Measuring Institutional Costs at California’s Public Universities

Technical Appendix

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Data and Methods

The primary source for data for this project is the Delta Cost Project. The Delta Cost Project, part of the American Institutes for Research, sought to provide policymakers, higher education administrators, researchers, and the general public with a better sense of how colleges and universities spend their money. The value of the Delta Cost Project data is that it allows for trend analysis and comparability. To provide this series, the Delta Cost Project used institutional level data from the National Center for Education Statistics’ Integrated Postsecondary Education Data System (IPEDS). Higher education institutions must complete 12 IPEDS surveys a year to be eligible for Federal Title IV funding, which includes financial assistance programs like Pell grants, GI bill funding, and Federal Perkins Loans. The IPEDS surveys, however, have changed over the years. Institutional accounting practices also have changed. And, in some cases, institutions did not always provide complete surveys. Therefore, it can be difficult to use IPEDs directly to track trends in institutional expenditures because of missing data and the fluid nature of the data. The Delta Cost project, through the process of imputation and standardization, has harmonized the financial reporting provided IPEDS and developed a data set that allows for analysis dating back to 1987.

In addition to smoothing the data, Delta Cost Project also developed a number of derived variables including a measure of expenditures labeled “education and related cost (E&R) per degree” as an aggregate measure of the total cost of instruction by degree. In the IPEDS survey, institutions report their expenditures in 12 broad categories such as instruction, research, student services, and institutional support (administrative costs). The “education and related cost” variable developed by Delta Cost estimates the full expenditures for student-related educational activities or the “total cost of education” by adding the direct cost categories (instruction and student services) to a pro rata share of spending on the indirect cost of educating a student (academic support, institutional support, research, operations and maintenance of the plant).

The expenditure per degree in constant dollars calculation, therefore, combines E&R expenditures with the total number of degrees as follows:

- **Total Degrees** is the sum of the number of associate, bachelor, master, doctoral, and first professional degrees conferred by the institution in a given year. This total notably does not include other credentials and certificates (e.g., teaching credentials) that may constitute a significant share of instruction at some schools.
- **E&R per Degree** is calculated by dividing the cost of education (E&R) by the total number of degrees produced by an institution (Total Degrees). The Consumer Price Index scaled to 2013 is used to obtain constant dollars.

When the E&R per Degree measure is presented for a group of institutions, the reported figure is weighted by the size of the relative institutions in the group. To accomplish that, the E&R for that group is summed in a given year and then divided by the sum of the Total Degrees conferred for the group.

Additionally, by creating standardized variables like E&R per Degree we can compare similar institutions, evaluate aggregate costs of instruction by state, or look at historical trends in the cost of producing a degree. The E&R per Degree variable, therefore, provides policymakers with a simple tool with which to connect resource inputs with outcomes in California’s higher education systems. It also provides higher education administrators

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1 IPEDS Expenditure Categories: Instruction, Research, Public Service, Academic Support, Student Services, Institutional Support, Operation and Maintenance of Plant, Scholarships and Fellowships, Auxiliary Services, Hospital Services, Independent Operations, Other Expenditures

2 IPEDS glossary defines operations and maintenance to be, “[a]n expense category that includes expenses for operations established to provide service and maintenance related to campus grounds and facilities used for educational and general purposes.”
the means with which to communicate the costs associated with higher education degree production and their progress towards institutional and statewide goals.

Not all of the cases from that dataset were used. The following types of schools were excluded in an effort to maintain comparability.

- Specialty schools were dropped from the analysis. In the case of California, this included the University of California San Francisco, UC Hastings College of Law, and the California State University Maritime Academy. Specialty schools in other states were also excluded.
- Schools that did not produce a bachelor degree in 1987 were not included. In the California context, this included universities that recently opened, such as UC Merced and CSU Monterey Bay. The exclusion had a similar effect on new schools in other states. This filter also excluded some former community colleges (primarily in Florida) that began conferring bachelor degrees in recent years.
- For-profit institutions were excluded.

**Comparable Institutions**

There are a myriad of ways to define comparable institutions. We have chosen two, Carnegie classifications (national comparison group) and the schools identified for the purpose of salary comparison as agreed to by the systems and the now defunct California Post-Secondary Education Commission (commission comparison group).

