



PPIC

PUBLIC POLICY
INSTITUTE OF CALIFORNIA

Measuring Institutional Costs at California's Public Universities

Technical Appendix

CONTENTS

Data and Methods	2
Comparable Institutions	3
Weighting of Degrees	8
Figure A1	9
Figure A2	9
Course of Study Mix and Cost Differences	10
Figure A3	10
Impact of Transfer Students	11
Figure A4	11
Differences in Mission	12
Figure A5	12

Patrick Murphy, Kevin Cook, and Talib Jabbar

Supported with funding from the Sutton Family Fund

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).¹ 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 plant²).

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

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

University of Cincinnati–Main Campus
 Ohio State University–Main Campus
 University of Oklahoma Norman Campus
 Oregon State University
 University of Oregon
 Pennsylvania State University–Main Campus
 University of Pittsburgh–Pittsburgh Campus
 University of South Carolina–Columbia
 The University of Tennessee
 University of Houston
 Texas A & M University–College Station

The University of Texas at Austin
 University of Utah
 Virginia Polytechnic Institute and State University
 Virginia Commonwealth University
 University of Virginia–Main Campus
 Washington State University
 University of Washington–Seattle
 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:

Yale University
 University of Illinois at Chicago
 Harvard University
 Massachusetts Institute of Technology

University of Michigan–Ann Arbor
 University at Buffalo
 University of Virginia–Main Campus
 Stanford University

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:

Alabama A & M University
 Alabama State University
 The University of Alabama
 Auburn University–Montgomery
 Auburn University Main Campus
 Jacksonville State University
 University of West Alabama
 University of Montevallo
 University of North Alabama
 University of South Alabama
 Troy University
 University of Alaska Fairbanks
 Northern Arizona University

University of Arkansas at Little Rock
 Arkansas State University–Main Campus
 Arkansas Tech University
 University of Central Arkansas
 Henderson State University
 Southern Arkansas University Main Campus
 Adams State College
 University of Colorado at Denver and Health Sciences Center
 University of Colorado at Colorado Springs
 Colorado School of Mines
 University of Northern Colorado
 Central Connecticut State University

Southern Connecticut State University
Western Connecticut State University
Delaware State University
Florida Agricultural and Mechanical University
Florida Atlantic University
Florida International University
University of North Florida
The University of West Florida
Albany State University
Armstrong Atlantic State University
Augusta State University
Columbus State University
Georgia College and State University
Georgia Southern University
Kennesaw State University
North Georgia College & State University
Valdosta State University
University of West Georgia
Boise State University
Idaho State University
University of Idaho
Chicago State University
Eastern Illinois University
Governors State University
Illinois State University
Northern Illinois University
Northeastern Illinois University
Southern Illinois University Carbondale
Southern Illinois University Edwardsville
Western Illinois University
Ball State University
Indiana University–Purdue University–Fort
Wayne
Indiana University–Purdue University–
Indianapolis
University of Southern Indiana
Indiana State University
Indiana University–South Bend
Indiana University–Northwest
Indiana University–Southeast
Purdue University–Calumet Campus
University of Northern Iowa

Emporia State University
Fort Hays State University
Kansas State University
Pittsburg State University
Washburn University
Wichita State University
Eastern Kentucky University
Morehead State University
Murray State University
Northern Kentucky University
Western Kentucky University
Grambling State University
Louisiana State University–Shreveport
Louisiana Tech University
McNeese State University
University of New Orleans
Nicholls State University
University of Louisiana at Monroe
Northwestern State University of Louisiana
Southeastern Louisiana University
Southern University and A & M College
Southern University at New Orleans
University of Louisiana at Lafayette
University of Maine
University of Baltimore
Bowie State University
Frostburg State University
University of Maryland–University College
University of Maryland–Baltimore County
Morgan State University
Salisbury University
Towson University
Bridgewater State College
Fitchburg State College
Framingham State College
University of Massachusetts–Boston
Salem State College
Westfield State College
Worcester State College
Central Michigan University
Eastern Michigan University
Ferris State University

