

Merit Aid, Sorting, and Institutional Access

Evidence from Tennessee's HOPE Scholarship

Balint Kidd ■ Tommy Soltanian ■ Tyler Sotomayor ■ Gabriel Uceda-Sosa

Columbia University Department of Economics

The puzzle: merit aid and income

What the literature says

- Dynarski (2000): Georgia's HOPE *widened* the attendance gap between higher- and lower-income students
- 71-study review (Herbaut & Geven 2020): merit grants rarely improve access, often *increase* inequality
- Standard view: broad merit $\Rightarrow$ regressive

What we find for Tennessee

- TN HOPE (GPA 3.0 *or* ACT 21): bottom-quintile share at TN publics **rose by 1.50 pp** ($\sim 11\%$ relative)
- Monotonic shift across Q_1 – Q_5
- Progressive, not regressive

Question: Why does Tennessee differ? And what does the difference teach us about program design?

Data and design

Data

- **Chetty Mobility Report Cards:** tax-linked Q_1 – Q_5 shares at every US college, by cohort
- **BEA** county per-capita income (baseline control)
- **NLSY97:** simulated HOPE eligibility
- *Aggregate* data — college $\times$ cohort, not individual-level. Mechanism inferred from heterogeneity.

Pre-trend $F = 1.23$ ($p = 0.32$) — does not reject parallel trends.

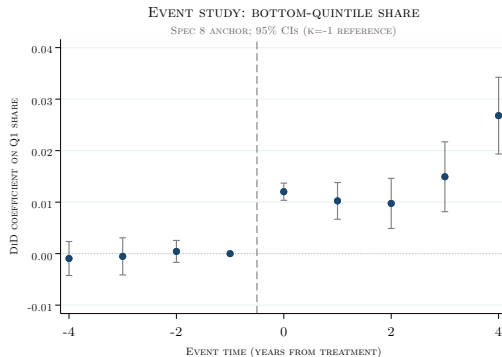
TWFE DiD

$$Y_{it} = \beta D_{it} + \gamma X_i + \alpha_i + \delta_t + \varepsilon_{it}$$

- 19 balanced TN publics; 25 non-merit control clusters (MA excluded for 2004 Adams)
- College + cohort FE, BEA baseline, state-clustered SEs
- Drop cohorts 1980–82; $t^* = 1987$
- $N = 4,333$; **26 clusters**

Event study: Q_1 share

$$Y_{it} = \sum_{k \neq -1} \beta_k \cdot \mathbf{1}[\text{TN}_i] \cdot \mathbf{1}[t - 1987 = k] + \gamma X_i + \alpha_i + \delta_t + \varepsilon_{it}$$



What you see

- Pre-trend coefficients ($k = -4, -3, -2$) cluster at zero
- Sharp jump at $k = 0$ (cohort 1987 — first full-HOPE cohort)
- Post-treatment growth through $k = +4$

Why $k = -1$ is reference Cohort 1986 is the *announcement* year; omitted. Setting $t^* = 1986$ alone gives near-zero (§robustness).

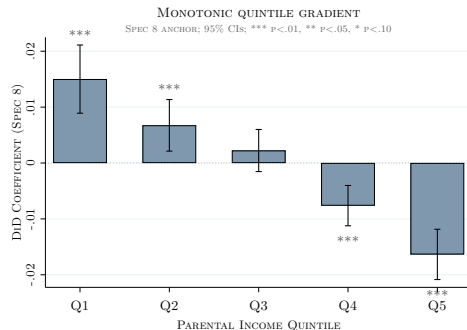
Headline: monotonic quintile gradient

Quintile ATTs (TN publics)

Outcome	ATT
Q ₁ share	+0.0150***
Q ₂ share	+0.0067***
Q ₃ share	+0.0022
Q ₄ share	-0.0076***
Q ₅ share	-0.0164***

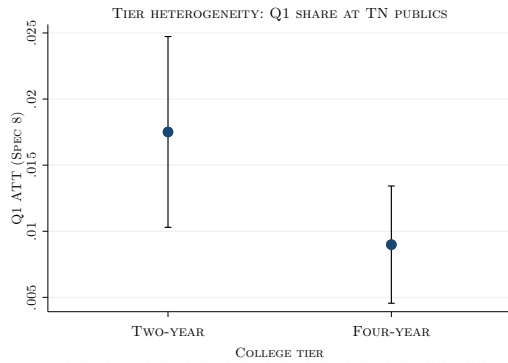
$N = 4,333$; 26 clusters

SE 0.0031 on Q₁. *** $p < 0.01$.



