

Public Bond Issuance and Persistent Inequality

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Roadmap

- 1. Research Motivation**
2. Summary of Findings
3. Data
4. Empirics
5. Conclusion



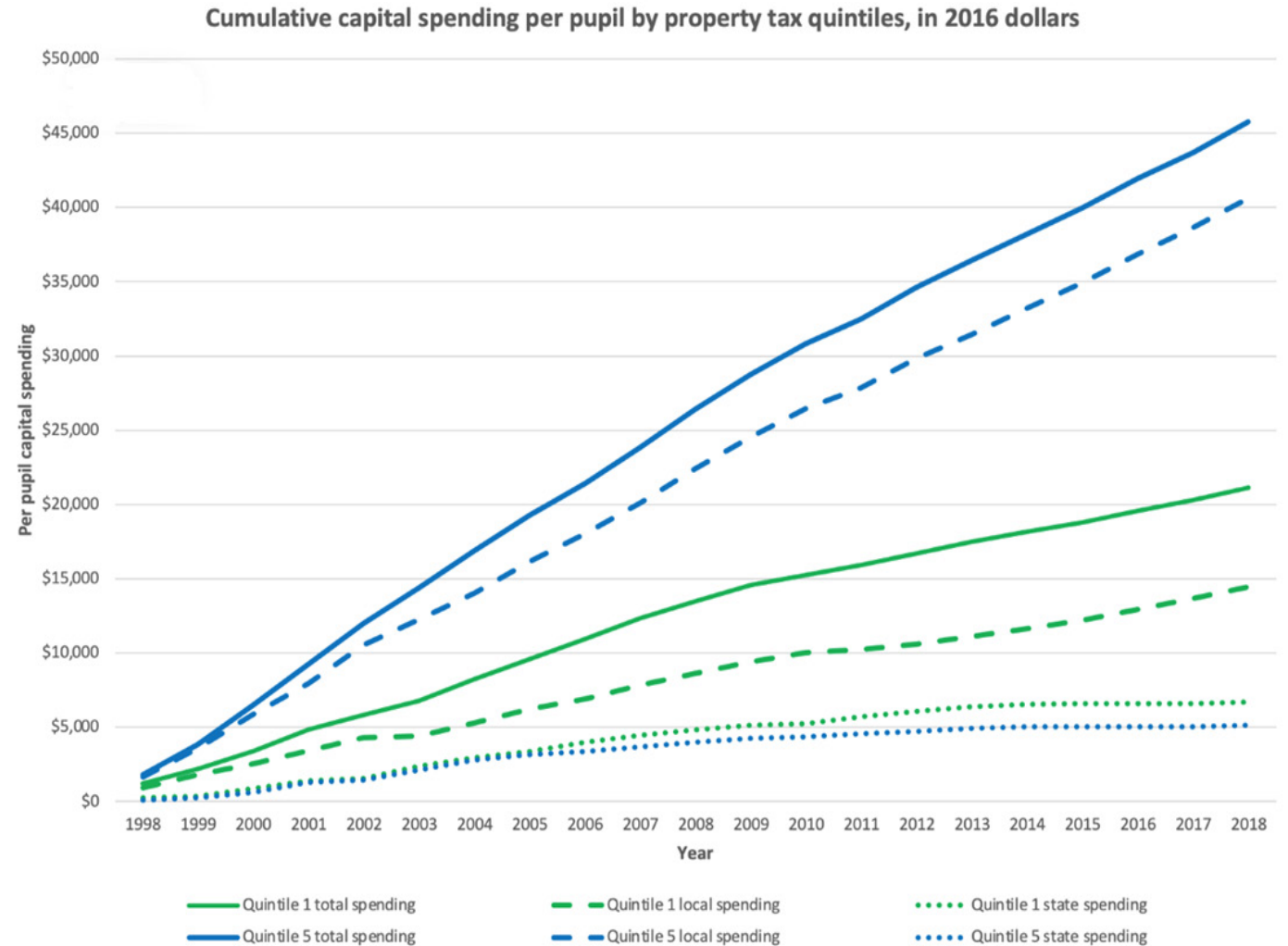
Education Bonds and Infrastructure

- Every year, **schools borrow roughly \$373 billion** (\$1.1 trillion outstanding) to fund education infrastructure.
- **Yet**, the U.S. Government Accountability Office in 2020 found that **over half of American schools need infrastructure repairs.**
- These two facts co-exist, because **education funding is disproportionately enjoyed by wealthy school districts.**
 - Local taxes pay for maintenance and daily operations
 - Infrastructure improvements covered mainly by local bond issuance



State Funding Has Not Resolved the Gap

- Over the last 20 years, state funding represents a tiny fraction of school capital expenditures.
- Local funding makes up most capital spending, and **the gap between rich and poor district funding has widened over time.**
- Graph is for California only.