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

Northeastern State University
Oklahoma State University–Main Campus
Southeastern Oklahoma State University
Southwestern Oklahoma State University
Portland State University
Southern Oregon University
Western Oregon University
Bloomsburg University of Pennsylvania
California University of Pennsylvania
Clarion University of Pennsylvania
East Stroudsburg University of Pennsylvania
Edinboro University of Pennsylvania
Indiana University of Pennsylvania–Main Campus
Kutztown University of Pennsylvania
Lincoln University of Pennsylvania
Mansfield University of Pennsylvania
Millersville University of Pennsylvania
Shippensburg University of Pennsylvania
Slippery Rock University of Pennsylvania
Temple University
West Chester University of Pennsylvania
Rhode Island College
University of Rhode Island
College of Charleston
Citadel Military College of South Carolina
Clemson University
South Carolina State University
Winthrop University
South Dakota State University
University of South Dakota
Austin Peay State University
East Tennessee State University
University of Memphis
Middle Tennessee State University
Tennessee State University
Tennessee Technological University
Angelo State University
Texas A & M University–Corpus Christi
Texas A & M University–Texarkana
Texas A & M University–Commerce
University of Houston–Clear Lake
University of Houston–Victoria

Lamar University
Texas A & M International University
Midwestern State University
University of North Texas
Prairie View A & M University
Sam Houston State University
Stephen F Austin State University
Texas State University–San Marcos
Sul Ross State University
Tarleton State University
Texas A & M University–Kingsville
Texas Southern University
Texas Tech University
Texas Woman's University
West Texas A & M University
Southern Utah University
Utah State University
Weber State University
University of Vermont
College of William and Mary
George Mason University
James Madison University
Longwood University
University of Mary Washington
Norfolk State University
Old Dominion University
Radford University
Central Washington University
Eastern Washington University
Western Washington University
Marshall University
West Virginia University
University of Wisconsin–Whitewater
University of Wisconsin–Eau Claire
University of Wisconsin–La Crosse
University of Wisconsin–Oshkosh
University of Wisconsin–Stout
University of Wisconsin–Milwaukee
University of Wisconsin–Platteville
University of Wisconsin–River Falls
University of Wisconsin–Stevens Point
University of Wyoming

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	Cleveland State University
Illinois State University	University of Wisconsin at Milwaukee
University of Connecticut	North Carolina State University
Wayne State University	University of Nevada at Reno
University of Maryland, Balt. County	Bucknell University
George Mason University	Loyola University of Chicago
University of Colorado at Denver	Tufts University
Georgia State University at Atlanta	University of Southern California
Arizona State University at Tempe	Reed College
State University of New York, Albany	

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:

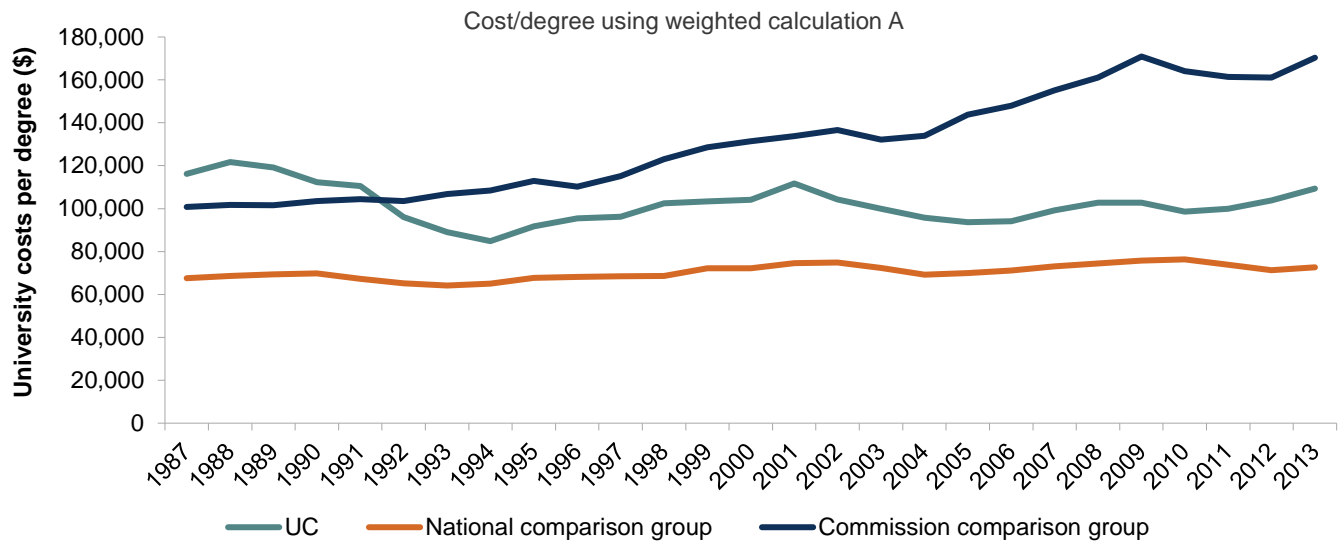
- **Weighted calculation A.** Since some of the research universities included in the comparison groups also issued associate degrees, in Calculation A, each associate degree was multiplied by 0.5 and all other degrees multiplied by 1.0.

