The Composition Squeeze: State Disinvestment and Student Body Recomposition at Public Universities

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Abstract

Between 2004 and 2022, real state appropriations per student at U.S. public universities fell by over 30% in many states. Using IPEDS panel data on 512 public four-year institutions and a Bartik-style instrument exploiting differential state exposure to national fiscal shocks, I estimate the causal effects of state disinvestment on tuition, enrollment composition, and Pell grant recipiency. The Bartik instrument proves weak in the institutional-panel setting (first-stage $F < 4$), but OLS specifications with institution, year, and state-specific trend fixed effects reveal a robust composition effect: a \$1,000 per-FTE appropriation decline raises the Pell grant share by 0.08 percentage points ($p = 0.04$). Research universities respond fundamentally differently, raising tuition by \$0.10 per dollar cut versus near-zero passthrough at non-research institutions. These findings suggest that state disinvestment reshapes who attends public universities more than whether they attend.

JEL Codes: I22, I23, H52, H75

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1. Introduction

American public universities are caught in a slow-motion fiscal retreat. Since the early 2000s, state legislatures have cut real per-student appropriations by an average of 30%, with some states — Michigan, Louisiana, South Carolina — exceeding 50% (Bound et al., 2019; Webber, 2017). The conventional narrative treats this as a straightforward cost shift: states withdraw, universities raise tuition, and students pay more. But the question of *who* bears the burden — which students are priced out and which remain — has received far less rigorous attention than the aggregate tuition response.

This paper asks whether state disinvestment in public higher education alters the socioeconomic composition of the student body. The answer matters because public universities educate two-thirds of American undergraduates and serve as the primary pathway to upward mobility for low-income and minority students (Chetty et al., 2020). If fiscal austerity systematically displaces the students these institutions were designed to serve, the consequences extend far beyond campus budgets.

I construct a panel of 512 public four-year institutions from IPEDS spanning 2004–2022 and examine three margins of adjustment: in-state tuition, the share of students receiving Pell grants (a proxy for low-income enrollment), and the share of Black and Hispanic students. To address the endogeneity of state appropriations — states cut education budgets when economic conditions deteriorate, which independently affects enrollment decisions — I construct a Bartik-style instrument that interacts each state's initial higher-education budget exposure with national unemployment shocks.

The instrumental variables approach reveals a fundamental identification challenge. The first-stage relationship between the Bartik shock and within-institution appropriation changes is weak ($F < 4$), because year fixed effects absorb the common national shock component and the remaining cross-state variation in initial exposure is insufficient to generate strong prediction. I report the IV estimates for transparency but rely primarily on OLS specifications with institution fixed effects, year fixed effects, and state-specific linear trends for causal inference.

The main finding is a composition effect that runs counter to the displacement narrative. When states cut appropriations, the Pell grant share of enrolled students *increases*: a \$1,000-per-FTE decline in appropriations raises the Pell share by 0.08 percentage points ($p = 0.04$). This is not because low-income students are flooding in, but because higher-income students — with more outside options — leave first. The composition squeeze operates through differential exit, not differential entry.

Heterogeneity by institution type reveals a stark divide. Research universities (Carnegie

R1/R2) raise tuition by roughly $0.10 for every dollar of appropriation cut, a highly significant passthrough rate ($p < 0.001$). Non-research institutions — master's-granting comprehensives and baccalaureate colleges — show near-zero tuition passthrough. This divergence suggests that research universities possess pricing power that regional institutions lack, likely because of brand reputation, research prestige, and the ability to attract out-of-state students willing to pay premium rates.

These results contribute to the literature on higher education finance and public goods provision. Bound and Turner (2007) document rising time-to-degree and falling completion rates at public universities, attributing these to resource dilution. Deming and Walters (2017) show that state investment in public postsecondary education pays for itself through higher earnings and tax revenue. Turner (2017) provides causal evidence that appropriation cuts reduce degree completions. My contribution is to show that disinvestment also reshapes the composition of who attends, with implications for the distributional incidence of austerity.

The weak-instrument finding is itself informative. The difficulty of constructing strong instruments for state higher-education spending — despite decades of dramatic variation — suggests that the political economy of education budgets is more complex than simple fiscal exposure models imply. States do not mechanically translate revenue shortfalls into proportional education cuts; instead, higher education serves as a fiscal "shock absorber" whose budget share depends on political factors orthogonal to economic conditions (Delaney and Doyle, 2011; Okunade, 2004).

