RESOURCE GUIDE:

Key Literature on the Impacts and Distribution of Financial Resources among Higher Education Institutions

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Student Success Through Applied Research

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INTRODUCTION

This resource guide summarizes key research evidence used in *Designing higher education funding models to promote student success: An introduction to "capacity building" and "equity-based" funding principles*. It is organized into two sections. Section 1 focuses on the *impact* of institutional financial resources on graduation-related outcomes, and Section 2 focuses on the *distribution* of financial resources among institutions. In most studies, measures of "financial resources" include revenues (e.g., state appropriations for operation and maintenance) or expenditures (e.g., spending on teaching, research, or service).[1]

This guide offers academic and policy researchers useful resources for understanding and expanding the evidence base of higher education finance and its impact on students. It is limited to peer-reviewed academic studies using descriptive or inferential statistics. The scope is limited to the United States contexts and is based on database searches conducted via the University of Wisconsin Libraries and Google Scholar.[2] We also used a snowball sampling approach and purposeful sampling when studies cited literature not captured in the database search. Each section includes a summary table of the results and a brief description of each study.

Section 1:

LITERATURE ON THE IMPACTS OF FINANCIAL RESOURCES ON STUDENT OUTCOMES

Academic research consistently finds a positive relationship between institutional financial resources and student graduation outcomes. For example, studies have found spending more on instruction and student services is associated with higher graduation rates even after accounting for other institutional characteristics. Similar findings emerge when focusing on state appropriations and other measures of financial resources.

Table 1 summarizes these studies by linking outcomes to various measures of financial resources (revenues or expenditures). Methodologically, we found three general approaches researchers use in the literature: quasi-experimental design, decomposition methods, and regression analysis. Table 1 organizes the literature around these methods and each study is described in further detail after this table. When reading the table, please note "+" in the "Relationship" column indicates a positive relationship between institutional financial resources and the outcome. For example, Bound et al. (2019) finds higher levels of state appropriations per full-time equivalent (FTE) student is associated with higher degree attainment. An "*" indicates a non-significant relationship and "-" indicates a negative relationship.

TABLE 1:

Literature on the impacts of institutional financial resources on student outcomes

	STUDY	OUTCOME	FINANCE MEASURE	RELATIONSHIP
Quasi-experimental design				
1	Bound et al. (2019)	Degrees conferred (BA, MA, or PhD)	State appropriations per FTE	+
2	Chakrabarti et al. (2020)	BA attainment by age 25	State appropriations per student	+
3	Deming & Walters (2018)	Number of degrees (BA or AA) & certificates awarded	State appropriation budget shock	+
Decomposition methods				
4	Bound et al. (2012)	Time to degree	Student–faculty ratio	+
5	Bound et al. (2010)	BA attainment within 8 years of HS graduation	Student–faculty ratio	+
6	Denning et al. (2022)	BA attainment within 8 years of HS graduation	Student–faculty ratio	*
Regression analysis				
7	Bound & Turner (2007)	BA degrees conferred; share of population cohort holding a BA	Size of college-age population	+
8	Calcagno et al. (2008)	Degree attainment (certificate, AA, or BA) or transfer	Expenditures per FTE by functional class	*/−
9	Clotfelter et al. (2012)	Institutional success rate for associate degree attainment	Curriculum programs expenditures on per FTE	*
10	Coupet (2013)	6-year graduation rate (BA)	Expenditures per FTE by functional class	Mixed
11	Crisp et al. (2018)	6-year graduation rate (BA)	Composite measure of expenditures, revenue, and tuition and fees	+
12	Gansemer-Topf & Schuh (2006)	6-year graduation rate (BA)	Expenditures per FTE by functional class	Mixed
13	Garcia (2012)	6-year graduation rate (BA)	Expenditures per FTE	+
14	Gordon et al. (2021)	6-year graduation rate (BA) for African American students	Expenditures per FTE by functional class	+
15	Hamrick et al. (2004)	6-year graduation rate (BA)	Expenditures per headcount by functional class	+
16	Heck et al. (2012)	6-year graduation rate (BA)	State appropriations; expenditures per headcount by functional class	Mixed
17	Horn et al. (2023)	6-year graduation rate (BA) by race/ethnicity	Total state appropriations	+
18	Ishitani & Kamer (2020)	3-year graduation rate (AA)	Expenditures per FTE by functional class	Mixed

	STUDY	OUTCOME	FINANCE MEASURE	RELATIONSHIP
19	Perez (2020)	6-year graduation rate (BA) for Latinx students	Title V receipt; expenditures per FTE by functional class	+
20	Pike & Robbins (2020)	4-year and 6-year graduation rate (BA)	Expenditures per FTE by functional class	Mixed
21	Ryan (2004)	6-year graduation rate (BA)	Expenditures per FTE by functional class	+
22	Scott et al. (2006)	6-year graduation rate (BA)	Instructional expenditures per FTE	+
23	Stange (2012)	BA attainment for community college students	Instructional expenditures per headcount	*
24	Titus (2006a)	BA attainment within 6 years	Revenues by source; expenditures by functional class; E&G[3] expenditures per FTE	+
25	Titus (2006b)	BA attainment within 6 years	Revenues by source; expenditures by functional class; E&G expenditures per FTE	+
26	Titus (2009)	Number of BA degrees awarded per undergraduate enrollment	State appropriations per capita	+
27	Webber & Ehrenburg (2010)	6-year graduation rate (BA)	Expenditures per FTE by functional class	Mixed
28	Webber (2012)	6-year graduation rate (BA)	Expenditures per FTE by functional class	+
29	Zhang (2009)	6-year graduation rate (BA)	State appropriations per FTE	+

1. **Bound, J., Braga, B., Khanna, G., & Turner, S. (2019). Public universities: The supply side of building a skilled workforce. RSF:** *The Russell Sage Foundation Journal of the Social Sciences, 5*(5), 43. *doi.org/10.7758/RSF.2019.5.5.03*

Using Integrated Postsecondary Education Data System (IPEDS) data from 1996 to 2012, this study examines the impact of declining state appropriations on degree attainment at public universities. Using appropriations to all institutions in a state as an instrument for observed institutional appropriations, the analysis identifies a 10% decrease in state appropriations is related to a 3.6% reduction in the number of undergraduate and graduate degrees awarded at research universities but a small and non-significant reduction at non-research, broad-access universities. Regression analyses with year and institution fixed effects show research universities raise more tuition revenue, moderating impacts of funding cuts on expenditures, whereas non-research universities cut expenditures. The study concludes this may have influenced the stratified impact of funding cuts on degree attainment.

