

Exchange-traded funds and municipal bond market

Viet-Dung Doan

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Motivation

Municipal bond market is

- Illiquid:
 - Municipal bonds: Amihud 3.34% per \$1 mil transaction (Schwert 2017)
 - Corporate bonds: Amihud 0.20% per \$1 mil transaction (Dannhauser 2017)
- Opaque:
 - 80% of muni bonds are not traded in a given month
⇒ No price observed

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Observation 1: High bargaining power of dealers over customers

What is special about ETFs?

- Possibility to invest in illiquid assets
- Intra-day trading of ETF shares
- Higher price discovery (Wermers & Xue 2015; Glosten, Nallareddy & Zou 2016)
- Daily holding disclosure

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Observation 2: ETF daily disclosure provides pricing information of the constituents

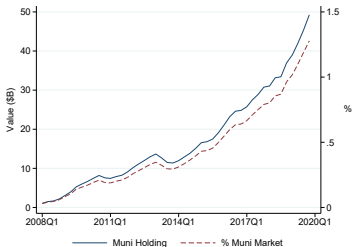
Breakdown of 2019Q4 US municipal bond holders¹

- Households and nonprofit: 49.1%
- Mutual funds: 21.6%
- Insurance companies: 12.9%
- ...
- **ETFs: 1.3%**

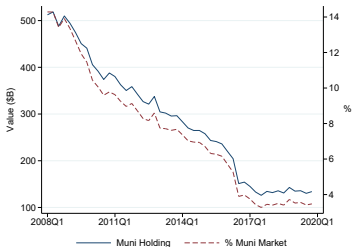
¹Source: Flow of Funds

Motivation

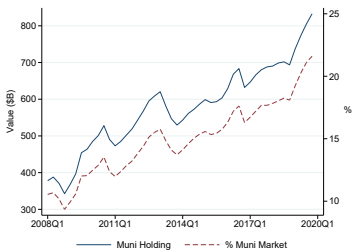
Exchange-traded Funds



Money Market Funds



Open-end Funds



Closed-end Funds



Do ETFs affect the pricing and trading of municipal bonds?

If so, through which channel?

Secondary Market

1. ETF holding is associated with declining bond price dispersion
2. Stronger effect for
 - Retail-sized trades
 - Bonds held by ETFs with higher disclosure quality
 - Bonds associated with higher uncertainty
3. Higher liquidity and trading activity
4. Lower dealer profit and dealer inventory imbalance

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Evidence is supportive of information channel: pricing information from ETF disclosure improves market transparency

Primary Market

Bonds issued by municipalities with other outstanding ETF-held bonds have:

1. Lower price dispersion in the first month after issuance
2. Lower yield, higher offering price and reoffering price
⇒ Extra financing of \$940,000 per county-year (conditional on having issuance)

Related Literature

Trading in OTC markets

- Bid-ask spread increases in asymmetric information (Glosten & Milgrom 1985, Kyle 1985)
- and decreases when search frictions are lower (Duffie et al 2005, 2007; Lagos & Rocheteau 2009)
 - but depends on investors' sophistication and access to other dealers
- Price dispersion decreases in market transparency (De Frutos & Manzano 2005)
- With higher transparency, liquidity is:
 - Lower due to shrinking dealer profit (Duffie et al 2005)
 - Higher due to lower adverse selection problem (Naik et al 1999)

Muni bond trading

- Dealers' high bargaining power (Green et al 2007)
- Higher bargaining power for investors with more timely information: Cuny (2018), Chalmers et al (2020)
- Dealer network: Li & Schürhoff (2019)

Muni bond issuance

- Underpricing and high price dispersion: Green et al (2007), Schultz (2012)
- Determinants of borrowing cost: Dagostino (2019), Gao et al (2019 x2)

