



Associations between Student Attributes and Success

This report uses logistic regression models to describe the variation in outcomes like retention and graduation by factors like student attributes and academic preparation. The models investigate different cohorts depending on the specific model outcome. All models use the most recent three cohorts of first-time, full-time freshmen available. For instance, for the logistic regression model that investigates freshman retention to the second year, the model uses first-time, full-time freshmen cohorts from FA14, FA15, and FA16. For the model that investigates 4-year graduation rates, the model uses cohorts from FA11, FA12, and FA13 because those three cohorts are the most recent cohorts that have available data on their 4-year graduation rates. Please see footnotes on all tables for detailed information on which groups of students were used for each model.

Tables in this report present logistic regression odds ratios as well as predicted probabilities of the retention or graduation event occurring, assuming all else is equal¹. Additionally, graphs that show the gap in predicted probabilities 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.

Key Findings

Non-residents, Pell recipients, and first-generation students have lower odds of retention and graduation compared to residents, non-Pell recipients, and non-first-generation students, respectively. CDHE Index (the measure of academic preparedness in the models) is positively associated with both retention and graduation. Females have significantly higher odds of graduating compared to males but do not differ from males in terms of retention to the second year. The associations by ethnicity groups are not as clearly defined and outcomes vary by ethnicity group.

Residency

After controlling for ethnicity, gender, CDHE index, first-generation and Pell recipient status, Colorado residents have higher odds of being retained or graduating in 4, 5, and 6 years compared to non-residents (59%, 20%, 41%, and 49% 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 5.3, 4.4, 7.0 and 8.1 percentage point increases in the likelihood of the respective event occurring for residents compared to non-residents.

Ethnicity

In terms of retention, minority students have similar odds of being retained compared to non-minority students after controlling for residency, gender, CDHE index, first-generation status, and Pell Grant recipient status. There is some variation in results when minority status is partitioned by ethnicity. For instance, African American 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 (14%, 17%, and 14% lower odds; respectively). These lower odds result in predicted

¹ All else equal assumes the student is a resident, non-minority, female, with an index of about 115 (the average) who is not first-generation or a Pell recipient unless otherwise indicated.



probabilities of graduation that are 3 to 4 percentage points lower than non-minority students (all else equal). Again, results vary by ethnic group.

Asian American

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. Indeed, odds for these outcomes among Asian American students are almost identical to the odds among non-minority students.

African American

After controlling for other demographic variables and CDHE index, African American students have 57% higher odds of being retained compared to non-minority students. African American students have a likelihood of being retained that is 3.6 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.

Hawaiian/Pacific Islander

Hawaiian/Pacific Islander students have similar odds of being retained and graduating in 4 or 6 years compared to non-minority students. When considering 5-year graduation patterns, Hawaiian/Pacific Islander students have statistically lower odds of graduating in that time period. The reason the models report varying statistical findings for this group of students may be because the sample size of this group, in particular, is so small.

Hispanic

In terms of retention, Hispanic students have similar odds and probabilities compared to non-minority students. However, Hispanic students have lower odds of graduation compared to non-minority students. The predicted probability of graduation in any time frame is 3.4 to 4.4 percentage points lower for Hispanic students compared to non-minority students (all else equal).

Multi-Racial

Multi-racial students have lower odds and probabilities for being retained and for graduating in 4 or 5 years compared to non-minority students. However, multi-racial students have similar odds of graduation in 6 years compared to non-minority students. The predicted probability of retention and graduation in 4 or 5 years is 3.4 to 6.5 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 graduation in 4 or 5 years compared to non-minority students. In terms of retention and graduation in 6 years, Native American students have similar odds and predicted probabilities as non-minority students. The reason the models report varying statistical findings for this group of students may be because the sample size of this group, in particular, is so small.



Gender

Females have similar odds of being retained compared to males after controlling for residency, ethnicity, CDHE index, first-generation status, and Pell recipient status. However, females have higher odds of graduating in 4, 5, or 6 years compared to males after controlling for the other variables (95%, 38%, and 24% higher odds; respectively). These higher odds result in the following percentage point gaps: a 16.5 percentage point gap in the likelihood of males graduating in four years compared to females, a 6.6 percentage point gap for males graduating in five years compared to females, and a 4.2 percentage point gap for males graduating in six years compared to females.

