

# Descriptive Logistic Regression Results

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This report uses logistic regression models to describe the multivariate relationships between student attributes/academic preparation and retention/graduation among the most recent three cohorts of first-time, full-time (FTFT) freshman. The odds ratios (table 1) obtained from the regression coefficients are provided as well as the difference in predicted probability (table 2) of retention/graduation assuming all else equal<sup>1</sup>. Additionally, graphs that show the gap in predicted probability by minority status, residency, first generation status, and Pell recipient status for each index level are included in Appendix A. Descriptive statistics for each regression model are provided in Appendix B.

## Summary

Non-residents, Pell recipients, and first-generation students have lower odds of retention and graduation. Index is positively associated with both retention and graduation. The associations by ethnic groups are not as clearly defined; there is variation by ethnicity group and cohort.

## Residency

After controlling for ethnicity, gender, index, first-generation and Pell Grant recipient status, resident students have higher odds of being retained or graduating in 4, 5, and 6 years compared to non-residents (55%, 19%, 48%, and 59% higher odds; respectively). These higher odds translate into higher predicted probabilities of being retained or graduating in 4, 5, and 6 years when all else is equal. There are 5.2, 4.3, 8.6 and 9.8 percentage point increases in the likelihood of the respective event occurring for residents compared to non-residents assuming all else is equal.

## Ethnicity

In terms of retention, minority students have similar odds of being retained compared to non-minority students after controlling for residency, gender, index first-generation and Pell Grant recipient status. There is some variation in results when minority status is partitioned by ethnicity. For instance, African American and Hispanic students have higher odds and probabilities of being retained compared to non-minority students. However, in terms of graduation minority students have lower odds of graduating in 4, 5, and 6 years compared to non-minority students (17%, 15%, and 19% lower odds; respectively). These lower odds result in predicted probabilities of graduation that are 4 to 5 percentage points lower than non-minority students (all else equal). Again results vary by ethnic group. Hispanic and multi-racial students have statistically lower odds; although, all ethnicities have slightly lower odds of graduation within 6 years.

### *Hawaiian /Pacific Islander & Asian American*

Hawaiian /Pacific Islander & Asian American students have similar odds of being retained and graduating in 4, 5, or 6 years compared to non-minority students after controlling for the other variables in the model.

### *African American*

After controlling for other demographic variables and index, African American students have 82% higher odds of being retained compared to non-minority students. African American students have a likelihood of being retained that is 4.8 percentage points higher than non-minority students. In terms of graduation, African American students have similar odds and probabilities compared to non-minority students assuming all else is equal.

### *Hispanic*

In terms of retention, Hispanic students have higher odds (17%) and probabilities (1.5 PP) compared to non-minority students. However, Hispanic students have lower odds of graduation compared to non-minority students. The predicted

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<sup>1</sup> All else equal assumes the student is a resident, nonminority, female, with an index of 114 who is not first generation or a Pell recipient unless otherwise indicated.

probability of graduation is 5 to 7 percentage points lower for Hispanic students compared to non-minority students (all else equal).

### *Multi-Racial*

In terms of retention, multi-racial students have similar odds and probabilities compared to non-minority students. However, multi-racial students have lower odds of graduation (in years 5 and 6) compared to non-minority students. The predicted probability of graduation is 6 to 7 percentage points lower for multi-racial students compared to non-minority students (all else equal).

### *Native American*

Native American students have lower odds and predicted probabilities of retention and graduation compared to non-minority students; however, the differences are not significantly significant. This is due to a small number of Native American students which causes larger uncertainty in the regression coefficients estimates.

### **Gender**

Females have similar odds of being retained compared to males after controlling for residency, ethnicity, CCHE index, first-generation, and Pell Grant recipient status. However, females have higher odds of graduating in 4, 5, or 6-years compared to males after controlling for the other variables (93%, 36%, and 21% higher odds; respectively). These higher odds result in the following gaps: a 16.0 percentage point gap in the likelihood of males graduating in four years compared to females, a 6.7 percentage point gap for males graduating in five years compared to females, and a 3.9 percentage point gap for males graduating in six years compared to females.

### **CCHE Index**

CCHE index is positively associated with retention and graduation after controlling for demographic variables. For every one point increase in index score a student has 3% higher odds of being retained and about 4% higher odds of graduating in 4, 5, or 6 years. A student with an index score of 115 has a predicted probability of being retained that is 1.4 percentage points higher and a predicted probability of graduating in 4, 5, or 6 years that is about 4 to 5 percentage points higher compared to a student with an index score of 110.

### **First Generation Status**

First generation status is negatively associated with retention and graduation after controlling for other demographic variables and CCHE index. First generation students have 36% lower odds of being retained compared to non-first generation students after controlling for other demographic and academic variables, which results in a 5.4 percentage point gap in predicted retention rates. First generation students also have lower odds of graduating compared to non-first generation students (20%, 27%, and 30% lower odds of graduating in 4, 5, or 6 years). These lower odds result in a 5 to 8 percentage point gap in the predicted probability of graduating in 4, 5, or 6 years.

### **Pell Recipient Status**

Pell recipient status is negatively associated with retention and graduation after controlling for other demographic variables and index. Pell recipients have about 22% lower odds of being retained compared to non-Pell recipients, which results in a 2.8 percentage point gap in Pell recipients' predicted probability of being retained compared to non-Pell recipients (all else equal). Pell recipients also have lower odds (19%, 22%, and 19%) of graduating in 4, 5, or 6 years compared to non-Pell recipients after controlling for the other variables in the model. Pell recipients have predicted probabilities of graduating in 4, 5, or 6 years that are a 4 to 5 percentage points lower compared to non-Pell recipients (all else is equal).