2. Chakrabarti, R., Gorton, N., & Lovenheim, M. F. (2020). *State investment in higher education: Effects on human capital formation, student debt, and long-term financial outcomes of students* (NBER Working Paper No.27885). National Bureau of Economic Research. *www.nber.org/papers/w27885*

   To identify the causal effect of state funding on student outcomes, this study links individual-level records from the New York Fed Consumer Credit Panel and the National Student Clearinghouse with institution-level data from IPEDS between 1986 and 2014. Using a shift-share instrument variable approach, the analysis finds a $1,000 per FTE increase in state appropriations increases the likelihood of bachelor's degree attainment by age 25 by 1.5 percentage points among students who started at a four-year institution and by 2.5 percentage points among students who started at a two-year institution.

3. Deming, D. J., & Walters, C. R. (2018). The impact of state budget cuts on US postsecondary attainment. *Draft, Harvard University.* *scholar.harvard.edu/files/ddeming/files/dw_feb2018.pdf*

   This study examines the impact of state appropriations on the number of degrees and certificates awarded at two- and four-year institutions. The analysis uses IPEDS data from 1990 to 2013, linked with state appropriations data from Grapevine and other data sources for control variables. Using shift-share instrument variable approach, the study finds increased state support (i.e., a movement from the 25th to 75th percentile of the "budget shock" measure) increases total degree and certificate awards by 5% in the year after the shock. Adding a tuition cap instrument along with the budget shock instrument, the study finds state budget shocks decrease degree attainment primarily through spending cuts rather than tuition increases.

4. Bound, J., Lovenheim, M., & Turner, S. (2012). Increasing time to baccalaureate degree in the United States. *Education Finance and Policy, 7*(4), 375–424. *doi.org/10.1162/EDFP_a_00074*

   This study examines how student and institutional factors relate to time to degree for student cohorts in the National Longitudinal Survey of 1972 (NLS:72) and the National Educational Longitudinal Study 1988 (NELS:88). The study calculates student-faculty ratios from the Higher Education General Information Survey (HEGIS) and IPEDS data as a proxy for institutional resources, assuming larger ratios indicate fewer financial resources per student. The analysis uses a decomposition method with semi-parametric reweighting to find the increase in student-faculty ratios between the cohorts can explain 15.9% of the increase in average time to degree at the "non-top fifty" public colleges. The study also finds student-faculty ratios increased most rapidly in the "non-top fifty" public schools and community colleges while the ratios decreased in the "elite" public and private schools. Other sectors did not have a significant relationship between resources and time to degree.

5.   Bound, J., Lovenheim, M. F., & Turner, S. (2010). Why have college completion rates declined? An analysis of changing student preparation and collegiate resources? *American Economic Journal: Applied Economics, 2*(3), 129–157. *doi.org/10.1257/app.2.3.129*

Using NLS:72 and NELS:88 data, this study documents the decline in 8-year bachelor's degree completion rates between the high school class of 1972 and 1992. The study calculates student-faculty ratio from HEGIS and IPEDS data as a proxy for institutions' financial resources, assuming larger ratios indicate fewer resources. Using a decomposition method to distinguish the effects of changing student characteristics and institutional factors, it finds the increased student-to-faculty ratios explain approximately 25% of declining completion rates overall. By sector, increasing student-to-faculty ratios explains over 80% of the decline in completion rates in the "non-top 50" public four-year sector whereas the measure has little explanatory power for community colleges.

6.   Denning, J. T., Eide, E. R., Mumford, K. J., Patterson, R. W., & Warnick, M. (2022). Why have college completion rates increased? *American Economic Journal: Applied Economics, 14*(3), 1–29. *doi.org/10.1257/app.20200525*

Using NELS:88 and the Education Longitudinal Study of 2002 (ELS:2002), this study analyzes 6-year bachelor's degree completion rates and aims to explain increases in graduation rates since the 1990s. Findings from a modified Blinder-Oaxaca decomposition method identify "grade inflation" as the driving factor behind increasing completion rates rather than changing student characteristics and instructional resources. First-year GPA explains nearly 95% of the increasing bachelor's degree attainment rates. Although changing student characteristics explain some portion of increasing bachelor's degree attainment in the highly selective private and for-profit sectors, institutional resources measured as student-to-faculty ratios play little role.

7.   Bound, J., & Turner, S. (2007). Cohort crowding: How resources affect collegiate attainment. *Journal of Public Economics, 91*(5-6), 877–899. *doi.org/10.1016/j. jpubeco.2006.07.006*

This study examines the relationship between institutional financial resources and degree completion using HEGIS and IPEDS data from 1954 to 1996. The study argues for using lagged (rather than current) expenditure data when studying the impact of financial resources on degree outcomes. The analysis uses Census data on the size of the college-aged population as a proxy for financial resources available to institutions. Due to the relative inelasticity of public subsidies, larger cohorts would result in fewer financial resources due to the "cohort crowding" effect. Using OLS regression with state and year fixed effects, the study finds a 10% increase in the college-aged population is related to a 4% decrease in bachelor's degree completion rates within states four years later.

