The Cost of Intermediary Market Power for Distressed Borrowers

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Motivation

It is well-known that repeated syndication interactions can facilitate coordination

- European Commission published the European Union (EU) report:
  - The potential competition concerns of the loan syndication process
  - Loans for leveraged buyouts and those for infrastructure

Regulators and corporations were clearly paying serious attention to

- The market power of syndication lenders
- Even, the possible "club deals"

Q: To what extent does lender market power affect the loan yield spread, and how?

Not merely an asset pricing question, but also an IO question, underscored by identification challenges

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Traditional neoclassical asset pricing theories are not enough

Traditional neoclassical asset pricing theories:

Asset price $=$ unbiased estimate of the fundamental value

Assumptions:

- Fully diversified investors who can trade assets freely across all markets
- Efficient markets with perfect information, perfect competition, no arbitrage

Yet many asset markets are mainly intermediated by a relatively small number of highly specialized institutional investors

- The channels of funding liquidity, leverage constraints, and fund flow risk

  e.g., Shleifer_Vishny (1997), Gromb_Vayanos (2002), He_Krishnamurthy (2013), Frazzini_Pedersen (2014), Drechsler_Savov_Schnabl (2018), Dou_Kogan_Wu (2022), ...

- Imperfect competition among highly specialized institutional investors

  $\sim$ relatively understudied in the literature

In this paper, we show

Lenders' market power largely affects loan pricing for distressed firms in primary markets

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Loan markets for distressed firms are important

Two loan markets for distressed borrowers:

- **Distressed loans:** borrowers' S&P rating $\leq$ CCC+ or five-year CDS spread $\geq$ 10%
- **Debtor-in-possession (DIP) loans:** borrowers in Chapter 11

Shape the "financial distress cost" for the whole corporate sector

- Affect survival rate of financially distressed firms
- Affect efficiency of bankruptcy processes (Dou, Taylor, Wang, and Wang, 2021)

Importance $\neq$ size of the market

- Intensive care unit (ICU) is important in the healthcare and hospital system
  - ICU admission $\leq$ 10% of hospital admission
  - ICU beds $\approx$ 10% of hospital beds
- Loan markets for distressed firms are just like ICUs in the economy
  - Distressed loans $\approx$ 10% of leveraged loans
  - Distressed loans $>$ 45% of leveraged loans in 2009

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Background of the markets

Specialized lenders possess strong market power in financing distressed firms

Qualitatively, not surprising:

(1) Demand side: The distressed borrowers' bargaining position is weak
- A dire liquidity situation and desperate need to raise capital to survive
- Limited access to alternative external funding options
- Limited commitment to future debt policies

(2) Supply side: High entry barriers lead to segmented and concentrated markets in which specialized lenders can tacitly collude
- Specialized skills and special resources in distress resolution
- Tight and repeated syndication relations with multi-market contact

(3) Creditor conflicts: Existing creditors may discourage others from participating
- Existing creditors' blocking power
- Existing creditors' favorable position in potential creditor conflicts

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Research objective is quantitative

To dissect the cost of distressed corporate borrowers

Risk-adjusted loan yield spread
$=$ costs of lenders (latent)
$+$ markups due to lender's market power

$=$ markups due to non-collusive market power
$+$ markups due to tacit collusion

Empirical challenges:

- Unobservable collusion capacity without reliable empirical proxies
- Latent confounding variable (endogeneity) issues in demand and supply estimation
  - Very difficult or impossible to find valid IVs

This paper builds a structural model with latent variables

- Simultaneous estimation of the parameters and unknown latent variables summarizing the confounders
- Collusive and non-collusive equilibria coherently in one unified framework
- Closed-form solutions $\Rightarrow$ MCMC Bayesian estimation with latent demand shifts
  - General: Bayes machine learning for classification
  - Not: BLP with single-equation estimation + IVs

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Outline

1. Motivating facts

2. Model in a nutshell

3. Data, identification, and estimation

4. Policy implications

Risk-adjusted loan spreads

Distressed loan:

Risk-adjusted loan yield spread ($\approx$ 337 bps)

$=$ Total cost of borrowers spread (TCB spread) ($\approx$ 517 bps)

$-$ Credit spread component ($\approx$ 160 bps)

$-$ Liquidity premium component ($\approx$ 20 bps)

DIP loan:

Risk-adjusted loan yield spread ($\approx$ 718 bps)

$=$ Total cost of borrowers spread (TCB spread) ($\approx$ 744 bps)

$-$ Credit spread component ($\approx$ 20 bps)