Table 1.

## Retention/Graduation Logistic Regression Results

	Retained <sup>1</sup>	4-year Graduation <sup>2</sup>	5-year Graduation <sup>3</sup>	6-year Graduation <sup>4</sup>
	Odds Ratio <sup>5</sup>			
CO Resident	1.548***	1.187***	1.479***	1.588***
Ethnicity <sup>6</sup> (Non-Minority Total)	1.111	0.830***	0.847***	0.812***
Asian Pacific	1.029	0.905	0.873	0.876
African American	1.823***	1.170	1.171	0.946
Hispanic	1.174*	0.747***	0.805***	0.787***
Multi-Racial	0.852	0.839	0.767**	0.710**
Native American	0.732	0.825	0.820	0.688
Female	0.935	1.933***	1.363***	1.213***
Index	1.027***	1.045***	1.038***	1.041***
First Generation	0.636***	0.804***	0.726***	0.696***
Pell Recipient	0.776***	0.812***	0.785***	0.811***
Observations	13,078	12,773	12,694	12,452
Model Chi <sup>2</sup>	307.58	1151.25	754.3	758.53
Model Degrees Freedom	11	11	11	11
Pseudo R <sup>2</sup>	0.029	0.067	0.045	0.047

<sup>1</sup>Includes new full-time freshmen who started in FA11, FA12, & FA13

<sup>2</sup>Includes new full-time freshmen who started in FA08, FA09, & FA10

<sup>3</sup>Includes new full-time freshmen who started in FA07, FA08, & FA09

<sup>4</sup>Includes new full-time freshmen who started in FA06, FA07, & FA08

<sup>5</sup>\*P<.1, \*\* P<.05, \*\*\* P<.01

<sup>6</sup>All the ethnicities are compared to the reference group of non-minority students which includes international, white, and students who do not report their ethnicity

Table 2.

Predicted Probability of Graduation and Retention				
Predicted Probability <sup>5</sup>	Freshman Retention <sup>1</sup>	4-year Graduation <sup>2</sup>	5-year Graduation <sup>3</sup>	6-year Graduation <sup>4</sup>
Residents	88.6%	50.9%	71.2%	73.9%
Non-Residents	83.4%	46.6%	62.6%	64.0%
PP Difference <sup>6</sup>	5.2***	4.3***	8.6***	9.8***
All Minority Ethnicities	89.6%	46.3%	67.7%	69.6%
Non-Minority	88.6%	50.9%	71.2%	73.8%
PP Difference	1.0	-4.6***	-3.5***	-4.2***
Asian Pacific	88.9%	48.4%	68.4%	71.2%
Non-Minority	88.6%	50.9%	71.2%	73.9%
PP Difference	0.3	-2.5	-2.9	-2.6
African American	93.4%	54.8%	74.3%	72.8%
Non-Minority	88.6%	50.9%	71.2%	73.9%
PP Difference	4.8***	3.9	3.1	-1.1
Hispanic	90.1%	43.6%	66.6%	69.0%
Non-Minority	88.6%	50.9%	71.2%	73.9%
PP Difference	1.5*	-7.3***	-4.7***	-4.9***
Multi-Racial	86.9%	46.5%	65.5%	66.7%
Non-Minority	88.6%	50.9%	71.2%	73.9%
PP Difference	-1.7	-4.4	-5.7**	-7.1***
Native American	85.1%	46.1%	67.0%	66.0%
Non-Minority	88.6%	50.9%	71.2%	73.9%
PP Difference	-3.5	-4.8	-4.2	-7.8
Female	88.6%	50.9%	71.2%	73.9%
Male	89.3%	34.9%	64.5%	70.0%
PP Difference	-0.7	16.0***	6.7***	3.9***
Index 110	87.5%	46.5%	68.0%	70.7%
Index 115	88.9%	52.0%	72.0%	74.6%
PP Difference	-1.4***	-5.4***	-4.0***	-4.0***
First Generation	83.2%	45.5%	64.3%	66.3%
Non-First Generation	88.6%	50.9%	71.2%	73.9%
PP Difference	-5.4***	-5.4***	-7.0***	-7.6***
Pell Recipient	85.8%	45.7%	66.0%	69.6%
Non-Pell Recipient	88.6%	50.9%	71.2%	73.9%
PP Difference	-2.8***	-5.2***	-5.2***	-4.2***

