Does the Ownership Structure of Government Debt Matter? Evidence from Munis

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Motivation

- Governments' ability to raise capital is important:
  - For example, to fill budget deficits and continue providing public goods and services.
  - Ricardian non-equivalence, e.g. under tax smoothing, highlights the role of debt issuance (various works by Barro and others).
- With limit to arbitrage and bond market frictions, the ownership of government debt matters.
  - The literature often highlights the distinction Foreign vs. Domestic debt holders (e.g. Japan vs. Greece), suggesting the preference for the latter partly due to currency depreciations, capital barriers, and self-fulfilling runs.
- We revisit the issue in a setting in which international complications are absent: **the U.S. municipal bond market**.

Some Background

Most municipal bonds exempt holders from federal income tax. This exemption also extends to ***state income tax*** for ***in-state holders***.

Consider **a municipal bond issued by NC**:

Holder	Federal Tax	State Tax
NC resident	Exempt	Exempt
NY resident	Exempt	NOT exempt

Thus, in-state residents have tax privilege in holding state bonds, and such privilege increases with state tax rate.

Tax Clienteles

Miller (1977): Bond yields should adjust to the point of capital structure irrelevance even in the world with heterogeneous income tax rate.

- → After-tax bond yields are all the same.
- → **Tax clienteles**: With tax privilege, in-state residents should hold state bonds.

<u>Quasi-exogenous cross-state variation</u>: concentrated domestic vs. diversified foreign ownerships.

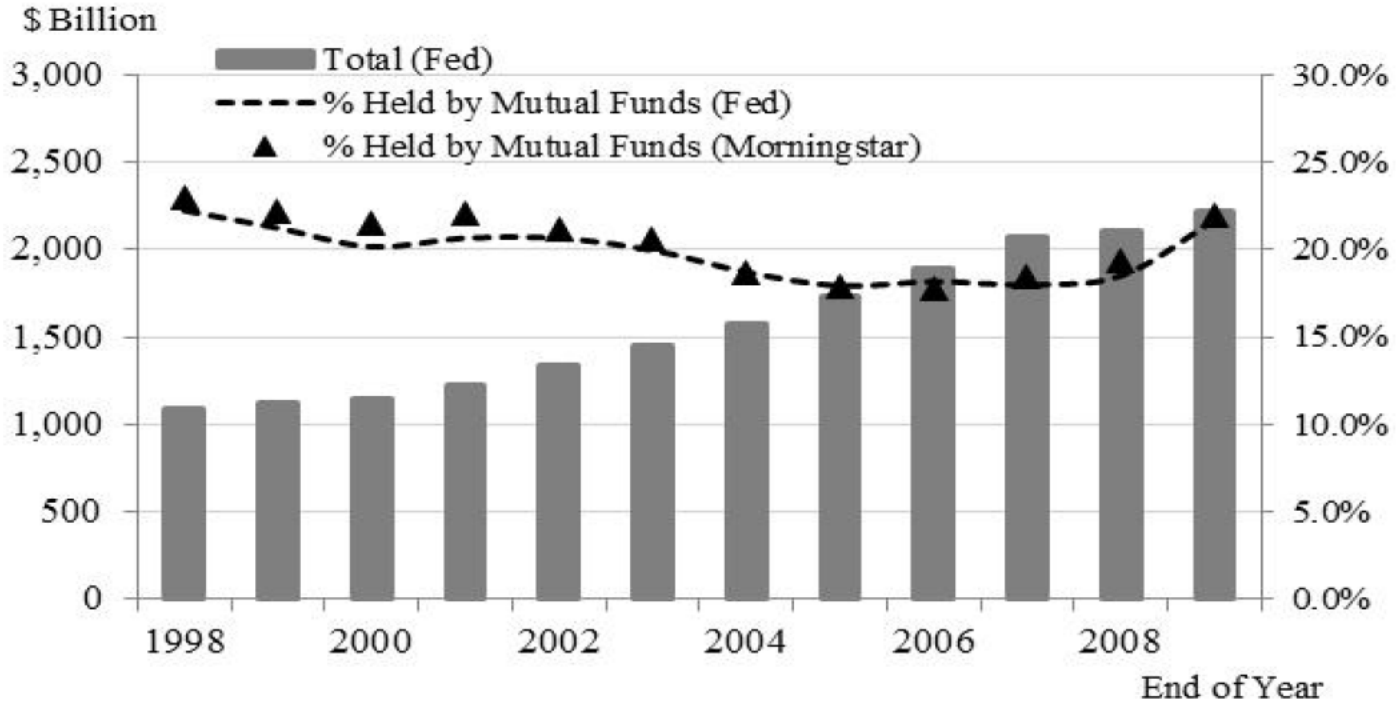
High state tax → Strong clientele → Bonds held ***mostly by in-state residents***.

…

Zero state tax → No clientele → Bonds held ***mostly by out-of-state residents*** (i.e., proportionally distributed across all diversified investors.)