$-$ Liquidity premium component ($\approx$ 13 bps)

Note: The TCB spread is calculated as follows:

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\text{TCB Spread} = {} & \text{Interest Rate Spread} + \text{Annual Fee} \\
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Concentrated markets

A. Names of specialized lenders

Rank	Distressed loan market: Lender name	Distressed loan market: # of deals	DIP loan market: Lender name	DIP loan market: # of deals
1	Bank of America	188	Wells Fargo	96
2	JP Morgan Chase	182	Bank of America	88
3	Wells Fargo	124	JP Morgan Chase	88
4	Citigroup	107	GE Capital Corp	82
5	Credit Suisse	105	Citigroup	67
6	Deutsche Bank	102	Deutsche Bank	41
7	Goldman Sachs	60	Credit Suisse	31
8	GE Capital	58	Wachovia Bank	28
9	UBS	58	Wilmington Trust	27
10	Wachovia Bank	53	CIT Group	21

B. Three loan types

Lender type	Distressed loans				DIP loans			
	# of deals	# frac.	$ of deals	$ frac.	# of deals	# frac.	$ of deals	$ frac.
Type 1: Existing creditor	52	11.80%	13	5.65%	56	12.80%	5	4.90%
Type 2: Specialized lender	336	76.20%	208	90.40%	334	76.60%	94	92.16%
Type 3: Lender of last resort	53	12.00%	9	3.91%	46	10.60%	3	2.94%
Total	441	100%	230	100%	436	100%	102	100%

Note: The loan size are measured by constant 2019 dollars and presented in the unit of billion dollars
Note: Existing creditor loans are those with one major lender who is an existing but not specialized lender
Note: Lender-of-last-resort loans are those with over 50% of the major lenders as HFs and PEs

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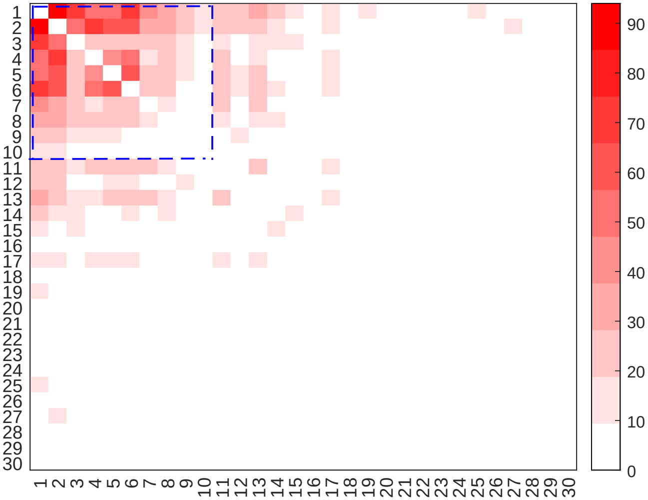
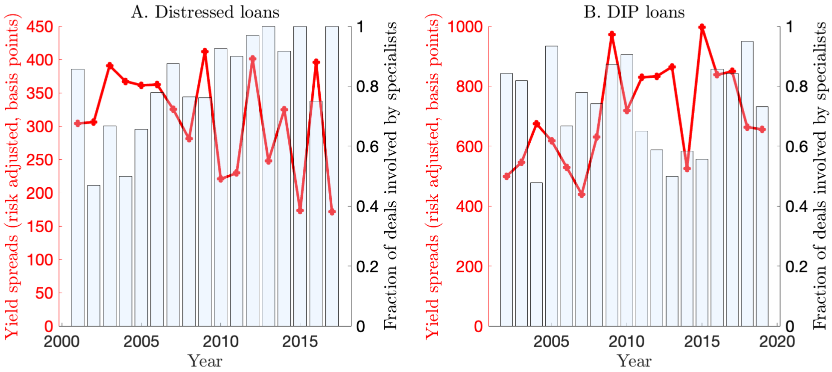
Syndication interaction intensity for distressed loans

