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Improving College Graduation Rates

Technical Appendices

CONTENTS

Appendix A. Determining Expected Graduation Rates	2
Appendix B. Graduation Rates by Campus and Race	7
Appendix C. Data Collection of Campus Strategies	10

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Appendix A. Determining Expected Graduation Rates

To determine the expected (or predicted) graduation rates of CSU campuses, taking into account changing student characteristics, we employ a set of ordinary least squares (OLS) regressions. Table A1 displays a set of student characteristics commonly shown to correlate with college completion, including academic preparation (25th percentile of SAT scores), the income of students and their families (the percentage of students receiving federal aid like Pell Grants and the percentage of students receiving any aid), gender, and race (the percentage of students who are historically underrepresented—African American, Latino, and American Indian). Institutions were limited to public, four-year degree-granting institutions that had at least 50 percent of their students participate in the SAT. Our analysis includes models for the entering cohorts of 2002 (six-year graduation in 2008) and 2008 (six-year graduation in 2014).

TABLE A1

Predicting graduation rates: variables

Variable name	CSU mean	Sample mean	Sample min	Sample max	Variable description
GRAD6	47.5	51.2	1.16	93.1	Percent of IPEDS-defined adjusted cohort graduating within 6 years
SATCOMP	860.7	936.5	660	1250	The 25th percentile SAT math score added to the 25th percentile SAT critical reading score
SATPCT	88.3	88.4	51	100	Percent of students participating in the SAT
ANYAID	60.2	79.6	44	100	Percent of students who received any financial aid
FEDAID	34.5	31.8	8	87	Percent of students who received a Federal Grant (such as a Pell Grant)
FEMALE	56.6	54.5	5.9	94.8	Percent of female first-time, full-time freshmen
UNDERREP	31.0	21.4	.63	100	Percent of first-time full-time freshmen who are African American, Latino, or American Indian

SOURCE: IPEDS.

NOTES: Table shows cohorts graduating in 2008, with means, minimums, and maximums for 292 institutions.

Incoming student characteristics explain up to 68 percent of the variation in graduation rates (see Table A3), much of which is driven by test scores. The 25th percentile combined SAT scores alone explain about 63 percent of the variation in graduation rates.

TABLE A2

Incoming student characteristics are correlated with graduation rates

Variable	Correlation (2008)	Correlation (2014)
SATCOMP	.79	.78
SATPCT	.30	.25
ANYAID	-.30	-.38
FEDAID	-.53	-.62
FEMALE	-.27	-.26
UNDERREP	-.33	-.40

SOURCES: Authors' calculations from IPEDS.

NOTES: The correlations are for six-year graduation rates for the 2008 graduating cohort.

TABLE A3

Predicting graduation rates: OLS models

Variable name	Model 1A (2008)	2A (2008)	3A (2008)	1B (2014)	2B (2014)	3B (2014)
SATCOMP	0.125** (0.006)	0.114** (0.007)	0.112** (0.007)	0.127** (0.006)	0.100** (0.007)	0.099** (0.007)
SATPCT		0.314** (0.053)	0.329** (0.052)		0.263** (0.051)	0.266** (0.050)
ANYAID		-0.065 (0.042)	-0.050 (0.044)		-0.022 (0.058)	0.003 (0.059)
FEDAID		-0.062 (0.054)	-0.153* (0.067)		-0.263** (0.050)	-0.370** (0.073)
FEMALE			0.042 (0.057)			-0.001 (0.061)
UNDERREP			0.057 (0.034)			0.074* (0.038)
Constant	-66.205** (5.294)	-76.486** (8.593)	-78.529** (9.447)	-65.938** (5.303)	-53.577** (9.883)	-53.150** (10.952)
r2	0.631	0.675	0.680	0.625	0.677	0.682
N	293	293	292	308	304	304

SOURCES: Authors' model based on IPEDS data.

NOTES: OLS regressions using variables from Table A1. Standard errors in parentheses; * denotes significance at the .05 level; ** denotes significance at the .01 level.

Using 2008 as the base year, we used coefficients from Model 3A in Table A3 to simulate the expected graduation rate changes due to changes in student characteristics from 2008 to 2014. We used 2014 data because national data were not yet available for the last year of the initiative. Additionally, we had already seen large increases in graduation rates in the five years since the initiative began.

