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The Organizational Ecology of College Affordability: Research Activity, State Grant Aid Policies, and Student Debt at U.S. Public Universities

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Abstract

Sociologists have theorized U.S. universities as a heterogenous organizational ecology. We use this lens to compare student debt and college prices for low-income students across public universities according to their research intensiveness and varied state grant aid policies. We show that students at research-intensive public universities have had an easier time repaying student loans than at other schools. By linking multiple data sets, we also provide the first comprehensive assessment for all 50 states of state-level need-based grant aid programs, which might alleviate loan repayment challenges. We find large disparities. California, Washington, Wyoming, and New Jersey spent more than $4,000 on aid per low-income student in 2015, more than the federal expenditure on Pell Grants for their state. Most states spend little in comparison. Contra the Bennett hypothesis, we also find that state need-based aid is strongly associated with both lower net prices and lower student loan nonrepayment rates.

Keywords

sociology of education, organizations, student debt

Introduction

Public universities enroll 62 percent of U.S. bachelor degree students.[1] Public universities are also a far larger engine of economic mobility for students from the bottom of the U.S. income spectrum than private institutions (Chetty et al. 2017). A key feature of public universities is that they link undergraduate learning to the practice of academic research. Sociologists have shown that research universities enjoy greater prestige and financial resources that might be leveraged for the benefit of students (Davis and Binder 2016; Eaton, Habinek, et al. 2016). Yet the affordability of public universities has declined for many low-income students as schools have increased tuition to cover declining state support per student (Nations 2018). As a result, public university students have increasingly relied on an expansion of federal student loan programs since the early 1990s (Berman and Stivers 2016).

While sociologists have linked the organizational features of for-profit and private nonprofit colleges to affordability and student debt (Addo, Houle, and Simon 2016; Cottom 2017; Houle 2013), few studies have considered potential organizational heterogeneity in patterns of college costs and loan borrowing at public universities (Nations 2018; Stevens and Gebre-Medhin 2016). This article evaluates levels of student debt and the challenges repaying those debts among low-income students at public universities with varying levels of research. We also assess the extent to which different states have used state-level need-based grant aid as a policy to limit college costs for low-income students that may underlie those

[1]Enrollment statistics here are from the National Center for Educational Statistics (Ginder, Kelly, and Mann 2017).

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debts. To describe potential variation in state aid generosity, college costs, and student debt, we approach public universities as organizations with heterogeneous prestige, financial resources, curricula, and student bodies (Brint et al. 2005; Davies and Zarifa 2012). This approach suggests that both university research categories and state grant aid policies help to structure U.S. higher education's organizational ecology with implications for the resources available to public universities for managing student loan borrowing.

Within this framework, we analyze data on student debt and state-level need-based grant aid across the different research strata of public universities. We also compare spending on state need-based grant aid to total institutional and state aid awards, including awards that have no economic-need requirement. These comparisons are our empirical focus because state aid policies and higher levels of research and associated prestige may offer resources for universities to maintain both affordability and quality for low-income students. Our analyses are entirely descriptive to provide a transparent first assessment of patterns in student debt, the price of college attendance for students, and state financial aid across public universities. Nevertheless, our findings illustrate that need-based grant aid could be particularly impactful for less research-intensive universities with fewer institutional resources.

Using newly available institution-level data for all public universities, we find that debt levels upon leaving school (for both graduates and nongraduates) between 2004 and 2014 were equivalent for low-income and middle-income borrowers within each strata of public universities, rising by as much as 40 percent (in 2014 constant dollars). Both low-income and middle-income borrowers also increasingly struggled to repay their loans after college among cohorts that left school from 2007 to 2013. Students at the lowest ranked public universities, however, failed to repay loans at much higher rates. These students either defaulted or failed to repay at least $1 of principal on their loan within three years of leaving school. At lower research schools, nonrepayment rates rose to 50 percent and higher for low-income students and 40 percent and higher for middle-income students. Nonrepayment rates rose to over 30 percent among low-income students at higher ranked public universities.

To what extent have state governments adopted need-based grant aid programs to shield students from rising college costs and debt risks? Remarkably little is known about the existence and generosity of such programs relative to financial need. By linking multiple higher education data sets, we provide the first assessment for all 50 states of such state-level programs relative to student financial need. State need-based grant funding across the United States grew to nearly $7 billion in 2015, nearly 25 percent of the total Pell Grant expenditure that year (National Association of State Student Grant & Aid Programs 2015). Some states offer more generous aid programs than others, however. Four states, California, Washington, Wyoming, and New Jersey, spent more than $4,000 per low-income student in 2015, which exceeds the federal expenditure on Pell Grants for their state. Yet most states have grant aid expenditures less than 25 percent of the federal Pell Grant expenditure, and most state aid is awarded without consideration for student financial need.

We structure the remainder of the article as follows. The following section reviews the gaps in existing literature about state and university-level variation in the role of public universities and need-based aid in educational mobility; then we explain our methods for combining different sources of higher education data to measure student debt, nonrepayment rates, state grant aid spending, and actual college price for low-income students. The next section details how debt and nonrepayment rates have increased across the different research strata of public universities over the past decade, followed by a section that details the generosity of state grant aid relative to need and relative to institutional grant aid and non–need based state grants. We show that net prices of attendance for low-income students are more strongly associated with state need-based aid than either institutional grant aid or state programs without need requirements. Net prices for low-income students tend to be about $1,000 lower for every 21 percent of tuition sticker price that was covered by state aid. The final section concludes by discussing how sociological research on postsecondary educational stratification could consider further ways that variations in the research activities of universities and state-level policies may together shape student outcomes.

Public Universities, Need-Based Grant Aid, and Educational Mobility

We take an institutional and ecological approach (Armstrong and Hamilton 2013; Shavit, Arum, and Gamoran 2007; Stevens, Armstrong, and Arum 2008; Stevens and Gebre-Medhin 2016; Stevens and Kirst 2015) to envision how research activities and state need-based grant aid policies might intersect in college cost structures. In considering both institutional diversity and widespread resource challenges for public universities, we argue that rising burdens from student debt are likely present across most public universities but especially acute at lower tier research public universities. Such institutional variation is missing from existing scholarship on both student debt and need-based grant aid.

Diverse Public Universities and Educational Mobility

Public universities are the cornerstone of mass bachelor degree education in America, enrolling nearly seven million baccalaureate students annually—far more than all private institutions combined. The large role of public universities in bachelor degree education is especially important because

Table 1. Research University Categories.

Research Intensity: Highest to Lowest				
Very High (73)				
Highest (AAU)	Very High (non-AAU)	High	Some	None
34	39	74	30	463

Note: Data from the Carnegie Classification of Institutions of Higher Education. AAU = Association of American Universities.

income gains are much more substantial for bachelor degree recipients than for students who attain a less than four-year degree (Hout 2012). The average share of public university students from low-income households also far exceeds that of private institutions (Eaton, Brady, and Stiles 2016). More than three million public university students attend public *research* universities where graduation rates tend to rival or surpass those at private institutions. At the same time, public universities have the highest rates of income mobility for students from the bottom of the U.S. income spectrum (Chetty et al. 2017). Yet public universities have faced increasing resource challenges as state funding per student has declined, with state funding growing much more slowly than enrollment.

We argue that variations in the level of research conducted at public universities may shape their ability to mitigate the impacts of state funding cuts on low-income students. The United States has a remarkably heterogeneous ecology of public universities (Armstrong and Hamilton 2013; Shavit et al. 2007; Stevens et al. 2008; Stevens and Gebre-Medhin 2016; Stevens and Kirst 2015). Few scholars, however, have examined how organizational stratification related to research intensiveness might spill over into undergraduate education with potential consequences for educational mobility.

We distinguish five strata of public universities on the basis of their research intensity. Universities with higher levels of research intensity tend to garner greater prestige from published university rankings. Table 1 shows how our four categories modify the 2010 Carnegie classification of research universities as very high, high, and some. We add a category for none for all public institutions that reported offering four-year degrees but lacked sufficient research to have a Carnegie research classification. The Carnegie categories divide doctoral-granting research universities according to the amount of research per faculty. We also divide the very high category between universities that are members of the prestigious Association of American Universities (AAU) as highest and those that are not AAU members as simply very high. This accounts for the greater levels of prestige and resources that are accorded to the very top public research universities.

Schools among the 34 public universities in the highest research category include UC Berkeley and University of Michigan. SUNY Albany and UMASS Amherst count among the 39 schools in the very high strata. The 74 high universities include Oklahoma State, Temple University, University of Texas San Antonio, and San Diego State University. Illinois State and Tennessee State are examples of the 30 some research schools. The 463 institutions in the none research category include schools commonly referred to as regional colleges, including most schools in the California State University system and regional schools in the Pennsylvania State University system.

Universities with higher levels of research tend to have higher prestige, with critical implications for undergraduate education. For example, *U.S. News & World Report* uses the level of research conducted at a university when formulating its annual rankings. Using data from the Institutional Data Archive on American Higher Education, we find that *U.S. News* only ranked 15 public universities in its top two tiers for universities in 2010 (Brint et al. 2011). All of the 15 public universities in the top two *U.S. News* tiers also placed in our highest research category. Meanwhile, all universities in our two lowest research categories fell in *U.S. News*'s lowest fifth tier for universities. We expect that public universities can leverage greater prestige from higher levels of research to also obtain greater tuition revenue and other public and private resources that can benefit students' chances at graduation and success after college (Bound and Turner 2007; Eaton, Brady, et al. 2016; Hoxby and Turner 2013; Webber and Ehrenberg 2010).

The ability of public universities to draw on resources from research activity in their undergraduate programs could be consequential because of reliance on public universities in the expansion of undergraduate education. Public universities have enrolled over 60 percent U.S. bachelor degree seekers since the 1990s (Ginder, Kelly-Reid, and Mann 2017). Combined enrollment at public research universities grew from 2.4 million in 1987 to over 3.2 million in 2012. Figure 1 shows that enrollment growth also occurred on a per-university basis. Note that the Y-axis of Figure 1 is logged with each tick 1.5 times greater than the tick below it. With roughly parallel upward slopes for logged enrollment over time, we can see that enrollment growth rates at higher ranked public universities were comparable to growth rates at lower ranked universities despite higher baseline enrollment levels at higher ranked schools.