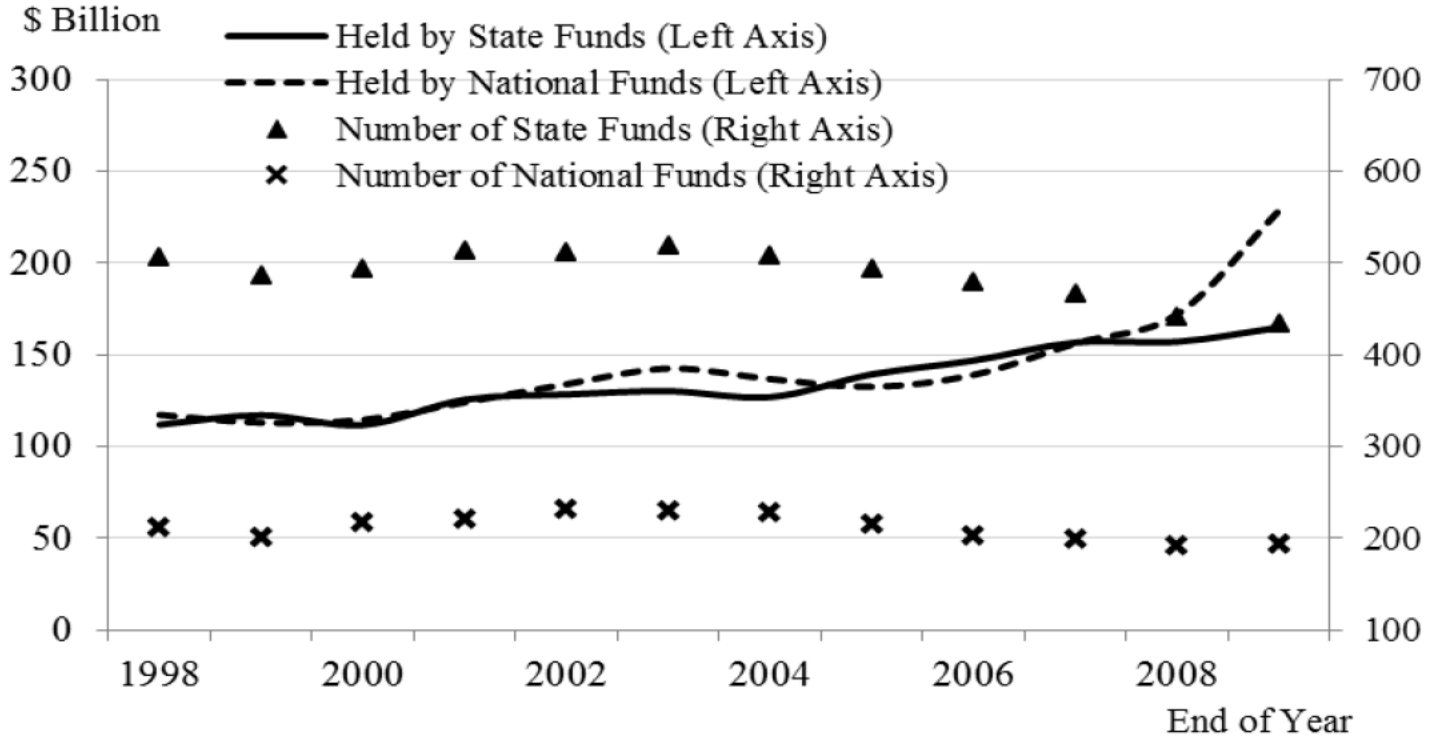
Municipal Bond Funds: Representativeness

- Morningstar return/flow (monthly) and ownership (monthly-semi-annual) data.
  - **920 muni funds** (and 960 other funds holding muni bonds).
  - Represent about **18-22% of ownership**, in line with Flow of Funds data.



Municipal Bond Funds: Types

- Morningstar classifies muni bond funds into three types:
  - **State funds** (604) – investing almost exclusively in a state
  - **National funds** (278) – investing in a diversified manner across several states
  - High-yield funds (38) – investing in speculative-grade bonds in several states



Who Holds State vs. National Funds?

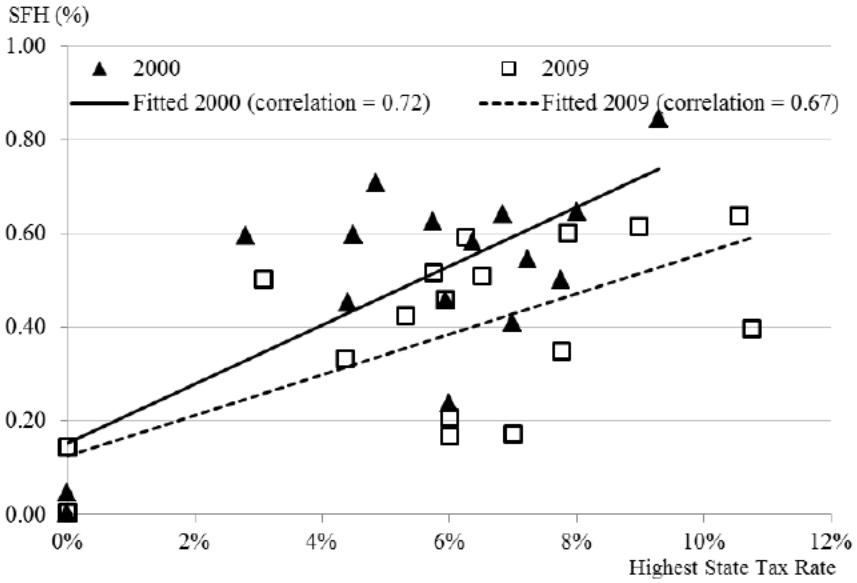
Vanguard California Intermediate-Term Tax-Exempt Fund Shares (VCAIX)

