leverage deterring investment during COVID among SMEs, especially mid-sized firms.

A Simple Model of Debt Overhang (for Large Firms)

- A firm has existing assets with risky payoff $\tilde{A}$, and outstanding debt D.
  $\Longrightarrow$ Default probability $\delta = prob(\tilde{A} < D)$
- A temporary project needs outlay e in $t = 1$ and pays off gross return R in $t = 2$.
  - e is assumed to be sufficiently small to not affect δ
- If the firm has to borrow to invest, and assuming it faces no credit constraint (e.g., a large firm), it will invest if R is no lower than the (gross) interest rate charged γ:

$$R \geq \gamma, \text{ and } \quad \gamma = \frac{r}{(1-\delta) + \delta \underline{A}/D}, \text{ where } \quad \underline{A} = \mathbb{E}(\tilde{A} < D)$$

- **Debt overhang**: higher $D \Longrightarrow$ higher $\gamma \Longrightarrow$ the less likely is the firm to invest
  - If the adverse shock (e.g. COVID-19) impairs the long-run prospect of $\tilde{A}$, it effectively increases leverage.

A Simple Model of Leverage & Credit Constraint for Small Firms

- Small firms are subject to a borrowing constraint: can borrow D up to a portion θ of assets (productive capital) K, i.e., $D \leq \theta K$.
- So a firm with net worth N can operate with $K = N/(1-\theta)$.
  Assuming the pre-shock steady state return on assets is R, and interest rate on debt is γ, then the enterprise value V_E rises in leverage:

$$V_E = N\frac{R-\gamma\theta}{r(1-\theta)}, \quad \text{and} \quad \frac{\partial V_E}{\partial \theta} > 0$$

- Small firms were already "maxed out" on debt before COVID hit, generally cannot borrow more to fund new investment.
- If COVID damages existing assets' value & thus shrinks borrowing capacity, they may even have to cut back on regular operations (apart from COVID-induced restrictions).
- Public funding assistance is critical for small firms.

Related Literature

- Debt overhang: High leverage leads to underinvestment (Myers 1977)
  - Additional distortion from large volume of bankruptcies & excessive liquidation
- High leverage can exacerbate constraints on firms' access to credit, which has been shown to restrain firm investment and employment (e.g., Chodorow-Reich 2013)
- Small firms are more subject to credit constraints (e.g., Gertler and Gilchrist 1994)
- High corporate leverage is likely to amplify impact of COVID-19 due to debt overhang & corporate failures (e.g., Brunnermeier and Krishnamurthy 2021, Kovner et al. 2021)
- A growing number of studies of bank lending, to SMEs in particular, use Y-14 data (e.g., Chodorow-Reich et al. 2021, Greenwald et al. 2021, Caglio et al. 2021)

Data

- Main dataset: FR Y-14Q Schedule H.1, Corporate Loans, originally for stress test purposes.
- Quarterly loan-level data set covering all C&I loans (including lines of credit and term loans) with **loan** and **borrower** characteristics, subject to the following conditions:
  - Reporting Banks: $100 billion or more in assets.
  - Only report loans with balances of $1 million or more.
- Vast majority of borrowers are private firms, and close to 60% are SMEs.
- Balance-sheet and income statement data on the borrowers, such as fixed assets and capital expenditures (trailing 12 months).
  - Borrower financial data often lag by a quarter or more, with data as of Q4 each year most prevalent. Employment data not available.
- Our analyses consider only borrowers that are nonfinancial firms, and use loan data from 2019:Q4 through 2020:Q4 to focus on comparing the pre-COVID & the COVID period.
  - Pre-COVID: Oct. 1, 2019—Mar. 14, 2020; COVID: Mar. 15—Dec. 31, 2020.

For SMEs, Leverage Constrained Availability of Bank Credit During COVID-19

- Size of newly originated loans (by Y-14 banks) contracted more for SMEs, especially small firms, with higher leverage, after COVID-19 hit.
- Probability of obtaining loans from a bank without prior relationship also fell for small firms with higher leverage during COVID.
- Some evidence that banks with more capital buffer cushion were willing to lend to riskier existing customers but not new ones during COVID.
- One special feature of the COVID-19 downturn is the unprecedented support by fiscal and monetary authorities, through programs such as the PPP and the MSLP.
- We thus explore, among the size-eligible firms, whether the MSLP benefited firms differentially depending on their leverage.
  - Regression discontinuity design around thresholds of leverage that determine eligibility for the MSLP to identify its effect.