- 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

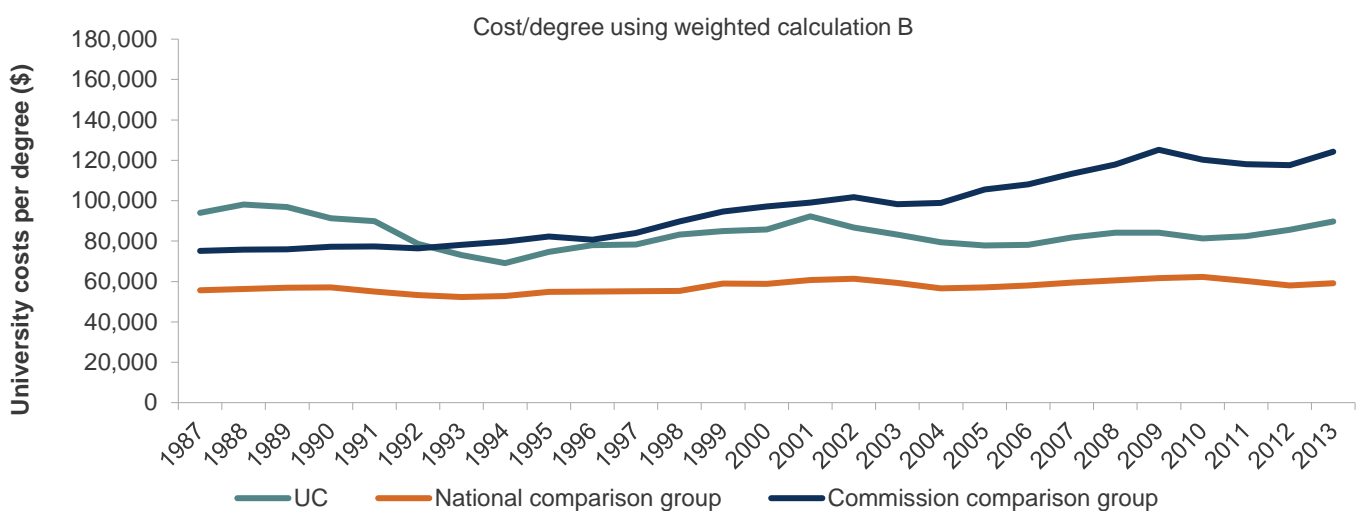


SOURCE: Authors' calculations using Delta Cost Project Data.

NOTE: Costs adjusted for inflation.