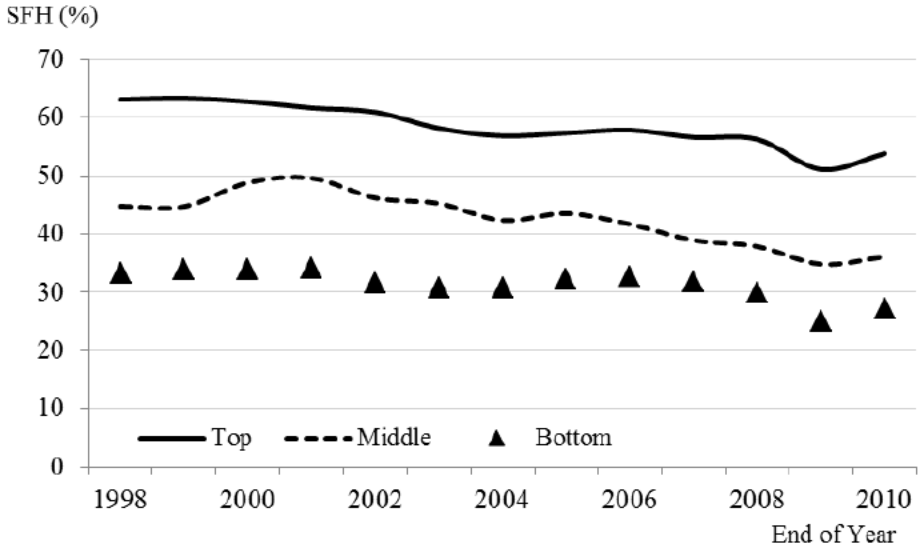
Product summary

This low-cost municipal bond fund seeks to provide federally tax-exempt and California state tax-exempt income and typically appeals to investors in higher tax brackets who reside in California. The fund typically has an average duration of about 5–6 years and invests in high-quality California municipal bonds across the yield curve. Risks of the fund include the fact that changes in interest rates, both up and down, can affect the fund by resulting in lower bond prices or an eventual decrease in income for the fund. Investors who are looking for a fund that may provide federal and California state tax-exempt interest income and can tolerate moderate price and income fluctuations may wish to consider this fund.

State Tax and State Fund Holding [1]

- **State fund holding** (***SFH***, fraction of bonds held by state funds as % of bonds held by all muni bond funds) is **positively associated with state tax rate**.