Effect of ETFs on assets

- Higher price discovery: Lettau & Madhavan (2018), Madhavan (2016), etc.
- Higher price: Dannhauser (2017)
- Increased return comovement: Da & Shive (2014)
- Lower future earnings response coefficients: Israeli, Lee & Sridharan (2017)
- Lower liquidity: Dannhauser (2017), Pan & Zeng (2019)
- Higher volatility: Ben-David et al (2018)
- Increased fragility through herding: Bhattacharya & O'Hara (2018)

Data

- Morningstar Mutual Fund Database
 - Monthly holdings
- Municipal Securities Rulemaking Board (MSRB)
 - All municipal security transactions since 2005
- Capital IQ
 - Bond characteristics
- Sample period: 2010-2019
 - Fixed-rate, federal-tax-exempt, AMT-free bonds with maturity ≥ 1 year
 - Exclude trades within six months of dated date/maturity date/refunded date/call date

Whether investors can learn about bond prices through ETFs

	Secondary Market	Primary Market
What to Measure	Whether the bond is held by any ETFs in a month	Whether the municipality has other outstanding bonds held by ETFs around issuance month
How to Measure	<ol style="list-style-type: none">1. Yes/No2. ETF share / Offer amount3. # ETFs holding the bond4. ETF disclosure quality	<ol style="list-style-type: none">1. Yes/No2. Aggregate ETF share / Aggregate offer amount3. # ETFs holding other bonds

Bond price dispersion

$$PriceDispersion_{b,t} = \sqrt{\frac{1}{N_{b,t}} \sum_k \left(\frac{P_{b,k,d} - M_{b,d}}{M_{b,d}} \right)^2}$$

- Monthly average relative distance between each trade price P and the EOD price M on the same trade date

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- Monthly average relative distance between each trade price P and the EOD price M on the same trade date

Other variables

- Liquidity
- Trading activity
- Issuance characteristics

Hypotheses

- Bond price dispersion decreases when held by ETFs
- The effect is stronger for retail investors who benefit more from improved market transparency

Regression Specification

$$Y_{b,t} = \alpha_b + \delta_t + \gamma_r + \beta \times \text{ETFHoldings}_{b,t} + \eta' X_{b,t} + \varepsilon_{b,t}$$

Summary Statistics: Primary Market

	N	Mean	Stdev	25th	50th	75th
ETF Holding	1,166,610	0.16	0.37	0.00	0.00	0.00
ETF Share (%)	1,166,610	0.80	2.54	0.00	0.00	0.00
# Holding ETFs	1,166,610	0.77	2.52	0.00	0.00	0.00
MF Holding	1,166,610	0.44	0.50	0.00	0.00	1.00
MF Share (%)	1,166,610	18.81	25.78	0.00	0.00	36.46
# Holding MFs	1,166,610	7.13	20.15	0.00	0.00	4.00
Offer Yield (%)	1,160,665	2.48	1.10	1.65	2.41	3.20
Yield Spread (%)	1,160,602	0.44	0.63	0.02	0.36	0.78
Offer Price (\$)	1,161,398	105.81	7.38	100.00	103.13	110.33
Reoffering Price (\$)	563,773	107.21	7.82	100.07	104.87	112.98
Trade Price Dispersion (\$)	250,875	0.62	0.51	0.20	0.56	0.90
Offer Coupon (%)	1,166,226	3.50	1.20	2.75	3.50	4.50
Offer Amount (\$m)	1,166,610	2.87	17.65	0.29	0.66	1.84
Maturity(yrs)	1,166,610	9.99	6.31	5.00	8.97	13.98
Callable	1,165,580	0.48	0.50	0.00	0.00	1.00
GO Bond	1,166,605	0.56	0.50	0.00	1.00	1.00
Bank Qualified	1,166,598	0.42	0.49	0.00	0.00	1.00
Rating ²	903,351	2.44	1.79	1.00	2.00	3.00

²Lower value indicates better rating.

