Municipal Bond Insurance & the U.S. Drinking Water Crisis

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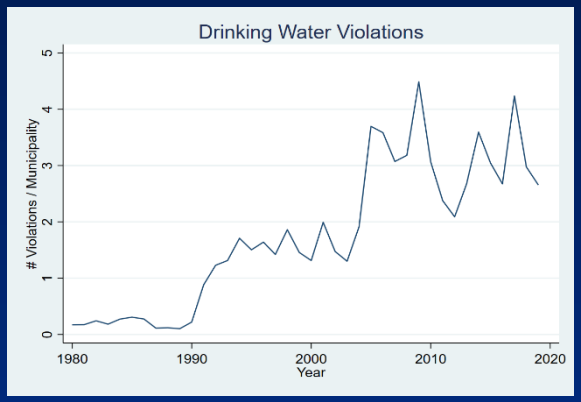
Motivation

- U.S. Drinking Water Crisis

Flint, Michigan

Water Pollution (EPA)



Amer. Society of Civil Eng.

- Common Explanation
  - Local govt's face tight budgets → cheaper, but worse, water infrastructure

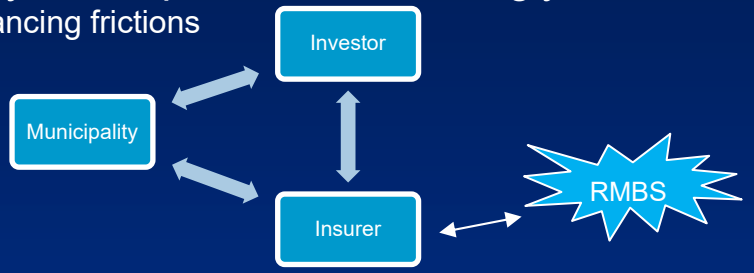
- However…
  - Tight budgets are a universal problem facing all local governments
  - Why are some cities—but not others–still able to provide clean water?

