A NEW THEORY OF CREDIT LINES (WITH EVIDENCE)

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FACTS

Credit lines make up c. $2T of committed credit, bulk of bank credit (80%)
Berg–Saunders–Steffen 20, Greenwald–Krainer–Paul 21, Chodorow-Reich et al. 21, and Sufi 09

Credit lines are rarely drawn (6%) even in crises (24%)
Ivashina–Scharfstein 10, Greenwald 21

Credit lines are bundled with loans, especially to risky firms (80%)
See below

Credit lines are sometimes revoked by lenders
Falato–Chodorow-Reich 22

QUESTIONS

Q1. Why are credit lines so common, even if rarely used?

Q2. Why are credit lines bundled with loans?

Q3. How does the risk of revocation affect borrowing and welfare?

THIS PAPER

Dynamic model of borrower B issuing debt
Admati et al 17/DeMarzo–He 21

Friction: Non-exclusivity

After borrowing from one lender at t, borrows from another at $t + \mathrm{d}t$

Innovation: Allow credit lines (CLs)

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T. New test effect of revocation risk: Increases borrowing (per R3)

MODEL

OVERVIEW

Infinite-horizon sequential borrowing: B borrows from one lender at each t

Credit line-debt bundle at date 0 and new debt afterward

B's cost $c(Q_t)$ of debt increasing and concave in stock of debt Q_t

Captures expected coupon payment $\downarrow$ as default prob. $\uparrow$ in Q

Universal risk-neutrality, deep pockets, and discounting at rate ρ

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NB: No revocation in baseline

B's VALUE

B's flow payoff: $v_t \mathrm{d}t = y\mathrm{d}t + p_t \mathrm{d}Q_t - c(Q_t)\mathrm{d}t$, where

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B's value: $V_t = \int_0^\infty e^{-\rho s} v_{t+s} \mathrm{d}s$

LENDERS' VALUE

Lenders' flow payoff from unit debt given Q_t: expected coupon $\gamma(Q_t)\mathrm{d}t$

CONTRACTS

Loans $(p_t, \mathrm{d}Q_t)$: Borrow $p_t \mathrm{d}Q_t$ against face value $\mathrm{d}Q_t$

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($\mathrm{d}\tilde{Q}$ put options on debt with strike $\tilde{p}$ sold at date 0)

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A2: Gains from trade:

Positive at $Q = 0$: $\gamma(0) > c'(0)$

Negative as $Q \to \infty$: $\gamma(\infty) < c'(\infty)$

BENCHMARKS

BENCHMARK I: EXCLUSIVE COMPETITION

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If B commits to one lender (of those competing at date 0) forever

B borrows at date 0 and never again

Price is above marginal cost

EXCLUSIVE COMP: INTUITION

Corporate finance intuition: Static trade-off theory

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Balance gains from trade (e.g. tax shield) with costs (e.g. distress)

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Durable goods monopolist intuition: $\text{MC} = \text{MR} \implies p > \text{MC}$

BENCHMARK II: NO CREDIT LINES

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Absent credit lines, with $\mathrm{d}t \to 0$

B issues more debt continuously

B captures no surplus

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Cf. Leverage ratchet effect and Coase Conjecture
(Admati et al. 18, DeMarzo–He 21, Coase 72,...)

NO CREDIT LINES: PROOF

As $\mathrm{d}t \to 0$, HJB for B's value V: $\rho V(Q) = y + p(Q)q - c(Q) + V'(Q)q$

Issuance: Linear in $q \implies$ coefficient $p(Q) + V'(Q) = 0$ $(\implies q > 0)$

Surplus: HJB becomes $\rho V(Q) = y - c(Q) \implies V(0) = \dfrac{y - c(0)}{\rho}$ as if $q_t \equiv 0$

Pricing: Using expressions for V' and V above: $-V'(Q) = p(Q) = \dfrac{c'(Q)}{\rho}$

NB: c concave $\implies$ V convex $(V'' = -c''/\rho > 0)$

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Durable goods monopolist intuition: Compete with future self

After selling monopoly Q to one lender, profit by selling more to another

RESULTS

LEMMA: RATCHET EFFECT FOR CREDIT LINES

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Say B has CL $(\tilde{p}, \mathrm{d}\tilde{Q})$ s.t. indifferent to drawing at Q_0

B prefers to draw for $Q > Q_0$

RATCHET EFFECT OF CLs: INTUITION

c concave $\implies$ more debt B has, less costly to have more

Idea: Higher $Q \implies$ lower repayment prob. $\implies$ lower cost of $\mathrm{d}\tilde{Q}$

