The Impact of the Shadow Banking Sector on Public Finance

Chuck Boyer and Kelly Posenau

University of Chicago

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Motivation

- Tax-exempt money market fund (MMF) sector held about 7% of municipal bond market prior to 2016.
  - Much more concentrated ownership of variable and short-term municipal market.
- Could this be a problem?
  - MMF shares treated like "demandable deposits": potential source of shock transmission.
  - Short-term rate spikes and liquidity issues may appear more quickly in balance sheets, especially for securities with embedded put options.

Research Question: How do shocks to clientele demand affect municipal borrowing costs?

What We Do

Use the 2016 SEC money market mutual fund (MMF) reform to study how shocks and frictions in money markets affect municipal financing.

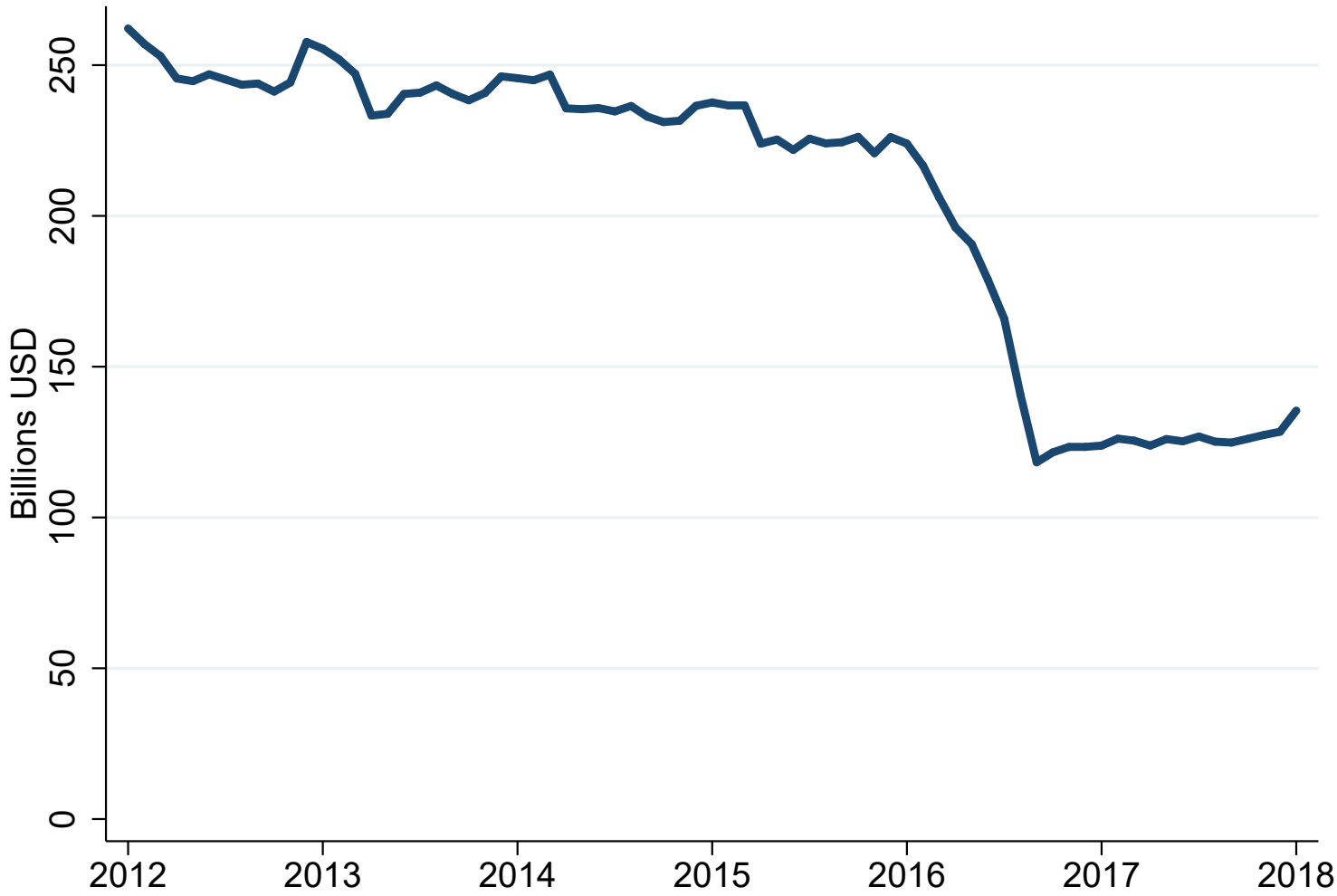
- We exploit the reform's differential treatment of institutional and retail funds in a differences-in-differences approach to estimate the causal effect of the reform on borrowing costs.
- Provide correlational evidence on characteristics of issuers and securities were most affected.