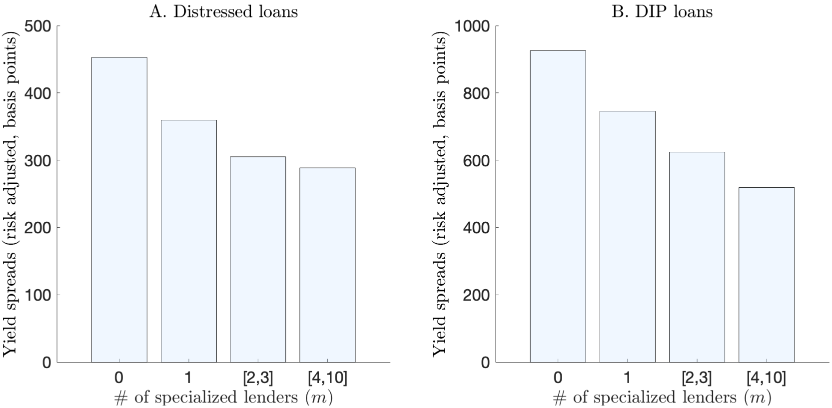


Ultra-high risk-adjusted loan spreads



Note: The curves represent the average risk-adjusted loan spread per year, and the bars represent the fraction of deals financed by the 10 specialized lenders per year.

Lender market power



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Demand for loans

Demand side (distressed corporate borrowers)

- An iso-elastic demand curve for a borrower type $k \in \{1, \cdots, K\}$:

$$\ln(L/A) = \alpha_k - \varepsilon_k \ln(R) + \sigma z$$

  - $L =$ loan size
  - $A =$ asset size
  - $R =$ risk-adjusted loan spread
  - $\alpha_k =$ latent demand curve level
  - $\varepsilon_k =$ latent elasticity
  - $z =$ borrower-specific demand shock

- **A latent-variable model**
  - Borrower type k is **latent** to econometricians
  - It is more flexible than BLP's latent demand shifts

Supply of loans

Supply side (institutional lenders)

- **Observe** 3 types of lenders: *existing, specialized, last-resort*

  (1) An existing creditor: Monopolistic lending with marginal costs $e^{\phi_1+\varsigma u}$

  (2) M specialized lenders: Cournot competition with marginal costs $e^{\phi_2+\varsigma u}$

  - Specialized lender's dis-utility of participating syndication is w, which is private information and distributed as

  $$w \sim \mu e^{-w/\mu}, \quad \text{where } \mu \text{ captures how difficult to participate}$$

  (3) A lender of last resort: Monopolistic lending with marginal costs $e^{\phi_3+\varsigma u}$

- Marginal costs:
  - $u =$ deal-specific cost shock
  - Intuitively, we expect $\phi_1 < \phi_2 < \phi_3$ (not imposed but verified by estimation)

- Nicely, the game should be played out in a sequential way

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Model timeline

Morning

Borrow from an existing lender

$\Pr = 1-\lambda_k$

Agreement not reached
[specialist i observes w_i]

Syndication of Specialists
[$w_i \leq w^*$ for some specialist i]
[specialist i loses w_i in utility]

No specialist is willing to lend
[$w_i > w^*$ for all specialists]
[no specialist loses w_i]

$\Pr = \lambda_k$

Agreement is reached

Afternoon

Observe k and x

Collusive oligopolistic competition
[specialists syndicate]
[decide whether deviate and pay $e^{\phi_2+\varsigma u}$]

Monopolistic lending of last-resort lenders
[hedge funds and private equity funds]
[pay $e^{\phi_3+\varsigma u}$]

Monopolistic lending of an existing creditor
[pay $e^{\phi_1+\varsigma u}$]

Existing creditor's problem

- A lender is the existing creditor with probability $1/M_0$
- The lending agreement is reached with probability λ_k
- Given that the agreement is reached, the existing creditor chooses L as:

$$\Pi_1(A,k,x) = \max_L \left[\left(e^{\alpha_k + \sigma z} \frac{A}{L} \right)^{1/\varepsilon_k} - e^{\phi_1 + \varsigma u} \right] L, \quad \text{with } x \equiv (z,u)$$

- The optimal monopolistic spread and loan size:

$$R_1(k,x) = \frac{\varepsilon_k}{\varepsilon_k - 1} e^{\phi_1 + \varsigma u} \quad \text{and} \quad L_1(A,k,x) = \left[1 - \frac{1}{\varepsilon_k} \right]^{\varepsilon_k} e^{\alpha_k - \varepsilon_k(\phi_1 + \varsigma u) + \sigma z} A$$

Therefore, the profit margin is

$$\frac{R_1(k,x) - e^{\phi_1 + \varsigma u}}{e^{\phi_1 + \varsigma u}} = \frac{1}{\varepsilon_k}$$