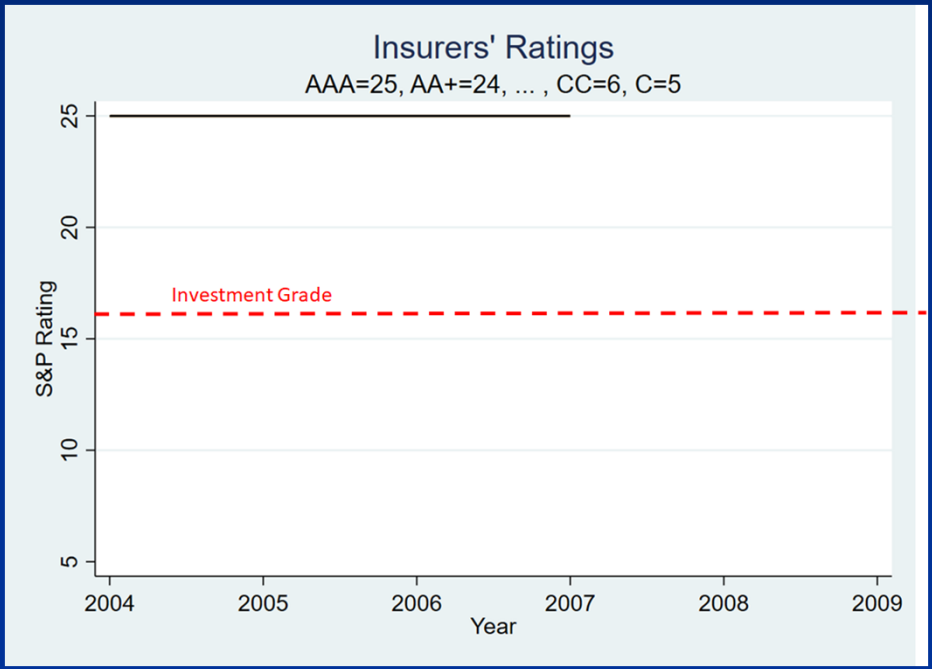
Hypothesis

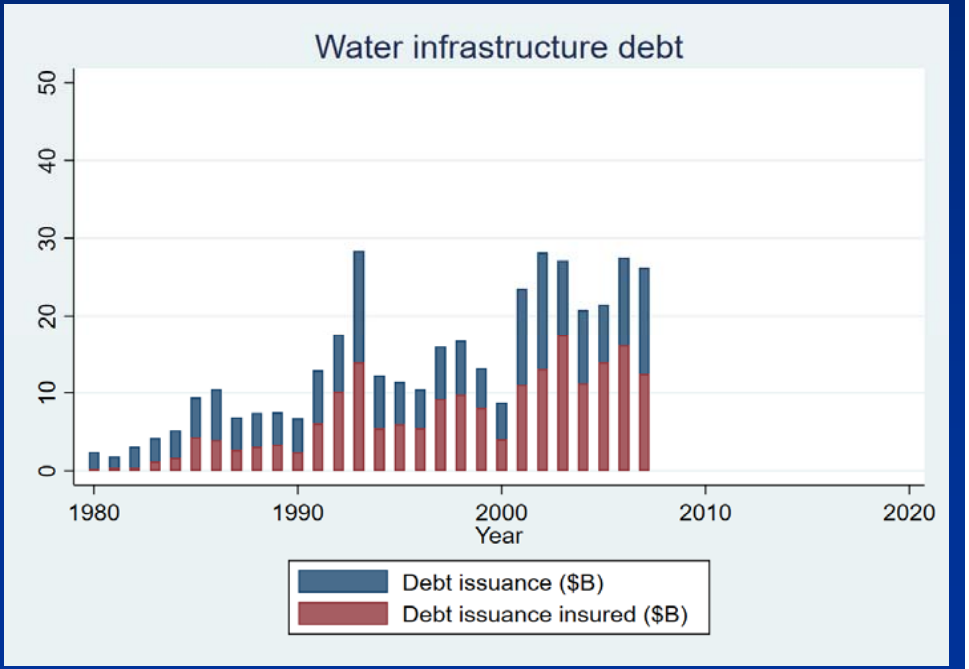
- U.S. drinking water crisis can be partly traced back to the collapse of municipal bond insurance

Part 1 of 2: Public water infrastructure financed by municipal debt, increasingly insured

- Small number of AAA-rated insurers, mitigate muni financing frictions
- 1990's: some–but not all—insurers back securitized financial products (e.g. RMBS), unrelated to muni bonds







