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ABSTRACT

A profile of graduation rates and time-to-degree was generated for undergraduates entering California State University in fall 1978 or fall 1979, as first-time freshmen (n=53,445) and community college transfer students (n=44,992). The profile analyzes: (1) the proportion of new students who ultimately graduate; (2) the distribution of degrees over time; (3) the average time-to-degree for new students; and (4) the extent to which time-to-degree is prolonged by the stop-out phenomenon (leaving school for one or more terms). Sixty percent of all upper division transfer students and nearly half of all first-time freshmen emerged with baccalaureate degrees. Twelve percent of the transfer students took 6 years or longer to earn their degree, and 10 percent of the freshmen took 8 years or longer. The average elapsed time to degree was about 3.5 years for transfers and 5.5 years for freshmen. Stopping out contributed half of a year to the elapsed time among transfers and added two-thirds of a year to the elapsed time among freshmen. These findings represent benchmarks for a public university with moderately selective admission requirements. (JDD)

California State University, Office of the Chancellor, Division of Analytic Studies, May 26, 1994

GRADUATION AND TIME TO DEGREE
A Research Note From The California State University*

Philip Garcia

PAPER PRESENTED AT THE ANNUAL FORUM OF THE ASSOCIATION FOR INSTITUTIONAL RESEARCH, NEW ORLEANS, MAY 29-JUNE 1, 1994.

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Jean Endo
Editor
Forum Publications

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At what rate do students earn bachelor's degrees? Certainly, this is now one of the most frequently asked questions of administrators in higher education. Even Congress wants an answer. In 1991, it passed the Student Right-to-Know and Campus Security Act which mandates that each college and university receiving federal funds disclose, in the very near future, a graduation rate for all full-time, degree-seeking freshmen. So the rush is on to generate an annual graduation rate that can be compared across institutions. But buyers and sellers beware! Odds are a single rate will not satisfy the array of inquiring parties.

The foremost problem is how to specify the element of time. Not all students graduate within the same time frame, but all graduation rates are bound to a single time interval. To illustrate this problem, let us compare 5-year and 10-year graduation rates for first-time freshmen who entered the California State University (CSU) in fall 1978:

5-Year Rate	10-Year Rate
29.6%	44.6%

What if readers were limited to just the 5-year graduation rate? In this situation, some could come away thinking only about 1 in 3 freshmen earned bachelor's degrees. The 10-year rate indicates that nearly 1 in 2 freshmen earned a degree. Oppositely, what if readers were limited to just the 10-year rate? In this instance, everyone would have a more accurate view of how many students actually graduate, but no one would have any idea about when students graduate. This is the crux of the problem. What most readers really want to know is how many students eventually graduate *and* how long does it take? No individual rate can simultaneously convey these two quantities.

The remedy, of course, is to monitor degree attainment over the number of years necessary to capture all graduation events, and to describe both the dispersion and centrality of when students earn baccalaureates. This is what we have done for cohorts of CSU students. The findings represent a set of baseline observations for 1) the proportion of new students who ultimately graduate, 2) the distribution degrees over time, 3) the average time-to-degree for new students, and 4) the extent to which time-to-degree is prolonged by the stop-out phenomenon—leaving school for one or more terms. We end our statistical description with some preliminary results on what student characteristics are causally related to extended time-to-degree, and a brief discussion on the trend in time-to-degree.

DATA AND METHODS

A complete profile on graduation rates and time-to-degree were generated from a combined dataset representing two adjacent cohorts of new undergraduates: those who entered the CSU in fall 1978 or fall 1979. These pooled observations include 53,445 first-time freshmen and 44,992 community college transfers who entered the CSU with at least 56 transferable units. Separate statistics were computed for each of these admissions' groups. A partial profile on graduation rates were generated in the same manner for the combined fall 1983/84 cohort and the fall 1987 cohort.

In all cases, graduation rates were computed by dividing the number of degrees earned within a specified time period by the original size of the cohort. The total observation time was confined to twelve-years, or twenty-four semesters. Findings from retrospective analysis of graduating classes suggest that 98 percent of CSU graduates earn their baccalaureates within a 12-year span. Thus, for the CSU, the 12-year graduation rate is essentially equal to the true eventual graduation rate.

To simplify the analysis, the observations from tri-semester and quarter campuses were modified to reflect the calendar for semester campuses. That is, graduation events that occurred in the winter term were assigned to the first half of the academic year, and graduation events that occurred in the summer term were assigned to the second half. This smoothing of the data did not alter measures of central tendency; for example, the collapsed categories for the academic calendar produce the same arithmetic means for elapsed time-to-degree (i.e., graduation date minus matriculation date) as the original categories.

