The Effect of State Appropriations on College Graduation Rates of Diverse Students

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Presentation Outline

I. Background

II. Conceptual Framework and Research Questions

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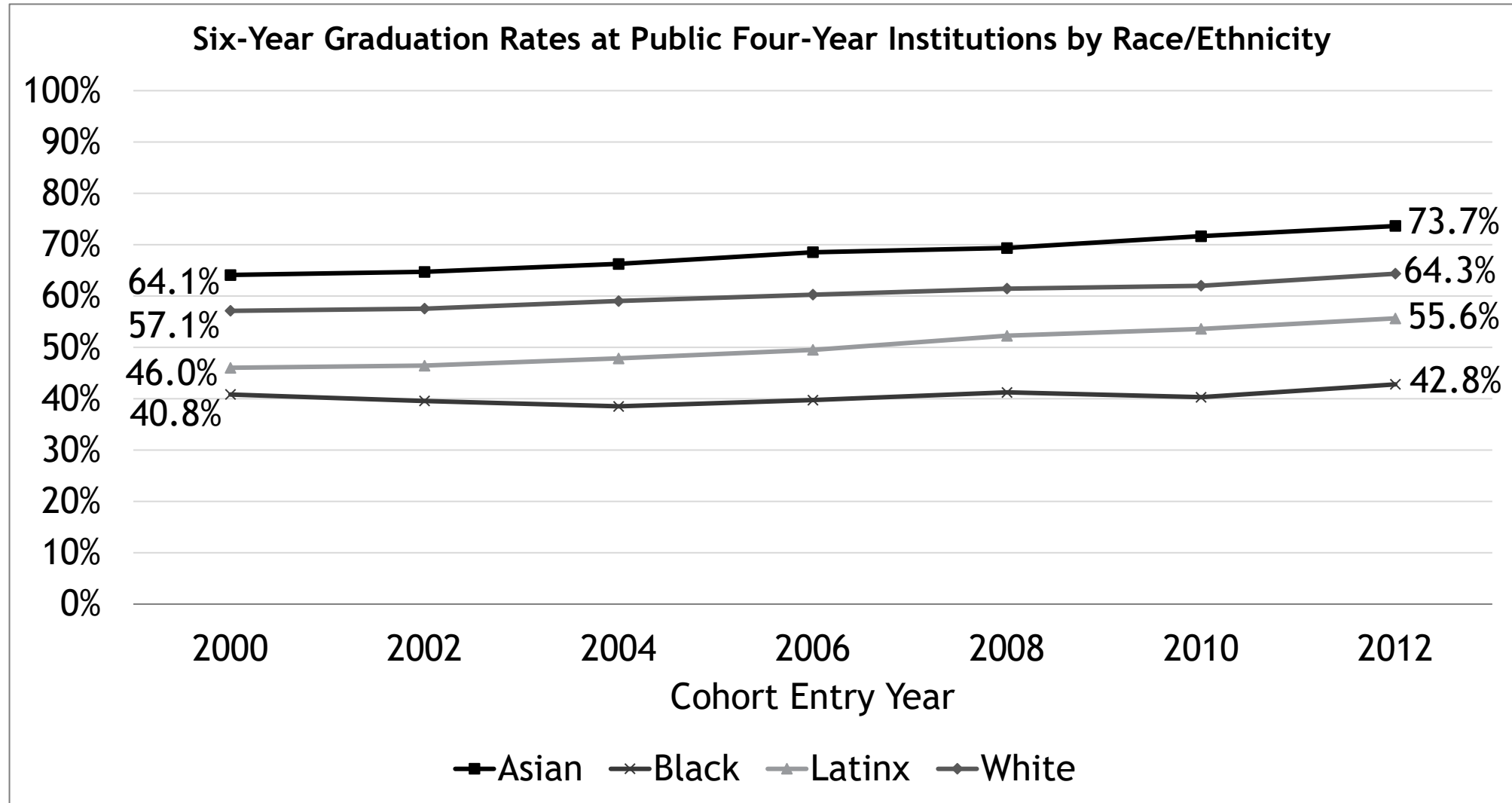IV. Results