Research Question

- Education bonds represent a large market, crucial for funding school infrastructure.
- Less wealthy school districts have found it difficult to access the bond market.
 - **Concern:** Interest on muni bonds is tax-exempt ==> school districts' interest costs are subsidized by state and federal taxpayers.
- Hence, we ask:

Why do less wealthy school districts have a hard time accessing capital to fund education infrastructure?



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Summary of Findings

1. Infrastructure bond issuance => **higher** test scores and home prices after CA loosened voting thresholds in 2001.
2. Large/wealthy districts propose **more** bond measures and approve more bonds.
3. Less wealthy districts must offer **higher yields** and pay **higher fees** for same quality bonds (discouraging to voters)
4. **Property tax** limits, **marketability** constraints, and funding **urgency** explain the higher costs.
5. First-come first-served state funding allocation => modernization funding **disproportionately benefits wealthy.**



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Data

1. Municipal bond issuance data (Issuance Documents)
2. Municipal bond election data (Hand collected)
3. Municipal bond fee data(State of California)
4. Test score data (State of California)
 - API (Academic Performance Index)
5. School district characteristics (State of California)
6. Home price index (Zillow)



Roadmap

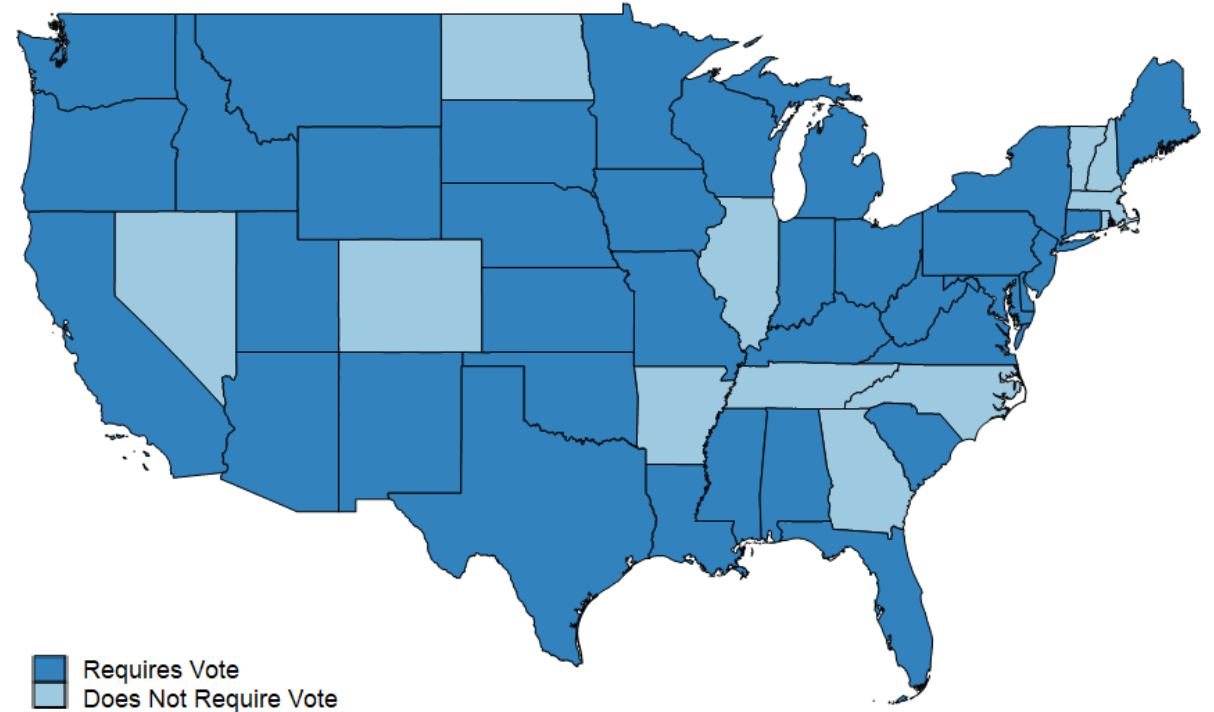
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What factors drive school bond issuance?