Specialized lenders' problem

- Suppose there are m participants in the syndication
- The value function of a specialized lender at the beginning of the afternoon, when w, k, and x are already observed, is

$$V^C(A,k,x,w,m;L^C) \equiv U^C(A,k,x,m;L^C) - w,$$

where $U^C(A,k,x,m;L^C)$ satisfies the following Bellman equation:

$$U^C(A,k,x,m;L^C) = \Pi_2(A,k,x,m;L^C) \;+\; \frac{W^C(L^C)}{1-\delta}, \quad \text{where}$$

$$W^C(L^C) = \mathbb{E}^{A',k'}\left\{\lambda(k')\frac{\Pi_1(A',k')}{M_0}\right\}$$
$$+\,\mathbb{E}^{A',k'}\left\{\left[1-\lambda(k')\right]\mathbb{E}^{w',m',x'}\left[\left(\Pi_2(A',k',x',m';L^C) - w'\right)\mathbf{1}_{\{w'\le w_C^*\}}\right]\right\}$$

- If it deviates, it will be punished by no collusion from the next period with probability ξ
- The collusive loan size $L^C(\cdot)$ satisfies the incentive-compatibility (IC) constraint:

$$\mathbb{E}^x\left[U^C(A,k,x,m;L^C)\right] \ge \mathbb{E}^x\left[U^D(A,k,x,m;L^C)\right],$$

where $U^D(A,k,x,m;L^C)$ is the value function if it deviates

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$$U^C(A, k, x, m; L^C) = \Pi_2(A, k, x, m; L^C) \;+\; \frac{W^C(L^C)}{1-\delta}, \quad \text{where}$$

$$W^C(L^C) = \mathbb{E}^{A',k'}\left\{\lambda(k')\frac{\Pi_1(A', k')}{M_0}\right\} + \mathbb{E}^{A',k'}\left\{\left[1-\lambda(k')\right]\mathbb{E}^{w',m',x'}\left[\left(\Pi_2(A', k', x', m'; L^C) - w'\right)\mathbf{1}_{\{w'\leq w_C^*\}}\right]\right\}$$

– If it deviates, it will be punished by no collusion from the next period with probability ξ

– The collusive loan size $L^C(\cdot)$ satisfies the incentive-compatibility (IC) constraint:

$$\mathbb{E}^x\left[U^C(A, k, x, m; L^C)\right] \geq \mathbb{E}^x\left[U^D(A, k, x, m; L^C)\right],$$

where $U^D(A, k, x, m; L^C)$ is the value function if it deviates

Specialized lenders' problem

- Suppose there are m participants in the syndication
- The value function of a specialized lender at the beginning of the afternoon, when w, k, and x are already observed, is

$$V^C(A, k, x, w, m; L^C) \equiv U^C(A, k, x, m; L^C) - w,$$

where $U^C(A, k, x, m; L^C)$ satisfies the following Bellman equation:

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Intuition for tacit collusion in syndicated loans

Given *m* specialized lenders choose to participate the syndication (an endogenous outcome),

- Collusive equilibrium: small loan size + high spread $\Rightarrow$ greater revenues
- Non-collusive equilibrium: large loan size + low spread $\Rightarrow$ smaller revenues

Collusion is preferred by specialized lenders, subject to the IC constraints

- Collusion is sustained by punishment for deviation:

$$\text{Collusive equilibrium} \longrightarrow \text{Non-collusive equilibrium with a probability } \xi$$

  where ξ captures collusion capacity

- The IC constrain to prevent deviation is

$$\text{Short-run profits of deviation} \leq \text{Long-run loss of cooperation value}$$

Equilibrium path: The IC constraint is binding state by state

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Equilibrium path: The IC constraint is binding state by state

Last-resort lender's problem

- When $m = 0$, the distressed borrower goes to the lender of last resort
- The last-resort lender chooses L as:

$$\Pi_3(A, k, x) = \max_L \left[\left(e^{\alpha_k + \sigma z} \frac{A}{L} \right)^{1/\varepsilon_k} - e^{\phi_3 + \varsigma u} \right] L, \quad \text{with } x \equiv (z, u)$$

- The optimal monopolistic spread and loan size:

$$R_3(k, x) = \frac{\varepsilon_k}{\varepsilon_k - 1} e^{\phi_3 + \varsigma u} \quad \text{and} \quad L_3(A, k, x) = \left[1 - \frac{1}{\varepsilon_k} \right]^{\varepsilon_k} e^{\alpha_k - \varepsilon_k(\phi_3 + \varsigma u) + \sigma z} A$$

Therefore, the profit margin is

$$\frac{R_3(k, x) - e^{\phi_3 + \varsigma u}}{e^{\phi_3 + \varsigma u}} = \frac{1}{\varepsilon_k}$$

