Distribution of Course Offering No-Pass Rates and Time-to-Degree Regression Models

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Overview

Exploratory data visualization techniques were used to investigate student success patterns for the 2012-2013 and 2013-2014 academic years. Large course offering no-pass rates were plotted by the number of overall course offerings (expressed as a percentage) for this period, and the data were disaggregated to compare student populations. This analysis revealed apparent disparities by underrepresented minority (URM) status, Pell Grant recipient status, and gender. Results suggest that certain groups of students are experiencing disproportionately high fail rates (i.e., those greater than or equal to 5%). These findings provided a foundation for further exploration and data analysis. Multivariate linear regression models associated time-to-degree to students' academic performance and their frequency of course retakes. Time-to-degree analyses of freshmen and transfers completing in 2012-13 and 2013-14 suggest that the strongest predictors were academic performance (GPA) and course retakes, followed by student demographics and academic program descriptors (i.e., academic discipline and number of majors completed).

Distribution of Course Offering No-Pass Rates Data Analysis

The institutional data used in this analysis included undergraduate course offering information for the 2012-2013 and 2013-2014 academic years. These data were used to generate a summary statistic representing the percentage of failing students at the course offering level. Throughout this report, this composite variable is referred to as the course *no-pass (NP) rate*. It is defined as the sum of students receiving final course grades of D, F, NP (no pass), and U (unsatisfactory) divided by the overall number of students awarded traditional grades (A+ through F), P/NP (pass/no pass), S/U (satisfactory/unsatisfactory), I, R, DR, L, or NR, at the course offering level. For the purposes of this study, courses that were primarily offered on a P/NP or S/U basis were

excluded. The grade options W (withdrawal) and IP (in progress) were not considered in this or any other analyses. There were 2,964 course offerings that enrolled 50 or more students and met these criteria.

As one goal of the analysis was to explore disparities in academic outcomes for certain demographic categories of students (focal groups), student background characteristics were used to disaggregate course offering no-pass rates. Course performance of the following populations was then compared using data visualization: underrepresented minority students (URMs) and their non-underrepresented peers[1] (non-URMs), males and females, and Pell Grant recipients, as defined by receipt of a federal Pell Grant during the term of the course offering, and non-Pell Grant recipients. In this study, receipt of a Pell Grant is used as a proxy for low socioeconomic status (SES). The student information system data collected and analyzed for these studies describe entire populations, with no sampling processes employed. As a consequence, significance tests comparing subgroups were not performed, "since the probability relation of a sample and a population is by definition unity when they are the same" (Morrison and Henkel, 1970, p. 189; Cowger, 1984 and 1985).

Using data visualization software (©Tableau Software), a series of two-dimensional graphs were created by plotting course no-pass (NP) rates against the overall number of applicable course offerings. Only courses with at least 5 students of a particular sub-group (i.e., URM, females, Pell Grant recipients) were included; this explains the variation in numbers of course offerings across the analyses. Disaggregated student data in Figures B-2, B-3, and B-4 are shown as overlapping areas, each with its area assigned a contrasting transparent color. The X-axis values depict the overall percentages of students in a given course receiving NP grades, expressed in one-percent intervals. Percentages along the Y-axis represent relative quantities of courses by their respective NP rates. To create the graphs, the course NP rates for each disaggregated student group first were rounded and then the numbers of offerings for each rounded value were calculated, generating smooth graphs.

One factor to consider when interpreting the graphs' relationships to their underlying populations and the impact of different variables on fail rates is the magnitude of these populations. For example, the reason for the dips that make the graphs appear to misalign is the differential size of the two groups being graphed. A fail rate of 1% for a group suggests that with 100 members of that group present, 1 failed. Thus, for the Pell Grant recipient and URM student groups, there would be relatively few sections having that fail rate or lower (but still above zero), in light of how rare it would be to get such a large gathering of such a small group (e.g., 100 URM students) as part of a single offering.

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[1] Underrepresented minority students (URMs) include Black/African American, Hispanic, and Native American/Alaska Native students. Non-URMs include students who reported their race/ethnicity to the UCLA Registrar as White/Caucasian, Asian/Asian American, Pacific Islander, other, and no response.

Summary of Findings from Course Offering No-Pass Rates Data Analysis

Figures B-1 through B-4 each show a "spike" at the far left of the X-axis that represents a high percentage of total course offerings with NP rates at or below 1%. The shared area trailing to the right depicts an overall decline in the proportion of courses with increasingly higher overall course NP rates. The area to the right of the 5% NP rate marker represents the 34.2% of all large UCLA course offerings in which 5% or more students receive failing grades.