<sup>1</sup>Includes new full-time freshmen who started in FA11, FA12, & FA13

<sup>2</sup>Includes new full-time freshmen who started in FA08, FA09, & FA10

<sup>3</sup>Includes new full-time freshmen who started in FA07, FA08, & FA09

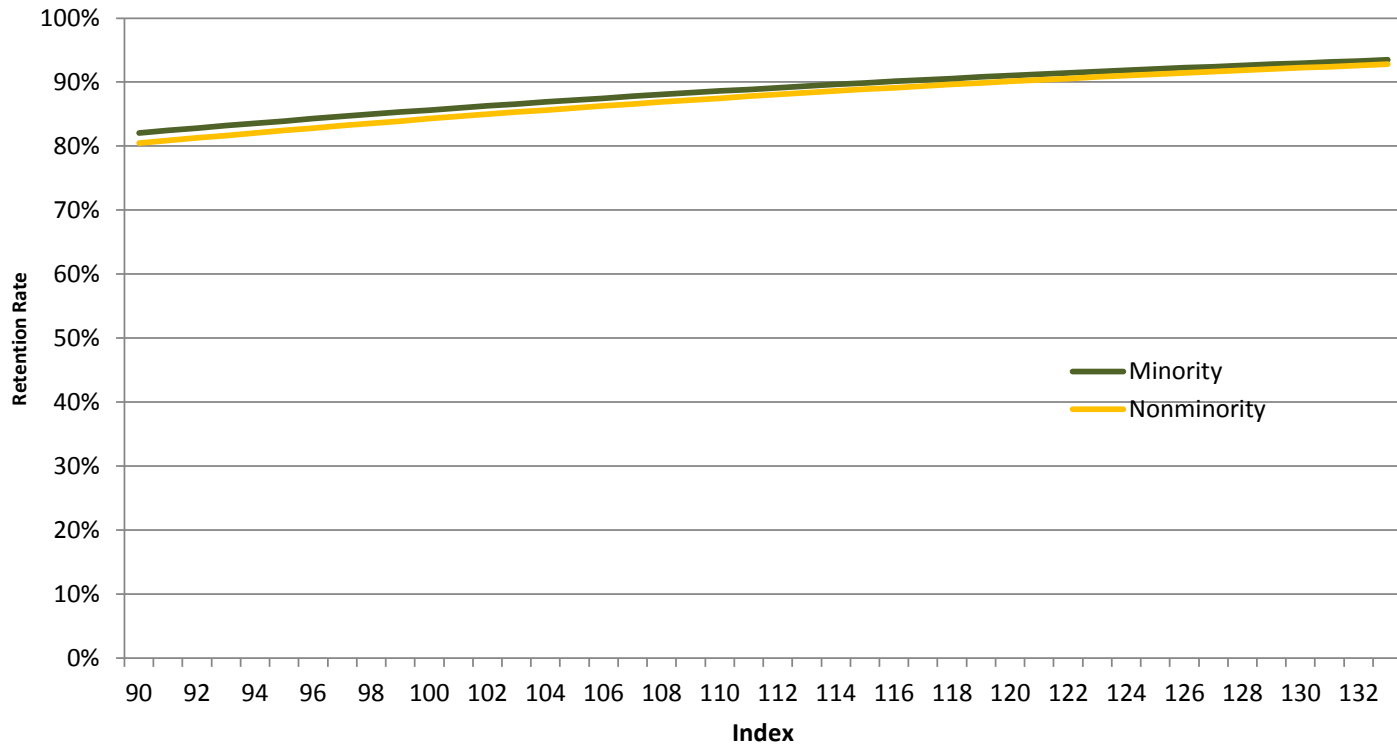
<sup>4</sup>Includes new full-time freshmen who started in FA06, FA07, & FA08

<sup>5</sup>The predicted probability of the specified retention/graduation outcome assumes a resident, nonminority, female, with an index of 114 who is not first generation or a Pell recipient unless otherwise indicated.

<sup>6</sup>Significance level of the coefficient that causes the percentage point (pp) difference in predicted probabilities

\*P<.1, \*\* P<.05, \*\*\* P<.01

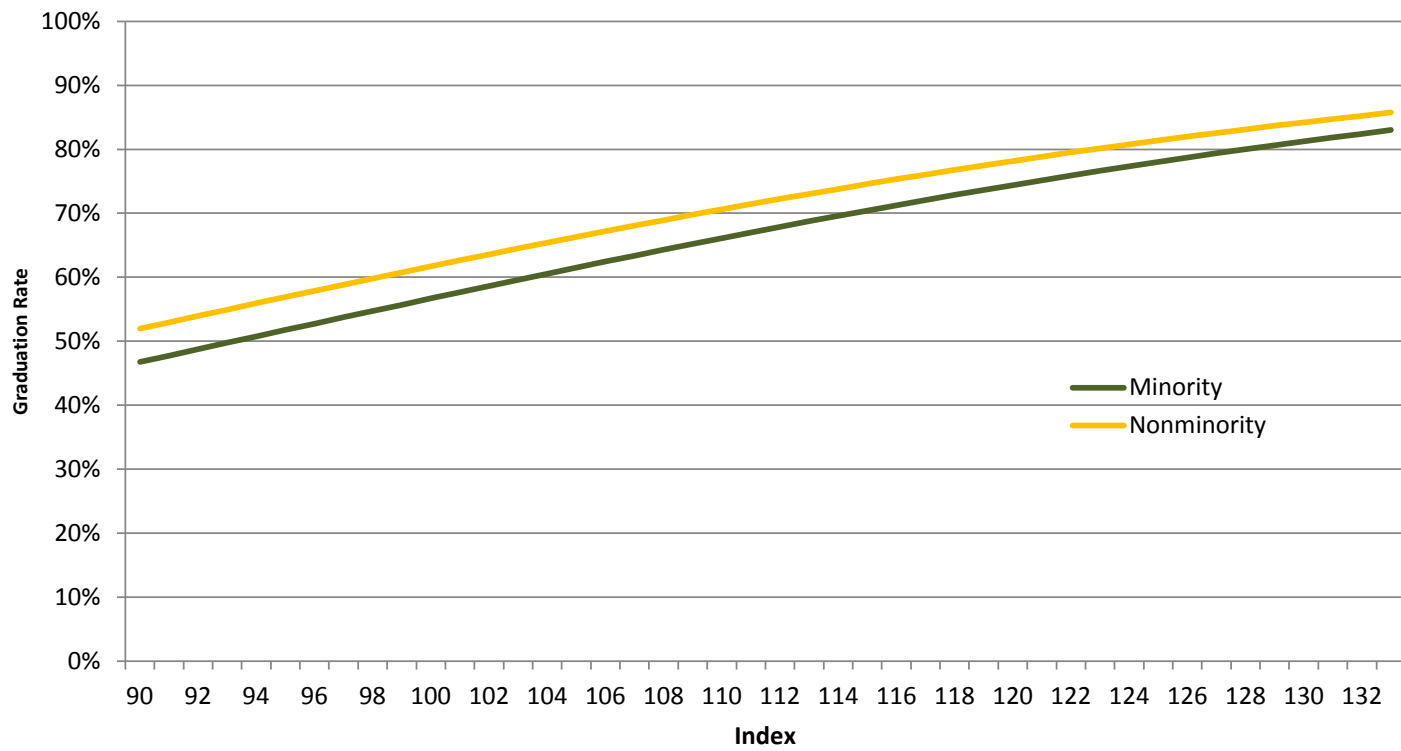
### Predicted Freshman Retention Rates by Minority Status