V. Discussion

Background

There are large college completion gaps by race and ethnicity

National Student Clearinghouse (2020): The percentage of students starting at a public four-year institution who ultimately complete a credential from any institution within six years

- Black (50%)

- Latinx (59%)

- Asian (80%)

- White (73%)

Similar completion gaps are seen in IPEDS completion rates of full-time, first-time students.

Six-Year Graduation Rates at Public Four-Year Institutions by Race/Ethnicity

64.1%
57.1%
46.0%
40.8%

73.7%
64.3%
55.6%
42.8%

Cohort Entry Year

→ Asian ✕ Black ▲ Latinx ◆ White

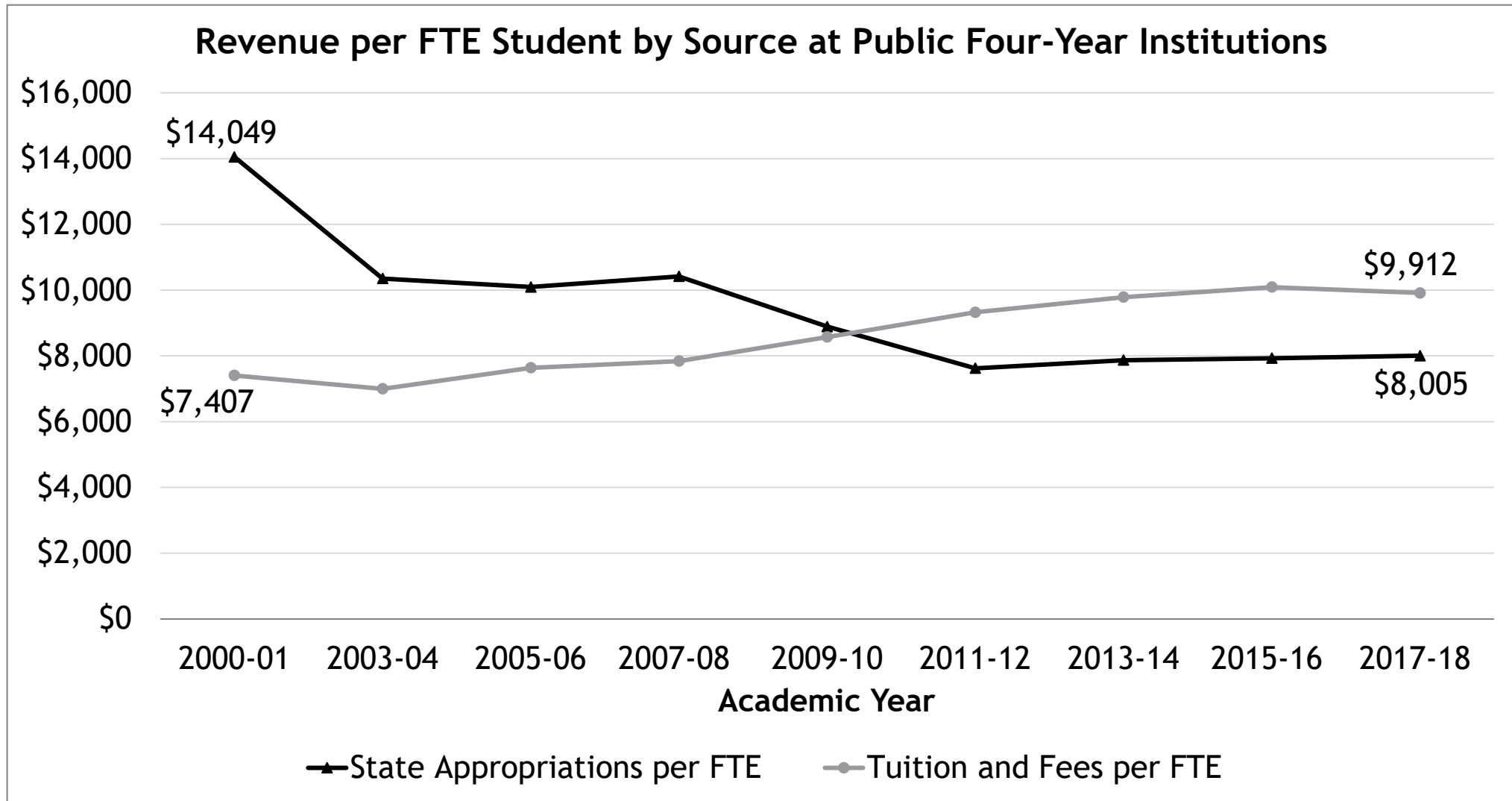Source. NCES. *Digest of education statistics.*

