Life after default: How dealer intermediation improves default recovery

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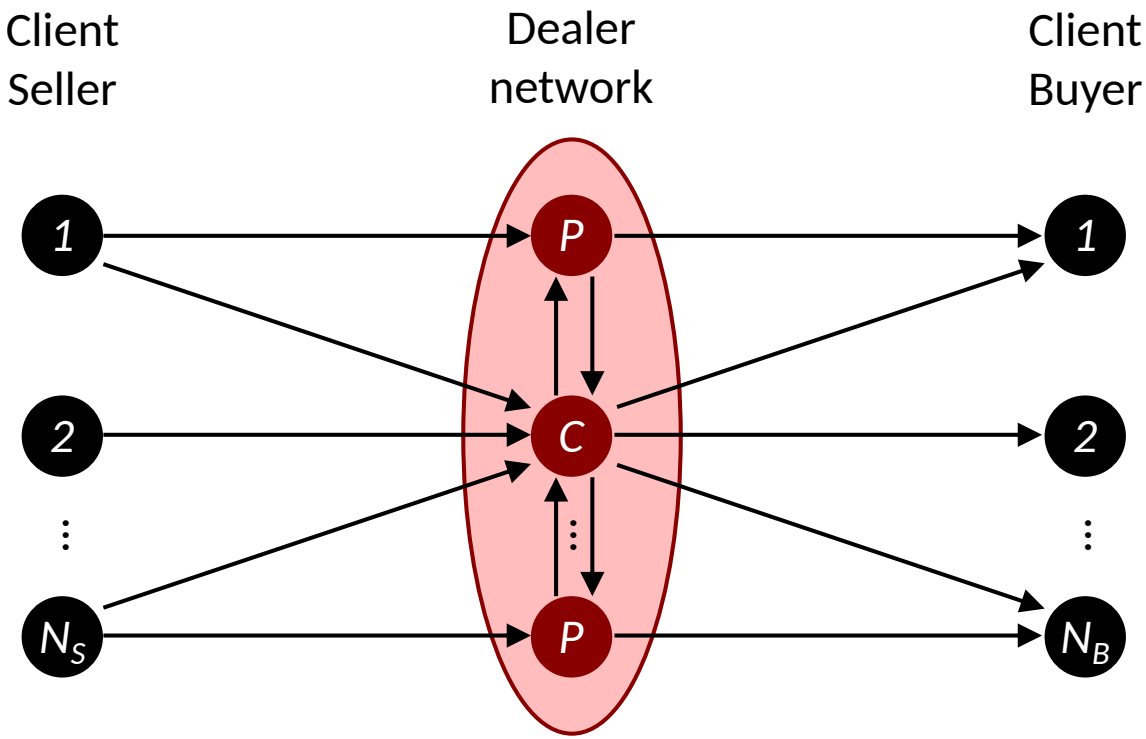
Corporate Distress

"Well, the company is bankrupt, and that means we're going to be shut down. I'm afraid there'll be no more monkey business."

- Default alters corporate bonds' natural holders & recovery risk
- Recovery determined by post-default intermediation?

OTC Bond Intermediation



- CHANNEL 1: Dealers match sellers with buyers
- CHANNEL 2: Dealers boost market confidence about the recovery

