

# The Electronic Evolution of Corporate Bond Dealers

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# Corporate Bond Market in Transition

- Electronic trading has become the norm in many asset classes.
  - ▶ Leads to lower transaction costs, better market quality, and a host of new market participants and venues.
- Unique features of the corporate bond market.
  - ▶ Trades arrive in large quantities but at low frequency.
  - ▶ OTC market intermediated by large bank dealers.
  - ▶ Heterogenous issuances lead to market fragmentation.
- Research questions:
  - ▶ The growth of electronic bond trading over time.
  - ▶ The impact of electronic trading on transaction costs and market quality, and the underlying channels for such effects.
  - ▶ Bond market features and the limitations to the growth of electronic bond trading.

# Electronic Trading in Corporate Bonds

- Electronic trading mechanisms:
  - ▶ Request for Quotation (RFQ).
    - ★ An investor electronically submits inquiries to dealers of the investor's choice.
    - ★ Dealers respond with bids or offers, which are released simultaneously at a time specified by the investor.
    - ★ The investor selects which dealer to trade with.
  - ▶ All to All Trading (All-to-All).
    - ★ Allows all buy- and sell-side firms to connect anonymously in a central marketplace.
- Most of the growth in electronic bond trading is through RFQ.
  - ▶ All-to-All accounts for less than 2% of the overall market volume during 2010-2017.

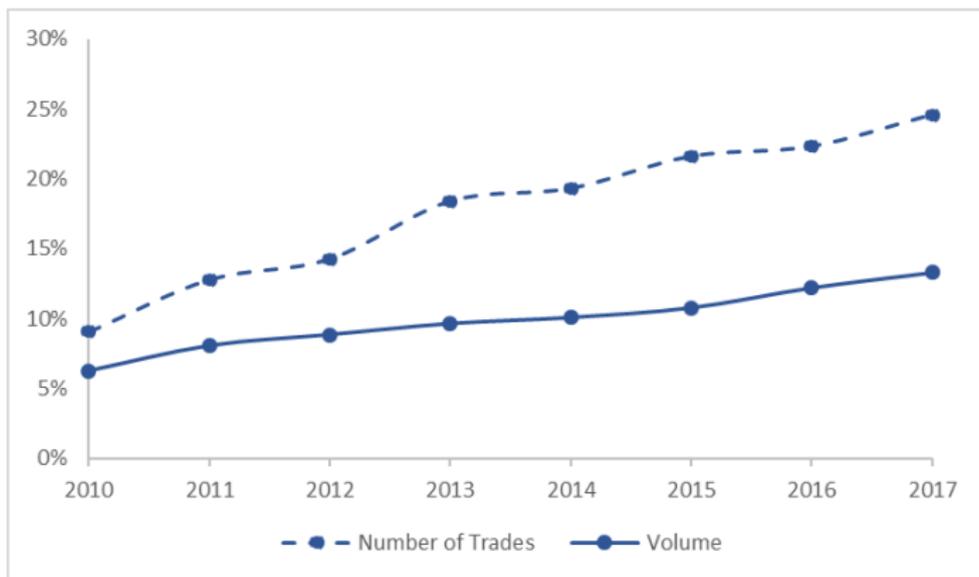
# Identifying Electronic Trades in Corporate Bonds

- Regulatory version of the TRACE data.
  - ▶ Sample period: January 2010 – December 2017.
  - ▶ Include: bond CUSIP, trade execution date and time, trade price and quantity, trade direction, and dealer identity.
- Data on electronic trades executed on MarketAxess.
  - ▶ Sample period: January 2010 – December 2017.
  - ▶ Include: bond CUSIP, trade execution date and time, trade price and quantity, trade direction.
- Merging TRACE with MarketAxess:
  - ▶ Using common variables in both data files.
  - ▶ 98.9% of MarketAxess electronic trades find a unique match in TRACE.