CDHE Index

CDHE 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 3.5% 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 1.6 percentage points higher and a predicted probability of graduating in 4, 5, or 6 years that is 3.3 to 4.1 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 CDHE index. First-generation students have 32% lower odds of being retained compared to non-first-generation students after controlling for other demographic and academic variables, which results in a 4.3 percentage point difference in predicted retention rates. First-generation students also have lower odds of graduating compared to non-first-generation students (20%, 35%, and 32% lower odds of graduating in 4, 5, or 6 years). These lower odds result in 5.7 to 9.1 percentage point gaps 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 CDHE index. Pell recipients have about 16% lower odds of being retained compared to non-Pell recipients, which results in a 1.7 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 (25%, 21%, and 21%) 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 4.6 to 7.2 percentage points lower compared to non-Pell recipients (all else equal).

Conclusions

Retention and graduation patterns vary by demographic group at Colorado State University. Students who are Colorado residents, who are female, and who come into college with a higher level of academic preparedness have higher odds of being retained and of graduating. First-generation students and students who are Pell recipients have lower odds of being retained and of graduating. Retention and graduation patterns vary by ethnicity group.



Regression Model Output: Odds and Predicted Probabilities

Table 1. Predicted Probability of Graduation and Retention

Predicted Probability ¹	Freshman Retention ²	4-year Graduation ³	5-year Graduation ⁴	6-year Graduation ⁵
Residents	89.2%	56.7%	74.6%	75.5%
Non-Residents	83.9%	52.3%	67.6%	67.4%
PP Difference ⁶	5.3***	4.4***	7.0***	8.1***
Overall Minority	88.5%	52.9%	70.8%	72.6%
Non-Minority	89.2%	56.7%	74.6%	75.4%
PP Difference	-0.7	-3.8**	-3.8***	-2.8**
Asian American	89.8%	56.6%	74.5%	74.1%
Non-Minority	89.2%	56.7%	74.6%	75.5%
PP Difference	0.6	-0.1	-0.1	-1.4
African American	92.8%	53.5%	76.1%	79.6%
Non-Minority	89.2%	56.7%	74.6%	75.5%
PP Difference	3.6**	-3.2	1.5	4.1*
Hawaiian/Pac. Islander	97.5%	46.8%	51.1%	65.8%
Non-Minority	89.2%	56.7%	74.6%	75.5%
PP Difference	8.3**	-9.9	-23.5	-9.7
Hispanic	88.0%	53.3%	70.5%	71.1%
Non-Minority	89.2%	56.7%	74.6%	75.5%
PP Difference	-1.2	-3.4*	-4.0**	-4.4**
Multi-Racial	85.8%	51.4%	68.1%	72.5%
Non-Minority	89.2%	56.7%	74.6%	75.5%
PP Difference	-3.4*	-5.3*	-6.5**	-3.0
Native American	85.0%	36.2%	59.2%	64.4%
Non-Minority	89.2%	56.7%	74.6%	75.5%
PP Difference	-4.2	-20.5**	-15.4*	-11.1
Female	89.2%	56.7%	74.6%	75.5%
Male	89.3%	40.2%	68.0%	71.3%
PP Difference	-0.1	16.5***	6.6***	4.2***
Index 110	87.5%	52.5%	71.4%	72.4%
Index 115	89.1%	56.6%	74.7%	75.7%
PP Difference	-1.6***	-4.1***	-3.3***	-3.3***
First-Generation	84.9%	51.0%	65.5%	67.6%
Non-First-Generation	89.2%	56.7%	74.6%	75.5%
PP Difference	-4.3***	-5.7***	-9.1***	-7.9***
Pell Recipient	87.4%	49.5%	69.9%	70.9%
Non-Pell Recipient	89.2%	56.7%	74.6%	75.5%
PP Difference	-1.7*	-7.2***	-4.7***	-4.6***

¹The predicted probability of the specified retention/graduation outcome assumes a resident, non-minority, female, with an index of about 115 (the average) who is not first-generation or a Pell recipient unless otherwise indicated.

²Includes first-time, full-time freshmen who started in FA14, FA15, FA16.

³Includes first-time, full-time freshmen who started in FA11, FA12, FA13.

⁴Includes first-time, full-time freshmen who started in FA10, FA11, FA12.

⁵Includes first-time, full-time freshmen who started in FA09, FA10, FA11.