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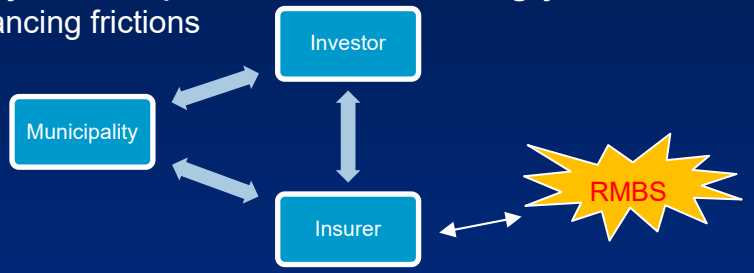
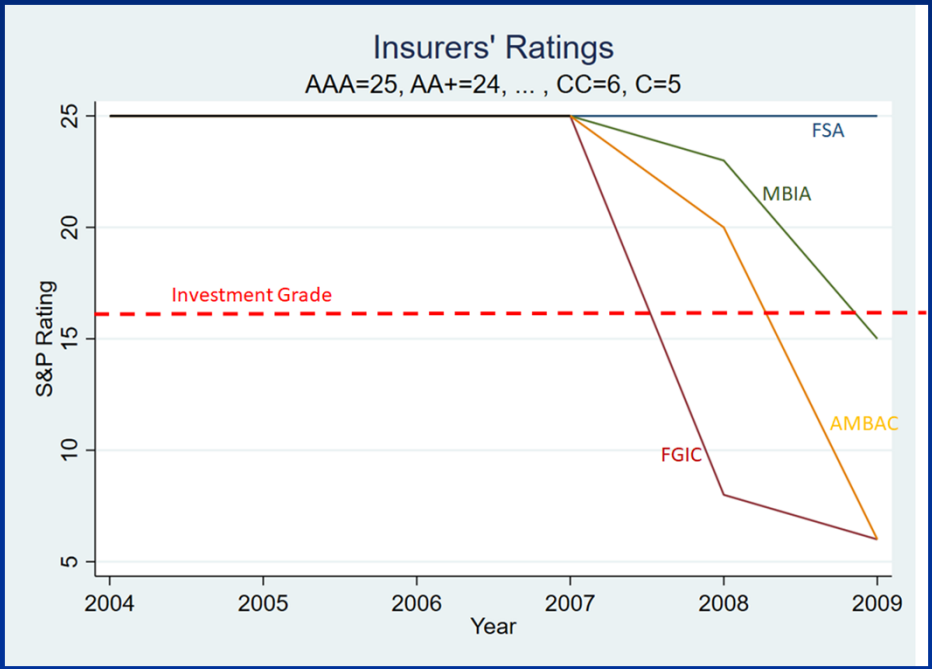
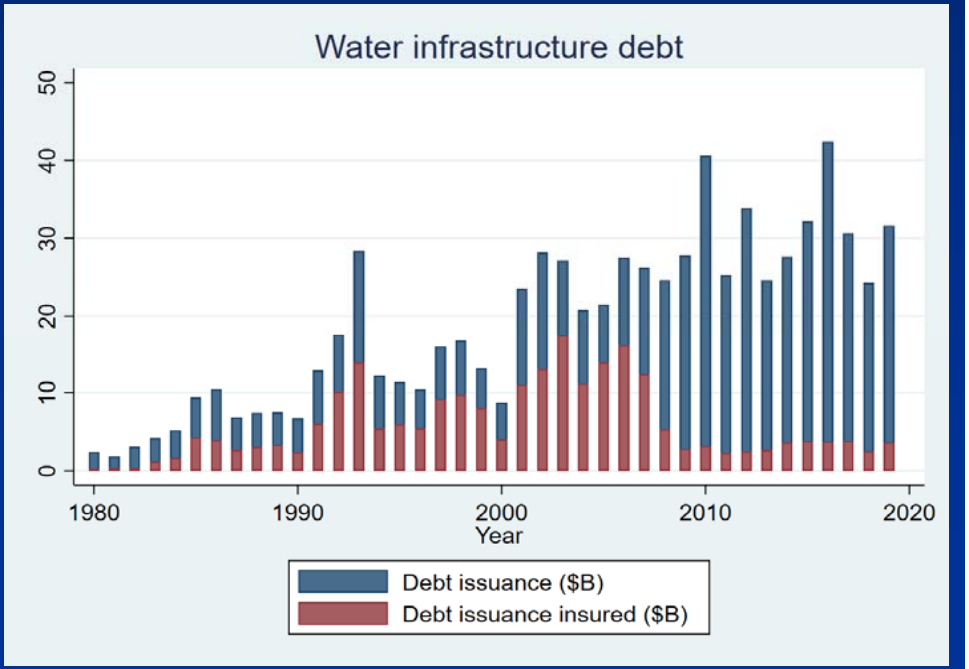
- 2007 crash -> shock to municipal insurers







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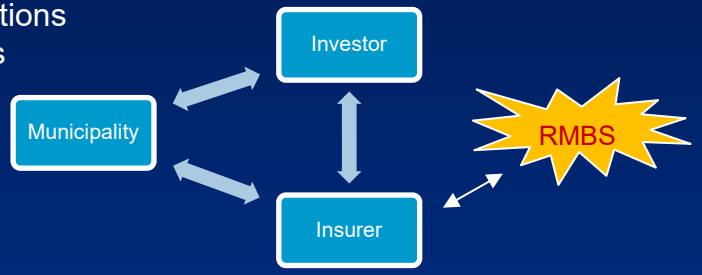
- U.S. drinking water crisis can be partly traced back to the collapse of municipal bond insurance

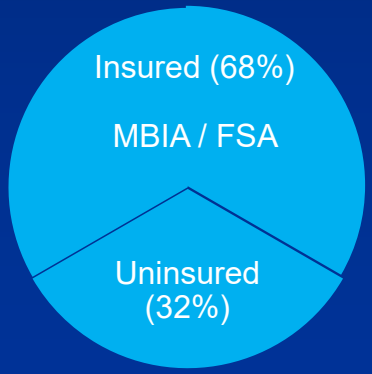
  Part 2 of 2: Negative shocks to insurers increase municipal borrowing costs

  - Insurers less likely to meet debt repayment obligations in default; putting greater strain on municipal finances
  - New creditors charge higher interest rates to compensate for greater risk of non-payment