How can the gaps be closed? State funding for institutions is one potential instrument for improving graduation rates

- Studies on student-faculty ratios, contingent faculty, and course registration policies illustrate the potential impact of reduced funding on educational quality (e.g., Ehrenberg & Zhang, 2005).

- Earlier research documented a direct relationship between state appropriations and postsecondary degree completion (e.g., Titus, 2009; Zhang, 2009).

- A similar area of research has focused on the effects of educational expenditures on student outcomes (e.g., Crisp et al., 2018).

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An understanding of the potential effect of state funding is urgent

- In the wake of the 2001 and 2008 recessions, competing budgetary priorities, and limited increases in tax revenue, state and local support of nearly $9,500 per FTE student in 2000 had fallen to $7,700 by 2018 in constant dollars (SHEEO, 2020).

- In the absence of evidence that funding matters, public higher education is at risk of further cuts and stratification in state funding, which may hinder the ability of institutions to help improve college completion rates and meet state attainment goals, particularly attainment equity for diverse populations.

State appropriations have declined since 2000-01, while revenue from tuition and fees increased over the same period.

Revenue per FTE Student by Source at Public Four-Year Institutions

State Appropriations per FTE: $14,049 (2000-01) → $8,005 (2017-18)
Tuition and Fees per FTE: $7,407 (2000-01) → $9,912 (2017-18)

Conceptual Framework and Research Questions

Conceptual Framework

Astin's (1993) input-environment-output (I-E-O) model

- According to the I-E-O model, an institution can improve graduation rates by increasing the quality of its inputs (e.g., better students) or the learning environment (e.g., better faculty).

- State appropriations and tuition are the main sources of educational expenditures (Leslie et al., 2012), and thus changes in state appropriations may be associated with changes in the quality of the learning environment.

Research Questions

- When controlling for potentially confounding influences, to what extent are changes in state appropriations associated with changes in graduation rates of diverse student groups?

  - past investigations have mainly focused on the potential effect of state appropriations on overall degree production or graduation rates

- To what extent does the relationship between state appropriations and graduation rates vary across institutions?

  - Past research has indicated that four-year institutions vary in their efficiency and effectiveness in promoting degree completion

- Does institutional type (e.g., Carnegie Classification, HBCU, HSI) moderate the effect of appropriations on graduation rates?

  - Black and Latinx students comprise a smaller share of the enrollment at research universities than at baccalaureate and master's institutions, and they constitute a larger share at HBCUs and HSIs, respectively

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Method

Sample

- Data source: IPEDS

- 437 public four-year institutions over 12 years

  - Title IV participating and degree-granting
  - full-time, first-time undergraduate students are present with a median entering cohort of at least 45 students over the panel period
  - Basic Carnegie Classification: research university, master's university, and baccalaureate college
  - Received state appropriations over panel period