More broadly: describe the variable rate and short-term tax-exempt sector.

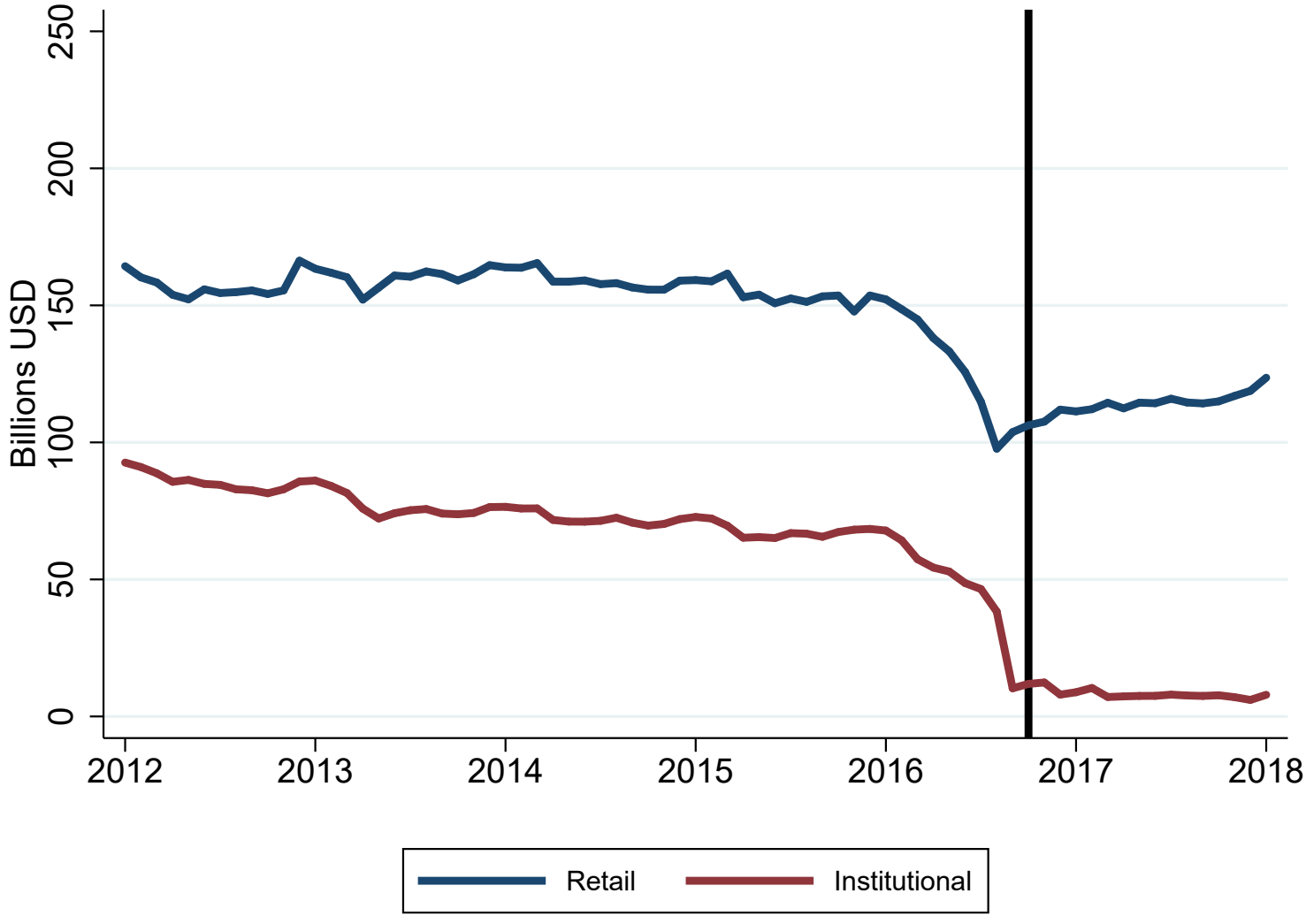
Background: MMF Reform

- In 2014, SEC announces series of reforms for MMFs.
  - Reforms were meant to make funds more "safe".
  - Prevent run-like activity seen during financial crisis, when Reserve Primary fund "broke the buck".
- Instituted floating net asset values (NAVs) and redemption fees/gates.
  - Institutional Tax-Exempt MMF: Floating NAV, Redemption Fees and Gates
  - Retail Tax-Exempt MMF: Redemption Fees and Gates
- Reforms went into effect in October 2016.
- Main critique: Reduce demand from prominent clientele $\Rightarrow$ higher borrowing costs.

Total Tax-Exempt MMF AUM



Retail and Institutional AUM



Empirical Strategy

- Treat reform as exogenous shock to demand for municipal debt.
- Some issuers more exposed to demand shock based on institutional vs. retail holdings.
  - Exposure: Share of total MMF borrowing in inst. funds.
  - Reliance: Share of total issuance held by inst. funds.
- Difference-in-difference regression analysis to tease out causal effects of the policy.
- Rules out alternative hypotheses that do not correlate with exposure/reliance.

Overview of Results

1. **How did the SEC reform affect the muni market?**
   More exposed issuers experienced on average:
   - decrease in MMF lending
   - increase in MMF borrowing costs
   - increase in borrowing costs of *all new issues*

   Importance of relationships in municipal markets
2. **What issuers were most affected?**
   - Most affected: small issuers, hospitals, housing authorities, and private issuers
   - Least affected: large issuers, cities, and states

   Informational frictions

Contributions: frictions in MMF lending, asset-specific demand, determinants of municipal bond yields