Note: Rates displayed assume female, non-first generation, resident, non-Pell recipient.

Data includes new freshmen from the FA11, FA12, & FA13 cohorts

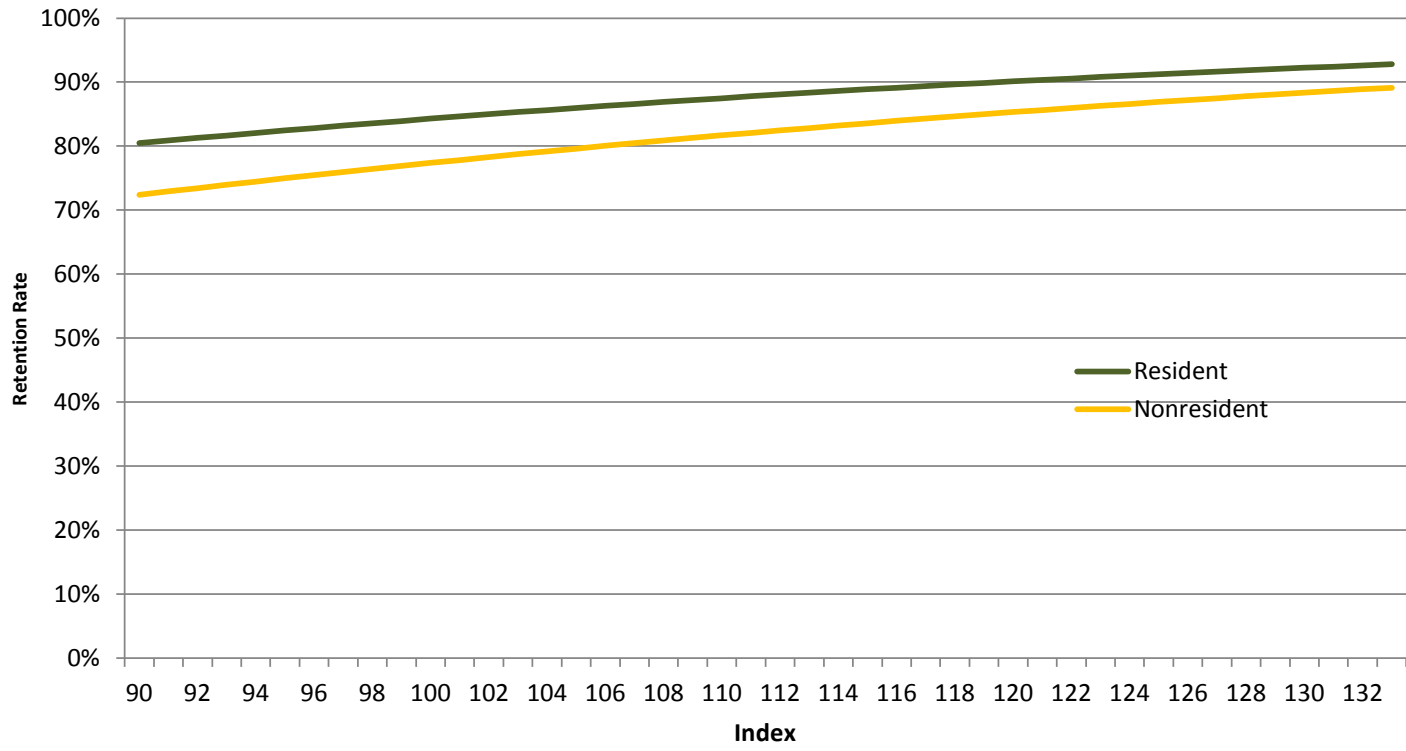
### Predicted Six-Year Graduation Rates by Minority Status



Note: Rates displayed assume female, non-first generation, resident, non-Pell recipient.