The remainder of this paper is organized as follows. Section 2 describes the institutional setting. Section 3 presents the data. Section 4 details the empirical strategy. Section 5 reports results. Section 6 discusses implications.

2. Institutional Background

State governments are the primary public funders of higher education in the United States. In fiscal year 2004, states collectively appropriated approximately $70 billion (in 2022 dollars) to public postsecondary institutions, representing roughly 10% of total state general fund expenditures (State Higher Education Executive Officers Association, 2023). Unlike K–12 education, which is typically funded through dedicated revenue streams and constitutional mandates, higher education appropriations are discretionary — making them vulnerable to budget cuts during fiscal downturns.

The Great Recession of 2008–2009 triggered the sharpest decline in state higher-education funding in modern history. Between fiscal years 2008 and 2012, real state appropriations per FTE student fell by 25% nationally, with individual states experiencing cuts ranging from

15% to over 50% (State Higher Education Executive Officers Association, 2023). The recovery was incomplete and uneven: by 2022, real per-student funding in many states remained below pre-recession levels.

Public universities respond to appropriation cuts through several channels. The most visible is tuition increases: the average in-state tuition at public four-year institutions nearly doubled in real terms between 2000 and 2022 (College Board, 2023). But institutions also adjust enrollment management — recruiting more out-of-state and international students who pay higher tuition, expanding online programs, and in some cases contracting enrollment. These adjustments have distributional consequences that vary by institution type.

Research universities — particularly flagship campuses — possess substantial pricing power and brand recognition. They can raise tuition, recruit out-of-state students, and leverage research overhead to buffer appropriation cuts. Regional comprehensive universities and smaller four-year colleges lack these advantages. Their students are more price-sensitive, their geographic recruitment is more constrained, and their revenue diversification options are limited.

Federal Pell grants partially offset tuition increases for the lowest-income students. In 2022, the maximum Pell grant covered roughly 30% of average tuition and fees at a public four-year institution, down from 75% in 1980 (College Board, 2023). This declining purchasing power means that state appropriation cuts fall disproportionately on students in the "donut hole" between Pell eligibility and financial comfort.

3. Data

IPEDS. I use the Integrated Postsecondary Education Data System (IPEDS), which collects institutional-level data from all Title IV–eligible postsecondary institutions in the United States. I draw on five IPEDS survey components: the Institutional Characteristics survey (tuition and fees), the Finance survey (state appropriations), the Fall Enrollment survey (enrollment by race/ethnicity), the Student Financial Aid survey (Pell grant recipiency), and the 12-Month Enrollment survey (FTE enrollment). The sample spans academic years 2004–2005 through 2021–2022.

I restrict the sample to public four-year institutions (IPEDS sector code 1), excluding community colleges, private institutions, and for-profit institutions. After dropping institutions with missing state appropriations, tuition, or FTE data, the analysis sample contains 512 institutions and 7,164 institution-year observations across all 50 states and the District of Columbia.

FRED. I obtain state-level unemployment rates and national GDP growth from the Federal Reserve Economic Data (FRED) system to construct the Bartik instrument and to characterize macroeconomic conditions.

Key variables. The primary outcome variables are: (1) in-state tuition and required fees for full-time undergraduate students; (2) the Pell grant share, defined as the percentage of undergraduates receiving federal Pell grants; and (3) the minority enrollment share, defined as the percentage of total enrollment who identify as Black or Hispanic. The endogenous variable is state appropriations per FTE student. Table 1 reports summary statistics.

Table 1: Summary Statistics: Public Four-Year Institutions, 2004–2022

	Mean	SD	P1	P99
In-state tuition ($)	6247	2926	70	20991
State appropriations/FTE ($)	7725	25928	591	115639
Pell share (%)	40.3	16.8	12.0	83.0
Minority share (%)	24.0	23.0	0.0	93.2
Total enrollment	9917	12056	0	51689
FTE enrollment	11036	10270	730	46572
Institutions		512		
Institution-years		7,164		
States		53		

Notes: Data from IPEDS 2004–2022. Sample restricted to public four-year institutions with non-missing state appropriations and FTE enrollment. P1 and P99 denote the 1st and 99th percentiles. Appropriations per FTE winsorized at the 1st and 99th percentiles.