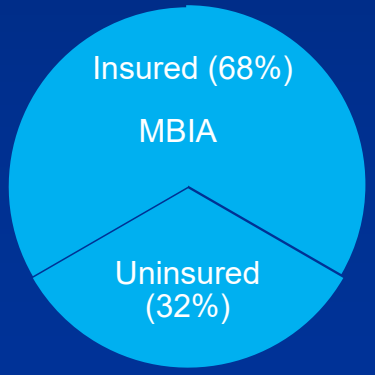


★ Test: Compare similar municipalities that use different insurers prior to 2007

Saline County (Kansas)



Geary County (Kansas)



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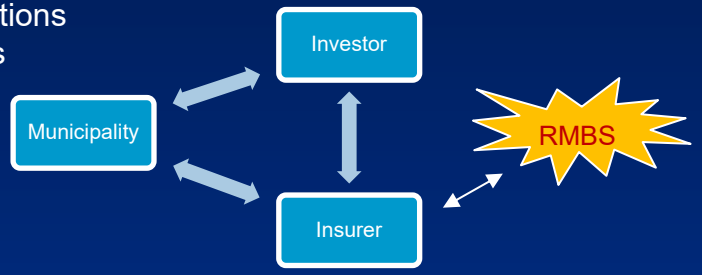

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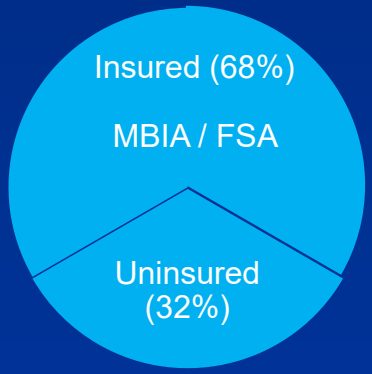
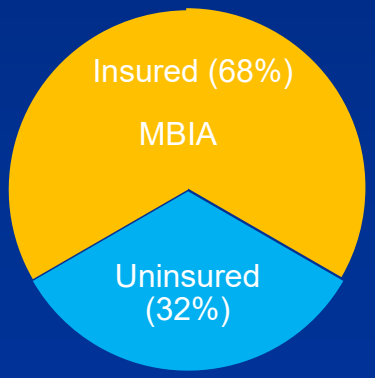


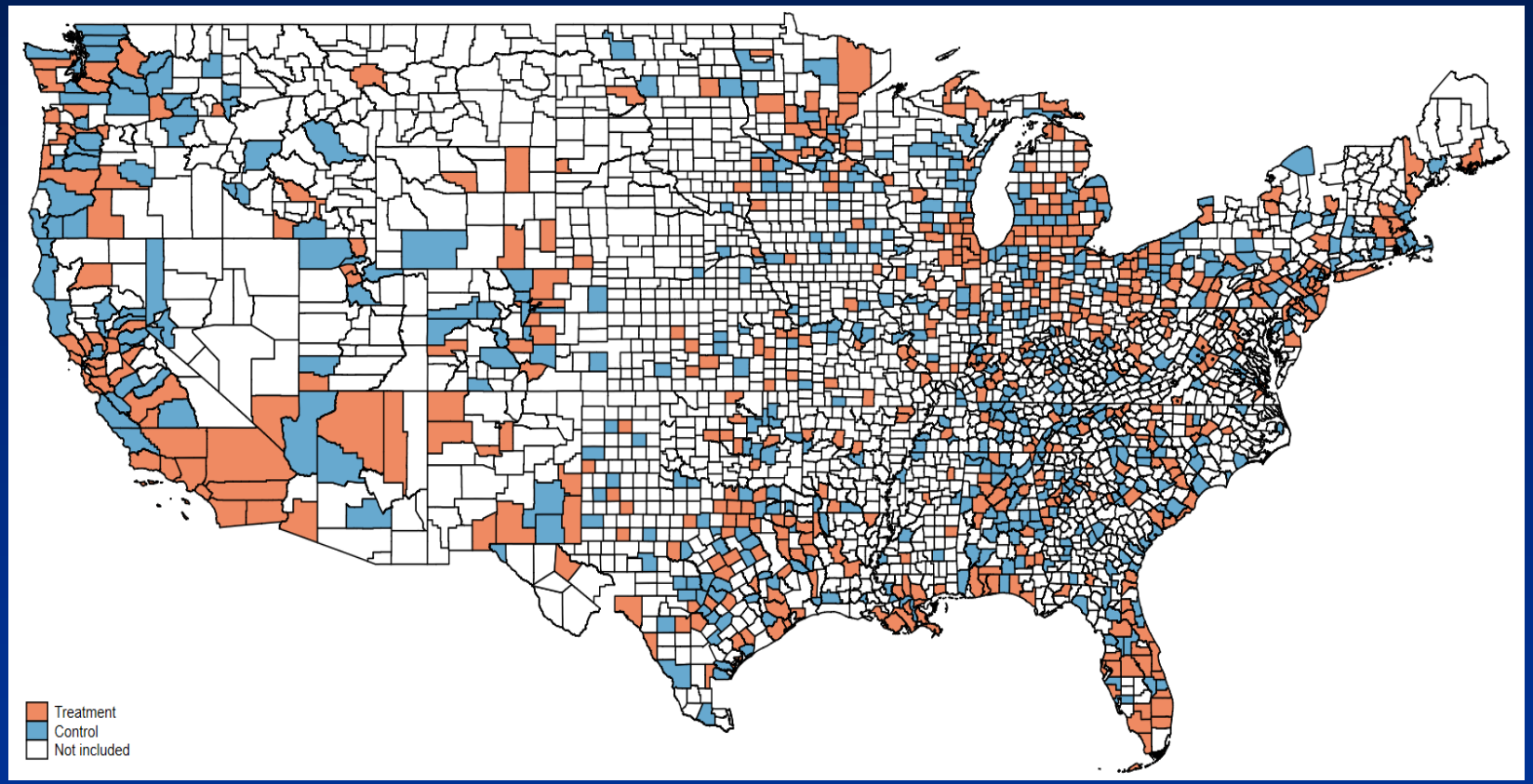
"control"