Leverage Reduced Loan Size for Small Firms During the Pandemic

VARIABLES	(1) Log(Volume)	(2) Log(Volume)	(3) Spread (BPS)	(4) Spread (BPS)	(5) Utilization Rate	(6) Utilization Rate
Leverage*COVID Crisis	-1.25**	-2.15*	1.82	-0.32	0.00	-0.02
	(0.52)	(1.06)	(1.27)	(1.23)	(0.03)	(0.02)
Leverage (Demeaned)	3.97***	2.42**	-1.45	-1.10	0.11**	0.09***
	(0.67)	(1.06)	(0.85)	(0.87)	(0.04)	(0.03)
Observations	2,128	746	2,128	746	43,467	16,279
State/Industry*Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Bank/Base-Rate*Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Impacted Industries Only	No	Yes	No	Yes	No	Yes

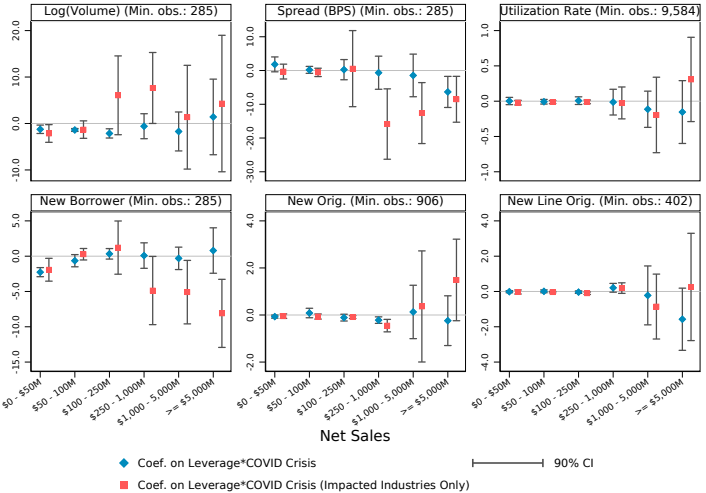
Note: **Only firms with Sales Up to $50M.** Coefficients for LHS Log(Volume) multiplied by 100. Spread in basis points (BPS). Utilization rate: utilized loan amount as percent of committed loan amount. Leverage: ratio of total debt over EBITDA. COVID-Crisis: $= 1$ from March 15, 2020 to the end of 2020, $= 0$ otherwise. Robust standard errors multi-way clustered at the state, industry, and bank level; ***, ** and *: significance at 1%, 5% and 10% level, respectively.

Leverage Lowered Odds of Forming New Relationship During COVID

VARIABLES	(1) New Borrower	(2) New Borrower	(3) Refinancing Flag	(4) Refinancing Flag	(5) Refinancing Flag (Lines Only)	(6) Refinancing Flag (Lines Only)
Leverage*COVID Crisis	-2.26***	-1.92*	-0.07*	-0.05	-0.01	-0.03
	(0.37)	(0.90)	(0.04)	(0.05)	(0.03)	(0.06)
Leverage (Demeaned)	0.63	0.76	-0.01	-0.08	0.00	-0.03
	(0.42)	(0.88)	(0.02)	(0.07)	(0.02)	(0.03)
Observations	2,128	746	20,648	5,965	18,413	5,117
State/Industry*Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Bank/Base-Rate*Quarter FEs	Yes	Yes	No	No	No	No
Impacted Industries Only	No	Yes	No	Yes	No	Yes

Note: **Only firms with sales Up to $50M.** Coefficients multiplied by 100. New borrower: = 1 if a newly originated loan is the first between a bank-firm pair, = 0 otherwise. Refinancing Flag: = 1 if a new loan is originated in a quarter when a firm has one or more loans maturing, = 0 otherwise. Refinancing (lines only): defined analogously, but only for new credit lines. Leverage: ratio of total debt over EBITDA. COVID-Crisis: = 1 from March 15, 2020 to the end of 2020, = 0 otherwise. Standard errors clustered by state, industry and bank (only state, industry for Refinancing regressions, which are borrower-level).

Similar Negative Effects of Leverage on Mid-Sized Firms During COVID



Note: Coefficients on Leverage*COVID crisis, multiplied by 100 except for LHS = Spread and Utilization Rate.

Better-Capitalized Banks Lent More to Riskier Small Firms During the Pandemic but Only If They Had Prior Relationship

VARIABLES	(1) Log(Volume)	(2) Log(Volume)	(3) Spread (BPS)	(4) Spread (BPS)	(5) New Borrower	(6) New Borrower
Leverage*COVID Crisis	-1.88*	-2.34**	2.57	-0.46	-2.62***	-2.03**
	(1.00)	(0.93)	(1.60)	(1.44)	(0.57)	(0.86)
Leverage (Demeaned)	4.07***	1.67	-2.31*	-0.83	0.89	0.74
	(0.61)	(1.03)	(1.31)	(1.13)	(0.66)	(0.81)
Leverage*High Capital Buffer*COVID Crisis	3.40	12.32***	-0.95	-1.57	1.17	1.54
	(2.17)	(2.11)	(2.73)	(4.53)	(0.97)	(2.48)
Leverage*High Capital Buffer	-0.25	2.02	1.84	-0.74	-0.56	0.05
	(1.11)	(1.64)	(1.93)	(2.16)	(0.91)	(0.99)
Observations	2,128	746	2,128	746	2,128	746
State/Industry*Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Bank/Base-Rate*Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Impacted Industries Only	No	Yes	No	Yes	No	Yes

Note: **Only firms with sales Up to $50M.** Coefficients multiplied by 100 except for LHS Spread.
COVID-Crisis: = 1 from March 15, 2020 to the end of 2020, = 0 otherwise.
Robust standard errors multi-way clustered at the state, industry, and bank level.

