The Merit Aid Illusion

THE HIDDEN WINNERS IN A COMPETITION FOR AFFLUENT COLLEGE STUDENTS

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Executive Summary

There is widespread concern in the policy community that colleges and universities are increasingly shifting their financial aid budgets to favor students from high-income families. Observers often argue that institutions of higher education are offering more merit aid to the most affluent students, leaving less aid for their low-income peers. To draw these conclusions, many analysts simply count the amount of non-need-based aid that institutions of higher education report, which may actually be notional discounts on inflated tuition prices rather than real benefits.

We use a more comprehensive approach that compares the net tuition that institutions charged students relative to what the institutions spent on each student, focusing on changes between the 2003–04 and 2015–16 academic years. The results contradict the claim that rising institutional aid has increasingly favored wealthy students. We find that the subsidies institutions of higher education provide to low-income students have increased relative to their high-income peers.

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Journalists and advocates have spilled a lot of ink in recent years warning that colleges are "lavishing" ever-larger financial aid packages on students from high-income families at the expense of low-income students.[1] They attest that non-need-based aid or merit aid for high-income students is exacerbating inequities in the US higher education system.

We are told that colleges are in an arms race to attract the most talented students and—in response to budget pressures—that they are increasingly desperate to enroll students from high-income families that can pay the highest tuition prices. To recruit these students, colleges are said to be outbidding one another with financial aid packages, leaving little aid leftover for low-income families that are priced out of these institutions. While this phenomenon was once limited to elite private institutions, many observers warn that public universities have now adopted the same practice, which has only intensified in recent years.

The way that some advocates put it, merit aid amounts to "stealing from low-income students" or "Robin Hood in reverse."[2] Others add that, due to merit aid, "financial aid disparities are getting worse," a trend that they say is "driven by politics, the pursuit of prestige and policies that have been shifting resources away from students with financial need."[3] They point to statistics about the growing sums that colleges spend on merit aid, and they profile students who received such awards. A recent *Wall Street Journal* article explained that "hundreds of colleges and universities are using academic scholarships and other merit-based financial aid to gain an edge in a battle for students," noting that at George Washington University, aid for students with financial need was up just 4 percent over the past few years while aid to students without financial need was up 52 percent.[4] Together, these reports can make it appear as though public and private institutions have made significant cuts in the amount of aid they offer to low-income students.

Analyses like these, however, are missing key information. They overlook that the money flowing in and out of an institution of higher education is fungible and institutions can simultaneously inflate tuition prices and then offer grants, discounts, or scholarships back to students selectively. That means that merit- or need-based aid could be nothing more than a notional discount—money an institution transfers between its own accounts without actually affecting its bottom line. Simply counting up the millions of dollars in what the institution of higher education labels financial aid (hereafter referred to as "institutional aid" regardless of whether it is provided based on financial need, merit, or both) is therefore an imprecise and incomplete way to measure student aid.

In this report we take a more comprehensive approach to measure the financial aid awards that students of different income groups receive at public and private nonprofit institutions and how those awards have changed over time. We examine four points in

time—the 2003–04, 2007–08, 2011–12, and 2015–16 academic years—but focus most of our discussion on changes between the first and last academic years in the period. Contrary to popular narratives about merit aid, we find no evidence that the total financial aid that public and private nonprofit institutions provide to high-income students has increased relative to what they provide low-income students. If anything, the shift in the distribution of financial aid appears to have favored low-income students at the expense of high-income students.

Institutional Aid or Discount on an Inflated Price?

The financial aid practices that worry institutional-aid critics are one part of a broader approach to pricing at institutions of higher education. While every college lists a sticker price for tuition and fees (what we call "gross tuition"), in reality, the college can charge different prices to different groups of students by offering them grants or scholarships as discounts on the sticker price. Institutions are uniquely situated to identify students' differing abilities to pay because many students complete financial aid applications such as the Free Application for Federal Student Aid in which they reveal family incomes and assets. But there are also more straightforward reasons for differentiated pricing, such as public institutions charging higher tuition to out-of-state residents. In short, tuition can vary considerably for different types of students, even those attending the same institution.

Differentiated pricing alone can make it difficult to know how much each student pays to attend an institution of higher education. Further complicating the question is the fact that institutions of higher education can inflate prices by as much or more than the aid they offer to students.

Imagine a student who pays $10,000 in tuition at a public college. In the next year the college raises tuition to $12,000 but provides this student with a $1,000 discount for having excellent grades. Is this a real discount? Those who criticize institutional aid practices believe it is. But it might be an accounting illusion.

If the institution increases its per-student spending by the same amount as the tuition increase ($2,000), then the discount is real; the student pays $1,000 more but receives $2,000 more in educational services. However, if the institution does not increase its spending on that student, or does so by less than the net $1,000 more that he is paying in tuition, his discount is an accounting illusion. In fact, he is now paying more for the same education, measured as the amount the college spends on him. The potential for an institution to engage in such a practice makes it hard to know if institutional aid provides a real benefit to students, which means counting up the aid the institution says it provided to students as either merit- or need-based aid could lead to misleading results.

Measuring Total Subsidies by Income Group

A better way to study institutional aid is to look at the total amount that institutions actually spend on students and compare it with what they charge in tuition. This approach comes much closer to revealing the real amount of aid provided to students, partly because institutions cannot use accounting tricks to manipulate the two numbers.

To measure the financial aid that institutions award individual students, we calculate each student's total institutional subsidy. We define the subsidy as the difference between what a university spends on a student and what it collects in tuition from the same student after providing him with any institutional aid. Note that this measure of net tuition does not reflect what the student ultimately paid out of pocket because it includes only financial aid from the institution of higher education, not from outside sources such as the federal government. That is because we want to know how much tuition the institution received from an individual student regardless of how he pays it. Therefore, our analysis is not meant

to reflect the price students ultimately pay and does not attempt to examine how affordable college is for different groups of students.[5]

To create the data set for our analysis, we link the National Postsecondary Student Aid Study (NPSAS) and the Integrated Postsecondary Education Data System (IPEDS). The NPSAS is a quadrennial survey administered by the US Department of Education's National Center for Education Statistics that provides nationally representative data about individual college students, including family income, tuition, and grant aid. Separately, IPEDS includes information about how much each institution spends. We briefly outline each component of our subsidy metric, and Appendix A includes additional details about our methodology.

Per-Student Spending at Each University. To construct this component of our subsidy measure, we adopt methodology from the Delta Cost Project, which uses financial data that each institution reports in IPEDS.[6] Using this approach we calculate the total spending at each institution, divided by the number of students enrolled, resulting in average per-student spending.[7] We use the spending category that the Delta Cost Project defines as "education and general," which includes all core operating expenditures but excludes auxiliary spending on hospitals, dormitories, athletics, and related service. It also includes spending on research, but we exclude that from our subsidy calculation. That means our measure of spending matches the "education and general" category, except that we have excluded any spending on research.[8]

This is excluded based on the assumption that much of the research activity neither directly relates to nor directly benefits undergraduate students' education. Appendix F shows the results of the analysis using a more narrow definition of spending limited to educational costs ("education and related"). We are unable to disaggregate graduate and undergraduate spending in the IPEDS data, although we exclude a small number of institutions that enroll 80 percent or more of their students in graduate and professional programs.