Figures B-2, B-3, and B-4 offer visual depictions of academic outcomes among various groups of students. The differences between focal and comparison groups are evident in Figures B-2 and B-4 where it is apparent that URMs and Pell Grant recipients were more likely to experience a higher NP rate for a greater percentage of courses. Specifically, 43.9% of the course offerings had a NP rate for URMs of 5% or higher, and 42.5% of course offerings had a NP rate for Pell Grant recipients of 5% or higher, in comparison to 29.4% for non-URMs and 29.3% for non-Pell Grant recipients, respectively.

Time-to-Degree Regression Models Data Analysis

The time-to-degree data calculated for this analysis were based on all degree earning undergraduates who entered the institution subsequent to fall 1998 and who completed their Bachelor's degree during 2012-13 and 2013-14. Elapsed regular session terms were used – counting students' matriculation through completion – for the time-to-degree statistic, which was the response variable for these analyses. Separate models were built for freshman entrants (n=8,662) and for transfer entrants (n=6,058), and the following variables were included the models:

- UC GPA, calculated to summarize the entire undergraduate career of the student; for freshmen, this averaged 3.32, and for transfers, this averaged 3.31
- Count of courses retaken during undergraduate study; for freshmen, this averaged 0.52, and for transfers, this averaged 0.32
- Count of separate major programs completed for degree (e.g., a double major would count as two); 7.2% of freshmen and 2.4% of transfers completed two or more programs
- Whether the student completed majors in Engineering and Applied Science (HSSEAS) and the Physical Sciences division, compared to other major programs; 21% of freshman completed degrees in these fields, compared to 18% of transfers
- URM status; 21% of both freshmen and transfers were URM
- Pell Grant recipient status (defined as the student ever receiving a federal Pell Grant during his or her studies); 38% of freshmen and 52% of transfers received Pell Grants

The models were built using a stepwise method, the academic performance (i.e., GPA and retaken course count) and major program variables entering in the first block, with the demographic variables entering in a second block.

Summary of Findings from Time-to-Degree Regression Models Data Analysis

Tables B-5a and B-6a describe the regression models. Academic performance data, specifically UC GPA, was the best predictor for time-to-degree. When students completed with a lower GPA, their time-to-degree is predicted to be longer. Further, retaking a greater number of courses also predicts a longer time-to-degree. Academic programs requiring more coursework (i.e., those in HSSEAS) or more patterns of required course to be sequentially completed (i.e., those in the Physical Sciences) were associated with longer time-to-degree, although Life Sciences, which also has sequenced courses, was not significant in this model. A similar relationship was found for the completion of multiple majors. After the models accounted for this variance, the demographic characteristics entered the equations, such that URM status was associated with longer time-to-degree for transfer students and Pell Grant recipient status was associated with longer time-to-degree for all undergraduate degree completers.

References

Cowger, C. D. (1984) Statistical Significance Tests: Scientific Ritualism or Scientific Method? *Social Services Review* 58: 358-371.

Cowger, C. D. (1985) Reply to Allen Rubin's Significance Testing with Population Data. *Social Services Review* 59: 520-522.

Morrison, D. E. and Henkel, R. E. (eds.) (1970) *The Significance Test Controversy*. Chicago: Aldine Publishing Co., p. 189.