RESULTS

Graduation Rates

Table 1 displays the annual graduation rates for first-time freshmen and upper division transfers for the 12-year observation period. The rates indicate there were 608 graduates per 1,000 new transfers and 468 graduates per 1,000 new freshmen. The higher rates for transfers should be expected because they are not a random group of new undergraduates. These transfers are survivors of the lower division college curriculum.

TABLE 1. CSU Graduation Rates for Selected Elapsed Times by Admission Basis

Elapsed Time in Years	Upper Division Transfers	First-Time Freshmen
0.0-1.0	0.005	0.000
1.1-2.0	0.169	0.001
2.1-3.0	0.404	0.006
3.1-4.0	0.499	0.096
4.1-5.0	0.542	0.283
5.1-6.0	0.565	0.372
6.1-7.0	0.579	0.411
7.1-8.0	0.589	0.432
8.1-9.0	0.596	0.445
9.1-10.0	0.601	0.455
10.1-11.0	0.605	0.462
11.1-12.0	0.608	0.468

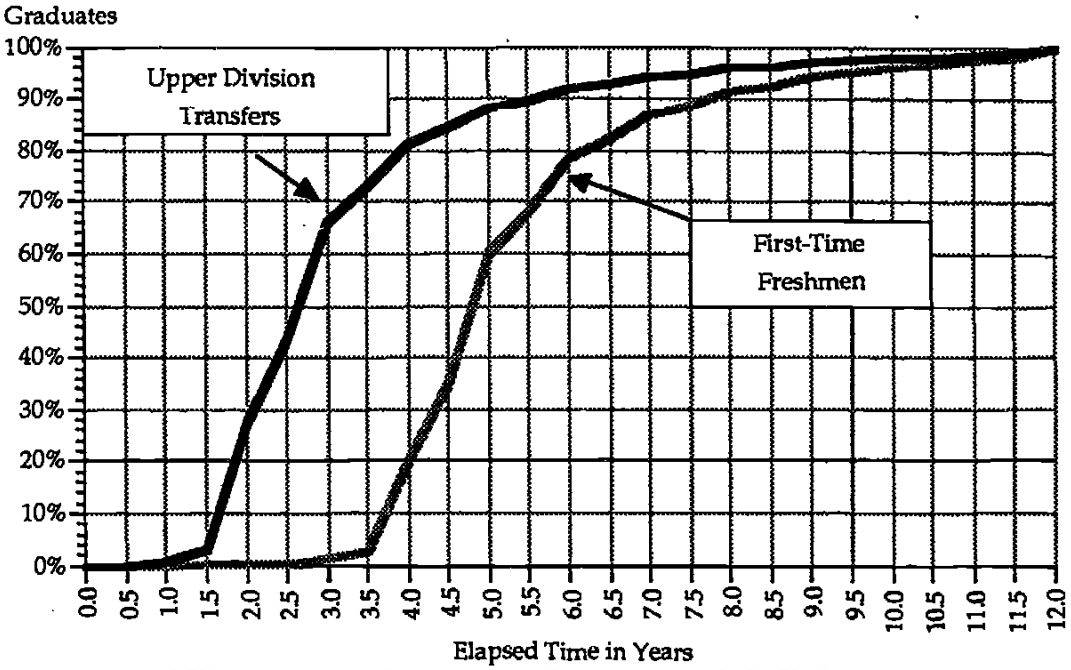

FIGURE 1. The Cumulative Percentage of CSU Graduates by Elapsed Time and Admission Basis

The traditional templates for time-to-degree suggest that most transfers should graduate after two years of enrollment and most freshmen should graduate after four years. The figures in table 1 suggest the majority of new undergraduates who entered the CSU in the late 1970s did not fit either template.

A clearer picture of when transfers and freshmen earn their baccalaureates can be extracted from figure 1, which graphs the cumulative percentage of graduates who emerged from each cohort. The transfer plots indicate that 27 percent of all degrees were conferred by the 2-year maker, 66 percent at the 3-year marker, and 81 percent by the 4-year marker. The freshmen plots indicate that 20 percent of all degrees were conferred by the 4-year maker, 60 percent by the 5-year marker, and nearly 80 percent by the 6-year marker.

Although most CSU graduates do take longer to earn degrees than expected, it not the case that they take twice as long as the assumed ideal. The majority of the graduation events occur around the 3- and 5-year markers. For example, the median or mode for transfers is the 3-year marker; and the median or mode for freshmen is the 5-year marker. On average, elapsed time-to-degree for transfers and freshmen is 3.5 years and 5.6 years, respectively. So the differences between the traditional templates and the observed CSU templates for time-to-degree from these analyses of percentage distributions appear to be about 1-1.5 years.

