Demography is Destiny?
University Finances and the Enrollment Cliff

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Motivation: The Demographic Puzzle



- U.S. births continued to decline after 2007.
- Why? Affordability concerns, changing priorities, and parenting?
- Fewer newborns today can mean fewer college students 18 years later.

This Paper

Research questions

1. How do university bond spreads respond to a foreseeable decline in local college-age cohorts?
2. How do exposed universities adjust financially and organizationally before those cohorts reach college age?

Empirical Approach

- Exposure: geographic variation in birth declines after 2007
- Data: university bonds, enrollment, finances, endowments, etc
- Main design: difference-in-differences comparing universities in areas with steeper vs. milder birth declines

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Why Universities and Their Bonds?

- **Universities produce human capital.** Universities educate future workers, and enrollment supports their operating revenues.
- **A long demographic horizon.** Local declines in births signal potential enrollment pressure years in advance.
- **Observable institutional adjustment.** Enrollment, spending, endowment, and mergers reveal how exposed universities adjust.
- **Different horizons within an issuer.** Bonds mature before or after the projected cliff, allowing comparisons within the same university.

Contribution

- **Demographic change and asset prices.**
  Larger early spread increases on longer-term bonds suggest that investors anticipate future enrollment risk.
  Mankiw and Weil (1989); Poterba (2001, 2004); Butler and Yi (2022)

- **Human capital and institutional finance.**
  Exposed universities adjust spending, and private nonprofits lower endowment payouts, before smaller cohorts reach college age.
  Bound and Turner (2007); Deming and Walters (2017); Brown et al. (2014)

- **Determinants of municipal bond spreads.**
  Among exposed universities, stronger enrollment and endowment growth are associated with larger late-period spread declines.
  Ang and Piazzesi (2003); Wang et al. (2008); Longstaff (2011)

Data

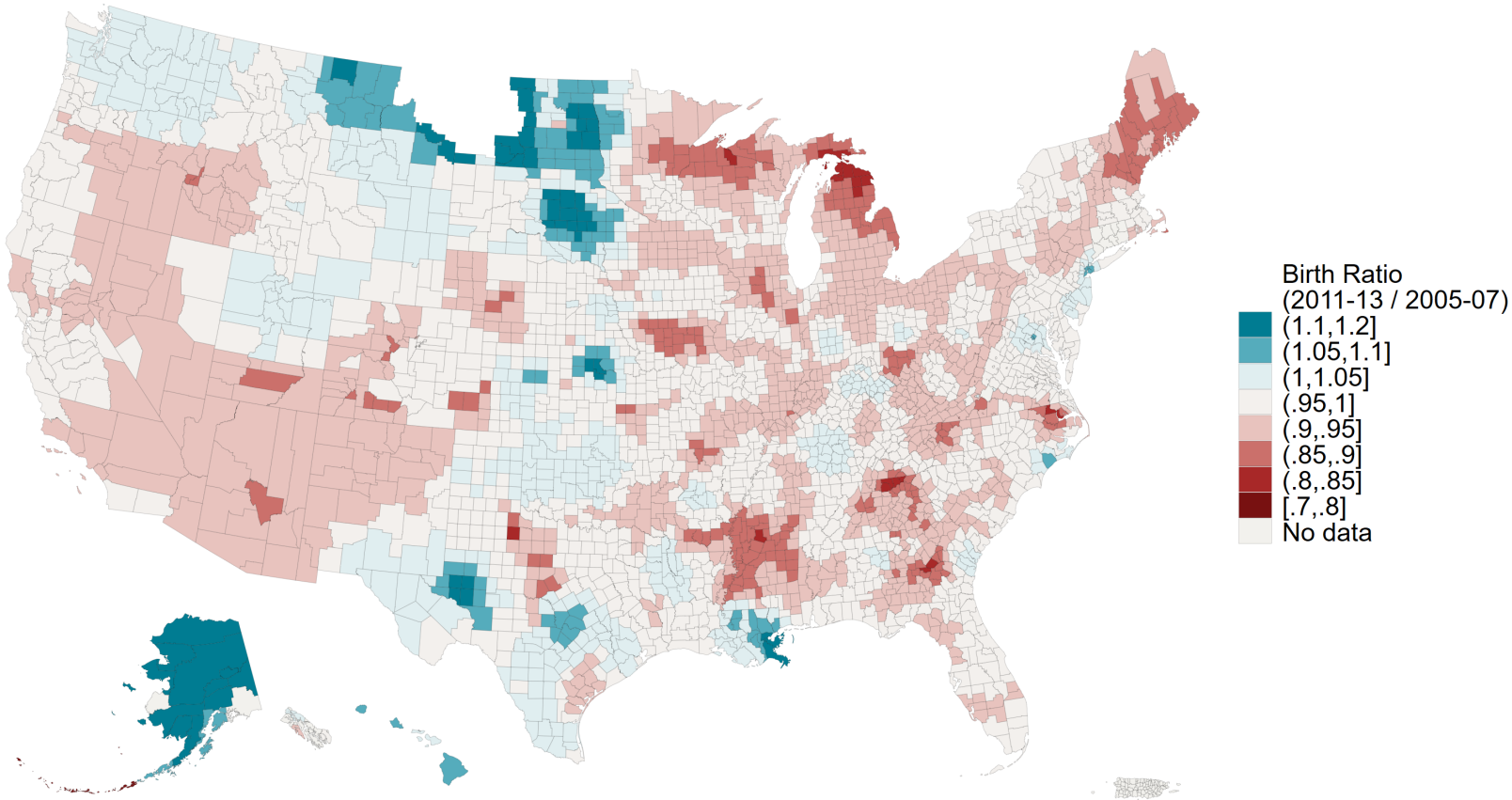
- **Bonds:** Mergent × MSRB, 2005–2024
  - 1.9M observations, 139,880 CUSIPs, ∼1,500 issuing universities
  - MMA, Treasury, and Tax-adjusted spreads
- **Universities:** IPEDS, 2005–2023, 29,000 institution-years
  - Enrollment, finances, admissions, test scores, etc.
- **Demographics:** SEER county population by age, using newborn counts to proxy birth-cohort size
- **Endowment flows:** IRS Form 990 Schedule D, 664 private non-profit institutions, 2009–2024