Figure and Table Index

Figures and Tables
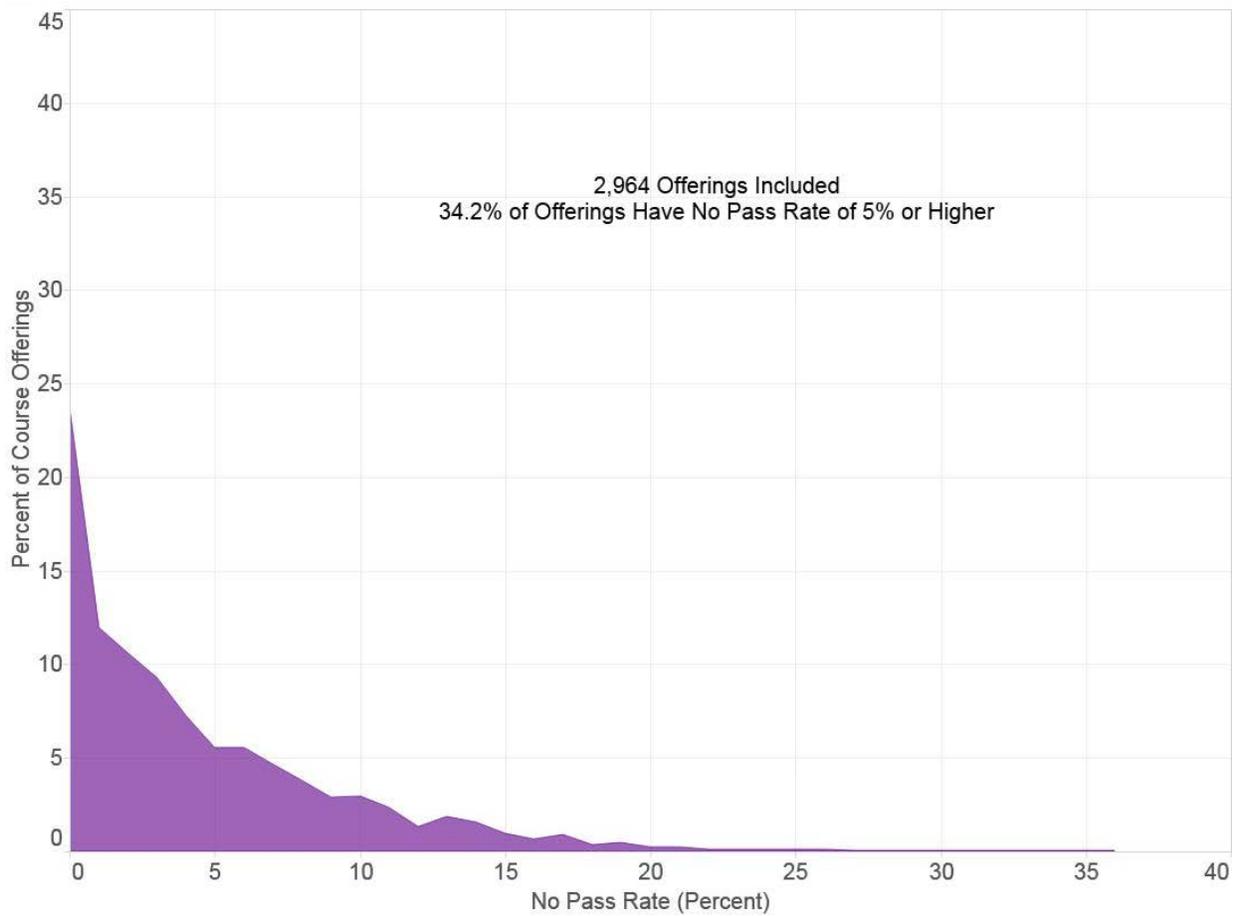

Figure B-1. Frequency distribution of large undergraduate course offerings (50 or more students) with their no-pass rates. The shaded area plots the proportional quantities of total course offerings (N=2,964) by ascending percentages of students receiving no-pass grades in those course offerings. More than one-third of large course offerings (34.2%) have no-pass rates of 5% or greater.

Figure B-2. Frequency distribution of undergraduate course offerings with their no-pass rates, with course offering data disaggregated by underrepresented minority (URM) status. The URM no-pass rate was at or above 5% for more course offerings than the non-URM no-pass rate.

