

Maturity Walls

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- **Maturity walls**: a **majority of debt** scheduled to mature within **short period** (< 2 yrs)
 - Large source of rollover risk
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- Rating agencies think maturity walls are important for **forecasting default**

RATING ACTION COMMENTARY

Fitch Downgrades Antero Resources LT IDR to 'B'; Places Ratings on Rating Watch Negative

Thu 02 Apr, 2020 - 5:12 PM ET

Elevated Refinancing Risk: AR has a sizable **large maturity wall** due between 2021 and 2023 (\$2.63 billion, starting with its 5.375% 2021 note, of which \$953 million remains outstanding). The unsecured bond markets have remained closed to the company, even as select peers have tapped it during a brief January window opening. The collapse in prices since that time have made this situation more difficult.

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Research Questions

1. Why do firms hold maturity walls, and how do they impact borrowing and default risk?
2. How exposed are firms with maturity walls when credit markets freeze?

What I do in this paper

- **Novel** measure of **repayment concentration**: standard deviation of debt maturity dates
 - **48%** of non-financial bond issuers have a maturity wall
 - Concentrated repayments $\longrightarrow$ $\uparrow$ default risk & $\uparrow$ spreads, *beyond* leverage & avg. maturity
 - **Why choose one?** Large **fixed costs** to issue bonds (economies of scale in issue size)

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 - Firms with **low** rollover risk concentrate & lenders **price** the exposure
- Quantify and counterfactuals
 - Walls $\uparrow$ spreads **36 bps** (21%) & default rates **30 bps** (25%), holding leverage fixed
 - Wall firms far less resilient to a credit market freeze; standard models miss up to **60%**

Empirical Facts

Maturity walls are common, priced, and rooted in issuance costs

Mergent FISD (bond issuances) + **Compustat** (balance sheets), 1995–2019

- σ_{Mat} : st. dev. of maturity dates; low $\sigma_{Mat} \rightarrow$ concentrated payments
- **Maturity wall**: $\geq 2/3$ of bond principal due within a **2-year window**

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1. **48%** of non-financial bond issuers have a maturity wall

More

2. +1 s.d. dispersion $\rightarrow$ $\downarrow$ 0.45 pps default prob. & $\downarrow$ 14 bps spread

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Holds *beyond* leverage and average maturity – the **spacing** is priced

3. Economies of scale in issuance: $< \$1B$ **85 bps**, $> \$3B$ **40 bps**

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Next: firms choose how much to borrow *and* how concentrated payments are

- Key trade-off: fixed debt issuance cost v. convex equity cost (rollover risk)

Model

Environment

Standard credit-risk model, plus **one new choice**: repayment concentration

- Discrete time, infinite horizon, continuum of risk neutral firms and lenders

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- Firm state $\mathcal{S} = (b_D, b_C, y, \eta)$:
 - **Dispersed** debt b_D , and **concentrated** debt b_C
 - Firm earns revenue y each period, y is AR(1) in logs
 - $\eta \in \{0, 1\}$: expiry indicator for the **concentrated** bond

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- Firms choose **how much** to owe, and **when** it is due: (b'_D, b'_C)
 - The same total $b'_D + b'_C$ can come due on many dates, or on one
 - Manager preference shock $\varepsilon(b'_D, b'_C)$ over the debt choice (σ_ε)
 - Default or continue; defaulters re-enter with no debt

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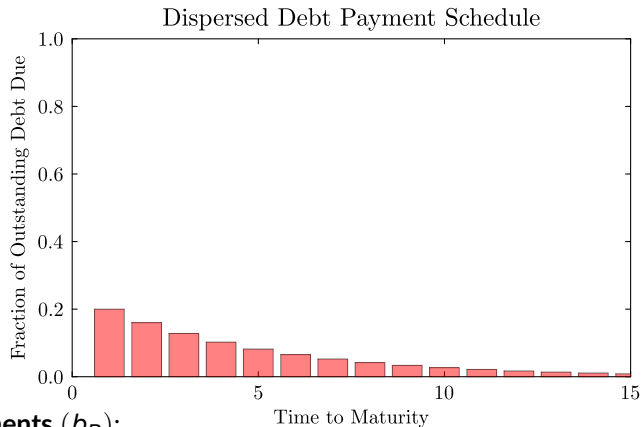
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- Two costs shape the choice:
 - c_I per bond issued $\rightarrow$ issue rarely, **concentrate**
 - αd^2 convex equity cost $\rightarrow$ keep repayments small, **disperse**

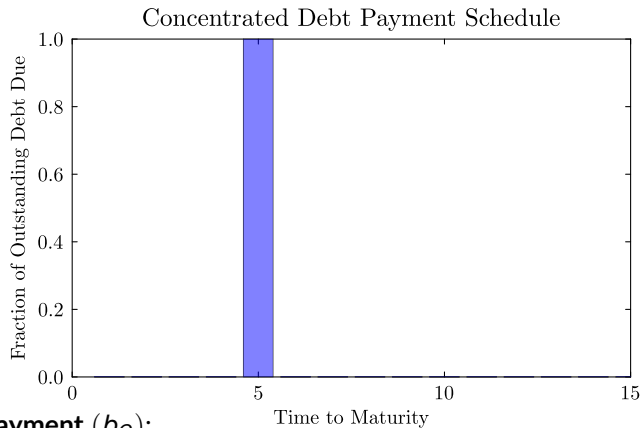
Modeling dispersed and concentrated debt payments



Dispersed Debt Payments (b_D):

- Exponentially maturing coupon bonds with constant amortization rate λ
- Each period: λb_D units of required principal repayments

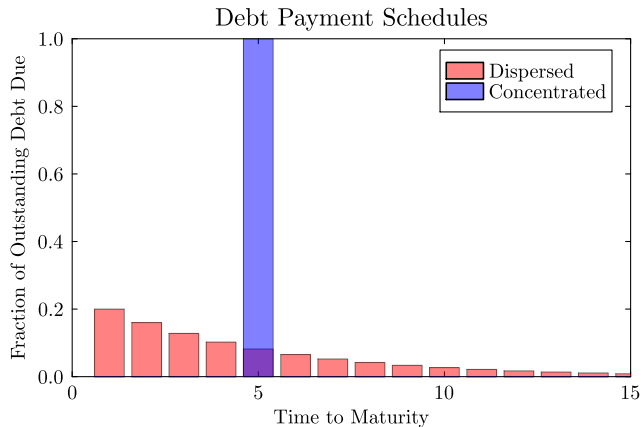
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Concentrated Debt Payment (b_C):

- Bond pays a coupon until **random** expiration ($\eta = 1$), arriving w.p. λ
- When bond expires ($\eta = 1$), firm must fully repay b_C

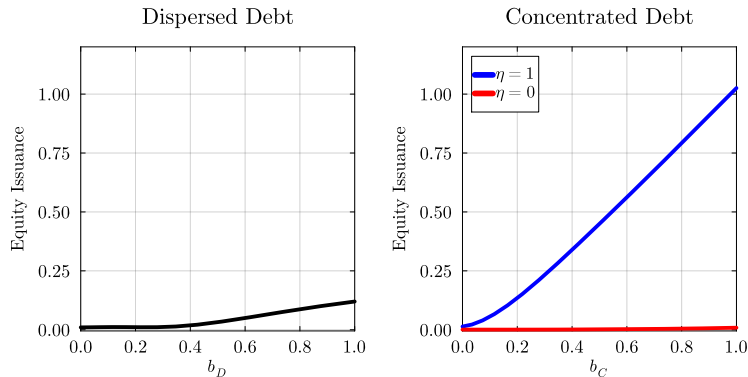
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Remarks:

- Firm pays $\underbrace{\tilde{c}(b_D + b_C)}_{\text{Coupon}} + \underbrace{\lambda b_D + \eta b_C}_{\text{Principal}}$ to avoid default
- Identical in payment amount and average maturity ($1/\lambda$)
- Differ only in the **schedule** of payments

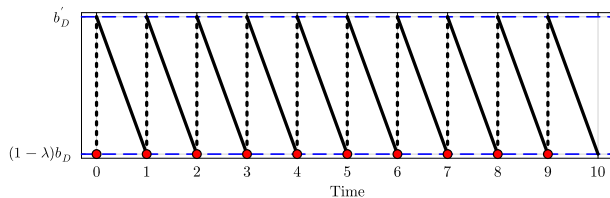
Dispersed debt smooths required repayments across states



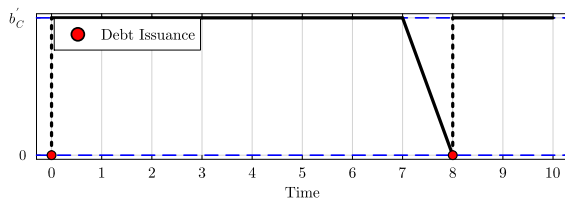
- **Left:** b_D repays λb_D every period — each injection stays small
- **Right:** b_C repays nothing until $\eta = 1$, then the whole principal at once
- Equity cost is convex: one large injection costs more than many small ones

Concentrated debt avoids repeated small issuances

Dispersed Debt Issuance

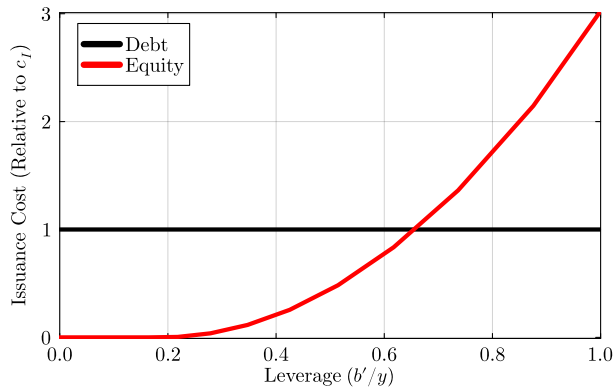


Concentrated Debt Issuance



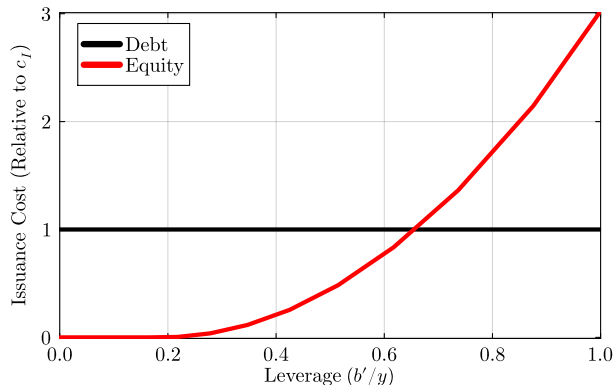
- **Top:** b_D amortizes every period, so the firm returns to market to stay at target
- **Bottom:** b_C holds leverage at target and the firm issues once
- Each visit costs c_I , no matter how small the issuance

Which firms choose a maturity wall?



Rel. cost: dispersed vs. concentrated debt

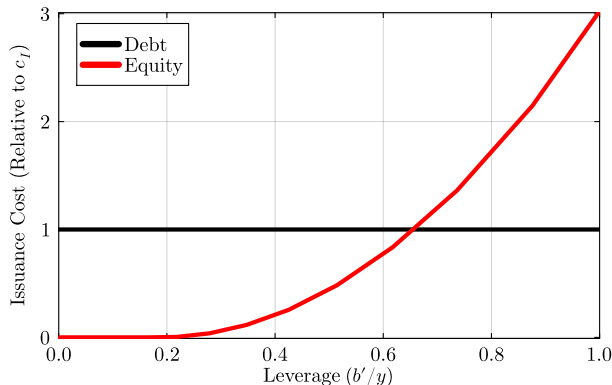
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- Debt issuance cost is flat
It is a fixed cost c_I
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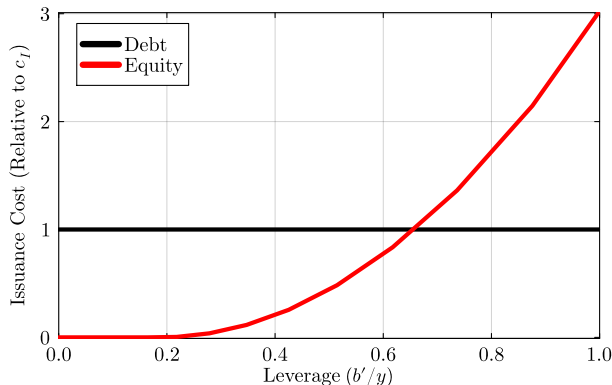
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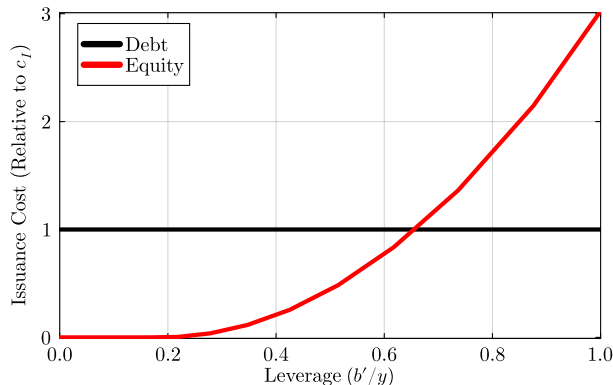
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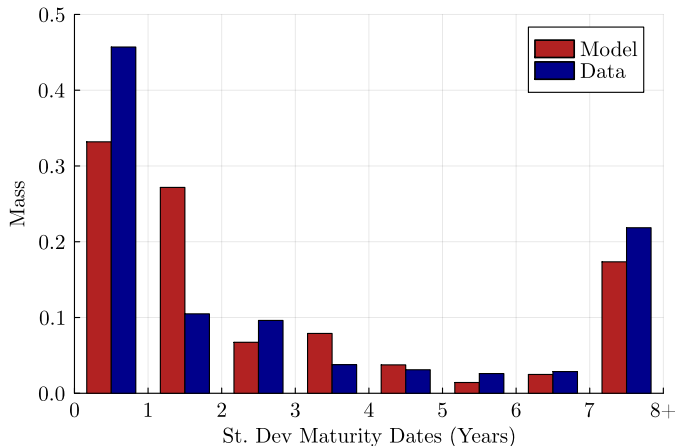


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Takeaway: Concentration is chosen by low rollover-risk firms, not distressed ones

Model matches maturity dispersion



Model Estimation Estimation Leverage fit Underwriter Fee fit

- Estimated via SMM using FISD and Compustat, 1995–2019
- Targets leverage, default risk, spreads, issuance costs, and maturity dispersion
- Matches the distribution of σ_{Mat} in the data

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	bps	%	Baseline Value
Δ Default Rate	30.0	25.0	1.2%
Δ Credit Spread	35.9	21.1	1.7%

A wall raises risk *given* leverage — even though it is comparatively **safe** firms that adopt one