FIGURE A2

Cost per degree using weighted calculation B



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

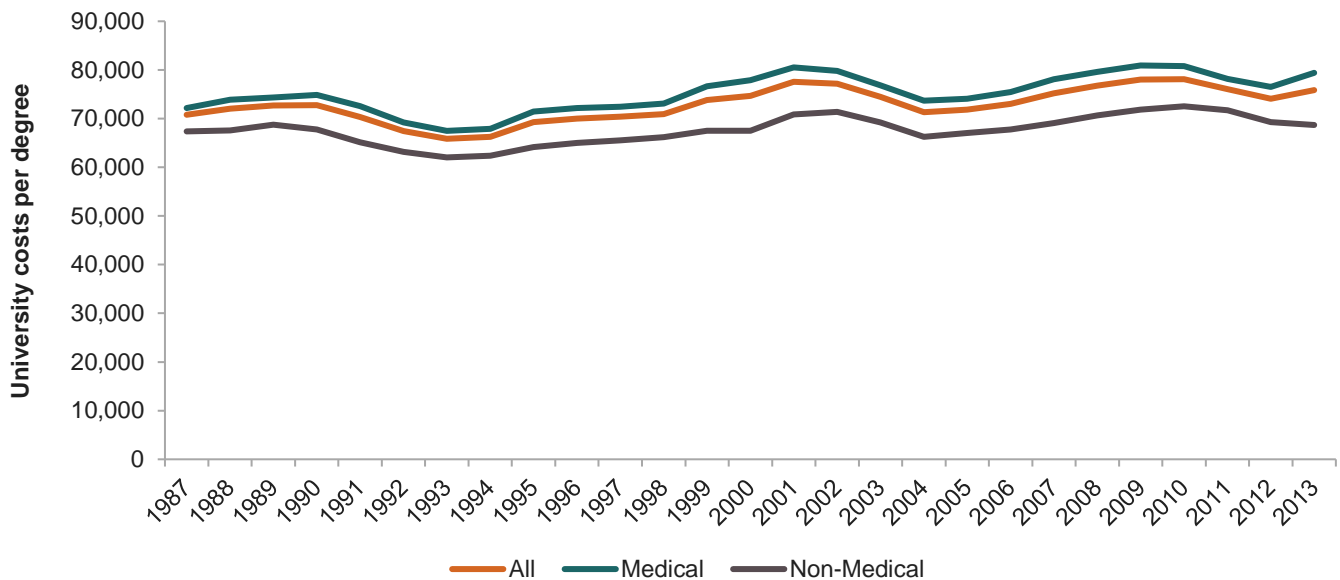
In addition to different types of degrees being associated with different cost structures, it is also the case that providing instruction in different subjects is associated with different costs. The costs associated with producing a medical doctor, for example, will be higher than those associated with 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



SOURCE: Authors’ calculations using Delta Cost Project Data.

NOTE: Costs adjusted for inflation.

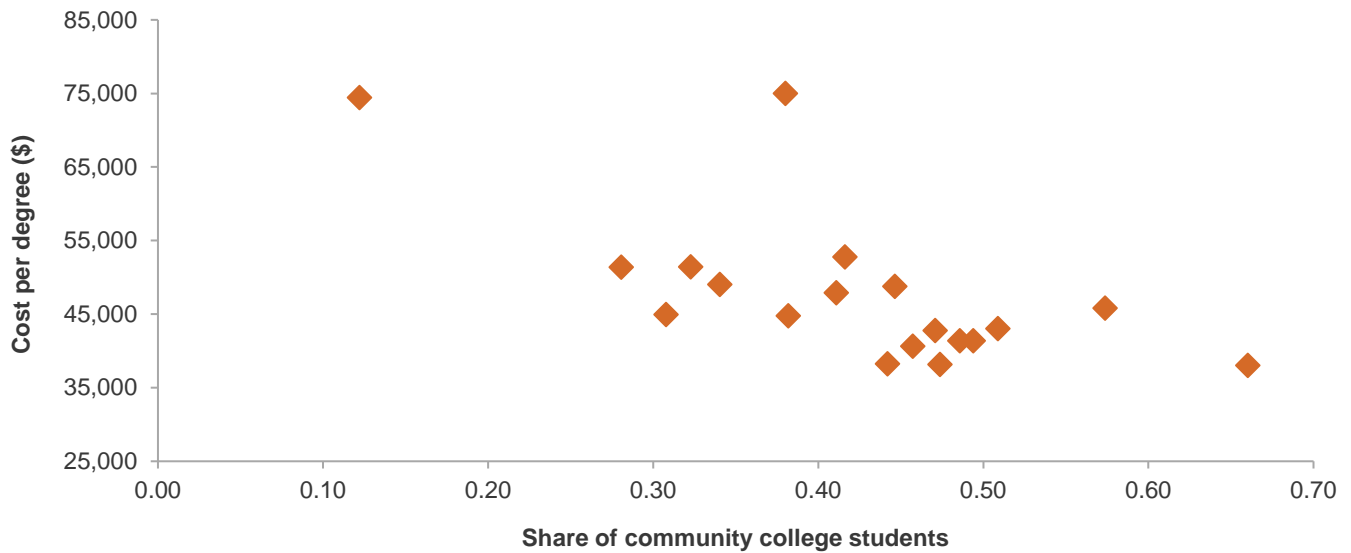
On average, those universities with medical programs averaged about \$7,500 (11 percent) more to produce any type of a degree over the period than those schools that didn't trained doctors. The comparison is imperfect, but supports the notion that the course mix can have a significant impact on costs.