- Most states (dark blue) require voters to authorize muni bonds.

• Large and wealthy districts propose and authorize more bonds in CA.



Wealth, size, and bond elections: selected variables

$$\text{Bond Election}_{it} = \tau_t + \beta_1 \ln \text{enrollment}_{it} + \beta_2 \text{wealth} + \beta_3 X_{it} + \varepsilon_{it}$$

	(1)	(2)	(3)
Log enrollment (SIZE)	0.306*** (14.74)	0.224*** (7.43)	0.286*** (8.01)
Log property tax per student (WEALTH)			0.219*** (3.77)
Local capital expense per student			-0.126*** (-5.33)
Unified district dummy		0.292*** (4.66)	0.351*** (4.87)
High school district dummy		0.310*** (3.71)	0.389*** (3.87)
Number of observations	18779	18779	13953



Wealth, size, and bond **success**: selected variables

$$\text{Bond Pass}_{it} = \tau_t + \beta_1 \ln \text{enrollment}_{it} + \beta_2 \text{wealth} + \beta_3 X_{it} + \varepsilon_{it}$$

	(1)	(2)	(3)
Log enrollment (SIZE)	0.183***	0.108	0.220**
	(2.94)	(1.40)	(2.18)
Log property tax per student (WEALTH)			0.517***
			(2.89)
Local capital expense per student			-0.038
			(-0.54)
Unified district dummy		-0.574***	-0.789***
		(-3.09)	(-3.85)
High school district dummy		-0.431*	-0.700**
		(-1.65)	(-2.38)
Number of observations	1594	1594	1326



Key regulatory change: Proposition 39 (2001)

- California Proposition 39 reduces voting threshold to pass school district bond measures from 66.67% to 55%.
- Bonds more likely to pass after this change => **more bond funding for schools**

	Bond election?	Bond pass?
Post 2001 dummy variable (LOOSEN RESTRICTIONS)	0.214 (1.10)	1.425*** (3.33)
Log enrollment (SIZE)	0.286*** (8.01)	0.220*** (2.18)
Log property tax per student (WEALTH)	0.219*** (3.77)	0.517** (2.88)
Number of observations	13953	1326



Did more bond funding change capital spending?

$$\text{Capital Spending per student}_{it+k} = \tau_t + \alpha_i + \beta_1 \text{pass bond}_{it} + \beta_2 \text{post2001} + \beta_3 \text{pass bond}_{it} * \text{post 2001} + \beta_4 X_{it} + \varepsilon_{it}$$

	(1) Log local cap. pp, yr t+1	(2) Log local cap. pp, yr t+2	(3) Log local cap. pp, yr t+3	(4) Log local cap. pp, yr t+4	(5) Log local cap. pp, yr t+5	(6) Log local cap. pp, yr t+6	(7) Log local cap. pp, yr t+7
Pass bond dummy	0.020	0.288***	0.235**	0.031	-0.038	-0.204**	-0.173*
	(0.32)	(3.68)	(2.38)	(0.29)	(-0.33)	(-1.98)	(-1.87)
Pass dummy * post 2001 dummy	0.351***	0.571***	0.651***	0.519***	0.341**	0.253*	-0.168
	(3.34)	(4.68)	(4.16)	(3.34)	(2.10)	(1.66)	(-1.10)
Log property tax per student	0.139**	0.015	-0.139	-0.274**	-0.349***	-0.420***	-0.416***
	(2.14)	(0.16)	(-1.29)	(-2.36)	(-2.84)	(-3.67)	(-3.71)
Log lag capital exp. per student	0.416***	0.185***	0.073***	-0.028*	-0.129***	-0.174***	-0.188***
	(24.64)	(10.91)	(4.98)	(-1.73)	(-7.87)	(-10.12)	(-10.37)
Log enrollment	-0.030	-0.251**	-0.423***	-0.601***	-0.631***	-0.585***	-0.503***
	(-0.36)	(-2.21)	(-3.35)	(-4.13)	(-4.16)	(-3.81)	(-3.28)
Number of observations	12581	11877	11217	10535	9835	9308	8725

Did more bond funding improve test scores?