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	Baseline	$0.84 c_I$	$0.75 c_I$
Dispersion σ_{Mat}	2.62 yrs	4.85 yrs	5.62 yrs
Book leverage	20.72%	38.03%	42.48%
Average credit spread	1.69%	2.64%	2.88%
Firm default rate	1.19%	1.96%	2.15%

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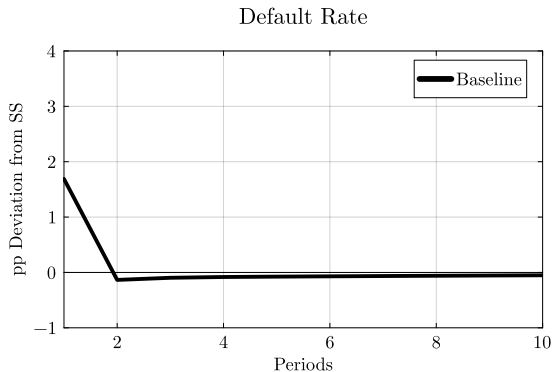
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The level effect dominates: cheaper issuance makes firms **riskier**, not safer

Standard models understate exposure when credit markets freeze

Credit market freeze

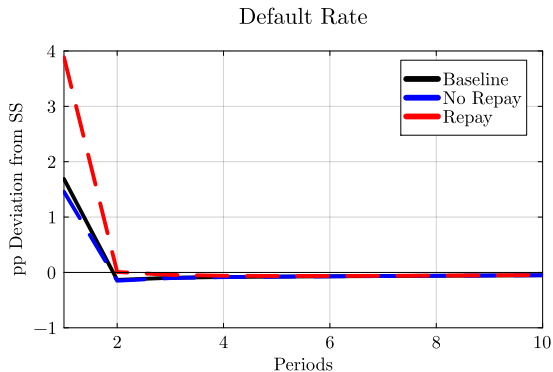
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- Severity matched to 2008 defaults
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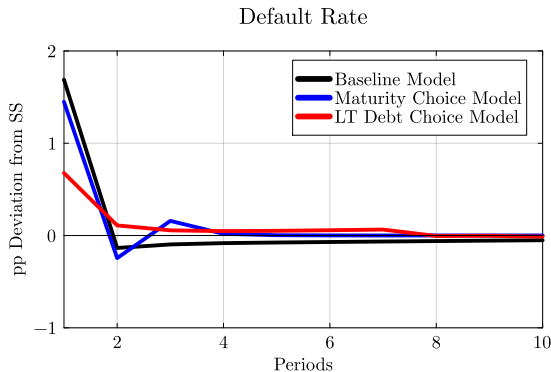
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Standard models cannot capture a wall: payment **concentrated and distant**

- **LT debt only**, all dispersed (DeMarzo & He, 2021) $\rightarrow$ misses **60%** (100 bps)
- **Maturity choice**, short-dated only (He & Milbradt, 2016) $\rightarrow$ misses **14%** (25 bps)

Conclusion

Repayment **concentration** is a distinct dimension of debt structure

- 48% of bond issuers have a wall, and they **choose** it
- Key trade-off: fixed issuance cost v. rollover risk

1. **How much do maturity walls matter for firm credit risk?**

- Holding leverage fixed: $\uparrow$ default rates 30 bps (25%) & spreads 36 bps (21%)

2. **Are firms less risky if it is cheaper to issue debt?**

- No — firms disperse *and* lever up; default $\uparrow$ 0.8–1.0 pp, spreads $\uparrow$ 0.9–1.2 pp

3. **How exposed are wall firms when credit markets freeze?**

- Rolling a wall at the freeze $\rightarrow$ default $\uparrow$ 3.9 pp vs 1.4 pp
- Standard debt-structure models understate this exposure by **14–60%**

Data

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- **Compustat:** balance sheet information
- **Sample period:** annual, 1995 - 2019

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Measuring repayment concentration: st. dev. of maturity dates

$$\sigma_{Mat,t} = \sqrt{\sum_{m=1}^M \overbrace{s_{m,t}}^{\text{share due in } m} \left(m - \underbrace{\mu_{Mat,t}}_{\text{avg. mat.}} \right)^2}$$

Low $\sigma_{Mat,t} \longrightarrow$ concentrated debt payments

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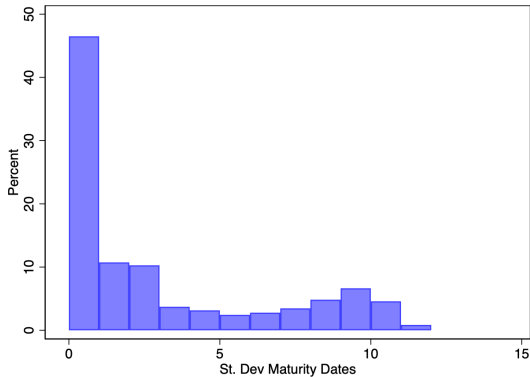
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Maturity wall: $\geq 2/3$ of bond principal due within a **2-year window**

- 12-24 month horizon over which rating agencies assess refinancing risk

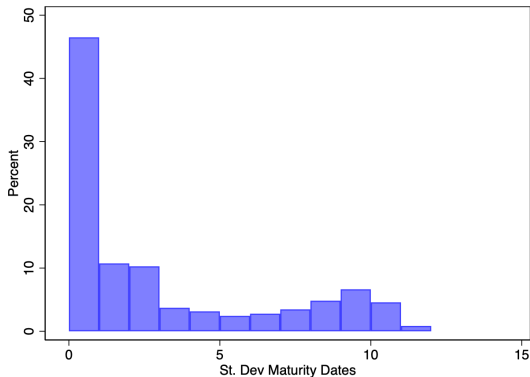
Fact 1: 48% of bond issuers have a maturity wall



Mean 2.6 yrs

Median 1.5 yrs

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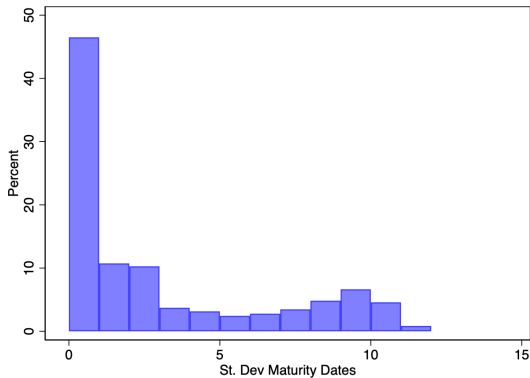
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	1 bond	2 bonds	3-5	6+
Firm-years	6,018	3,012	4,142	4,217
Share w/ wall	1.00	0.43	0.20	0.03
Share of all walls	0.73	0.16	0.10	0.01

- ~3/4 of walls are single-bond firms ($\sigma_{Mat} = 0$ mechanically)
- Other 1/4 returned to market bunched principal anyway

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Maturity walls appear to be a choice not a constraint

- Walls survive among firms that *can* disperse (large, IG, old)
- Firms don't hoard cash or cut investment as a large payment approaches

[More](#)

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Fact 2: Concentrated repayments associated w/ higher credit risk

	(1) Prob Default (pps)	(2) Yield (pps)	(3) Coupon (bps)	(4) Credit Spread (bps)
Leverage	5.784*** (0.422)	0.579*** (0.099)	65.881*** (7.661)	50.792*** (8.061)
Avg. Bond Maturity	-0.286 (0.254)	0.053 (0.053)	0.438 (4.895)	4.558 (4.911)
St. Dev of Maturity Dates _{t-1}	-0.454* (0.249)	-0.151*** (0.052)	-13.248*** (5.096)	-14.311*** (4.788)
Observations	6367	1374	1910	1216
R^2	0.241	0.769	0.764	0.692
Controls	Firm	Firm & Bond	Firm & Bond	Firm & Bond
Fixed Effects	Ind & Year	Ind & Year	Ind & Year	Ind & Year