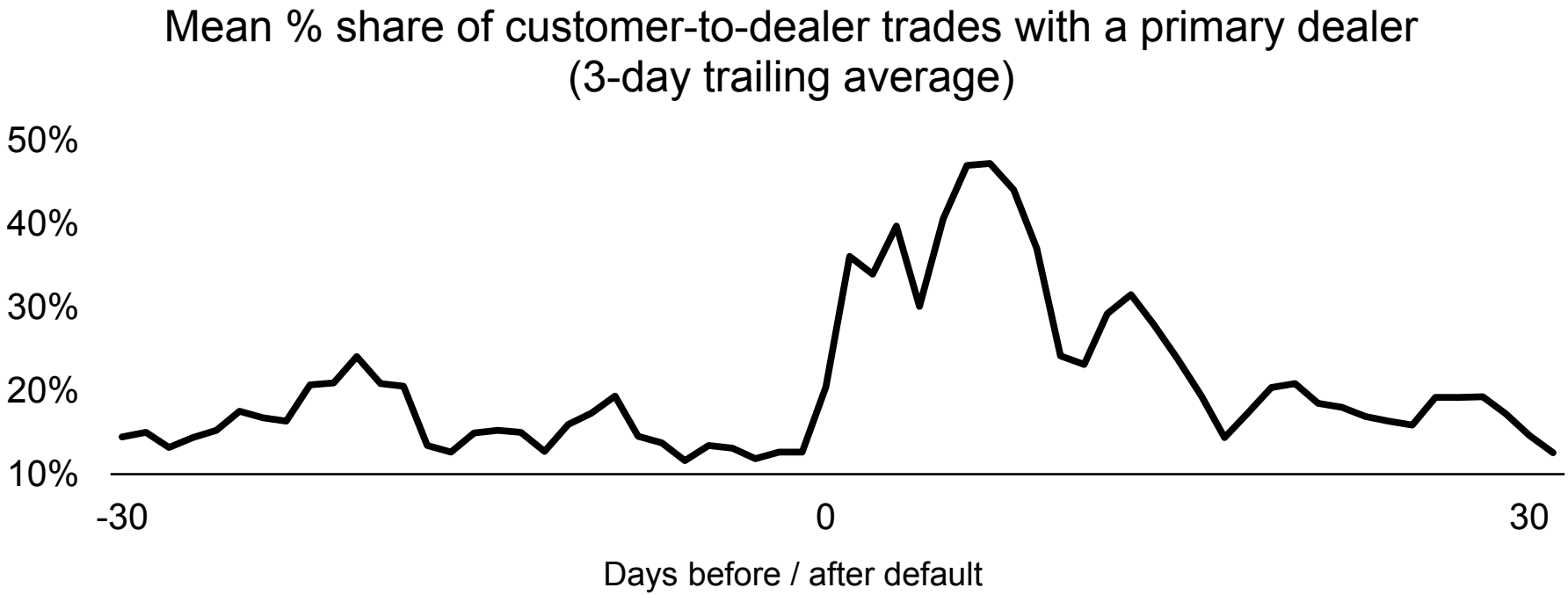
What We Do

- What is the role of dealers in defaulted bond intermediation?
  - Defaulted bond-specific dealer network becomes more concentrated
  - Post-default trading migrates to bond's primary dealer (40–50%)
- How does intermediation by primary dealers impact prices?
  - Trade-level recovery increases by $2 & less price rebound
  - Bond-level recovery increases by $6 (vis-à-vis $38.8 avg recovery)
  - Effect largest & most persistent when primary dealer intermediates early
- How do primary dealers do it?
  - Direct channel: Longer intermediation chains, more principal trading, larger inventories (Duffie et al. 2005; Glode & Opp 2019; Hugonnier et al. 2019; Sambalaibat 2022; Chaderina & Glode 2023)
  - Feedback channel: Boost in market confidence $\rightarrow$ feedback loop

Data Sources

- Default events from Moody's Default & Recovery Database (DRD) + FISD + S&P Capital IQ + Thomson Reuters
  - 2,636 unique U.S. corporate bond default events 2004–2016
  - 498 issuers
- Firm- and bond-specific data from the Mergent Fixed Income Securities Database (FISD) and S&P Capital IQ
- Regulatory corporate bond transaction data from the Trade Reporting and Compliance Engine (TRACE)
  - 109 million reported transactions 2004–2016
  - 3,383 dealers form the global dealer network
- Construct defaulted bond-specific dealer networks & recoveries

Trading Migrates to Primary Dealers



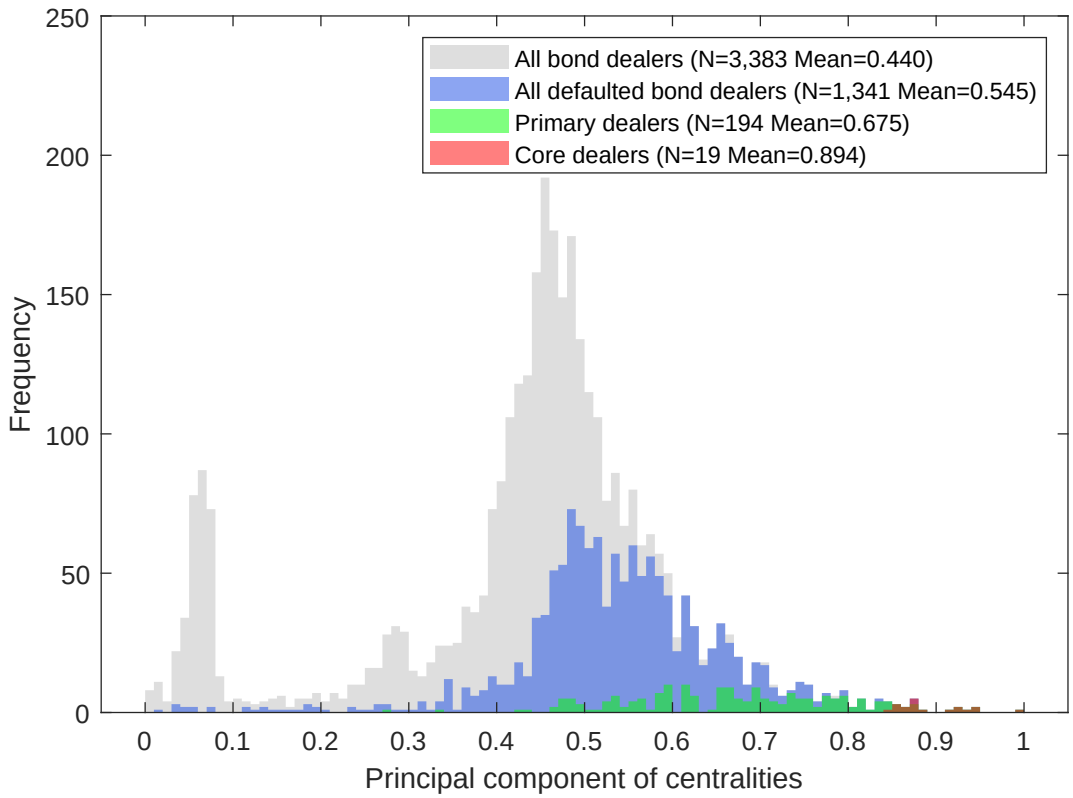
- Primary dealer handles most pre-default order flow (17%)
- Post-default trading migrates to defaulted-bond primary dealers
- 40–50% of post-default order flow intermediated by primary dealer