Simulations based on these models are not definitive. They are an approximation of how changes in the student composition at a university might affect the graduation rate. The projected graduation rates are dependent on the relationships between student characteristics and graduation rates, and may change accordingly. Even though student characteristics explain a majority of the variation in graduation rates, the relationship between, for example, test score performance and graduation rates can change over time. For instance, the test might change, universities throughout the nation may improve at graduating students with lower SAT scores, or perhaps some omitted or unobservable variable correlated with both SAT scores and graduation rates could change over time, thereby causing the relationship between SAT and graduation rates to change. In order to account for possible changes over time, we calculated the expected gains using models from the 2014 graduation data in addition to the 2008 graduation data (Table A4). Both models yield similar predictions in both direction and magnitude. The models predicted that graduation rates at most CSU campuses would stay about the same, as most CSUs saw little or no change in SAT scores from 2008 to 2015.

TABLE A4
Simulated changes by model

Campus	Model 3A (2008)	Model 3B (2014)
Los Angeles	5.7	5.1
San Jose	3.8	4.2
Long Beach	3.5	2.1
Fullerton	3.4	3.0
San Francisco	2.3	2.8
San Marcos	2.1	2.1
Pomona	1.5	2.5
Dominguez Hills	1.2	3.9
East Bay	1.1	1.1
Maritime	0.5	1.2
Fresno	0.1	-0.8
San Bernardino	-0.2	-0.8
San Diego	-0.6	1.3
San Luis Obispo	-0.7	-0.1
Sonoma	-1.2	-1.1
Monterey	-1.7	-1.1
Stanislaus	-1.9	-1.2
Northridge	-2.1	-0.7
Chico	-3.6	-3.8
Humboldt	-3.7	-3.0
Sacramento	-4.8	-5.0
Bakersfield	-5.0	-5.6

SOURCES: Authors' calculations using IPEDS data.

NOTES: Coefficients are from OLS regressions in Table A3.

Yet many campuses saw substantial increases in graduation rates. In fact, the minor differences between models were overwhelmed by the actual graduation rate changes, as Table A5 shows.

TABLE A5

Differences between actual and simulated changes by model

Campus	Model 3A (2008)	Model 3B (2014)
Bakersfield	1.0	1.9
Chico	6.7	7.1
Dominguez Hills	-1.9	-2.4
East Bay	-6.4	-7.6
Fresno	3.9	4.3
Fullerton	3.2	3.2
Humboldt	5.7	4.8
Long Beach	5.1	4.8
Los Angeles	6.6	6.5
Maritime	-9.6	-9.7
Monterey	7.6	7.3
Northridge	7.4	7.9
Pomona	6.0	4.5
Sacramento	6.4	7.1
San Bernardino	4.3	4.1
San Diego	6.0	4.4
San Francisco	3.8	4.4
San Jose	6.0	6.1
San Luis Obispo	5.9	5.4
San Marcos	2.3	1.9
Sonoma	6.2	7.0
Stanislaus	2.4	2.3
Average difference	3.6	3.4

SOURCES: Authors' calculations using IPEDS data.

NOTES: Coefficients are from OLS regressions in Table A3.

To determine whether student characteristics were driving increases in graduation rates, we also analyzed the residuals for the models in 2008, the year before the graduation initiative, and 2014, the year before the end of the initiative. If the residuals from 2008 and 2014 do not change, this would suggest that any increases in graduation rates could have been due to different students. The raw and standardized residuals were calculated for each CSU campus from the OLS models described in Table A3. Differences in the residuals were calculated for the graduation cohorts of 2008 and 2014. The difference represents the growth of the residual from 2008 to 2014 for each campus. These results are in Table A6. The residual analysis shows that most CSU campuses outperformed similar schools before the initiative in 2008 (Column 1), and most campuses outperformed similar schools by

even more in 2014 (Columns 3 and 6). This is further evidence that student characteristics are not the only driver of higher graduation rates at CSU.