In the aggregate, highest research university enrollment grew from less than 700,000 to more than 800,000. Enrollment at non-AAU very high research schools increased

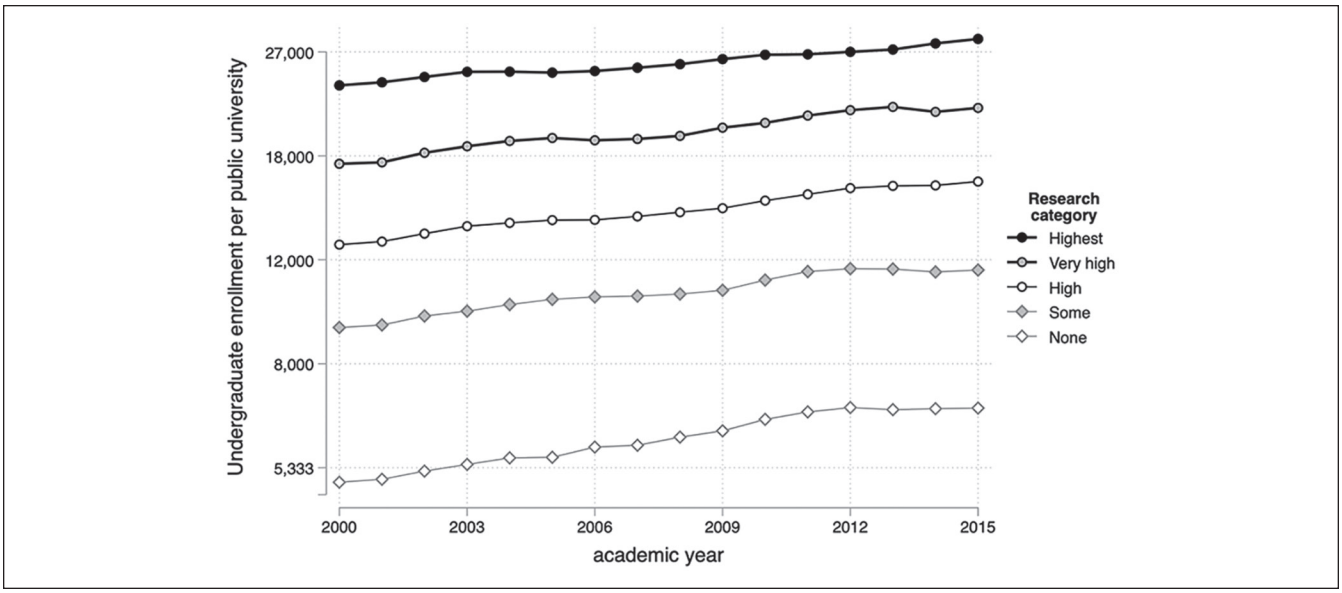

Figure 1. Undergrad enrollment at public universities by research category
Source: Data from Integrated Postsecondary Education Data System (IPEDS).
Note: The Y-axis of Figure 1 is logged with each tick 1.5 times greater than the tick below it. The roughly parallel upward slopes for logged enrollment over time therefore illustrates that enrollment growth rates at higher ranked public universities were comparable to growth rates at lower ranked universities.

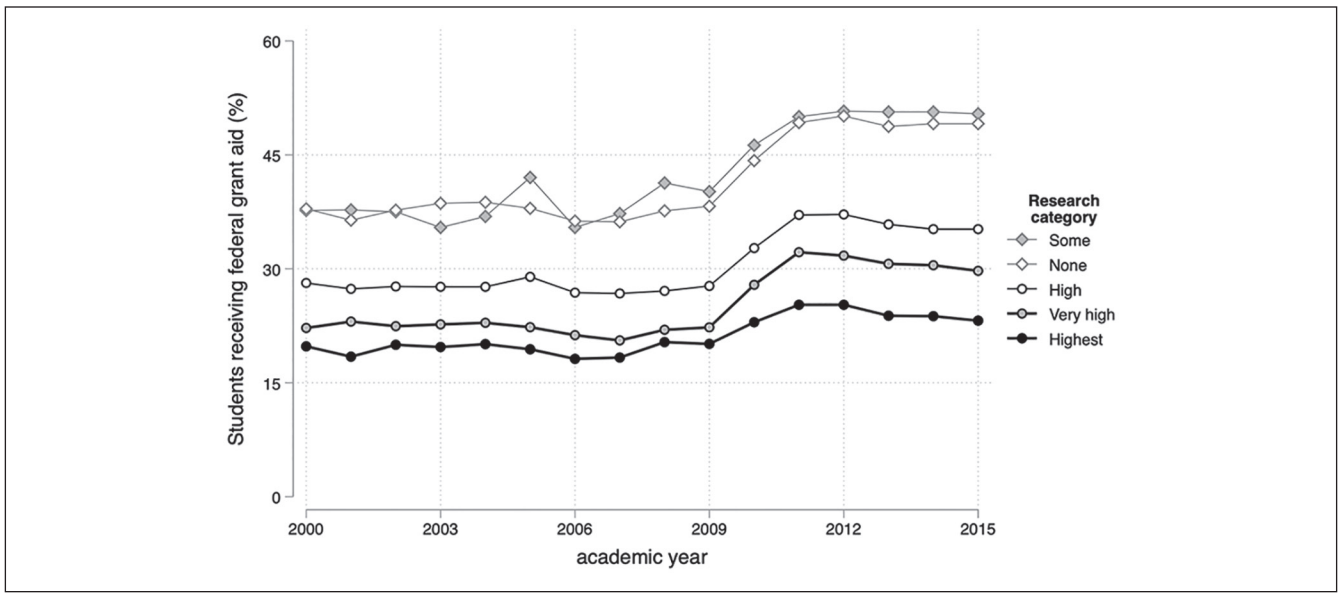

Figure 2. Students receiving federal grant aid by research category.
Note: We use the Integrated Postsecondary Education Data System (IPEDS) variable from the Student Financial Aid survey for percentage of full-time, first-year students receiving federal grant aid because Pell recipient data are not available prior to 2008 to measure time trends. Between 2008 and 2014, however, Pell recipients made up between 97 and 99 percent of all federal grant aid recipients, making the share of students receiving any federal grant aid a good proxy for the share of students with sufficient financial need to qualify for Pell Grants.

from under 700,000 to nearly 950,000. Enrollment at high research universities increased from 850,000 to nearly 1.2 million. Public universities in the some research category had enrollment increases from 200,000 to over 300,000. Enrollment at nonresearch public universities grew at a comparable pace from 2 million to nearly 3.4 million. Enrollment across all public universities thus grew from 4.5 million to 6.7 million. For comparison, enrollment across all private nonprofit undergraduate four-year institutions grew from just 2.1 million to just 2.9 million.

Public research universities also enrolled increasing shares of their students from low-income households (Bound,

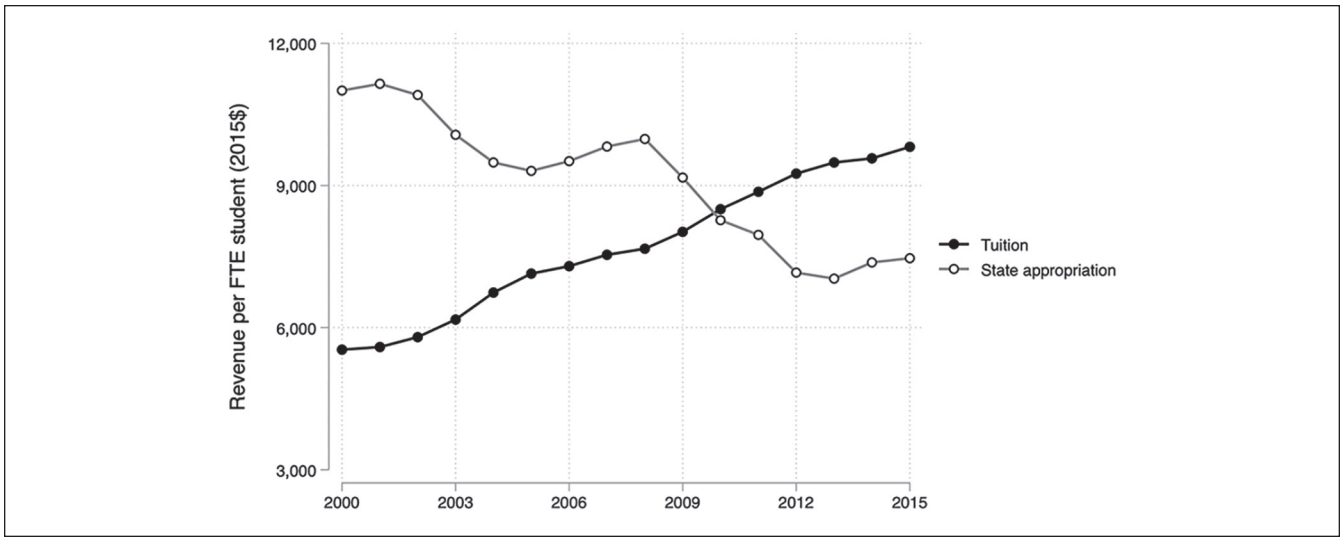

Figure 3. Public university revenue per FTE student by source.
Note: Tuition data are based on variable from Integrated Postsecondary Education Data System (IPEDS) Financial Survey for net-tuition revenue (total revenue from tuition after reallocations to institutional aid and tuition waivers) per full-time equivalent (FTE) undergraduate, graduate, and professional students. State appropriation revenue is estimated using the IPEDS variable from the IPEDS Financial Survey.