Variables

- DV: Six-year graduation rates were obtained for 12 freshman cohorts entering between 2001 and 2012. Graduation rates represent the proportion of full-time, first-time, bachelor's degree-seeking students who completed their program within six years, minus exclusions (e.g., death, military service, Peace Corps service). Graduation rates were calculated for Black, Latinx, White, and all students

- Structural: Carnegie classification, minority-serving status, institutional size, graduate student presence, and admissions selectivity

- Contextual: urbanization and region

- Demographic: gender, race/ethnicity, socioeconomic status, non-traditionality, and academic preparedness

- Affordability: published tuition and fees as well as various types of financial aid, including the average student loan debt, average federal grant amount, average state grant amount, and average institutional grant amount

- Resources: state appropriations per FTE and relative reliance on public funding and tuition

** All financial variables were adjusted for inflation using CPI.

Data Analysis

- Linear Mixed Regression: separate models for All students, Black students, Latinx students, and White students

  - Within-between model: extent to which within-institution change in state appropriations is associated with change in graduation rates

  - Random slope model: extent to which coefficient varies across institutions

  - Mixed effects model: estimation of total effect that reflects within and between institution differences

Results

Within-between model

WITHIN EFFECTS	All	Black	Latinx	White
	b	b	b	b
FTE Undergraduate Enrollment (log)	-2.52***	-2.84*	-4.31**	-1.19
FTE Graduate Enrollment Percent (log)	-0.47	-1.03	0.99	-0.75*
Admission Selectivity	0.00	0.01	0.02	0.00
Percent Female in Cohort	0.14***	0.11***	0.11***	0.15***
Percent Same Race in Cohort (log)±	-1.83***	-5.25***	-0.34	0.02
Percent Pell Recipient	-0.03***	-0.07**	-0.03	-0.01
Percent Part-time (log)	0.63	-0.10	0.51	-0.13
Percent Over 25 (sqrt)	-1.07***	-2.34**	-2.47**	-0.63
Immediate enrollment (inv log)	-0.24**	-0.49*	-0.38	-0.27**
SAT 25th Percentile	0.01***	0.02***	0.02***	0.01***
Tuition and Fees (log)	1.74*	1.80	2.74	1.00
Average Loan (1,000's)	-0.12**	-0.13	-0.01	-0.07
Average Pell Grant (log)	0.30	-1.65	0.15	0.52
Average State Grant (log)	0.12	0.14	-0.57	-0.07
Average Institutional Grant (log)	0.71***	0.36	0.31	0.83***
Tuition Percent of Expenditures	0.03	0.01	0.07	0.03
Appropriations Percent of Expenditures	-0.04**	-0.05*	-0.04	-0.06***
Appropriations per FTE (log)	2.13*	4.42*	3.75[a]	3.09*
OLS adjusted r-square	.91	.82	.85	.89
n	4055	2938	2189	3787

[a] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; between-effects not shown here.

Interpreting the within-effect

- The effect sizes can be conceptualized in terms of the expected percentage point increase in graduation rates within institutions if appropriations were to increase by 10%

    - all students (.20 percentage points)
    - Black students (.42 percentage points)
    - Latinx students (.36 percentage points)
    - White students (.29 percentage points).

Random Slope Model

	All	Black	Latinx	White
Within-Effects				
Appropriations per FTE (log)	1.77[a]	2.25	2.64	2.66**
Covariance				
State-level intercept	3.52**	7.34**	-	4.64**
Institution-level intercept	10.64***	18.60***	15.00***	14.18***
Appropriations per FTE (log)	23.86**	44.38**	29.03*	37.53***
AIC	75.60	229.29	138.98	187.78
n	4055	2938	2189	3787

[a] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Interpreting the random slope estimate

- For any particular institution, a 10% increase in appropriations would be associated with a percentage point change in graduation rates of:

  - -.30 to .63 for all students,
  - -.42 to .85 for Black students
  - -.26 to .77 for Latinx students
  - -.33 to .84 for White students

Examining Institutional type as a moderator

- the addition of interaction terms to the random slope model only improved the predictive power of the Black cohort model, namely the HBCU interaction term

- A 10% increase in appropriations was associated with a .77 percentage point increase in graduation rates of Black students at HBCUs relative to other institutions.