Tuition and Institutional Aid. We use the NPSAS for these components of our subsidy measure. The NPSAS reports all institutional aid (grants, scholarships, and other discounts) that each student received and the gross tuition price (tuition before any aid is applied) the student was charged. Note that institutional aid refers only to funds provided by the institution itself and not other sources of aid, such as most state grant programs and all federal grant and loan programs.[9]

Subsidy. To calculate the subsidy each student receives, we subtract tuition and institutional aid from the per-student spending at the institution he attended. In other words, the subsidy approximates what the institution spent on the student, less what the student paid. In theory, this value accounts for all the financial aid that an institution provides,

Table 1. Components of the Average per-Student Subsidy in 2015–16

Institution Sector	Per-Student Spending	Institutional Aid	Gross Tuition	Subsidy (Per-Student Spending + Institutional Aid – Gross Tuition)
Public	$23,664	$2,211	$11,622	$14,253
Private Nonprofit	$35,844	$14,714	$33,762	$16,796

Note: Figures are averages for all students in the analytical subsample.
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

regardless of whether it was formally defined as merit aid, defined as need-based aid, or not labeled as financial aid at all. Table 1 illustrates the subsidy calculation for all students at public and private institutions for the 2015–16 academic year.

Our subsidy measure is positive for the vast majority of students, reflecting that colleges and institutions tend to spend more per student than they charge in tuition. At public institutions that is largely because those institutions receive a general appropriation from state governments that helps defray the total cost that would otherwise be passed on to students. At private nonprofit institutions, which typically do not receive appropriations from state governments, a positive subsidy reflects other sources of revenue beyond tuition, such as donations and endowment earnings. In some cases, the subsidy can be negative when institutions charge students tuition that exceeds per-student spending, typically for out-of-state students at public institutions or students at private nonprofit institutions with high tuition.[10] Additionally, our subsidy measurement may be moderately overstated for most institutions in our analysis because we are unable to disaggregate spending on graduate programs.[11]

Household Income. We use the income information in the NPSAS to divide students (dependent and independent combined) into quartiles based on the income distribution of American households during the year covered by each installment of the NPSAS.[12] In the 2015–16 academic year, students and families in the lowest income quartile earned less than $25,948, while students and families in the top income quartile earned more than $98,809. Appendix B lists the cutoffs for income quartiles in each year of the study.[13] Defining income quartiles in this way means that the cutoff for each quartile varies from year to year but allows us to compare the distribution of students to the country at large in the given year. Throughout the report we refer to the bottom quartile as "low income" and the top quartile as "high income."

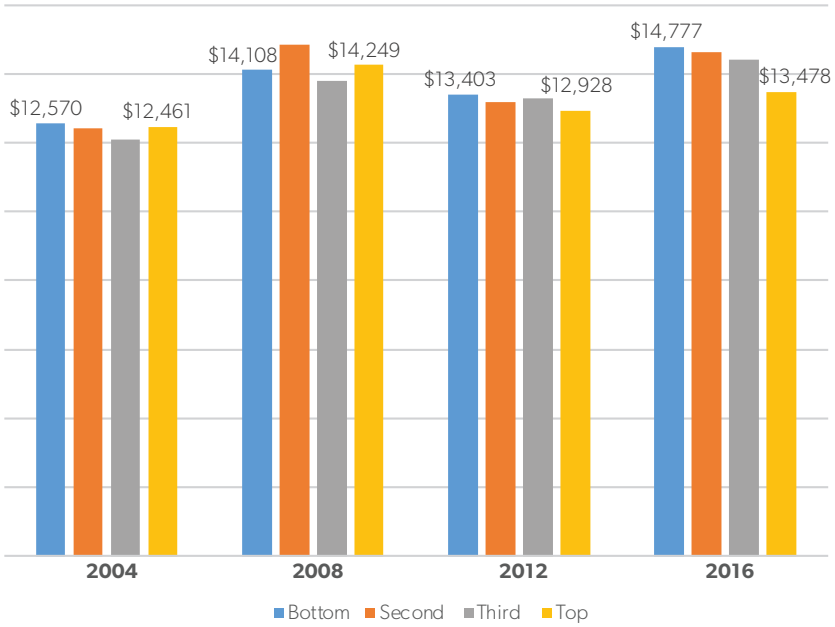
Student Subsample. We limit our analysis to students enrolled full time in bachelor's degree programs at public and private nonprofit, four-year institutions.[14] Limiting the analysis to full-time students aligns the tuition data in the NPSAS with our per-student spending measure, which, due to data limitations, must be based on full-time enrollment. We report our results for public and private institutions separately throughout the report. All figures are adjusted for inflation and shown in 2016 dollars.[15] Statistically significant changes are reported at the 95 percent confidence level. Appendix C shows average per-student spending, institutional aid, gross tuition, and subsidy at public and private nonprofit institutions for all years and income groups in this analysis.

It is important to be aware that because the NPSAS is nationally representative of the undergraduate population, it therefore reflects the enrollment patterns and choices of students in a given year. Therefore, changes in spending and tuition that we observe can reflect changes in where students enroll and changes the institutions themselves made to their policies. Our main findings were unchanged when we tested them against a number of adjustments to the analysis, including university selectivity, student dependency status, and different measures of university spending.[16] Appendix F shows the results for several of these adjustments to the analysis.

Results

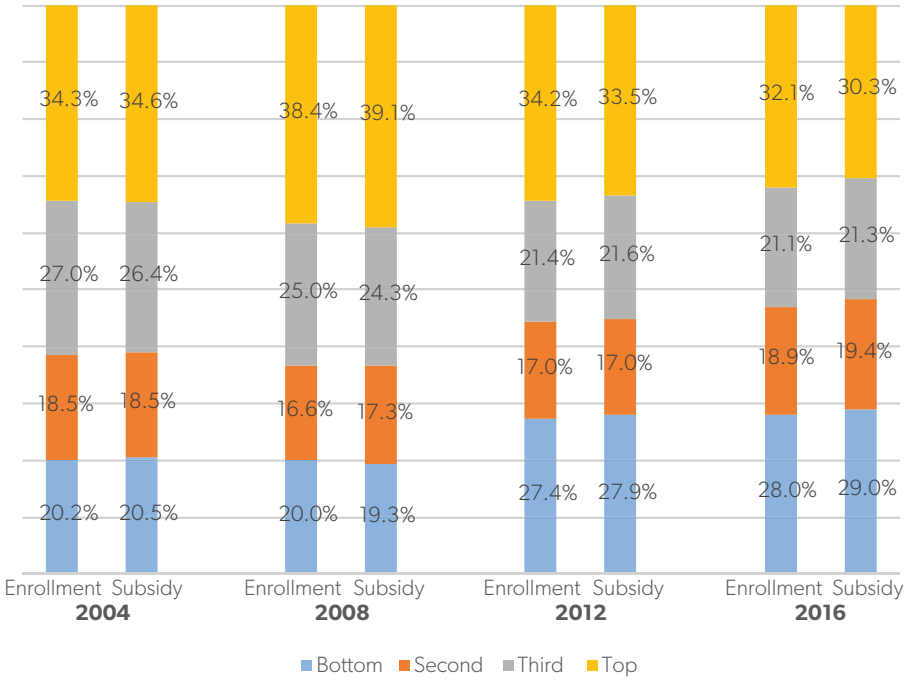
Figure 1 shows the average subsidy (in 2016 dollars) that students in each income quartile received at public institutions in the years covered in this analysis. In the first three years examined, there is not a statistically significant difference between the average subsidy that students from low-income and high-income families received at public institutions. However, there is a notable change in the 2015–16 academic year: Low-income students receive a larger average subsidy ($14,777) than do high-income students ($13,487), and that difference is statistically significant. This finding suggests that the warnings about institutional aid are overblown. The distribution of financial aid dollars at

Figure 1. Average per-Student Subsidy at Public Institutions by Income Quartile



Note: Figures shown in 2016 dollars.
Source: Authors' calculation using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Figure 2. Share of Total Subsidies and Enrollment at Public Institutions by Income Quartile



Source: Authors' calculation using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

public institutions now appears to favor low-income students over high-income students, where previously there was no statistical difference between the groups.