Data includes new freshmen from the FA06, FA07, & FA08 cohorts

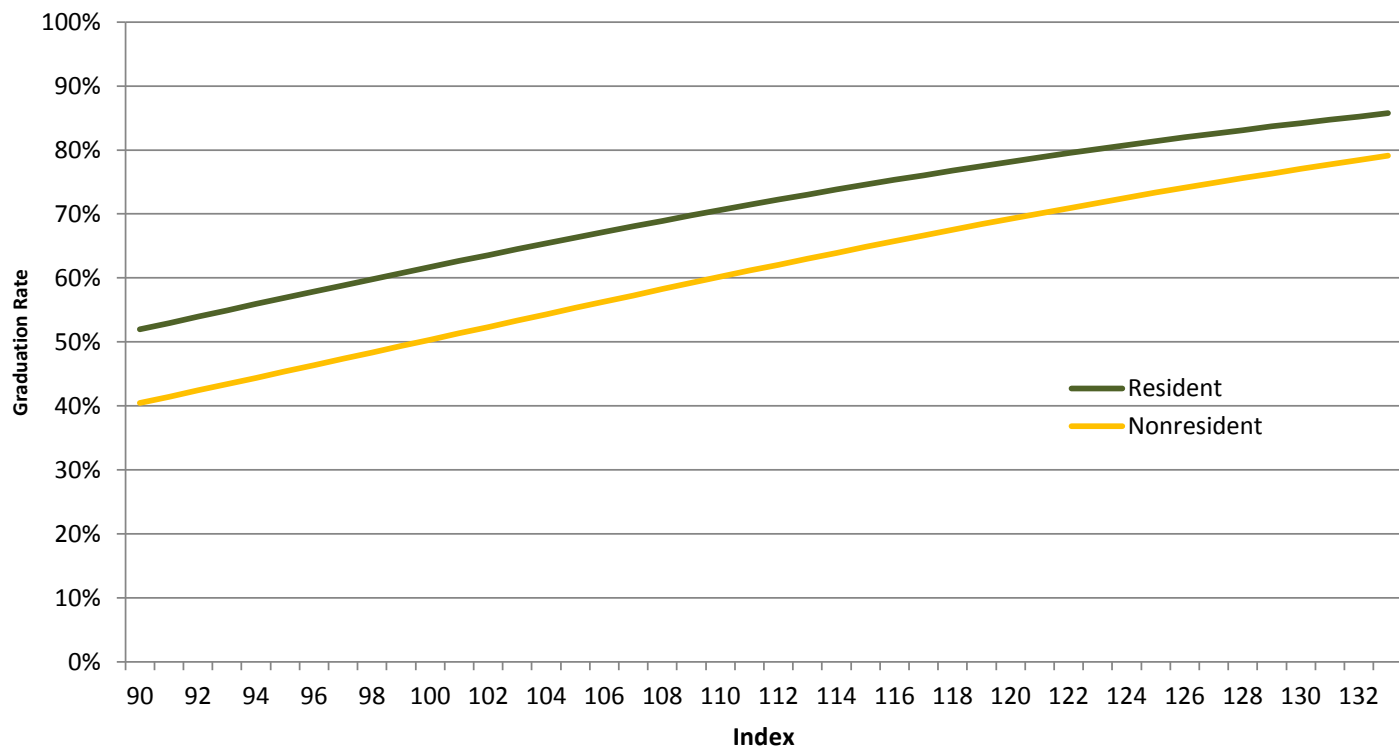
### Predicted Freshman Retention Rates by Residency



Note: Rates displayed assume female, non-first generation, non-minority, non-Pell recipient.

Data includes new freshmen from the FA11, FA12, & FA13 cohorts

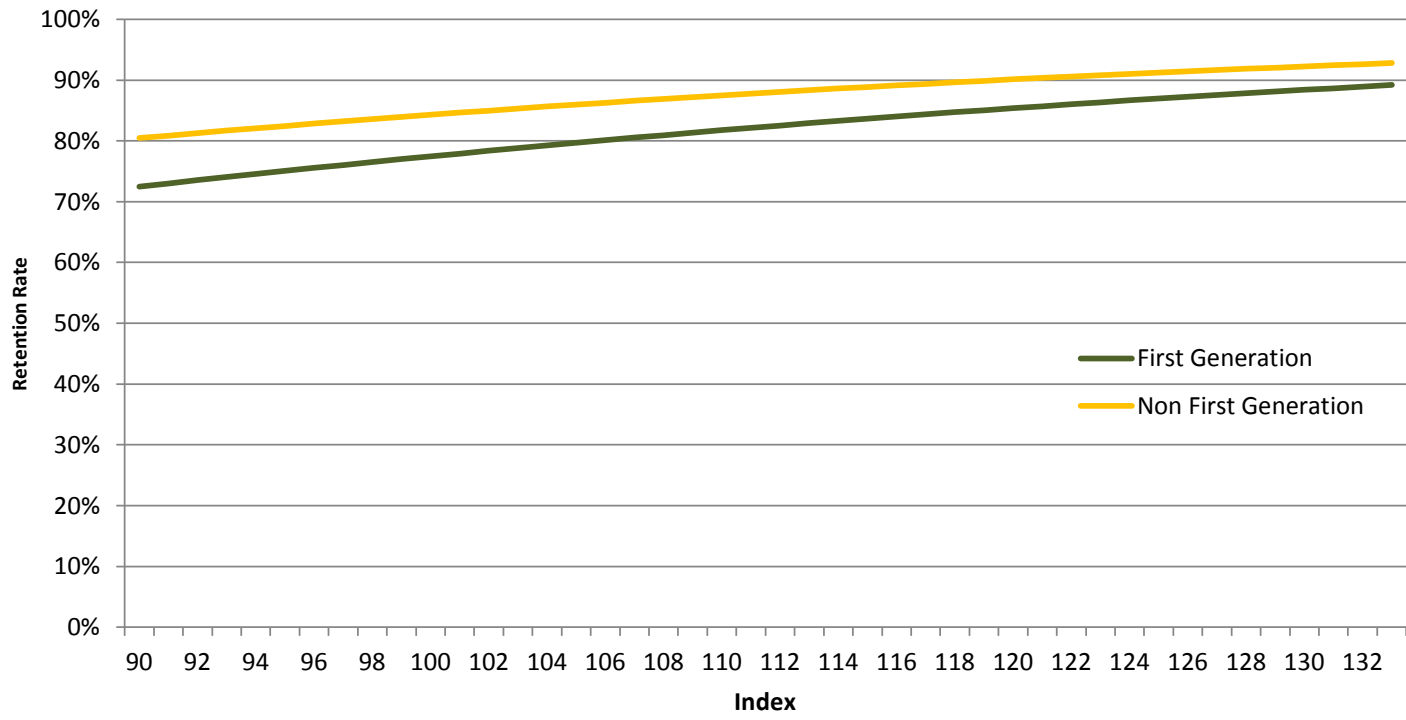
### Predicted Six-Year Graduation Rates by Residency