Summary Statistics: Secondary Market³

	N	Mean	Stdev	25th	50th	75th
ETF Holding	9,923,299	0.08	0.27	0.00	0.00	0.00
ETF Share (%)	9,923,299	0.35	2.10	0.00	0.00	0.00
# Holding ETFs	9,923,299	0.12	0.46	0.00	0.00	0.00
MF Holding	9,923,299	0.23	0.42	0.00	0.00	0.00
MF Share (%)	9,923,299	7.72	21.04	0.00	0.00	0.00
# Holding MFs	9,923,299	0.56	1.86	0.00	0.00	0.00
Explicit Price Disclosure	806,177	0.58	0.49	0.00	1.00	1.00
Implicit Price Disclosure	806,177	0.82	0.38	1.00	1.00	1.00
Price Dispersion (%)	9,663,482	1.34	1.26	0.50	1.02	1.75
Price Dispersion Retail (%)	8,505,564	1.43	1.29	0.58	1.11	1.84
Price Dispersion Inst (%)	2,829,937	0.94	1.11	0.21	0.54	1.27
Amihud (% per \$m)	7,431,105	8.45	10.13	0.53	4.69	12.49
IRC (%)	2,553,741	0.80	0.93	0.11	0.37	1.22
Roll (\$)	3,766,183	1.24	1.17	0.32	0.95	1.87
Turnover (%)	9,923,299	16.10	40.03	1.10	3.37	11.11
# Trading Days	9,923,299	2.45	2.15	1.00	2.00	3.00

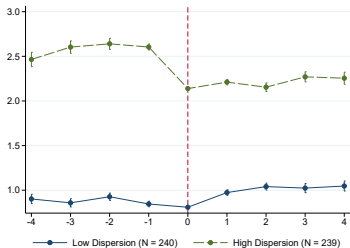
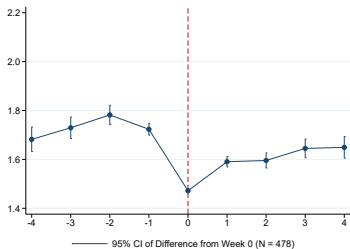
³Conditional on having at least one trade

Price Dispersion of ETF-held Bonds

Experiment: First Week a Bond is Held by any ETF

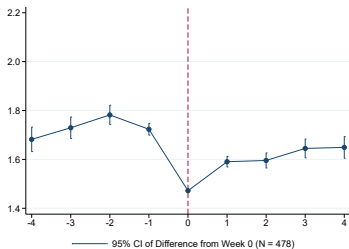
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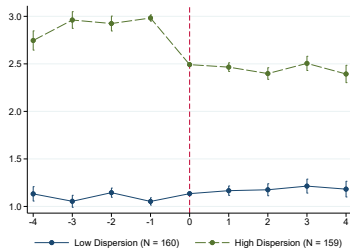
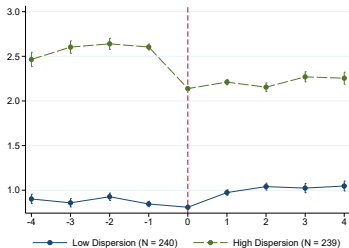
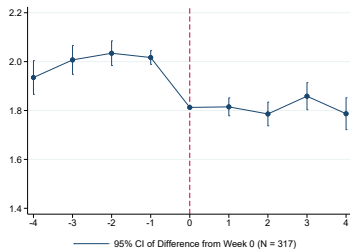


Experiment: First Week a Bond is Held by any ETF

Price Dispersion (%)



Retail Price Dispersion (%)