For the national comparison group for the UC system, we use the Carnegie 2010 classification “Research University, very high research activity” coded as 15 in the Delta Cost Project’s Carnegie 2010 variable. This classification applied to all of the UC schools used in the classification. In Figure 2, where we report for UC comparable schools from the rest of the nation, we include only public universities with the “very high research activity” classification (n = 61). These schools are:

- University of Alabama at Birmingham
- University of Alabama in Huntsville
- Arizona State University
- University of Arizona
- University of Arkansas
- University of Colorado Boulder
- Colorado State University–Fort Collins
- University of Connecticut
- University of Delaware
- University of Central Florida
- Florida State University
- University of Florida
- University of South Florida–Main Campus
- Georgia Institute of Technology–Main Campus
- Georgia State University
- University of Georgia
- University of Hawaii at Manoa
- University of Illinois at Chicago
- Indiana University–Bloomington
- Iowa State University
- University of Iowa
- University of Kansas
- University of Kentucky
- University of Louisville
- Louisiana State University and Agricultural & Mechanical College
- University of Maryland–College Park
- University of Michigan–Ann Arbor
- Michigan State University
- Wayne State University
- University of Minnesota–Twin Cities
- Mississippi State University
- University of Missouri–Columbia
- Montana State University
- University of Nebraska–Lincoln
- University of New Mexico–Main Campus
- SUNY at Albany
- University at Buffalo
- Stony Brook University
- University of North Carolina at Chapel Hill
- North Carolina State University at Raleigh
- North Dakota State University–Main Campus
### University of Cincinnati–Main Campus
- University of Oregon
- Oregon State University
- University of Oklahoma Norman Campus
- University of South Carolina–Columbia
- The University of Tennessee
- University of Virginia–Main Campus
- University of Wisconsin–Madison
- Purdue University–Main Campus

The final edition of the CPEC publication *Fiscal Profiles 2010* lists the salary comparison schools comparable to the UCs in the notes to Display 100. All of these schools are classified as “very high research activity” though they are a mix of public and private institutions (n = 8). The commission comparison group for the UCs is composed of the following schools:

<table>
<thead>
<tr>
<th>Yale University</th>
<th>University of Michigan–Ann Arbor</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Illinois at Chicago</td>
<td>University at Buffalo</td>
</tr>
<tr>
<td>Harvard University</td>
<td>University of Virginia–Main Campus</td>
</tr>
<tr>
<td>Massachusetts Institute of Technology</td>
<td>Stanford University</td>
</tr>
</tbody>
</table>

For the national comparison group for the CSU system, we began with the Carnegie 2010 classification, but the variation was greater. The CSU’s ranged from a classification of “Research University, high research activity,” coded as 16, to “Master’s Colleges and Universities, medium programs,” coded as 19. In Figure 3, where report CSU comparable schools from the rest of the nation, we include public universities with 2010 Carnegie classifications of 16 through 19 (n = 274). The national comparison schools are:

<table>
<thead>
<tr>
<th>Alabama A &amp; M University</th>
<th>University of Arkansas at Little Rock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama State University</td>
<td>Arkansas State University–Main Campus</td>
</tr>
<tr>
<td>The University of Alabama</td>
<td>Arkansas Tech University</td>
</tr>
<tr>
<td>Auburn University–Montgomery</td>
<td>University of Central Arkansas</td>
</tr>
<tr>
<td>Auburn University Main Campus</td>
<td>Henderson State University</td>
</tr>
<tr>
<td>Jacksonville State University</td>
<td>Southern Arkansas University Main Campus</td>
</tr>
<tr>
<td>University of West Alabama</td>
<td>Adams State College</td>
</tr>
<tr>
<td>University of Montevallo</td>
<td>University of Colorado at Denver and Health</td>
</tr>
<tr>
<td>University of North Alabama</td>
<td>Sciences Center</td>
</tr>
<tr>
<td>University of South Alabama</td>
<td>University of Colorado at Colorado Springs</td>
</tr>
<tr>
<td>Troy University</td>
<td>Colorado School of Mines</td>
</tr>
<tr>
<td>University of Alaska Fairbanks</td>
<td>University of Northern Colorado</td>
</tr>
<tr>
<td>Northern Arizona University</td>
<td>Central Connecticut State University</td>
</tr>
<tr>
<td>University Name</td>
<td>University Name</td>
</tr>
<tr>
<td>---------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>Southern Connecticut State University</td>
<td>Emporia State University</td>
</tr>
<tr>
<td>Western Connecticut State University</td>
<td>Fort Hays State University</td>
</tr>
<tr>
<td>Delaware State University</td>
<td>Kansas State University</td>
</tr>
<tr>
<td>Florida Agricultural and Mechanical University</td>
<td>Pittsburg State University</td>
</tr>
<tr>
<td>Florida Atlantic University</td>
<td>Washburn University</td>
</tr>
<tr>
<td>Florida International University</td>
<td>Wichita State University</td>
</tr>
<tr>
<td>University of North Florida</td>
<td>Eastern Kentucky University</td>
</tr>
<tr>
<td>The University of West Florida</td>
<td>Morehead State University</td>
</tr>
<tr>
<td>Albany State University</td>
<td>Murray State University</td>
</tr>
<tr>
<td>Armstrong Atlantic State University</td>
<td>Northern Kentucky University</td>
</tr>
<tr>
<td>Augusta State University</td>
<td>Western Kentucky University</td>
</tr>
<tr>
<td>Columbus State University</td>
<td>Grambling State University</td>
</tr>
<tr>
<td>Georgia College and State University</td>
<td>Louisiana State University–Shreveport</td>
</tr>
<tr>
<td>Georgia Southern University</td>
<td>Louisiana Tech University</td>
</tr>
<tr>
<td>Kennesaw State University</td>
<td>McNeese State University</td>
</tr>
<tr>
<td>North Georgia College &amp; State University</td>
<td>University of New Orleans</td>
</tr>
<tr>
<td>Valdosta State University</td>
<td>Nicholls State University</td>
</tr>
<tr>
<td>University of West Georgia</td>
<td>University of Louisiana at Monroe</td>
</tr>
<tr>
<td>Boise State University</td>
<td>Northwestern State University of Louisiana</td>
</tr>
<tr>
<td>Idaho State University</td>
<td>Southeastern Louisiana University</td>
</tr>
<tr>
<td>University of Idaho</td>
<td>Southern University and A &amp; M College</td>
</tr>
<tr>
<td>Chicago State University</td>
<td>Southern University at New Orleans</td>
</tr>
<tr>
<td>Eastern Illinois University</td>
<td>University of Louisiana at Lafayette</td>
</tr>
<tr>
<td>Governors State University</td>
<td>University of Maine</td>
</tr>
<tr>
<td>Illinois State University</td>
<td>University of Baltimore</td>
</tr>
<tr>
<td>Northern Illinois University</td>
<td>Bowie State University</td>
</tr>
<tr>
<td>Northeastern Illinois University</td>
<td>Frostburg State University</td>
</tr>
<tr>
<td>Southern Illinois University Carbondale</td>
<td>University of Maryland–University College</td>
</tr>
<tr>
<td>Southern Illinois University Edwardsville</td>
<td>University of Maryland–Baltimore County</td>
</tr>
<tr>
<td>Western Illinois University</td>
<td>Morgan State University</td>
</tr>
<tr>
<td>Ball State University</td>
<td>Salisbury University</td>
</tr>
<tr>
<td>Indiana University–Purdue University–Fort Wayne</td>
<td>Towson University</td>
</tr>
<tr>
<td>Indiana University–Purdue University–Indianapolis</td>
<td>Bridgewater State College</td>
</tr>
<tr>
<td>University of Southern Indiana</td>
<td>Fitchburg State College</td>
</tr>
<tr>
<td>Indiana State University</td>
<td>Framingham State College</td>
</tr>
<tr>
<td>Indiana University–South Bend</td>
<td>University of Massachusetts–Boston</td>
</tr>
<tr>
<td>Indiana University–Northwest</td>
<td>Salem State College</td>
</tr>
<tr>
<td>Indiana University–Southeast</td>
<td>Westfield State College</td>
</tr>
<tr>
<td>Purdue University–Calumet Campus</td>
<td>Worcester State College</td>
</tr>
<tr>
<td>University of Northern Iowa</td>
<td>Central Michigan University</td>
</tr>
<tr>
<td></td>
<td>Eastern Michigan University</td>
</tr>
<tr>
<td></td>
<td>Ferris State University</td>
</tr>
</tbody>
</table>
Grand Valley State University
Michigan Technological University
University of Michigan–Dearborn
University of Michigan–Flint
Northern Michigan University
Oakland University
Saginaw Valley State University
Western Michigan University
Minnesota State University–Mankato
Metropolitan State University
University of Minnesota–Duluth
Minnesota State University–Moorhead
Saint Cloud State University
Southwest Minnesota State University
Winona State University
Alcorn State University
Delta State University
Jackson State University
University of Mississippi Main Campus
Mississippi Valley State University
University of Southern Mississippi
Central Missouri State University
Truman State University
Northwest Missouri State University
Southeast Missouri State University
Missouri State University
Montana State University–Billings
The University of Montana
University of Nebraska at Kearney
Peru State College
Wayne State College
University of Nevada–Las Vegas
University of Nevada–Reno
University of New Hampshire–Main Campus
Rowan University
New Jersey City University
Kean University
Montclair State University
New Jersey Institute of Technology
Ramapo College of New Jersey
Rutgers University–Camden
The Richard Stockton College of New Jersey