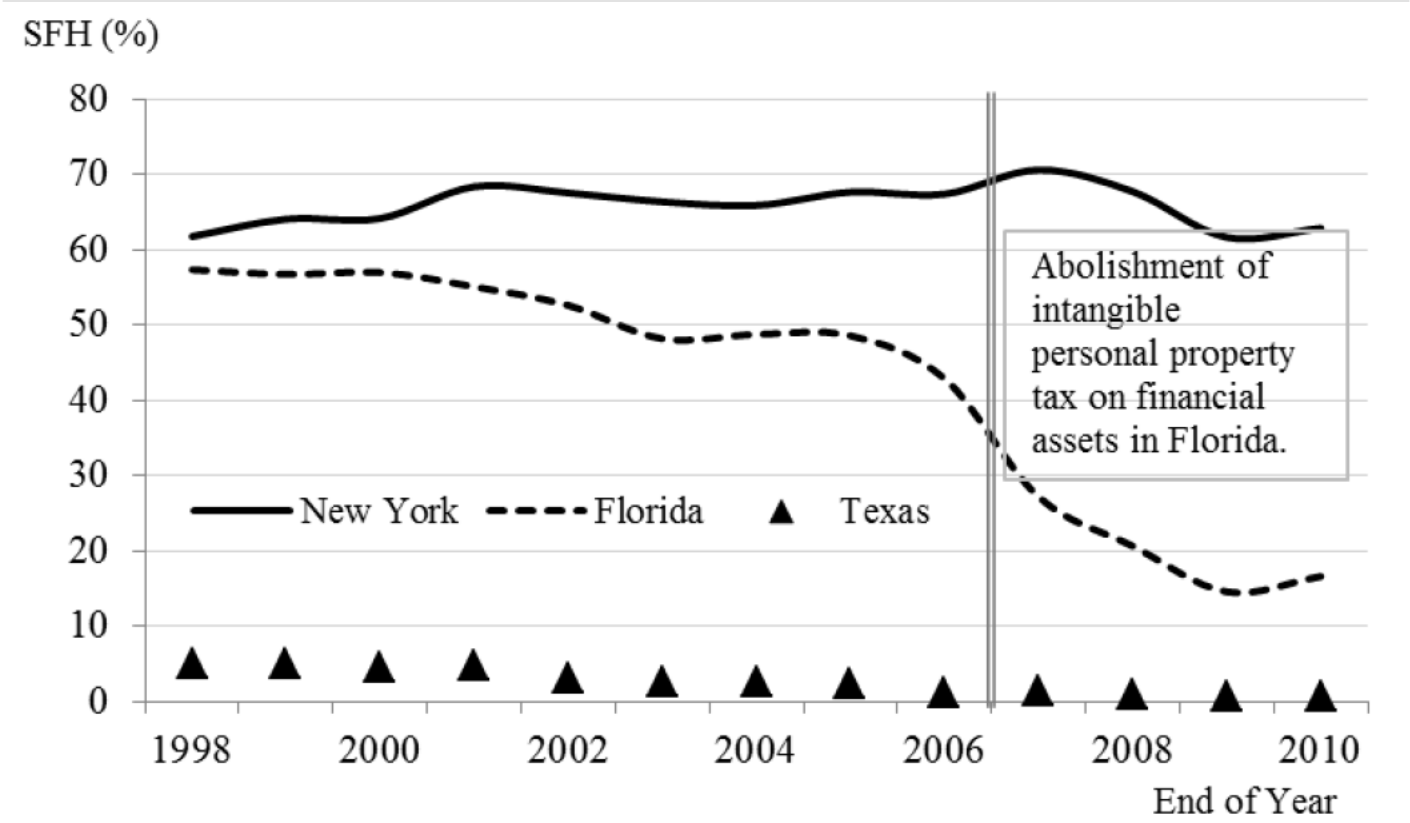




- This confirms the importance of **tax clienteles** in driving the presence of in-state bond holders.

State Tax and State Fund Holding [2]

- The tax clientele effects are also confirmed by a natural experiment in Florida where the intangible property tax on financial assets were removed in 2007.



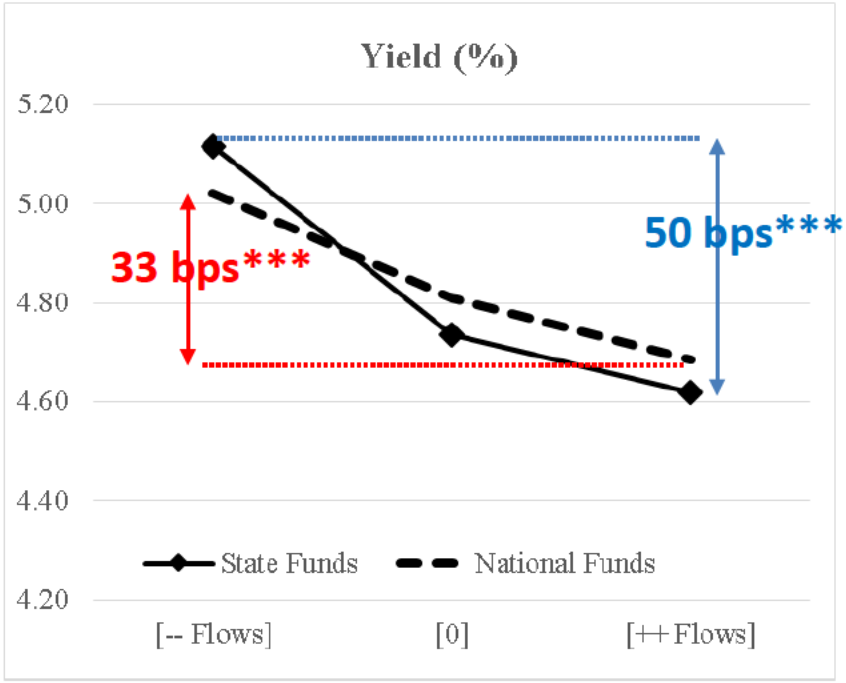
Pricing Implications

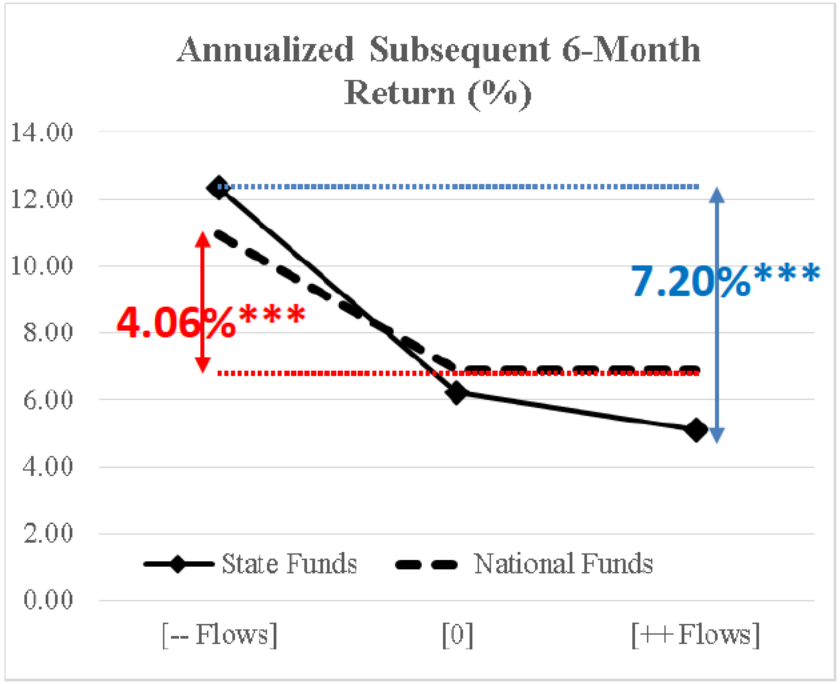
- Concentrated in-state ownership segments the state, likely to make it **more susceptible to demand and supply shocks**:
  - Capital moves slowly to take advantage of price dislocation (Mitchell, Pedersen, and Pulvino (2007)).
  - In-state residents have limited wealth and high bargaining power, demanding larger return for absorbing the shocks.