Baseline Result: Price Dispersion and ETF Holdings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ETF Holding _{b,t}	-0.025*** (0.005)	-0.071*** (0.017)	-0.056*** (0.015)						
MF Holding _{b,t}	0.024*** (0.006)	-0.018 (0.014)	0.013 (0.013)						
ETF Share (%) _{b,t}				-0.001 (0.000)	-0.001 (0.002)	-0.002 (0.001)			
MF Share (%) _{b,t}				0.001*** (0.000)	-0.001 (0.001)	-0.000 (0.001)			
Ln(# ETFs) _{b,t}							-0.022*** (0.005)	-0.051*** (0.018)	-0.055*** (0.015)
Ln(# MFs) _{b,t}							0.021*** (0.005)	-0.112*** (0.021)	-0.058*** (0.019)
Price Stdev _{b,t-1}	0.539*** (0.010)			0.538*** (0.010)			0.538*** (0.010)		
Observations	481,414	508,659	508,659	481,414	508,659	508,659	481,414	508,659	508,659
Adjusted R ²	0.64	0.56	0.60	0.64	0.56	0.60	0.64	0.56	0.60
Bond FEs		✓	✓		✓	✓		✓	✓
Year-Month FEs	✓		✓	✓		✓	✓		✓
Rating FEs	✓	✓	✓	✓	✓	✓	✓	✓	✓

Concerns

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Solutions

- Retail and institutional trades should be affected differently
- Variation in the quality of ETF daily disclosure
- Bonds with more uncertainty should benefit more

Stronger Effect on Retail Trades

Institutional-sized trades (\geq \$100,000) versus retail-sized trades ($<$ \$100,000)

	Institutional trades			Retail trades		
	(1)	(2)	(3)	(4)	(5)	(6)
ETF Holding $_{b,t}$	-0.023** (0.010)	-0.079*** (0.021)	-0.058*** (0.019)	-0.030*** (0.011)	-0.106*** (0.023)	-0.078*** (0.022)
MF Holding $_{b,t}$	0.020 (0.013)	-0.041*** (0.016)	-0.016 (0.014)	0.018 (0.013)	-0.008 (0.017)	0.023 (0.016)
Price Stdev $_{b,t-1}$	0.534*** (0.019)			0.627*** (0.017)		
Observations	40,591	116,758	116,758	40,591	116,758	116,758
Adjusted R^2	0.64	0.56	0.60	0.75	0.63	0.66
Bond Controls	✓	✓	✓	✓	✓	✓
Bond FEs		✓	✓		✓	✓
Year-Month FEs	✓		✓	✓		✓
Rating FEs	✓	✓	✓	✓	✓	✓

Stronger Effect when Average Trade Size is Smaller

	Equal weighted			Value weighted (by $\sqrt{\# Trades}$)		
	(1)	(2)	(3)	(4)	(5)	(6)
ETF Holding _{b,t}	0.012 (0.012)	-0.010 (0.009)	-0.041*** (0.008)	0.000 (0.018)	-0.023* (0.012)	-0.048*** (0.011)
MF Holding _{b,t}	-0.110*** (0.009)	-0.025*** (0.008)	-0.004 (0.008)	-0.114*** (0.010)	-0.016* (0.009)	0.002 (0.009)
ETF Holding × # Retail Fraction _{b,t}	-0.039*** (0.013)			-0.035** (0.018)		
MF Holding × # Retail Fraction _{b,t}	0.142*** (0.009)			0.154*** (0.010)		
ETF Holding × Par Retail Fraction _{b,t}	-0.016** (0.007)			-0.009 (0.009)		
MF Holding × Par Retail Fraction _{b,t}	0.049*** (0.005)			0.045*** (0.006)		
ETF Holding × Ln(Average Par) _{b,t}				0.129*** (0.017)		
MF Holding × Ln(Average Par) _{b,t}				0.047*** (0.015)		
Observations	1,696,141	1,696,141	1,696,141	1,696,141	1,696,141	1,696,141
Adjusted R ²	0.59	0.58	0.58	0.59	0.58	0.58
Bond Controls	✓	✓	✓	✓	✓	✓
Bond FEs	✓	✓	✓	✓	✓	✓
Year-Month FEs	✓	✓	✓	✓	✓	✓
Rating FEs	✓	✓	✓	✓	✓	✓