⁶Significance level of the coefficient that causes the percentage point (pp) difference in predicted probabilities *P<.05, ** P<.01, *** P<.001

**Table 2. Logistic Regression Results: Models for Retention and Graduation Outcomes**

	Retained ¹	4-year Graduation ²	5-year Graduation ³	6-year Graduation ⁴
	Odds Ratio ⁵			
CO Resident	1.585***	1.197***	1.407***	1.488***
Ethnicity ⁶ (Non-Minority Total) ⁷	1.07	1.16**	1.21***	1.16**
Asian American	1.065	0.996	0.994	0.930
African American	1.569**	0.880	1.084	1.269
Hawaiian/Pacific Islander	4.687	0.672	0.356*	0.626
Hispanic	0.887	0.872*	0.816**	0.802**
Multi-Racial	0.731*	0.806*	0.728**	0.856
Native American	0.689	0.433*	0.494*	0.588
Female	0.986	1.948***	1.383***	1.237***
Index	1.030***	1.034***	1.035***	1.035***
First-Generation	0.682***	0.796***	0.647***	0.678***
Pell Recipient	0.845**	0.750***	0.792***	0.793***
Observations	13,588	13,067	13,083	12,863
Model Chi ²	371.66	956.60	793.08	684.73
Model Degrees Freedom	11	11	11	11
Pseudo R ²	0.033	0.053	0.047	0.042

¹Includes first-time, full-time freshmen who started in FA14, FA15, & FA16

²Includes first-time, full-time freshmen who started in FA11, FA12, & FA13

³Includes first-time, full-time freshmen who started in FA10, FA11, & FA12

⁴Includes first-time, full-time freshmen who started in FA09, FA10, & FA11

⁵*P<.05, ** P<.01, *** P<.001

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

⁷Coefficients for the non-minority total row are calculated from separate logistic regression models using a dichotomous variable where 0 = minority and 1 = non-minority. All other coefficients presented in this table were calculated from logistic regression models that utilized a disaggregated ethnicity variable.