Data: 2012-2017

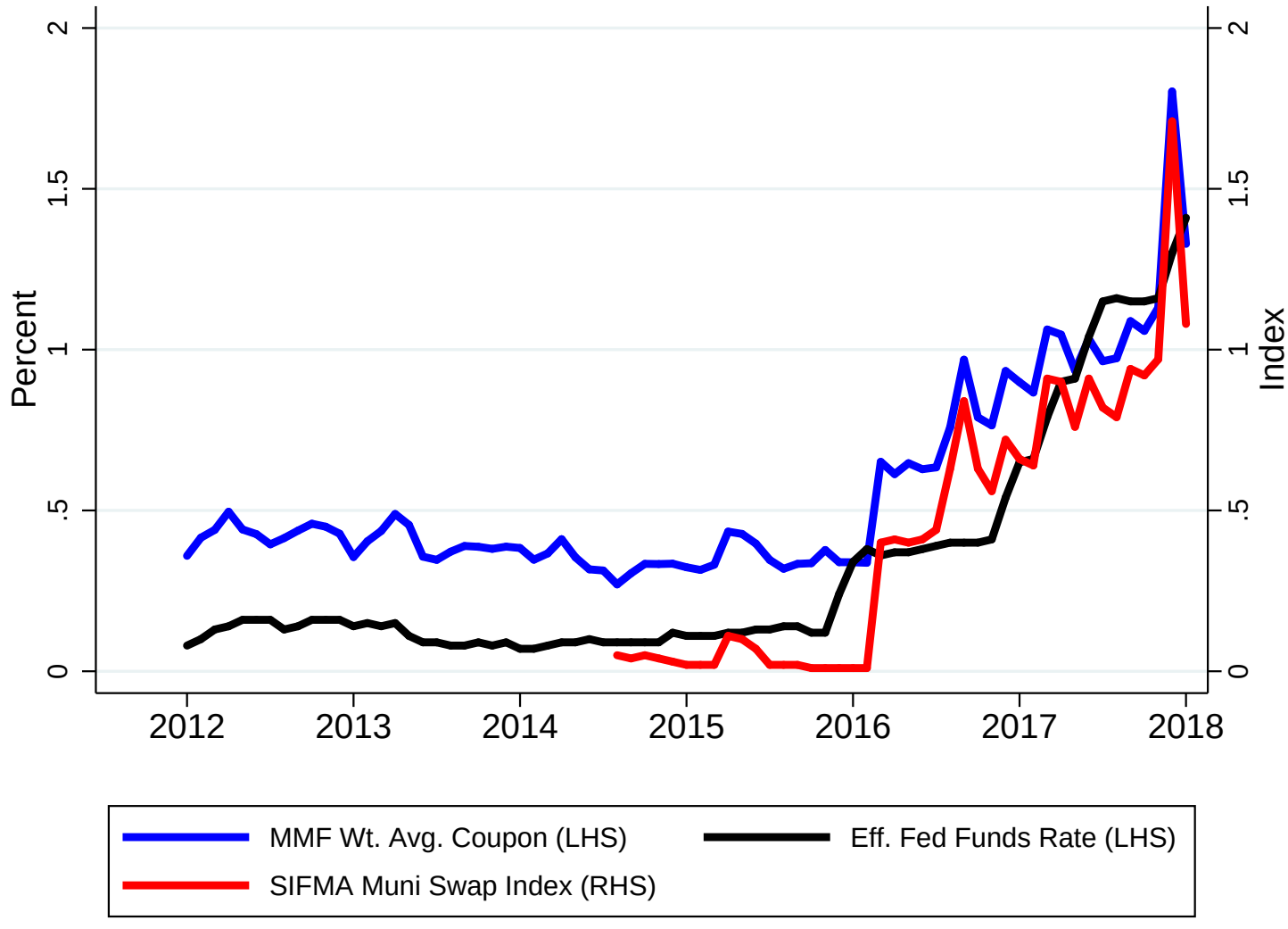
1. MMF monthly portfolio holdings and coupon rates: Crane Data
2. Share class designation: CRSP & fund prospectuses
3. Municipal bond issuance characteristics: Mergent
4. Issuer/obligor characteristics: Atlas Muni

Portfolio Composition of Tax-Exempt MMFs

1. Variable rate demand obligations - **55% AUM on Average**
2. Tender option bond floating notes - **18% AUM on Average**
3. Commercial paper - **7% AUM on Average**
4. Anticipation notes - **8% AUM on Average**
5. Other notes, certificates, warrants - **2% AUM on Average**
6. Other bonds - **7% AUM on Average**

Sectors: hospitals, private, housing authorities, states, and cities.

2016 SEC Reform: Broad Price Impact



MMF Lending

$$Y_{c,i,t} = \alpha + \beta Post_t \times \text{Inst. Exposure}_{i,2015} + \gamma Post_t + \lambda \text{Inst. Exposure}_i + \epsilon_{c,i,t}$$

- $Y_{c,i,t}$ is the log of holding value or the coupon rate on CUSIP c, issued by i, at time t **in MMF portfolios**.
- Inst. Exposure is the fraction of the holdings by an issuer that were held by institutional funds in 2015.
- Post is indicator for whether observation is after 2015.