Outline

1. **Motivating facts**

2. **Model in a nutshell**

3. **Data, identification, and estimation**

4. **Policy implications**

Data sample

Distressed loan sample (2001-2017)

- Data sources: IHS Markit, Compustat, Dealscan
- How to identify distressed loans?
  - *Step #1*: 5Y CDS Spread$>$1,000 bps or rating$\leq$ CCC+, whichever first, as the start of a distressed period
  - *Step #2*: 5Y CDS Spread$<$500 bps, rating$>$B-, default, or bankruptcy, whichever first, as the end of a distressed period
  - *Step #3*: Merge distressed periods with Dealscan
- Our sample: 441 loan facilities

DIP loan sample (2002-2019)

- Data sources: UCLA-LoPucki BRD, Bankruptcydata.com, PACER, and Dealscan
- Our sample: 436 loan facilities

LPC Loan Pricing Data

NYU-Salomon Center Default + Moody's Default and Recovery database

Estimation

Model parameters to estimate:

- Heterogeneous demand curve: α_k and ε_k for $k \in \{1, \cdots, K\}$
- Punishment on deviation: $\xi \in [0, 1]$
- Participation dis-utility (blocking power of existing creditors): μ
- Variable cost: ϕ_ℓ for $\ell \in \{1, 2, 3\}$

Latent variables to estimate

- Classification: identify the demand curve each borrower belongs to, k.

MCMC Bayesian estimation (or Bayes machine learning for classification)

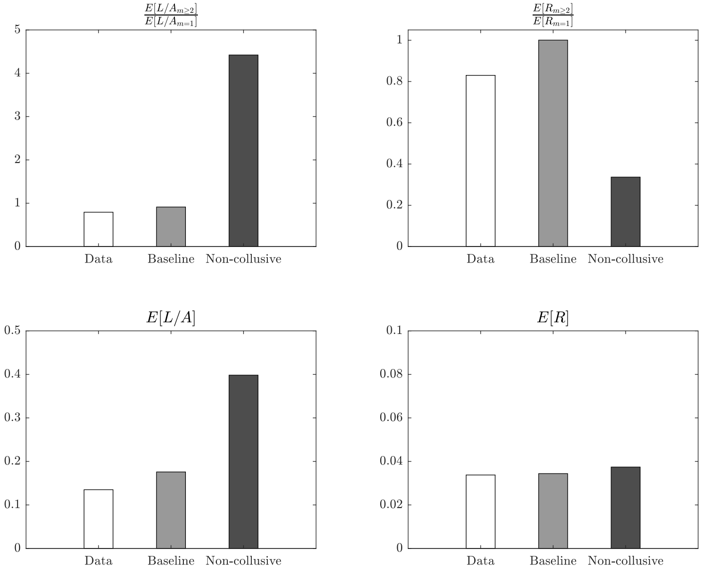
- Utilize the observables: lender type, lender number, loan size, loan price;
- Estimate the posterior distribution of model parameters;
- Treat the latent demand shift k as auxiliary classification (let the machine learn).

Parameter Estimates

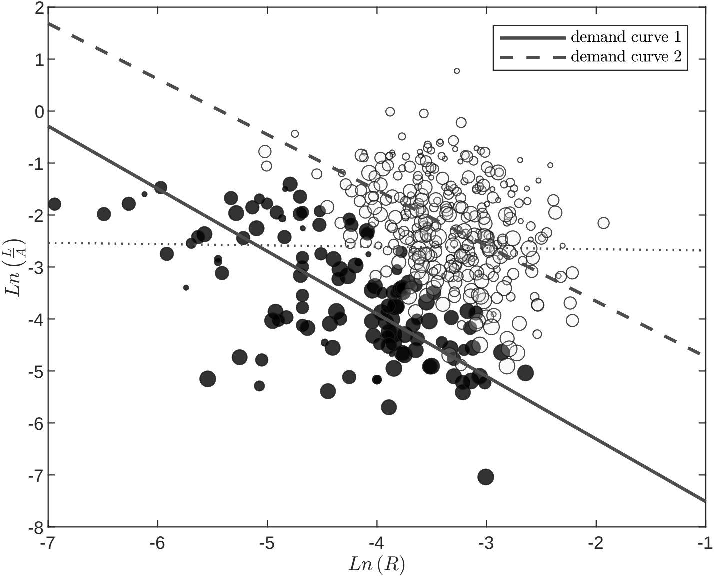
		Distressed Loan	DIP Loan
ξ	Collusion intensity	0.817	0.492
		(0.058)	(0.093)
μ	Participation cost	30.79	34.81
$\exp(\phi_1)$	Variable cost: *existing*	21 bps	149 bps
$\exp(\phi_2)$	Variable cost: *specialized*	22 bps	158 bps
$\exp(\phi_3)$	Variable cost: *last-resort*	27 bps	197 bps
α_1	Demand curve 1: Level	-8.718	-11.031
ε_1	Demand curve 1: Elasticity	1.204	1.947
α_2	Demand curve 2: Level	-5.799	-8.041
ε_2	Demand curve 2: Elasticity	1.069	1.588
α_3	Demand curve 3: Level		-5.505
ε_3	Demand curve 2: Elasticity		1.253