Geary County (Kansas)



"treatment"

“Treatment vs. Control”

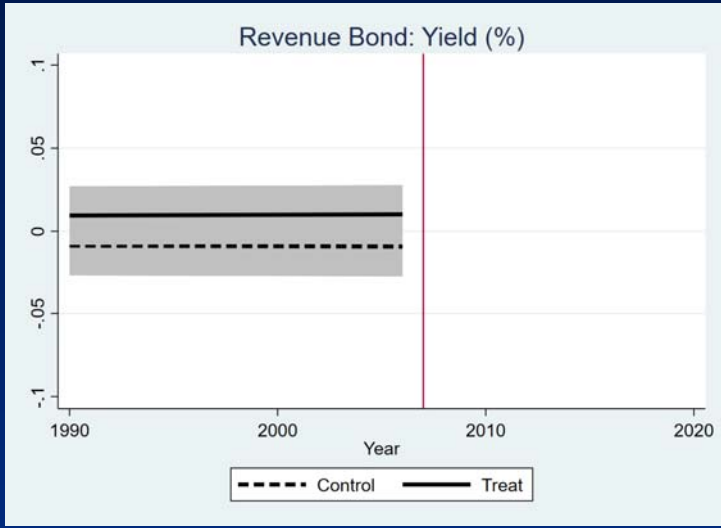


Treatment vs. Control Statistics

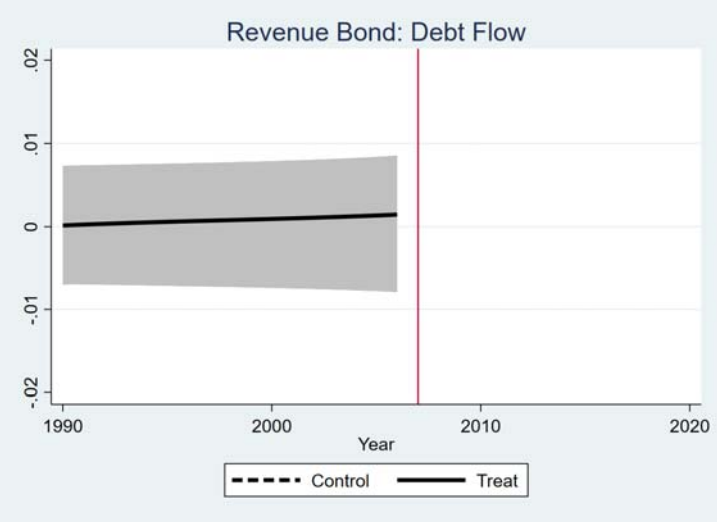
	Control			Treatment			T-test
	N	mean	sd	N	mean	sd	Control–Treatment
Water revenue (M)	389	12.53	12.78	376	13.65	12.68	−1.22
Water interest expense (M)	389	1.257	1.685	376	1.380	1.642	−1.02
Water investment (M)	389	8.362	8.412	376	9.165	8.562	−1.31
Population (K)	389	259.8	256.0	376	264.8	263.7	−0.27
Property tax (M)	389	135.2	128.0	376	135.7	130.6	−0.05
Dummy: Rated by Moody's	507	0.195	0.397	507	0.168	0.374	1.11
Moody's Rating (weighted)	99	16.48	3.985	85	16.16	5.201	0.46
Dummy: Investment grade (Moody's)	99	0.838	0.370	85	0.859	0.350	−0.40
Debt outstanding (M)	507	63.11	81.33	507	66.66	82.89	−0.69
Rev debt outstanding (M)	507	59.88	91.46	507	63.94	91.38	-0.71
Debt issuance (M)	507	2.837	4.577	507	3.087	4.871	−0.84
Offering yield	507	0.0516	0.00796	507	0.0520	0.00721	−0.84
# SWDA Violations	506	2.688	3.210	504	2.274	2.934	2.14
# SWDA Viol. pop wgt (K)	506	7.465	10.91	504	6.623	10.55	1.25