Another way to assess changes in the distribution of financial aid is to examine the share of all subsidies each group receives. Under this approach, we measure the proportion of the total dollars that institutions provide to students from each income group (Figure 2). We also show the share of total enrollment by income quartile to compare an income quartile's share of subsidies with its share of enrollment.

We find that high-income students received a *smaller* share of total subsidies in 2015–16 than in earlier years.[17] While their share of enrollment at public institutions appears to have declined over time, the decline in the share of subsidies for high-income students is larger.[18] Meanwhile, the share of the total subsidies that low-income students received shows no sign of having declined; it increases in parallel with enrollment. In other words, we do not find evidence to support the claim that rising institutional aid awards have shifted the distribution of financial aid at public institutions to favor high-income students at the expense of low-income students.

We now turn to the results for private nonprofit institutions. Figure 3 shows the average subsidy at private nonprofit institutions by income quartile during the period analyzed. It does not show that increases in the average subsidies at private nonprofit institutions have favored high-income students relative to low-income students. The gap between the average subsidy that low- and high-income students receive remains constant for the first three years in the analysis. Then, in the 2015–16 academic year, it shrinks substantially. (The difference is within the margin of error.) That is because there is a large increase in the average amount of aid that low-income students receive—a trend that runs counter to the narratives that suggest financial aid increasingly favors high-income students at the expense of low-income students.

Lastly, Figure 4 displays the proportion of total subsidies provided at private nonprofit institutions by income group. For reference, we also include the proportion of students enrolled from each income quartile. Similar to the findings in Figure 3, we do not find evidence that the share of total subsidies that high-income students receive has increased over time. It has, however, increased for low-income students.

In the 2003–04 academic year these students accounted for 16.7 percent of students at private nonprofit institutions and received just 12.6 percent of the subsidies provided across all those institutions, a 4.1 percentage point gap. High-income students, in contrast, received a disproportionately larger share (5.1 percentage point gap) of the subsidies relative to their enrollment in the first year of the analysis.

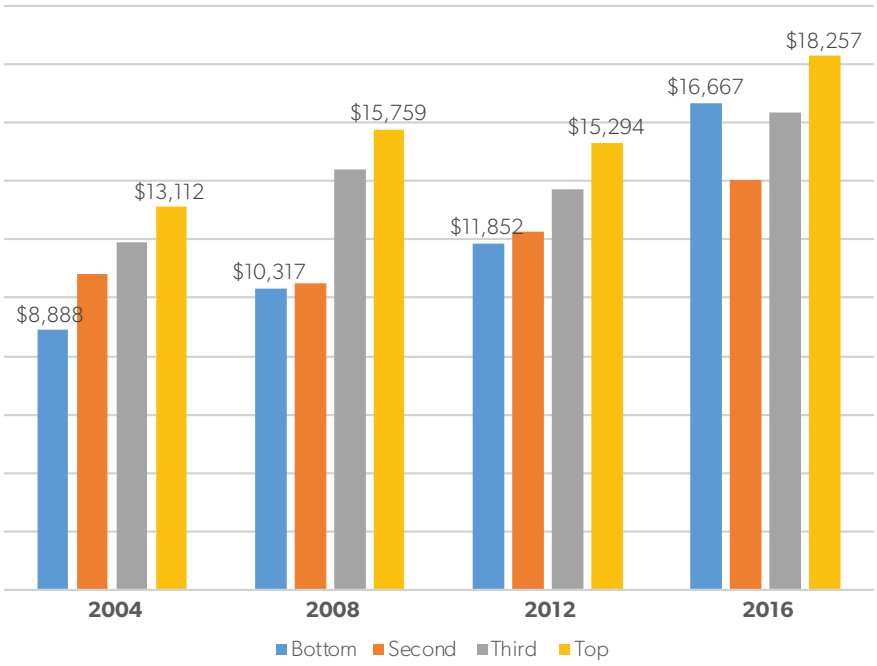
While that pattern holds for the next three years in the analysis, in the 2015–16 academic year the gap between enrollment and subsidy shares completely disappears among low-income students. This is more evidence in contrast to the claim that private, nonprofit institutions are shifting more resources to high-income students. When counting the total subsidy that these colleges provide, we find the opposite.

Discussion

We now discuss some of the key factors underlying our findings, starting with public institutions.

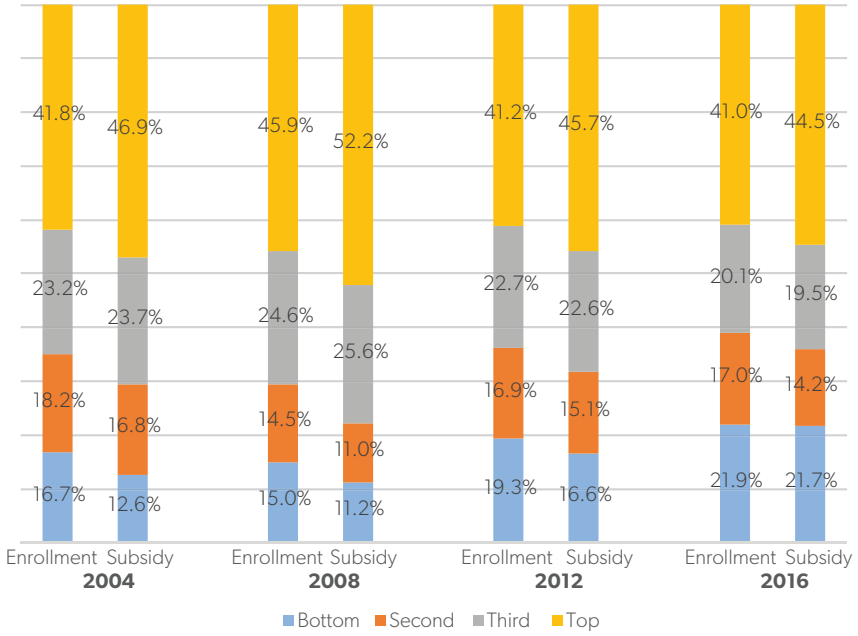
The decline in average and total subsidies that high-income students received relative to low-income students (as shown in Figures 1 and 2) is driven largely by changes in the net tuition these students paid. However, looking only at changes in institutional aid obscures this trend and helps demonstrate why looking at such statistics alone can be misleading. Institutional aid actually increased for high-income students from $993 in 2003–04 to $2,312 in 2015–16, after adjusting for inflation.[19] The comparable figures for low-income students show a smaller increase from $1,135 to $1,839.[20] These figures suggest that institutions are awarding high-income students roughly $500 more in institutional aid compared to what they give low-income students.[21] But when we consider the other two components of our analysis—per-student spending and gross tuition—for a more complete picture, we see that the overall effect is just the opposite.