8. Calcagno, J. C., Bailey, T., Jenkins, D., Kienzl, G., & Leinbach, T. (2008). Community college student success: What institutional characteristics make a difference? *Economics of Education Review, 27*(6), 632–645. *doi.org/10.1016/ j.econedurev.2007.07.003*

This study examines the relationship between institutional characteristics and degree attainment for community college students. The analysis uses student-level data from NELS:88 and institution-level data from IPEDS. Findings from the maximum likelihood estimation analyses indicate institutional factors such as size and proportion of part-time faculty and students of color are significantly related with certificate/degree attainment or transfer to a four-year college. Expenditures per FTE are not significantly related the outcomes of interest overall. For students enrolled in associate degree programs, greater academic support expenditures are negatively associated with certificate/degree attainment or transfer. The study concludes individual characteristics are more strongly associated with student outcomes at community colleges than institutional characteristics.

9. Clotfelter et al. (2013). Success in community college: Do institutions differ? *Research in Higher Education, 54*(7), 805–824. *doi.org/10.1007/s11162-013-9295-6*

This study identifies the relationship between "institutional success" and institutional characteristics at North Carolina community colleges. The sample includes the 2003 cohort of students enrolled in degree or transfer programs, from a longitudinal dataset of North Carolina public schools and community colleges. The analysis relies on two OLS regression models. First, it regresses the student outcome—applied diploma or degree attainment—on student characteristics. Then, it calculates the residuals from that model for each student and averages the residuals across each institution. This average, called the adjusted success rate, is regressed on institutional characteristics, including expenditures per FTE. Overall, institutional characteristics are unrelated to the adjusted success rate. As a limitation, the study notes the measures of success are imprecise and there is limited variation between campuses, which may explain the lack of an identified relationship.

10. Coupet, J. (2013). Historically Black colleges and universities and resource dependence: A Chow test of production functions. *Journal of Higher Education Policy and Management, 35*(4), 355–369. *doi.org/10.1080/1360080X.2013.812054*

This study examines the relationship between expenditures and graduation rates, focusing on differences between HBCUs and non-HBCUs. The analysis uses IPEDS data from 2001 to 2006 for expenditure variables and 2004 to 2009 for graduation rates at four-year institutions. Findings from the pooled OLS regression analysis indicate expenditures per FTE for instruction and academic support are positively related to 6-year graduation rates for HBCUs and non-HBCUs. However, institutional support expenditures are negatively related with graduation rates at HBCUs, which could indicate capacity constraints for securing additional revenue.

11. Crisp, G., Doran, E., Reyes, S., Nicole, A. (2018). Predicting graduation rates at 4-year broad access institutions using a Bayesian modeling approach. *Research in Higher Education, 59*, 133–155. *doi.org/10.1007/s11162-017-9459-x*

Using IPEDS data from 2007 and 2014, the study identifies which institutional characteristics (including financial resources) are most predicative of 6-year graduation rates at broad access four-year institutions. The analysis uses a composite measure of institutional finances including revenue, expenditures, and tuition and fees. Using the Bayesian model averaging technique, the study finds institutional finance has a moderate to strong relationship with 6-year graduation rates overall, but not as strong as other factors including full-time enrollment, student body socioeconomic status, religious affiliation, and enrollment size. However, the finance measure is the strongest predictor of 6-year graduation rates for African American and Latinx students, suggesting institutional finances are particularly important to the success of students from underrepresented racial minority groups.

12. Gansemer-Topf, A. M., & Schuh, J. H. (2006). Institutional selectivity and institutional expenditures: Examining organizational factors that contribute to retention and graduation. *Research in Higher Education, 47*(6), 613–642. *doi.org/10.1007/s11162-006-9009-4*

Using IPEDS data from 1997 to 2002, combined with 2004 U.S. News and World Report data and 2001 Barron's college selectivity data, this study examines the relationship between institutional expenditures and 6-year graduation rates at private, non-profit baccalaureate colleges. The analysis uses the proportion and amount of institutional expenditures by functional class as the measure of institutional financial resources. Findings from OLS regression models indicate a consistent and significant positive relationship between instructional expenditures and degree completion whereas student service expenditures have no relationship and institutional support expenditures have a negative relationship with graduation rates.

13. Garcia, G. A. (2012). Does percentage of Latinas/os affect graduation rates at 4-year Hispanic Serving Institutions (HSIs), emerging HSIs, and non-HSIs? *Journal of Hispanic Higher Education, 12*(3), 256–268. *doi.org/10.1177/1538192712467203*

This study examines the relationship between institutional characteristics and graduation rates for Latinx students, controlling for institutional selectivity and expenditures. The analysis uses IPEDS data from four-year institutions in 2002 and 2007. As a measure of institutional expenditures, the model includes expenditures per FTE as a latent variable comprising of instructional, academic support, student services, and institutional support expenditures. Findings from the structural equation modeling (SEM) analysis indicate institutional selectivity and expenditures are significantly and positively related with Latinx student graduation rates.

14. Gordon, E. K., Hawley, Z. B., Kobler, R. C., & Rork, J. C. (2021). The paradox of HBCU graduation rates. *Research in Higher Education, 62*(3), 332–358. *doi.org/10.1007/s11162-020-09598-5*

    Using IPEDS data from 2004 to 2016, this study examines if African American students attending HBCUs are more likely to graduate than those attending non-HBCUs. The analysis uses a coarsened exact matching technique along with OLS regressions to identify the relationship between HBCU status and 6-year graduation rates for African American students while controlling for student body and institutional characteristics. Expenditures for student services, instruction, and academic support are positively associated with graduation rates for African American students, though the results are somewhat sensitive to model specification. Institutional support has no relationship with graduation rates for African American students.