Elapsed vs. Enrolled Time

The basic recipe for completing an undergraduate degree program within the 2- and 4-year templates for time-to-degree is to maintain continuous enrollment and to earn more than 30 semester units each academic year. In table 2, the average elapsed time for both transfers and freshmen has been partitioned into the average time it took to complete each 30-unit increment and the average time students took off (i.e., stop-out time). The listed averages indicate that CSU

undergraduates take longer to graduate than expected because they lack both ingredients of the basic recipe.

A big reason time-to-degree at the CSU is longer than expected is because its students take time off. Among the upper division transfers, 29.4 percent of the eventual graduates took at least one term off before they received their baccalaureates. Moreover, fully 67.8 percent of the graduates from the freshmen cohorts took at least one term off. Among transfers, stop-out behaviors peaks at the third fall term after entry; among freshmen, stop-out behaviors peaks at the fifth fall term after entry (see figure 2).

All toll, the average stop-out time for transfers was equal to one semester term per student, and the average for freshmen was equal to two tri-semester terms per student. But even if CSU students had refrained from taking time off, their average time-to-degree still would be longer than the 2- and 4-year markers associated with the traditional templates for transfers and freshmen.

Both transfers and freshmen, on average, require nearly three semesters to complete their first set of 30 units; and both need at least a full three semesters to complete their senior year. The drawn out first year suggests that upon entry many students within each undergraduate group experience an immediate period of adjustment. The extended senior year suggests that many students are unwilling or unable to complete degree requirements within the commonly accepted time span.

The summed mean values associated with each of the four class levels give us another view about graduation time at the CSU. When we consider just the average time enrolled at the university—3.0 years for transfers and 4.9 years for freshmen—the differences between the traditional templates and the observed CSU templates for time-to-degree now appear to be only one year.

TABLE 2. The Components of Elapsed Time by Admission Basis

Components	Upper Division Transfers	First-Time Freshmen
0-30 units (Freshman Year)		1.3
31-60 units (Sophomore Year)		1.0
61-90 units (Junior Year)	1.3	1.1
91-124 or more units (Senior Year)	1.7	1.5
Stopped Out	0.5	0.7
Total Elapsed Time	3.5	5.6

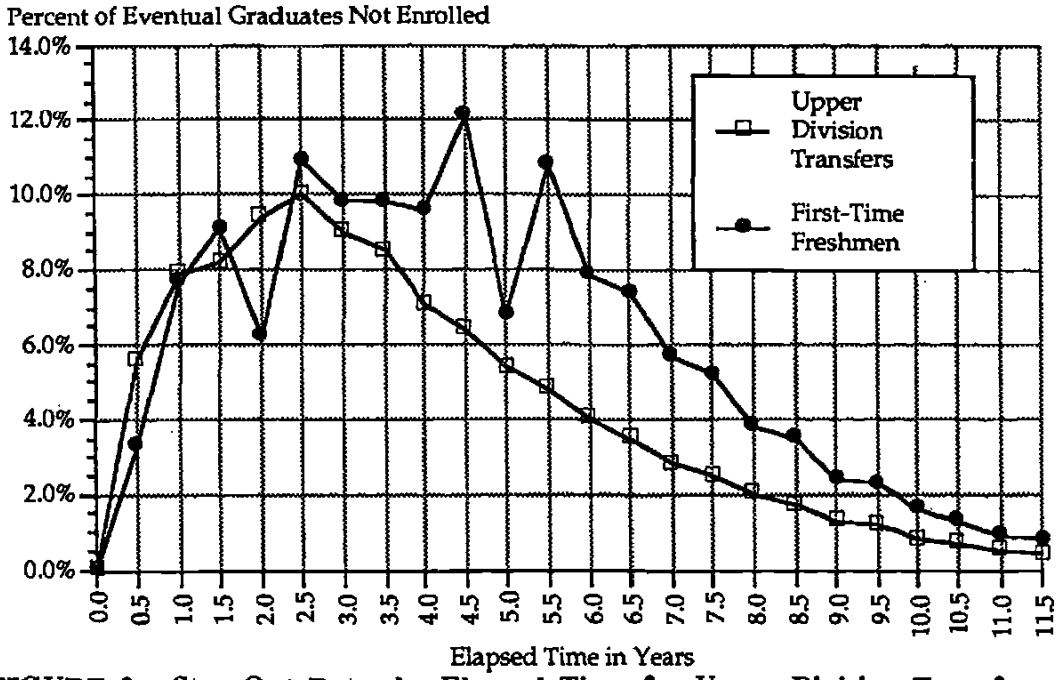

FIGURE 2. Stop-Out Rates by Elapsed Time for Upper Division Transfers and First-Time Freshmen