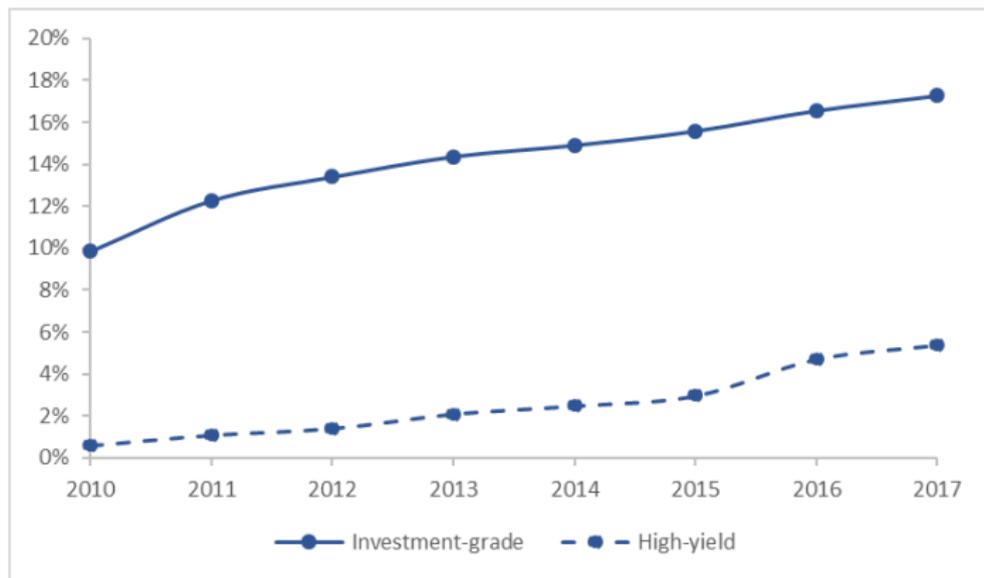
# Sample Construction

- Bond characteristics data
  - ▶ Data source: Mergent FISD.
  - ▶ Include: credit rating, amount outstanding, issuance and maturity dates, and etc.
  - ▶ Filters:
    - ★ Issued by US firms in US dollars.
    - ★ Industries: industrial, financial, and utility.
    - ★ Rated by Moody's or S&P.
    - ★ Exclude: private placements.
- Final sample includes over 105 million trades in 29,787 bonds.
- Caveat: Identification of electronic trades is solely based on MarketAxess data.
  - ▶ Other electronic trading platforms are smaller: MarketAxess accounts for about 85% of electronic bond trades (Source: <<Greenwich Associates 2018 Corporate Bond Trading>>).