- States whose muni bonds are locally held observe **higher local political risk premium**.
  - State residents have concentrated portfolios of locally issued bonds, thus demanding compensation for local risk.
  - Similar to the pricing of domestic risk factor in segmented countries (Bekaert, Harvey, Lundblad, and Siegel (2011)).

Demand Shocks

- **High in-state ownership → High susceptibility to demand shocks**, as measured by the price effects of flow-induced trades.

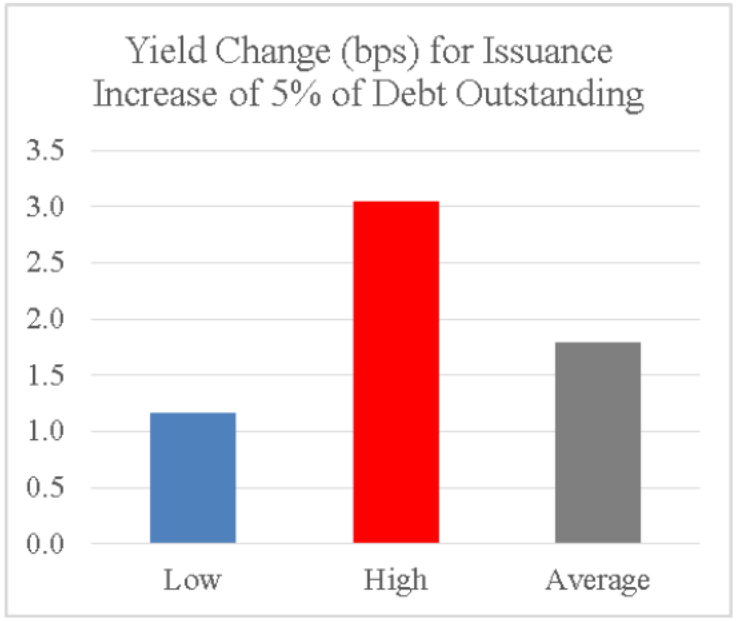




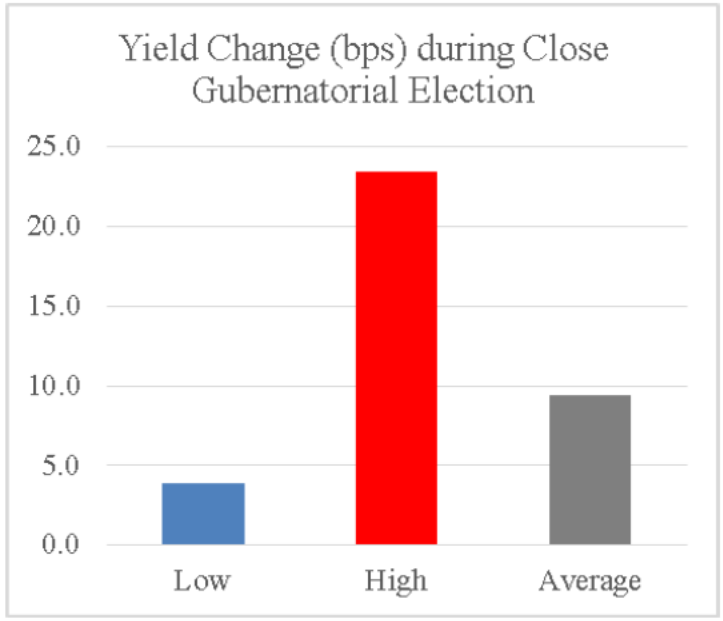
Local Supply Shocks and Local Risk

- **High in-state ownership →**

High susceptibility to supply shocks, as measured by the sensitivity of yield to issuance amount.