Appendix A

Figure 1. Predicted Freshman Retention Rates by Minority Status

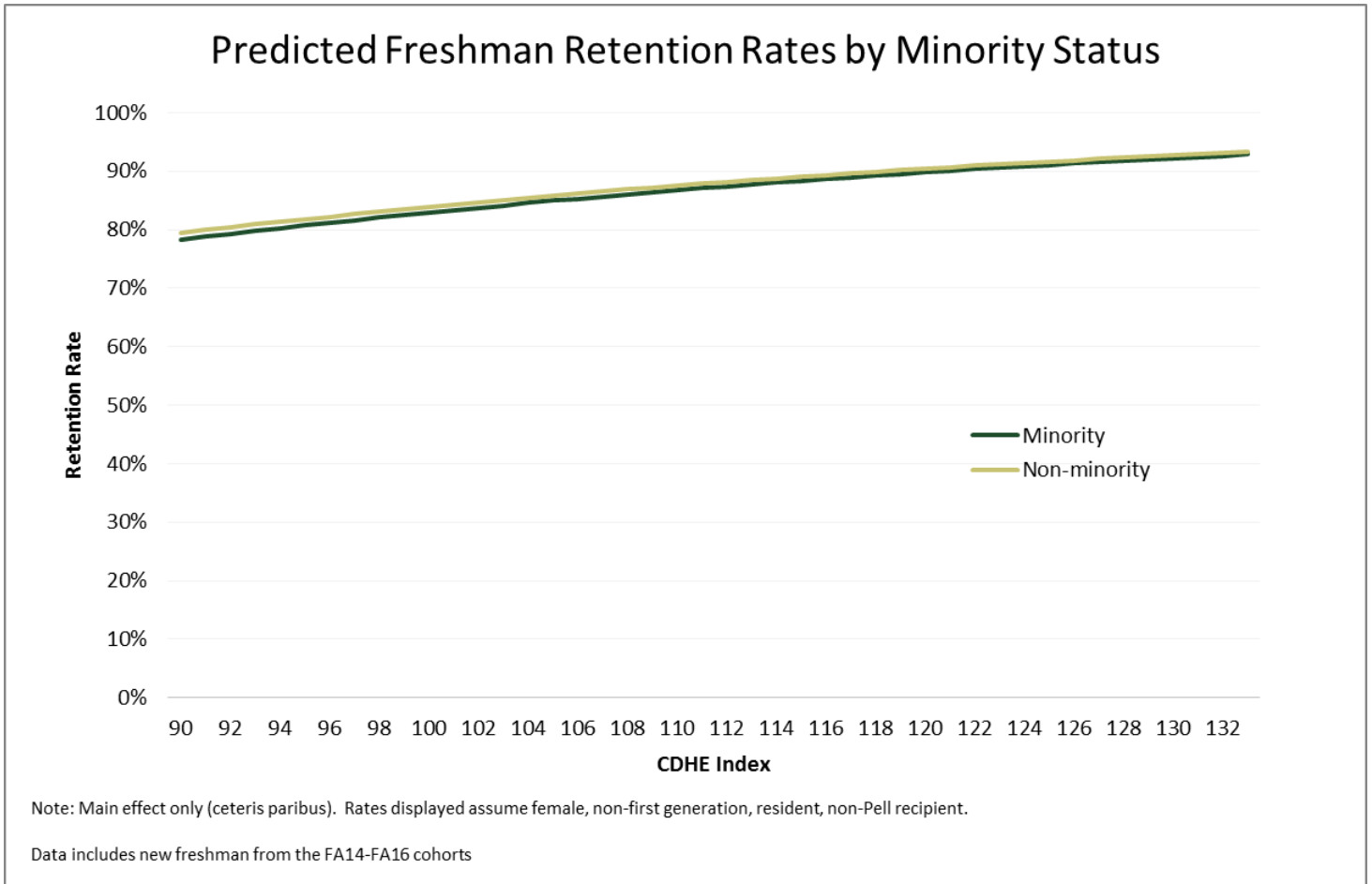




Figure 2. Predicted Six-Year Graduation Rates by Minority Status