Lovenheim, and Turner 2009, 2012; Bound and Turner 2007). Disparities in low-income enrollments, however, widened between higher research public universities (which tend to take fewer low-income students) and less research-intensive public universities (which tend to take more low-income students). Figure 2 shows these disparities by charting the share of full-time first-year students receiving Pell Grants, an indicator for low-income status. We use the first-year student Pell Grant measure because it provides data going back to 2000 while other Integrated Postsecondary Education Data System (IPEDS) measures for all undergrads and low-income students are only available from 2010 onward. Starting in 2009–2010, an increase in the Pell income eligibility threshold contributed to the growth in Pell enrollments. Figure 2, however, shows that the divergence in Pell enrollments between the research strata began before 2009 and has continued since 2012 as Pell enrollment shares declined at higher research strata schools.

Public universities faced steep declines in funding per student over the past decade as they enrolled increasing numbers of students, including those from low-income households. These per-student funding declines accelerated with the onset of the 2008 recession, making it a particularly important period for examination. To address resource shortfalls, public universities have increased revenue per student from tuition. Figure 3 shows the parallel decline in state funding per student and increasing tuition between 2000 and 2015. This conforms with recent findings that public universities increasingly have replaced declining state funding with tuition, though tuition increases have been smaller than per-student state funding reductions (Webber 2017). Increases in tuition across the ecology of public universities have led to rising student loan borrowing, including by low-income students. We turn now to what little is known about how trends in student loan borrowing differ across the different strata of public universities.

Student Debt at Public Universities

A growing body of research has found that rising student debt has substantial consequences for college completion and financial hardship after college (Berger and Houle 2016; Dwyer, Hodson, and McCloud 2013; Dwyer, McCloud, and Hodson 2012; Houle and Berger 2015). Organizational studies relating to variations in college costs and student debt, however, primarily have focused on variations between public, private, and for-profit schools as well as four-year versus two-year institutions (Eaton, Habinek, et al. 2016; Kelchen, Goldrick-Rab, and Hosch 2017; Looney and Yannelis 2015). Yet ambiguities remain regarding how trends in student debt and its consequences may vary across the different strata of public universities.

Across all public universities, average debt per student at graduation, including both borrowers and nonborrowers, increased by 18 percent from $12,628 in 2006 to $14,908 in 2013 in 2013 constant dollars (The Institute for College Access & Success 2016). Average debt per borrower at graduation increased at a faster rate of 24 percent, and from a higher baseline of $20,208 to $25,049. Data limitations, however, have made it difficult for researchers to disaggregate these trends by income group, state, or the different strata of public universities.

We are similarly unaware of scholarship examining trends in financial distress such as student loan repayment rates for the different strata of public universities. Existing

scholarship suggests, however, that high nonrepayment rates should be particularly acute at lower ranked public universities. Some prominent economists have argued that students rarely borrow too much because, on average, the earnings gains from college are higher than the costs of repaying student debt (Akers and Chingos 2016; Avery and Turner 2012). While this may be true on average, 40 percent who entered a public university as a first-year student in the fall of 2003 had not completed a degree by 2009 or received the wage gains that come with it (NCES 2018). In fact, scholars have found negative effects on graduation rates from debt as some students who borrow heavily early in college will hesitate to take on further debt to complete college (Dwyer et al. 2012, 2013).

Consistent with lower wage gains for students who do not complete a bachelor's degree, scholars have documented large increases in financial distress and student loan defaults after college (Looney and Yannelis 2015). Even students who complete a degree have a higher risk of default if they come from a household with little transferable wealth to aid with loan repayment (Addo et al. 2016; Houle 2013). As a result, student loan default rates tend to be highest at schools with fewer resources to support degree completion and schools that enroll large numbers of low-income students and African American students (Addo et al. 2016; Looney and Yannelis 2015). For example, student loan default rates approached 30 percent in 2011 at for-profit and community colleges (Looney and Yannelis 2015). The overall rate of 90-day delinquencies on repayment for all U.S. student loans that have entered repayment, however, is twice as high as the overall default rate for all U.S. student loans (Brown et al. 2014; Edmiston, Brooks, and Shepelwich 2013).

Federal income-based repayment (IBR) programs alleviate some financial burdens for low-income students who are unable to repay their student loans. IBR programs cap the amount a borrower must pay monthly at a level thought to be manageable for the amount of income they have (Shireman 2017). After 20 years, borrowers in IBR programs have their debts forgiven. As a result, some borrowers can end up only making payments that cover a portion of the interest on their loans and none of the original principal. The share of federal student loan borrowers enrolled in IBR doubled from 13 percent to 28 percent from 2014 to 2017. Nevertheless, low-income borrowers can still face risks from higher student debt levels because IBR enrollment is not automatic and borrowers can become ineligible for IBR if they miss too many payments or fail to comply with other bureaucratic requirements (Shireman 2017).

State Need-Based Grant Aid

Need-based grant aid can mitigate the risk for students of being unable to repay debts after college. Existing research has also found that need-based grant aid is more effective than student debt for encouraging college enrollment and completion among low-income students (Alon 2007; Baum, McPherson, and Steele 2008; Dynarski 1999, 2000, 2002; Goldrick-Rab 2016; Goldrick-Rab et al. 2016; Heller 1999). Going only to students with financial need, need-based grant aid is also more effective in expanding college attainment than merit-based scholarships, which tend to go to better-off students and students who would have completed college anyway (Heller and Marin 2002).

While the benefits of need-based grant aid are well known, federal funding for America's largest such program, which is known as the Pell Grant, has not kept up with rising tuition and other college costs (The College Board 2016). Despite college cost increases, the average Pell Grant award has increased by just $374 since 1975 in inflation-adjusted dollars from $3,350 to $3,724. The maximum Pell Grant award has actually declined in inflation-adjusted dollars from $6,164 to $6,095 as of 2019.

State need-based grants could potentially fill some of the gap between Pell Grant awards and college costs. Unlike institutional aid, state grants are typically funded by taxes and other state revenues rather than public universities themselves. State grants can be used to cover tuition, room, and board costs, thus offsetting the need to borrow using student loans. Scholars have documented a high tuition/high aid funding model for public universities that first emerged the early 1990s (Hearn, Griswold, and Marine 1996; Toutkoushian and Shafiq 2010). Both tuition and need-based grant aid spending have since expanded dramatically. Spending on need-based grants across all states increased 37 percent from $5.7 billion in 2005 to $7.8 billion in 2015 (National Association of State Student Grant & Aid Programs 2015). The scale of state programs has begun to approach $30 billion in annual Pell grants and $14 billion in veteran grants (The College Board 2016).

Despite the growth in state spending on need-based aid, we have scant understanding of how state grant aid programs differ across states and the different strata of public universities. We particularly lack a baseline understanding of how the generosity of such programs compares to financial need. Nor do we know if state need-based aid programs tend to reduce the actual price of college for low-income students. Relatedly, little is known as to whether state need-based grant aid is more effective in reducing net prices or student loan repayment challenges than other state grant aid and institutional grant aid that is sometimes awarded without consideration for financial need.

Data

We assembled a new data set that combines college-level data from multiple sources to assess low-income student debt, loan

[2]Arkansas and Maine do not report the share of their expenditures that go to students at state versus private institutions. We therefore exclude these states from our analysis.

Table 2. Variables and Data Sources.

Variable	Data Source	Level	Variable Description
Enrollment	IPEDS[a]	University	Total undergraduate enrollment
Students receiving federal grants	IPEDS[a]	University	Share of full-time, first-year students receiving federal grant aid[b]
Tuition revenue per FTE student	IPEDS[a]	University	Net tuition revenue (after institutional aid and tuition waivers) per FTE student
Student debt	College Scorecard[c]	University[d]	Average student loan debt per borrower in an exiting cohort upon entering repayment
Loan non-repayment	College Scorecard[c]	University[d]	Share of students in an exiting cohort who have entered repayment on federal loans but defaulted or failed to pay down at least $1 in principal after three years.
Federal grant aid expenditure per Pell recipient	IPEDS[a]	State	The total dollars of federal Pell Grant aid per Pell recipient in the state
State need-based grants per federal Pell recipient	NASSGAP[e] and IPEDS[a]	State	Total state spending on need-based grant aid (NASSGAP) per Pell recipient in the state (IPEDS)
All state grants for fulltime frosh per Pell recipient	IPEDS[a]	University	Total state grant aid dollars awarded to full-time first-year students at the school level irrespective of need divided by the number of full-time first-year Pell recipients
All institutional grants for full-time freshmen per Pell recipient	IPEDS[a]	University	Total institutional grant aid dollars awarded to full-time first-year students irrespective of need at the school level divided by the number of full-time first-year Pell recipients
State aid per recipient	NASSGAP[e]	State	The total dollars in state, need-based grant aid per recipient of state, need-based grant aid
State coverage of federal Pell recipients	NASSGAP[e] and IPEDS[a]	State	The ratio of state, need-based grant aid recipients (NASSGAP) to the number ofnfederal Pell grant recipients in the state (IPEDS)
Net price for low-income students	IPEDS[a]	University	Average net price paid by low-income students, including tuition, room, board, and other costs, after receiving grant aid
Aid as a share of sticker price	NASSGAP[e] and IPEDS[a]	University[f]	Aid per Pell recipient divided by the in-state sticker price for the university

Note: FTE = full-time equivalent.
[a]Integrated Postsecondary Education Data System.
[b]We use the number of Pell recipients throughout the article except for Figure 2 because the number of Pell recipients is not available prior to 2008 to measure time trends. Between 2008 and 2014, however, Pell recipients made up between 97 percent and 99 percent of all federal grant aid recipients, making it a good proxy for the share of students receiving need-based Pell Grants.
[c]2017 College Scorecard September 2017 release. College Scorecard Data on student debt and loan nonrepayment are derived from federal administrative data for student loans from the National Student Loan Data System.
[d]College Scorecard data are published at the Office of Postsecondary Education Identification (OPE ID) level, which corresponds to the IPEDS Unit ID level of a research university in most cases. In a small number of cases, however, OPEIDs encompass multiple separate public research universities, such as in the case of the Rutgers-New Brunswick, Rutgers-Camden, and Rutgers-Newark, which are reported under a single OPEID.
[e]National Association of State Student Grant Aid Program database need-based grant aid data for public, four-year universities.
[f]State need-based aid as a share of sticker price is calculated by dividing the state-level aid spending per Pell recipient by the university-level sticker price reported in IPEDS. Non–need based aid is calculated entirely at the school level.

nonrepayment rates, and the use of state need-based aid across different states and the different research strata of U.S. public universities. Table 2 provides descriptions and data sources for all variables included in our analyses. First, we use National Student Loan Data System (NSLDS) data published through College Scorecard on student debt upon leaving school and student loan nonrepayment rates. These data are available at the university level for public universities. The data are for student debt upon leaving school for federal student loan borrowers only. Comparable data are not available on the number of students leaving school with zero debt. Nonrepayment rates are the percentage of borrowers who have either defaulted or failed to repay at least $1 of principal within three years after leaving school. Nonrepayment rates are the preferred measure for financial distress from student loans because default rates are more easily manipulated by schools and loan servicers that could face regulatory penalties (U.S. Department of Education 2017).