$$API\ Score_{it+k} = \tau_t + \alpha_i + \beta_1 pass\ bond_{it} + \beta_2 post2001 + \beta_3 pass\ bond_{it} * post\ 2001 + \beta_4 X_{it} + \varepsilon_{it}$$

	(1) Mean API, yr t+1	(2) Mean API, yr t+2	(3) Mean API, yr t+3	(4) Mean API, yr t+4	(5) Mean API, yr t+5	(6) Mean API, yr t+6	(7) Mean API, yr t+7
Pass bond dummy	-2.934 (-1.13)	-3.708 (-1.42)	-1.276 (-0.47)	-2.327 (-0.86)	-4.630 (-1.89)	-2.550 (-0.97)	-2.517 (-1.05)
Pass dummy * post 2001 dummy	5.232* (1.83)	6.706** (2.30)	1.967 (0.63)	4.607 (1.44)	6.874** (2.39)	4.755 (1.47)	4.028 (1.33)
Log property tax per student	-0.029 (-0.02)	-3.098* (-1.76)	-4.908** (-2.27)	-5.418** (-2.24)	-6.467** (-2.23)	-6.947** (-2.25)	-7.322** (-2.47)
Log lag capital exp. per student	0.355** (2.24)	0.824*** (3.18)	0.796*** (2.82)	0.749*** (2.61)	0.563* (1.75)	0.903*** (3.27)	0.563* (1.83)
Log enrollment	2.233 (1.01)	1.525 (0.30)	3.697 (0.84)	4.349 (0.82)	6.933 (1.04)	9.776 (1.53)	11.698** (2.39)
Number of observations	8610	7941	7279	6636	5966	5559	4834

Did more bond funding increase home prices?

$$\text{Log home price}_{it+k} = \tau_t + \alpha_i + \beta_1 \text{pass bond}_{it} + \beta_2 \text{post2001} + \beta_3 \text{pass bond}_{it} * \text{post 2001} + \beta_4 X_{it} + \varepsilon_{it}$$

	(1) Log mean house price, yr t+1	(2) Log mean house price yr t+2	(3) Log mean house price, yr t+3	(4) Log mean house price, yr t+4	(5) Log mean house price, yr t+5	(6) Log mean house price, yr t+6	(7) Log mean house price, yr t+7
Pass bond dummy	0.001	0.001	-0.008	-0.012	-0.020	-0.022	-0.029**
	(0.14)	(0.17)	(-0.85)	(-1.13)	(-1.57)	(-1.59)	(-2.08)
Pass dummy * post 2001 dummy	0.012	0.005	0.020	0.024	0.029*	0.030*	0.029*
	(1.04)	(0.36)	(1.32)	(1.44)	(1.74)	(1.82)	(1.76)
Log property tax per student	-0.018***	-0.023***	-0.013	-0.002	0.011	0.021	0.029**
	(-4.27)	(-2.99)	(-1.22)	(-0.13)	(0.77)	(1.46)	(2.07)
Log lag capital exp. per student	0.000	-0.001	-0.001	-0.002	-0.001	0.000	0.000
	(-0.49)	(-0.67)	(-1.19)	(-1.52)	(-0.85)	(-0.29)	(0.21)
Log enrollment	-0.002	0.000	0.005	0.008	0.008	0.011	0.019
	(-0.39)	(0.01)	(0.40)	(0.51)	(0.49)	(0.69)	(1.17)
Number of observations	12937	12920	12243	11553	10872	10193	9524

Spending, test scores, and home prices by district wealth

- Low and high wealth school districts spend more after bonds pass:
 - Low wealth districts spend about **30% more capital** than average districts
 - High wealth districts spend about **50% more capital** than average districts
- Low and high wealth districts have higher test scores when bonds pass:
 - Low wealth improve API by **1.5% more** than average wealth districts
 - High wealth improve API by **1.6% more** than average wealth districts
- Low and high wealth districts have higher home values when bonds pass:
 - Low wealth increase home prices by **5% more** than average wealth districts
 - High wealth increase home prices by **6% more** than average wealth districts



Why do low wealth districts less often approve bond measures?

- Bond issuance **improves real outcomes** for both low and high wealth districts ...
- Yet voters in low wealth districts **reject bond measures** more often. Why?
- One possible explanation is **cost**: If bonds from low wealth districts **cost more**, voters may approve them less, despite their tangible benefits.