Akin to leverage ratchet effect:

Higher debt begets higher debt

R1: RATCHET-ANTI-RATCHET EFFECT

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Suppose B has debt Q_0 and CL $(\tilde{p}, \mathrm{d}\tilde{Q})$ in place s.t. indifferent to drawing

If $\mathrm{d}\tilde{Q}$ large enough, B doesn't take any new debt $(\mathrm{d}Q_t \equiv 0)$

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No p for d$\tilde{Q}$ large enough by A2: grains from trade < 0 at $Q = \infty$

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$\Longrightarrow$ credit lines implement exclusivity absent borrower commitment

R1 RESONATES WITH PRACTICE

Credit line latent off-equilibrium threat

Explains low utilization

Credit line large so price falls enough after drawn

Explains large size

R2: BUNDLING

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At date 0, B chooses a bundle of a loan (p, Q_0) and CL $(\tilde{p}, \mathrm{d}\tilde{Q})$ s.t.

(p, Q_0) coincides with outcome of exclusive competition

$(\tilde{p}, \mathrm{d}\tilde{Q})$ makes B indifferent to drawing at Q_0 with $\mathrm{d}\tilde{Q}$ "large"

R2: BUNDLING: INTUITION

Credit lines allow B to commit not to dilute by R1

Use credit lines to implement optimum without dilution (i.e. BM1)

R2 RESONATES WITH PRACTICE

Credit line bundled with loan as commitment device to curb dilution

Explains bundling, esp. for risky firms with high dilution risk

REVOCATION

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Assume: if drawn, credit lines honored with some prob. (else disappear)

R3: REVOCATION RISK

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Less worried about dilution by credit line if might not be there

$\Longrightarrow$ harder to deter new debt

$\Longrightarrow$ harder to commit not to dilute in the first place

PREDICTION

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Increased risk of borrower's credit line being revoked

$\Longrightarrow$ borrower takes on more debt

TEST

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Based on fact that unhealthy lenders more likely to revoke credit lines (Chodorow-Reich–Falato 22)

Construct (neg) health shocks for borrowers' CL lenders and all lenders (following Chodorow-Reich 14 and Darmouni 20)

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$\beta > 0$: Shocks to CLs increase borrowing (in line with our theory)

$\gamma < 0$: Shocks to all lenders decrease it (in line with literature)

INCREASE DEBT AFTER SHOCKS TO CLs

	(1)	(2)	(3)	(4)
Shock	-0.16^{***}	-0.17^{***}	-0.17^{***}	-0.18^{***}
	(0.05)	(0.05)	(0.05)	(0.05)
Shock CL		0.03^{***}	0.02^{**}	0.03^{***}
		(0.01)	(0.01)	(0.01)
Number of Syndicates			0.03^{***}	0.04^{***}
			(0.01)	(0.01)
Pre CL Indic				-0.03^{**}
				(0.01)
Constant	0.20^{***}	0.19^{***}	0.19^{***}	0.18^{***}
	(0.04)	(0.04)	(0.04)	(0.04)
Observations	4883	4883	4883	4883
Adjusted R^2	0.002	0.003	0.009	0.010

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Here: Commitment to take on less debt

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Ratchet effects in dynamic corporate finance

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Latent contracts:

In lit.: Help lenders support collusive outcomes

Here: Help borrowers support monopolistic outcome

CONCLUSION

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Heretofore unexplored role of credit lines: commit not to dilute