Note: Rates displayed assume female, non-first generation, non-minority, non-Pell recipient.

Data includes new freshmen from the FA06, FA07, & FA08 cohorts

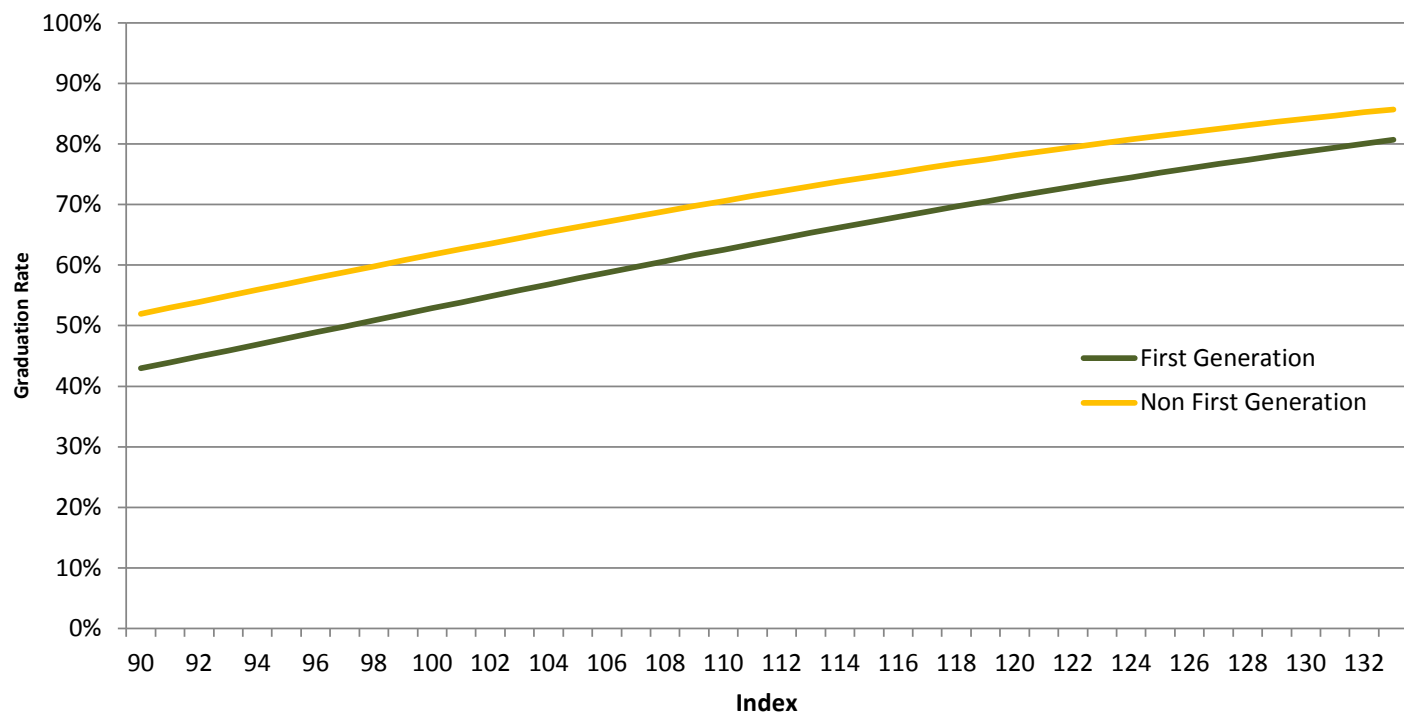
### Predicted Freshman Retention Rates by First Generation Status



Note: Rates displayed assume female, resident, non-minority, non-Pell recipient.