# Share of Electronic Trading in Corporate Bonds

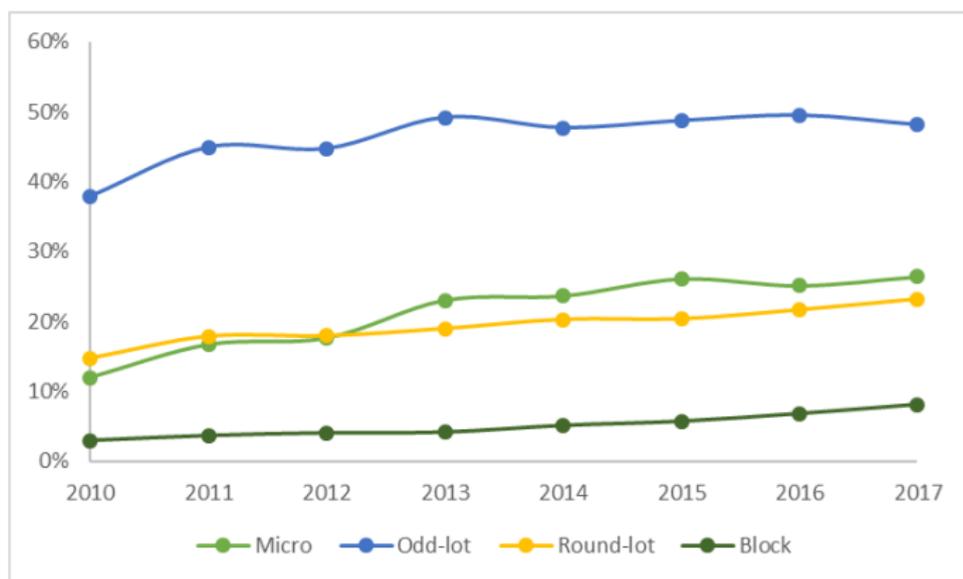


# Growth of Electronic Bond Trading: Investment-grade vs. High-yield



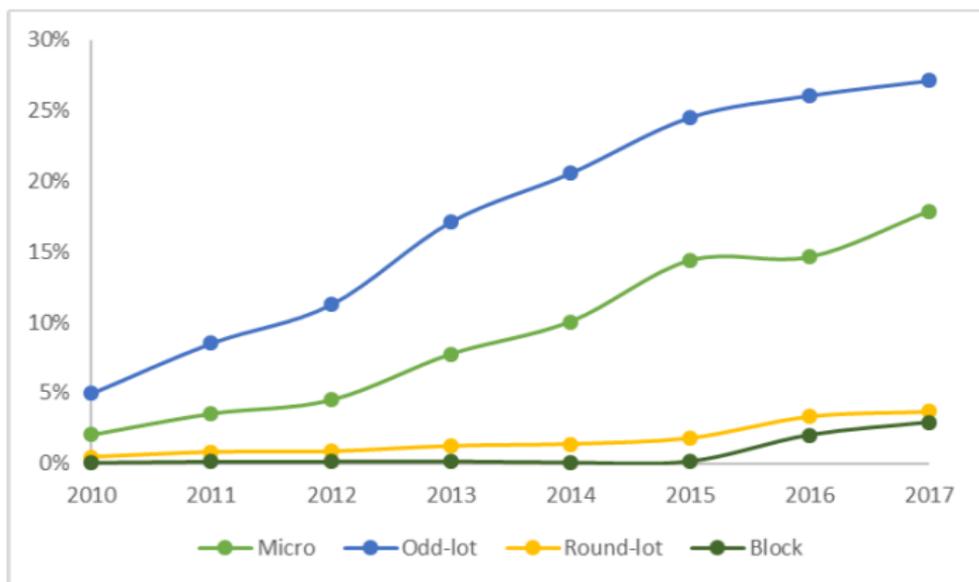
# Growth of Electronic Trading across Size Categories: Investment-grade Bonds

- Trade size categories:
  - ▶ Micro (\$1 to \$100K), Odd-lot (\$100K to \$1M), Round-lot (\$1M to \$5M), and Block (above \$5M).



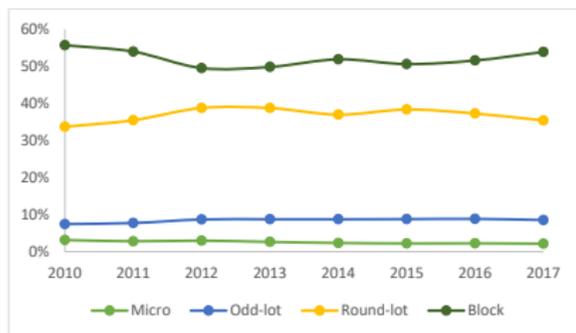
# Growth of Electronic Trading across Size Categories: High-yield Bonds

- Trade size categories:
  - ▶ Micro (\$1 to \$100K), Odd-lot (\$100K to \$1M), Round-lot (\$1M to \$5M), and Block (above \$5M).

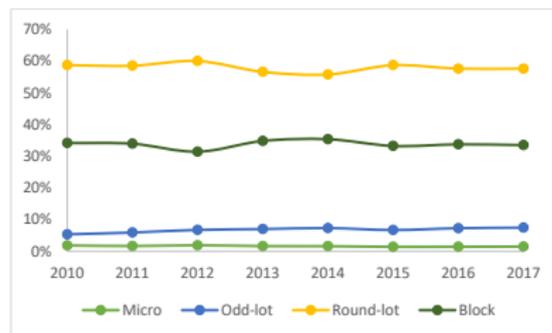


# Distribution of Bond Trades across Size Categories

- Does electronic trading lead to trade shredding?



Investment-grade

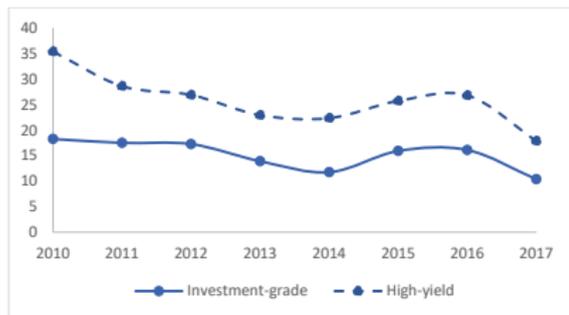


High-yield

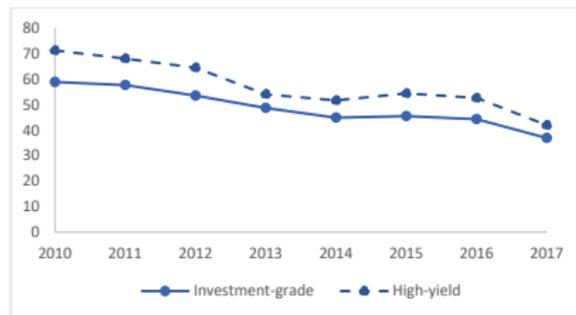
# Transaction Costs in Electronic and Voice Venues