Trading with Primary Dealers (Probit)

	$PrimaryDealer_{ij} \mid Trade_{ij}^{CD}$	
Specification	(1)	(2)
PostDefault	**0.16****	**0.13****
PostDefault × Pre-default HHI		**0.29*****
Pre-default HHI	0.06	−0.02
Default type	Yes	Yes
Bond features	Yes	Yes
Seniority FE	Yes	Yes
Trade size FE	Yes	Yes
Year FE	Yes	Yes
# observations	547,742	547,742

HHI captures institutional ownership concentration

Primary Dealers: Who Are They?



- Primary dealers are more central
- Primary dealers are not core dealers

Model: Setup

- Single distressed bond bilaterally sequentially traded $i = 1, ..., I$
- Par value normalized to 1 $\Rightarrow$ price is the recovery rate
- Primary dealer with prob. p and Non-primary dealer with prob. $1 - p$
  - *Trade indicator*: $D_i = 1$ for primary and $D_i = 0$ for non-primary dealer
  - $\mathbb{E}[D_i] = p$, $\text{Var}(D_i) = p(1-p)$, and $\text{Cov}(D_i, D_{j \neq i}) = 0$

ASSUMPTION 1: Search Technology

$\lambda_{\text{PD}} > \lambda_{\text{ND}} > 0$. That is, primary dealers have a strictly higher arrival rate of specialized vulture buyers than non-primary dealers.

ASSUMPTION 2: Inventory Costs

Primary dealers have lower per-period inventory costs than non-primary dealers $k_{\text{PD}} < k_{\text{ND}}$.