TABLE A6

Differences in residuals from 2008 to 2014

Campus	Raw 2008 (1)	Raw 2014 (2)	Raw Diff (3)	Std 2008 (4)	Std 2014 (5)	Std diff (6)
Northridge	5.3	11.4	6.1	0.53	1.11	0.58
Los Angeles	7.4	13.4	6.0	0.75	1.31	0.56
Long Beach	9.2	14.8	5.6	0.92	1.45	0.53
Chico	4.6	9.6	5.0	0.46	0.94	0.49
Monterey	-5.9	-1.2	4.7	-0.59	-0.12	0.47
Sacramento	2.3	7.0	4.7	0.23	0.68	0.45
San Bernardino	10.7	15.2	4.5	1.08	1.49	0.41
Fresno	14.3	18.1	3.8	1.43	1.77	0.34
Humboldt	-8.6	-4.9	3.7	-0.86	-0.48	0.38
Sonoma State	-6.8	-3.3	3.5	-0.69	-0.33	0.36
San Jose	-2.6	0.8	3.4	-0.26	0.07	0.34
San Luis Obispo	-4.6	-1.4	3.2	-0.46	-0.14	0.32
Pomona	0.7	2.9	2.2	0.07	0.29	0.22
Bakersfield	9.3	11.2	1.9	0.93	1.09	0.16
San Diego	5.2	6.7	1.5	0.52	0.65	0.13
Fullerton	3.7	5.0	1.3	0.37	0.49	0.12
San Francisco	2.5	3.2	0.8	0.25	0.32	0.07
Stanislaus	13.9	14.4	0.5	1.40	1.40	0.00
San Marcos	-1.7	-3.9	-2.2	-0.17	-0.38	-0.21
Dominguez Hills	16.4	12.3	-4.0	1.66	1.22	-0.45
East Bay	9.8	0.6	-9.2	0.99	0.06	-0.93
Maritime	9.5	-5.8	-15.3	0.96	-0.58	-1.54

SOURCES: Authors' calculations using IPEDS data.

NOTES: Table sorted by difference between raw residuals from 2008 and 2014 (Column 3). Raw residuals are the difference between actual and predicted graduation rates based on Model 3 for each year. Std indicates studentized residuals based on Model 3 for each year.

Appendix B. Graduation Rates by Campus and Race

Table B1 presents six-year graduation rates by campus from 2008 to 2015, as well as 2006 baseline graduation rates and 2015 goal graduation rates.

TABLE B1
Six-year graduation rate growth by campus

Campus	Baseline (2006)	Goal (2015)	2008	2009	2010	2011	2012	2013	2014	2015
San Luis Obispo	67.0%	76.0%	69.4%	71.7%	72.9%	74.6%	72.2%	69.7%	75.0%	75.8%
San Diego	58.3%	64.3%	61.3%	66.3%	66.2%	65.6%	66.0%	66.2%	66.0%	68.1%
Chico	53.7%	59.7%	55.7%	58.0%	61.8%	59.0%	57.2%	56.1%	59.3%	63.7%
Maritime	53.1%	71.1%	62.0%	68.7%	61.1%	62.3%	57.9%	58.7%	54.2%	57.5%
Sonoma	50.8%	56.8%	49.6%	52.9%	56.9%	56.7%	54.9%	53.9%	55.5%	58.6%
Stanislaus	50.1%	56.1%	52.7%	49.5%	49.5%	49.1%	48.7%	52.0%	53.3%	54.9%
Fullerton	49.1%	55.1%	49.0%	51.6%	51.4%	50.1%	51.2%	53.5%	55.7%	61.9%
Pomona	48.3%	58.3%	50.4%	52.9%	56.6%	50.3%	50.8%	52.4%	56.4%	62.9%
Long Beach	47.8%	54.8%	49.0%	54.4%	54.0%	54.0%	56.9%	60.3%	65.2%	67.0%
Fresno	45.5%	51.5%	48.0%	47.8%	50.6%	49.4%	48.1%	48.6%	52.4%	58.5%
San Bernardino	44.3%	50.3%	43.7%	45.5%	44.0%	44.6%	43.5%	41.1%	48.0%	52.1%
Humboldt	44.2%	57.2%	42.2%	41.5%	36.6%	39.7%	40.5%	40.1%	43.8%	45.6%
East Bay	43.2%	49.2%	44.4%	47.6%	45.1%	43.3%	41.0%	38.1%	38.1%	45.1%
San Francisco	42.4%	50.4%	43.7%	47.5%	48.0%	46.5%	47.3%	45.5%	49.7%	51.2%
Sacramento	42.1%	51.1%	41.6%	43.9%	42.0%	41.6%	41.4%	42.9%	43.7%	46.0%
Bakersfield	41.7%	47.7%	44.5%	38.4%	43.0%	41.4%	38.6%	39.5%	41.2%	38.8%
San Jose	41.4%	50.4%	41.4%	46.4%	48.0%	46.4%	46.9%	48.1%	51.6%	56.8%
Northridge	40.0%	49.0%	41.1%	43.7%	47.9%	46.1%	48.0%	45.8%	46.8%	50.4%
San Marcos	38.1%	45.1%	45.1%	47.3%	44.2%	48.5%	44.6%	47.9%	48.5%	51.4%
Monterey	35.6%	49.6%	38.7%	41.5%	40.9%	37.8%	36.8%	38.3%	45.3%	53.4%
Los Angeles	34.8%	44.8%	30.6%	33.7%	37.4%	36.5%	36.5%	35.7%	41.1%	45.3%
Dominguez	32.9%	39.9%	34.0%	34.9%	30.9%	24.4%	27.6%	29.4%	32.3%	34.7%
Channel Islands	-	-	-	52.5%	58.4%	53.9%	51.1%	51.6%	61.5%	56.5%
System-wide	46.0%	54.0%	48.9%	51.3%	52.4%	51.3%	51.4%	51.8%	54.0%	57.0%