- How the rise of electronic trading has affected transaction costs in bond trading?
- Transaction cost measure (Hendershott and Madhavan (2015)):

$$Cost_{i,j,t} = \ln(P_{i,j,t}/P_{i,j,t}^B) \cdot Sign_{i,j,t}$$

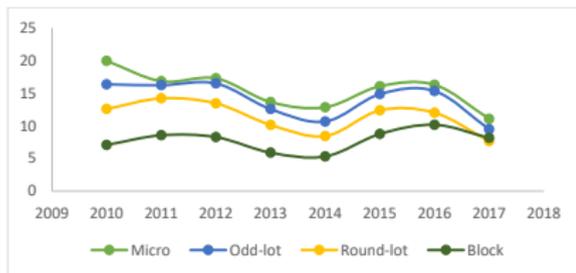


Electronic Trading

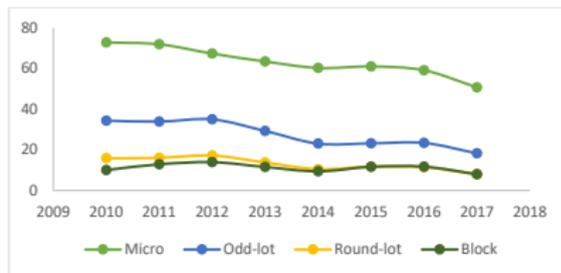


Voice Trading

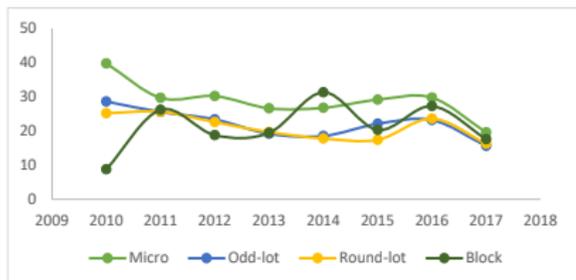
# Transaction Costs across Size Categories



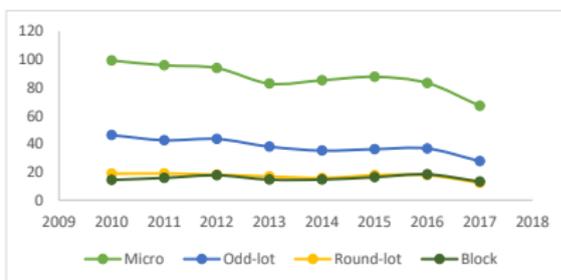
**Electronic Trading in Investment-grade Bonds**



**Voice Trading in Investment-grade Bonds**



**Electronic Trading in High-yield Bonds**



**Voice Trading in High-yield Bonds**

# Electronic Trading and Transaction Costs: Cross Venue Effects

- How does the rise of electronic trading affect transaction costs in voice trading?
  - ▶ Endogenous venue selection by traders can result in higher costs in voice trading (Hendershott and Madhavan (2015)).
  - ▶ More informative prices, lower search costs and increased competition from electronic trading venues can lead to lower costs in voice trading.
- Panel regressions with fixed effects:

$$Cost_{i,t,s,d} = \beta * E - Share_{i,t,s,d} + \lambda * X_{i,t} + \mu_t + \mu_s + \mu_d$$

- ▶  $Cost_{i,t,s,d}$ : Average D-C transaction costs in voice trading.
- ▶  $E - Share_{i,t,s,d}$ : Share of D-C trades executed electronically.
- ▶  $X_{i,t}$ : Log(Outstanding Amount), Time to Maturity, 3 Industry Dummies, and 21 Credit Rating Dummies.
- ▶  $\mu_t$ ,  $\mu_s$ , and  $\mu_d$ : day, trade size, and dealer fixed effects, respectively.