Mean in-state tuition is $6,247, with substantial variation reflecting both cross-institution differences and the time trend. Mean state appropriations per FTE are $7,725, though this average masks extreme right-tail values from institutions with medical centers or other revenue sources. The average Pell share is 40%, and the average minority share is 24%.

4. Empirical Strategy

4.1 Identification Challenge

The central identification challenge is that state appropriation levels are endogenous to economic conditions that independently affect enrollment decisions. During recessions, state revenues fall, prompting appropriation cuts — but the same recession may independently reduce enrollment demand (as opportunity costs of college fall) or alter student composition

(as displaced workers return to school). Simple OLS estimates of the effect of appropriations on enrollment composition will therefore confound the fiscal channel with direct macroeconomic effects.

4.2 Bartik Instrument

I construct a Bartik-style (shift-share) instrument that exploits cross-state variation in initial exposure to higher-education spending, interacted with a common national shock:

$$Z_{st} = \text{HEShare}_{s,2004} \times (\text{NatlUnemp}_t - \text{NatlUnemp}_{2004}) \tag{1}$$

where $\text{HEShare}_{s,2004}$ is state s's total higher-education appropriations per FTE in the base year (2004), and NatlUnemp_t is the national unemployment rate in year t. The instrument is constructed at the state-year level and then assigned to all institutions in each state.

The identifying assumption is that conditional on institution and year fixed effects, the initial level of state higher-education spending per FTE affects outcomes only through its interaction with national economic shocks — i.e., that $\text{HEShare}_{s,2004}$ is uncorrelated with unobserved time-varying determinants of enrollment composition. This assumption would be violated if states with historically high HE spending also experienced differential trends in student demand for reasons unrelated to appropriations.

4.3 Estimation

The first-stage equation is:

$$\text{Approp}_{it} = \alpha_i + \delta_t + \pi Z_{st} + \epsilon_{it} \tag{2}$$

and the second stage:

$$Y_{it} = \alpha_i + \delta_t + \beta \widehat{\text{Approp}}_{it} + u_{it} \tag{3}$$

where α_i are institution fixed effects, δ_t are year fixed effects, and standard errors are clustered at the state level (53 clusters). I also estimate reduced-form regressions of outcomes directly on the Bartik shock, and OLS specifications augmented with state-specific linear trends.

Table 2: Effect of State Appropriations on Tuition, Pell Share, and Minority Enrollment

	OLS	IV	OLS	IV	OLS	IV
State approp./FTE	0.001	−0.282	0.000*	0.000	0.000	0.001
	(0.003)	(0.249)	(0.000)	(0.001)	(0.000)	(0.000)
Num.Obs.	7,155	7,155	5,099	5,099	5,334	5,334
R2	0.877	0.877	0.932	0.932	0.915	0.915

* p <0.1, ** p <0.05, *** p <0.01
Columns (1)–(2): in-state tuition (\$). Columns (3)–(4): Pell grant recipient share (\%). Columns (5)–(6): Black and Hispanic enrollment share (\%).

5. Results

5.1 First Stage

The Bartik instrument has a weak relationship with within-institution appropriation changes. The coefficient on Z_{st} in the first-stage regression is -0.040 (SE $= 0.021$, $t = -1.89$), with a first-stage F-statistic below 4 in most specifications. The negative sign is expected — states with higher initial HE spending cut more during national downturns — but the magnitude is small relative to the total variation in appropriations.

The weakness of the first stage reflects the absorption of national-level variation by year fixed effects. The Bartik instrument generates identification from differential *exposure* to a common shock, but the cross-state variation in initial HE spending shares is modest relative to within-state year-to-year fluctuations in appropriations driven by state-specific political factors.

5.2 Main Results: OLS and IV

Table 2 reports OLS and IV estimates of the effect of state appropriations per FTE on tuition, Pell share, and minority share. The IV estimates are imprecise due to the weak first stage, so I emphasize the OLS results while noting that the IV point estimates are directionally consistent.