Takeaway:

- +1 s.d. dispersion $\rightarrow$ $\downarrow$ 0.45 pps default prob. & $\downarrow$ 14 bps spread
- Holds *beyond* leverage and average maturity — it is the **spacing** that is priced

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Fact 3: There are economies of scale in bond issuance

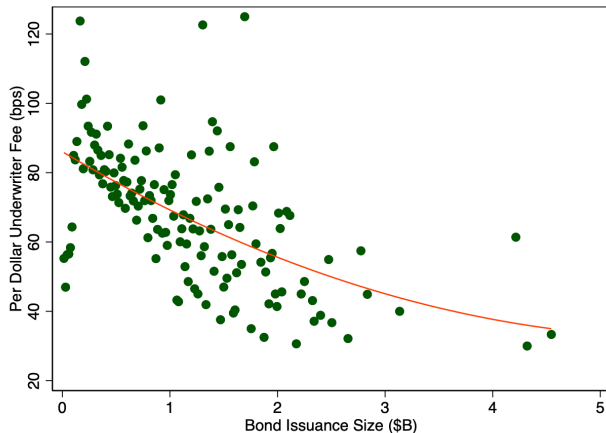
Underwriter fees: cost to *issue*

- Two services, both **fixed per issue**:
 - Screening & certification
 - Demand discovery & placement
- Attach to the *bond*, not the dollars

Fact 3: There are economies of scale in bond issuance

Underwriter fees: cost to *issue*

- Two services, both **fixed per issue**:
 - Screening & certification
 - Demand discovery & placement
- Attach to the *bond*, not the dollars
- Underwriter spread (fee / size):
 - < \$1B issue: **85 bps**
 - > \$3B issue: **40 bps**
- Residualized: still a **25 bps** gap



Takeaway: economies of scale, consistent with large fixed costs

Firms pick b'_D and b'_C to maximize equity value

$$V(\mathcal{S}) = \max_{\{b'_D, b'_C\}} \left\{ \psi(d) + \varepsilon(b'_D, b'_C) + \beta \mathbb{E}_{\{y', \eta'\}} \max \{ V(\mathcal{S}'), 0 \} \right\}$$

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Subject to:

$$d = \overbrace{(y - c_F - \tilde{c}(b_D + b_C))(1 - \tau)}^{\text{After tax income}} - \overbrace{(\lambda b_D + \eta b_C)}^{\text{Principal due}}$$

$$+ \underbrace{q_D(b'_D, b'_C, y)I_D + q_C(b'_D, b'_C, y)I_C}_{\text{Issuance revenue}} - \underbrace{c_I(\mathbb{1}_{I_D > 0} + \mathbb{1}_{I_C > 0})}_{\text{Fixed issuance cost}}$$

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- Issuance: $I_D = b'_D - (1 - \lambda)b_D$ $I_C = b'_C - (1 - \eta)b_C$
- Payout: $\psi(d) = d$ for $d \geq 0$, and $d - \alpha d^2$ for $d < 0$
- c_I per bond issued $\rightarrow$ issue rarely
- αd^2 convex $\rightarrow$ keep repayments small

Debt is priced by rep lender making zero-profits in expectation

- $\delta(S')$: default decision in state $S' \equiv (b'_D, b'_C, y', \eta')$
- $\mathcal{R}(b_D, b_C, y)$: lender's recovery value in default
- m'_j : share of principal that bond $j \in \{D, C\}$ repays next period

$$q_j(b'_D, b'_C, y) = \beta \mathbb{E}_{\{y', \eta'\}} \left\{ (1 - \delta(S')) \left(\overbrace{\tilde{c} + m'_j}^{\text{Payment tomorrow}} + \overbrace{(1 - m'_j)q_j(b''_D, b''_C, y')}^{\text{Expected future revenue to lender}} \right) + \delta(S')\mathcal{R}(b'_D, b'_C, y') \right\}$$

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Dispersed: $m'_D = \lambda$ a fixed fraction, every period

Concentrated: $m'_C = \eta' \in \{0, 1\}$ all of it at once, w.p. $Pr(\eta' = 1) = \lambda$

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Concentrated: $m'_C = \eta' \in \{0, 1\}$ all of it at once, w.p. $Pr(\eta' = 1) = \lambda$

- Same expected principal repaid, $\mathbb{E}[m'_j] = \lambda$, and same average maturity $1/\lambda$
- But q_C prices a **joint** event: the principal is due *and* the firm is in a bad state

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How exposed are wall firms when markets freeze?

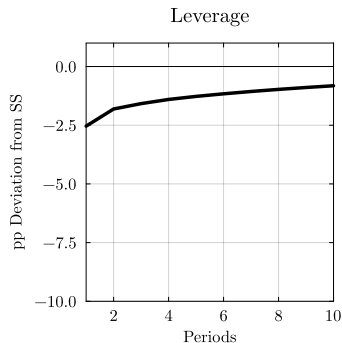
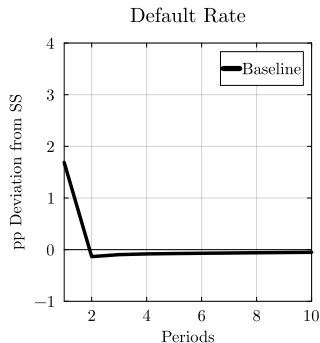
Credit market freeze

- Unanticipated, one-period shock
 - i. debt market shuts, $q_D = q_C = 0$
 - ii. equity issuance cost rises
- Severity matched to 2008 defaults
- Wall may fall due when markets shut

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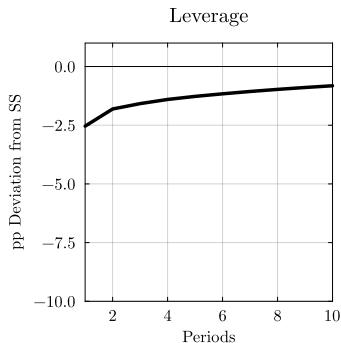
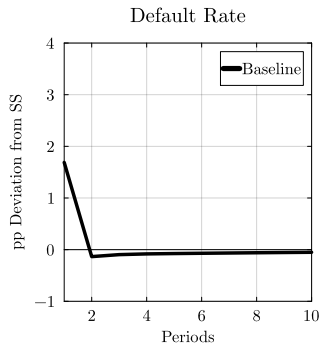


- **Stress test**, not a priced risk, because shock is **unanticipated**

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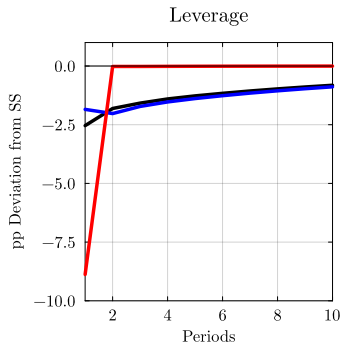
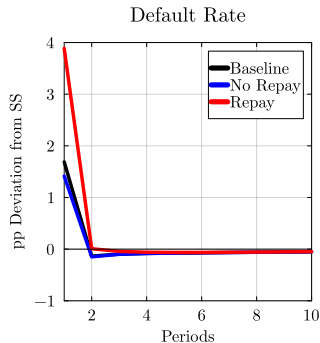


- **Stress test**, not a priced risk, because shock is **unanticipated**
- Average across firms: **168 bps** (140%) on impact
- Only $\approx \lambda$ of firms roll a wall in any given period

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Credit market freeze

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- **Stress test**, not a priced risk, because shock is **unanticipated**
- Average across firms: **168 bps** (140%) on impact
- Only $\approx \lambda$ of firms roll a wall in any given period
- Rolling over wall at the freeze: default $\uparrow$ **3.9 pp** vs. 1.4 pp

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Which firms are holding maturity walls?