- Higher collusion capacity in the market of distressed loans
- Larger variable costs in the DIP market
- Consistent with the intution: $\phi_1 < \phi_2 < \phi_3$

Why the non-collusive model fails (Distressed loans)



Demand curve estimation for distressed loans



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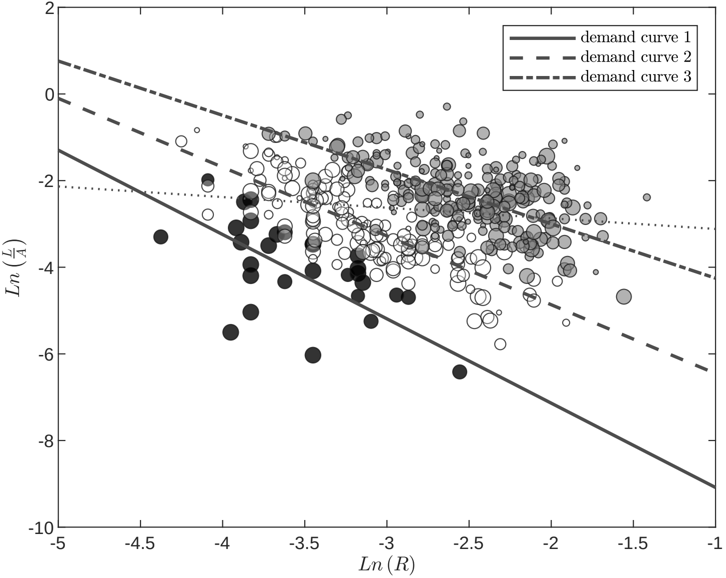
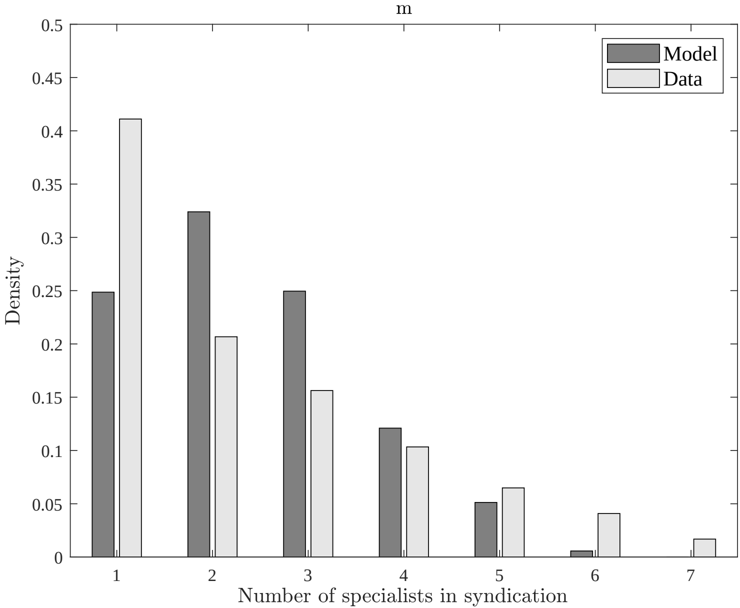
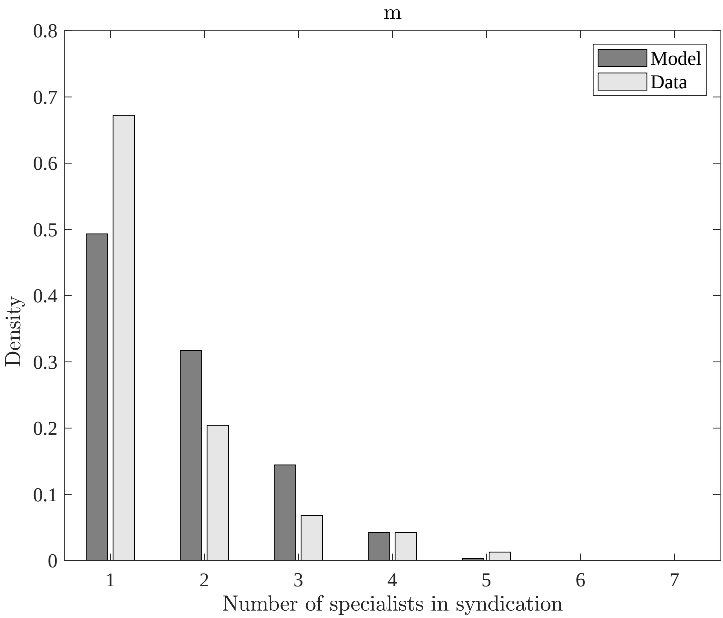