Factors Affecting Elapsed Time

The answer to why transfers and freshmen take more than two or four years to earn bachelor's degrees is naturally a multivariate response, and the obstacles to a shorter graduation time are numerous. For instance, students who complete just 12 units a semesters are fated to a six-year degree. CSU students pursuing science, engineering, and agricultural degrees often must complete total unit loads that go well beyond the traditional 124 semester unit standard. Students who enter the university as undeclared majors may have to participate in more prerequisite courses than others. Students who change from one discipline to another may have a more difficult time than others finishing their degree requirements. Moving from one campus to another may destine students to a longer than average academic career. Students who enter the university under special admission criteria may have to enroll in a battery of pre-college courses before they can attempt general education requirements. And the list goes on.

A glimpse at how these factors and others affect time-to-degree can be gleaned from the separate regression analyses summarized in tables 3 and 4. In each case, the dependent variable is elapsed time and the set of independent variables represent choices (negotiated or otherwise) which tend to lengthen academic careers or academic, age, ethnic and gender statuses associated with a greater inclination to leave college without earning a degree. The metric for all the independent variables is binary coding (1/0). Therefore, their mean values are equal to the proportion of the population who held each predictor characteristic.

TABLE 3. Regression Slopes (b_i) and Means ($\overline{X}_i$) for Predictors of Elapsed Time Upper Division Transfers

Predictor Variable	Variable Type	b_i	$\overline{X}_i$	$b_i\overline{X}$	$b_o + \sum_{i=1}^{m14} b_i\overline{X}_i$
Intercept—b_o		2.091			2.091
Stopped out	Choice	2.158	0.294	0.634	2.725

Attempted fewer than 12 units at entry	Choice	0.970	0.242	0.234	2.959
Attempted 12 to 15 units at entry	Choice	0.288	0.571	0.164	3.123
Changed discipline	Choice	0.687	0.172	0.118	3.241
Changed campus	Choice	0.830	0.083	0.069	3.310
Science, engineering, or agriculture degree	Choice	0.280	0.172	0.048	3.358
Undeclared major at entry	Choice	0.419	0.070	0.029	3.387
Male	Gender	0.056	0.492	0.028	3.415
Mexican American	Ethnic	0.156	0.043	0.007	3.422
Age less than 20 at entry	Age	0.175	0.020	0.004	3.426
African American	Ethnic	0.058	0.032	0.002	3.428
Other Latino	Ethnic	0.077	0.013	0.001	3.429
Pacific Islander	Ethnic	0.026	0.004	0.000	3.429
Special Admit	Academic	0.000	0.011	0.000	3.429
$R^2 = 0.393$					

To assess the impact of each of the 14 predictors, we computed the products of the regression slope and their corresponding mean values. These quantities reflect the unique contribution each determinant makes on the observed average elapsed time. The $b_i\overline{X}_i$ figures are listed in descending order of magnitude.

The figures in the right-hand columns represent the cumulative summation of the regression intercept and successive products of the corresponding regression slopes and means. So, for example, the portion of the upper division transfer cohorts composed only of students who did not possess any of the characteristics related to extended time-to-degree have average elapsed time equal to their traditional template—2.0 years. Because about 30 percent of the graduates take an average of two years off, elapsed time rises to 2.7 years. And since one fourth of the students, at entry, took less than 12 units and another one half took just 12-15 units, elapsed time rises to 2.9 years and then 3.1 years. In all, the "choice" variables account for nearly all the elapsed time beyond the 2-year marker.

For freshmen, the profile is somewhat similar. The segment of the freshmen cohorts consisting only of students who did not possess any of the characteristics related to extended time-to-degree have average elapsed time equal to their traditional template—4.0 years. Stop-out behavior raises the average to 4.7 years and the contribution of the rest of the "choice" variables raises it to 5.1 years. So, most of the elapsed time beyond the 4-year marker appears to be related to options students choose to exercise. But, unlike transfers, a significant portion of extended time is associated with age and gender statuses—0.42 years. Thus freshmen in general, and

TABLE 4. Regression Slopes (b_i) and Means ($\overline{X}_i$) for Predictors of Elapsed Time First-Time Freshmen