Figure 3. Average per-Student Subsidy at Private Nonprofit Institutions by Income Quartile



Note: Figures shown in 2016 dollars.
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Figure 4. Share of Total Subsidies and Enrollment at Private Nonprofit Institutions by Income Quartile



Source: Authors' calculation using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Table 2. Changes in per-Student Subsidy Components at Public Institutions by Income Quartile, 2003–04 to 2015–16

Income Quartile	Increase in per-Student Spending	Increase in Institutional Aid	Increase in Gross Tuition	Increase in Subsidy
Bottom	$5,829	$705	$4,326	$2,207
Second	$5,803	$1,030	$4,614	$2,216
Third	$5,557	$1,408	$4,648	$2,316
Top	$5,842	$1,318	$6,143	$1,017

Note: Figures are changes in per-student averages in 2016 dollars.
Source: Authors' calculation using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Despite the rise in institutional aid, high-income students saw a larger increase in tuition than did low-income students. The average gross tuition that high-income students paid increased by $6,143 during the period studied, compared to a $4,326 increase for low-income students. That difference is more than enough to erase the larger increases in institutional aid high-income students saw. This could be interpreted to mean that either institutions raised tuition faster than they raised institutional aid for high-income students or these students opted to enroll in more expensive institutions over time—or both.

We also find that institutions increased their per-student spending by approximately the same amount (in absolute dollars) for both high- and low-income income groups. Table 2 illustrates the changes.

We find that the larger increase in tuition that high-income students paid is the result of those students increasingly opting to attend out-of-state institutions. When we exclude all out-of-state students from our sample, the statistically significant difference in subsidies between the low-income and high-income groups in 2015–16—our key finding—is no longer evident. As more high-income students attend out of state, the subsidies they receive decline because out-of-state tuition is much higher than in-state tuition, and it is often high enough to fully offset per-student spending at the institution. Ironically for those who have criticized institutions for using aid to recruit out-of-state students because it disadvantages low-income students, we find that those recruiting efforts may actually increase the amount of aid available for low-income students on average. However, our analysis does not look at the effects that out-of-state recruiting may have on low-income student enrollment, only the distribution of dollars.

We use the same decomposition approach shown in Table 2 to understand the changes in subsidies at private nonprofit institutions. One of the most noteworthy changes at private nonprofit institutions is the large increase in subsidies among low-income students, both in terms of average subsidy that each student receives and the share of total subsidies received relative to their enrollment. Unlike at public institutions, however, the increase is not enough to make the subsidies they receive *greater* than the subsidies that their high-income peers receive. Instead, we aim to better understand how the subsidies for low-income students close the gap in the average amount and share of subsidies at private institutions.

Table 3 shows the change in average per-student spending, institutional aid, gross tuition, and subsidy between 2003–04 and 2015–16 academic years at private nonprofit institutions. Looking only at the institutional aid, we find that these institutions increased institutional aid awards by the same nominal amounts for students from both the low- and

Table 3. Changes in Subsidy Components at Private Nonprofit Institutions by Income Quartile, 2003–04 to 2015–16

Income Quartile	Increase in per-Student Spending	Increase in Institutional Aid	Increase in Gross Tuition	Increase in Subsidy
Bottom	$10,722	$7,393	$10,337	$7,778
Second	$3,403	$7,885	$8,100	$3,188
Third	$4,491	$9,105	$9,176	$4,420
Top	$9,105	$7,507	$11,467	$5,144

Note: Figures are changes in per-student averages in 2016 dollars.
Source: Authors' calculation using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

high-income groups. Those statistics might lead some to conclude that little has changed at these institutions with respect to the distribution of aid awards. But table 3 shows the other two components of our subsidy measure—gross tuition and spending—explain the large gain in subsidies among low-income students.

The increase in average per-student spending is a major factor in closing the gap in subsidies between high- and low-income students. Spending at the institutions where low-income students attended increased by more ($10,722 per student) than where high-income students attended ($9,105 per student). In percentage terms, that is a 46 percent increase in per-student spending at the private nonprofit institutions where low-income students attend, compared to a 28 percent increase for high-income students.[22]

This could be because low-income students are now more likely to enroll at more selective institutions that spend more per student than they were in 2003–04.[23] The subsample we use for this analysis shows that in the 2015–16 academic year, 82 percent of the low-income students enrolled in private nonprofit institutions attended institutions ranked as very selective and moderately selective in the NPSAS data set.[24] In the 2003–04 academic year, the comparable figure was just 68 percent. That change is the largest among all the income groups.[25]

Tuition also played a role in the changing distribution of subsidies. While the gross tuition that private nonprofit institutions charged low-income students increased over time, the increase was larger for high-income students. As a result, the subsidy for low-income students increased by $7,778 over the period studied, far outpacing the $5,144 increase among high-income students. And because the subsidy that low-income students received started at a lower base in 2003–04, the additional $7,778 is nearly a 100 percent increase compared with a 40 percent increase for high-income students.

Put another way, per-student spending at all institutions increased between the 2003–04 and 2015–16 academic years, but the increase was *larger* among low-income students. Meanwhile, gross tuition increased at all institutions, but the increase was *smaller* among low-income students. The net effect is a large increase in the subsidy that low-income students received relative to their high-income peers.

Conclusion

This report suggests that the funds institutions of higher education designate as institutional aid or merit aid do not tell the whole story about how much financial aid institutions actually provide students. Those who only examine non-need-based and merit

aid often conclude that colleges and institutions have increased scholarships for high-income students at a faster pace than for low-income students.

However, as we show in this report, institutional aid is just one of several variables that factor into how much students receive in financial aid. Comparing the net tuition that institutions charged students relative to what the institutions spent on those students reveals a more accurate assessment of the true discounts institutions provide. This approach offers evidence that contradicts the claim that rising institutional aid awards have made the distribution of financial aid awards less equitable over time. Instead, it suggests that students from low-income families have seen their share of financial aid awards rise relative to their high-income peers.

We do acknowledge, however, that our findings say little about how *affordable* tuition prices are for students from different income groups. Rising institutional aid and subsidies are not synonymous with increasing affordability. The data for this analysis make clear that the net tuition students are charged can increase even while institutions of higher education increase spending and financial aid budgets at a relatively faster rate.

This analysis also excludes the other sources of financial aid students can use to offset tuition, such as federal Pell Grants. These findings do not tell us what the "right" level of subsidy that students from different income groups should receive. Our goal was to examine only whether the distribution of those subsidies had changed in a way that favors high-income students, as many observers have feared. Our analysis reports national averages, which means that the results may not be representative for individual institutions of higher education.

For those worried that the financial aid practices of colleges and institutions have exacerbated inequities in our higher education systems, this analysis finds reason for optimism. At public institutions, low-income students now receive larger financial aid benefits from those institutions than their high-income peers do, which is a change from over a decade ago. Meanwhile, the subsidies that private nonprofit institutions provide low-income students have surged since the earliest year in this study, far outpacing gains in awards for high-income students.

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Appendix A. Data and Methodology

We calculate spending for each institution using IPEDS data and a methodology developed by Delta Cost Project (DCP). Specifically, we use DCP's definition of spending for "education and general expenses," which is defined as "the total education and general expenditures [which] includes all core operating expenditures, including sponsored research, but excluding auxiliary enterprises."[26] We divide this spending figure by the number of students that each institution enrolls to calculate per-student spending. The enrollment variable we use is FTE12MN. FTE12MN is the 12-month full-time equivalent enrollment as reported in IPEDS, which includes undergraduate and graduate students.