Second, we combine the National Association of State Student Grant Aid Programs (NASSGAP) database with

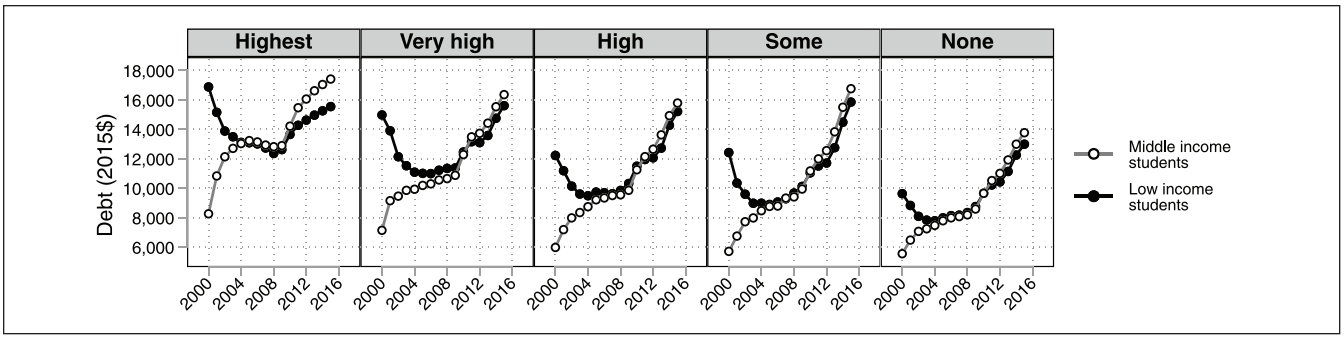

Figure 4. Public university student debt after college by research category, 2000–2015.
Note: Student debt on the Y-axis is calculated using the College Scorecard data for total amount owed in federal student loans by all students leaving school in a given year either by completing a degree or dropping out.

college cost data from IPEDS. The NASSGAP data are reported on a state-by-state basis, and the IPEDS data are reported for each university or college. We link the two at the state level. Specifically, we link state-level NASSGAP data for 2006–2010 and 2014 to IPEDS data on federal student aid, state grant aid, institutional grant aid, student household income, and college actual net prices. Using this data set, we can compare across states the generosity of state need-based aid per student relative to students' average financial need in each state. We also can examine how these state-level measures of grant aid programs relate to net college costs and student loan nonrepayment by income group within the different strata of public universities.

We specifically use NASSGAP data on need-based state undergraduate student grant aid awards to students at four-year state universities. We turn to the NASSGAP data because no other data set provides comprehensive data on state need-based aid at the state or college level. NASSGAP publishes an incredibly detailed longitudinal database of all state student aid programs at the state program level. We use only the data on need-based grant aid, in accordance with our thesis that the targeting of such programs will be particularly effective in limiting college costs for lower-income students. Similarly, we only use data on expenditures to support students at public universities, with spending on community college and private college students excluded.[2] Our estimates use expenditure data only from state aid programs that report using a measure of economic need for program eligibility although they may use other measures as well.

By drawing on IPEDS data, we are able to standardize state grant aid measures according to the number of low-income students in public universities in each state. To accomplish this, we simply divide the total state expenditure on need-based grant aid for students at public four-year schools by the total number of Pell Grant recipients at public four-year schools in the state. We use the count of Pell Grant recipients at public four-year schools because it is available for years prior to 2010, the first year for which IPEDS surveyed the number of students by income bracket at universities. The measure of state grant aid per Pell recipient at the state level is necessarily crude because the reader may recall that data for such aid expenditures are only available at the state level. Unfortunately, the estimate of state grant aid generosity per Pell recipient does not account for differences in state aid program awards within states between different public universities. Such differences in aid program awards can occur in states such as California, where in-state tuition rates differ across the state's universities.

We use IPEDS data to measure total state grant aid awards and total institutional grant aid at the school level. Unfortunately, these data are not disaggregated in IPEDS between need-based aid and aid with no economic need requirements. The IPEDS data are also only available for full-time, first-year students. Nevertheless, we can compare the average amounts awarded per low-income first-year student to see how state need-based aid awards compare to other state and institutional grant aid awards. We can also examine if need-based grant aid is more strongly associated with lower net prices and loan nonrepayment rates than other state aid spending and institutional grant aid spending. This could provide suggestive evidence for whether institutional grant aid tends to be need-based and whether need-based grant aid is more effective in aiding low-income students.

We also use IPEDS data on college-level in-state net price by income group to estimate the relationship between state grant aid and college costs incurred by students. We are able to do this because IPEDS includes a college-level variable for net price by students' income brackets. Specifically, we use the in-state net price data for students from households in the $0 to $30,000 income bracket. The net price data differs from the in-state sticker price in that it (a) includes room and board costs and not just tuition and (b) reflects the actual full cost paid by students after all state, federal, and institutional grant aid are accounted for. IPEDS net price measures are an imperfect proxy for actual costs incurred by students. For example, IPEDS net price measures exclude out-of-pocket living expenses for students who live at home with their parents (La

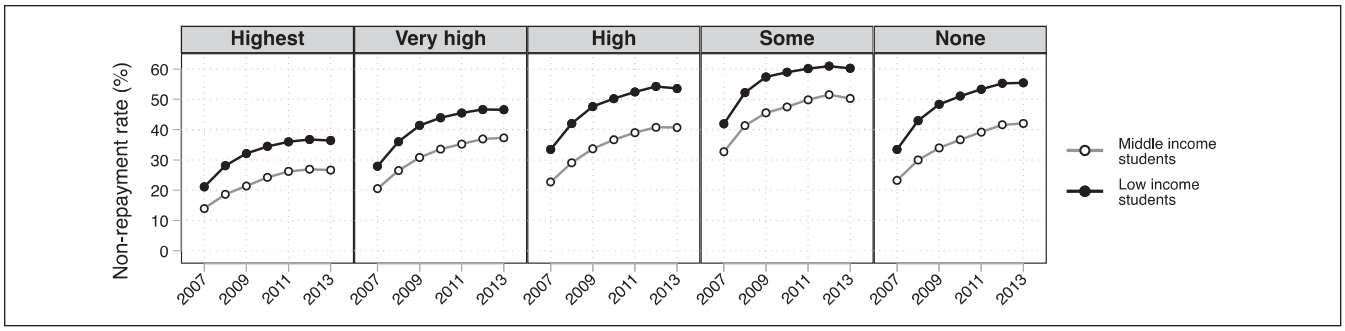

Figure 5. Public university student loan nonrepayment by research category.
Note: The nonrepayment rate is estimated using College Scorecard Data for the share of students in an exiting cohort who have entered repayment on federal loans but defaulted or failed to pay down at least $1 in principal after three years. Data are reported in the figure by the year in which students exited school.

Rocque 2016). Nevertheless, the IPEDS net price variables offer the best available data to estimate the relationship between state-level state aid program expenditures and average costs for students. We estimate this relationship at the state level for all universities in the state and for universities in each state by research category.

Rising Debt and Loan Nonrepayment at Public Universities

Student Loans at Public Research Universities

We find relatively uniform increases in student loan borrowing across all strata of research universities for both low- and middle-income borrowers. The survey cited earlier found higher levels of baseline debt at graduation for all income groups, increasing 24 percent from $20,208 to $25,049 (The Institute for College Access & Success 2016). This discrepancy is primarily because our data are for all borrowers in an exiting cohort, including nongraduates who may leave with less debt because they exit school early. Unfortunately, college-level data are not available on the number of students who left school with zero debt, so our analysis examines only average debt per borrower for those with positive debt levels.

In Figure 4, we can see that student debt levels were equivalent for both low-income and middle-income students from 2006 onward and increased sharply for both groups. In 2000, low-income students tended to borrow more than middle-income students. Borrowing levels of low-income and middle-income students, however, converged in the first four years of the twenty-first century. In the some research category, borrowing by low-income and middle-income students increased from just under $10,000 in 2006 to over $16,000 in 2016 (2016 constant dollars). In the highest research category, borrowing increased faster for middle-income students, from just over $12,000 in 2006 to close to $18,000 in 2016. Borrowing increased for low-income students at the highest research universities from $10,000 to just over $16,000. The greater increase in debt levels upon leaving school may reflect in part that students at lower research strata schools drop out at higher rates, thereby borrowing for fewer years before leaving school. IPEDS data show, however, that first-year borrowing by full-time students at the highest tier schools averaged $6,598 in 2015, 9 percent higher than average borrowing of $6,073 in the lowest research strata.

Student Loan Nonrepayment by Public University Students

We find that low-income students who left school between 2007 and 2013 particularly struggled to repay their debts. With lower graduation rates, lower-strata public universities saw particularly low student loan nonrepayment rates. Figure 5 shows that nonrepayment rates by low-income borrowers topped 60 percent in the some research category and exceeded 50 percent in the high category. Even at very high research universities, however, more than 40 percent of low-income borrowers in exiting cohorts since 2009 were unable to pay down any debt in the first three years of repayment. This trend is not limited to low-income students. While Figure 5 shows that nonrepayment rates were lower between 2006 and 2010 for middle-income than low-income students, nonrepayment rates neared 50 percent for exiting middle-income cohorts between from 2010 onward at universities with some research.