# Electronic Trading and Transaction Costs: Cross Venue Effects

	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
	<b>Full Sample</b>	<b>Matched Sample</b>	<b>Investment-grade</b>	<b>High-yield</b>
E-Share	-18.938*** (-3.58)	-17.499*** (-4.18)	-13.347*** (-4.12)	-29.356*** (-4.35)
Log(Amount out)	-2.906*** (-3.88)			
Time to Maturity	1.802*** -7.88			
Credit Rating FE	Yes	No	No	No
Industry FE	Yes	No	No	No
Size FE	Yes	No	No	No
Day FE	Yes	No	No	No
Dealer FE	Yes	Yes	Yes	Yes
Bond-Day-Size FE	No	Yes	Yes	Yes
Observations	14,774,258	9,726,101	6,906,160	2,819,941
$R^2$	0.31	0.6	0.65	0.56

# Dealer Competition

- Electronic trading increases price-based competition among dealers.
- Panel regressions with fixed effects:

$$PriceDiff_{i,t,s,B/S} = \beta * E - Share_{i,t,s,B/S} + \lambda * X_{i,t} + \mu_t + \mu_s + \mu_{B/S}$$

- ▶ *PriceDiff*: The difference between the highest and the lowest prices among different dealers.
  - ★ Step 1: Calculate  $Price_{i,t,s,B/S}$  for each dealer  $d$ .
  - ★ Step 2: Calculate  $PriceDiff_{i,t,s,B/S}$  as the difference between the highest and the lowest  $Price_{i,t,s,B/S}$ .
- ▶  $E - Share_{i,t,s,d}$ : Share of D-C trades executed electronically.
- ▶  $X_{i,t}$ : Log(Outstanding Amount), Time to Maturity, 3 Industry Dummies, and 21 Credit Rating Dummies.
- ▶  $\mu_t$ ,  $\mu_s$ , and  $\mu_d$ : day, trade size, and dealer fixed effects, respectively.

# Dealer Competition

	<b>I</b>	<b>II</b>	<b>III</b>
	<b>Full</b>	<b>Investment-</b>	<b>High-</b>
	<b>Sample</b>	<b>grade</b>	<b>yield</b>
E-Share	-0.634*** (-104.53)	-0.600*** (-89.58)	-0.809*** (-83.41)
Log(Amount out)	0.081*** (31.89)	0.082*** (29.07)	0.075*** (14.27)
Time to Maturity	0.008*** (12.95)	0.009*** (15.06)	0.004*** (3.53)
Credit Rating FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Size FE	Yes	Yes	Yes
Direction FE	Yes	Yes	Yes
Day FE	Yes	Yes	Yes
Observations	4,934,180	3,514,511	1,419,669
$R^2$	0.18	0.19	0.17

# Dealer Competition and Execution Quality

- Competition limits price discrimination.
  - ▶ O'Hara, Wang, and Zhou (2018): dealers provide better execution quality to more active investors.
- Panel regressions with fixed effects:

$$PriceDiff_{i,t,s,B/S,d} = \beta * E - Share_{i,t,s,B/S,d} + \lambda * X_{i,t} + \mu_t + \mu_s + \mu_{B/S}$$

- ▶  $PriceDiff_{i,t,s,B/S,d}$ : The difference between the highest and the lowest prices among trades with the same dealer.
- ▶ Other controls are as before.

# Dealer Competition and Execution Quality

	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
	<b>Full Sample</b>	<b>Matched Sample</b>	<b>Investment-grade</b>	<b>High-yield</b>
E-Share	-0.227*** (-12.21)	-0.192*** (-9.60)	-0.178*** (-9.28)	-0.269*** (-7.70)
Log(Amount out)	0.022*** (4.25)			
Time to Maturity	0.004*** (4.47)			
Credit Rating FE	Yes	No	No	No
Industry FE	Yes	No	No	No
Size FE	Yes	No	No	No
Direction FE	Yes	No	No	No
Day FE	Yes	No	No	No
Dealer FE	Yes	Yes	Yes	Yes
Bond-Day-Size-Direction FE	No	Yes	Yes	Yes
Observations	2,810,900	981,575	637,272	344,303
$R^2$	0.12	0.47	0.47	0.47

# Inter-Dealer Trading

- Electronic trading reduces search costs in the OTC markets.
  - ▶ Electronic trading contributes to lower transaction costs by providing greater inventory management.
- Panel regressions with fixed effects:

$$DDShare_{i,t,s,d} = \beta * E - Share_{i,t,s,d} + \lambda * X_{i,t} + \mu_t + \mu_s + \mu_d$$