Model: Prices and Beliefs

- Linear pricing rule for the recovery rate, RR_i,

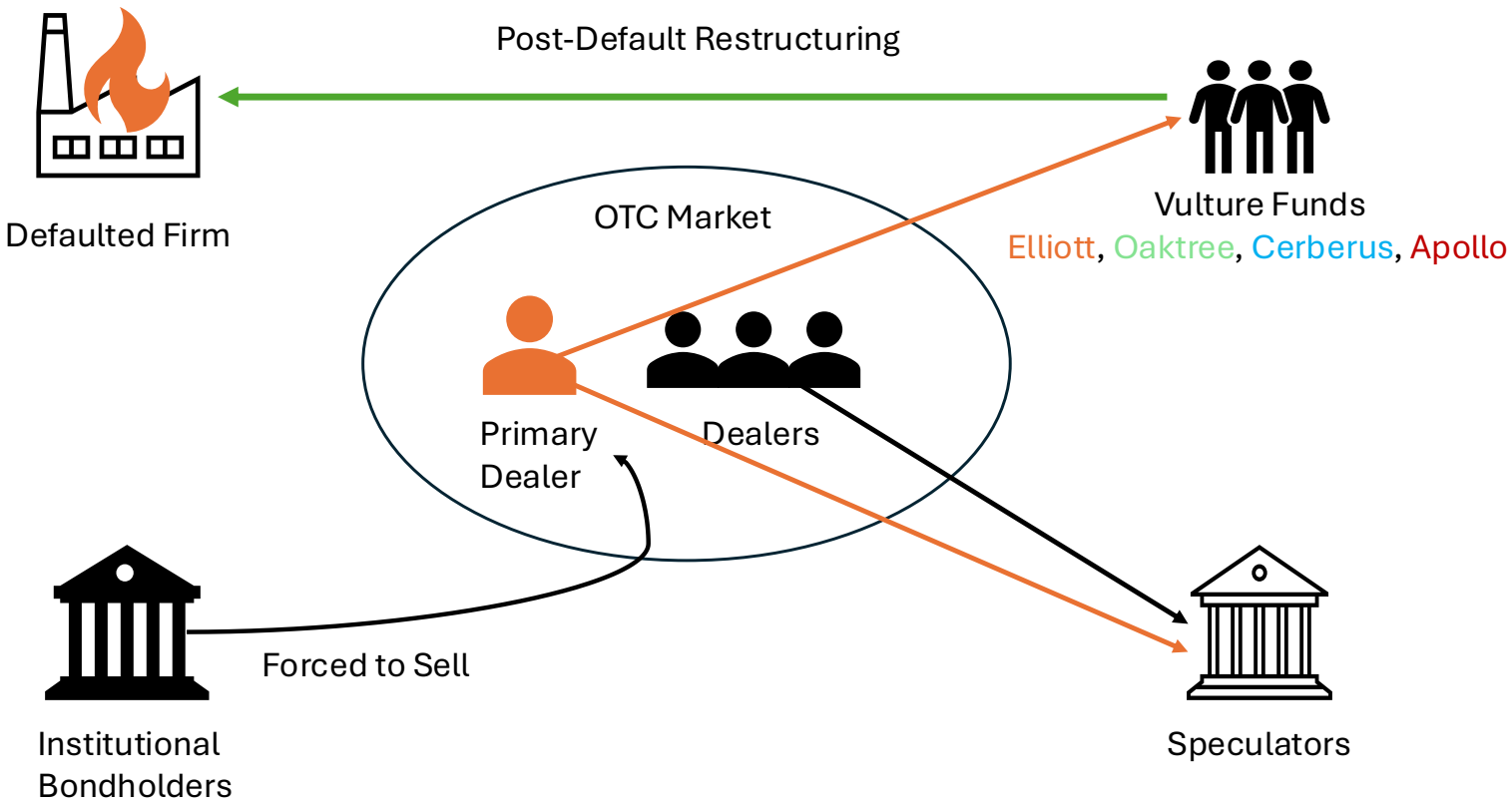
$$RR_i = a + \underbrace{b_D D_i}_{\text{Direct effect}} + b_\pi \underbrace{(\pi_i - \pi_0)}_{\text{Market beliefs}} + \eta_i$$

- Direct effect: $b_D > 0$ lower/higher markups, search, matching, and other costs
- Market recovery beliefs: Prior π_0 and evolve as

$$\pi_i = \pi_{i-1} + \underbrace{a_D D_i}_{\text{Belief boost } a_D \geq 0} - \underbrace{a_{\pi(1-D)} \pi_{i-1}(1 - D_i)}_{\text{Persistence decline}} + \underbrace{a_{\pi D} \pi_{i-1} D_i}_{\text{Persistence boost } a_{\pi D} > 0} + \varepsilon_i$$

- Market learns from TRACE, regulatory filings, and public news (Elliott Management, Oaktree, and Cerberus have all been in the news)

Eco System


Post-Default Restructuring
Defaulted Firm
OTC Market
Vulture Funds
Elliott, Oaktree, Cerberus, Apollo
Primary Dealer
Dealers
Forced to Sell
Institutional Bondholders
Speculators

Model: Investors and Market Beliefs

- Two types of investors: active and passive
- Active vulture investors:
  - Positively influence debtor firm restructuring by actively participating in firm-level activities (Wruck, 1990; Hotchkiss and Mooradian, 1997)
  - $a_D \geq 0$ market-wide belief improvement about recovery
  - Primary dealers trade with active vulture investors
  - Trading with primary dealers boosts market confidence about future recoveries $\Rightarrow$ feedback effect
- Passive speculators:
  - Hold bonds for speculative profits and do not influence recovery
  - Non-primary dealers trade with passive investors
  - Trading with non-primary dealers reduces market confidence about future recoveries

PG&E 2019 Bankruptcy

Reuters (2019)

San Francisco-based PG&E earlier this month filed an outline of a reorganization plan that would pay $17.9 billion for claims stemming from wildfires, including up to $8.4 billion for individual wildfire victims.

When PG&E filed for bankruptcy, it anticipated wildfire liabilities topping $30 billion.

"Our plan of reorganization sets forth a framework to meet PG&E's legal obligations in full while prioritizing victims and customers," the company said responding to the committee's filing.