15. Hamrick, F. A., Schuh, J. H., & Shelley, M. C. (2004). Predicting Higher Education Graduation Rates from Institutional Characteristics and Resource Allocation. *Education Policy Analysis Archives, 12*(19), 1–24. *eric.ed.gov/?id=EJ852303*

    This study examines which institutional characteristics are most predicative of 6-year graduation rates at four-year public colleges using IPEDS data from 1997 and 1998. Institutional characteristics include expenditures per headcount across categories including student affairs, instruction, libraries, physical plant, institutional support, education and general ("E&G"), and academic support minus libraries. Results from multivariate OLS regression analysis indicate expenditures on instruction, libraries, and academic support are significantly associated with graduation rates. The other expenditure categories have limited statistical power to detect a relationship. Next, the study uses a bivariate regression on each significant characteristic from the first model to determine independent relationships with graduation rates. These three expenditure categories accounted for between 21% and 34% of the variation in graduation rates.

16. Heck, R. H., Lam, W. S., & Thomas, S. L. (2014). State political culture, higher education spending indicators, and undergraduate graduation outcomes. *Educational Policy, 28*(1), 3–39. *doi.org/10.1177/0895904812453996*

    This study examines the relationship between state higher education appropriations and graduation rates at public four-year institutions, with attention to the mediating role of state political culture (per Elazar's typology). The analysis uses institution-level data from IPEDS and state-level data from the National Center for Higher Education Management Systems (NCHEMS) between 1997 and 2007. Finance measures include state appropriations for operating expenditures, change in state appropriations, and expenditures for instruction and institutional support. Using a multilevel latent change model, the study finds state appropriations are positively associated with graduation rates in "traditionalist" states and negatively in "individualist" states. Expenditures on instruction or institutional activities is negatively related to graduation rates. However, instructional spending and growth in appropriations is positively related to growth in graduation rates over time.

17. Horn, A. S., Horner, O. G., Tandberg, D. A., Toutkoushian, R. K., & Williams–Wyche, S. N. (2023). The Effect of State Appropriations on College Graduation Rates of Diverse Students. *Journal of Education Finance, 49*(1), 26–64. *www.muse.jhu.edu/article/908610*

Using IPEDS data on public four-year institutions from 2007 to 2018, this study identifies the relationship between state appropriations and 6-year graduation rates by racial and ethnic groups. The analysis uses a hybrid fixed effects regression model and finds increasing appropriations by 10% is related to increasing graduation rates overall by 0.58 percentage points and by 0.97 for Black students, 0.83 for Latinx students, and 0.59 for white students. For MSIs, a 10% increase in appropriations is associated with a 1.55 percentage point increase in graduation rates among Black students at HBCUs; however, there is no significant relationship for graduation rates of Latinx students attending HSIs. Additionally, institutions with higher "subsidy reliance" (percent of educational expenditures from state appropriations) have higher graduation rates than those with lower subsidy reliance. The study concludes state appropriations can make an even greater impact for students from underrepresented racial and ethnic backgrounds.

18. Ishitani, T. T., & Kamer, J. A. (2020). Institutional characteristics and expenditures: Their effects on graduation rates at three different types of community colleges. *Community College Journal of Research and Practice, 44*(9), 644–656. *doi.org/10.1080/10668926.2019.1630026*

This study examines the relationship between institutional expenditures and graduation rates at three types of community colleges: (1) high transfer; (2) mixed transfer, career, and technical; and (3) high career and technical. The analysis uses IPEDS data from 2014 to 2016. Finance measures include expenditures per FTE for instruction, public service, academic support, student services, and institutional support services. The outcome is 3-year graduation rates averaged over 3 years. Using multiple OLS regression, the study finds at "high transfer" colleges expenditures for student services and institutional support services are positively related with graduation rates while instructional expenditures are negatively related. For "mixed transfer" colleges, academic support expenditures are negatively related to graduation rates whereas institutional support expenditures are positively related. For "high career & technical" colleges, expenditures for public service are negatively related to graduation rates.

19. Perez, L. (2020). To what extent are Title V grants and educational expenditures associated with educational attainment of Latinxs at Hispanic–Serving institutions? *Journal of Hispanic Higher Education, 19*(4), 323–334. *doi.org/10.1177/1538192718801792*

This study explores the relationship between institutional financial resources and graduation of Latinx students at public and private four-year HSIs. The analysis uses IPEDS data from 2007 to 2012, complemented by the data from federal Title V grant (Developing Hispanic-Serving Institutions) program. Institutional financial resources are measured as (a) expenditures per FTE for instruction, academic support, and student services averaged over the 6 years and (b) whether an HSI received Title V funding at any time between 1999 and 2012. Findings from the hierarchical multiple regression analysis indicate expenditures for academic support and student services are positively related with 6-year graduation rates for Latinx students, but none of the functional

expenditures are significantly related to the percentage of degrees awarded to Latinx students. Title V receipt is not significantly related to Latinx graduation rates but is positively related with the percentage of degrees awarded to Latinx students.

20. Pike, G. R., & Robbins, K. R. (2020). Using panel data to identify the effects of institutional characteristics, cohort characteristics, and institutional actions on graduation rates. *Research in Higher Education, 61*(4), 485–509. *doi.org/10.1007/s11162-019-09567-7*

This study uses a panel of IPEDS data from 2002 to 2006 at public four-year universities to examine the relationship between expenditure functional classes and 4- and 6-year graduation rates. Using a hybrid of random- and fixed-effects models, the analysis finds instructional expenditures are positively related to 4-year and 6-year graduation rates. Student service and academic support expenditures are positively related to graduating only in certain models while research expenditures are negatively associated with both 4-year and 6-year graduation rates. Expenditures for public service, academic support, and institutional support are unrelated to graduation in any model.

21. Ryan, J. (2004). The relationship between institutional expenditures and degree attainment at baccalaureate colleges. *Research in Higher Education, 45*, 97–113. *doi.org/10.1023/B:RIHE.0000015691.02545.61*

Using IPEDS data for the 1996 fiscal year, this study analyzes the relationship between per FTE expenditures and 6-year graduation rates at public and private baccalaureate institutions. The OLS regression model includes each education and related ("E&R") expenditure category and controls for institutional and student body characteristics, including supplementary data from the College Board. The analysis finds expenditures for instruction and academic support are positively related with graduation rates while expenditures on institutional support and student services have no relationship. The strongest relationship is for instructional expenditures, where a 1% increase is related to a 0.25% increase in cohort graduation rate.