Firms with Leverage Higher Than A MSLP Threshold Appear to Substitute toward Bank Loans During COVID

VARIABLES	(1) Pre-COVID Log(Volume)	(2) Pre-COVID Spread (BPS)	(3) Pre-COVID New Borrower	(4) COVID Log(Volume)	(5) COVID Spread (BPS)	(6) COVID New Borrower
Leverage (4 to 4.5 Dummy)	-34.16	-34.83***	23.73**	48.77*	19.31*	13.13
	(30.97)	(6.33)	(10.46)	(23.28)	(10.94)	(7.95)
Leverage (Demeaned)	-6.31	5.86	10.06	-158.95	-138.64**	-19.59
	(5.18)	(15.43)	(6.38)	(114.21)	(53.41)	(33.94)
Leverage (4 to 4.5 Dummy)*Leverage	96.55	36.47	-76.27**	135.15	122.04**	8.33
	(92.41)	(38.36)	(31.48)	(113.38)	(56.14)	(33.47)
Observations	301	301	301	474	474	474
Base-Rate/Security/Maturity FEs	Yes	Yes	Yes	Yes	Yes	Yes
MSLP Size Eligible Only	Yes	Yes	Yes	Yes	Yes	Yes

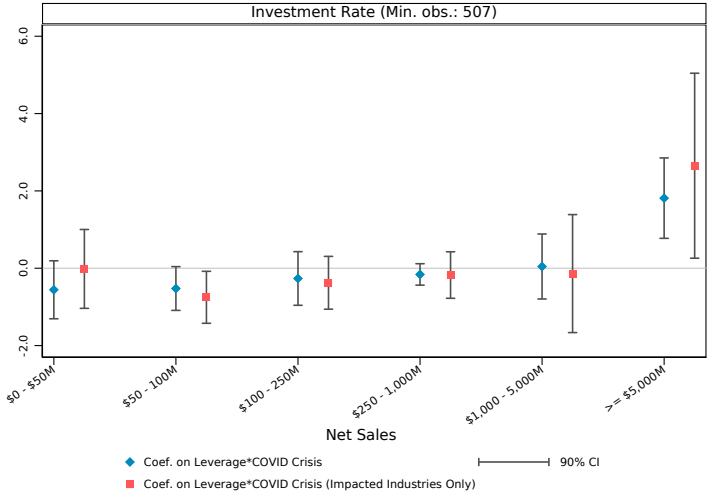
Note: **Only MSLP size-eligible firms with leverage between 3.5 and 4.5.** Leverage $\in [3.5, 4]$ is omitted category. Coefficients multiplied by 100 except for LHS Spread. Pre-COVID: October 1, 2019 to March 14, 2020; COVID: March 15, 2020 to end of 2020. Robust standard errors multi-way clustered at the state, industry, and bank level.

Higher Leverage Deterred Investment by Small Firms During COVID

VARIABLES	(1) Pre-COVID Investment Rate	(2) Pre-COVID Investment Rate	(3) COVID Investment Rate	(4) COVID Investment Rate
Leverage	0.06	-0.21	-0.67*	-0.16
	(0.17)	(0.42)	(0.36)	(0.27)
Observations	7,335	2,151	4,191	1,272
State/Industry FEs	Yes	Yes	Yes	Yes
Impacted Industries Only	No	Yes	No	Yes
Leverage*COVID Crisis Coef.	-	-	-0.73	0.04
Leverage*COVID Crisis Std. Err.	-	-	0.43	0.58

Note: **Only firms with sales Up to $50M & with loans maturing in the year of investment.**
Controlling for log sales, sales growth, profitability, asset tangibility and liquidity, all lagged by one year.
Investment rate: 12-month capital expenditures as of Q4 in year t normalized by prior year Q4 capital stock.
Pre-COVID: t = 2019:Q4, COVID: t = 2020:Q4. Coefficients multiplied by 100.
Robust standard errors multi-way clustered by state and industry.

Higher Leverage Depressed Mid-Sized Firms' Investment During COVID



Note: **Only firms with loans maturing in the year of investment.** Coefficients on Leverage*COVID crisis, multiplied by 100.

Conclusion & Policy Implication

- We use data on nonfinancial firms borrowing from Y-14Q banks to study how pre-COVID leverage affected the availability of bank loans to nonfinancial firms, especially SMEs, and their investment during the pandemic.
- After COVID-19 hit, higher leverage reduced the size of newly originated loans to SMEs, and lowered small firms' probability of borrowing from a bank without prior relationships.
- Banks with greater capital cushion appear more willing to lend to higher-leverage small firms during the COVID period, but only if they already had prior relationships.
- Some evidence of higher leverage deterring investment during the pandemic, most notably among mid-sized firms.
- Public funding likely supported small firms, and bond purchases buoyed large (public) firms, whereas mid-sized firms may have fallen through the policy cracks to some extent.