Predictor Variable	Variable Type	b_i	$\overline{X}_i$	$b_i\overline{X}$	$b_0 + \sum_{i=1}^{i=14} b_i\overline{X}_i$
Intercept—b_0		4.040			4.040
Stopped out	Choice	0.981	0.678	0.665	4.705
Age fewer than 20 at entry	Age	0.331	0.969	0.321	5.026
Attempted 12 to 15 units at entry	Choice	0.267	0.662	0.177	5.203
Male	Gender	0.215	0.451	0.097	5.300
Undeclared major at entry	Choice	0.286	0.249	0.071	5.371
Changed entering discipline	Choice	0.214	0.327	0.070	5.441
Science, engineering, or agriculture degree	Choice	0.199	0.243	0.048	5.489
Attempted less than 12 units at entry	Choice	0.524	0.064	0.034	5.523

Special admit	Academic	0.328	0.079	0.026	5.549
Mexican American	Ethnic	0.350	0.045	0.016	5.565
African American	Ethnic	0.278	0.036	0.010	5.575
Other Latino	Ethnic	0.220	0.013	0.003	5.578
Pacific Islander	Ethnic	0.015	0.004	0.000	5.578
Changed campus	Choice	0.000	0.140	0.000	5.578
$R^2 = 0.651$					

males in particular, are very likely to take at least nine semesters to earn baccalaureates, even in the absence of the other time-extending characteristics.

Factors Affecting Stop-Out Time

Since stop-out time was such an important part of elapsed time-to-degree, we regressed the remaining 13 independent variables on observed stop-out time to get an idea about what kind of traits drive the decision to discontinue enrollment. Here, stop-out activity is viewed as an intervening variable. So whereas the regression statistics in tables 3 and 4 denote the *direct* impact of the predictor variables on elapsed time-to-degree, the regression statistics in table 5 and 6 denote their *indirect* impact on elapsed time-to-degree via stop-out behavior (see appendix figures A and B for displays of the two-stage model with path coefficients).

Again, the singular contribution of each of the 13 predictor variables on the mean value for the dependent variable was assessed by examining the products of the regression slopes and their corresponding mean values. All the components of the average transfer and freshmen stop-out times are listed in tables 5 and 6.

For both transfers and freshmen, the two factors contributing most to the observed stop-out mean values were changing disciplines and changing campuses. Thus discontinuing enrollment appears to be partially related to significant disruptions or transitions in study among sizable numbers of undergraduates. It also appears that transfers who began their university study by taking less than full-time course loads (i.e., fewer than 12 units) or freshmen who began as undeclared majors were also over-represented among those who stopped out.

TABLE 5. Regression Slopes (b_i) and Means ($\bar{X}_i$) for Predictors of Stop-Out Time
Upper Division Transfers

Predictor Variable	Variable Type	b_i	$\bar{X}_i$	$b_i\bar{X}$	$b_0 + \sum_{i=1}^{i=13} b_i\bar{X}_i$
Intercept—b_0		0.184			0.184
Changed entering discipline	Choice	0.543	0.172	0.093	0.277
Changed campus	Choice	1.083	0.083	0.090	0.367
Attempted fewer than 12 units at entry	Choice	0.311	0.242	0.075	0.442
Attempted 12 to 15 units at entry	Choice	0.042	0.571	0.024	0.466
Undeclared major at entry	Choice	0.272	0.070	0.019	0.485
Male	Gender	0.023	0.492	0.011	0.497
Science, engineering, or agriculture degree	Choice	0.023	0.172	0.004	0.500
African American	Ethnic	0.118	0.032	0.004	0.504
Mexican American	Ethnic	0.054	0.043	0.002	0.507
Age less than 20	Ethni..	0.036	0.020	0.001	0.507
Other Latino	Ethnic	-0.006	0.013	0.000	0.507
Pacific Islander	Ethnic	-0.048	0.004	0.000	0.507
Special admits	Academic	0.000	0.011	0.000	0.507

$R^2 = 0.094$

Changes in Time-to-Degree

The call from some quarters of academia is that time-to-degree is lengthening. Monitors of this phenomenon recognize two distinct shifts in student behavior. The first shift is that students who originally planned to graduate in two or four years are taking longer. One rough way to check for this shift is to identify declines in the proportion of eventual graduates who earn degrees within 2-3 years or 4-5 years. The assumption is that these graduates have the academic and financial wherewithal to earn degrees within the boundaries of the traditional templates.