SOURCES: CSU Analytic Studies.

NOTES: Table sorted by 2006 baseline graduation rates. Channel Islands was a new campus as of fall 2003 and did not have a six-year graduation goal, but the campus is included in the system-wide calculations.

The graduation rate for underrepresented minority students grew slightly faster than for white and Asian students, though this pattern varied by campus. Table B2 shows the changes in graduation rates for underrepresented minority (URM) students and white and Asian (non-URM) students. For example, at CSU San Bernardino, in 2008, Latino, African American, and American Indian students had a graduation rate of 41.3 percent, but that improved to 51.8 percent by the 2015 cohort. At the same time, white and Asian students saw their graduation rate improve from 48.3 percent to 53.0 percent, for a change of 4.7 percentage points.

TABLE B2

Graduation rate growth among underrepresented minority students by campus

Campus	URM 2008 Cohort	URM 2015 Cohort	URM Difference	Non-URM 2008 Cohort	Non-URM 2015 Cohort	Non-URM Difference
Fresno	38.0%	55.4%	17.4%	54.6%	62.4%	7.9%
Long Beach	47.8%	64.3%	16.5%	58.0%	71.1%	13.1%
Los Angeles	27.4%	41.7%	14.2%	37.5%	58.1%	20.7%
Chico	42.9%	56.7%	13.8%	57.9%	66.3%	8.4%
Fullerton	43.8%	56.7%	12.8%	52.4%	66.8%	14.4%
Northridge	34.0%	45.8%	11.8%	46.6%	57.6%	10.9%
Pomona	43.7%	55.5%	11.8%	53.7%	70.0%	16.2%
San Jose	32.3%	44.1%	11.7%	44.3%	61.9%	17.6%
Maritime Academy	50.0%	61.5%	11.5%	66.4%	56.4%	-9.9%
San Francisco	33.7%	44.4%	10.7%	47.5%	55.5%	8.0%
San Bernardino	41.3%	51.8%	10.5%	48.3%	53.0%	4.7%
Sonoma	42.8%	52.3%	9.5%	52.2%	60.4%	8.3%
San Marcos	41.1%	50.4%	9.3%	49.0%	53.5%	4.5%
San Diego	54.9%	62.3%	7.3%	63.4%	71.7%	8.2%
Humboldt	29.0%	36.0%	6.9%	46.8%	50.6%	3.8%
Monterey Bay	48.6%	54.9%	6.3%	33.9%	52.6%	18.7%
Sacramento	34.4%	40.6%	6.2%	43.9%	49.4%	5.6%
San Luis Obispo	60.3%	66.5%	6.1%	70.9%	77.8%	6.9%
East Bay	31.8%	37.2%	5.4%	52.9%	51.4%	-1.4%
Stanislaus	48.1%	52.1%	4.0%	54.5%	56.8%	2.3%
Dominguez Hills	35.1%	34.5%	-0.6%	37.0%	45.3%	8.3%
Bakersfield	43.5%	39.7%	-3.8%	47.9%	41.8%	-6.1%
Channel Islands	-	52.2%	-	-	58.0%	-
System-wide	39.8%	50.1%	10.3%	53.7%	63.1%	9.3%

SOURCES: CSU Analytic Studies.