Treatment: Severity of the Local Birth Decline

$$\text{BirthRatio}_i = \frac{\sum_{c \in \mathcal{N}(i)} \sum_{t=2011}^{2013} C_{ct}}{\sum_{c \in \mathcal{N}(i)} \sum_{t=2005}^{2007} C_{ct}}$$

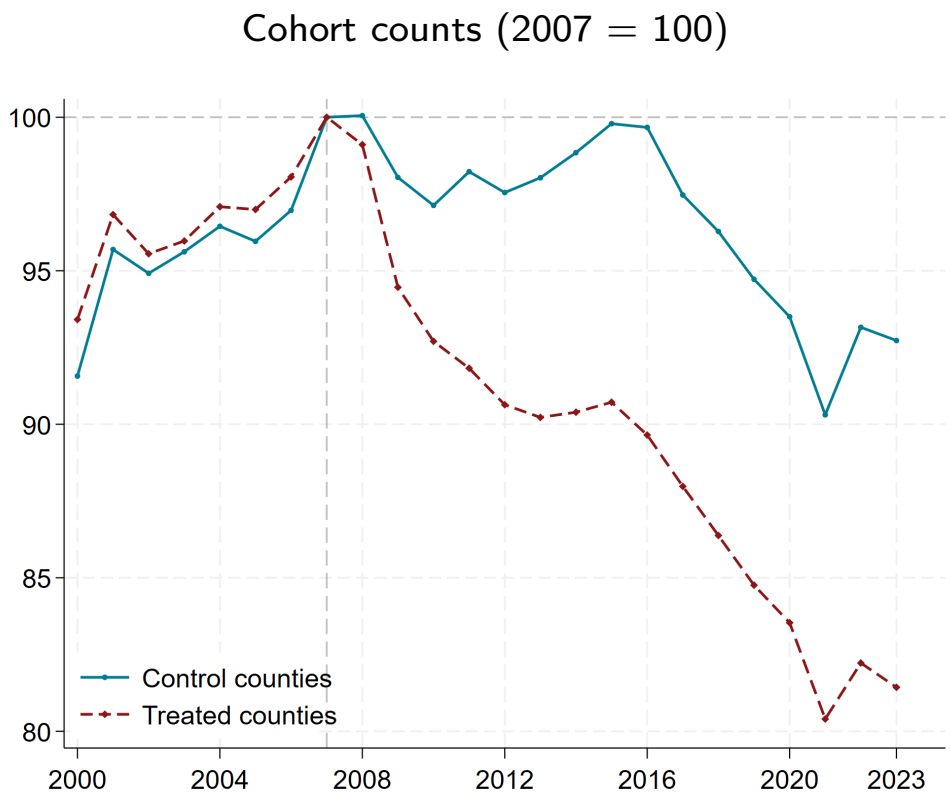
- C_{ct}: number of newborns in county c in year t.
- $\mathcal{N}(i)$: home county and first- and second-order neighbors.
- Treated universities have a ratio below the sample median. Controls have smaller declines or growth.