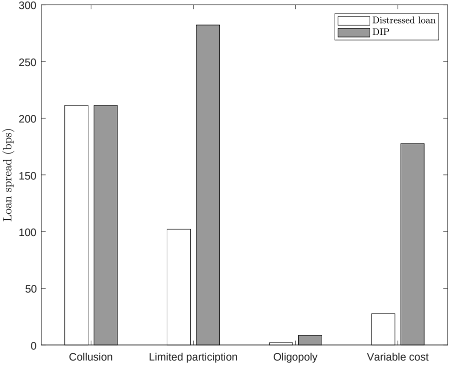
Distribution of *m* for distressed loans



Distribution of *m* for DIP loans



Counterfactual analysis: Decomposition of loan spreads



Sources of Loan Spread:

Collusion ($\xi \to 0$);

Limited participation ($\mu \to 0$);

Oligopolistic market ($M \to \infty$);

Variable costs ($\exp(\phi_i) \to 0$).

- Collusion contributes over 200 bps to the loan spreads as markups in both markets
- Much larger blocking power of existing creditors in the DIP loan market
- Market power would be still large even with low levels of market concentration
- Much larger marginal costs of making loans in the DIP loan market

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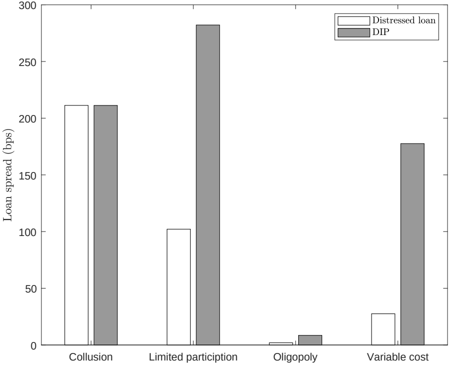

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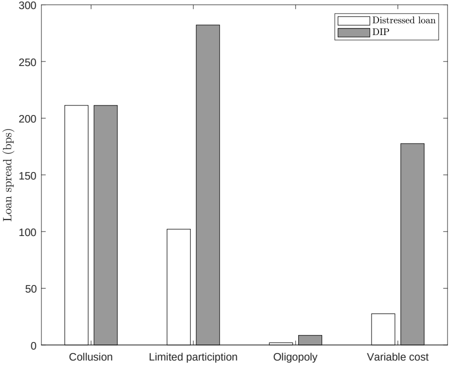

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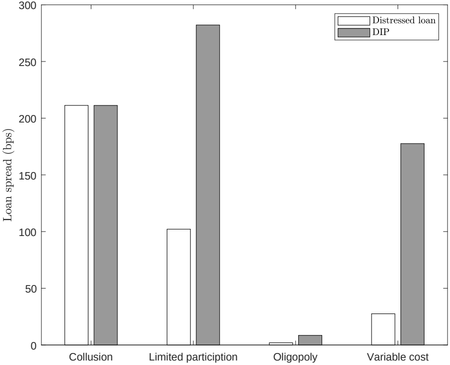

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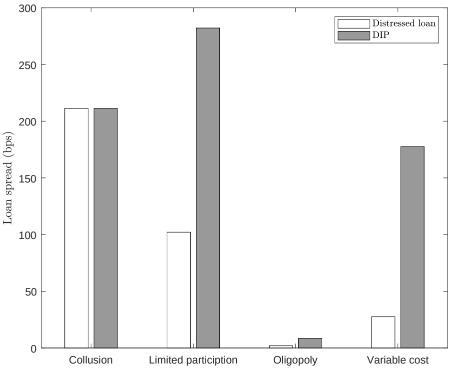

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Policy I: Government lending facilities

Suppose government sets up a special purpose vehicle (SPV)

- Participate the loan syndicate for each distressed borrower with probability $\tau \in [0, 1]$