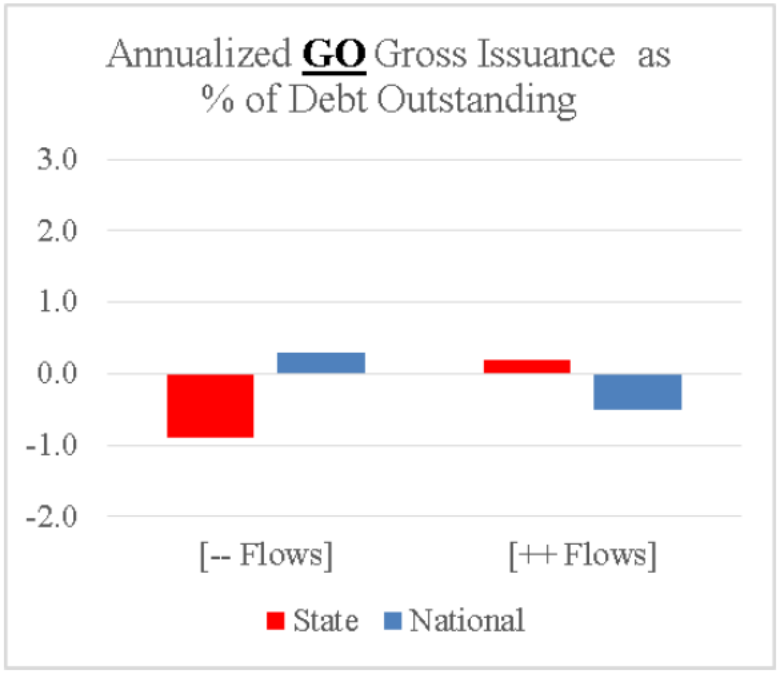


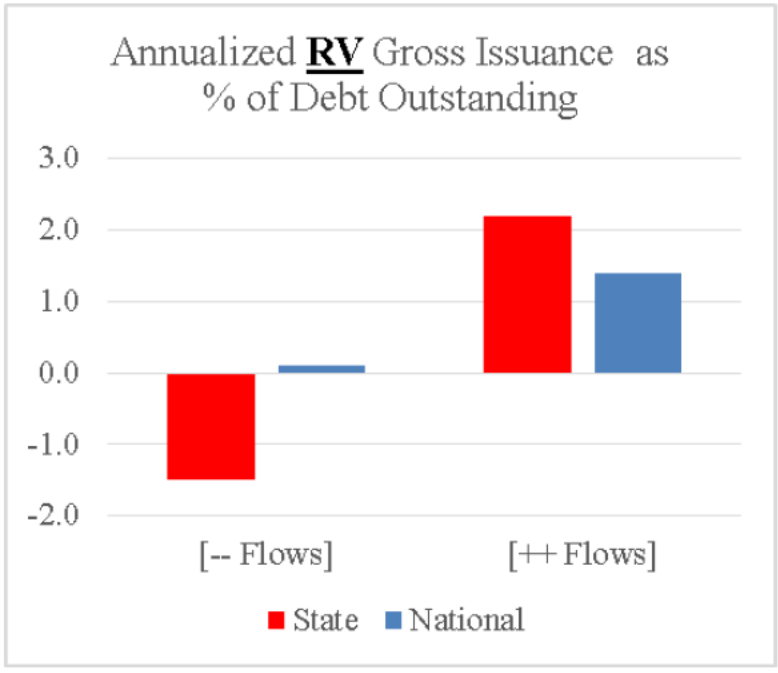
High local risk premium, as measured by the increased yield during periods of close Gubernatorial elections.



Capital Raising Implications

- When faced with **+ (-) demand shocks**, state agencies **increase (decrease) issuance of RV bonds**.
- Effects are **concentrated among states with high in-state ownership**.





Conclusion

- We use municipal bond funds' ownership to confirm the positive association between tax rate and home-state-biased ownership.
  - **Top tax tercile:** Munis mostly owned by **"state funds."**
  - **Bottom tax tercile:** Munis mostly owned by **"national funds."**

- States whose munis are <u>mostly owned by in-state residents</u> are associated with:
  - More limited cross-state risk sharing in the muni bond market.
  - **Higher susceptibility** of bond prices to **demand and supply shocks**.
  - **Higher sensitivity** of muni bond prices to **local political risk**.
  - **Difficulty in raising capital** for public projects **during stress periods**.

Municipal Bond Funds: Characteristics

- State funds are smaller, hold fewer bonds and states, and slightly longer maturity bonds.
- In each type, much of the variation comes from the cross section not the time series.

	State Funds				National Funds			
	Cross-Sectional Statistics of Time-Series Mean		Time-Series Statistics of Cross-Sectional Mean		Cross-Sectional Statistics of Time-Series Mean		Time-Series Statistics of Cross-Sectional Mean	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
TNA ($ million)	**253**	733	291	44	**618**	1,226	732	184
Number of holdings	**103.42**	101.54	110.43	12.11	**175.68**	171.40	195.03	41.01
Flow (%)	-0.01	1.08	-0.04	0.54	0.37	1.80	0.24	0.88
Return (%)	0.31	0.09	0.31	0.57	0.31	0.23	0.31	0.50
Cash holding (%)	1.97	3.06	1.77	0.68	4.47	6.35	3.56	1.43
Number of states held	**2.00**	2.20	2.06	0.51	**29.71**	10.18	30.44	2.03
Average assets in a state (%)	**81.80**	27.74	81.48	4.72	**5.92**	12.65	5.71	1.71
Maximum assets in a state (%)	86.85	10.02	87.22	3.55	16.53	13.11	16.11	1.15
Average bond maturity (years)	**15.68**	4.65	15.89	0.93	**13.45**	4.59	13.70	0.70
Assets in bonds with maturity 0-7 years (%)	13.28	14.59	12.79	2.64	23.13	18.67	22.15	3.10
Assets in bonds with maturity 8-15 years (%)	31.71	14.59	31.14	3.67	32.76	16.89	32.85	3.03
Assets in bonds with maturity over 15 years (%)	43.40	23.78	44.80	4.87	32.96	21.91	34.57	3.67

State Tax and State Fund Holding

- **State fund holding** (*SFH*, fraction of bonds held by state funds as % of bonds held by all muni bond funds) is **positively associated with state tax rate**.