Low wealth districts pay higher yields than high wealth districts

$$Yield_{it} = \tau_t + \beta_1 property\ tax_{it} + X_{it} + \mu_{it} + \varepsilon_{it}$$

	(1) No other controls	(2) (more controls)	(3) No other controls	(4) (more controls)
Property taxes per pupil	-0.092** (-2.18)	-0.040 (-0.35)		
Property tax quintile 1 dummy			-0.101 (-1.20)	-0.135 (-0.99)
Property tax quintile 2 dummy			0.034 (0.18)	-0.021 (-0.17)
Property tax quintile 4 dummy			-0.129 (-1.53)	-0.154* (-1.70)
Property tax quintile 5 dummy			-0.275*** (-2.96)	-0.227* (-1.68)
Number of observations	13031	13031	13031	13031



Low wealth districts pay higher fees than high wealth districts

$$Fee = \tau_t + \beta_1 \text{property tax}_{it} + X_{it} + \mu_{it} + \varepsilon_{it}$$

	(1) Total cost	(2) Fin. Adv.	(3) Underw.	(4) Counsel	(5) Rat. Ag.	(6) Cr. Enh.	(7) Other
Property tax quintile 1 dummy	-0.081 (-0.53)	-0.003 (-0.03)	0.069* (1.73)	-0.014 (-0.35)	0.003 (0.31)	-0.107** (-2.22)	0.028 (0.37)
Property tax quintile 2 dummy	-0.145 (-1.17)	-0.058 (-0.91)	0.049 (1.43)	-0.049 (-1.57)	0.000 (0.02)	-0.038 (-1.06)	-0.059 (-1.04)
Property tax quintile 4 dummy	-0.129 (-1.06)	-0.090 (-1.56)	0.013 (0.42)	-0.031 (-0.95)	0.005 (0.68)	-0.004 (-0.13)	-0.001 (-0.02)
Property tax quintile 5 dummy	-0.220* (-1.66)	-0.180*** (-2.49)	-0.090*** (-2.66)	-0.040 (-0.93)	-0.006 (-0.73)	0.082** (2.02)	0.072 (1.12)
Number of observations	2565	2215	2527	2113	2291	2238	2565



Why are costs higher for low wealth districts?

1. Property tax constraints

- Municipal bonds repaid through property taxes.
- Offset with bond structure: Capital appreciation bonds (CABs) and/or longer maturities.

Due to time,
we will just
show these
results today.

2. Marketability constraints

- Lower demand (reputation effect, infrequent issuers)
- Can use credit guarantees or negotiated bids.