Figure B-3. Frequency distribution of undergraduate course offerings with no-pass rates, with course offering data disaggregated by Pell Grant recipient status. The no-pass rate for students receiving Pell Grants was at or above 5% for more course offerings than the no-pass rate for students not receiving Pell Grants.
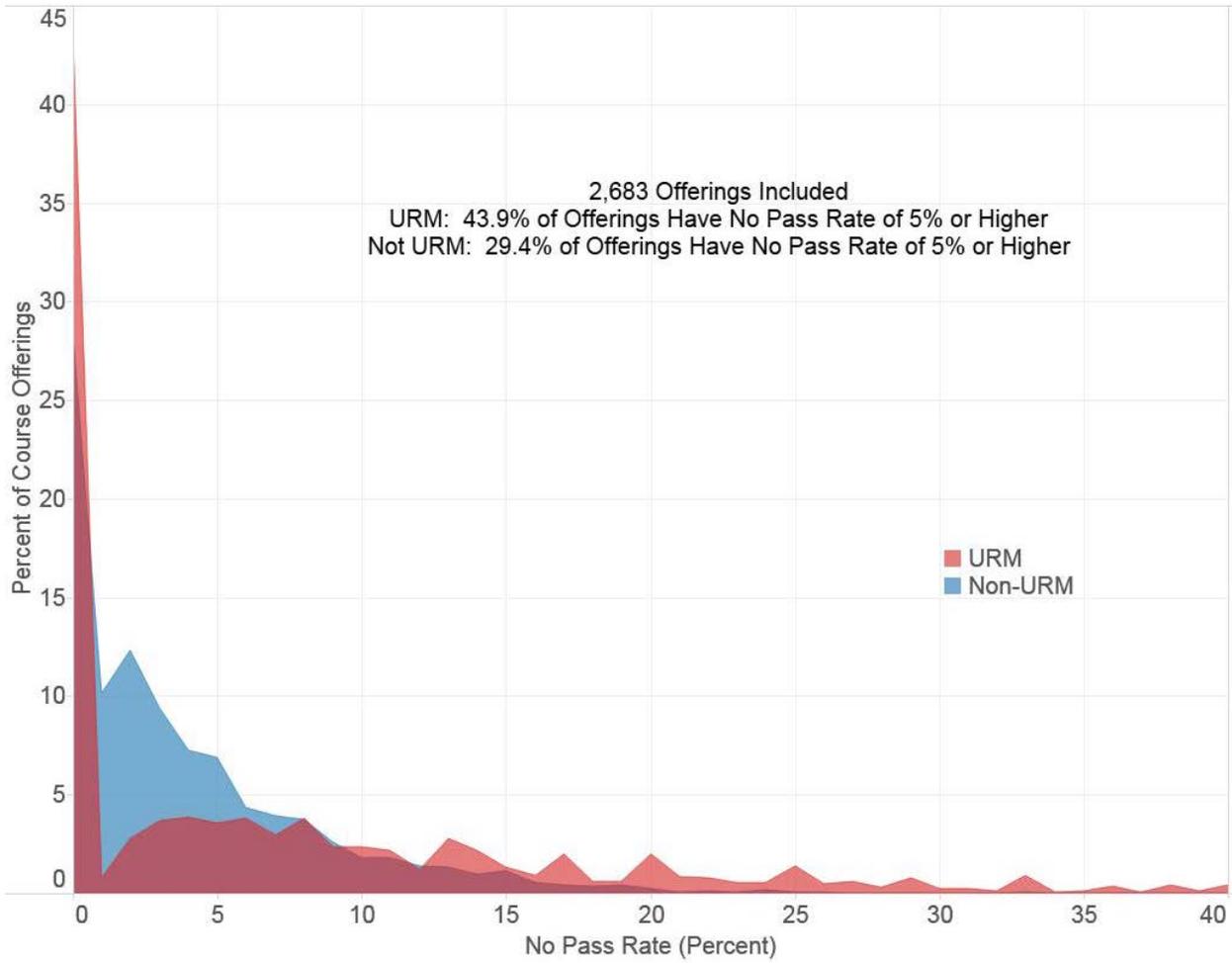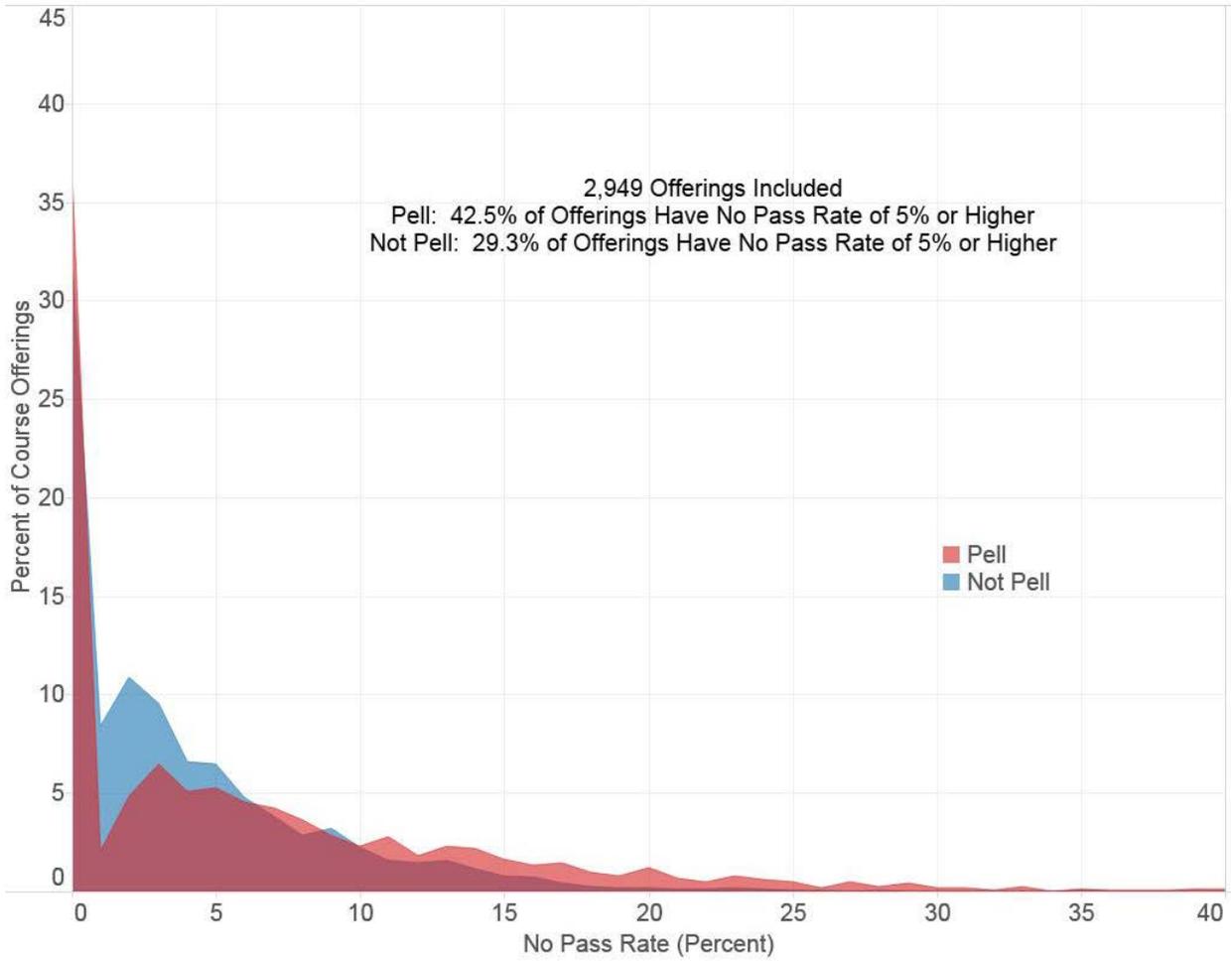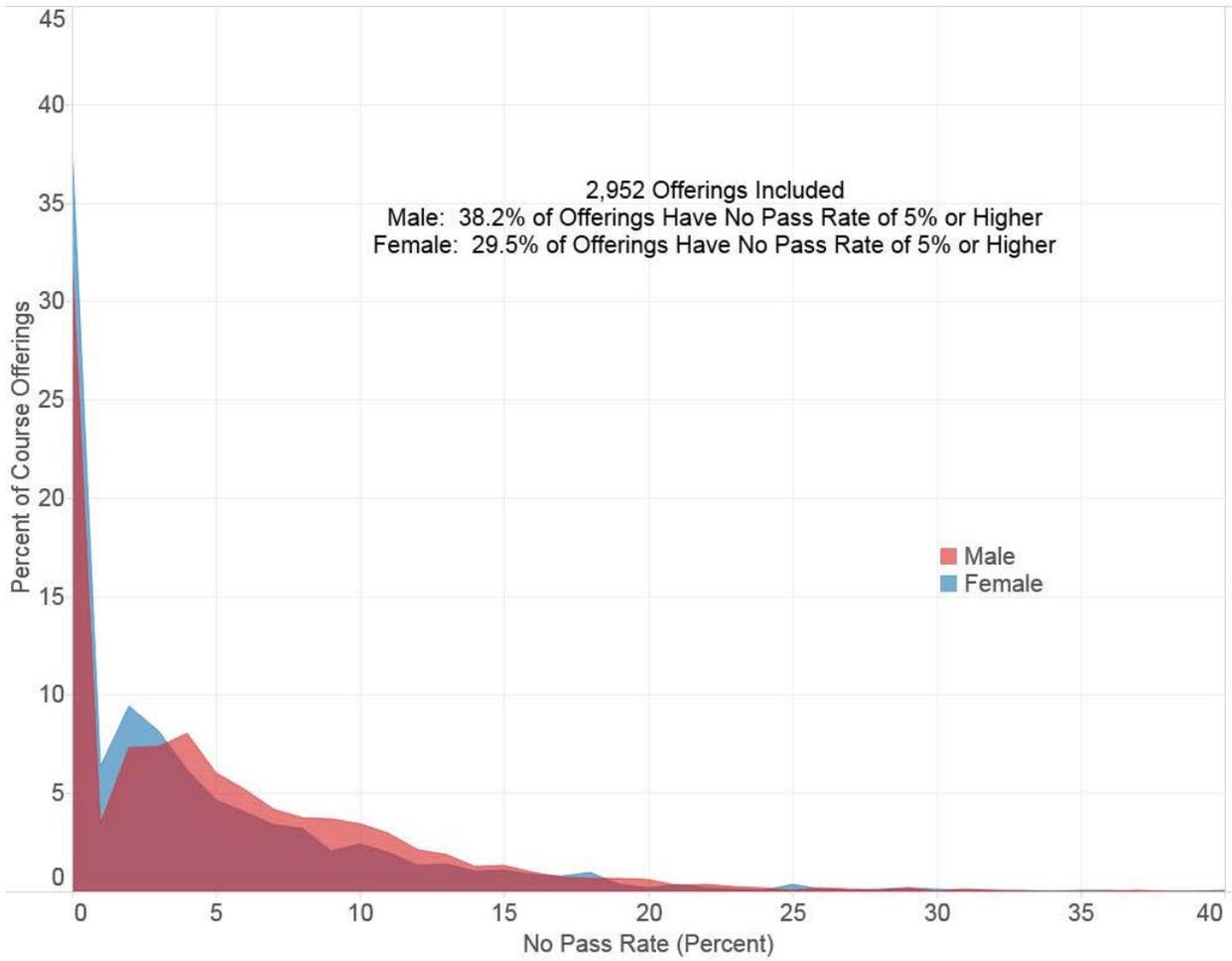
Figure B-4. Frequency distribution of undergraduate course offerings with no-pass rates, with course offering data disaggregated by gender. The male no-pass rate was at or above 5% for more course offerings than the female no-pass rate.