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Bond Controls	✓	✓	✓	✓	✓	✓
Bond FEs	✓	✓	✓	✓	✓	✓
Year-Month FEs	✓	✓	✓	✓	✓	✓
Rating FEs	✓	✓	✓	✓	✓	✓

Stronger Effect when ETFs Disclose Better Information

Whether investors can learn the bond price, either explicitly or implicitly through calculation, from ETF disclosure

	All trades			Institutional trades			Retail trades		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Implicit Price Disclosure _{b,t}	-0.105*** (0.031)		-0.054* (0.029)	-0.089** (0.038)		-0.033 (0.038)	-0.094** (0.047)		-0.024 (0.046)
Explicit Price Disclosure _{b,t}		-0.163*** (0.037)	-0.142*** (0.036)		-0.162*** (0.044)	-0.149*** (0.045)		-0.195*** (0.056)	-0.185*** (0.056)
MF Holding _{b,t}	0.010 (0.016)	0.008 (0.016)	0.009 (0.016)	0.021 (0.019)	0.019 (0.019)	0.020 (0.019)	0.046** (0.019)	0.044** (0.019)	0.044** (0.019)
Observations	153,233	153,233	153,233	53,369	53,369	53,369	53,369	53,369	53,369
Adjusted R ²	0.69	0.69	0.69	0.64	0.64	0.64	0.70	0.70	0.70
Bond Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bond FEs	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year–Month FEs	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rating FEs	✓	✓	✓	✓	✓	✓	✓	✓	✓

Stronger Effect on Bonds with More Uncertainty: Rating

	All (1)	Institutional (2)	Retail (3)
ETF Holding _{b,t}	-0.023 (0.023)	-0.029 (0.029)	0.007 (0.032)
MF Holding _{b,t}	0.097*** (0.025)	0.108*** (0.028)	0.136*** (0.031)
ETF Holding × Rating _{b,t}	-0.009 (0.007)	-0.008 (0.007)	-0.019** (0.008)
MF Holding × Rating _{b,t}	-0.019*** (0.007)	-0.031*** (0.008)	-0.029*** (0.009)
Observations	359,966	83,539	83,539
Adjusted R ²	0.61	0.62	0.68
Bond Controls	✓	✓	✓
Bond FEs	✓	✓	✓
Year–Month FEs	✓	✓	✓
Rating FEs	✓	✓	✓

Stronger Effect on Bonds with More Uncertainty: Maturity

	All (1)	Institutional (2)	Retail (3)
ETF Holding _{b,t}	0.085* (0.045)	0.153*** (0.051)	0.111* (0.064)
MF Holding _{b,t}	-0.001 (0.037)	-0.022 (0.043)	-0.085* (0.046)
ETF Holding × Ln(Maturity) _{b,t}	-0.055*** (0.018)	-0.078*** (0.021)	-0.070** (0.027)
MF Holding × Ln(Maturity) _{b,t}	0.006 (0.014)	0.002 (0.017)	0.042** (0.019)
Ln(Maturity) _{b,t}	-0.066 (0.046)	-0.206*** (0.044)	0.034 (0.060)
Observations	508,659	116,758	116,758
Adjusted R ²	0.60	0.60	0.66
Bond Controls	✓	✓	✓
Bond FEs	✓	✓	✓
Year–Month FEs	✓	✓	✓
Rating FEs	✓	✓	✓

Stronger Effect on Bonds with More Uncertainty: GO versus Revenue Bonds

	All (1)	Institutional (2)	Retail (3)
ETF Holding _{b,t}	-0.068*** (0.016)	-0.073*** (0.022)	-0.107*** (0.026)
MF Holding _{b,t}	0.018 (0.015)	-0.021 (0.018)	0.034 (0.021)
ETF Holding × GO Bond _{b,t}	0.050* (0.027)	0.053* (0.028)	0.108*** (0.032)
MF Holding × GO Bond _{b,t}	-0.017 (0.025)	0.014 (0.025)	-0.031 (0.032)
Observations	508,659	116,758	116,758
Adjusted R ²	0.60	0.60	0.66
Bond Controls	✓	✓	✓
Bond FEs	✓	✓	✓
Year–Month FEs	✓	✓	✓
Rating FEs	✓	✓	✓