We cannot differentiate spending at each institution by undergraduate and graduate education because institutions do not disaggregate the spending information they report to IPEDS based on these categories. Our per-student spending calculation reflects total spending divided by total enrollment and therefore includes both graduate education spending and graduate enrollment. Because some institutions might spend more per student on graduate education, and because many of the highest-spending institutions have large graduate programs that account for the majority of their enrollment, the per-student spending and subsidy estimates could be overstated in our analysis.

We make one adjustment to mitigate some of the effects of this possible limitation by excluding any institution that enrolls 80 percent or more of its students in graduate or professional programs. This tends to exclude a small number of institutions that are focused on health care fields. We also set the threshold at a lower level to exclude institutions with more than 65 percent of their students enrolled in graduate programs and found no meaningful changes to our findings.

As we note in the body of this report, we exclude research spending from our measure of per-student spending but otherwise use the same definition and construction as DCP. We use the "education and general" category because it is DCP's most comprehensive definition of spending. It avoids categorization problems that might arise due to self-reported IPEDS data. (For example, some institutions might classify classroom lighting as an "operation and maintenance expense," while others might classify it as an "instructional expense.")

We also test our results using another DCP definition of spending, the more narrow "education and related" category. DCP defines education and related expenses as "spending on instruction, student services, and the education share of spending on central academic and administrative support, and operations and maintenance." As we note in endnote 16, using the education and related measure does not change our key findings.

Several flaws have been identified in the DCP methodology that we correct for in this report. Notably, Ozan Jacquette and Edna Parra found systematic sample selection bias in the DCP data set due to the way that some colleges report data in IPEDS.[27] The DCP data set was designed for long-term trend analysis and therefore did not account for some institutions that are labeled as parent or child institutions in a university system. This resulted in some observations including finance data for multiple institutions. Jaquette and Parra estimate that up to 9 percent of all observations in the DCP data set could be affected by this design, meaning that the data for some observations are embedded in other institutions.[28]

To correct for the problems identified by Jaquette and Parra, we aggregated financial and enrollment data for institutions that are a part of university systems (unless the child institution reported its own spending and enrollment data). We then divided the total spending by the total number of students enrolled across *all* institutions in the system. Some institutions in university systems report their financial and

enrollment data at the institution level, not the system level. For these institutions, we did not aggregate enrollment or financial data.

One limitation to this approach of calculating per-student spending is that institutions in a university system may spend vastly different amounts, which could result in biased estimates of the average per-student spending levels. We tested the main results of our analysis by excluding any institution in the analysis if we had created financial data for it by the method just discussed. The patterns we observed with respect to our main findings remain, but the sample size shrinks, and some of the key changes are no longer statistically significant.

Lastly, DCP provided annual updates to its database and methodology only through 2015. Due to a change in the way IPEDS data were reported in 2016, we needed to adjust the DCP methodology in that year and, for consistency, prior years. DCP calculates education and general expenses by summing eight broad budget categories. DCP then deducts the amount of interest payments and operation and maintenance expenses related to each specific budget category.

In 2016, IPEDS stopped separately reporting interest payment and operation and maintenance expenses related to each budget category. Instead, IPEDS groups these expenses in the larger budget category totals. Therefore we had to adjust all prior years in our analysis to consistently include these expenditures in the per-student spending figures so that they would match the IPEDS reporting convention for 2016. As a result, our methodology differs slightly from DCP to account for these changes in IPEDS reporting.

Appendix B. Income Quartiles

Table B1. Income Quartiles for US Households in Nominal and Inflation-Adjusted Dollars

		Nominal Dollars		
Quartile	**2002**	**2006**	**2010**	**2014**
1	$0–$21,383	$0–$24,599	$0–$24,000	$0–$25,947
2	$21,384–$42,380	$24,600–$48,019	$24,001–$49,099	$25,948–$53,599
3	$42,381–$74,999	$48,020–$85,027	$49,100–$87,999	$53,600–$98,809
4	$75,000 and Above	$85,028 and Above	$88,000 and Above	$98,810 and Above
		2016 Dollars		
Quartile	**2002**	**2006**	**2010**	**2014**
1	$0–$27,183	$0–$28,979	$0–$26,306	$0–$26,736
2	$27,184–$53,875	$28,980–$56,569	$26,307–$53,817	$26,737–$55,228
3	$53,876–$95,342	$56,570–$100,167	$53,818–$96,455	$55,229–$101,813
4	$95,343 and Above	$100,168 and Above	$96,456 and Above	$101,814 and Above

Note: Income statistics for 2002 are used for the 2003–04 academic year and so on. Figures converted to 2016 dollars using Personal Consumption Expenditure Price Index.
Source: US Census Bureau, Current Population Survey.

Appendix C. Average Institutional Spending and Tuition Characteristics

Table C1. Average per-Student Spending, Institutional Aid, Gross Tuition, and Subsidy by Academic Year

Public Institutions					Private Nonprofit Institutions				
2003–04									
Income Quartile	**Per-Student Spending**	**Institutional Aid**	**Gross Tuition**	**Subsidy**	**Income Quartile**	**Per-Student Spending**	**Institutional Aid**	**Gross Tuition**	**Subsidy**
1	$17,316	$1,135	$5,881	$12,570	1	$23,519	$5,535	$20,166	$8,888
2	$17,458	$1,258	$6,302	$12,415	2	$25,598	$6,987	$21,772	$10,814
3	$17,619	$1,072	$6,610	$12,081	3	$26,853	$8,278	$23,230	$11,901
4	$18,835	$993	$7,367	$12,461	4	$32,643	$6,786	$26,317	$22,593
2007–08									
Income Quartile	**Per-Student Spending**	**Institutional Aid**	**Gross Tuition**	**Subsidy**	**Income Quartile**	**Per-Student Spending**	**Institutional Aid**	**Gross Tuition**	**Subsidy**
1	$19,855	$1,355	$6,802	$14,108	1	$26,813	$7,523	$24,020	$10,317
2	$20,661	$1,664	$7,274	$14,851	2	$26,501	$8,896	$24,886	$10,510
3	$20,352	$1,417	$7,771	$13,793	3	$30,844	$10,111	$26,550	$14,405
4	$21,989	$1,177	$8,757	$14,249	4	$37,678	$7,587	$29,507	$15,759
2011–12									
Income Quartile	**Per-Student Spending**	**Institutional Aid**	**Gross Tuition**	**Subsidy**	**Income Quartile**	**Per-Student Spending**	**Institutional Aid**	**Gross Tuition**	**Subsidy**
1	$20,381	$1,439	$8,417	$13,403	1	$27,994	$10,725	$26,867	$11,852
2	$20,553	$1,835	$9,203	$13,185	2	$29,190	$12,205	$29,141	$12,255
3	$21,529	$1,466	$9,726	$13,268	3	$30,946	$13,164	$30,386	$13,724
4	$22,654	$1,470	$11,195	$12,928	4	$37,975	$10,997	$33,678	$15,294
2015–16									
Income Quartile	**Per-Student Spending**	**Institutional Aid**	**Gross Tuition**	**Subsidy**	**Income Quartile**	**Per-Student Spending**	**Institutional Aid**	**Gross Tuition**	**Subsidy**
1	$23,145	$1,839	$10,207	$14,777	1	$34,241	$12,928	$30,503	$16,667
2	$23,261	$2,288	$10,918	$14,631	2	$29,001	$14,872	$29,872	$14,002
3	$23,176	$2,480	$11,258	$14,397	3	$31,344	$17,383	$32,406	$16,321
4	$24,677	$2,312	$13,510	$13,478	4	$41,748	$14,293	$37,784	$18,257