Data includes new freshmen from the FA11, FA12, & FA13 cohorts

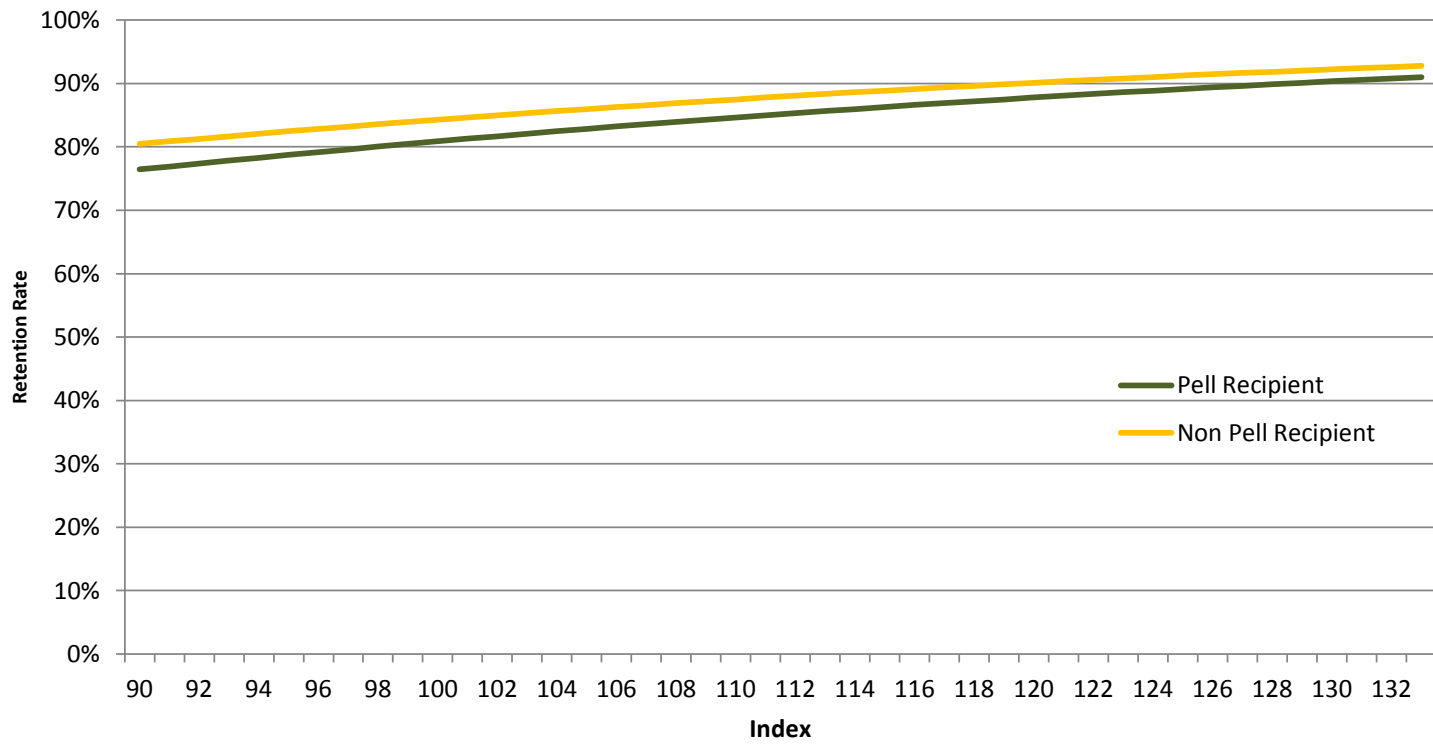
### Predicted Six-Year Graduation Rates by First Generation Status



Note: Rates displayed assume female, resident, non-minority, non-Pell recipient.

Data includes new freshmen from the FA06, FA07, & FA08 cohorts

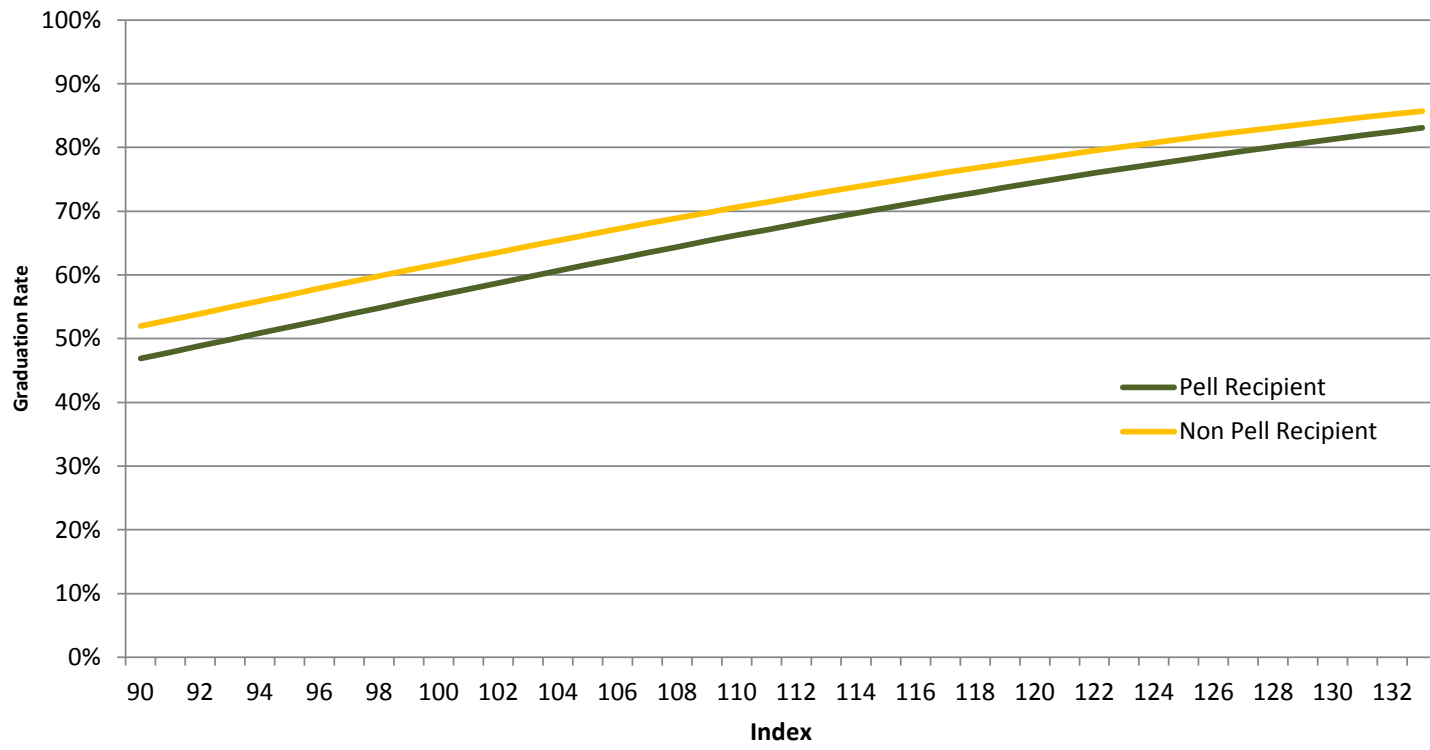
### Predicted Freshman Retention Rates by Pell Recipient Status