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



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

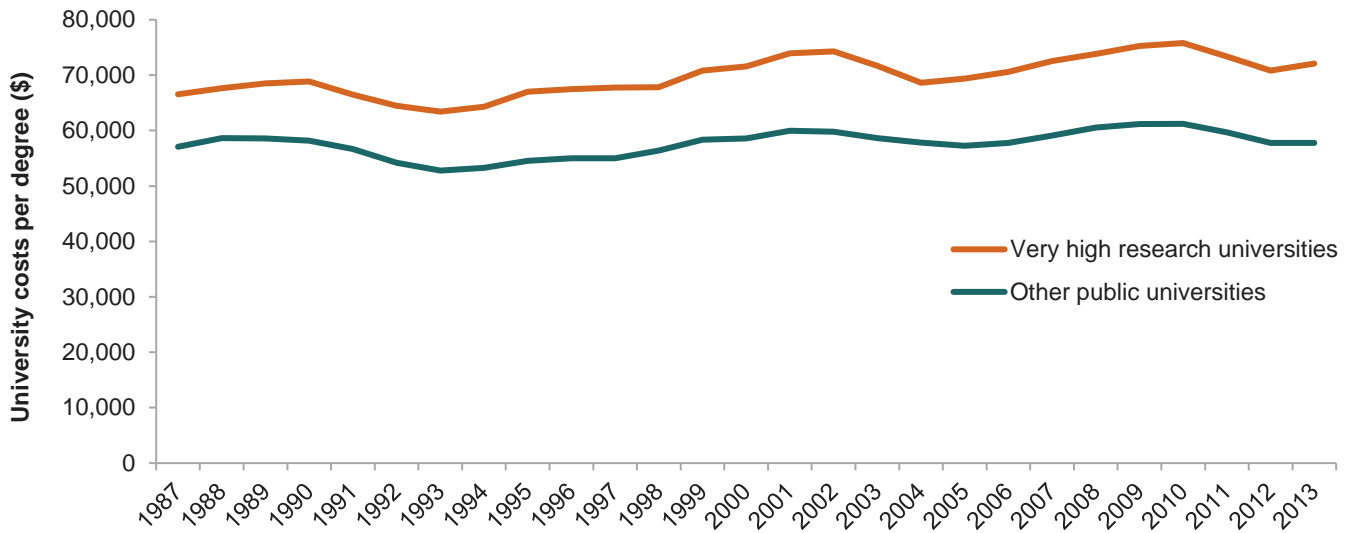
NOTE: Costs adjusted for inflation.

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.



PPIC

PUBLIC POLICY
INSTITUTE OF CALIFORNIA

The Public Policy Institute of California is dedicated to informing and improving public policy in California through independent, objective, nonpartisan research.

Public Policy Institute of California
500 Washington Street, Suite 600
San Francisco, CA 94111
T: 415.291.4400
F: 415.291.4401
PPIC.ORG

PPIC Sacramento Center
Senator Office Building
1121 L Street, Suite 801
Sacramento, CA 95814
T: 916.440.1120
F: 916.440.1121