These rates of nonrepayment underscore the perils of even moderate levels of student loan borrowing at lower strata research universities across both low-income and middle-income students. While IBR programs for federal loans may mitigate these risks, need-based grant aid might provide a state level policy option for keeping student loan borrowing in check. We turn now to our analysis of such state-based programs and their relationship with college cost and loan nonrepayment.

[3]Maine and Arkansas are omitted from Figure 6 and all subsequent figures because they do not break out data for their small state need-based grant aid programs for public universities versus other private and two-year institutions.

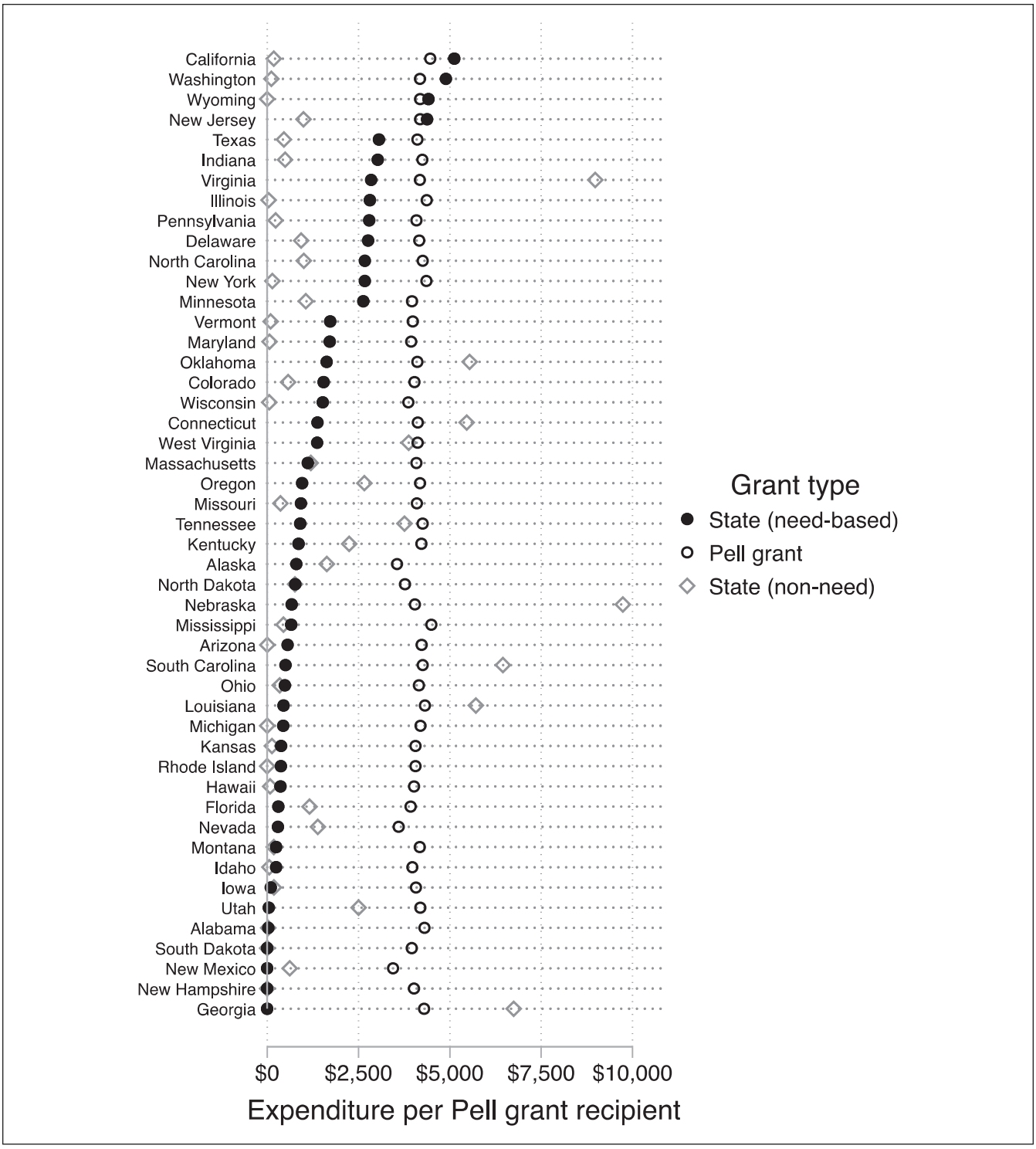

Figure 6. State need-based aid expenditure per Pell recipient versus Pell Grant expenditures.
Note: Clear dots represent the total dollars spent on federal Pell Grant aid per Pell Grant recipient in the state in 2014–2015 as reported in Integrated Postsecondary Education Data System (IPEDS). Black dots represent the total dollars spent on state need-based grant aid as reported in National Association of State Student Grant Aid Programs per the number of Pell Grant recipients reported in IPEDS for the state. All amounts are for public university students only.

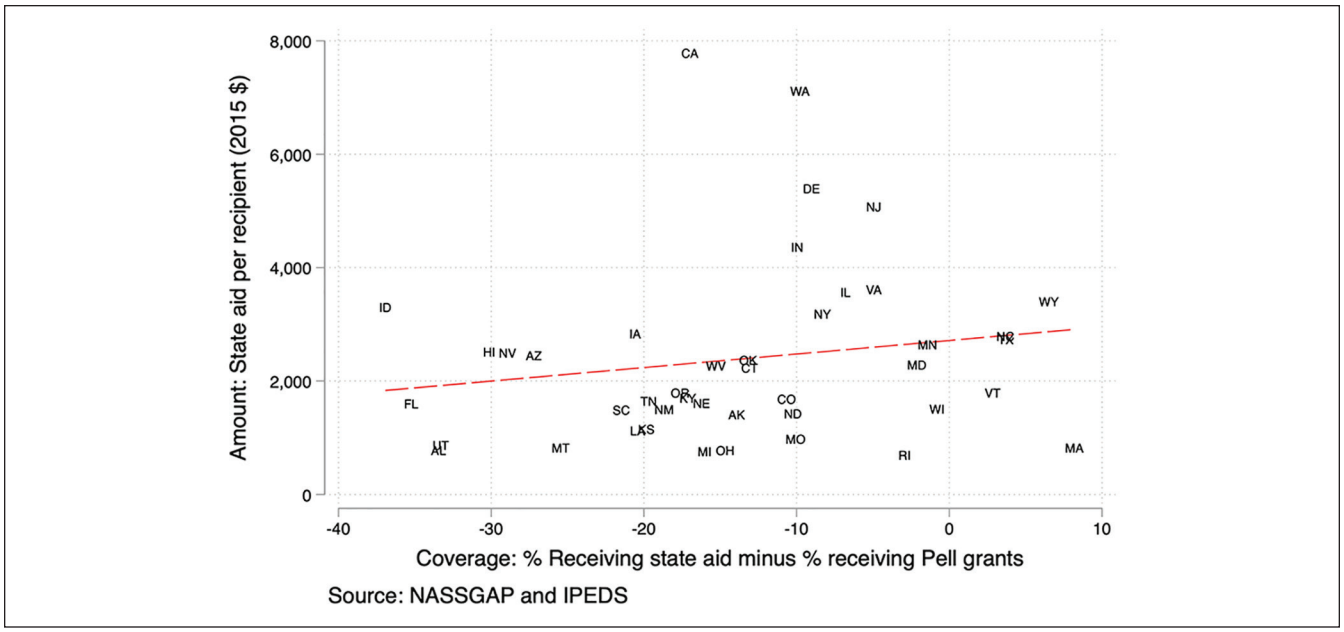

Figure 7. State need-based aid per recipient and state aid coverage of Pell Grant recipients.
Note: The Y-axis represents total dollars in state need-based grant aid per recipient of state need-based grant aid as reported in National Association of State Student Grant Aid Programs (NASSGAP) in 2013–2014. The X-axis reports the ratio of state need-based grant aid recipients reported in NASSGAP to the number of federal Pell Grant recipients in the state reported in Integrated Postsecondary Education Data System. All amounts are for public university students only.

Affordability and State Need-Based Aid

State need-based grant aid programs vary dramatically in both the share of students receiving aid and the size of overall aid expenditures. The variation in state need-based grant aid has been noted in NASSGAP reports for the past 10 years (National Association of State Student Grant & Aid Programs 2015). But there has been limited analysis of how aid programs vary across states relative to levels of economic need or public university tuition prices.

Our findings indicate that although a few states invested heavily in need-based aid by 2015, most states spend little relative to federal programs, state-based grants with no economic need requirement, and institutional grant aid programs. We first illustrate this by comparing total state need-based grant aid expenditures relative to Pell Grant expenditures by state in 2015. This is shown in Figure 6 with state need-based grant aid spending per Pell Grant recipient (in black) against Pell Grant spending per Pell Grant recipient for that state (in stripes). We can see that four states—California, Washington, Wyoming, and New Jersey—spend more than $4,000 per Pell recipient on state aid, higher than the federal Pell Grant expenditure for their state. After a large drop, these leading states are followed by 11 states that spend between $2,000 and $3,000 per Pell recipient and 50 percent to 75 percent of the federal Pell expenditure for their state. Six states and the District of Columbia spend less than $100 per Pell recipient on state aid.

Spending per low-income student is a function of both the amount of aid per recipient and the share of low-income students who receive aid. We find that in 2015, states that spent more per recipient also tended to cover more low-income students. This is depicted in Figure 7, which plots states according to their average grant award per recipient on the Y-axis and the difference in the percentage of students receiving state grants minus the percentage of students receiving Pell Grants on the X-axis. We can see that many states have a negative coverage ratio, which means that all but a handful cover fewer students than federal Pell grants. The upward-sloping dashed line

[4]For average in-state sticker price, we use Integrated Postsecondary Education Data System (IPEDS) college-level data on sticker price to estimate the mean sticker price for universities within each research strata in the state weighted by number of Pell Grant students enrolled at each university. This makes the in-state sticker average more reflective of the sticker prices used at the universities that enroll more Pell Grant students within the research category in the state. It approximates the average sticker price that low-income students would pay without any gift and grant aid from any source.
[5]This is the case with California, for example, which provides Cal Grants up to a maximum that is approximately equivalent to the in-state tuition sticker price for each of its public universities. This means that the maximum Cal Grant for University of California system students is approximately $13,000, as compared to approximately $6,000 for students at campuses of the California State University system for which tuition is lower. In such cases, our estimates may sometimes underestimate the portion of sticker price that is covered by need-based grant aid at higher tuition universities and overestimate the share of sticker price covered at lower tuition universities.