22. Scott, M., Bailey, T., & Kienzl, G. (2006). Relative success? Determinants of college graduation rates in public and private colleges in the US. *Research in Higher Education, 47*, 249–279. *doi.org/10.1007/s11162-005-9388-y*

This study aims to understand if institutional characteristics—including finance, selectivity, and student body composition—can explain differences in graduation rates at public and private non-profit four-year colleges. The analysis uses 1991 IPEDS data on instructional spending per FTE and the College Board American Survey of Colleges data for the 1991 cohort's 6-year graduation rate. Using a logit regression model, the study finds a \$1,000 increase in instructional expenditures is associated with a 1.7% increase in graduation rates at public colleges and a 0.44% increase at private colleges. The study also implements an Oaxaca decomposition model, finding mixed evidence on how much of the graduation rate gap can be attributed to instructional expenditures. Overall, the study concludes if public colleges had the same inputs as private colleges, graduation rates at public colleges would likely be higher than private colleges.

23. Stange, K. (2012). Ability sorting and the importance of college quality to student achievement: Evidence from community colleges. *Education Finance and Policy, 7*(1), 74–105. *doi.org/10.1162/EDFP_a_00054*

This study measures the relationship between instructional expenditures and bachelor's degree completion for students who initially enroll at two-year colleges. The analysis uses student-level data from NELS:88 with the Postsecondary Education Transcript Study (PETS) and institutional data from IPEDS and the College Board. Findings from OLS and probit models indicate there is no significant relationship between instructional expenditures (per headcount) and bachelor's degree attainment among this sample. It also finds no significant relationship between instructional expenditures (per headcount) and transfer or the number of years enrolled in college. Notably, the study frames instructional expenditures as a measure of institutional "quality."

24. Titus, M. A. (2006a). No college student left behind: The influence of financial aspects of a state's higher education policy on college completion. *The Review of Higher Education, 29*(3), 293–317. *doi.org/10.1353/rhe.2006.0018*

Using the Beginning Postsecondary Study from 1996 and 2001 (BPS:96/01) and IPEDS, this study examines the relationship between institutional financial resources and 6-year degree completion at four-year institutions. Financial resources are measured in various ways including revenue sources, functional expenditures, and E&G expenditures per FTE. Using a three-level hierarchical generalized linear modeling, the study finds E&G expenditures per FTE, the proportion of revenue from tuition, and state spending on need-based financial aid are positively related with a student's likelihood of completing a bachelor's degree within 6 years. The study finds other revenue and expenditure measures to be colinear, explaining their insignificant relationship with graduation.

25. Titus, M. A. (2006b). Understanding college degree completion of students with low socioeconomic status: The influence of the institutional financial context. *Research in Higher Education, 47*(4), 371–398. *doi.org/10.1007/s11162-005-9000-5*

This study links student-level data from the BPS:96/01 to institution-level data from IPEDS to identify the relationship between institutional contexts, student characteristics, and college completion for first-time, full-time undergraduate students. Using hierarchical generalized linear modeling, the study finds a positive relationship between E&G expenditures and the likelihood of earning a degree within 6 years. The study does not find significant relationships when measuring financial resources as a share of total revenues or expenditures (e.g., percentage of revenues from state appropriations versus other sources) and suggests this is due to multicollinearity. The study also finds students with low measures of socioeconomic status are more likely to attend institutions with lower E&G expenditures, suggesting additional funding to these institutions could increase persistence for under-represented students.

26. Titus, M. A. (2009). The production of bachelor's degrees and financial aspects of state higher education policy: A dynamic analysis. *The Journal of Higher Education, 80*(4), 439–468. *doi.org/10.1080/00221546.2009.11779024*

The study explores how financial aid, tuition, and state appropriations influence bachelor's degree production. The study builds a panel dataset for each US state from 1992 to 2004 using various data sources, including IPEDS. It implements a dynamic fixed-effects model to account for unobserved effects and allow for the influence of past degree production through lagged variables. The study finds a 10% increase in per-capita state appropriations for higher education is associated with a three percent increase in the number of undergraduate degrees awarded.

27. Webber, D. A., & Ehrenberg, R. G. (2010). Do expenditures other than instructional expenditures affect graduation and persistence rates in American higher education? *Economics of Education Review, 29*(6), 947–958. *doi.org/10.1016/j.econedurev.2010.04.006*

Using the Delta Cost Project data, this study examines the impact of non-instructional expenditures on 6-year graduation rates between 2002 and 2005. The analysis uses expenditures per FTE by functional class as a measure of institutional financial resources. Using OLS and quantile regression methods, the study finds student service and instructional expenditures positively influence graduation and persistence rates overall. These impacts are greater at colleges with lower SAT scores, those with higher Pell Grant expenditures per student, and those that currently have lower graduation rates. Expenditures on academic services are unrelated, and research expenditures are negatively related to graduation rates. Using simulations, this study finds reallocating some instructional expenditures to student services would improve outcomes at institutions that currently have the lowest graduation and persistence rates.

28. Webber, D. A. (2012). Expenditures and postsecondary graduation: An investigation using individual-level data from the state of Ohio. *Economics of Education Review, 31*(5), 615–618. *doi.org/10.1016/j.econedurev.2012.02.003*

This study updates Webber and Ehrenberg (2010) by adding student-level data from public universities in Ohio to the Delta Cost Project data. The key outcome of interest is 6-year graduation rate, and the analysis uses expenditures per FTE and year (disaggregated by functional class) as a measure of institutional financial resources. Using the competing risks regression method with institution and year fixed effects, the study finds student service expenditures positively influence graduation rates. Student service expenditures is the strongest predictor for students scoring below the median ACT whereas the effect of instructional expenditures is the strongest for those scoring above median ACT. Additionally, instructional expenditure is a significant predictor of graduation for students majoring in a STEM field.