Table B-1a.
*Linear Regression Model for **Freshman** Time-to-Degree*
    Dependent Variable: Elapsed Regular Session Terms as Time to Degree

Model	Predictor Variables	B	$SE\ B$	β	R	R^2	ΔR^2
Step 1		--	--	--	0.36	0.13	--
	(Constant)	20.95	0.23	--	--	--	--
	Cumulative UC GPA	-2.53	0.07	-0.36 ***	--	--	--
Step 2		--	--	--	0.37	0.14	0.004
	(Constant)	19.84	0.29	--	--	--	--
	Cumulative UC GPA	-2.23	0.08	-0.32 ***	--	--	--
	Count of Retakes and Repeats	0.22	0.03	0.08 ***	--	--	--
Step 3		--	--	--	0.37	0.14	0.001
	(Constant)	19.63	0.30	--	--	--	--
	Cumulative UC GPA	-2.25	0.08	-0.32 ***	--	--	--
	Count of Retakes and Repeats	0.22	0.03	0.08 ***	--	--	--
	Count of Majors Completed	0.26	0.11	0.02 *	--	--	--
Step 4		--	--	--	0.37	0.14	0.001
	(Constant)	19.57	0.30	--	--	--	--
	Cumulative UC GPA	-2.24	0.08	-0.32 ***	--	--	--
	Count of Retakes and Repeats	0.22	0.03	0.08 ***	--	--	--
	Count of Majors Completed	0.27	0.11	0.03 *	--	--	--
	Completed HSSEAS or Physical Sciences Degree	0.17	0.07	0.02 *	--	--	--
Step 5		--	--	--	0.37	0.14	0.002
	(Constant)	19.29	0.31	--	--	--	--
	Cumulative UC GPA	-2.18	0.08	-0.31 ***	--	--	--
	Count of Retakes and Repeats	0.21	0.03	0.08 ***	--	--	--
	Count of Majors Completed	0.24	0.11	0.02 *	--	--	--
	Completed HSSEAS or Physical Sciences Degree	0.20	0.07	0.03 **	--	--	--
	Pell Grant Recipient Status	0.26	0.06	0.04 ***	--	--	--