Mixed Effects Model

	All	Black	Latinx	White
	b	b	b	b
Average Loan (1,000's)	-0.12**	-0.16	-0.06	-0.08
Average Pell Grant (log)	0.15	-1.57	0.23	0.34
Average State Grant (log)	0.23	0.44	-0.54	0.05
Average Institutional Grant (log)	0.89***	0.60	0.42	1.24***
Tuition Percent of Expenditures	0.08***	0.03	0.04	0.09***
Appropriations Percent of Expenditures	-0.07***	-0.06**	-0.02	-0.07***
Appropriations per FTE (log)	7.91***	5.44***	4.38***	8.61***
OLS adjusted r-square	.91	.82	.85	.89
n	4055	2938	2189	3787

p <.05, ** *p* <.01, *** *p* <.001. Note: only selected covariates are shown here.

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Interpreting the total mixed effect

- The effect sizes can be conceptualized in terms of the expected percentage point difference in graduation rates between institutions if one has 10% greater appropriations:

  - all students: .75 percentage points
  - Black students: .52 percentage points
  - Latinx students: .42 percentage points
  - White students: .82 percentage points

  **Caution should be exercised when interpreting these associations, as mixed effects models are more susceptible to producing biased estimates for causal inference.

Discussion

State funding matters

- The mixed model results suggest that better-funded institutions frequently have higher graduation rates, wherein a 10% greater amount of appropriations was associated with a .42 to .82 percentage point advantage for the racial subgroups.

- The within-effects suggest that a 10% increase in state appropriations would be associated with a .29 to .42 percentage point increase among specific racial groups.

The effect may be more attributable to quality than price

- As the current study controlled for tuition and financial aid, the effect of state appropriations is most likely a function of investments in educational quality rather than differences in net price

- Specifically, given a direct linkage with educational expenditures (Leslie et al., 2012), state appropriations revenue may be allocated in ways that foster educative conditions conducive to student engagement and timely degree completion
  - promoting instructional excellence
  - expanding highly effective programs (e.g., service-learning)
  - strengthening academic and social support services

The effect of state funding varies across institutions

- A 10% increase in appropriations at any particular institution could be associated with both negative and positive percentage point changes in graduation rates ranging from -.42 to +.85.

    - Institutions differ in their effectiveness and efficiency
    - Institutions differ in their ability to compensate for lost state appropriations

- The effect of appropriations on Black graduation rates was about five times greater at HBCUs than at other institutions, which means that a similar relative increase in appropriations is likely to yield a larger effect on graduation rates of Black students at HBCUs.
    - HBCUs may thus have a great deal to gain from an influx of resources.

Implications

- Using conservative estimates, a 10% increase in state appropriations nationally would have yielded about 28,000 more bachelor's degrees to Black, Latinx, and White students over the twelve-year period

  - 19,600 degrees to White students
  - 4,900 degrees to Black students
  - 3,400 degrees to Latinx students

Implications

- Direct appropriations should be conceived as a complimentary rather than substitutive policy lever to grant aid. Need-based grant aid is crucial for ensuring that students of modest means are able to afford college tuition, fees, and the associated cost of living.

  - But the positive effects of greater affordability may be offset by declining direct appropriations if the ability of campuses to promote student learning and timely degree completion is diminished.
  - A reduction in the net price of college enrollment in the absence of high educational quality is tantamount to expanding college access without improving opportunities for student success.

- In addition to the price and quality dimensions of higher education finance, improvements in completion gaps by race and ethnicity will also arguably necessitate critical investments in P-12 education, college readiness programs, and the student-college matching process.

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Thank you!

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