Findings

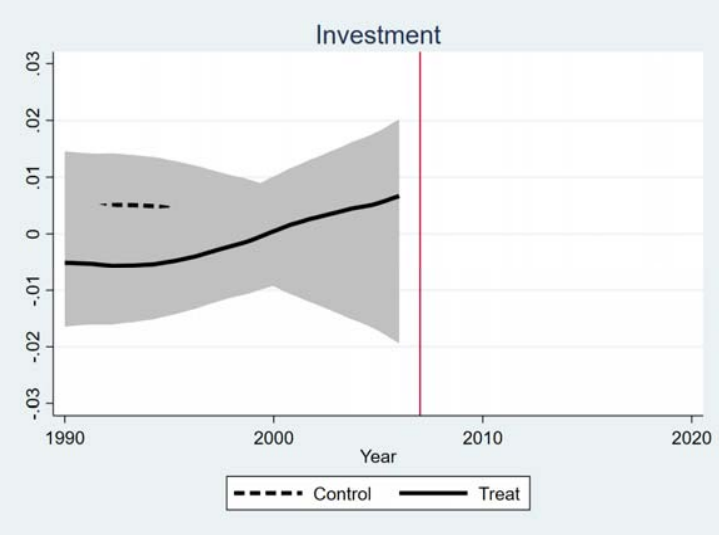
Borrowing Costs



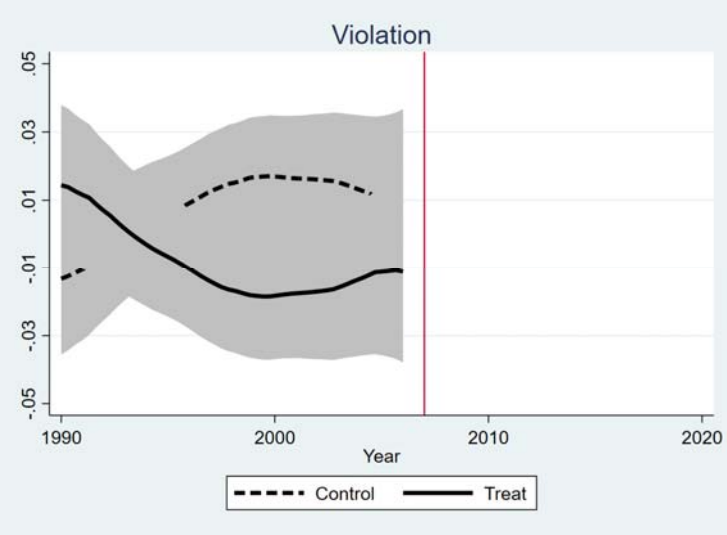
Debt Amounts



Infrastructure Investment

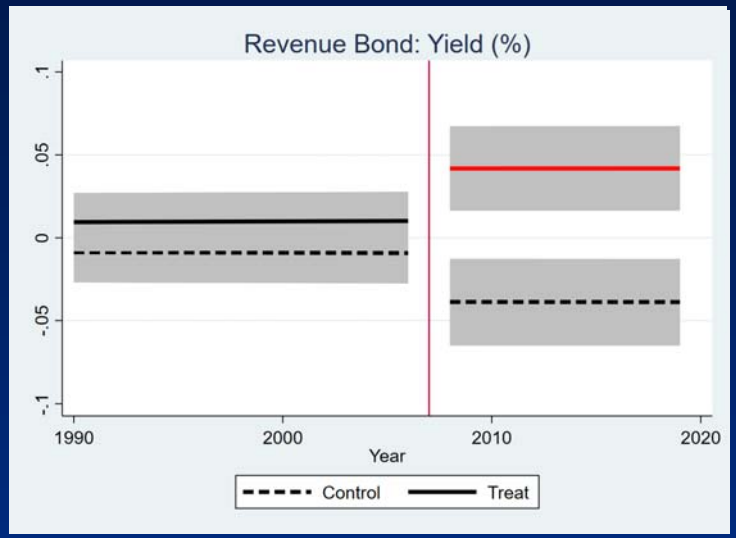


Water Pollution

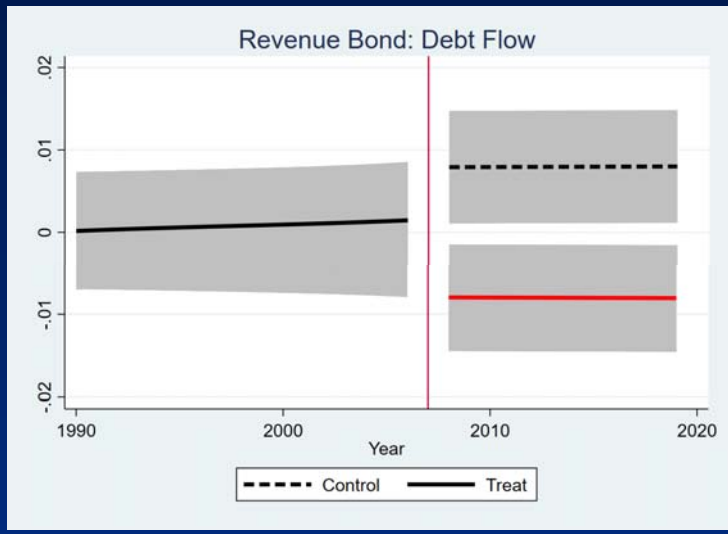


Findings

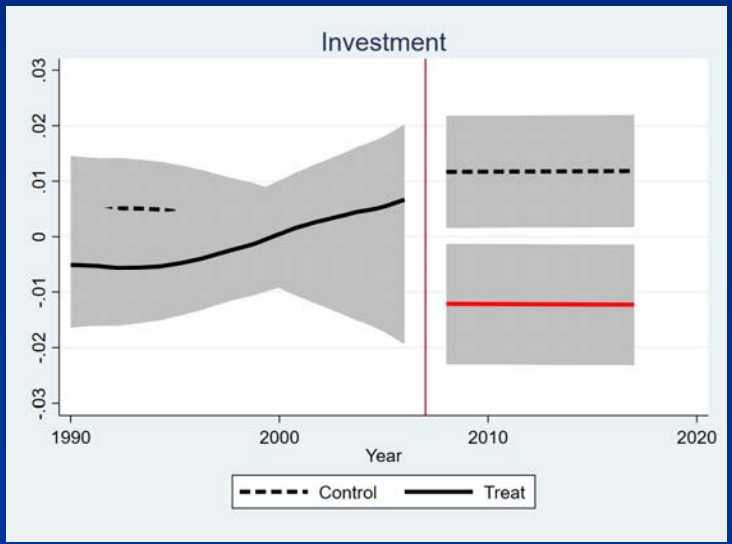
Higher Borrowing Costs



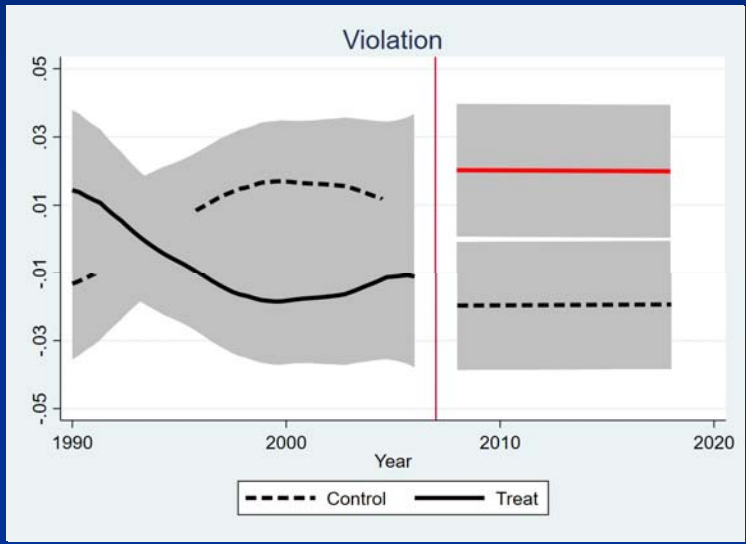
Lower Debt Amounts



Lower Infrastructure Investment



Greater Water Pollution



→ shows how water pollution can be traced back to financial market failures

Finding 1: Borrowing Costs

Interest Rate (weighted) = β*Downgrade + Controls + Year FE + County FE + e

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment	0.137**	0.137**	0.136**	0.136**	0.136**	0.140**	0.141**
	(0.0641)	(0.0640)	(0.0639)	(0.0637)	(0.0638)	(0.0626)	(0.0627)
Maturity	0.0313	0.0315	0.0309	0.0331	0.0333	0.0245	0.0246
	(0.0241)	(0.0241)	(0.0241)	(0.0243)	(0.0242)	(0.0238)	(0.0239)
Debt issuance	−0.146***	−0.145***	−0.147***	−0.148***	−0.148***	−0.160***	−0.161***
	(0.0310)	(0.0310)	(0.0311)	(0.0316)	(0.0317)	(0.0306)	(0.0306)