NOTES: Table sorted by URM difference. Graduation rates are from the entering cohorts of first-time freshmen of the 2008 and 2015 graduating cohorts. URM students include African American, Latino, and American Indian students. Non-URM students include white, Asian, and Pacific Islander students. Channel Islands was a new campus as of fall 2003 and did not have a six-year graduation goal, but the campus is included in the system-wide calculations.

Table B3 shows the changes in graduation gaps by campus. At CSU San Bernardino, for example, in 2008, white and Asian students had a graduation rate that was 7 percentage points higher than Latino, African American, and American Indian students. In 2015, that gap was only 1.3 percentage points, meaning the campus narrowed its graduation gap by 5.7 percentage points. Note that Maritime Academy had fewer than 20 underrepresented minority students in the 2008 graduation cohort, and fewer than 30 in the 2015 cohort—its graduation gap fluctuates due to these small numbers. The other campuses all have hundreds of underrepresented minority students, and their gaps are more stable. Still, several campuses saw their gaps close, while other saw their gaps grow over the course of the initiative.

TABLE B3
Changes in graduation gap by campus

Campus	Graduation gap 2008	Graduation gap 2015	Change in graduation gap
Maritime Academy	16.4%	-5.1%	-21.5%
Fresno	16.6%	7.1%	-9.5%
East Bay	21.1%	14.2%	-6.8%
San Bernardino	7.0%	1.3%	-5.7%
Chico	15.0%	9.5%	-5.4%
San Marcos	8.0%	3.2%	-4.8%
Long Beach	10.2%	6.8%	-3.4%
Humboldt	17.8%	14.7%	-3.1%
San Francisco	13.8%	11.1%	-2.7%
Bakersfield	4.5%	2.1%	-2.3%
Stanislaus	6.4%	4.7%	-1.7%
Sonoma	9.4%	8.1%	-1.3%
Northridge	12.7%	11.8%	-0.9%
Sacramento	9.4%	8.8%	-0.6%
San Luis Obispo	10.5%	11.3%	0.8%
San Diego	8.5%	9.4%	0.9%
Fullerton	8.6%	10.2%	1.6%
Pomona	10.0%	14.5%	4.4%
San Jose	12.0%	17.8%	5.9%
Los Angeles	10.0%	16.5%	6.4%
Dominguez Hills	1.8%	10.8%	9.0%
Monterey Bay	-14.6%	-2.3%	12.4%
Channel Islands	-	5.8%	-
System-wide	14.0%	13.0%	-1.0%

SOURCES: CSU Analytic Studies.

NOTES: Differences from Table B1. Channel Islands was a new campus as of fall 2003 and did not have a six-year graduation goal, but the campus is included in the system-wide calculations.

Appendix C. Data Collection of Campus Strategies

We relied on two data sources to investigate campus plans related to the 2015 Graduation Initiative: institutional documents and interviews with campus leaders. First, the CSU website has information on the 2015 Graduation Initiative and breaks down the plans by campus. All but six campuses have published their delivery plans online and these plans are publicly available on institutional websites. Most of these plans were produced in late 2009 or early 2010, but CSU Los Angeles and CSU East Bay did not have a plan released with a date earlier than May 2011 and July 2014, respectively.