	St. Dev of Maturity Dates		
	(1)	(2)	(3)
Leverage	0.369*** (0.069)	0.304*** (0.065)	0.300*** (0.069)
Size	1.391*** (0.111)	1.219*** (0.219)	1.210*** (0.219)
Age	0.196*** (0.066)	0.444** (0.180)	0.395** (0.185)
Q	0.139* (0.077)	-0.096 (0.089)	-0.198* (0.101)
Profit	0.124** (0.054)	0.040 (0.045)	0.096* (0.052)
Cash	0.095* (0.057)	0.021 (0.055)	0.022 (0.058)
Fraction of Bond Debt	0.309*** (0.051)	0.118** (0.046)	0.157*** (0.051)
No. Bonds Outstanding	0.717*** (0.121)	0.701*** (0.117)	0.773*** (0.127)
Interest Coverage Ratio	0.018 (0.148)	-0.272* (0.156)	-0.219 (0.151)
Avg. Bond Maturity	1.996*** (0.077)	1.161*** (0.093)	1.084*** (0.103)
Observations	6477	6693	6249
R ²	0.714	0.862	0.880
Fixed Effects	Ind & Yr	Firm & Yr	Firm & Ind × Yr

Who **disperses** their repayments?

- ↑ **Size**: +1 s.d. → +1.2 yrs
- ↑ **Age**: +1 s.d. → +0.4 yrs
- ↑ **Leverage**: +1 s.d. → +0.3 yrs

So **small, young, less-levered** firms hold walls

- Constraint or choice?

See

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Concentration also predicts realized default and firm failure

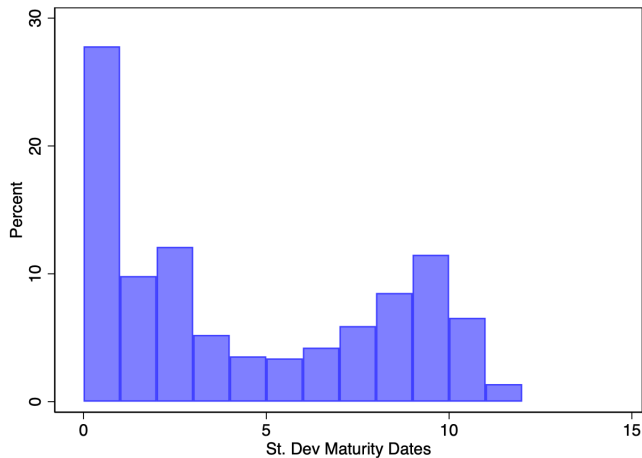
Merton PD is a deterministic function of leverage and equity vol — does it show up in realized outcomes? (bond default in FISD, or forced delisting in CRSP)

Horizon	Maturity wall	σ_{Mat} (+1 s.d.)
Current year	~ 0	~ 0
Next 3–5 years	+2.8 to +3.9 pps	–0.7 to –1.5 pps
Base rate	5–8%	

Takeaway:

- No association *within* the current year — as expected of a measure of future rollover exposure
- Association grows at longer horizons
- Same result in two independent data sources, not just the model-implied measure

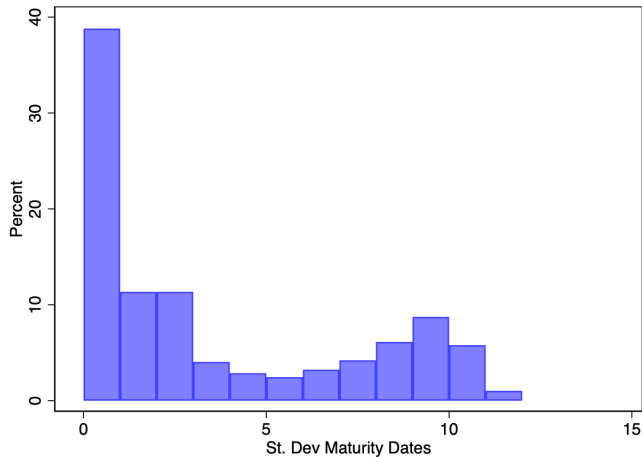
Firms concentrate debt maturity dates (weighted by firm age)



Average: 3.1 years

Median: 4.5 years

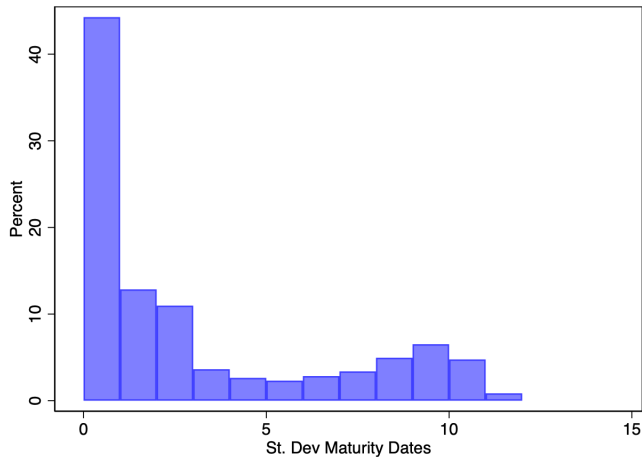
Firms concentrate debt maturity dates (weighted by firm size)



Average: 3.8 years

Median: 2.7 years

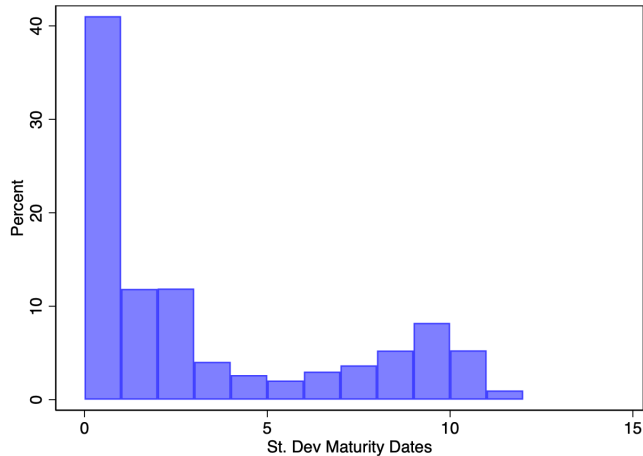
Firms concentrate debt maturity dates (weighted by firm leverage)



Average: 3.3 years

Median: 1.8 years

Firms concentrate debt maturity dates (weighted by bond debt pct)



Average: 3.4 years

Median: 1.9 years

Firms infrequently issue corporate bonds

	Mean	Std. Dev
Bond Issuance Frequency	0.146	0.353
Number of Bonds Issued	1.709	1.107
Time Since Last Issue (Years)	3.326	2.137
Bond Issuance Size (\$M)	448.130	362.719
Bond Amount Outstanding (\$M)	1,474.353	2,737.262
Bond Issuance to Amount Outstanding	0.432	0.334
Bond Issuance to Legacy Bond Debt	1.082	8.124
Number of Bonds Issued Last 5 Years	1.181	2.293
Number of Bonds Issued Last 10 Years	2.073	3.637
Number of Bonds Issued Last 20 Years	3.082	5.143