According to the filing, the committee's reorganization plan would create a trust to pay wildfire claims that would be funded with $12 billion in cash and $12 billion in shares in a reorganized PG&E.

Investors including bondholders Apollo Capital Management and Elliott Management Corp among others would commit more than $28 billion in new money to PG&E, leaving them with nearly 59% of shares and new debt in the reorganized company, the filing said.

The trust for wildfire claims would control roughly 40% of shares in a reorganized PG&E, the filing added.

Apollo, Elliott and other PG&E bondholders in June proposed a reorganization plan putting up to $31 billion into PG&E, including up to $18 billion to pay pre-bankruptcy wildfire claims.

That plan would have left the bondholders with 85% to 95% of shares in a reorganized PG&E in exchange for a cash contribution of $19 billion to $20 billion. They would also have exchanged unsecured debt for secured debt.

Model: Recovery Rates

- Two types of recovery rates:
  - Transaction-level RR_i
  - Bond-level $\overline{RR}_{l+1} \equiv \frac{1}{l+1} \sum_{i=1}^{l+1} RR_i$
  - Bond-level trade indicator $\overline{D}_{l+1} \equiv \frac{1}{l+1} \sum_{i=1}^{l+1} D_i$
- Regression specification:

$$RR_i = \alpha^{\text{TL}} + \beta_{l+1}^{\text{TL}} D_i + \text{error}$$

- We are interested in

$$\beta_{l+1}^{\text{TL}} = \frac{\text{Cov}(D_{l+1}, RR_{l+1})}{\text{Var}(D_{l+1})} \text{ and } \beta_{l+1}^{\text{BL}} = \frac{\text{Cov}(\overline{RR}_{l+1}, \overline{D}_{l+1})}{\text{Var}(\overline{D}_{l+1})}$$

Model: Results On Recovery Rates

- Growth rate of beliefs $\kappa \equiv 1 + a_{\pi D} p - a_{\pi(1-D)}(1-p) \in (0,1)$
- Expected beliefs $A_l \equiv \mathbb{E}[\pi_l]$

$$A_l = a_D p \frac{1-\kappa^l}{1-\kappa} + \kappa^l \pi_0 = A_\infty - \kappa^l (A_\infty - A_0)$$

- Define $B_{l,l} \equiv \frac{\mathrm{Cov}(D_i, \pi_i)}{\mathrm{Var}(D_i)} = a_D + (a_{\pi D} + a_{\pi(1-D)}) A_{l-1}$ then

$$\beta^{\mathrm{TL}}_{l+1} = b_D + b_\pi B_{l+1,l+1}$$

RESULT 1: Bond-level coefficient $>$ Trade-level coefficient

$$\beta^{\mathrm{BL}}_{l+1} = \frac{1}{l+1} \sum_{i=1}^{l+1} \beta^{\mathrm{TL}}_i + \frac{1}{l+1} \sum_{i=1}^{l+1} \gamma^{\mathrm{FE}}_i \underset{l\to\infty}{\to} \beta^{\mathrm{TL}}_{l\to\infty} + \frac{\kappa b_\pi}{1-\kappa} B_{\infty,\infty} > \beta^{\mathrm{TL}}_{l\to\infty}$$

RESULT 2: Positive feedback effect

$$\gamma^{\mathrm{FE}}_{l+1} = \frac{\mathrm{Cov}(RR_{l+1}, \frac{1}{l}\sum_{i=1}^{l} D_i)}{\mathrm{Var}(\frac{1}{l}\sum_{i=1}^{l} D_i)} = b_\pi \sum_{i=1}^{l} \kappa^{l-i} B_{i,i} \underset{l\to\infty}{\to} \frac{\kappa b_\pi}{1-\kappa} B_{\infty,\infty}$$

Model: Other Predictions

Proposition 3: Price Rebound

Let $P_{i,0}$ be the execution (sale) price of the ith forced seller's trade at $t = 0$, and let $P_{i,1}$ be the (average) resale or re-marked price at a later date. Then, in equilibrium,

$$\mathbb{E}\left[P_{i,1} - P_{i,0} \middle| D_i = 1\right] < \mathbb{E}\left[P_{i,1} - P_{i,0} \middle| D_i = 0\right].$$

Price rebound is strictly smaller for trades routed via primary dealers.

Proposition 4: Chain Length & Inventory Holding

In equilibrium, if primary dealers choose direct placement with specialized buyers whenever possible (i.e. if λ_{PD} is sufficiently large and k_{PD} sufficiently small), the resulting chain lengths are truncated or zero. If instead, they rely on splitting or repeated passing to other dealers, longer chains emerge. Also, primary dealers hold larger overnight inventories if k_{PD} is low relative to k_{ND} and λ_{PD} is high enough to justify waiting for a specialized buyer rather than selling immediately.