Exposure: Local Birth Declines Vary across the Country



Source: SEER County Population Data. Ratio of births in 2011-13 to births in 2005-07, computed over the county and all neighboring counties.

Local Birth-Cohort Trends by Treatment Status



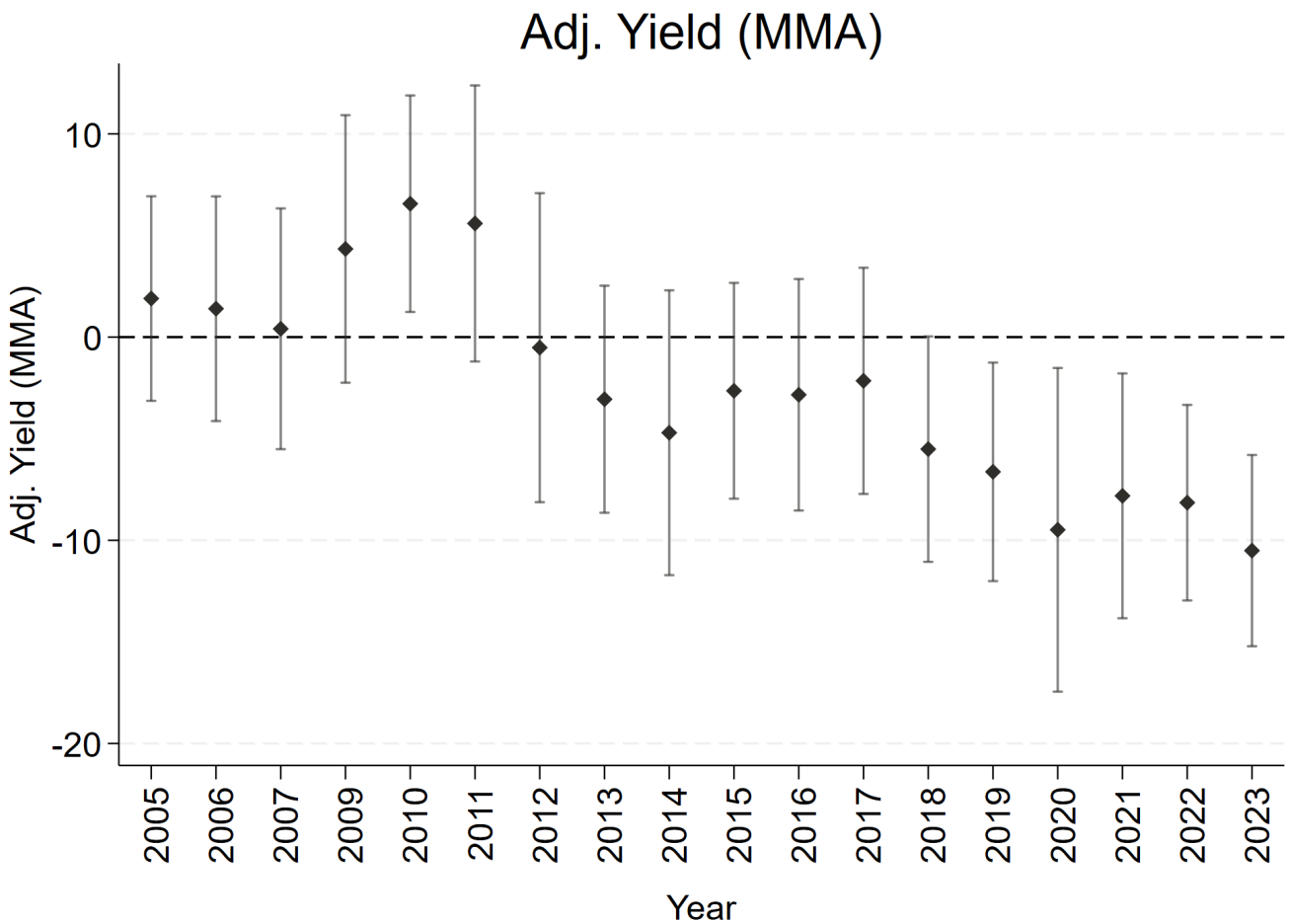
- Cohort counts indexed to 2007 = 100.
- Similar paths across two groups before 2007.
- Two groups diverge markedly after 2007.
- The 2007 cohort turns 18 in 2025.