The College of New Jersey
William Paterson University of New Jersey
New Mexico Highlands University
New Mexico Institute of Mining and Technology
Western New Mexico University
CUNY City College
SUNY at Binghamton
SUNY College of Environmental Science and Forestry
SUNY Institute of Technology at Utica–Rome
SUNY College at Brockport
SUNY College at Buffalo
SUNY College at Cortland
SUNY at Fredonia
SUNY College at New Paltz
SUNY College at Oswego
SUNY–Potsdam
SUNY College at Plattsburgh
SUNY Empire State College
Appalachian State University
East Carolina University
Fayetteville State University
North Carolina A & T State University
University of North Carolina at Charlotte
University of North Carolina at Greensboro
North Carolina Central University
University of North Carolina–Wilmington
University of North Carolina at Pembroke
Winston–Salem State University
Western Carolina University
University of North Dakota
University of Akron Main Campus
Bowling Green State University–Main Campus
Cleveland State University
Kent State University–Kent Campus
Miami University–Oxford
Ohio University–Main Campus
University of Toledo
Wright State University–Main Campus
Youngstown State University
University of Central Oklahoma
East Central University
For the CSU commission comparison schools, the list includes a mix of public and private institutions. Additionally, the mission of the schools also vary with some receiving the Carnegie “very high research activity” designation, to some private schools that do not grant graduate degrees. For one school on that list, the University of Texas–Arlington, we were unable to collect complete data and therefore excluded it from the analysis (n = 19). The Commission comparison for the CSUs schools are:

- Rutgers University
- Illinois State University
- University of Connecticut
- Wayne State University
- University of Maryland, Balt. County
- George Mason University
- University of Colorado at Denver
- Georgia State University at Atlanta
- Arizona State University at Tempe
- State University of New York, Albany

- Cleveland State University
- University of Wisconsin at Milwaukee
- North Carolina State University
- University of Nevada at Reno
- Bucknell University
- Loyola University of Chicago
- Tufts University
- University of Southern California
- Reed College

There are other groups of comparison schools that could be used. For example, the CSU budget office regularly uses a subset of the above list to report comparable tuition figures. The advantage of using the Delta Cost Project data is that others are free to construct their own set of comparison institutions.

The national comparison schools used in Figure 1 combine the groups from both the UC comparison group (61 schools) and CSU (274 schools) listed above.

Weighting of Degrees

Many analyses of the costs associated with higher education note that costs differ relative to the type of degree being produced. The most common distinction is between graduate and undergraduate instruction, with the premise being that graduate instruction is more costly. For example, the National Association of College and University Business Officials (NACUBO) used a multiplier of 1.25–1.7 to indicate the relatively higher expenses associated with graduate instruction in their cost of college model. This model is used to estimate the cost of a single year of college.

Given that this analysis uses degrees as the measure of outcome, as opposed to a single year of instruction, the question of weighting becomes more challenging. For example, some master’s degree programs are designed to be completed in 2 years or less. Taking the NACUBO multiplier of 1.7 times 2 years yields an estimate that would be only 85 percent of the costs of a 4-year undergraduate degree (3.4/4 = .85). Using the same approach, a PhD that takes 6 years would reflect 2.55 times the cost of a 4-year undergraduate degree (6*1.7/4 = 2.55).

The Delta Cost Project reports associate, bachelor, first professional, and doctorate degrees, as well as a number of non-degree associated completions. We focused on only degrees and explored a number of different weighting schemes in an effort to determine if there was any significant impact on the comparisons. The weights we used were:

- **Weighted calculation A.** Since some of the research universities included in the comparison groups also issued associate degrees, in Calculation A, each associate degree was multiplied by 0.5 and all other degrees multiplied by 1.0.
**Weighted calculation B.** To give greater weight to graduate degrees, in Weighted Calculation B, each associate degree was multiplied by 0.5, each bachelors degree multiplied by 1.0 all masters and first professional degrees multiplied by 1.5, and all PhDs multiplied by 3.0.

Figures A1 and A2 recreate Figure 2 from the report using the two different weighting calculations applied to the UC system and its comparison groups. Because the production of different types of degrees is relatively the same in the comparison schools, the only noticeable effect is to shift the lines slightly. Similarly, the pattern over time also changes little. Applying weights to the CSU system and its comparison groups produced similar findings.