#1 Primary Dealers Improve Trade-Level Recovery

- Trade-level recovery rate captures investor-level experience:

$$RR_{ij} = price_{ij}/par_j$$

- OLS/IV regression of trade-specific recovery rate

$$RR_{ij} = \alpha + \beta PrimaryDealer_{ij} + \gamma' X_{ij} + \epsilon_{ij}$$

  - RR_{ij} is price paid in post-default client-to-dealer transaction i in bond j
  - $PrimaryDealer_{ij}$ is binary variable indicating whether bond is sold to primary dealer
  - X_{ij} controls for bond features, seniority, year fixed effects, industry fixed effects, industry distress fixed effects, liquidity, macroeconomic and company features (and dealer fixed effects in saturated specification)

#1 Primary Dealers Improve Trade-Level Recovery

	Trade-level recovery rate RR_{ij} (% of par)			
Specification	(1)	(2)	(3)	(4)
PrimaryDealer	4.52***	**2.03*** **	6.79***	4.24***
Bond features	Yes	Yes	Yes	Yes
Liquidity features	Yes	Yes	Yes	Yes
Macroeconomic features	Yes	Yes	Yes	Yes
Company features	Yes	Yes	Yes	Yes
Seniority FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Industry distress FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Dealer FE	No	Yes	No	No
Empirical model	OLS	OLS	2SLS	Heckman
R^2	0.5959	0.6185	0.5942	0.5961
# observations	108,536	108,536	108,536	108,536

- Column (2) adds dealer fixed effects; columns (3)–(4) control for potential endogeneity & selection bias (1st-stage Probit estimates probability of trading with primary dealer for each transaction)
- Primary dealers increase trade-level recovery by $2.0-$6.8
- Plus, primary dealers stabilize falling prices

#2 Primary Dealers Improve Bond-Level Recovery

- Bond-level recovery rate captures bond-level experience:

$$RR_j = \frac{1}{T+1} \sum_{s=t}^{t+T} \left(\frac{1}{|K_{js}|} \sum_{i \in K_{js}} RR_{ij} \right)$$

- OLS/IV regression of mean recovery rate per bond

$$RR_j = \alpha + \beta PrimaryDealer_j + \gamma' X_j + \epsilon_j,$$

  - RR_j is mean price paid post-default
  - $PrimaryDealer_j$ is percentage share of primary dealer intermediation
  - Bartik-IV to address endogeneity, replacing $PrimaryDealer_j$ by

$$\widehat{PrimaryDealer}_j = \frac{1}{K_j} \sum_{i=1}^{K_j} \widehat{\Pr}(PrimaryDealer_{ij})$$

#2 Primary Dealers Improve Bond-Level Recovery

	Total recovery rate RR_j (% of par)			
Specification	(1)	(2)	(3)	(4)
PrimaryDealer	6.79**	**6.08****	4.03*	4.67*
Dealer features	No	Yes	No	Yes
Default type	No	Yes	No	Yes
Bond features	Yes	Yes	Yes	Yes
Seniority FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Industry distress FE	Yes	Yes	Yes	Yes
Liquidity features	Yes	Yes	Yes	Yes
Macroeconomic features	Yes	Yes	Yes	Yes
Company features	Yes	Yes	Yes	Yes
Empirical model	OLS	OLS	Bartik	Bartik
R^2	0.6303	0.6312	0.6273	0.6297
# observations	2,093	2,093	1,275	1,275

- Trading with primary dealers increases total recovery by \$4.0-\$6.8 per \$100 par value (vis-à-vis \$38.8 avg recovery)
- Trade-level (Direct effect) $<<$ Bond-level (Direct + Confidence)

#3 Primary Dealer Early in Recovery Process

	Trade-level recovery rate RR_{ij} (% of par)			
Specification	(1)	(2)	(3)	(4)
PrimaryDealer	2.76***	**0.73**	5.14**	2.55***
PrimaryDealer × (*DaysSinceDefault* < 5)	3.74**	**3.21****	3.25*	3.70**
(*DaysSinceDefault* < 5)	−2.89**	−2.58**	−2.81**	−2.87**
Bond features	Yes	Yes	Yes	Yes
Liquidity features	Yes	Yes	Yes	Yes
Macroeconomic features	Yes	Yes	Yes	Yes
Company features	Yes	Yes	Yes	Yes
Seniority FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Industry distress FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Dealer FE	No	Yes	No	No
Empirical model	OLS	OLS	2SLS	Heckman
R^2	0.5991	0.6207	0.5970	0.5992
# observations	107,067	107,067	107,067	107,067