What 1.50 pp means: Q₁ share rose from ~13% to ~14.5% — an ~11% relative increase. Scaled to 19 balanced TN publics $\times$ 5 post-HOPE cohorts, the coefficient corresponds to ~2,500 additional Q₁ enrollments relative to the non-merit counterfactual. Q₁ and Q₅ endpoints both significant at 1%; pre-trend test passes.

Where the gain concentrates: tier heterogeneity



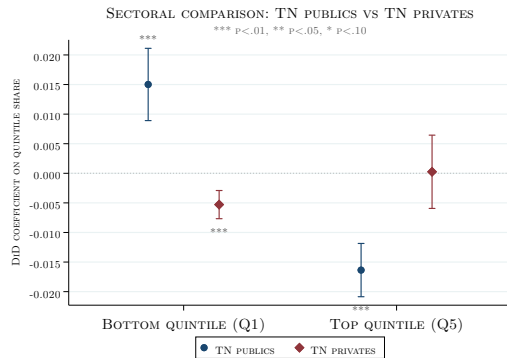
Q_1 ATT by tier

- Two-year publics: $+0.0175^{***}$
- Four-year publics: $+0.0090^{***}$
- $\sim 2\times$ larger at community colleges

What's different about the tiers

- Community colleges have *open admission* — cost is the primary barrier to attendance
- Four-year publics also apply *admissions filters*
- Q_5 students are largely absent at CCs — the CC gain is hard to reconcile with a Q_5 -exit story

Private-sector comparison



TN privates (TWFE DiD)

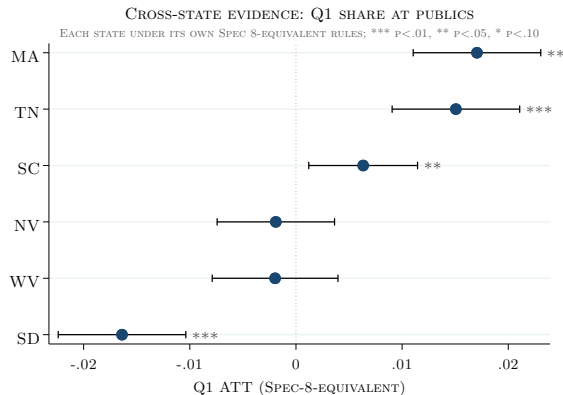
Outcome	ATT
Q ₁ share	-0.0053***
Q ₅ share	+0.0003 (NS)

Reading

- No mirror shift at privates $\Rightarrow$ public gain is not a TN-wide trend
- Small Q₁ decline at privates (opposite sign)
- HOPE ($\sim$ \$3–4k) $\approx$ public tuition; small vs. private ($\sim$ \$20k+)

Compositional shift is specific to the public sector. *Consistent with* relative-price reallocation.

Cross-state evidence: design predicts direction



Four design parameters

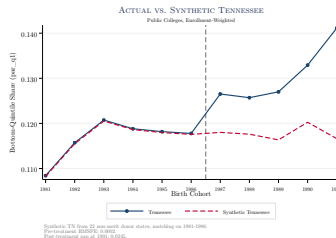
- Threshold strictness
- Award structure (first- vs last- $\$$)
- Award magnitude
- Capacity response

NV and WV: predicted nulls

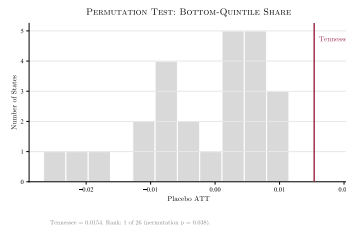
- NV: \$960 award too small to move behavior
- WV: enrollment contraction confounds the denominator

Robustness: the Q_1 result survives

Test	Q_1 ATT
Baseline	+0.0150***
LW detrending	+0.0132***
Rambachan–Roth	$M^* > 2$
Triple-difference	+0.0203***



Synthetic control (Abadie 2010):
post-1987 gap $\sim +2.45$ pp at cohort 1991.