Lag log violation		0.0102	0.0105	0.0104	0.0105	0.0103	0.0102
		(0.0137)	(0.0136)	(0.0136)	(0.0136)	(0.0136)	(0.0136)
Lag log water revenue			0.0504	0.0381	0.0418	0.0483	0.0483
			(0.0402)	(0.0388)	(0.0358)	(0.0352)	(0.0351)
Lag log debt out'				0.0326	0.0341	0.0218	0.0218
				(0.0331)	(0.0319)	(0.0312)	(0.0313)
Lag log property tax					−0.0117	0.0249	0.0255
					(0.0496)	(0.0558)	(0.0553)
Lag log population						−0.0665	−0.0670
						(0.0450)	(0.0447)
Total insurance frac						0.276***	0.277***
						(0.0850)	(0.0854)
Moody rating							2.55e-05
							(0.00313)
Is rated by Moody							0.00871
							(0.0577)
Observations	9,513	9,513	9,513	9,513	9,513	9,513	9,513
County FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Municipalites in our sample face higher borrowing costs: **5.16% to 5.3%**

Findings

Numerical magnitudes: Municipalites in our sample …

1. Face higher borrowing costs: **5.16% to 5.3%**
2. Raise **$1.5 billion less** per year
3. Invest **$274 million less** per year on water infrastructure