N=8,662
Significance: * p < .05, ** p < .01, *** p < .001

Table B-1b

*Components of Linear Regression Model for **Freshman Students***

Variables	Mean	SD	N
Time to Degree in Elapsed Terms	12.56	2.79	8,662
Cumulative UC GPA	3.32	0.40	
Count of Retakes and Repeats	0.52	0.99	
Completed HSSEAS or Physical Sciences Degree	0.21	0.41	
Count of Majors Completed	1.07	0.26	
Pell Grant Recipient Status	0.38	0.49	
URM Status	0.21	0.40	

Note: Completed HSSEAS or Physical Sciences Degree, Pell Grant Recipient Status, and URM Status were coded 1 if the characteristic was present and coded 0 if the characteristic was not present; thus, these means indicate the percentage of cases having these characteristics.

Table B-2a

*Linear Regression Model for **Transfer** Time-to-Degree*
    Dependent Variable: Elapsed Regular Session Terms as Time to Degree

Model	Predictor Variables	B	SE B	β	R	R^2	ΔR^2
Step 1		--	--	--	0.29	0.09	--
	(Constant)	14.18	0.30	--	--	--	--
	Cumulative UC GPA	-2.11	0.09	-0.29 ***	--	--	--
Step 2		--	--	--	0.33	0.11	0.025
	(Constant)	12.06	0.33	--	--	--	--
	Cumulative UC GPA	-1.54	0.10	-0.21 ***	--	--	--
	Count of Retakes and Repeats	0.74	0.06	0.18 ***	--	--	--
Step 3		--	--	--	0.34	0.11	0.003
	(Constant)	11.10	0.41	--	--	--	--
	Cumulative UC GPA	-1.56	0.10	-0.21 ***	--	--	--
	Count of Retakes and Repeats	0.74	0.06	0.18 ***	--	--	--
	Count of Majors Completed	1.00	0.24	0.05 ***	--	--	--
Step 4		--	--	--	0.34	0.11	0.002
	(Constant)	10.94	0.41	--	--	--	--
	Cumulative UC GPA	-1.52	0.10	-0.21 ***	--	--	--
	Count of Retakes and Repeats	0.71	0.06	0.17 ***	--	--	--
	Count of Majors Completed	0.99	0.24	0.05 ***	--	--	--
	Completed HSSEAS or Physical Sciences Degree	0.33	0.10	0.04 ***	--	--	--
Step 5		--	--	--	0.35	0.12	0.010
	(Constant)	10.71	0.41	--	--	--	--
	Cumulative UC GPA	-1.52	0.10	-0.21 ***	--	--	--
	Count of Retakes and Repeats	0.70	0.06	0.17 ***	--	--	--
	Count of Majors Completed	0.91	0.24	0.05 ***	--	--	--
	Completed HSSEAS or Physical Sciences Degree	0.33	0.10	0.04 ***	--	--	--
	Pell Grant Recipient Status	0.62	0.07	0.10 ***	--	--	--
Step 6		--	--	--	0.36	0.13	0.002
	(Constant)	10.62	0.41	--	--	--	--
	Cumulative UC GPA	-1.50	0.10	-0.21 ***	--	--	--
	Count of Retakes and Repeats	0.71	0.06	0.17 ***	--	--	--
	Count of Majors Completed	0.85	0.24	0.04 ***	--	--	--
	Completed HSSEAS or Physical Sciences Degree	0.38	0.10	0.05 ***	--	--	--
	Pell Grant Recipient Status	0.57	0.07	0.09 ***	--	--	--
	URM Status	0.38	0.09	0.05 ***	--	--	--

N=6,058
Significance: * p < .05, ** p < .01, *** p < .001

Table B-2b

*Components of Linear Regression Model for **Transfer Students***

Variables	*Mean*	*SD*	*N*
Time to Degree in Elapsed Terms	7.21	3.06	6,058
Cumulative UC GPA	3.31	0.42	
Count of Retakes and Repeats	0.32	0.73	
Completed HSSEAS or Physical Sciences Degree	0.18	0.38	
Count of Majors Completed	1.02	0.15	
Pell Grant Recipient Status	0.52	0.50	
URM Status	0.21	0.40	

Note: Completed HSSEAS or Physical Sciences Degree, Pell Grant Recipient Status, and URM Status were coded 1 if the characteristic was present and coded 0 if the characteristic was not present; thus, these means indicate the percentage of cases having these characteristics.