Note: Rates displayed assume female, resident, non-minority, non-first generation.

Data includes new freshmen from the FA11, FA12, & FA13 cohorts

### Predicted Six-Year Graduation Rates by Pell Recipient Status



Note: Rates displayed assume female, resident, non-minority, non-first generation.

Data includes new freshmen from the FA06, FA07, & FA08 cohorts



Appendix B

Descriptive Statistics for the Logistic Regression Predicting Freshman Retention (FA11, FA12, & FA13 cohorts)

Variable	Observations	Proportion	Standard Deviation	Min	Max
Retained	13241	85.7%	0.350	0	1
CO Resident	13241	75.3%	0.431	0	1
Asian Pacific	13241	2.1%	0.142	0	1
African American	13241	2.1%	0.144	0	1
Hispanic	13241	11.0%	0.313	0	1
Multi-Racial	13241	4.0%	0.195	0	1
Native American	13241	0.4%	0.062	0	1
Non-minority	13241	80.4%	0.397	0	1
Female	13241	55.4%	0.497	0	1
Index (mean)	13078	115.1	11.5	76	146
First Generation	13241	25.3%	0.435	0	1
Pell Recipient	13241	22.7%	0.419	0	1

Descriptive Statistics for the Logistic Regression Predicting 4-Year Graduation (FA07, FA08, & FA09 cohorts)

Variable	Observations	Proportion	Standard Deviation	Min	Max
Graduated (4 yrs.)	12880	40.8%	0.491	0	1
CO Resident	12880	79.1%	0.406	0	1
Asian Pacific	12880	2.2%	0.145	0	1
African American	12880	2.0%	0.141	0	1
Hispanic	12880	7.9%	0.270	0	1
Multi-Racial	12880	2.6%	0.159	0	1
Native American	12880	0.5%	0.070	0	1
Non-minority	12880	84.8%	0.359	0	1
Female	12880	55.7%	0.497	0	1
Index (mean)	12773	114.0	11.2	80	146
First Generation	12880	24.0%	0.427	0	1
Pell Recipient	12880	18.2%	0.386	0	1

Descriptive Statistics for the Logistic Regression Predicting 5-Year Graduation (FA07, FA08, & FA09 cohorts)

Variable	Observations	Proportion	Standard Deviation	Min	Max
Graduated (5 yrs.)	12799	62.2%	0.485	0	1
CO Resident	12799	78.9%	0.408	0	1
Asian Pacific	12799	2.2%	0.146	0	1
African American	12799	1.9%	0.135	0	1
Hispanic	12799	7.6%	0.264	0	1
Multi-Racial	12799	2.4%	0.153	0	1
Native American	12799	0.6%	0.076	0	1
Non-minority	12799	85.4%	0.353	0	1
Female	12799	55.3%	0.497	0	1
Index (mean)	12694	113.7	11.1	88	146
First Generation	12799	24.8%	0.432	0	1
Pell Recipient	12799	15.6%	0.363	0	1

Descriptive Statistics for the Logistic Regression Predicting 6-Year Graduation (FA06, FA07, & FA08 cohorts)

Variable	Observations	Proportion	Standard Deviation	Min	Max
Graduated (6 yrs.)	12567	65.1%	0.477	0	1
CO Resident	12567	79.4%	0.405	0	1
Asian Pacific	12567	2.3%	0.148	0	1
African American	12567	1.8%	0.134	0	1
Hispanic	12567	7.4%	0.262	0	1
Multi-Racial	12567	2.3%	0.150	0	1
Native American	12567	0.5%	0.071	0	1
Non-minority	12567	85.7%	0.350	0	1
Female	12567	55.8%	0.497	0	1
Index (mean)	12452	113.1	10.9	86	144
First Generation	12567	25.7%	0.437	0	1
Pell Recipient	12567	13.9%	0.346	0	1