Note: All figures are inflation adjusted to 2016 dollars using Personal Consumption Expenditure Price Index.
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Appendix D. Confidence Intervals (95 Percent) for Key Figures

Table D1. Average per-Student Subsidy at Public Institutions by Income Quartile

2003–04		2007–08		2011–12		2015–16	
Q		Q		Q		Q	
1	$11,865–$13,275	1	$13,350–$14,866	1	$12,828–$13,979	1	$14,134–$15,420
2	$11,789–$13,040	2	$14,050–$15,653	2	$12,655–$13,715	2	$13,869–$15,392
3	$11,590–$12,573	3	$13,358–$14,228	3	$12,680–$13,855	3	$13,660–$15,134
4	$11,866–$13,056	4	$13,632–$14,867	4	$12,378–$13,479	4	$12,898–$14,059

Note: "Q" stands for "Quartile."
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Table D2. Share of Total Subsidies and Enrollment at Public Institutions by Income Quartile

Enrollment

2003–04		2007–08		2011–12		2015–16	
Q		Q		Q		Q	
1	19.1%–21.2%	1	19.2%–20.6%	1	26.4%–28.4%	1	26.8%–29.2%
2	17.6%–19.4%	2	15.9%–17.4%	2	16.1%–17.9%	2	17.9%–19.8%
3	26.0%–28.1%	3	24.0%–25.9%	3	20.4%–22.4%	3	20.0%–22.2%
4	33.1%–35.5%	4	37.5%–39.4%	4	33.0%–35.5%	4	30.8%–33.3%

Subsidy

2003–04		2007–08		2011–12		2015–16	
Q		Q		Q		Q	
1	19.0%–22.0%	1	17.2%–21.4%	1	25.9%–29.8%	1	27.1%–31.0%
2	17.3%–19.8%	2	15.4%–19.2%	2	15.8%–18.2%	2	18.0%–20.7%
3	24.5%–28.3%	3	21.3%–27.3%	3	20.1%–23.0%	3	19.8%–22.9%
4	32.5%–36.6%	4	34.3%–43.9%	4	31.5%–35.7%	4	28.7%–31.9%

Note: "Q" stands for "Quartile."
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Table D3. Average per-Student Subsidy at Private Nonprofit Institutions by Income Quartile

2003–04		2007–08		2011–12		2015–16	
Q		Q		Q		Q	
1	$6,907–$10,870	1	$8,447–$12,187	1	$9,466–$14,239	1	$14,620–$18,714
2	$9,285–$12,343	2	$8,513–$12,507	2	$9,658–$14,851	2	$11,599–$16,405
3	$10,476–$13,325	3	$12,224–$16,586	3	$11,113–$16,336	3	$14,013–$18,629
4	$11,577–$14,649	4	$13,075–$18,443	4	$12,370–$18,218	4	$16,270–$20,244

Note: "Q" stands for "Quartile."
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Table D4. Share of Total Subsidies and Enrollment at Private Nonprofit Institutions by Income Quartile

Enrollment

2003–04		2007–08		2011–12		2015–16	
Q		Q		Q		Q	
1	15.1%–18.1%	1	13.9%–16.1%	1	17.7%–20.9%	1	20.4%–23.4%
2	17.0%–19.5%	2	13.3%–15.7%	2	15.4%–18.4%	2	15.7%–18.4%
3	21.9%–24.6%	3	23.1%–26.0%	3	21.1%–24.2%	3	18.7%–21.5%
4	39.7%–44.0%	4	44.1%–47.7%	4	39.3%–43.0%	4	39.2%–42.8%

Subsidy

2003–04		2007–08		2011–12		2015–16	
Q		Q		Q		Q	
1	9.2%–16.0%	1	8.9%–13.5%	1	13.1%–20.0%	1	18.8%–24.7%
2	14.0%–19.7%	2	8.5%–13.5%	2	11.4%–18.7%	2	11.5%–16.9%
3	20.1%–27.2%	3	20.7%–30.4%	3	18.1%–27.1%	3	16.3%–22.8%
4	40.9%–52.9%	4	41.2%–63.3%	4	35.9%–55.5%	4	39.2%–49.9%

Note: "Q" stands for "Quartile."
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Appendix E. Sample Size for Key Figures

Table E1. Sample Sizes for Figures 1 and 2 (Public Institutions)

Income Quartile	2003–04	2007–08	2011–12	2015–16
1	1,950	3,660	2,290	2,450
2	1,850	2,640	1,490	1,500
3	2,620	2,780	1,900	1,790
4	3,630	3,950	3,110	2,730
Total	10,050	13,030	8,790	8,470

Note: Sample sizes are rounded to the nearest 10.
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

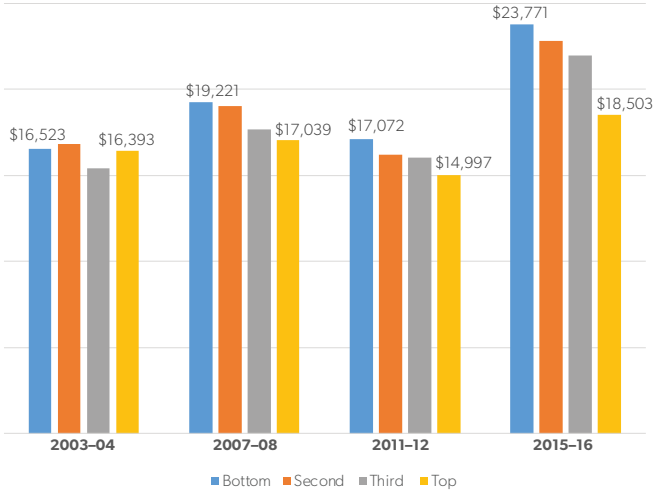
Table E2. Sample Sizes for Figures 3 and 4 (Private Nonprofit Institutions)

Income Quartile	2003–04	2007–08	2011–12	2015–16
1	1,060	2,300	980	1,330
2	1,200	2,160	920	940
3	1,560	2,400	1,290	1,270
4	2,870	3,870	2,660	2,550
Total	6,690	10,730	5,850	6,090

Note: Sample sizes are rounded to the nearest 10.
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

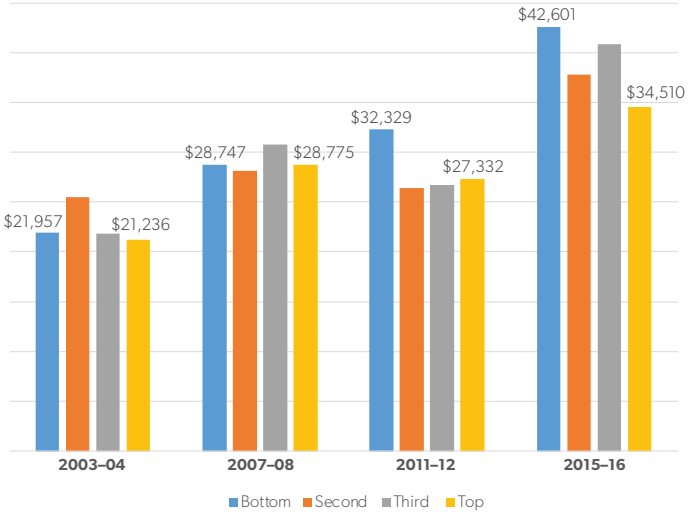
Appendix F. Main Findings Using Alternative Analyses