Event-Study Difference-in-Differences

$$Y_{it} = \alpha_i + \delta_t + \sum_{k \neq 2008} \beta_k \, \text{Treated}_i \mathbf{1}\{t = k\} + \mathbf{X}'_{it}\gamma + \varepsilon_{it}.$$

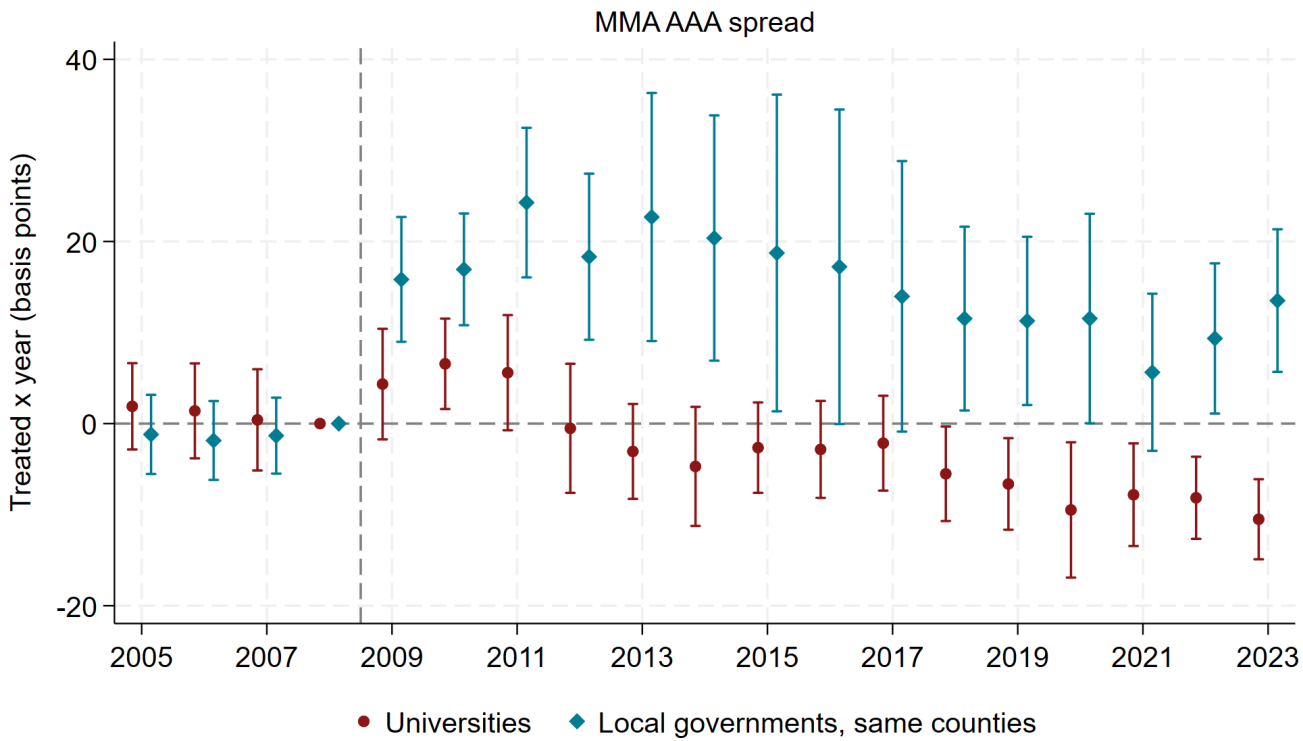
- University and year fixed effects; reference year: 2008.
- Controls: coupon, log offering amount, remaining maturity, callability, insurance, GO and tax-exempt status, bond age, and negotiated offering; county income and unemployment.
- Standard errors: university and year for bonds; university for institutional outcomes.
- Pooled bond windows:
  - Post_1: 2009–2011; Post_2: 2012–2019; Post_3: 2020–2023.