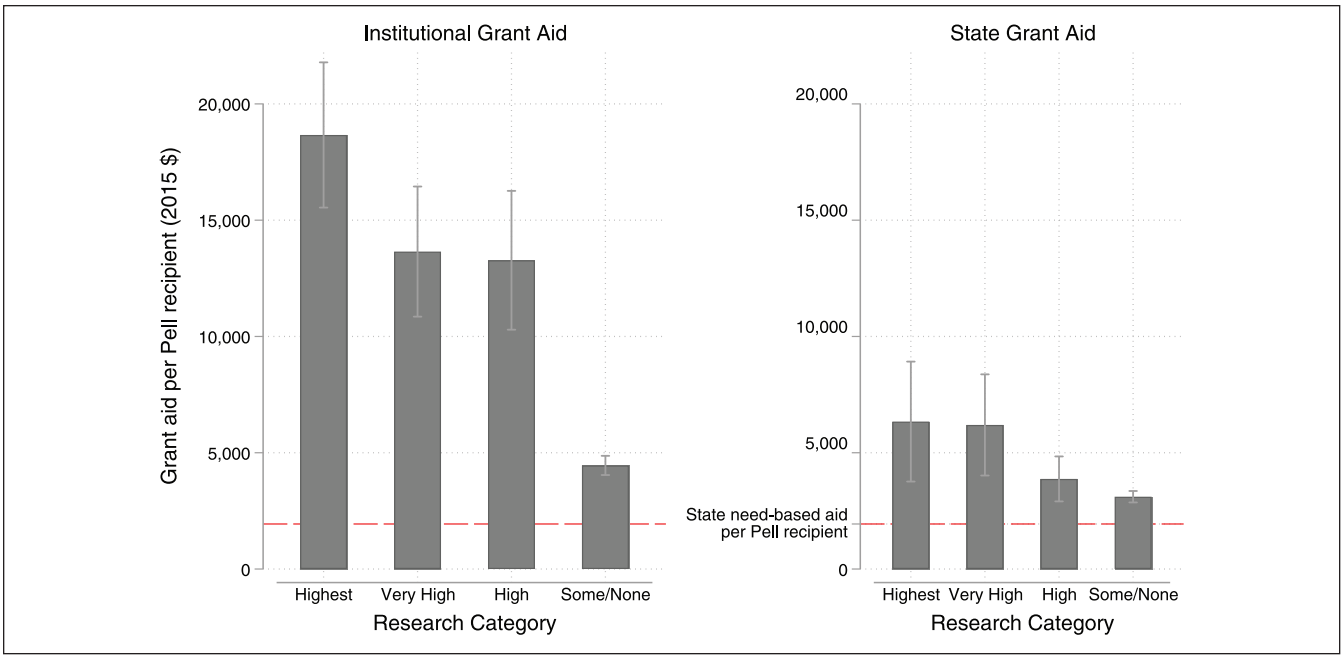

Figure 8. 2015 institutional grant aid and state grant aid awards by research category.
Note: Data from Integrated Postsecondary Education Data System for institutional grant aid and state grant aid awarded to full-time, first-time undergraduate students during their first year, per full-time and first-time Pell recipients in 2015. Data include both need-based and merit-based dollars, including dollars awarded to higher income students that do not qualify for Pell.

represents a fitted regression estimate showing a strong relationship between amount of aid per recipient and the percentage of all low-income students receiving aid.

At a more granular level, Figure 7 shows the large disparities across states in the size of need-based grant awards and coverage of Pell Grant recipients. We can see that California and Washington ($8,000 and $7,000 respectively) have generous state grant awards per recipient but that more than 15 percent of their undergraduates receive Pell Grants and no state aid. In contrast, most states provide average grants of less than $2,000 and even lower numbers of Pell undergraduates receiving state aid. Massachusetts stands out on the far right of the X-axis for covering more students than Pell Grants but offering low aid per recipient. Like most states, Massachusetts offers below $1,000 per recipient even though it has the 10th highest in-state tuition sticker price of $10,874. Georgia, South Dakota, and New Hampshire are shown to not provide any state need-based grant aid despite significant shares of students who qualify for Pell Grants.[3] The case of Georgia highlights that these estimates reflect only states' need-based grant aid programs. Georgia offers a generous state grant known as the Georgia Hope Scholarship. However, unlike need-based aid, the Georgia Hope Scholarship is awarded on the basis of a merit GPA qualification and provided to students of all income levels. As a result, substantial funds go to high-income students under non–need based aid programs.

We also find that states tend to allocate fewer resources to need-based programs than are awarded through other state grant aid programs and institutional grant aid. Figure 8 presents total annual grant aid award dollars divided by the number of Pell recipients for the different research strata. Bars in the left panel represent data for institutional grant aid awards. Bars in the right panel present data for total state grant aid awards, including non–need based grants. For comparison, the average state need-based aid spending per low-income student is represented by the dashed red line. State need-based aid spending data cannot be broken out by research category because they are only available at the state level.

The left institutional aid panel of Figure 8 shows that higher research strata universities award much more grant aid relative to their low-income enrollments than schools in the some/none research strata and much more than total state need-based grant aid awards. Schools in the highest research category award an average of $18,665 in institutional grant aid for every low-income student they enroll, more than nine times the average state need-based grant spending for every low-income student of $1,937. Schools in the lowest research category award just $4,456 of institutional grant aid.

The right panel of Figure 8 shows that the average of total state aid spending for every low-income student ranges from

[6]Some readers may wonder about two outliers in the Panel Set A plots. At the very top of the highest plot are Penn State and University of Pittsburgh, whose high in-state sticker prices appear to be mitigated by Pennsylvania's moderate need-based grant aid program. In the high research plot, we can see University of Wyoming on the far right, where state grant aid awards per low-income student amount to 111 percent of the school's $3,968 in-state sticker price.

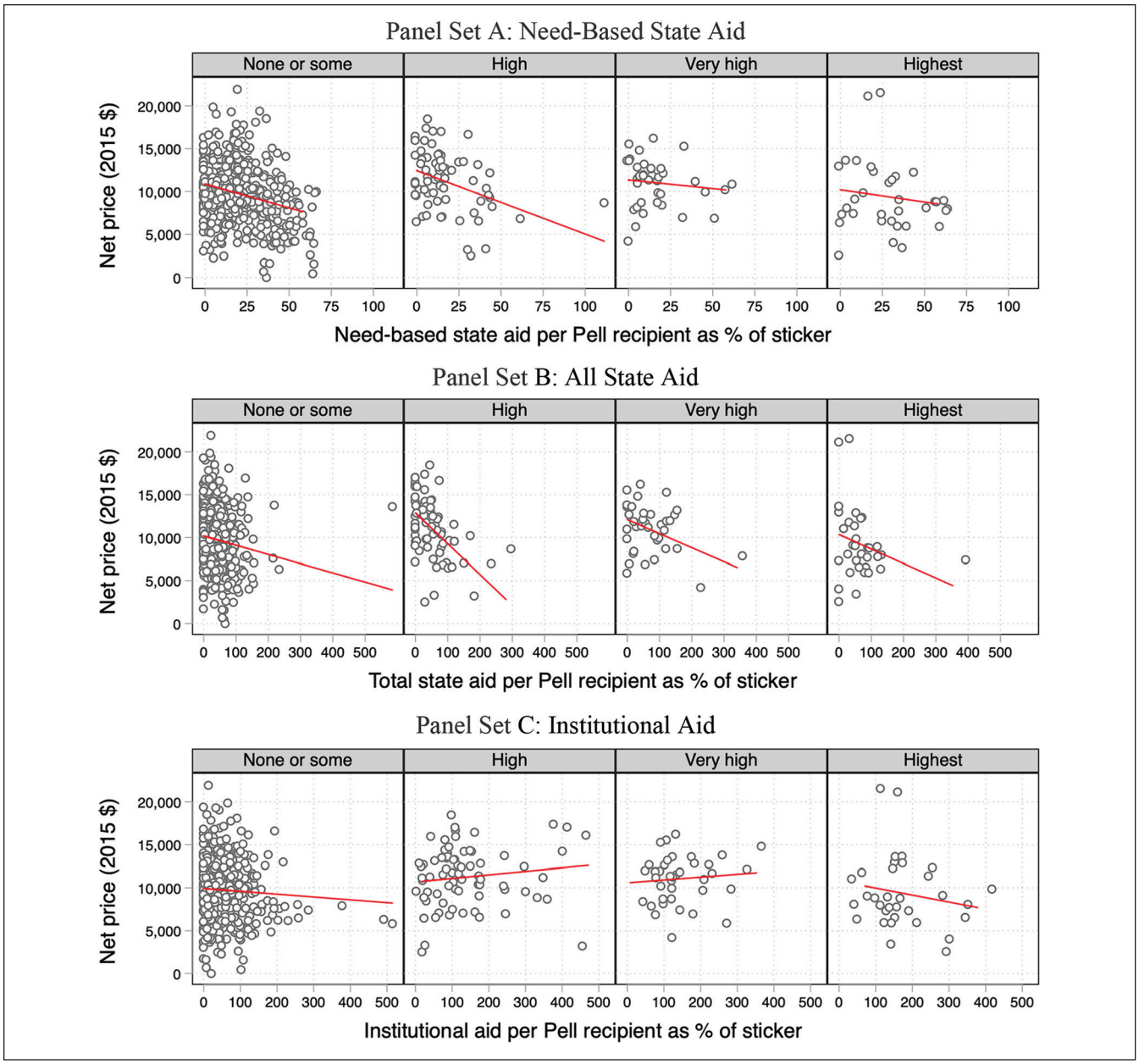

Figure 9. 2015 net price for low-income students and grant aid by research category.
Note: Net price is the average net price paid by low-income students, including tuition, room, board, and other costs after receiving grant aid, as reported in Integrated Postsecondary Education Data System (IPEDS) at the school level. Aid as a percentage of tuition is the total spending for each type of aid divided by the number of Pell recipients, divided by the instate tuition sticker price. For need-based state aid, this is calculated at the state level using National Association of State Student Grant Aid Programs data on aid spending and IPEDS data for total Pell recipients in the state. For all state aid and all institutional aid, this is calculated at the school level using IPEDS data on the total amounts of aid awarded to full-time, first-year students, including non-Pell students, divided by the total number of full-time, first-year Pell recipients at the school.