Liquidity of ETF-held Bonds

(II)liquidity Measures

- Amihud (2002)
- Imputed Round-trip Cost (Feldhütter 2012)
- Roll (1984)
- and Price Dispersion (Jankowitsch et al 2011)

Trading Activity Measures

- Turnover
- Number of days with trades

ETF-held Bonds Have Lower Illiquidity Measures

	Amihud (% per \$m)			IRC (%)			Roll (\$)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ETF Holding _{b,t}	-0.371*** (0.030)	-0.214*** (0.037)	-0.184*** (0.036)	-0.043*** (0.007)	0.009 (0.010)	0.001 (0.009)	-0.058*** (0.005)	0.003 (0.007)	-0.001 (0.006)
MF Holding _{b,t}	-0.477*** (0.025)	0.043 (0.038)	0.080** (0.037)	-0.054*** (0.006)	-0.057*** (0.009)	-0.041*** (0.008)	-0.074*** (0.005)	-0.011* (0.006)	-0.002 (0.005)
Amihud _{b,t-1}	0.081*** (0.001)								
IRC _{b,t-1}				0.366*** (0.004)					
Roll _{b,t-1}							0.158*** (0.003)		
Observations	912,614	1,199,416	1,199,416	247,244	482,010	482,010	774,366	1,202,154	1,202,154
Adjusted R ²	0.08	0.12	0.13	0.50	0.49	0.51	0.30	0.33	0.34
Bond Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bond FEs		✓	✓		✓	✓		✓	✓
Year-Month FEs	✓		✓	✓		✓	✓		✓
Rating FEs	✓	✓	✓	✓	✓	✓	✓	✓	✓

... and Higher Trading Activity

	Turnover (%)			Ln(# Trading Days)		
	(1)	(2)	(3)	(4)	(5)	(6)
ETF Holding _{b,t}	4.217*** (0.159)	0.509*** (0.098)	0.464*** (0.096)	0.069*** (0.003)	0.027*** (0.003)	0.023*** (0.003)
MF Holding _{b,t}	4.610*** (0.088)	-1.412*** (0.221)	-1.396*** (0.224)	-0.044*** (0.001)	-0.026*** (0.002)	-0.025*** (0.002)
Turnover _{b,t-1}	0.266*** (0.005)					
Ln(# Trading Days) _{b,t-1}				0.134*** (0.001)		
Observations	9,622,305	9,607,523	9,607,523	9,622,305	9,607,523	9,607,523
Adjusted R ²	0.18	0.45	0.45	0.28	0.36	0.36
Bond Controls	✓	✓	✓	✓	✓	✓
Bond FEs		✓	✓		✓	✓
Year-Month FEs	✓		✓	✓		✓
Rating FEs	✓	✓	✓	✓	✓	✓

Dealer Activity

Lower Dealer Markup for ETF-held Bonds

	Dependent Variable: Average Dealer Markup (%)			
	(1)	(2)	(3)	(4)
ETF Holding _{b,t}	-0.029** (0.013)	0.040* (0.021)	-0.017 (0.014)	-0.045*** (0.013)
MF Holding _{b,t}	-0.029** (0.011)	-0.273*** (0.019)	-0.099*** (0.012)	-0.016 (0.012)
ETF Holding × # Retail Fraction _{b,t}		-0.085*** (0.023)		
MF Holding × # Retail Fraction _{b,t}		0.306*** (0.020)		
ETF Holding × Par Retail Fraction _{b,t}			-0.022** (0.010)	
MF Holding × Par Retail Fraction _{b,t}			0.131*** (0.010)	
ETF Holding × Ln(Average Par) _{b,t}				0.098*** (0.026)
MF Holding × Ln(Average Par) _{b,t}				-0.102*** (0.026)
Observations	362,292	362,292	362,292	362,292
Adjusted R ²	0.67	0.68	0.68	0.68
Bond Controls	✓	✓	✓	✓
Bond FEs	✓	✓	✓	✓
Year-Month FEs	✓	✓	✓	✓
Rating FEs	✓	✓	✓	✓