Curb competition with future self

Implement monopoly outcome

A NEW THEORY OF CREDIT LINES

$$q > 0$$

$q > 0$

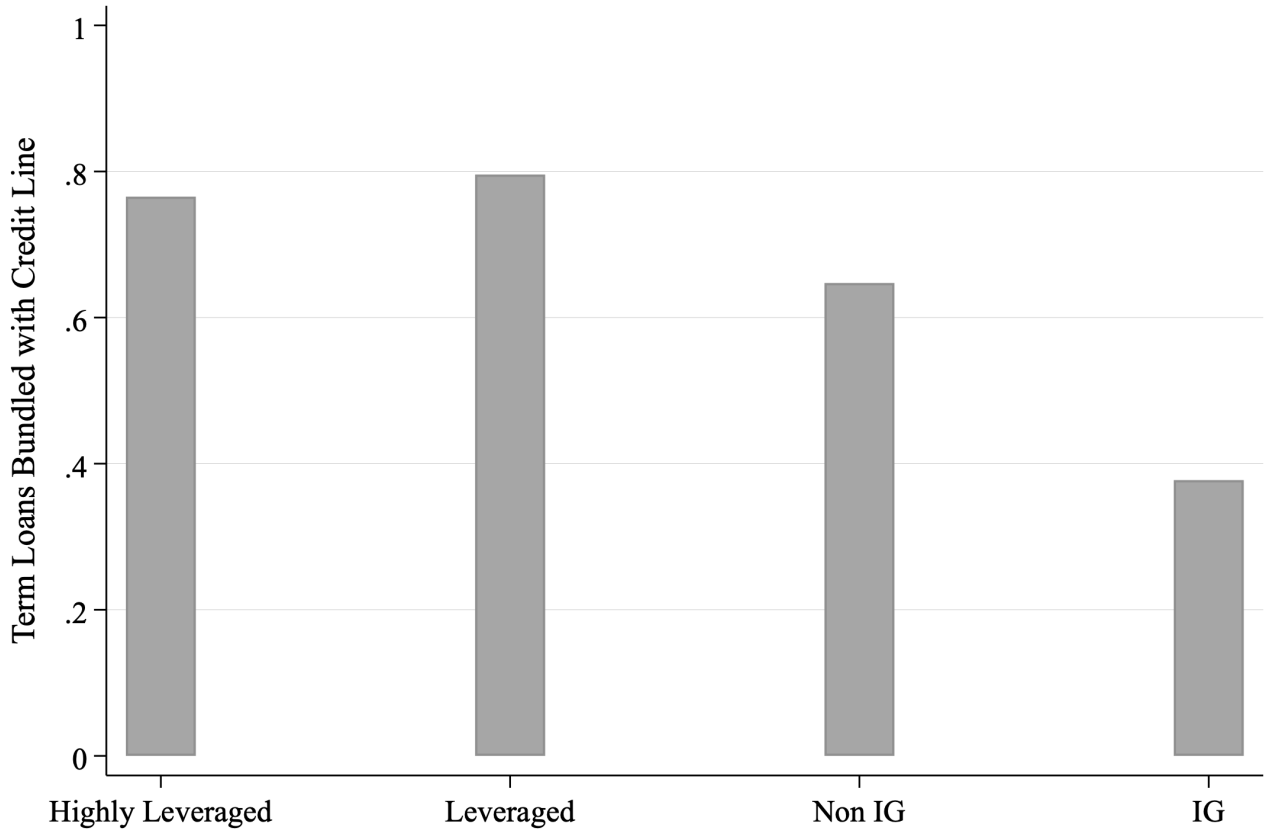
p satisfies B–S "PDE": $\rho p(Q) = \gamma(Q) + p'(Q)q$ where $p(Q) = \dfrac{c'(Q)}{\rho}$

$$\implies q = \frac{\gamma(Q) - c'(Q)}{-c''(Q)/\rho} > 0$$

(Go back)

BUNDLING AND FIRM RISK

Figure: BUNDLING AND FIRM RISK



Data from Dealscan: US C&I syndicated loans from 1997–2021 to non-financial firms with ≥ 1 US lender a US bank

(Go back)

DATA

DEALSCAN SYNDICATED LOAN DATA

Restrict to deals originated in US, exclude loans to financials

Keep C&I loans: deal purpose is general purpose or working capital

Impute lenders' syndicate weights following Chodorow-Reich 14

Controls

- Number of syndicates firm i borrowed from during normal period
- Indicator variable tracking if firm borrowed CL in normal period

(Go back)

SHOCK CONSTRUCTION

CONSTRUCTION OF SHOCKS

Dealscan US C&I syndicated loan data, following Chodorow-Reich 14 and Darmouni 20

$\Delta L_{b,-i}$: decrease b's lending to $j \neq i$ in crisis $\Delta L_{b,-i} := 1 - \dfrac{2\sum_{j\neq i} \alpha_{b,j,\text{cris}} L_{b,j,\text{cris}}}{\sum_{j\neq i} \alpha_{b,j,\text{norm}} L_{b,j,\text{norm}}}$

Normal: 1/2004–8/2008; crisis: 10/2008–12/2010

$L_{b,j}$: # loans from b to j

$\alpha_{b,j}$ average syndicate weight

i's shock: sum $\Delta L_{b,-i}$ over lenders last pre-crisis syndicate S, weighted by α_s:

$$\text{Shock CL}_i = \sum_{b\in S_{CL}} \alpha_s^{CL} \Delta L_{b,-i} \qquad\qquad \text{Shock}_i = \sum_{b\in S} \alpha_s \Delta L_{b,-i}$$

Shock $\text{CL}_i = 0$ if firm i's last pre-crisis syndicate has no CL

S_{CL} is a syndicate that originates a deal including a CL

(Go back)