Permutation test: TN's ATT
(+0.0154) ranks 1 of 26 ($p = 0.038$).

Takeaway: design determines direction

Four design levers

- Threshold strictness
- Award structure (first- vs. last-\$)
- Award magnitude
- Capacity response

Reframe

- “Merit aid is regressive” is **too coarse**
- Outcome depends on *parameter configuration*, not program existence
- Georgia and Tennessee: same framework, different design parameters
- Cross-state: sign of effect tracks design across six state programs

Limitations

What this paper can't do

- Single treated state (cross-state evidence partly mitigates)
- Aggregate data — compositional shift identified at institution level, not individual decisions
- College-county vs. student-county BEA (FSRDC would close)
- National quintile cutoffs (state-specific would be a useful check)
- Middle quintiles (Q_2 – Q_4) corroborative, not independently identified

Ongoing work: structural model

Framework

- Random-utility college-choice model
- Eligibility threshold τ as a discrete switch
- Joint income–ability distribution, corr ρ

What it enables

- Compositional gradient *derived* from microfoundations
- Counterfactuals on design (τ , S , structure)
- Calibration underway (NLSY97 microdata)

$$V_{ij} = \alpha \ln(y_i + S \cdot \mathbf{1}[a_i \geq \tau] - C_j) + h(a_i, \theta_j) + \varepsilon_{ij}$$

y = parental income, S = HOPE award, a = achievement, τ = threshold, C_j = tuition at j , θ_j = institution quality. Logit ε .

Next steps and thanks

Next steps

- State-specific income quintiles (Census / ACS)
- IPEDS tuition validation across programs
- Origin-county FSRDC design
- Downstream labor-market outcomes

Thank you.

Questions?

Tyler Sotomayor
trs2169@columbia.edu

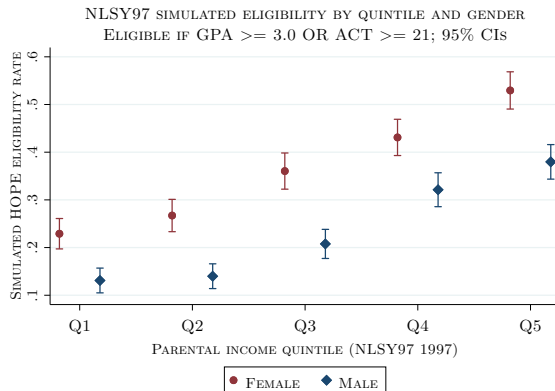
Gabriel Uceda-Sosa
gu2145@columbia.edu

Backup: specification menu

Spec	Label	Panel	Drop 80–82	BEA	t^*	Q_1 ATT
1	Full, time-varying BEA	Full	No	Time-var	1987	+0.0171
2	Baseline BEA, full	Full	No	Baseline	1987	+0.0162
3	No BEA, full	Full	No	None	1987	+0.0185
4	Balanced, no BEA	Bal.	Yes	None	1987	+0.0172
5	Balanced, no drop	Bal.	No	Baseline	1987	+0.0166
8	Cleanest (chosen)	Bal.	Yes	Baseline	1987	+0.0150
10	Cleanest, no BEA	Bal.	Yes	None	1987	+0.0145
12	Cleanest $t^*=1986$	Bal.	Yes	Baseline	1986	+0.0127

All 12 specs (excluding unreliable 4-cluster bordering-state designs): Q_1 ATT in [+0.013, +0.019]. Result is not sensitive to any single choice.