Figure F1. Average per-Student Subsidy at Public Institutions by Income Quartile, Selective Institutions Only



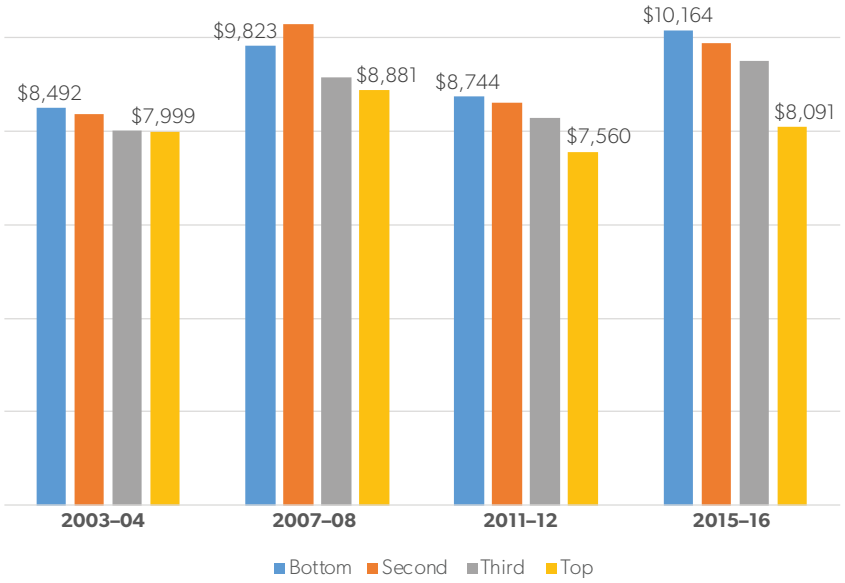
Notes: Figures shown in 2016 dollars.
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Figure F2. Average per-Student Subsidy at Private Nonprofit Institutions by Income Quartile, Selective Institutions Only



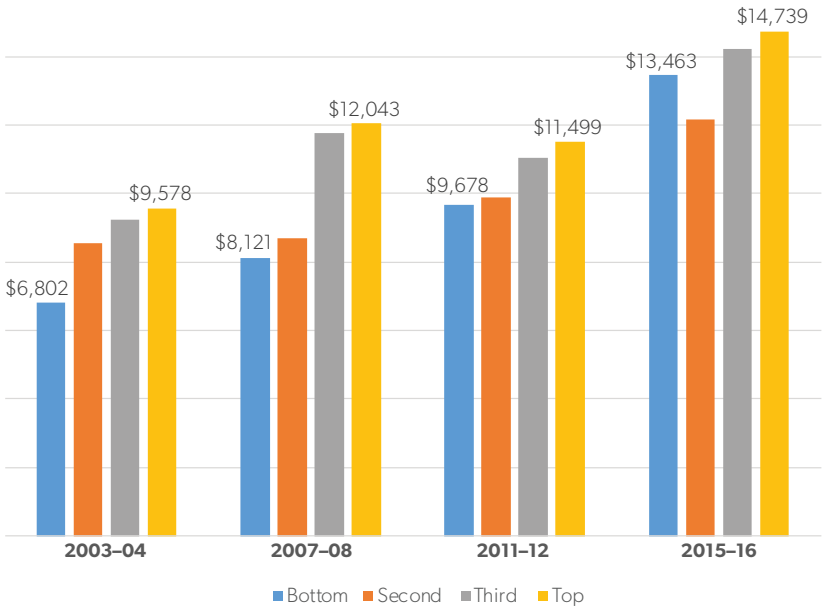
Note: Figures shown in 2016 dollars.
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Figure F3. Average per-Student Subsidy at Public Institutions Calculated Using "Education and Related" Spending



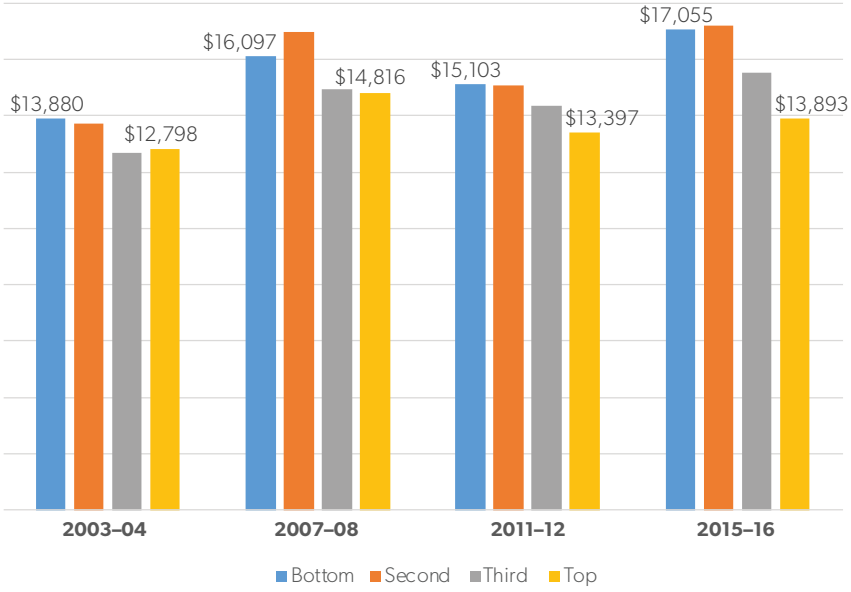
Note: Figures shown in 2016 dollars.
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Figure F4. Average per-Student Subsidy at Private Nonprofit Institutions Calculated Using "Education and Related" Spending



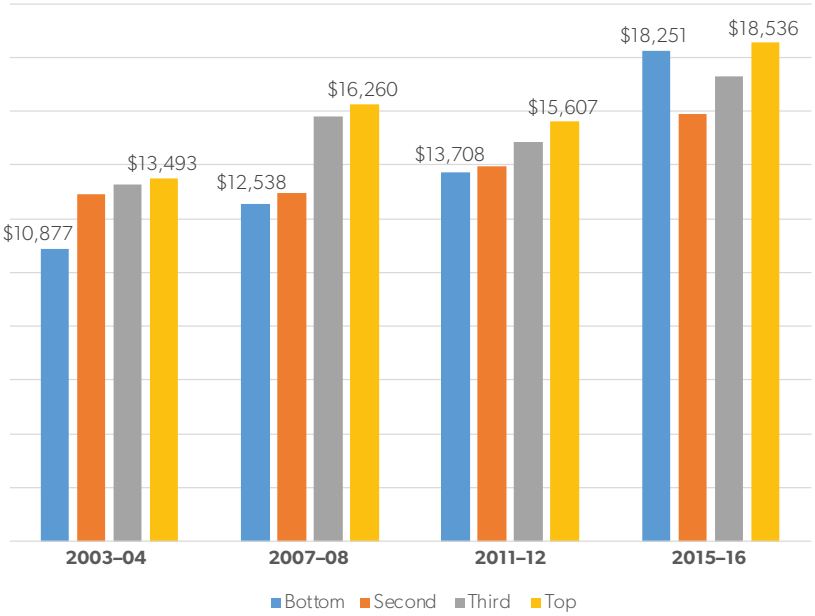
Note: Figures shown in 2016 dollars.
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Figure F5. Average per-Student Subsidy at Public Institutions Including State Financial Aid Programs



Note: Figures shown in 2016 dollars.
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Figure F6. Average per-Student Subsidy at Private, Nonprofit Institutions Including State Financial Aid Programs



Note: Figures shown in 2016 dollars.
Source: Authors' calculations using Integrated Postsecondary Education Data System and National Postsecondary Student Aid Study.