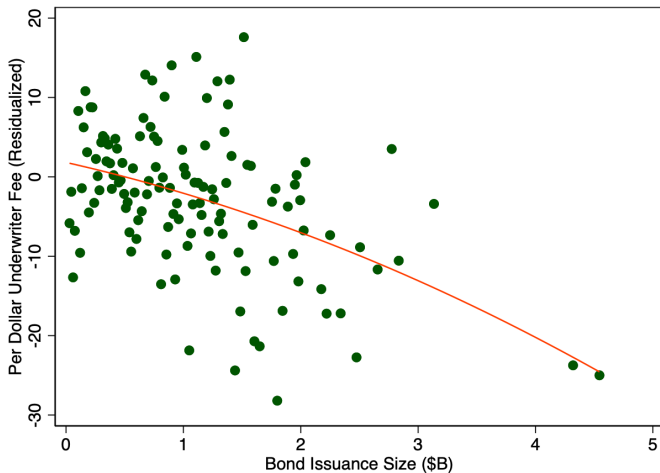
Firms issue bonds infrequently:

- 15% of obs feature a bond issuance
- Avg bonds issued in last 10 years is 2.1

Firms issue large amounts

- New issuance is 43% of amount outstanding
- $\approx 110\%$ of maturing legacy debt: largely a **rollover**

Economies of scale robust to firm and bond controls



Do firms behave differently before large repayment dates?

	Cash	Investment	1_{Buyback}
s_1	-0.002 (0.007)	0.007 (0.008)	-0.241*** (0.052)
s_2	-0.003 (0.008)	0.002 (0.008)	-0.228*** (0.051)
s_3	-0.002 (0.007)	0.003 (0.008)	-0.217*** (0.049)
s_4	-0.006 (0.007)	0.002 (0.008)	-0.253*** (0.048)
s_5	-0.007 (0.006)	0.002 (0.007)	-0.222*** (0.048)
Fixed Effects	Firm & Year	Firm & Year	Firm & Year
Additional Controls	Yes	Yes	Yes

Note: s_m is share of long-term debt due in m years

How has the literature modeled long-term debt?

Modeling long-term debt with exponentially declining maturity structure:

- Hatchondo and Martinez (JIR, 2009); Arellano and Ramanarayanan (JPE, 2012); Aguiar et. al (ECMA, 2019)
- He and Xiong (JF, 2012); Dangl & Zechner (RFS, 2021); DeMarzo & He (JF, 2021); Jungherr and Schott (RED, 2021); Jungherr et. al (R&R ReSTUD, 2023)

Modeling long-term debt randomly maturing “lumpy” bond:

- Geelen (R&R JF, 2019); Gomes and Schmid (JF, 2021); Chen et al (JFE, 2021)

Closest papers, and how I differ

- **Choi, Hackbarth, Zechner (2018, 2021)**
 - Establish dispersion as a capital-structure margin
 - I measure *spacing*, not just shares
 - I study *consequences*, not determinants
- **Huang, Oehmke, Zhong (2019)**
 - Optimal schedule from a private-information friction
 - Mine is a fixed issuance cost, disciplined by estimation
- **Chaderina (2023)**
 - Endogenous dispersion, but near-term and distress-driven
 - My wall is long-term debt at a *distant* horizon

Equilibrium Definition

A recursive Markov equilibrium is a set of value and policy functions $\{V^*, b_D^*, b_C^*\}$ and debt prices $\{q_D^*, q_C^*\}$ such that:

1. Given prices q_D^* and q_C^* , firms optimize yielding V^* , b_D^* , and b_C^*
2. The default decision is consistent with firm decision rules
3. Debt prices q_D^* and q_C^* are such that the representative lender expects to earn zero profits
4. Stationary distribution of firms determined by firm decision rules and law of motion for y and η
 - Mass of defaulting firms are replaced with an equal mass of firms with $b_D = 0$, $b_C = 0$, $\eta = 1$ and $y \sim \bar{G}$

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Mapping the model to the data

Model is estimated on annual FISD & Compustat data from 1995 - 2019

- Parameters divided into **externally calibrated** and **internally estimated**
- **Externally calibrated** parameters are chosen outside model
 - Estimate income process to capture underlying asset value fluctuations
 - Income is mapped to annual sales data
 - $\log(y') = \rho_y \log(y) + \sigma_y \varepsilon_y, \quad \varepsilon_y \sim \mathcal{N}(0, 1)$
 - Average maturity $1/\lambda$ is matched to average maturity of corp. bonds
- **Internally estimated** parameters are jointly estimated via SMM
 - Match empirical moments important for debt issuance, rollover, and concentration
 - Construct model equivalent St. Dev of Debt Maturity Dates

Mapping b_D & b_C to σ_{Mat}

Model Estimation

Parameter	Description	Value	SE	Target/Reference	Data	Model
Externally Calibrated						
β	Discount factor	0.960	-	4% Annual Risk Free Rate	-	-
$\tilde{c}$	Per-period coupon payment	$1/\beta - 1$	-	Eqm price of riskless debt is 1	-	-
τ	Corporate tax rate	0.300	-	Hennessy & Whited (2007)	-	-
ρ_y	Persistence: income shock	0.660	-	Auto-correlation of log sales	0.66	0.66
σ_y	St. dev: income shock	0.310	-	Log sales volatility	0.31	0.31
$1/\lambda$	Average Maturity of debt	8.300	-	Avg. debt maturity	8.30	8.30
Internally Estimated						
c_f	Fixed cost of production	0.967	0.244	Default rate (%)	1.13	1.20
α	Equity issuance cost	0.011	0.002	Avg. debt to income	2.22	2.12
σ_ε	St. dev: pref. shock	0.001	0.000	St. dev debt to income	5.36	5.34
χ	Lender recovery fraction	0.093	0.040	Avg. credit spread	1.87	1.70
c_l	Fixed debt issuance cost	0.003	0.001	Avg. dispersion maturity dates	2.61	2.62
				Avg. underwriter fee (%)	0.79	0.75

Model fit: Leverage Distribution

Model fit: σ_{Mat} Distribution

Model fit: Underwriter Fee Distribution

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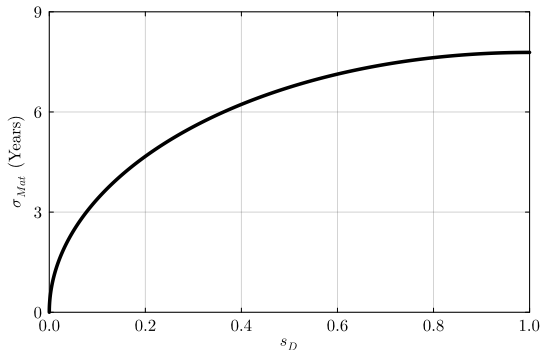
Constructing σ_{Mat} in the model