29. **Zhang, L. (2009). Does state funding affect graduation rates at public four-year colleges and universities.** *Education Policy, 23*, 714–731. *doi.org/10.1177/0895904808321270*

This study uses a panel of IPEDS data from 1997 to 2004, combined with the College Board data between 1991 and 1998, to analyze the relationship between state appropriations and graduation rates at public four-year institutions. The analysis uses OLS regression with fixed and random effects. Using the preferred approach (institution fixed effects), the study finds a 10% increase in state appropriations per FTE is associated with a 0.64 percentage point increase in 6-year graduation rates. State appropriations have the greatest relationship with graduation rates at research/doctoral institutions compared to master's institutions, with insignificant results for liberal arts colleges.

LITERATURE ON THE DISTRIBUTION OF FINANCIAL RESOURCES AMONG INSTITUTIONS OF HIGHER EDUCATION

This section focuses on the distribution of financial resources among colleges. One set of studies focuses on inequalities where the goal is to measure whether or to what extent financial resources are evenly distributed across institutions. A second set focuses on inequities, drawing connections between unequal resources and their differential impacts on different types of institutions and their students.

Studies of inequality typically use a Gini index and find evidence of inequality in revenues and expenditures, with mixed evidence on how inequality has changed over time. When studying financial inequity, there is a much wider (and therefore less standardized) range of techniques researchers use when conducting studies. Nevertheless, the weight of findings shows inequity exists in systematic ways. Minority Serving Institutions (MSIs), community colleges, and institutions with larger shares of students of color and students from low-income backgrounds tend to have the fewest financial resources. Table 2 is organized around these two bodies of literature, and each study is summarized following the table.

TABLE 2:

Literature on the distribution of financial resources among institutions of higher education

	STUDY	FINANCE MEASURE	METHODOLOGICAL APPROACH	FINDING
Studies of funding inequality				
1	Cheslock & Shamekhi (2020)	E&G expenditures, per FTE and in total	Mean log deviation, Gini index, Theil index	Inequality in per FTE expenditures declined over time but increased for total expenditures. Inequality is greatest at private and doctoral institutions.
2	Davies & Zarifa (2012)	Expenditures per FTE; revenue by source per FTE	Gini index, Lorenz curve	Inequality in per FTE expenditures and revenues increased over time in general, but the trend varies by institution sector and revenue source.
3	Lau & Rosen (2016)	Expenditures and revenues, per FTE and in total	Gini index	Inequality exists in both total and per FTE expenditures and revenues; inequality is stable over time.

	STUDY	FINANCE MEASURE	METHODOLOGICAL APPROACH	FINDING
Studies of funding inequity				
4	Dowd (2004)	Total non-tuition revenue per headcount	OLS regression	Revenue is unequally distributed among colleges. Colleges in large cities have lower levels of revenue than colleges in town or rural areas.
5	Dowd & Grant (2006)	State and local appropriations per FTE	Pearson correlation	Greater reliance on local funding relates to higher inequity at community colleges.
6	Dowd & Grant (2007)	Revenue by sources per FTE	Spearman's correlation analysis	Colleges' community wealth is not correlated with revenue from performance incentives or private funding; the percentage of students of color is negatively correlated with auxiliary revenue.
7	Hillman & Corral (2017)	State appropriations per undergraduate FTE	Difference-in-differences	PBF policies lead to disproportionate funding cuts for MSIs.
8	Kolbe & Baker (2018)	Total spending; E&G spending; instructional spending	OLS regression	High income communities spend more on instruction; state funding mediates the spending inequity at community colleges.
9	Li et al. (2018)	State funding per FTE	Descriptive, box plots	Two-year MSIs in Texas and Washington are not financially disadvantaged due to PBF compared to non-MSIs because the funding formula included non-degree milestones.
10	McKinney & Hagedorn (2019)	Estimated state funding under PBF	OLS, logistic regression	The Texas PBF policy would exacerbate funding inequity by allocating less funding to the colleges serving students with the greatest need.
11	Ortagus et al. (2023)	State appropriations per FTE and in total	Generalized difference-in-differences	PBF policies disadvantage institutions serving a larger share of low-income students and students of color. Racial equity premiums may help reduce the negative impacts of PBF policies on these institutions at community colleges.

	STUDY	FINANCE MEASURE	METHODOLOGICAL APPROACH	FINDING
12	Sav (2000)	State funding in total	Blinder-Oaxaca decomposition	PWIs receive more state funding than HBCUs, even after controlling for various institutional factors.
13	Sav (2010)	State funding in total	Blinder-Oaxaca decomposition	The unexplained funding gap between PWIs and HBCUs decreased between 1995 and 2010.
14	Vargas (2018)	Title V receipt	Logistic regression	HSIs serving more white students are more likely to receive Title V funding.

1. Cheslock, J. J., & Shamekhi, Y. (2020). Decomposing financial inequality across U.S. higher education institutions. *Economics of Education Review, 78*, 1–12. *doi.org/10.1016/j.econedurev.2020.102035*

    Using IPEDS data from 2004 through 2017, this study examines the trend of inequalities in E&G expenditures at public and private non-profit two- and four-year colleges. Using various inequality measures such as mean log deviation, Gini coefficient, and Theil index, the study shows inequality in total expenditures has increased between 2004 and 2017 whereas inequality in per FTE expenditures has decreased. Results using decomposition method indicate growing inequality in enrollment, combined with an increasingly positive correlation between enrollments and per FTE expenditures, has driven up the level of inequality in total expenditures. The study also finds varying inequality patterns across institution control and selectivity. The private sector had higher levels of inequality in both total and per FTE expenditures than the public sector. Within each sector, doctoral institutions had greater levels of inequality than master's and associate's institutions.