Notes

1. Michael Melia, "Colleges Lavishing More Financial Aid on Wealthy Students," Associated Press, September 27, 2016, https://apnews.com/d4dd5acc3b574cc4afb159bd8ad6b86b.

2. Harold O. Levy, "Merit Scholarships Steal from Low-Income Students," CNN, April 20, 2016, www.cnn.com/2016/04/20/opinions/college-merit-aid-steals-from-low-income-students-levy/index.html.

3. Jon Marcus, "In an Era of Inequity, More and More College Financial Aid Goes to the Rich," Hechinger Report, December 7, 2017, https://hechingerreport.org/era-inequity-college-financial-aid-going-rich/.

4. Melissa Korn, "Prizes for Everyone: How Colleges Use Scholarships to Lure Students," *Wall Street Journal*, April 17, 2018, www.wsj.com/articles/prizes-for-everyone-how-colleges-use-scholarships-to-lure-students-1523957400.

5. Jason D. Delisle and Preston Cooper, *Low-Income Students at Selective Colleges: Disappearing or Holding Steady?*, American Enterprise Institute, July 12 2018, www.aei.org/publication/low-income-students-at-selective-colleges-disappearing-or-holding-steady/.

6. Spending categories reported in IPEDS include instruction, research, academic support, institutional support, student services, operations and maintenance, grant aid, and public service. See Appendix A for a detailed explanation of the methodology.

7. Total enrollment is measured using 12-month full-time equivalency as reported by IPEDS.

8. Core operating expenditures include all expenses associated with colleges, schools, and departments. This can include spending on admissions, registrar activities, salaries for faculty and administration, and day-to-day operational support of the institution. The "education and related" category is broad, and some may argue that certain components, such as spending on public service activities, portions of central academic and administrative supports, and operation and maintenance are far removed from spending on students' educations. We note, however, that our key findings are unchanged when we use a less-comprehensive measure of spending defined by Delta Cost Project as "education and related," the results for which are shown in Appendix F. See Appendix A for a detailed explanation of methodology.

9. Institutional aid includes all need-based and non-need-based aid allocated by an institution. This includes grants that are funded by the state but allocated by the institution, such as the California State University Grants (commonly known as "Cal Grants"). We use the variable INGRTAMT in the NPSAS for institutional aid.

10. In the 2015–16 academic year, approximately 10 percent of students in our sample received a negative subsidy, indicating that they were charged more in tuition (after applying institutional aid) than the college's average per-student spending amount. Many of these students were out-of-state students attending a public university or a former for-profit college that converted to a nonprofit.

11. See Appendix A for more discussion of this limitation.

12. The NPSAS defines independent students as those who are 24 or older, are married, have legal dependents, have served in the armed forces, are orphans, or are homeless. For incomes, we use the variable CINCOME exclusively throughout our analysis.

13. The NPSAS reports data on student income from one year before the stated academic year. For example, the NPSAS for the 2015–16 academic year captures 2014 income. Independent students report their own income, and dependent students report their parents' income.

14. We limit the analysis to full-year, full-time students who are US citizens or legal residents and enrolled in a four-year program at either a public or nonprofit colleges.

15. Figures are converted to 2016 dollars using Personal Consumption Expenditures Price Index, Excluding Food and Energy (Chain-Type Price Index), seasonally adjusted. For more information, see Federal Reserve Bank of St. Louis, "Personal Consumption Expenditures Excluding Food and Energy (Chain-Type Price Index)," https://fred.stlouisfed.org/series/PCEPILFE.

16. When we ran the analysis for only selective institutions (using the definitions included in the NPSAS data set), the general patterns and trends we saw for all four-year institutions were even stronger. The results also held when we ran the analysis for dependent students only, excluding independent students whose incomes are difficult to interpret because the NPSAS reports the student's own

income, not parents' income, for those students. We also found that our main results were stronger when we added state grant aid to our subsidy measure and when we ran the analysis using a more narrow per-student spending measure meant to capture only those costs directly related to educational services ("education and related" in the Delta Cost methodology). Our main findings were unchanged when we excluded institutions where 60 percent of students were enrolled in graduate and professional programs, when we excluded any institutions in a parent-child relationship for which we adjusted finance information (i.e., main campus and branch campuses), or when looking at income quintiles instead of quartiles. The results also remained steady when we excluded on-campus students, who might receive institutional aid packages for on-campus housing expenses.

17. The figure in 2015–16 is statistically significant from those in 2003–04 and 2007–08. The change shown since 2011–12 is within the margin of error. See Appendix D for all confidence intervals and Appendix E for n sizes.

18. It is difficult to draw definitive conclusions about the declines in the share of students enrolled at public institutions who are from high-income families. The differences in enrollment shares between 2015–16 and other years are within the margin of error, except for the 2007–08 academic year.

19. Authors' calculations using NPSAS. In the 2003–04 academic year, the average institutional aid to high-income students in our sample was $993, with a 95 percent confidence interval between $889 and $1,098. In 2015–16, the average amount for high-income students was $2,312, with a 95 percent confidence interval between $2,050 and $2,573.

20. Authors' calculations using NPSAS. In the 2003–04 academic year, the average institutional aid to low-income students in our sample was $1,135, with a 95 percent confidence interval between $987 and $1,283. In 2015–16, the average amount for low-income students was $1,839, with a 95 percent confidence interval between $1,607 and $2,072.

21. Authors' calculations using NPSAS. Notably, there is no difference in the average amount of institutional aid received by high- and low-income students in our sample at the 95 percent confidence level for the 2015–16 academic year. There is a statistically significant difference at the 90 percent confidence level.

22. Appendix C shows the average per-student spending, institutional aid, gross tuition, and subsidy at public and private nonprofit institutions for all years and income groups in this analysis.

23. Some evidence supports this explanation. For more information, see Delisle and Cooper, *Low-Income Students at Selective Colleges*.

24. The selectivity rankings in the NPSAS are broad categories based on SAT or ACT scores and acceptance rates. We use them here to provide a sense of the general changes in the selectivity of the types of institutions low-income students attend.

25. While this trend is true for all income quartiles, the shift is largest for low-income students between 2004 and 2016. Specifically, 81 percent of students in the second income quartile attended very selective or moderately selective private nonprofit institutions in 2016, compared to 73 percent in 2004. Similarly, 88 and 95 percent of students from the third and top income quartile, respectively, attended very selective or moderately selective private nonprofit institutions in 2016. In 2004, the comparable numbers were 82 percent and 87 percent.

26. Delta Cost Project, "Delta Cost Project Database," www.deltacostproject.org/delta-cost-project-database.

27. Ozan Jacquette and Edna Parra, "The Problems with the Delta Cost Project Database," *Research in Higher Education* (February 17, 2016), https://arizona.pure.elsevier.com/en/publications/the-problem-with-the-delta-cost-project-database.

28. Jacquette and Parra, "The Problems with the Delta Cost Project Database."