TABLE 6. Regression Slopes (b_i) and Means ($\overline{X}_i$) for Predictors of Stop-Out Time
First-Time Freshmen

Predictor Variable	Variable Type	b_i	$\overline{X}_i$	$b_i\overline{X}$	$b_0 + \sum_{i=1}^{i=13} b_i\overline{X}_i$
Intercept—b_0		0.257			0.257
Changed campus	Choice	1.031	0.140	0.145	0.401
Changed entering discipline	Choice	0.259	0.327	0.085	0.486
Undeclared major at entry	Choice	0.214	0.249	0.053	0.539
Attempted 12 to 15 units at entry	Choice	0.068	0.662	0.045	0.584
Male	Gender	0.071	0.451	0.032	0.616
Attempted fewer than 12 units at entry	Choice	0.442	0.064	0.028	0.644
Special admit	Academic	0.179	0.079	0.014	0.659
Science, engineering, or agriculture degree	Choice	0.048	0.243	0.012	0.670
Mexican American	Ethnic	0.138	0.045	0.006	0.676
African American	Ethnic	0.161	0.036	0.006	0.682
Other Latino	Ethnic	0.110	0.013	0.001	0.684
Pacific Islander	Ethnic	0.030	0.004	0.000	0.684
Age less than 20 at entry	Age	-0.011	0.969	-0.010	0.673

$R^2 = 0.083$

TABLE 7. Graduation Rates by Elapsed Time for Selected Cohorts of Upper Division Transfers and First-Time Freshmen

Elapsed Time	Upper Division Transfers 1978/79	Upper Division Transfers 1983/84	Upper Division Transfers 1987	Elapsed Time	First-Time Freshmen 1978/79	First-Time Freshmen 1983/84	First-Time Freshmen 1987
2.0	0.169	0.110	0.118	4.0	0.096	0.067	0.066
2.5	0.266	0.194	0.205	4.5	0.163	0.127	0.127
3.0	0.403	0.346	0.368	5.0	0.283	0.273	0.278
Cohort Size	44,992	47,741	14,261	Cohort Size	53,455	50,589	30,391

Table 7 lists 2-year through 5-year graduation rates for transfers and freshmen across cohorts who entered the CSU at three different dates. The rate differences between the 1978/79 and 1983/84 cohorts imply that there was a slight increase in the average time-to-degree for both undergraduate groups. Clearly a smaller proportion of the younger transfers graduated within two years and a smaller proportion of the younger freshmen graduated within four years. Contrasts between the 1983/84 and 1987 cohorts, however, imply that the lengthening did not persist into the latter part of the decade.

Despite the decreases in early graduates, it is all but certain that the majority of 1983/84 and 1987 transfers will earn degrees in 3 years or less and the majority of comparable freshmen will earn degrees in 5 years or less, just like the graduates from the 1978/79 cohorts. For this not to be the case, the 12-year graduation rate for transfers would have to soar from 608 per 1,000 to 736 per 1,000, and the freshmen rate would have to climb from 468 per 1,000 to 556 per 1,000.

The second student shift that can lead to lengthened time-to-degree is in fact improved persistence to degree. Higher graduation rates from year-to-year usually reflect some success with students who under previous regimes would have been drop outs. Therefore, to the extent this occurs, average time-to-degree will rise as graduation rates rise. We have contrasted 8 years of graduation rates from the 1983/84 cohort with the 12 years of graduation rates from the 1978/79 cohorts to detect the prospect of higher rates. The rates for upper division transfers and first-time freshmen are plotted in figure 3.

The prognosis for upper division transfers is only a meager gain in eventual graduation rates between the two sets of combined cohorts—maybe one percentage point. On the other hand, the prognosis for first-time freshmen is a 4-5 percentage point gain, with most of the improvement taking place at the 6-year marker and after. Consequently, average time-to-degree among first-time freshmen will undoubtedly be higher in the 1980s than it was in the 1970s. Most of the increase, however, will be associated with greater persistence on the part of degree-seeking students.