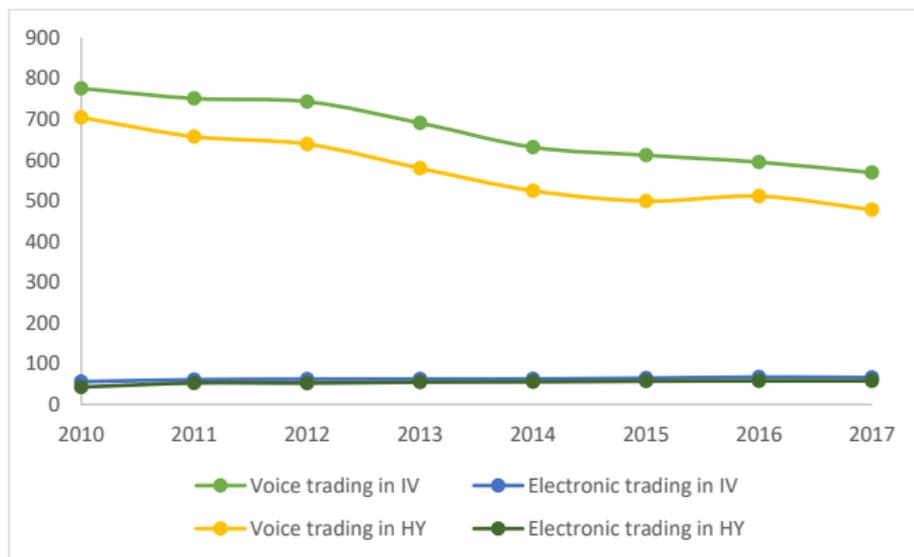
- ▶  $DDShare_{i,t,s,d}$ : The share of inter-dealer trade out of total trade.
- ▶ Other controls are as before.

# Inter-Dealer Trading

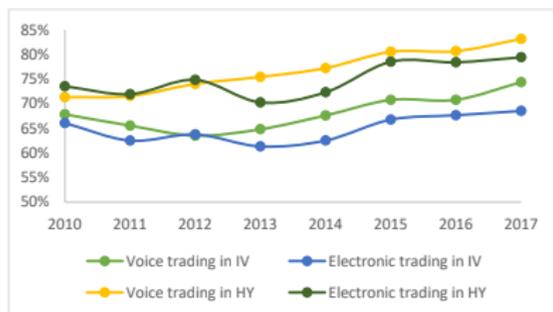
	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
	<b>Full Sample</b>	<b>Matched Sample</b>	<b>Investment- grade</b>	<b>High- yield</b>
E-Share	-0.061*** (-3.87)	-0.058*** (-4.68)	-0.061*** (-4.98)	-0.038** (-2.31)
Log(Outstanding Amount)	0.010*** (4.16)			
Time to Maturity	-0.000** (-2.43)			
Credit Rating FE	Yes	No	No	No
Industry FE	Yes	No	No	No
Size FE	Yes	No	No	No
Day FE	Yes	No	No	No
Dealer FE	Yes	Yes	Yes	Yes
Bond-Day-Size FE	No	Yes	Yes	Yes
Observations	22,779,777	14,444,377	10,752,445	3,691,932
$R^2$	0.38	0.58	0.57	0.6

# Market structure effects of electronic trading: market concentration

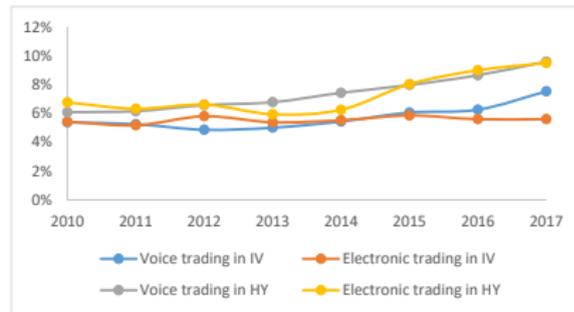
- Has electronic trading elicited new entrants into bond trading?
  - ▶ Top 10 bond dealers dominate both voice trading and electronic trading.
  - ▶ Number of active dealers declines.