$6,341 for the highest research tier to $3,110 in the lowest tier. These total state aid awards include both need-based and non–need based grant aid, which are not disaggregated in IPEDS. Students at higher research tier schools may be more likely to satisfy merit-based state aid criteria for non–need based programs. At the same time, the larger total state aid awards per low-income student in higher research tier schools reflects that those universities tend to enroll fewer low-income students. Higher research strata schools also tend to have higher tuition rates to which state grant aid awards are sometimes linked.

Actual Net Price for Low-Income Students and State Aid

Do state need-based aid programs actually reduce net prices for low-income students? And are state need-based awards more effective than institutional or non–need based state

grants? The famous Bennet hypothesis posits that universities will simply increase tuition to capture increases in state financial aid. So even if state need-based grant aid is increased as a percentage of sticker price, a university could increase tuition to the point where actual net price for low-income students is still no lower than in a state with lower tuition and less grant aid. While there is evidence that for-profit colleges do respond this way to aid increases, scholarship suggests that this does not occur at public universities, which are under the oversight of state governments (Cellini and Goldin 2012; Lau 2014). We likewise find that actual net prices for low-income students are lower in states with more generous state need-based grant aid. We also find that need-based state grant awards are more strongly associated with lower net prices for low-income students than are institutional grants and total state grant awards.

As described in the data section, we use IPEDS data on in-state actual net price for students from households in the $0 to $30,000 income bracket in 2015. This actual net price differs from the in-state sticker price in that it (a) includes prices for room and board and not just tuition and (b) reflects the actual full price paid by students after all state, federal, and institutional grant aid are accounted for. For our measure of state aid, we use the state-level state grant aid expenditure per low-income student as a share of the weighted average sticker price for all public universities in the state.[4] This is primarily because state aid spending cannot be broken out by research category. In addition, actual state aid spending on a given student may reflect a formula that awards higher aid for students at public universities with higher sticker prices. The average of state spending per student in a state would then not accurately reflect the actual spending in a given research category if that state's tuition rates were substantially higher in one research category than another.[5] We try to adjust for this by dividing the state grant aid per low-income student by universities' sticker prices. This gives us a university-level estimate of state aid per low-income student as a percentage of sticker price. For comparison, we calculate total equivalent measures for institutional grant aid and total state grant aid (including non–need based aid) awards per low-income student as a percentage of sticker price using IPEDS university-level data on those forms of aid.

We find that higher need-based state grant aid is much more associated with lower actual net prices than either total state grant or institutional grant aid. We show this in Figure 9 with three sets of panels, one for each type of aid. Each panel presents results for our four research categories. We group the some and none research university strata together in one category because there are no meaningful differences in estimates between the two groups and few states have schools in the some research category. Within each research category, each school is then plotted on the Y-axis with a circle according to its 2015 actual net price for low-income students and on the X-axis according to the aid per low-income student for each panel set's given type of aid. The red lines in each panel of Figure 9 reflect the linear fit of the relationship between actual net price for low-income students and the type of aid as a percentage of tuition.

Panel Set A in Figure 9 plots schools according to their state's need-based grant aid spending per low-income student on the X-axis. The plots and fitted lines represent that every 10 percent of tuition sticker price matched by state need-based aid is associated with $541 less in net price. This relationship is strongest at schools in the two lowest research categories. The estimated relationship has a p value of .001 using robust standard errors clustered by state. Panel Set B shows that total state aid per low-income student is also associated with lower net prices. Because total state grant aid includes awards to higher income students, total state grant aid for every low-income student enrolled ranges as high as 500 percent. For example, the state-funded Georgia Hope scholarship program provides $7 million in aid to first-year students of all incomes at Georgia College and State University, the equivalent of $29,000 for each of the schools' 251 first-year Pell recipients. With a wider range, the X-axis in Panel Set B makes it difficult to perceive that the slope for total state aid's relationship with actual net price is much flatter than for need-based aid. Every 10 percent of tuition sticker price matched by these total state grant aid expenditures is associated with just $159 less in net price for low-income students.

Panel Set C of Figure 9, meanwhile, shows that there is no meaningful association whatsoever between institutional grant aid spending and net prices for low-income students. This finding suggests that institutional grant aid more commonly goes to students from wealthier backgrounds.[6]

Loan Nonrepayment and State Aid

Numerous factors contribute to university-level differences in low-income student loan repayment rates, including net price after grant aid, graduation rates, and the macroeconomic environment of a state. Scholars have found that these factors contribute to both student loan defaults (Gross et al. 2010; Hillman 2014) and student loan repayment rates (Kelchen 2017; Liu and Belfield 2014). Scholars have given little attention, however, to variation in student loan repayment rates among low-income students at public universities.

Differences in state need-based aid may contribute to variations in student loan repayment rates between states and university research strata. First, greater state need-based aid may help students borrow less by keeping actual net prices down for low-income students. Leaving school with less debt then could make repayment easier. Second, state need-based aid could enable public universities to offset funding cuts with greater tuition revenue from wealthier students

[7]Data and code to replicate these reported and unreported regressions and figures are available at http://faculty.ucmerced.edu/ceaton2/index.php/replication/.

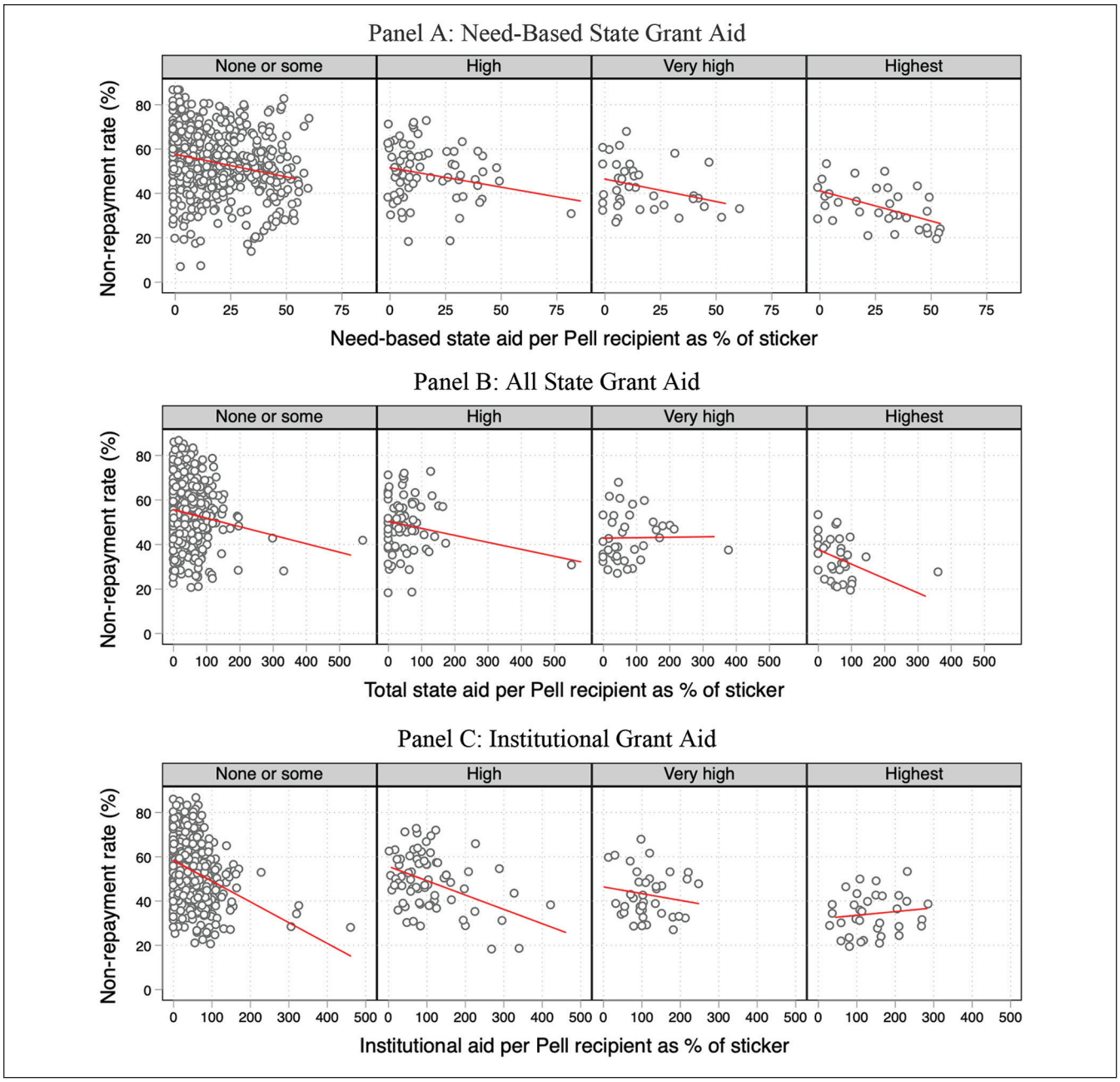

Figure 10. 2013 cohort loan nonrepayment and grant aid by research category.
Note: The nonrepayment rate is estimated using College Scorecard Data for the share of students in the 2013 exiting cohort who have entered repayment on federal loans but defaulted or failed to pay down at least $1 in principal after three years. Aid as a percentage of tuition is the average total spending per year for each type of aid divided by the number of Pell recipients, divided by the average instate tuition sticker price for the four years prior to 2013. For need-based state aid, this is calculated at the state level using National Association of State Student Grant Aid Programs data on aid spending and Integrated Postsecondary Education Data System (IPEDS) data for total Pell recipients in the state. For all state aid and all institutional aid, this is calculated at the school level using IPEDS data on the total amounts of aid awarded to full-time, first-year students, including non-Pell students, divided by the total number of full-time, first-year Pell recipients at the school.

while maintaining lower actual net prices for low-income students. By offsetting cuts with tuition revenue, public universities might avert instructional cuts that contribute to falling graduation rates (Webber and Ehrenberg 2010; Zhang 2009). As discussed earlier, grant aid in general also increases graduation rates by encouraging college persistence among students who might choose to drop out rather than assume more debt (Dwyer et al. 2012, 2013; Goldrick-Rab et al. 2016). Higher graduation rates in turn provide an earning boost that can help prevent high rates of nonrepayment among even those low-income students who assume only small amounts of student debt (Looney and Yannelis 2015).