Let

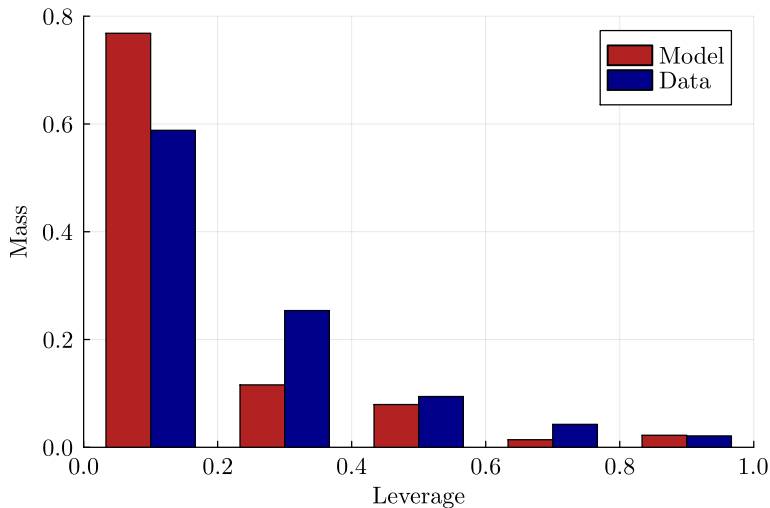
$$s_D = \frac{b_D}{b_D + b_C}$$

The mapping from s_D to σ_{Mat} is

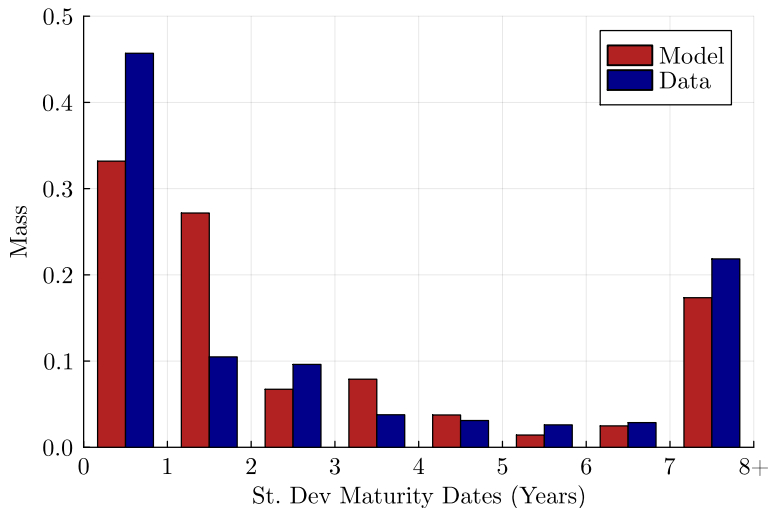
$$\sigma_{Mat} = \frac{\sqrt{(1 - \lambda)(2s_D - s_D^2)}}{\lambda}$$



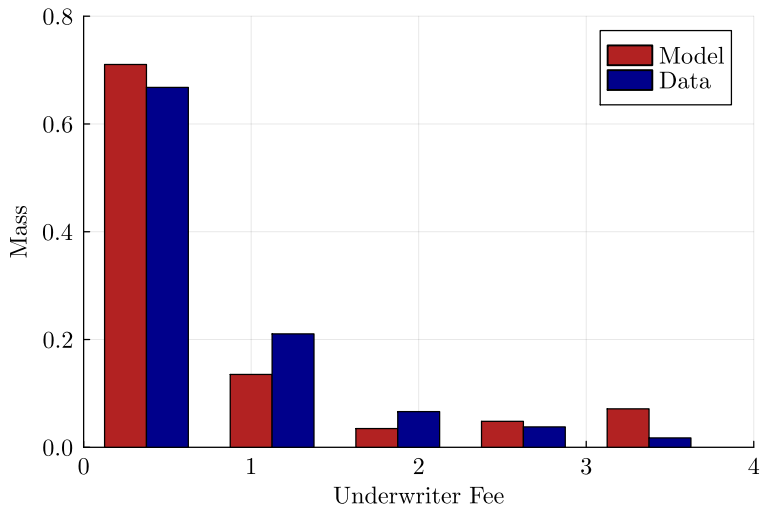
Model Fit: Market Leverage Distribution



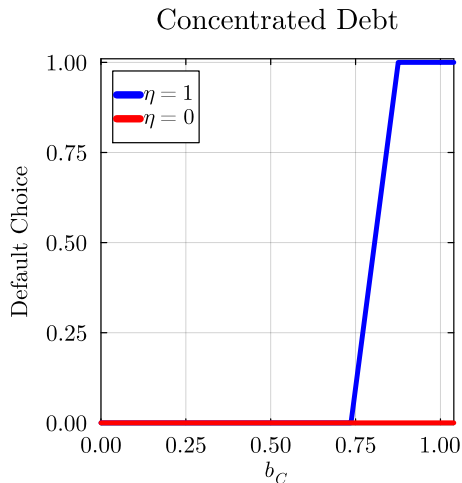
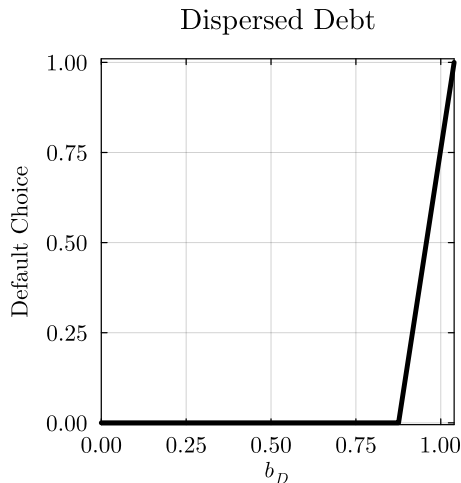
Model Fit: St. Dev of Maturity Dates Distribution



Model Fit: Underwriter Fee Distribution

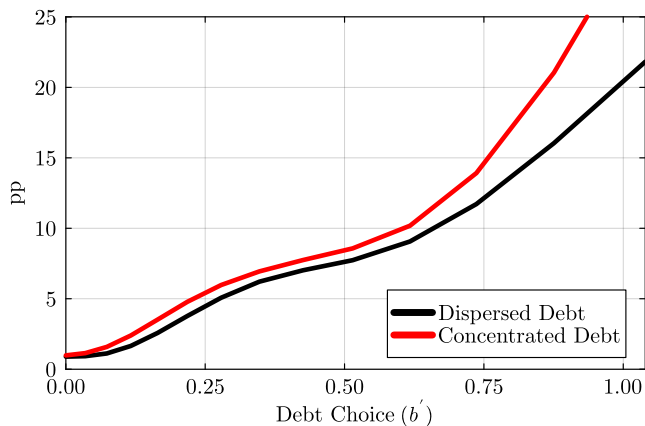


Default behavior depends on debt payment concentration choice



Firm w/ b_C cannot sustain as high a level of debt as b_D

Dispersed debt payments $\rightarrow$ lower interest rates



Takeaway: Interest rates price in firm def. risk $\rightarrow$ borrowing cost $b_C >$ borrowing cost b_D

Firms do not act constrained as a payment approaches

	Cash	Investment	Buyback Debt
% Debt Due in 1 Year	-0.002 (0.007)	0.007 (0.008)	-0.241*** (0.052)
% Debt Due in 2 Years	-0.003 (0.008)	0.002 (0.008)	-0.228*** (0.051)
% Debt Due in 3 Years	-0.002 (0.007)	0.003 (0.008)	-0.217*** (0.049)
% Debt Due in 4 Years	-0.006 (0.007)	0.002 (0.008)	-0.253*** (0.048)
% Debt Due in 5 Years	-0.007 (0.006)	0.002 (0.007)	-0.222*** (0.048)
Observations	6657	6676	6793
Fixed Effects	Firm & Year	Firm & Year	Firm & Year

Takeaway: a firm bound by a wall should hoard cash, cut investment, or retire debt early. None of that shows up — and the buyback loadings are **negative**.