4. Suffer **165 more** water violations per year (each violation **~ 458,433 people)**

Alternative Explanations? Perhaps the worst insurers were associated with municipalities that experienced greater declines during the crisis…

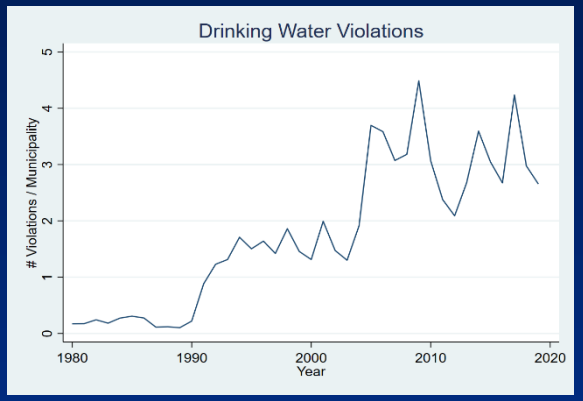
Evidence against:

1. Prior to 2007, municipalities in control & treatment have similar trajectories
2. After 2007, municipalities in control and treatment share similar economic trends in population growth, property taxes, & drinking water service revenues
3. Our result hold for revenue bonds, but *not* general obligation bonds, which are more reflective of general economic conditions

→ **Suggest that bond insurance is not just picking up general economic trends**

Conclusion

- Question: What explains drinking water crises in some cities but not others?



- Answer: Collapse of municipal bond insurance an important contributor
  - Shows that bond insurance is important in spite of low municipal default rates
  - In addition to fiscal issues, financial market functioning is critical for public goods