MMA Spread ES: Spreads Widen, Then Reverse



- MMA spread event study: differential changes relative to 2008.
- Early estimates are positive; the late-period differential is negative.

Early Widening Is County-Wide; Late Discount Is Universities' Own



- Municipal bonds issued within the same counties provide a robust placebo to absorb any confounding regional economic trends.
- The negative effect is unique to universities.

Late-Period Relative Spread Declines: 9–15 bps

	MMA	Treasury	Tax-adj	Rating
Treated × Post_1 (2009–2011)	4.54	5.60	4.94	−0.02
	(3.95)	(3.89)	(6.75)	(0.07)
Treated × Post_2 (2012–2019)	−4.46	−4.09	−8.57	−0.10
	(3.57)	(3.69)	(6.56)	(0.10)
Treated × Post_3 (2020–2024)	−9.80**	−9.26**	−14.65**	−0.05
	(3.69)	(3.69)	(6.13)	(0.13)
Observations	1.85M	1.85M	1.85M	1.41M

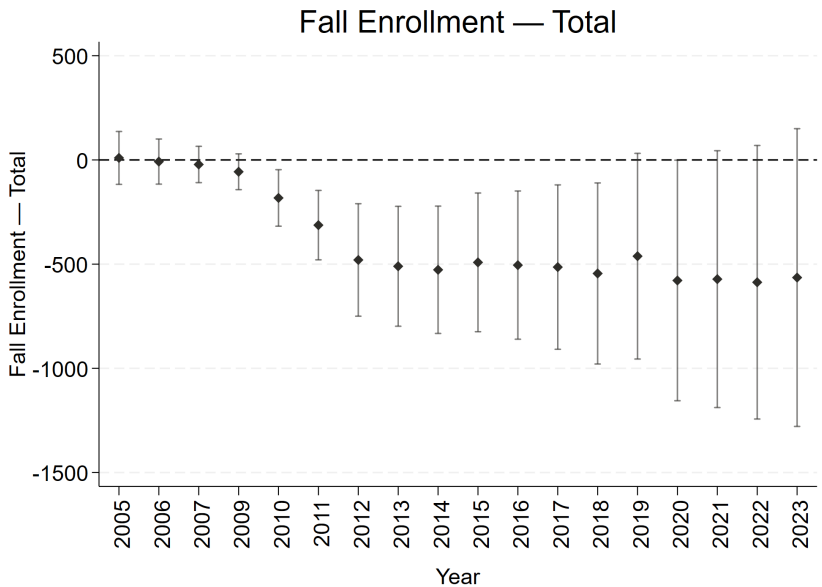
- Early pooled estimates are positive but statistically insignificant.
- A 9.8 bp decline is about 24% of the mean MMA spread of 41 bps.

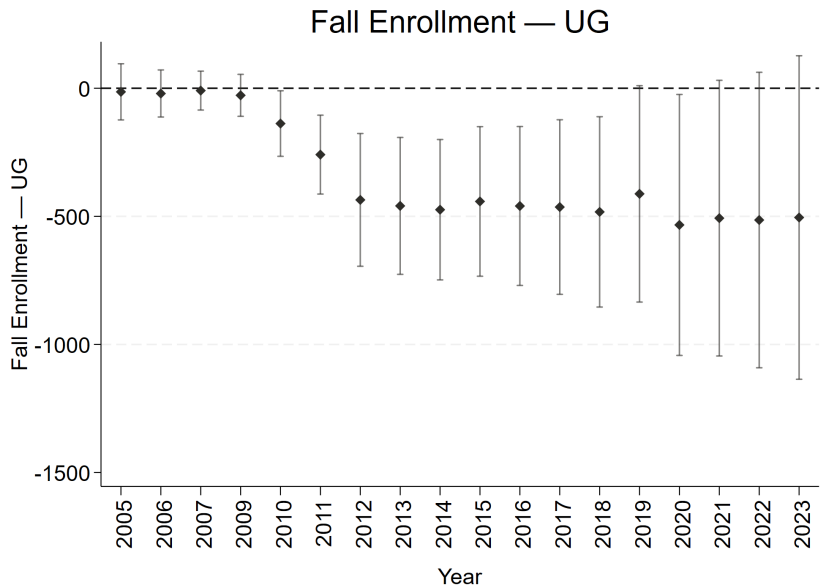
Spread Effects by Remaining Maturity: MMA Spread