MMF Lending Results

VARIABLES	(1) Log Value	(2) Log Value	(3) Log Value	(4) Coupon	(5) Coupon	(6) Coupon
Post × Inst. Exposure (2015)	0.148***	-0.309***	-0.207**	0.189***	0.287***	0.302***
	(0.0508)	(0.0794)	(0.0824)	(0.0539)	(0.0885)	(0.0897)
Post	0.133***	0.178***	0.223***	-0.0165	0.156***	0.0132
	(0.0221)	(0.0329)	(0.0346)	(0.0330)	(0.0485)	(0.0496)
Inst. Exposure (2015)	-0.396***	-0.159*	-0.222***	-0.523***	-0.483***	-0.507***
	(0.0721)	(0.0815)	(0.0788)	(0.0877)	(0.108)	(0.106)
Constant	15.97***	15.99***	15.95***	1.002***	0.949***	1.017***
	(0.0389)	(0.0421)	(0.0409)	(0.0585)	(0.0651)	(0.0651)
Observations	220,228	15,907	18,340	220,222	15,907	18,340
R-squared	0.008	0.004	0.007	0.008	0.014	0.009
FE	None	None	None	None	None	None
Cluster	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer
Sample	2015-2016	EOY 2015/2016	Q4 Avg 2015/2016	2015-2016	EOY 2015/2016	Q4 Avg 2015/2016

Clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Effect on New Issues

$$Y_{d,i,t} = \alpha + \beta Post_t \times \text{Inst Reliance}_{i,2015} + \gamma Post_t + \lambda \text{Inst Reliance}_i + \epsilon_{d,i,t}$$

- Issue-level regression: allows us to be restrictive and control for potential outcomes.
- Y: Log value of issue, coupon rate.
- Post dummy for issues in years after 2015.
- Limit sample to new issues in 2015-2017
- Institutional reliance: average of total borrowing from MMFs in 2015 as a proportion of total Mergent issuance from 2000-2015

Effect on New Issues

VARIABLES	(1) Log Value	(2) Log Value	(3) Log Value	(4) Coupon	(5) Coupon	(6) Coupon
Post × Reliance (inst.)	1.959	2.188*	3.315**	1.980***	1.759***	1.503**
	(1.416)	(1.215)	(1.411)	(0.710)	(0.663)	(0.736)
Post	-0.0158	-0.0360	-0.00832	0.0106	-0.00273	-0.00774
	(0.0360)	(0.0348)	(0.0361)	(0.0274)	(0.0265)	(0.0282)
Reliance (inst)	-2.265	-2.513**	-3.669***	-4.579***	-4.271***	-4.493***
	(1.417)	(1.206)	(1.397)	(0.705)	(0.654)	(0.721)
Maturity (years)		0.0700***	0.0787***		0.0439***	
		(0.00237)	(0.00246)		(0.00285)	
Below Aa			0.432***			-0.0323
			(0.0674)			(0.0520)
Constant	14.57***	13.88***	13.67***	3.743***	3.312***	3.805***
	(0.0419)	(0.0459)	(0.0538)	(0.0307)	(0.0400)	(0.0306)
Observations	107,423	107,423	102,778	105,636	105,636	101,055
R-squared	0.001	0.091	0.113	0.008	0.063	0.008
Cluster	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer
Sample	2015-2017	2015-2017	2015-2017	2015-2017	2015-2017	2015-2017

Clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Overview of Other Results

- Adjustments in issuance
  - **Issuers decreased their share of VRDOs and anticipation notes as percent of total new issuance**
- Cross-sectional decomposition of the effect
  - Greater decrease in MMF lending and increase in borrowing costs for: **Small issuers, hospitals/private/housing authorities, VRDOs and derivatives**
- Demonstration of inelasticity of muni markets
  - **First pass estimates suggest price elasticity for new issues of .02 to .03, probably less!**

Conclusion

- We demonstrate the effects of the 2016 SEC MMF reform on municipal money markets.
  - Document a drop in demand from MMFs for municipal securities that corresponds to an increase in price.
- Find that preexisting relationships were a significant predictor of future borrowing costs
  - Issuers that were more reliant on exposed funds for their overall borrowing experienced a greater increase in borrowing costs.
- Document cross-sectional variation in the effect of MMF demand on various types of issuers and bonds.
- Policy implications for COVID-19 municipal support and beyond