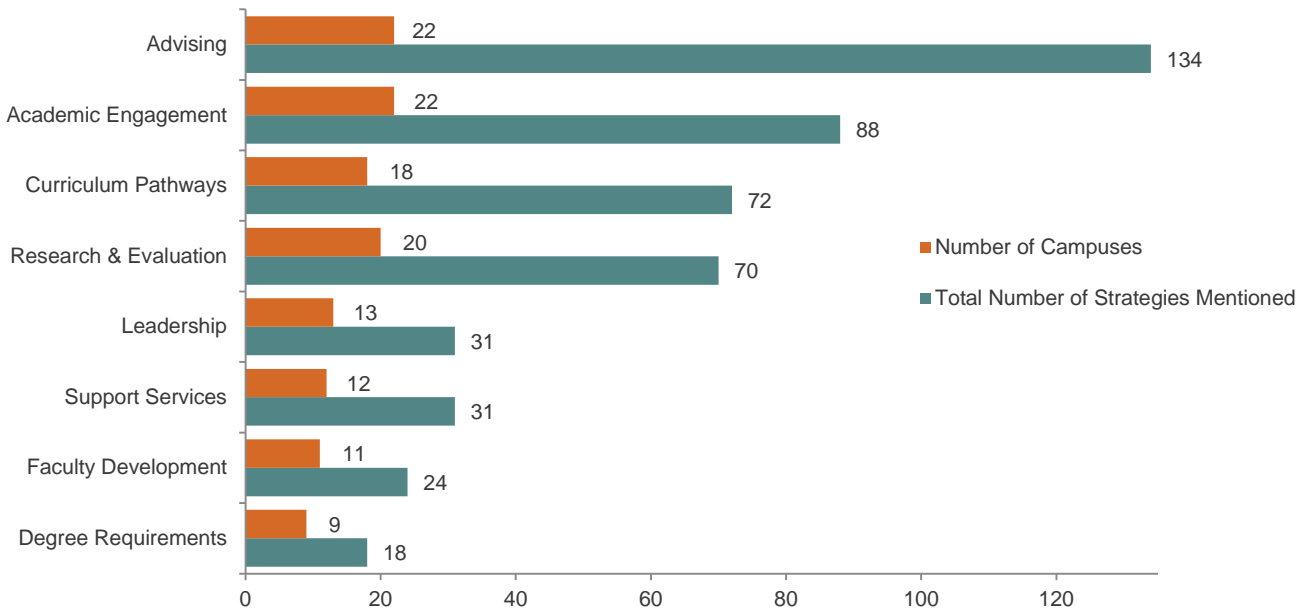
Interviews revealed that campuses often developed plans early in the process. As a result, some of the listed programs were altered or discontinued, and new programs added. Nevertheless, the plans shed light on the goals of campus policies and programs. We catalogued the programs outlined in each campus plan into nine groups, based on the categories from the CSU Graduation Initiative website:

1. **Academic engagement:** engaging students in academic development
2. **Advising:** improving in-person and virtual advising by improving policy, communication, and advising systems
3. **Curriculum pathways:** improving student engagement and success through the academic curriculum for prospective and current students
4. **Degree requirements:** changing degree requirements to improve efficiencies and student success
5. **Faculty development:** working with faculty to improve academic systems and to increase professional development
6. **Leadership:** improving collaboration across divisions
7. **Research and evaluation:** collecting and evaluating data to improve understanding of issues as they pertain to retention and closing the achievement gap
8. **Support services:** providing services that improve student support
9. **Other:** strategies unrelated to any of the above, including, for example, recruitment or admissions practices

Figure C1 presents the frequency with which each of the above categories (excluding other) was mentioned in the campus plans.

FIGURE C1

CSU employed a diverse set of strategies, with a heavy focus on advising and academic engagement



SOURCES: Campus websites, CSU Chancellor’s Office website.

NOTE: Authors’ calculations from plans and interviews.

Campus Outreach and interviews

We interviewed campus leaders—including deans and vice presidents of undergraduate studies, various vice presidents, officials from institutional research, associate vice provosts, and a campus president—and two officials with specific knowledge about the Graduation Initiative from the Chancellor’s Office. We spoke with representatives from 13 campuses: Fresno, Fullerton, Humboldt, Long Beach, Los Angeles, Marcos, Monterey Bay, Northridge, Sacramento, San Diego, San Francisco, San Jose, and San Luis Obispo. Most, if not all, of the campuses had created a steering committee responsible for overseeing efforts related to the initiative, with the provost typically acting as the main leader. However, due to high turnover in the provost position across campuses, we interviewed other individuals critical in the development and implementation of the campus plans.



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