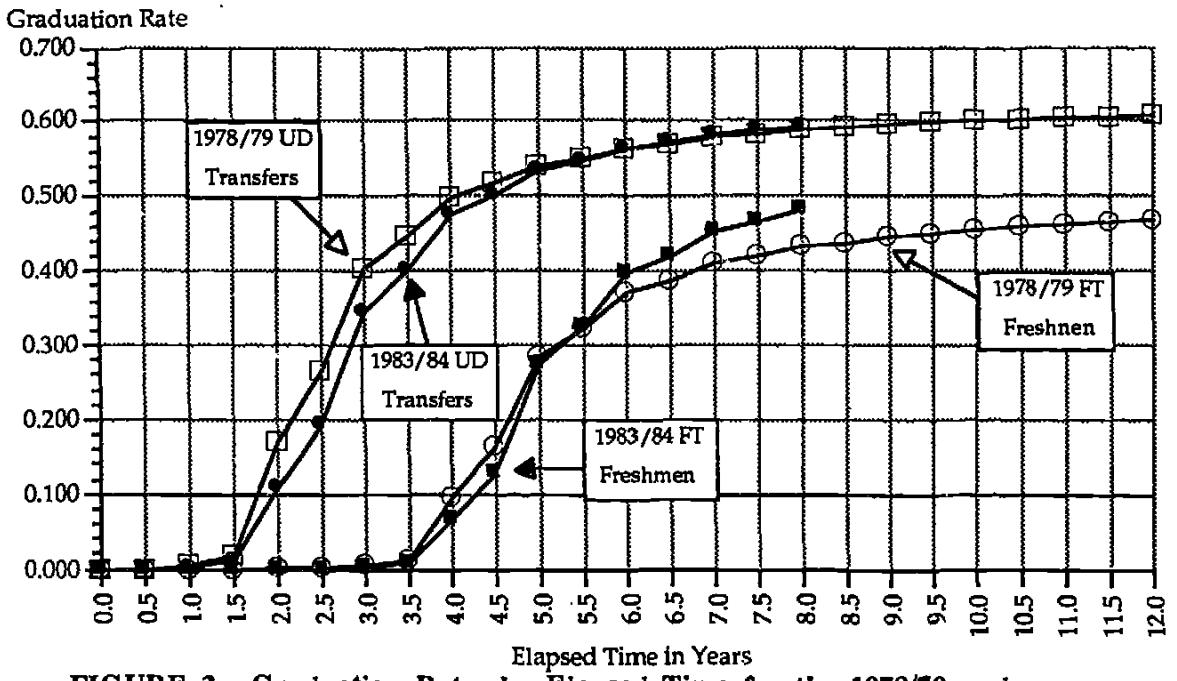

FIGURE 3. Graduation Rates by Elapsed Time for the 1978/79 and 1983/84 Cohorts of Upper Division Transfers and First-Time Freshmen

Discussion

In summary, sixty percent of all upper division transfers and nearly half of all first-time freshmen emerged from the fall 1978 or fall 1979 cohorts of new CSU students with baccalaureates. Each group contained a small segment of students who showed die-hard persistence. For example, 12 percent of the transfers who graduated took 6 years or longer to earn their degree, and 10 percent of the freshmen who graduated took 8 years or longer. The average

elapsed time-to-degree was about 3.5 years for transfers and 5.5 years for freshmen. Stopping out contributed half of a year to the elapsed time among transfers and added two-thirds of a year to the elapsed time among freshmen.

These findings represent benchmarks for a public university with moderately selective admission requirements. The CSU draws most of its transfers from the pool of California community college students who earn at least 56 transferable units and maintain a 2.0 grade point average or better, and it attracts most its freshmen from the top one-third of the State's high school graduates. Campus policies also accommodate part-time attendance. For example, part-time students pay lower fees, class schedules include significant numbers of night classes, and there are no time limits on how long a student may remain an undergraduate.

The description of the CSU data also highlights some important points about how to assess graduation and time-to-degree. First, estimates of time-to-degree should be based on panel data for well defined cohorts of entering students—for example, freshman and transfer data always should be analyzed separately. Second, sufficient longitudinal observations need to be gathered so the bulk of the graduation activity is present in all calculations. Graduation rates based on arbitrary cut-off dates will have only limited value. Third, a distinction should be made between elapsed time and enrolled time. Many students may delay their graduation date by stopping out for one term or more. And, fourth, indicators of time-to-degree may rise as a result of increasing graduation rates. Thus, increasing averages for time-to-degree do not necessarily signal bad news.

Lastly, the analyses suggest that analysts should be wary of simple contrasts between current time-to-degree observations and the traditional 2- and 4-year templates for earning baccalaureates. The basic patterns of time-to-degree manifested by the 1978/79 cohorts were essentially the same as the patterns exhibited by cohorts of new CSU students who entered the CSU in fall 1973. So we ask: When were the 2- and 4-year templates the statistical norms? And for whom? Regardless if authoritative answers emerge or not, analysts are probably better served by establishing their own empirical benchmarks and pursuing new time-series observations.

The major task ahead for those who monitor baccalaureate attainment is the identification of a parsimonious set of variables that adequately predicts degree completion, and in turn explains variations in time-to-degree. Likely candidates are measures of academic preparation, unit requirements for individual majors, and unmet financial need or the desire to work while attending college. Armed with these multivariate data, analysts can begin to assess whether observed shifts in graduation rates or time-to-degree represent intrinsic changes in student behavior, or reflect changing student bodies and changing curricula.

*SAS programming was provided by George A. Corbett.