Years to maturity	Post_1	Post_2	Post_3	Obs.
0–5 years	2.557	−0.531	−2.613	488,268
	(3.916)	(2.552)	(2.344)	
5–10 years	1.169	−5.776	−9.367**	511,867
	(5.022)	(3.965)	(4.048)	
10–20 years	4.709	−6.245	−14.131**	607,318
	(4.224)	(4.712)	(5.066)	
20–30 years	11.393**	2.704	−8.942	245,981
	(5.185)	(5.507)	(5.829)	

- Post_1: 2009–2011; Post_2: 2012–2019; Post_3: 2020–2023.
- Early widening is significant only in the 20–30-year bucket.
- Late declines are significant in the 5–10 and 10–20-year buckets.

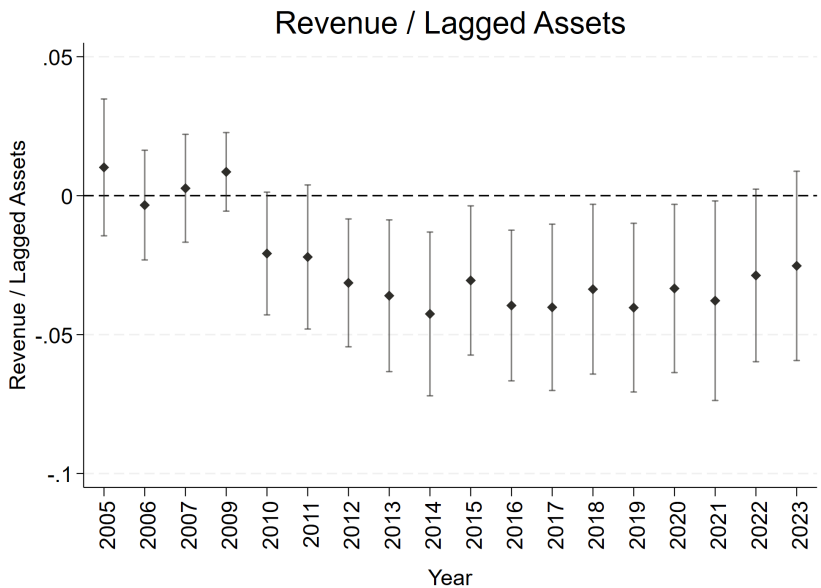
Enrollment Declines Mainly among Undergraduates

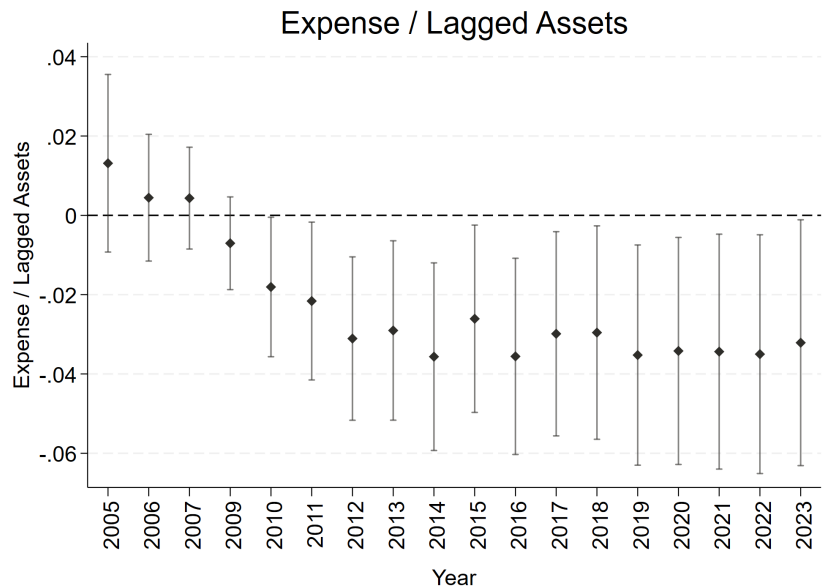




- Relative enrollment declines: 452 total students and 395 undergraduates.
- These losses begin before the smaller birth groups reach college age and reflect earlier conditions in exposed regions.

Revenue and Expenses Contract Together





- Revenue and expense ratios decline by similar magnitudes.