**FIGURE A1**
Cost per degree using weighted calculation A

![Cost per degree using weighted calculation A](image)

**SOURCE:** Authors’ calculations using Delta Cost Project Data.

**NOTE:** Costs adjusted for inflation.

**FIGURE A2**
Cost per degree using weighted calculation B

![Cost per degree using weighted calculation B](image)

**SOURCE:** Authors’ calculations using Delta Cost Project Data.

**NOTE:** Costs adjusted for inflation.
While there are different cost structures associated with graduate and undergraduate education, the introduction weights to the calculation does not add a great deal to our understanding of changes over time or compared to other institutions at the system level. Should the relative mix change dramatically over time, one would expect to see an impact.

**Course of Study Mix and Cost Differences**

In addition to different types of degrees being associated with different cost structures, it is also the case that providing instruction in different subjects is associated with different costs. The costs associated with producing a medical doctor, for example, will be higher than those associated with producing a political science doctorate, though both may take roughly the same amount of time.

Having a deeper understanding of the course mix being provided would provide greater insight into differences in cost per degree. The comparisons in the report generally assume that the mix among the compared schools is roughly the same. We do know, however, on an individual basis, one institution’s instructional mix may be significantly different than another’s.

Exploring how systematic these differences are and getting a sense of their magnitude is difficult using the Delta Cost Project data. While the database contains hundreds of variables, there is little that distinguishes both costs and degrees by course of study. To provide an example of the potential impact, however, we made a simple comparison of schools that conferred medical degrees to similar research universities that did not. We combined the 61 very high research activities used in the UC comparison group with the 8 UC schools and then divided them into those with medical degrees (n = 47) and those that do not have them (n = 22). The results are presented in Figure A3.

**FIGURE A3**

Cost per degree at institutions with medical programs are significantly higher than those without

![Graph showing cost per degree over time for institutions with and without medical programs](image)

**SOURCE:** Authors’ calculations using Delta Cost Project Data.

**NOTE:** Costs adjusted for inflation.
On average, those universities with medical programs averaged about $7,500 (11 percent) more to produce any type of a degree over the period than those schools that didn’t trained doctors. The comparison is imperfect, but supports the notion that the course mix can have a significant impact on costs.

**Impact of Transfer Students**

Another feature that appears to have a systematic impact on an institution’s cost per degree is the relative share of transfer students that it enrolls and graduates. In general, we expect a transfer student to take less time completing a degree compared to a first-time, full-time freshman, all other factors being the same. As a consequence, we would expect a university that graduates more community college transfers as a share of its total graduates to have a lower cost per degree. The data contained in the Delta Cost Project do not provide an easy way to identify the share of degrees awarded to transfer students compared to first-time, full-time freshman. But, to explore whether there appears to be a relationship between the share of transfer graduates and cost per degree, we used data from the CSU system Analytic Studies webpage. We were able to collect data on headcounts of students, both first-time full-time freshman and community college transfers at different campuses. We then calculated the relative share for a single year. The variation across campuses is significant. At Cal-Poly San Luis Obispo, the community college transfers comprise 12 percent of the 2014 cohort. At CSU Dominguez Hills, that figure is 66 percent. Figure A4 plots the share of community college transfer students against the cost per degree measure for 2013 for 19 of the CSU campuses used for this report.

**FIGURE A4**

As the share of community college transfers decreases, the cost per degree increases

![Graph showing the relationship between share of community college transfers and cost per degree](image)

**SOURCE:** Authors’ calculations using Delta Cost Project Data and CSU Analytical Studies.

**NOTE:** Costs adjusted for inflation.
Differences in Mission

There are macro differences that go beyond institutional decisions and practices. For example, CSU faces fundamentally different cost structures than that of UC, given their very different missions and student composition. California’s Master Plan mandates that the CSU system accept the top one-third of California high school graduates and focus on undergraduate instruction. The CSU system is able to provide this instruction at a relatively low cost and with relatively low tuition. The Master Plan mandates that the UC system be more selective and have an explicit focus on graduate and professional instruction as well as research. As a result, their costs are higher. This fundamental difference is not just a California phenomenon. Figure A5 presents cost per degree data for the two groups of nationally comparable institutions relative to the UC and CSU systems. The “very high research activity” schools (R1) average 20 percent higher cost per degree and that difference is consistent over the period.

FIGURE A5
Very high research universities face higher cost structures

SOURCE: Authors’ calculations using Delta Cost Project data.
NOTE: Costs adjusted for inflation.
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