State	Number of State-months	Tax Status of Bonds Issued by: State	Tax Status of Bonds Issued by: Other States	State Tax Rate (%): Mean	% State Fund Holding: Mean	Average % State Fund Holding by Maturity: 0-7 Year	8-15 Year	15+ Year
Top Tax Tercile (States with Highest Average State Tax Rate)								
CA	156	Exempt	Taxable	9.72	77.34	66.45	73.84	80.33
NY	156	Exempt	Taxable	7.37	65.57	43.00	58.23	74.83
etc.								
Average (excluding DC)				**7.98**	**58.76**	**41.62**	**57.93**	**65.09**
Bottom Tax Tercile (States with Lowest Average State Tax Rate)								
CT	156	Exempt	Taxable	5.00	54.02	30.93	56.25	65.28
TX	156	Exempt	Taxable	0.00	2.73	4.15	2.91	2.17
etc.								
Average (excluding IL and FL)				**2.43**	**31.93**	**20.09**	**32.51**	**36.55**
Top - Bottom (excluding unusual states)				**5.56*** **	**26.83*** **	**21.53*** **	**25.42*** **	**28.54*** **

State Tax and Important Debt Variables

- Other debt characteristics, on the other hand, don't seem to vary materially with state tax rates.

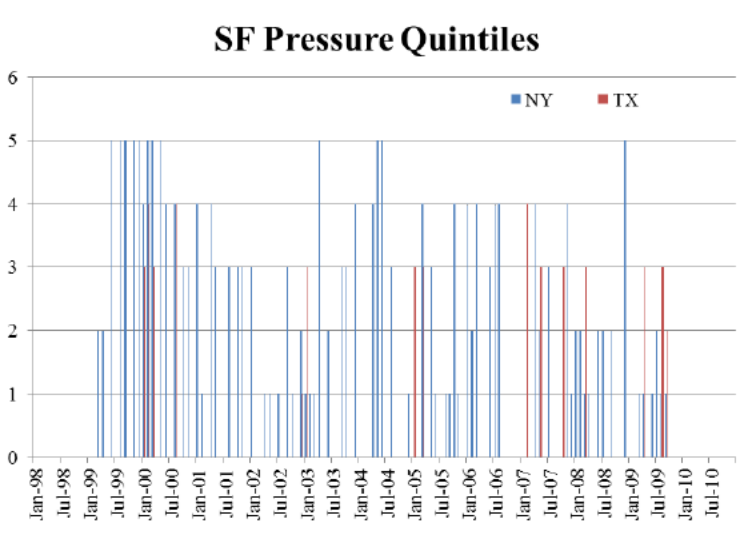
State	Credit Rating Worst	Credit Rating Best	20-Yr Yield (%)	20-Yr Spread (%)	20-Yr Return (%)	GDP	Debt/ GDP	Unemp. Rate (%)	Equity Return (%)	Net Iss. /Debt	GO Iss. /Debt	RV Iss. /Debt	No. of Close Elec.
Top Tax Tercile (States with Highest Average State Tax Rate)													
CA	BBB	AA-	5.01	-0.06	5.24	1,583	0.16	6.97	0.95	0.09	0.09	0.10	1
NY	AA	AA	4.84	-0.23	5.88	923	0.24	5.86	0.46	0.06	0.07	0.09	0
etc.													
Average (excluding DC			**4.80**	**-0.27**	**5.71**	**651**	**0.16**	**5.91**	**0.60**	**0.08**	**0.08**	**0.09**	
Middle Tax Tercile													
Average (excluding WI)			4.68	-0.30	5.77	266	0.15	5.55	0.55	0.08	0.06	0.09	
Bottom Tax Tercile (States with Lowest Average State Tax Rate)													
CT	AA	AA	4.75	-0.32	5.77	191	0.16	5.01	0.66	0.08	0.10	0.05	1
TX	AA	AA+	4.86	-0.21	5.85	929	0.15	5.77	0.68	0.10	0.12	0.08	0
etc.													
Average (excluding IL			**4.83**	**-0.24**	**5.68**	**443**	**0.17**	**6.00**	**0.64**	**0.07**	**0.08**	**0.06**	
Top - Bottom (excludin			**-0.03**	**-0.03****	**0.02**	**207*****	**-0.01*****	**-0.08*****	**-0.04**	**0.00**	**0.00**	**0.02*****	

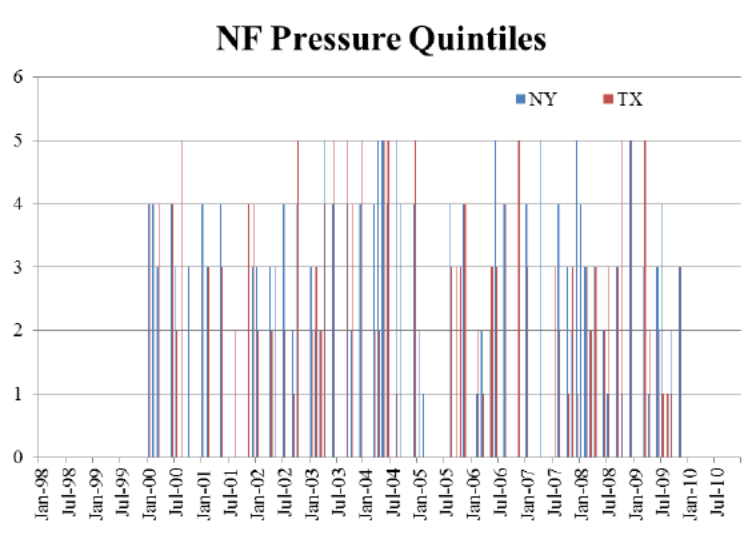
Demand Shocks

- We exploit flow-induced fire sales and purchases (Coval and Stafford (2007)) to identify episodes of demand shocks for each state.

$$Pressure_{s,m,t} = \frac{\sum_{i \in G} \left(\max\left(0, \Delta H_{i,s,m,t}\right) | HiFlow_{i,t}\right) - \sum_{i \in G} \left(\max\left(0, -\Delta H_{i,s,m,t}\right) | LoFlow_{i,t}\right)}{Outstanding\ Debt\ OR\ Net\ Issuance}$$

- Calculated and sorted into quintiles separately for each state and for state and national funds.