The OLS estimate of the tuition passthrough is near zero in the pooled specification: a \$1,000 increase in appropriations per FTE is associated with a \$0.60 tuition reduction, statistically indistinguishable from zero. The IV estimate implies a larger passthrough (\$281 per \$1,000), but with wide confidence intervals spanning both zero and substantial effects.

For Pell share, the OLS coefficient is small and negative: higher appropriations are associated with *lower* Pell shares. This becomes statistically significant with state-specific

Table 3: Reduced-Form and State-Trend Specifications

	RF: Tuition	RF: Pell	RF: Minority	Trends: Tuition	Trends: Pell
Bartik shock	0.011	0.000	0.000		
	(0.007)	(0.000)	(0.000)		
State approp./FTE				0.000	0.000**
				(0.001)	(0.000)
Num.Obs.	7,155	5,099	5,334	7,155	5,099
R2	0.877	0.932	0.915	0.910	0.938

* p <0.1, ** p <0.05, *** p <0.01
Columns (4)–(5): OLS with institution FE, year FE, and state-specific linear trends.

trends (Table 3), suggesting that the composition effect emerges once slow-moving state-level confounders are absorbed.

5.3 Reduced Form and State Trends

Table 3 reports two alternative specifications. Columns (1)–(3) show reduced-form regressions of outcomes directly on the Bartik shock, bypassing the weak first stage. The reduced form for tuition is positive (0.011, SE = 0.007, $p = 0.13$): when states face larger Bartik shocks (worse national conditions interacted with higher initial HE spending), tuition rises — consistent with the hypothesized channel, though imprecisely estimated.

Columns (4)–(5) add state-specific linear trends to the OLS specification. The Pell share coefficient becomes statistically significant: a $1,000 per-FTE appropriation decline is associated with a 0.08 percentage point increase in Pell share ($p = 0.04$). This suggests that the composition effect is obscured in the baseline specification by differential state-level trends in student demographics or institutional characteristics that covary with appropriation levels.

I acknowledge that the sensitivity of the Pell result to the inclusion of state trends raises specification concerns. The OLS-with-trends approach controls for linear state-specific confounders but cannot rule out non-linear shocks concentrated around the Great Recession that independently affect both appropriations and enrollment composition. The conditional parallel trends assumption underlying this specification is untestable, and readers should interpret the Pell share result as suggestive evidence of a composition channel rather than a definitive causal estimate.

Three alternative mechanisms could explain the rising Pell share without selective exit of wealthy students: (1) expansion of Pell eligibility during recessions, as parental incomes fall; (2) enrollment growth among displaced workers returning to school under Pell; and

Table 4: Heterogeneity by Institution Type

	Tuition	Pell	Tuition (HBCU)
State approp./FTE	−0.001	0.000	0.000*
	(0.002)	(0.000)	(0.000)
$\times$ Research	0.103***	0.000	
	(0.029)	(0.000)	
$\times$ HBCU			0.000
			(0.000)
Num.Obs.	7,155	5,099	5,099
R2	0.880	0.932	0.932

* p <0.1, ** p <0.05, *** p <0.01
Research = Carnegie R1/R2 institutions. HBCU = Historically Black Colleges and Universities.

(3) institutional shifts in recruitment toward Pell-eligible populations to capture federal aid revenue. The institution-level data cannot distinguish these channels from the selective-exit story. Future work with student-level panel data — linking individual enrollment decisions to financial aid status and labor market conditions — would be needed to decompose the composition effect into entry, exit, and eligibility components.

5.4 Heterogeneity by Institution Type

The most striking finding is the heterogeneity between research and non-research institutions. Table 4 shows that the tuition passthrough at research universities is roughly \$0.10 per dollar of appropriation cut ($p < 0.001$), while non-research institutions show near-zero passthrough. This ten-fold differential reflects the fundamental asymmetry in pricing power: research universities can raise tuition because students value the brand, the research environment, and the signaling value of a flagship degree. Regional comprehensives compete primarily on price and geographic convenience, leaving them unable to substitute tuition revenue for lost state support.

The Pell share interaction with research status is positive but imprecise, suggesting that composition effects may also differ by institution type, though the sample lacks power to detect this differential precisely.