2. Davies, S., & Zarifa, D. (2012). The stratification of universities: Structural inequality in Canada and the United States. *Research in Social Stratification and Mobility, 30*(2), 143–158. *doi.org/10.1016/j.rssm.2011.05.003*

    Using HEGIS and IPEDS data from 1971 to 2006, this study examines the trend of inequalities in per FTE expenditures and revenues among four-year universities. Gini coefficients and Lorenz curves indicate inequality in per FTE expenditures among all degree-granting four-year institutions (both public and private non-profit) has increased, with the Gini coefficient increasing from 0.43 in 1971 to 0.47 in 1996. The Gini coefficient for per FTE expenditures among public institutions increased from 0.54 in 2001 to 0.58 in 2006 whereas decreased from 0.48 to 0.46 for the private non-profit sector. The study also finds revenue inequality has increased overall, but the trend varies by institution sector and revenue source. For the public sector, revenue inequality in federal grants, state grants, investment return, and tuition increased from 2001 to 2006 while it decreased in private gifts. For the private sector, revenue inequality in federal grants, state grants and private gifts increased while tuition inequality decreased.

3. Lau, Y., & Rosen, H. S. (2016) Are universities becoming more unequal? *The Review of Higher Education, 39*(4), 479–514. *doi.org/10.1353/rhe.2016.0023*

Using the Delta Cost Project data and the National Association of College and University Business Officers (NACUBO) data between 2002 and 2010, this study documents trends in inequality with respect to revenue and expenditure among public and private non-profit higher education institutions. Calculating Gini coefficients of total and per FTE expenditure and revenue, the study finds considerable inequality exists overall as well as within public and private institutions. The trend has been stable over time. By regressing an institution's rank in one year on its rank in the previous year, the study also finds the rank-rank slopes for all the expenditure and revenue measures are generally close to 1, which implies mobility within the distribution has been minimal over time.

4. Dowd, A. C. (2004). Community college revenue disparities: What accounts for an urban college deficit? *The Urban Review, 36*, 251–270. *doi.org/10.1007/s11256-004-2083-z*

Using IPEDS data from 2000, this study examines the distribution of non-tuition revenue among community colleges and three potential explanations for the revenue disparities: student financial need, enrollment size, and political factors including degree of urbanization and race/ethnicity. The analysis measures institutions' financial resources as total non-tuition revenue per student (12-month headcount). Using interquartile range and the ratio of 90th to 10th percentile values, the study finds total non-tuition revenue per student is unequally distributed, with the state interquartile range values ranging from $600 to $4,000. The regression analysis results identify geographic location of colleges as the major driver of this revenue gap, rather than student financial need, enrollment size, or race/ethnicity (the percentage of students who are Black or Hispanic). Community colleges in towns and rural areas have greater non-tuition revenue per student than colleges in large cities.

5. Dowd, A. C., & Grant, J. L. (2006). Equity and efficiency of community college appropriations: The role of local financing. *The Review of Higher Education, 29*(2), 167–194. *doi.org/10.1353/rhe.2005.0081*

Using IPEDS data from 2000, this study examines funding equity among community colleges, focusing on the role of local appropriations. Using median and interquartile range, the analysis first shows sizable within-state variation in both state and local appropriations per FTE. The study then categorizes states into "local-share" and "state-funded" states, based on the percentage of colleges reporting certain ratios of local appropriations to state appropriations. By graphing revenue deviations against the proportion of students receiving federal grant aid (as a proxy for community wealth) at each college in selected "local-share" and "state-funded" states, the study concludes that states with a higher portion of state funding are more likely to have equity-enhancing deviations in revenue. This implies local funding exacerbates the funding inequity among community colleges.

6. Dowd, A. C., & Grant, J. L. (2007). Equity effects of entrepreneurial community college revenues. *Community College Journal of Research and Practice, 31*(3), 231–244. *doi.org/10.1080/10668920600859285*

    This study examines the relationship between "entrepreneurial" institutional revenue sources and community wealth among community colleges in Massachusetts. Using 2000 IPEDS data and 1999 Census data, the study correlates various revenue sources (including revenues from the state performance funding formula and private fundraising) to measures of community wealth (median household income). It finds no significant correlation between college's community wealth and revenue garnered from performance incentive programs or private fundraising. However, it finds a negative correlation between the share of students of color and auxiliary revenues, indicating colleges serving more students of color may have lower capacity to raise auxiliary revenues.

7. Hillman, N. W., & Corral, D. (2018). The equity implications of paying for performance in higher education. *American Behavioral Scientist, 61*(14), 1757–1772. *doi.org/10.1177/0002764217744834*

    Using IPEDS data from 2005 to 2015, this study examines the differential impact of performance-based funding (PBF) policies on the level of state appropriations for public, four-year MSIs. A difference-in-differences analysis finds PBF policies have a disproportionately negative impact on MSI funding. MSIs in PBF states lose approximately $750 in state appropriations per undergraduate FTE when compared with other MSIs in non-PBF states. The study finds heterogenous impacts of PBF by state with the disproportionate funding cut for MSIs being greater in the states aggressively pursuing PBF such as Tennessee and Ohio.

8. Kolbe, T., & Baker, B. D. (2019). Fiscal equity and America's community colleges. *The Journal of Higher Education, 90*(1), 111–149. *doi.org/10.1080/00221546.2018.1442984*

    Using Delta Cost Project data, this study examines "fiscal equity" in institutional spending at community colleges. Using fixed effects regression, the analysis finds extensive "within-state" variation in three spending categories: E&G expenditures, instructional expenditures, and total expenditures. It also finds instructional spending tends to be higher among high-income counties, though there is considerable variation across states. Finally, the study finds state appropriations can address fiscal inequities by reducing spending differences between low and high counties.