Walls survive among firms that plainly *can* disperse

	All	Inv. grade	Large	Old
Share with a maturity wall	0.48	0.21	0.13	0.21
$\Delta\text{Pr}(\text{wall})$ per +1 s.d. leverage	-0.115	-0.205	-0.153	-0.137

- Within every group, it is the **less-levered** firms that choose walls

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No inference rests on the wall cutoffs

Principal threshold	Prevalence (% issuers)			Spread gap (bps)			Default gap (pp)		
	1yr	2yr	3yr	1yr	2yr	3yr	1yr	2yr	3yr
$\geq 50\%$	57.9	64.4	73.3	90	85	82	4.3	4.9	4.7
$\geq 60\%$	46.7	52.9	60.8	90	93	91	4.4	5.0	4.8
$\geq 2/3$	42.3	47.5	54.7	97	102	99	4.5	4.9	4.9
$\geq 75\%$	40.0	44.5	50.5	93	102	107	4.4	4.9	5.1
$\geq 80\%$	39.0	43.2	48.4	90	100	107	4.4	4.8	5.0

- Prevalence moves *smoothly* as the definition loosens (39% $\rightarrow$ 73%)
- Risk gaps are nearly **flat**: 80–110 bps in spreads, 4.2–5.1 pp in default
- The 2/3, 2-year cell used in the paper is representative of the whole grid

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σ_{Mat} vs. the Herfindahl index

	Credit rating (higher = safer)				
	All firms			Multi-bond	
	(1)	(2)	(3)	≥ 2	≥ 3
Repayment dispersion (σ_{Mat})	0.573*** (0.067)		0.467*** (0.074)	0.427*** (0.077)	0.375*** (0.082)
Herfindahl index		-0.412*** (0.073)	-0.182** (0.082)	-0.337*** (0.091)	-0.502*** (0.110)
Observations	9851	9881	9817	7096	5423
R^2	0.740	0.736	0.740	0.727	0.722

- σ_{Mat} survives controlling for the HHI, including among multi-bond firms
- HHI captures unequal shares; σ_{Mat} also captures how far apart the dates lie

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Doesn't shelf registration kill the fixed cost?

Concern: most large issuers use shelf registration, so the fixed cost can be spread over many takedowns “pay-as-you-go”

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Concern: most large issuers use shelf registration, so the fixed cost can be spread over many takedowns “pay-as-you-go”

Response:

- Shelf saves on the one-time SEC *registration* step
- But the costs that dominate the underwriter fee **recur with each takedown**:
 - the underwriting spread itself
 - legal and due-diligence work
 - demand discovery and placement — every bond has its own terms and investor base
- The underwriter spread I plot is the **realized fee per issue**, net of whichever registration route the firm uses
- It still falls steeply with issue size → a substantial per-issuance fixed component survives shelf registration

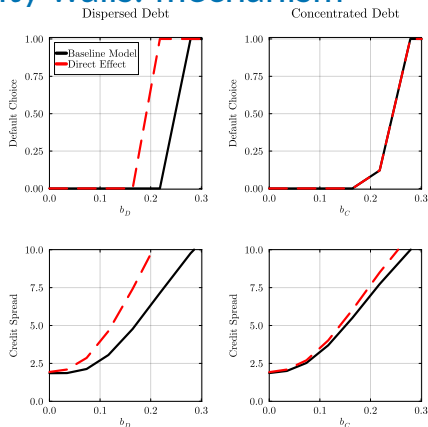
External validation: predictors of repayment dispersion

	St. Dev Maturity Dates	
	Data	Model
St. Dev Maturity Dates _{t-1}	0.749	0.890
Leverage	0.182	0.189
Sales	-0.071	-0.033
Additional Firm Controls	Yes	—

- Both **untargeted**: same regression run in the data and in simulated model data
- Model reproduces the **persistence** of the dispersion choice
- And the signs & magnitudes on leverage (+) and revenue (—)

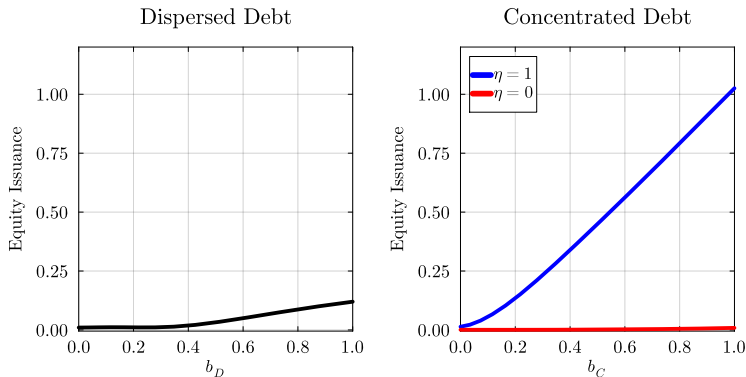
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Direct effect of maturity walls: mechanism



- Firms holding **dispersed** debt can no longer sustain as much once forced into a wall $\rightarrow$ default threshold shifts **left**, spreads rise
- Firms already holding **concentrated** debt barely change

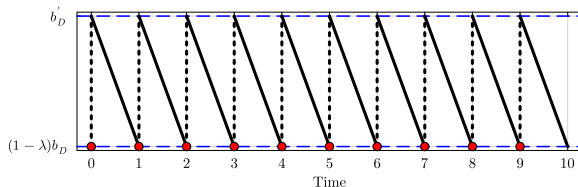
Dispersed debt smooths required repayments across states



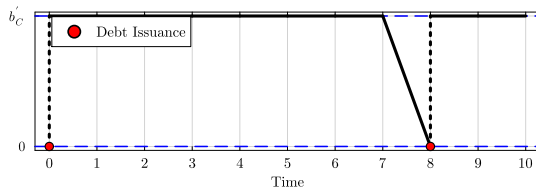
- Dispersed debt spreads principal repayments across states
- Smaller repayment needs reduce costly equity injections
- Benefit strongest when debt levels are high or firm income is low

Concentrated debt avoids repeated small issuances

Dispersed Debt Issuance



Concentrated Debt Issuance



- Dispersed debt amortizes every period $\rightarrow$ frequent top-ups to stay at target leverage
- Each issuance triggers the fixed cost
- Concentrated debt holds leverage at target while returning to market rarely

Why not just issue b_D infrequently? The firm can – but b_D amortizes mechanically at λ , so leverage drifts below target and the firm forgoes the tax shield. Only b_C holds leverage at target *and* keeps issuance rare.

Is the model's leverage response too big?

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- Average underwriter fees fell $\approx 13\%$
- Aggregate bond debt among public issuers **more than tripled**
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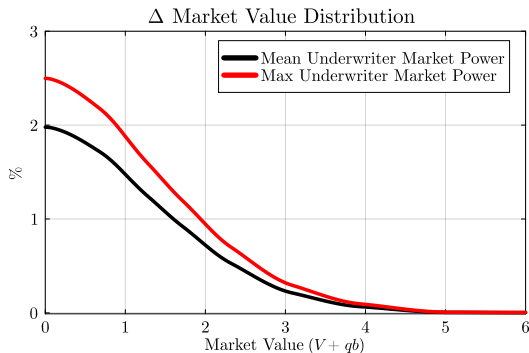
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So the model's response is, if anything, conservative

Suggestive, not causal: the post-1999 expansion also reflects falling rates and the secular shift from loans to bonds, so it overstates the share attributable to issuance costs alone.

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Removing underwriter rents raises firm value



- All firms gain weakly; the **smallest** firms gain most
- Average market value rises **0.85%** (mean rents) to **1.01%** (max rents)
- But with walls gone, all firms pay the fixed cost more often: PDV of future issuance costs rises **10%**