ETF-held Bond Trades are Less Likely Completely Unwound

Whether a bond sale is completely passed through dealers to new customers

	Same day (%) (1)	One week (%) (2)	One month (%) (3)	# Days until filled (4)
ETF Holding _{b,t}	-0.833*** (0.273)	-0.326* (0.187)	-0.192** (0.087)	0.057* (0.029)
MF Holding _{b,t}	-0.445 (0.287)	-0.636*** (0.196)	-0.056 (0.085)	0.062** (0.031)
Observations	377,943	377,943	377,943	377,034
Adjusted R ²	0.19	0.19	0.21	0.18
Bond Controls	✓	✓	✓	✓
Bond FEs	✓	✓	✓	✓
Year-Month FEs	✓	✓	✓	✓
Rating FEs	✓	✓	✓	✓

Lower Overnight Inventory Imbalance for ETF-held Bonds

	Average daily Δ Inventory (%)			Cumulative monthly Δ Inventory (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
ETF Holding _{b,t}	-0.038*** (0.004)	-0.031*** (0.004)	-0.031*** (0.004)	-0.128*** (0.016)	-0.156*** (0.019)	-0.159*** (0.019)
MF Holding _{b,t}	-0.054*** (0.003)	-0.063*** (0.005)	-0.064*** (0.005)	-0.195*** (0.014)	-0.205*** (0.020)	-0.207*** (0.020)
Observations	995,678	933,239	933,239	995,678	933,239	933,239
Adjusted R^2	0.02	0.11	0.11	0.01	0.07	0.07
Bond Controls	✓	✓	✓	✓	✓	✓
Bond FEs		✓	✓		✓	✓
Year-Month FEs	✓		✓	✓		✓
Rating FEs	✓	✓	✓	✓	✓	✓

Lower Overnight Inventory Imbalance for ETF-held Bonds

	Average daily Δ Inventory (%)			Cumulative monthly Δ Inventory (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
ETF Holding _{b,t}	-0.038*** (0.004)	-0.031*** (0.004)	-0.031*** (0.004)	-0.128*** (0.016)	-0.156*** (0.019)	-0.159*** (0.019)
MF Holding _{b,t}	-0.054*** (0.003)	-0.063*** (0.005)	-0.064*** (0.005)	-0.195*** (0.014)	-0.205*** (0.020)	-0.207*** (0.020)
Observations	995,678	933,239	933,239	995,678	933,239	933,239
Adjusted R^2	0.02	0.11	0.11	0.01	0.07	0.07
Bond Controls	✓	✓	✓	✓	✓	✓
Bond FEs		✓	✓		✓	✓
Year-Month FEs	✓		✓	✓		✓
Rating FEs	✓	✓	✓	✓	✓	✓

Main Takeaway

- Dealers are less profitable when trading on bonds held by ETFs
- Dealer activity declines for ETF-held bonds

Primary Market of Muni Bonds

Valuation of Newly-Issued Bonds

Higher valuation for bonds issued by municipalities with outstanding ETF-held bonds