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APPENDIX FIGURES

Figure A Upper Division Transfers—Path Model of Time-To-Degree

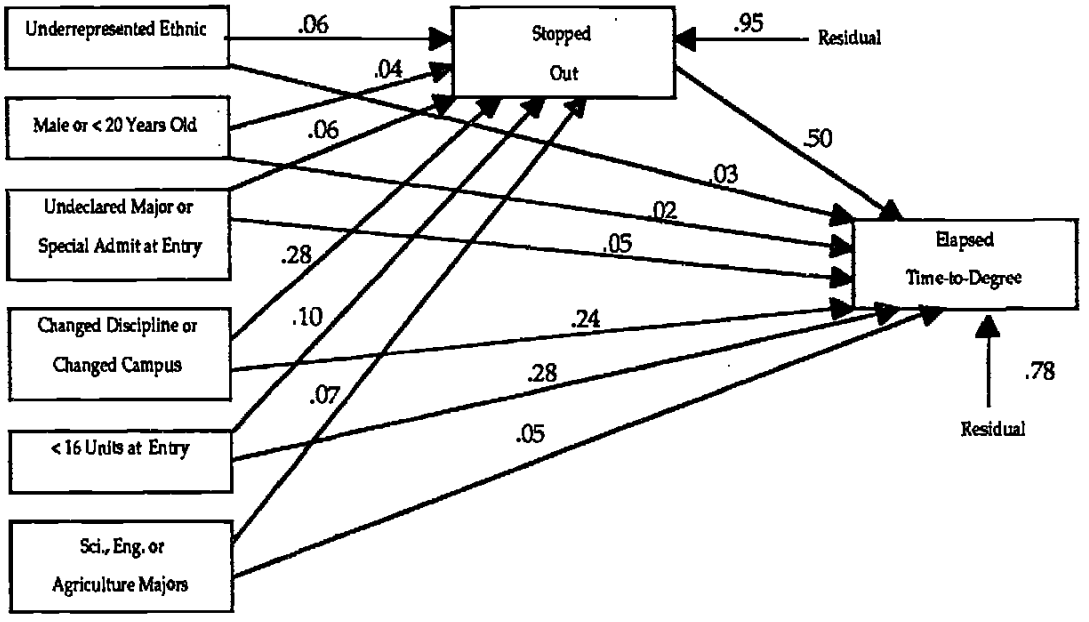
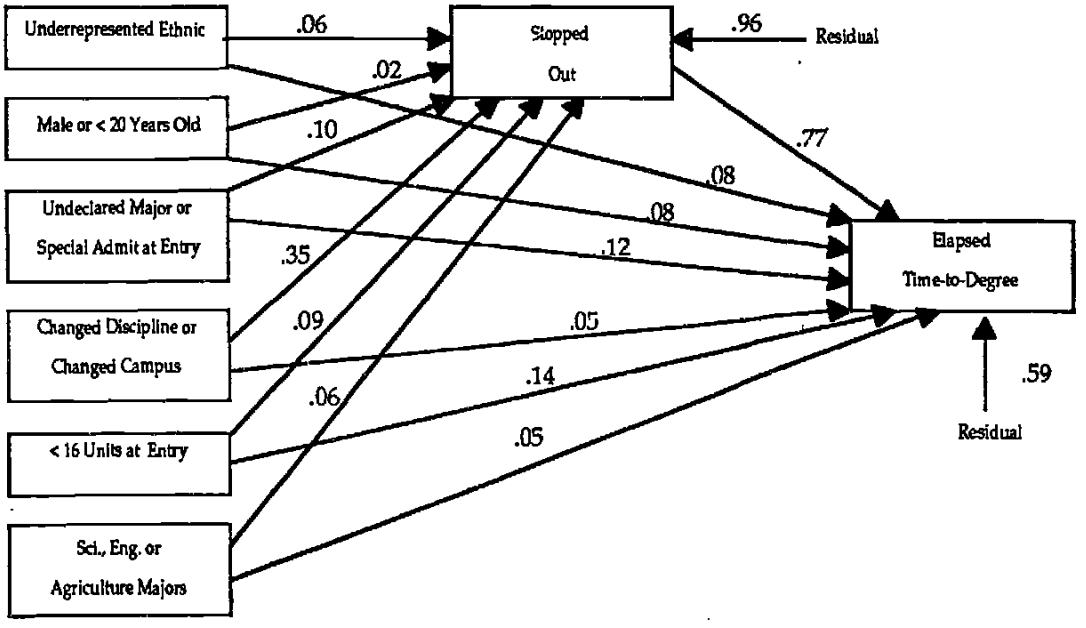


Figure B First-Time Freshmen—Path Model of Time-To-Degree



Notes: CSU data are from the 1978 and 1979 fall cohorts of new undergraduates;
Path coeficients equal b regression weights and residuals equal $\sqrt{1-R^2}$.