	(1)	(2)	(3)	(4)	(5)	(6)
	Borrower size	Baseline	Non-collusive	Government lending facility		
				Direct effect	Indirect effect	
					$\tau = 0.8$	$\tau = 1.0$
				A. Distressed loans		
R (bps)	Small	396	−240	−249	0	−240
	Large	269	−156	−162	−102	−156
L/A	Small	0.195	1.359	1.380	0.000	1.359
	Large	0.131	0.748	0.762	0.274	0.748
				B. DIP loans		
R (bps)	Small	757	−244	−249	0	−244
	Large	518	−125	−129	−69	−125
L/A	Small	0.126	0.189	0.190	0.000	0.189
	Large	0.084	0.090	0.091	0.039	0.090

Small borrowers are more vulnerable to lender market power, especially tacit collusion:

- Small borrowers exhibit lower price elasticity of demand
- Tacit collusion is more sustainable in smaller loans

⇒ Policies aiming at helping distressed firms should target more small firms, and need to be very aggressive to generate indirect effects!

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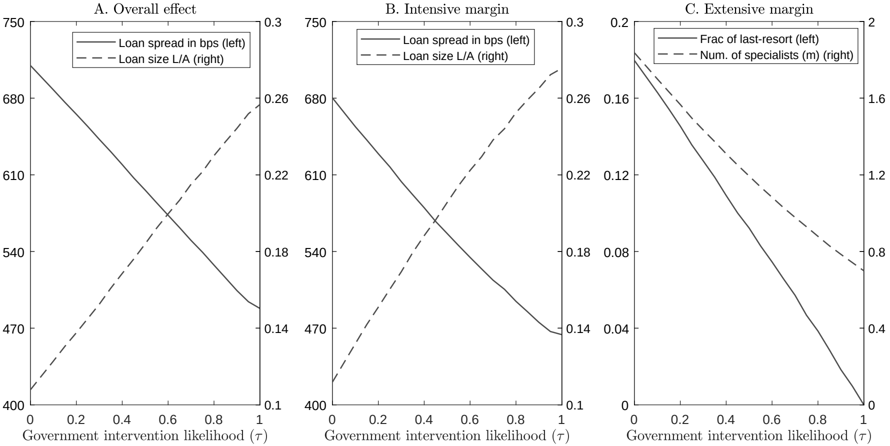
Effects of intensive and extensive margins

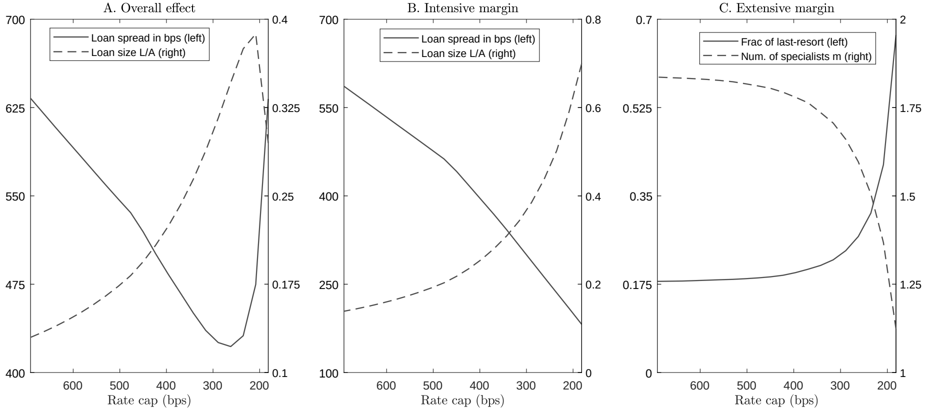


Policy II: Interest rate cap

Suppose the regulator can directly consider the interest rate cap in the following form:

$$R_{max}(x) \equiv \mathcal{R}_{max} e^{\phi+\varsigma u},$$

where $\mathcal{R}_{max}$ is a positive constant.



Conclusion

Intermediary asset pricing based on market concentration and coordination

- A novel source of financial distress costs

Imperfect competition $\Rightarrow$ a large cost for distressed borrowers, esp. small ones

- Tacit collusion exhibits in both markets and have similar effects
- Blocking power and large costs mainly exhibit in the DIP loan market

Policy implications

- Government lending facilities can be effective
  - $\Rightarrow$ Easy to implement, no moral hazard, not credit-accessibility harmful
  - $\Rightarrow$ Should target on small borrowers
- Interest rate cap is less applicable
  - $\Rightarrow$ Hard to implement, moral hazard, credit-accessibility harmful