Consistent with evidence that need-based grant aid reduces hardship and nonrepayment (Goldrick-Rab et al. 2016; Hillman 2014), we find that higher state need-based grant aid is more strongly associated with lower student loan nonrepayment rates across all states and research strata. We plot this relationship in Figure 10 for each type of aid and each of the four research strata of public universities. Within each research strata panel, states are plotted on the Y-axis according to their nonrepayment rates for their 2013 exiting cohort (dropouts and graduates). States are plotted on the X-axis according to the given type of grant aid per Pell recipient enrolled as a percentage of tuition for the four years prior to 2013. The fitted regression line shows the estimated relationship between nonrepayment rates and each type of aid.

We find the strongest association between higher grant aid and lower nonrepayment rates in the case of state need-based grant aid. Student loan nonrepayment rates tend to be about 2 percent lower for every 10 percent of tuition sticker price that is covered by state need-based aid. Panel Set A of Figure 10 shows that this relationship is consistent across all research categories. The relationship for state need-based grant aid has a p value of less than .001 even after controlling for schools' acceptance rate.

Panel Set B, for total state aid, has a wider range for its X-axis, reflecting large amounts of spending on non–need based aid relative to Pell recipient enrollments. The Panel Set shows that total state aid is only weakly associated with lower nonrepayment rates. We estimate that nonrepayment rates tend to be only .4 percent lower for every 10 percent of tuition sticker price that is covered. This relationship is less consistent across the four research categories. Panel Set C shows that nonrepayment rates have a slightly stronger negative association with institutional grant aid. Nonrepayment rates tend to be .9 percent lower for every 10 percent of tuition sticker price that is covered. This association is again inconsistent across research strata. This association of institutional aid and sticker price warrant further examination given that institutional grant aid has no association with low-income net price.

Discussion and Conclusions

Our findings illustrate how an organizational ecology approach can help explain wide variations between public universities in affordability, student loan borrowing, and loan repayment. We showed that loan nonrepayment rates tend to be lower at universities in higher research strata. We also found that schools across all research strata tend to have lower net prices and lower loan nonrepayment rates in states with more need-based grant aid spending. In unreported regressions, we find that the association of loan repayment with research strata and state need-based aid spending is statistically significant even after controlling for admission selectivity as a confounding factor.[7] These findings illustrate how state policies and research intensiveness are key dimensions that structure the U.S. higher education ecology. We expect universities' position in this ecology will shape the extent to which they can tap resources from their research activities and state-funded grant aid for needy students.

By combining broad grant aid eligibility with generous grant levels, California, Washington State, Wyoming, and New Jersey stand out for high spending on state aid relative to sticker prices. This reflects support from both Democratic and Republican state government leaders for need-based grant aid programs (McLendon, Tandberg, and Hillman 2014). Wyoming only fully implemented its need-based Hathaway scholarship as one of the most generous and widely available state grant aid programs in 2010. This reflects the fact that need-based grant aid programs are an area of ongoing major policy change for student aid.

High aid spending helped California, Wyoming, and Washington achieve the 1st, 11th, and 12th lowest net prices for low-income students in 2015. New Jersey placed a less impressive 36th for net price. Wyoming, California, Washington, and New Jersey's exiting cohorts in 2013 also had the 1st, 5th, 9th, and 15th lowest federal loan nonrepayment rates for low-income students. In contrast, South Carolina and Alabama stand out for high in-state sticker prices, near-zero aid, and high actual costs of attendance for low-income students of more than $12,000 annually. Accordingly, South Carolina and Alabama's public universities had the highest and 9th highest levels of student debt for low-income students. Alabama had the 2nd highest loan nonrepayment rates, and South Carolina had the 19th highest nonrepayment rates.

We also found that need-based grant aid was more strongly associated than institutional aid with lower net prices and nonrepayment rates for low-income students. This is consistent with the possibility that institutional aid is mostly awarded without consideration for financial need. At the same time, however, public universities in each strata spend much more on institutional grant aid than state need-based grant aid spending. Together, these findings suggest that universities could bolster student loan outcomes by shifting more of their institutional grant aid spending to need-based awards. With fewer financial resources and more low-income students, however, the lowest research strata universities spend less than a third of what the highest strata spend per low-income student on institutional grant aid. Lower strata research universities accordingly appear to have fewer institutional aid resources that could be shifted to need-based programs.

Lower strata research schools might find more success in asking state governments to shift more state aid spending into need-based programs. We found that 16 states spend more on grant programs that do not consider financial need. The states with the highest spending on need-based aid, moreover, spent little on non–need based aid. This illustrates the centrality of state government in structuring the higher education ecology (Barr and Turner 2013; Delaney 2014; Stevens and Kirst 2015), a finding that conforms

with welfare state scholars' emphasis on federalism as a key institutional driver of U.S. social policy (Eaton and Weir 2015; Weir, Orloff, and Skocpol 1988).

Future research could further apply an organizational ecology approach to investigate large variances in net price and loan repayment at schools in similar research strata and with similar state need-based grant aid programs. For example, University of Michigan reported net prices for low-income students in 2015 of just $5,470, much lower than other schools in the highest research strata and despite the state of Michigan's negligible spending on need-based aid. We found no broader association between net price and institutional grant aid across all public universities, suggesting that institutional aid is mostly not awarded according to need. Michigan, however, spent $40,484 per low-income student on institutional aid in 2015, more than any other school in the highest research tier. While exact data are not available, moreover, the university's M-Pact grant was a prominent need-based institutional grant at the time, which has since been expanded into a new program that covers all tuition and fees for students from families with less than $65,000 in household income.

From an organizational ecology perspective, researchers could ask how universities such as Michigan are able to steer institutional grants to need-based aid when state government programs are lacking. Such a study would require universities to report how much of their institutional grant aid spending is awarded on the basis of need, data that are not systematically reported at present. With improved data, however, researchers could examine the extent to which schools are able to maintain instructional support by coupling need-based aid with higher tuition rates paid by wealthier students. Such research could also consider other ecological pressures such as incentives to use merit aid to boost admission yields and the average test scores of incoming students, both factors in *U.S. News* rankings. These contravening pressures may help explain why institutional aid was not associated with lower net prices for low-income students across public universities more broadly as of 2014.

Amid federal gridlock and rising anxieties among Americans about student debt risks, state- and university-level policymaking provides two of the most promising arenas for near-term policy innovation to alleviate loan burdens. Whether state or institutionally funded, the variety of existing aid programs coupled with the organizational diversity of public universities provides opportunities for experimentation and research into the most effective levels and forms of student aid. We already have examples from California to Wyoming where state need-based grant aid is a central component in lower net prices and loan nonrepayment rates for low-income students. University of Michigan meanwhile demonstrates how a research-intensive public university can use need-based institutional grant aid to achieve lower net prices for low-income students. Even among these leading states and schools, however, low-income students still struggled to repay their debts in years for which we have data. Among those leaving school in 2013, 31 percent of low-income borrowers failed to repay any debt within three years at both University of Michigan and University of Wyoming. In the California State University system, over 40 percent of low-income borrowers were unable to repay any debt. We hope that our findings will spur further scholarship and policy efforts to address these enduring challenges.

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Sheisha Kulkarni is currently a postdoctoral fellow at the University of Virginia. In 2020, she will be doing a postdoctoral fellowship at the National Bureau of Economic Research and afterward will be joining the faculty at the McIntire School of Commerce at the University of Virginia. Her research concerns how consumers use information to make decisions about their household finances and how consumers use the various credit products (e.g., payday loans and student debt) available to them.

Robert Birgeneau is the Silverman Professor of Physics, MSE and Public Policy at the University of California, Berkeley. Together with Mary Sue Coleman, he chaired the American Academy's Lincoln Project, which looked comprehensively at the challenges facing U.S. public research universities as a result of massive state disinvestment. Under his leadership, UC Berkeley became the first major university in the United States to offer comprehensive financial aid to undocumented students and the first public research university to offer an extensive financial aid plan to middle-class students. His primary research focuses on the phases and phase transitions in condensed matter systems, most especially low dimensional quantum materials.

Henry Brady is Class of 1941 Monroe Deutsch Professor of Political Science and Public Policy, Dean of the Goldman School of Public Policy at UC Berkeley. He is currently Faculty director of the Center for Governing and Investing in the Future, co-principal investigator for the Berkeley Institute for Data Science (BIDS), and a member of the Lincoln Project of the American Academy of Arts and Sciences on the future of American public research universities. He has written on electoral politics, social welfare and higher education policy, political polling, and statistical methodology. His most recent book is *Unequal and Unrepresented: Political Inequality and the People's Voice in the New Gilded Age*.

Michael Hout is professor of sociology at New York University. He uses demographic methods to study social change in inequality, religion, and politics in developed and developing countries. For much of his career, he was involved with the General Social Survey (GSS), a long-running data collection project. His current work uses the GSS to study changing educational outcomes and social mobility in the United States, comparing cohorts and time periods. In related work, he is using topic models to study the terms ordinary people use to describe their occupations.