- Column (2) adds dealer fixed effects; columns (3)–(4) control for potential endogeneity & selection bias
- Primary dealer effect largest early in recovery process
- Provides support for $a_{\pi D} \geq 0$

#4 Primary Dealer & Market Confidence in Recovery

- Do primary dealers boost market confidence in recovery?
- Model-implied lagged aggregate primary dealer index

$$\overline{PrimaryDealer}_{i-1j} = \frac{1}{i} \sum_{l=1}^{i} PrimaryDealer_{i-lj}$$

- Add lagged $\overline{PrimaryDealer}_{i-1j}$ to OLS/IV specification

$$RR_{ij} = \alpha + \gamma \, \overline{PrimaryDealer}_{i-1j} + \beta \, PrimaryDealer_{ij} + \delta' \, X_{ij} + \epsilon_{ij}$$

- γ (β) measures permanent (transitory) primary dealer effect

#4 Positive Feedback Effect from Primary Dealer

	Trade-level recovery rate RR_{ij} (% of par)			
Specification	(1)	(2)	(3)	(4)
$\overline{PrimaryDealer}$	6.72***	**6.01*** **	7.29***	7.04***
PrimaryDealer	1.92**	**0.00**	3.17*	1.97**
Bond features	Yes	Yes	Yes	Yes
Liquidity features	Yes	Yes	Yes	Yes
Macroeconomic features	Yes	Yes	Yes	Yes
Company features	Yes	Yes	Yes	Yes
Seniority FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Industry distress FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Dealer FE	No	Yes	No	No
Empirical model	OLS	OLS	2SLS	Heckman
R^2	0.6047	0.6260	0.6047	0.6047
# observations	107,067	107,067	107,067	107,067

- Column (2) adds dealer fixed effects; columns (3)–(4) control for potential endogeneity & selection bias
- Primary dealer intermediation boosts recovery values more than presence in current transaction—feedback loop effect

#5 Price Rebound

- Post-default price rebound

$$PriceRebound_{ij} = \frac{1}{10} \sum_{t=31}^{40} \left(\frac{1}{|K_{jt}|} \sum_{k \in K_{js}} RR_{kj} \right) - RR_{ij}$$

  - Price difference between the mean bond price in transactions 31-40 days after default and transaction *ij* 0-30 days after default

- OLS/IV analysis:

$$PriceRebound_{ij} = \alpha + \beta\, PrimaryDealer_{ij} + \delta'\, X_{ij} + \epsilon_{ij}$$

#5 Primary Dealers Lead to Lower Price Rebound

	$PriceRebound_{ij}$			
Specification	(1)	(2)	(3)	(4)
PrimaryDealer	−3.19***	**-0.81***	−5.62***	−2.24**
Bond features	Yes	Yes	Yes	Yes
Liquidity features	Yes	Yes	Yes	Yes
Macroeconomic features	Yes	Yes	Yes	Yes
Company features	Yes	Yes	Yes	Yes
Seniority FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Industry distress FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Dealer FE	No	Yes	No	No
Empirical model	OLS	OLS	2SLS	Heckman
R^2	0.4595	0.4956	0.4594	0.4663
# observations	106,992	106,992	106,992	106,992

- Column (2) adds dealer fixed effects; columns (3)–(4) control for potential endogeneity & selection bias
- Less rebound → agrees with Proposition 3

#6 Length of Intra-Day *C(N)DC* Round-Trip Chains

	$IntermediationChainLength_{ij}$				
Specification	(1)	(2)	(3)	(4)	(5)
PostDefault × *PrimaryDealer*				0.13***	**0.11*** **
PostDefault	−0.02*	0.01	0.00	−0.01	0.00
PrimaryDealer	−0.07***	−0.14***	−0.15***	−0.16***	−0.08***
Dealer features	No	No	Yes	Yes	Yes
Default type	No	Yes	Yes	Yes	Yes
Bond features	No	Yes	Yes	Yes	Yes
Seniority FE	No	Yes	Yes	Yes	Yes
Trade size FE	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	No	No	No	No
Dealer FE	No	No	No	No	Yes
# observations	143,787	143,787	143,787	143,787	143,787

- Primary dealers have longer intermediation chains post default → agrees with Proposition 4

#7 Dealer vs Broker Role

	$\Pr(BrokerRole_{ij})$				
Specification	(1)	(2)	(3)	(4)	(5)
PostDefault × *PrimaryDealer*				−1.09***	**-1.13*** **
PostDefault	−0.11***	−0.18***	−0.21***	−0.03	−0.02
PrimaryDealer	−0.25***	−0.27***	−0.23**	−0.01	**0.31*** **
Dealer features	No	No	Yes	Yes	Yes
Default type	No	Yes	Yes	Yes	Yes
Bond features	No	Yes	Yes	Yes	Yes
Seniority FE	No	Yes	Yes	Yes	Yes
Trade size FE	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	No	No	No	No
Dealer FE	No	No	No	No	Yes
# observations	625,548	625,548	625,548	625,548	625,548