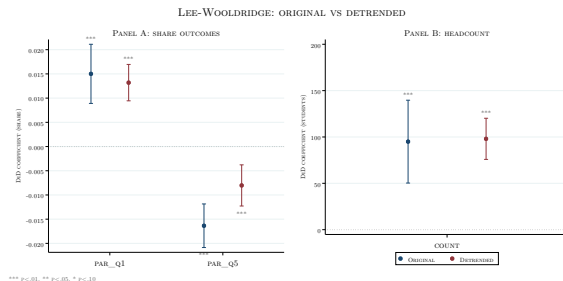
Backup: NLSY97 simulated HOPE eligibility



Microfoundation for the threshold story

- Eligibility rises from $\sim 32\%$ at Q_1 to $\sim 60\%$ at Q_5
- Female eligibility exceeds male at every quintile
- Gender gap largest at the low-income margin (~ 10 pp)
- Applies HOPE's rule to NLSY97 national achievement distribution

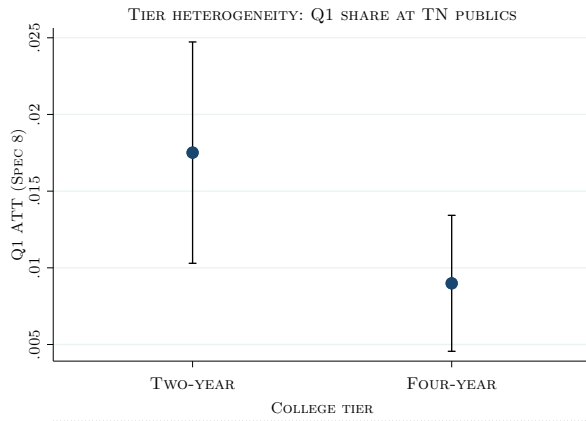
Backup: Lee–Wooldridge detrending



Unit-specific detrending

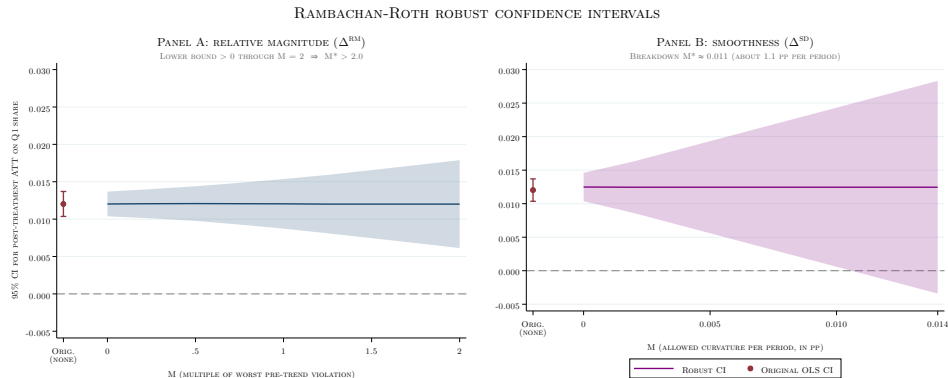
- Fits college-specific linear pre-trend on cohorts 1983–1986
- Subtracts, re-estimates DiD
- Q_1 : $+0.0150 \rightarrow +0.0132$ (12% attenuation, still $p < 0.001$)
- **Count**: $+95 \rightarrow +98$ (unchanged)
- Q_5 : attenuates $\sim$ half but still $p < 0.001$

Backup: Tier heterogeneity



Two-year publics (Q_1 ATT = +0.0175) dominate four-year publics (+0.0090). Consistent with the threshold mechanism: marginal-eligibility students cluster at community colleges, where a relaxation of financial constraints pulls in new entrants rather than changing who pays.

Backup: Rambachan–Roth sensitivity



Panel A: relative-magnitude breakdown $M^* > 2.0$. **Panel B:** smoothness breakdown $M^* \approx 0.011$ (~ 1.1 pp per-period curvature).