	Yield Spread (%) (1)	Offer Price (\$) (2)	Reoffering Price (\$) (3)	UW Spread (\$) (4)	Price Dispersion (\$) (5)
ETF Holding _{<i>i,t-1</i>}	-0.025** (0.010)	0.591*** (0.085)	0.494*** (0.088)	-0.001** (0.000)	-0.020*** (0.007)
MF Holding _{<i>i,t-1</i>}	-0.008 (0.006)	0.037 (0.044)	0.053 (0.064)	0.000 (0.000)	-0.005 (0.006)
Offer Coupon _{<i>b</i>}	-0.065*** (0.004)	4.937*** (0.109)	5.112*** (0.122)	-0.001*** (0.000)	-0.048*** (0.003)
Ln(Maturity) _{<i>b</i>}	0.312*** (0.012)	-0.951*** (0.167)	-0.359* (0.197)	0.001*** (0.000)	0.326*** (0.008)
Ln(Offer Amount) _{<i>b</i>}	0.045*** (0.003)	-0.080* (0.041)	-0.352*** (0.051)	0.000 (0.000)	0.028*** (0.003)
Callable _{<i>b</i>}	0.188*** (0.008)	-4.089*** (0.063)	-4.194*** (0.081)	-0.004*** (0.000)	-0.001 (0.007)
GO Bond _{<i>b</i>}	-0.020*** (0.005)	0.296*** (0.049)	0.205** (0.084)	-0.000 (0.000)	0.009 (0.009)
Bank Qualified _{<i>b</i>}	-0.204*** (0.008)	0.970*** (0.075)	0.937*** (0.084)	-0.001*** (0.000)	-0.093*** (0.008)
Coincident Index Growth (%) _{<i>s,y-1</i>}	0.009 (0.015)	-0.027 (0.084)	-0.120 (0.112)	-0.000 (0.000)	0.001 (0.010)
Observations	896,645	896,853	441,756	441,756	209,856
Adjusted R ²	0.78	0.75	0.75	0.12	0.23
Issuer FEs	✓	✓	✓	✓	✓
Year-Month FEs	✓	✓	✓	✓	✓
Rating FEs	✓	✓	✓	✓	✓

Price Dispersion of Newly-Issued Bonds

Stronger effect on retail-sized trades, just as in secondary market

	All (1)	Institutional (2)	Retail (3)
ETF Holding $_{i,t-1}$	-0.032* (0.019)	0.001 (0.022)	-0.045** (0.020)
MF Holding $_{i,t-1}$	0.024 (0.027)	0.041 (0.034)	0.024 (0.030)
Offer Coupon $_b$	-0.061*** (0.006)	-0.094*** (0.007)	-0.057*** (0.007)
Ln(Maturity) $_b$	0.314*** (0.024)	0.386*** (0.022)	0.252*** (0.023)
Ln(Offer Amount) $_b$	0.009 (0.007)	0.005 (0.008)	0.011 (0.007)
Callable $_b$	0.047* (0.025)	0.078*** (0.019)	0.044* (0.024)
GO Bond $_b$	-0.020 (0.036)	-0.023 (0.039)	-0.023 (0.032)
Bank Qualified $_b$	-0.152*** (0.056)	-0.148* (0.077)	-0.183*** (0.058)
Coincident Index Growth (%) $_{s,y-1}$	-0.042 (0.030)	-0.030 (0.035)	-0.023 (0.031)
Observations	10,725	10,725	10,725
Adjusted R^2	0.43	0.40	0.33
Issuer FEs	✓	✓	✓
Year-Month FEs	✓	✓	✓
Rating FEs	✓	✓	✓

Estimated Extra Financing

- Coefficient estimate: 60 cents higher offering price per \$100 par amount
- Conditional on having at least one issue, an average municipality issues 13 bonds per year with total offer amount \$39 mil
- Extra financing \approx \$230,000 per year
- County-level: \$940,000 per year

Conclusion

- Positive effects of ETFs on municipal bonds
 - Lower price dispersion, higher liquidity, and higher valuation
- Both primary market and secondary market are affected
- Stronger effect on retail trades and on bonds associated with higher uncertainty
- Dealer profit margin and activity decline
- Consistent with **information channel**: Market transparency due to ETF holding disclosure improves customers' bargaining power over dealers