Demand Shocks

- ***SF Pressure*** has larger price impacts than ***NF Pressure***, consistent with our hypothesis.

Pressure Quintile	Pressure (%)	SFH (%)	Yield (%)	Return (%)
From state funds				
1 (Positive)	2.49	59.01	4.62	5.13
3	0.04	54.46	4.74	6.24
5 (Negative)	-1.20	56.30	5.12	12.33
1 - 5			**-0.50*** **	**-7.20*** **
From national funds				
1 (Positive)	2.54	39.02	4.69	6.90
3	0.09	49.23	4.81	6.88
5 (Negative)	-1.38	44.00	5.02	10.96
1 - 5			**-0.33*** **	**-4.06** **
State (1 - 5) - National (1 - 5)			-0.16*	-3.14*

- Caution: ***SF Pressure*** may not be exogenous as state economy may drive both fund flows and bond yields.

Demand Shocks

20-year bond yield regression

	(1)	(2)	(3)
SF Pressure Q1	-0.023		-0.031
	(0.037)		(0.036)
SF Pressure Q5	**0.247****		**0.227****
	(0.121)		**(0.112)**
NF Pressure Q1		0.042	0.040
		(0.049)	(0.047)
NF Pressure Q5		**0.178****	**0.157****
		(0.085)	**(0.071)**
State net issuance/Debt	0.340***	0.406***	0.379***
	(0.081)	(0.077)	(0.077)
Term spread	-0.081*	-0.078*	-0.085**
	(0.041)	(0.040)	(0.041)
State equity return	-0.429**	-0.427**	-0.382**
	(0.188)	(0.191)	(0.193)
State debt/GDP	0.546***	0.664***	0.598***
	(0.200)	(0.209)	(0.209)
State unemployment rate	0.011***	0.014***	0.012***
	(0.004)	(0.003)	(0.003)
Including state tax rate, market equity return, and credit rating, state, year, and month dummies			
F-Test: Pressure Q1 = Pressure Q5	3.08*	1.79	
F-Test: SF Pressure Q1 - SF Pressure Q5 = NF Pressure Q1 - NF Pressure Q5			2.93*

Supply Shocks

20-year bond yield regression

	(1)	(2)	(3)
High SFH	-0.012**	-0.051***	-0.046***
	(0.005)	(0.016)	(0.014)
State net issuance/Debt	**0.203*** **	**0.037**	**0.234*** **
	(0.058)	**(0.080)**	**(0.072)**
High SFH x State net issuance/Debt		**0.479****	**0.376****
		(0.200)	**(0.173)**
State tax rate			-0.954*
			(0.501)
Term spread			-0.073*
			(0.040)
Market equity return			-0.165
			(0.564)
State equity return			-0.492***
			(0.188)
State debt/GDP			0.526***
			(0.169)
State unemployment rate			0.013***
			(0.003)
Including credit rating, state, year, and month dummies			

- Use (demeaned) net issuance as % of outstanding debt as measure of supply shocks.
- Net issuance increases bond yields, consistent with the ***supply effects***.
- The supply effects are ***larger for states with high state fund holding***, i.e. segmented states.

Political Risk Pricing

20-year bond yield regression

	(1)	(2)	(3)
High SFH	-0.012**	-0.014**	-0.011**
	(0.005)	(0.005)	(0.005)
Close election	**0.094****	**0.058**	**0.039**
	(0.039)	**(0.045)**	**(0.042)**
High SFH x Close election		**0.191*****	**0.195*****
		(0.070)	**(0.068)**
State net issuance/Debt			0.175**
			(0.076)
State tax rate			0.424
			(0.441)
Term spread			-0.073*
			(0.040)
Market equity return			-0.123
			(0.563)
State equity return			-0.533***
			(0.198)
State debt/GDP			0.691***
			(0.187)
State unemployment rate			0.017***
			(0.002)
Including credit rating, state, year, and month dummies			

- Use close Gubernatorial election (margin < 5%) as proxy for local political risk.
- High political risk is reflected in bond yields, consistent with existence of ***political risk premium***.
- However, such effects are ***concentrated among states with high state fund holding***.

Future Plan

- Extend the data to 2014.
- Sketch a simple model to help guide the exploration and interpretation.
  - Any guidance?
  - Modifying/extending Hong, Kubik, and Stein (JFE, 2008) to a multi-country bond issuance setting?
- Explore more deeply the real effects of segmentation.
  - For example, two states hit by the same hurricane, does the concentration of local ownership explain the speed of recovery (through its effect on the ability to raise funds)?