Lower Payouts Accompany Higher Endowment Growth

Form 990, private non-profits	Growth	Return	Contribution	Payout
Treated × Post_2 (2012–19)	0.0093^{**}	0.0000	0.0033	-0.0074^{***}
	(0.0047)	(0.0022)	(0.0042)	(0.0027)
Treated × Post_3 (2020+)	0.0104^{*}	0.0000	0.0038	-0.0068^{**}
	(0.0060)	(0.0028)	(0.0048)	(0.0034)
Observations	10,283	10,198	10,128	10,289

- Treated private institutions show a relative increase of about 1 percentage point in annual endowment growth.
- Payout rates fall by 0.7 percentage points relative to controls.

Late-Period Pricing within Treated Universities

Standardized institution-level measure	$\text{Post}_3 \times$ measure
Change in expenses / lagged assets	1.699
2012–2019 vs. 2005–2007	(3.302)
Change in government funding / lagged assets	3.820
2012–2019 vs. 2005–2007	(2.319)
Mean endowment growth rate	-9.021^{***}
2009–2019	(2.719)
Change in Form 990 payout rate	11.795
2012–2019 vs. 2009–2011	(8.212)
Log change in fall enrollment	-18.687^{***}
2017–2019 vs. 2005–2007	(4.785)
Change in revenue / lagged assets	1.811
2012–2019 vs. 2005–2007	(2.921)

- Stronger enrollment and endowment growth before 2020 are associated with larger late spread declines.
- Expense cuts show no consistent association with late discounts.

Sharper Local Declines Predict More Mergers in Public Systems

Merged by 2023, active in 2008	Binary treated	Continuous birth ratio	N
Full cohort	−0.001 (0.003)	−0.051** (0.020)	4,024
Four-year non-profits	0.000 (0.005)	−0.081** (0.036)	1,998
Public four-year	0.004 (0.015)	−0.206** (0.088)	679
Private four-year non-profit	−0.001 (0.001)	−0.003 (0.003)	1,319
Bond-issuing universities	0.000 (0.002)	−0.017 (0.016)	1,423

- In the full cohort, a 0.10 lower birth ratio is associated with a 0.51 percentage point higher merger probability.
- For public four-year institutions, the same decrease is associated with a 2.06 percentage point higher probability.

Conclusion

- **Early widening.** Spread increases on longer-term bonds in 2009–2011 are consistent with investors anticipating enrollment risk.
- **Universities adjust.** Exposed universities reduce spending as revenues fall; private nonprofits also lower endowment payouts.
- **Later discount.** Estimates turn negative in 2020–2023. Among treated universities, stronger prior enrollment and endowment growth are associated with larger declines.

Demography need not be destiny: universities have time to adjust, and investors can revise their expectations.

Thank You!

Early Repricing and the 2025 Maturity Cutoff

	MMA		Treasury		Tax-adj	
Treated × Post_1 ×	Year FE	Univ.×Yr	Year FE	Univ.×Yr	Year FE	Univ.×Yr
matures before 2025	1.35		1.99		−0.18	
	(4.24)		(4.20)		(7.05)	
matures 2025 or later	11.66**	12.23***	12.72***	13.42***	18.54**	22.14***
	(4.16)	(2.93)	(4.25)	(2.78)	(6.70)	(5.00)
Observations	1.85M	1.86M	1.85M	1.86M	1.85M	1.86M

- Bonds maturing before 2025 retire before any post-2007 cohort turns 18
- Treated universities' bonds maturing before 2025 show no differential, while their bonds maturing in 2025 or later widened significantly.

Enrollment Losses: Public, Doctoral, and Midwestern Institutions

Enrollment indexed to 2007	2013	2018	2023
Doctoral	−0.042**	−0.057**	−0.077**
Master's	0.003	0.001	0.002
Baccalaureate	0.006	−0.007	0.011
Associate's	−0.074*	−0.035	−0.098
Public	−0.051**	−0.059*	−0.093**
Private	0.013	−0.007	0.078
Northeast	0.034	0.017	0.193
Midwest	−0.096**	−0.110**	−0.139**
South	0.024	0.055	0.051
West	−0.017	−0.007	0.048
Rust Belt	−0.076	−0.306	−0.236
Rest of country	0.010	0.054	0.087

- Losses concentrate in public, doctoral, and Midwestern institutions
- Private, Northeastern, and Southern institutions show none

The Late Discount Is Concentrated in the West