- Primary dealers less likely to broker agency trades post default → agrees with Proposition 4

#7 Primary Dealers Have Larger Inventories

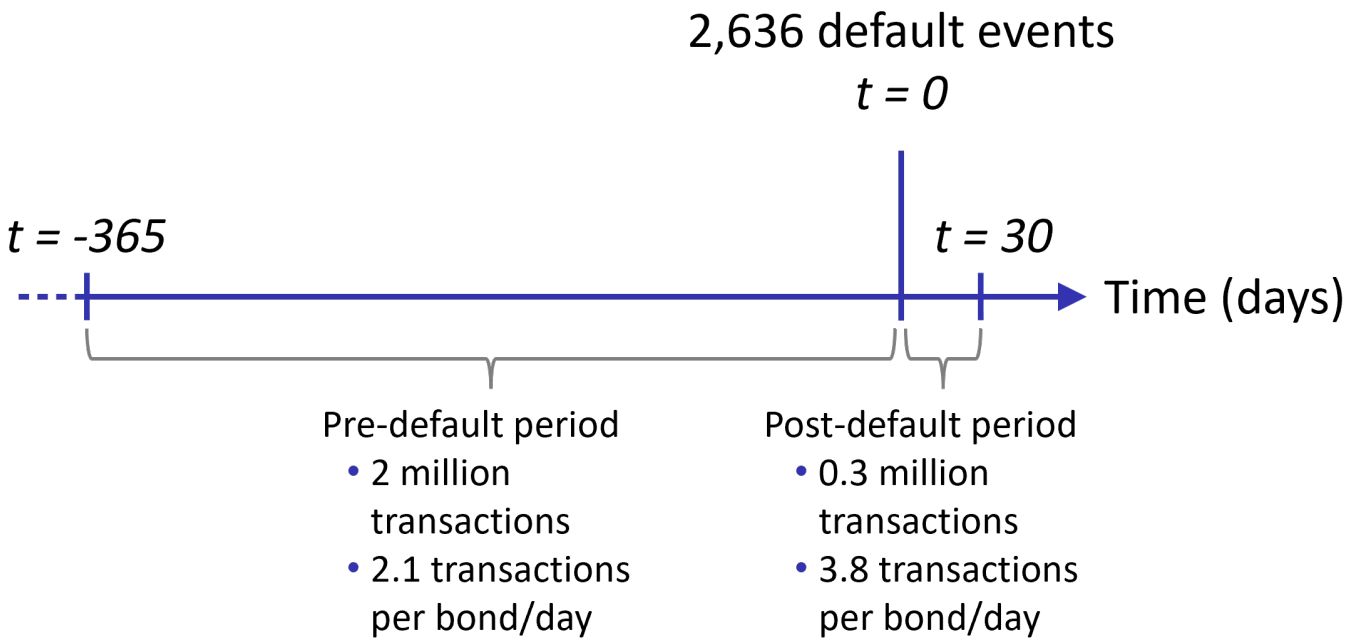
	Dealer inventory							
Statistic	*N*	*Mean*	*SD*	*q5*	*q25*	*q50*	*q75*	*q95*
Dealer inventory before default	2,474	1.7%	8.5%	-8.1%	-0.6%	0.8%	3.7%	14.8%
Dealer inventory after 30 days	2,474	2.6%	9.8%	-8.4%	-0.6%	1.2%	5.1%	18.2%
Post–Pre		**0.9%*** **						

- The dealer inventory is denoted in %(par value) held on dealers' balance sheets
- Primary dealers have larger inventories post default $\rightarrow$ agrees with Proposition 4

Conclusions

- Intermediation shifts to *primary* dealers with prior expertise in defaulted bonds
  - Direct channel: Longer intermediation chains, more principal trading, larger inventories (Duffie et al. 2005; Glode & Opp 2019; Hugonnier et al. 2019; Sambalaibat 2022; Chaderina & Glode 2023)
  - Feedback channel: Boost in market confidence $\rightarrow$ feedback loop $\rightarrow$ extra 4-6% of trade-level recovery
  - All of the bond-level recovery is from the feedback effect
- Provide a novel link between the firm-level reorganization in distress and the intermediation of its securities

Pre- vs. Post-Default Trading



- Post-default trading (almost) doubles
- OTC bond intermediation: pre-default = post-default?