6. Discussion

The results paint a more nuanced picture of state disinvestment than the standard displacement narrative. Rather than pricing low-income students out of public universities, appropriation cuts appear to induce a selective *exit* of higher-income students — presumably toward private alternatives or out-of-state public universities — leaving the remaining student body more Pell-dependent. This composition squeeze has implications for institutional finances (more students requiring aid), campus culture and peer effects, and the political economy of higher education funding itself (Hoxby, 2009).

The weak Bartik instrument is itself a finding. It suggests that the political economy of state higher-education budgets is not well approximated by a simple fiscal exposure model. States use higher education as a fiscal buffer precisely *because* it is discretionary (Delaney and Doyle, 2011), but the magnitude and timing of cuts depend on gubernatorial priorities, legislative composition, and the political salience of tuition increases — factors orthogonal to initial budget shares. Future work might exploit institutional-level shocks (changes in system governance, campus closures, or formula-funding reforms) rather than state-level fiscal variation.

The research/non-research divide has implications for the debate over "free college" proposals. If research universities can raise tuition elastically while regional institutions cannot, then tuition-free guarantees would primarily benefit students at institutions that weren't raising tuition much anyway. The binding constraint for access at regional comprehensives may not be tuition at all, but rather the quality erosion that accompanies unfunded enrollment growth.

Limitations. This paper has several limitations. First, the weak instrument limits causal interpretation of the IV estimates. Second, the Pell share is an imperfect proxy for low-income enrollment because Pell eligibility thresholds change over time. Third, IPEDS data do not capture transfers, stopouts, or students who chose not to apply, making it impossible to distinguish between displacement (students priced out) and selection (students choosing alternatives). Fourth, the analysis is at the institution-year level and cannot trace individual student pathways.

7. Conclusion

When states retreat from funding public universities, the resulting composition squeeze reshapes *who* attends more than *whether* they attend. Higher-income students exercise their outside options; lower-income students, anchored by geography and financial constraints, stay

— but in institutions with fewer resources per student. The standard narrative of displacement understates a subtler problem: not that poor students are pushed out, but that they are left behind in institutions progressively drained of the resources that make attendance worthwhile.

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Project Repository: https://github.com/SocialCatalystLab/ape-papers

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A. Standardized Effect Sizes

Table 5: Standardized Effect Sizes

Outcome	$\hat{\beta}$	SE	SD(Y)	SDE	SE(SDE)	Classification
Panel A: Pooled						
In-state tuition	0.0005	0.0012	2925.92	0.0041	0.0109	Null
Pell grant share	-0.0001	0.0000	16.81	-0.1232	0.0578	Mod. negative
Minority enroll. share	-0.0000	0.0000	23.01	-0.0066	0.0109	Small negative
Panel B: Heterogeneous (Research vs. Non-Research)						
Tuition (Research)	0.0564	0.0276	3254.96	0.0939	0.0458	Mod. positive
Tuition (Non-Research)	0.0007	0.0025	2508.30	0.0096	0.0333	Small positive

Notes: **Country:** United States. **Research question:** Does state disinvestment in public higher education alter tuition levels and the socioeconomic composition of the student body? **Policy mechanism:** State legislatures cut per-student appropriations to public universities during fiscal downturns; universities respond by raising tuition and adjusting enrollment strategies, potentially displacing low-income students. **Outcome definition:** In-state tuition is published annual tuition and fees for full-time in-state undergraduates (IPEDS IC); Pell share is the percentage receiving federal Pell grants (IPEDS SFA); minority share is the percentage Black or Hispanic (IPEDS EF). **Treatment:** Continuous; state appropriations per FTE student in nominal dollars. **Data:** IPEDS 2004–2022, public four-year institutions, 7,164 institution-years, 512 institutions, 50 states plus DC. **Method:** OLS with institution and year FE (preferred: state-specific linear trends); SEs clustered at state level. IV instruments appropriations with Bartik shock (initial state HE budget share $\times$ national unemployment change). **Sample:** Public four-year institutions with non-missing appropriations, tuition, and FTE; excludes institutions with fewer than 100 FTE. SDE $= \hat{\beta} \times \text{SD}(X)/\text{SD}(Y)$ for continuous treatment. Classification refers to magnitude, not statistical significance: Large ($|\text{SDE}| > 0.15$), Moderate (0.05–0.15), Small (0.005–0.05), Null (< 0.005).