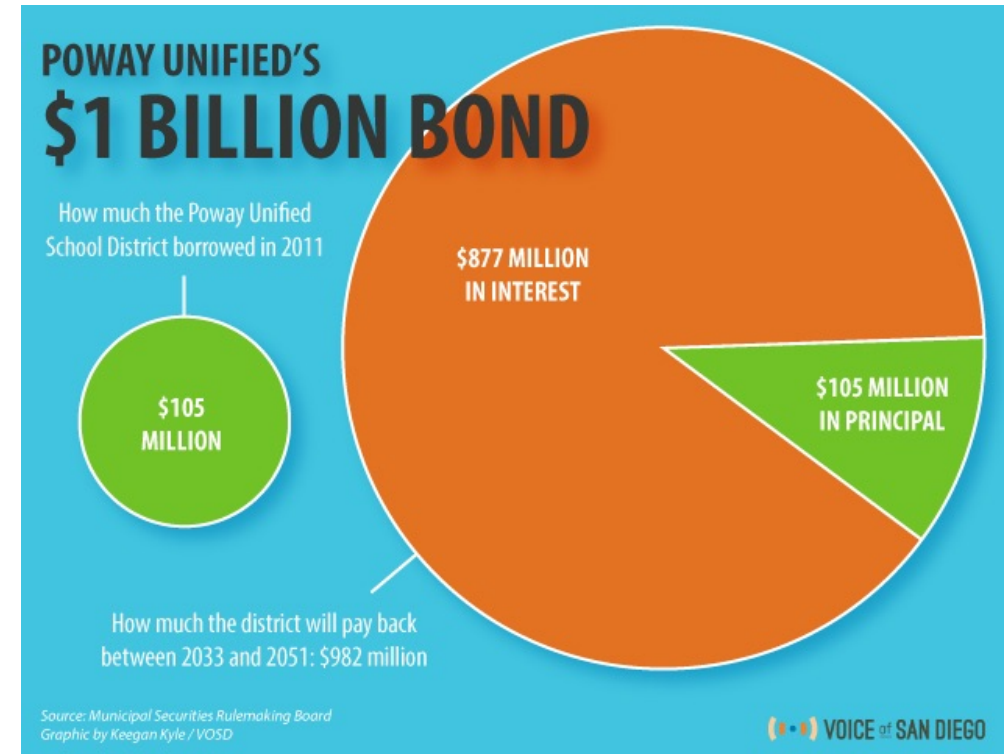
3. Urgency

- Need repairs sooner!
- Issue right away rather than waiting for lower rates or shopping for lower fees.



Background on CABs

- Capital Appreciation Bonds (CABs): zero-coupon bonds. Allow issuers to delay repayment until maturity.
- Many CABs were extremely expensive for school districts.
- In 2013, the Governor of CA signed Assembly Bill 182, which put limits and new oversight on CABs.



Low wealth districts issue CABs and longer maturity bonds

$$CAB_{it} = \tau_t + \beta_1 \text{property tax quintile}_{it} + X_{it} + \mu_{it} + \varepsilon_{it}$$

$$\text{Maturity}_{it} = \tau_t + \beta_1 \text{property tax quintile}_{it} + X_{it} + \mu_{it} + \varepsilon_{it}$$

	(1) CAB dummy (fewer controls)	(2) CAB dummy (more controls)	(3) CAB dummy (most controls)	(1) Log maturity (fewer controls)	(2) Log maturity (more controls)	(3) Log maturity (most controls)
Property tax quintile 1 dummy	0.862*** (3.65)	0.516** (2.21)	0.740*** (2.90)	1.165** (2.17)	0.714* (1.88)	1.329*** (3.11)
Property tax quintile 2 dummy	-0.084 (-0.38)	-0.394* (-1.80)	-0.330 (-1.50)	0.898* (1.67)	0.496 (1.27)	0.827** (2.09)
Property tax quintile 4 dummy	0.031 (0.13)	-0.276 (-1.10)	-0.349 (-1.32)	0.250 (0.45)	0.062 (0.16)	0.059 (0.15)
Property tax quintile 5 dummy	-0.349 (-1.45)	-0.159 (-0.59)	-0.353 (-1.22)	-0.640 (-1.09)	-0.308 (-0.73)	-0.899** (-2.11)
Number of observations	2553	2512	2512	2565	2517	2517



Other results (no time for tables)

Marketability constraints

- Lower demand (reputation effect, infrequent issuers)
- Controlling for credit quality, low wealth districts more likely to use credit guarantees and negotiated bids

• Urgency constraints

- Low wealth districts issue faster and in larger amounts

• Can the state make up the difference?

- Mixed results: State funding helps close the gap for new construction
- **But**, state funding widens the gap for modernization funding
- This is driven by first-come first-served allocation ,which allows more wealthy districts to obtain funds faster.



Conclusion

- We link inequality in educational outcomes to infrastructure funding in the municipal bond market.
- High costs of borrowing (driven by tax constraints, marketability, and urgency) for less wealthy school districts are an important yet understudied driver of disparity.
- Not only are wealthier districts better able to secure infrastructure funding through education bonds, but they borrow more cheaply (the municipal bond market is subsidized by state and federal taxpayers)
 - **This may not be an efficient use of taxpayer money if we want to promote more equity in education!**



APPENDIX SLIDES

Sample bond ballot from 2020

Ballot question

The ballot question was as follows:^[1]

“ To improve the quality of Ukiah Unified schools; repair or replace leaky roofs; make health and safety improvements; and modernize/construct classrooms, restrooms and school facilities; shall Ukiah Unified School District issue \$75,000,000 of bonds at legal rates, generating on average \$4,000,000 annually as long as bonds are outstanding at a rate of approximately 5 cents per \$100 assessed value, with annual audits, independent citizens’ oversight committee, NO money for salaries and no money taken by the State? ^[2] ”

- This bond was passed in March 2020 with 55.15% approval (needed 55% approval to pass).
- Estimate of property tax (“5 cents per \$100 assessed value) was required to be disclosed starting in 2018, and it was generally absent from ballots before.