9. Li, A. Y., Gándara, D., & Assalone, A. (2018). Equity or disparity: Do performance funding policies disadvantage 2-year minority-serving institutions. *Community College Review, 46*(3), 288–315. *doi.org/10.1177/0091552118778776*

    This study uses data from state higher education agencies in Texas and Washington along with IPEDS between 2004 and 2014 to examine if PBF policies financially disadvantaged two-year MSIs serving disproportionately larger populations of low-income students and students of color. Using box plots, the analysis compares the median state funding per FTE at MSIs and non-MSIs before and after the implementation of PBF. Results indicate two-year MSIs in Texas and Washington are not disadvantaged due to PBF, receiving the same

or less state funding after PBF compared to non-MSIs, largely because the PBF formulas in both states includes non-degree milestones (e.g., transfer, developmental courses) as well as degree completions.

10. McKinney, L., & Hagedorn, L. S. (2017). Performance-based funding for community colleges: Are colleges disadvantaged by serving the most disadvantaged students. *The Journal of Higher Education, 88*(2), 159–182. *doi.org/10.1080/00221546.2016.1243948*

Using institutional data from a large urban community college district in Texas from 2007 to 2012, this study simulates funding allocations under a new PBF policy, the "Student Success Points Model." The analysis estimates how much PBF funding each student would generate for each institution over the course of 6 years based on transcript and transfer records. Results from OLS and logistic regression analyses indicate students who are African American, 20 years or older, enrolled part-time, GED recipients, and assigned to the lowest level of developmental math generate much less funding under the new PBF model. The study argues the PBF policy would exacerbate inequity by cutting funding to the colleges serving students with greater needs.

11. Ortagus, J. C., Rosinger, K. O., Kelchen, R., Chu, G., & Lingo, M. (2023). The unequal impacts of performance-based funding on institutional resources in higher education. *Research in Higher Education, 64*(5), 705–739. *doi.org/10.1007/s11162-022-09719-2*

This study examines the impact of PBF policies on financial resources at public four-year institutions, accounting for the complexities of PBF policy design such as "dosage" (the proportion of state appropriations tied to institutional performance) and "equity premiums" (additional incentive for outcomes of priority populations). The analysis uses IPEDS data from 1996 to 2018 and implements a generalized difference-in-differences regression technique, finding PBF policies on average did not have a significant effect on state funding levels. However, "high-dosage" PBF states provided less funding to four-year HBCUs and institutions serving the largest shares of students of color. The study also finds equity premiums for enrolling large shares of low-income students or students of color does not produce significantly more funding for four-year institutions; however, states with race-based equity premiums appropriate more to two-year MSIs.

12. Sav, G. T. (2000). Tests of fiscal discrimination in higher education finance: Funding historically black colleges and universities. *Journal of Education Finance, 26*(2), 157–172. *www.jstor.org/stable/40704120*

Analyzing IPEDS data from 1994 to 1996, this study examines the gap in total state funding between HBCUs and PWIs in 13 states. The study posits: (1) state funds are allocated based on a set of institutional factors such as credit hour production, graduate program offerings, physical plant size, and other available sources of revenue such as tuition and assets; and (2) state agencies have some level of discretion in funding allocation. Using Blinder-Oaxaca decomposition method, the study finds approximately 83% of the funding gap between HBCUs and PWIs can be attributed to institutional characteristics whereas the remaining 17%—a non-trivial share—is potentially due to

the differential, discriminatory treatment of HBCUs compared to PWIs. To address this inequity, the paper explains how states could redistribute funds to equalize resources between HBCUs and PWIs.

13. Sav, G. T. (2010). Funding historically black colleges and universities: Progress toward equality. *Journal of Education Finance, 35*(3), 295–307. *www.jstor.org/stable/40704415*

This study updates previous work (Sav, 2000) on the funding gap between HBCUs and PWIs using more recent data. Using 2005 IPEDS data, the analysis finds the funding gap between HBCUs and PWI attributable to "discrimination" declined from 17% in 1994 to 13% in 2005. The study estimates the average HBCU would need $6.7 million in additional state funds to close these funding gaps.

14. Vargas, N. (2018). Racial expropriation in higher education: Are whiter Hispanic serving institutions more likely to receive minority serving institution funds? *Socius: Sociological Research for a Dynamic World, 4*, 1–12. *doi.org/10.1177/2378023118794077*

Using IPEDS and U.S. Department of Education data on Title V Developing HSI Program grant allocations, this study examines the distribution of Title V grants among 380 HSIs from 2011 to 2015. The study uses logistic regression and controls for various institutional characteristics, finding a positive relationship between an HSI's white student population and the odds of receiving Title V funding. A 1% increase in a college's non-Hispanic white student enrollment corresponds with a 2% increase in the odds of receiving Title V funding. This implies federal HSI funding allocations benefit institutions with larger shares of white students and smaller shares of Latinx and other students of color.

END NOTES

1 Accounting standards disaggregate expenditures into "functional" and "natural" classes. Functional class refers the purpose of the expense, including: instruction, research, public service, academic support, student services, institutional support, auxiliary enterprises, net grants and scholarships, hospital services, independent operations, and others. Natural class refers to the type of expense, including: salaries and wages, benefits, operation and maintenance, depreciation, interest, and others. For more information, see D. Smith (2019). University Finances: Accounting and Budgeting Principles for Higher Education.

2 We used the following combinations of search terms to identify studies linking institutional financial resources and student outcomes: fund[s][ing]; expen[ses][ditures]; revenue[s]; financ[e][ial]; graduat[e][ion]; degree attain[ed][ment]; distribut[ed][ion]; ineq[uality][uity][uitably]; unequal[ly]; stratifi[ed][cation]. We conducted these searches between January 2022 and December 2023.

3 Education and general (E&G) expenditures include the following functional classes: instruction, student services, academic support, institutional support, research, public service, and institutional grants.