# Market structure effects of electronic trading: market concentration



Market Share of Top 10 Dealers



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# Trade Size Effects

	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
	<b>Retail</b>	<b>Odd-lot</b>	<b>Round-lot</b>	<b>Block</b>
<i>Panel A. Transaction Costs</i>				
E-Share	-9.767***	-8.837***	-7.022***	-6.628***
	(-2.65)	(-5.80)	(-5.42)	(-3.43)
Dealer FE	Yes	Yes	Yes	Yes
Bond-Day FE	Yes	Yes	Yes	Yes
<i>Panel B. Dealer Competition</i>				
E-Share	-0.697***	-0.462***	-0.353***	-0.209***
	(-99.15)	(-80.86)	(-54.55)	(-32.36)
Controls	Yes	Yes	Yes	Yes
Trade Direction FE	Yes	Yes	Yes	Yes
Day FE	Yes	Yes	Yes	Yes
<i>Panel C. Inter-Dealer Trading</i>				
E-Share	-0.057***	-0.046***	-0.029***	-0.021***
	(-3.86)	(-4.99)	(-5.66)	(-7.36)
Dealer FE	Yes	Yes	Yes	Yes
Bond-Day FE	Yes	Yes	Yes	Yes

# Electronic Trading around Stress Periods

- Are the benefits of automation observed in normal trading periods also prevail during stress periods?
  - ▶ Study periods with regulation induced fire sales by insurance firms (Ellul, Jotikasthira and Lundblad (2011)).
  - ▶ Identify a total of 509 downgrades to junk using FISD data.
  - ▶ Sub-periods analysis:
    - ★ *Downgrade*: [+1,+30].
    - ★ *pre – Downgrade*: [-180,-90].
    - ★ *post – Downgrade*: [+90,+180].

# Electronic Trading around Stress Periods

*Panel A. Comparing with e-trading in the same bonds before rating downgrade*

	N	Downgraded Bonds over [+1,+30]	Downgraded Bonds over [-180,-90]	Test on Difference	
				Difference	p-value
E-share in volume (%)	490	7.92	11.52	-3.60	0.00
E-share in number of trades (%)	490	8.68	13.17	-4.49	0.00

*Panel B. Comparing with e-trading in the same bonds after rating downgrade*

	N	Downgraded Bonds over [+1,+30]	Downgraded Bonds over [+90,+180]	Test on Difference	
				Difference	p-value
E-share in volume (%)	474	7.34	9.11	-1.77	0.03
E-share in number of trades (%)	474	8.66	10.10	-1.44	0.00

*Panel C. Comparing with e-trading in similar bonds at the same time*

	N	Downgraded Bonds over [+1,+30]	Control Bonds over [+1,+30]	Test on Difference	
				Difference	p-value
E-share in volume (%)	498	7.64	9.76	-2.12	0.00
E-share in number of trades (%)	498	8.61	14.11	-5.50	0.00

# Electronic Trading around Stress Periods

- How does electronic trading affect transaction costs during stress times?
- Panel regression with fixed effects for each subsample:

$$Cost_{i,t,s,d} = \beta * E - Share_{i,t,s,d} + \mu_{i,t,s} + \mu_d$$

	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
	<b>Downgraded Bonds over [+1,+30]</b>	<b>Downgraded Bonds over [-180,-90]</b>	<b>Downgraded Bonds over [+90,+180]</b>	<b>Control Bonds over [+1,+30]</b>
E-Share	-15.759 (-1.14)	-40.464*** (-3.85)	-31.012** (-2.41)	-28.804** (-2.26)
Dealer FE	Yes	Yes	Yes	Yes
Bond-Day-Size FE	Yes	Yes	Yes	Yes

# Conclusions

- Electronic trading in corporate bonds has been growing but remains fairly small and segmented.
  - ▶ Most of the growth has been in smaller sized trades in investment-grade bonds.
  - ▶ Not much evidence of trade shredding as in other financial markets.
- Electronic trading has had wide-ranging effects on transactions costs and execution quality in both electronic and voice trading.
  - ▶ Electronic trading provides information, reduces search costs and increases dealer competition.
- Special features of the bond markets have and may continue to limit the growth of electronic bond trading.
  - ▶ Markets are dominated by a small number of large dealers.
  - ▶ Effects of electronic trading are mainly observed in smaller sized trades.
  - ▶ Electronic trading is not robust across stress periods.