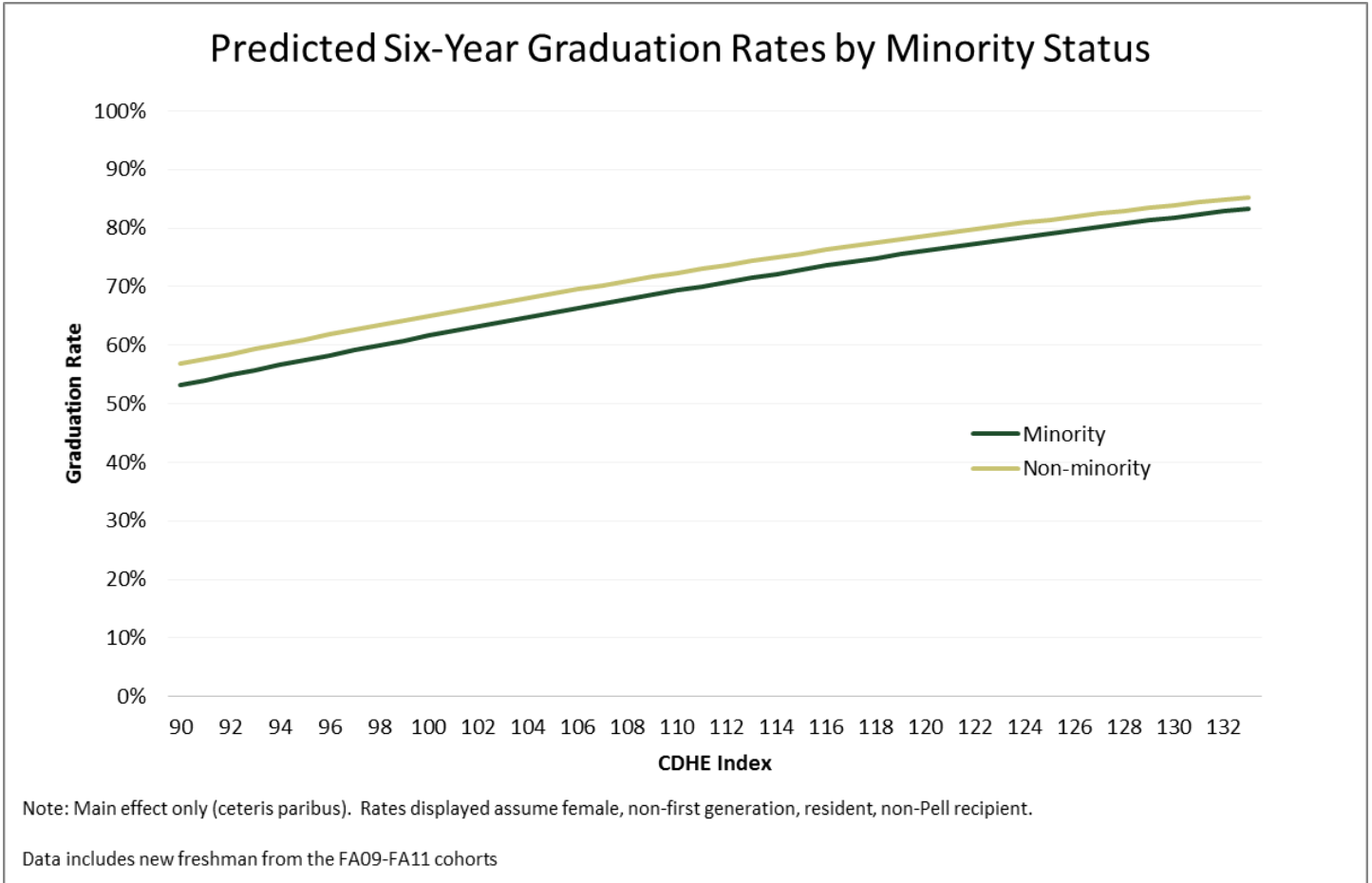




Figure 3. Predicted Freshman Retention Rates by Residency

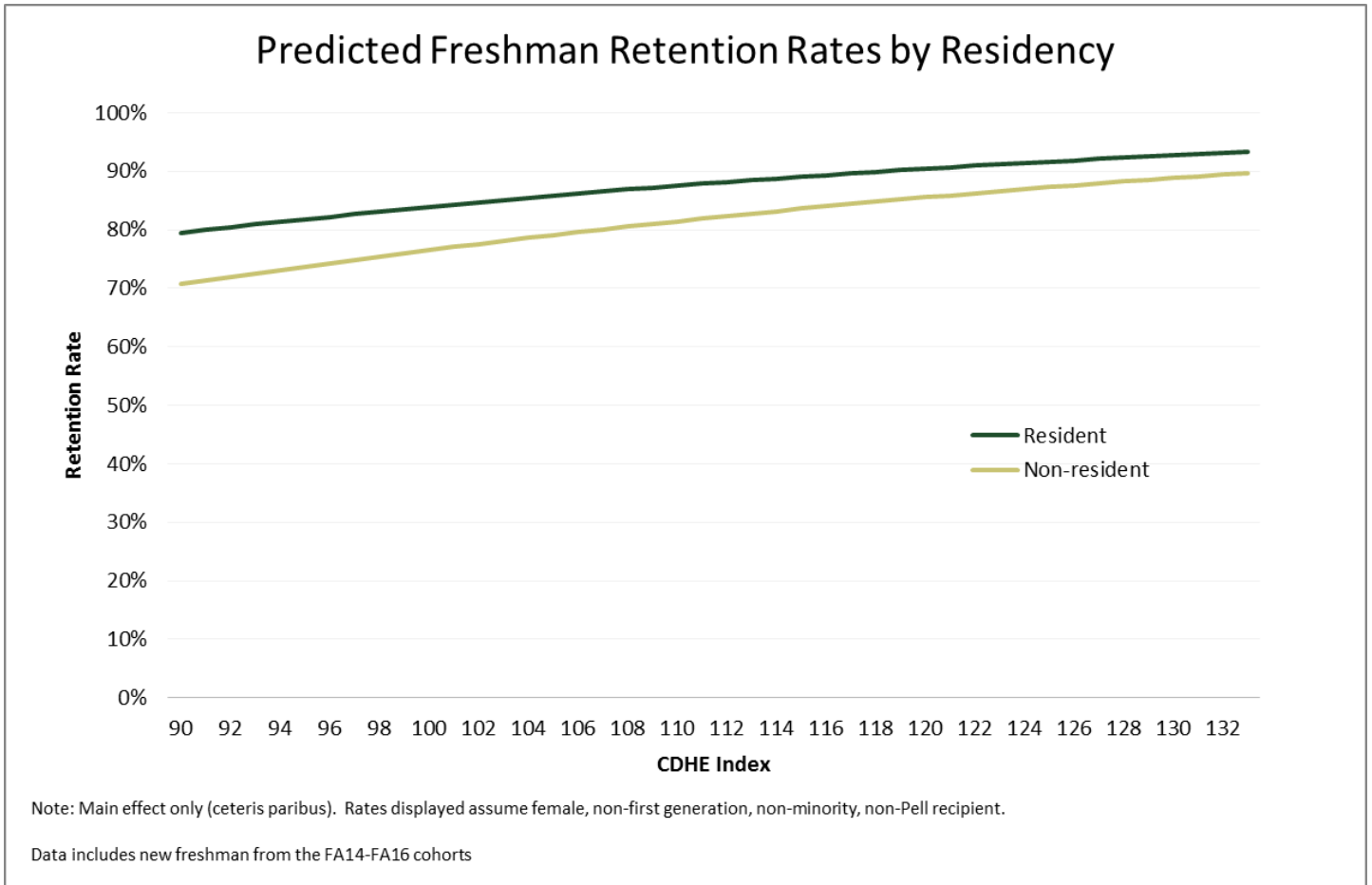




Figure 4. Predicted Six-Year Graduation Rates by Residency

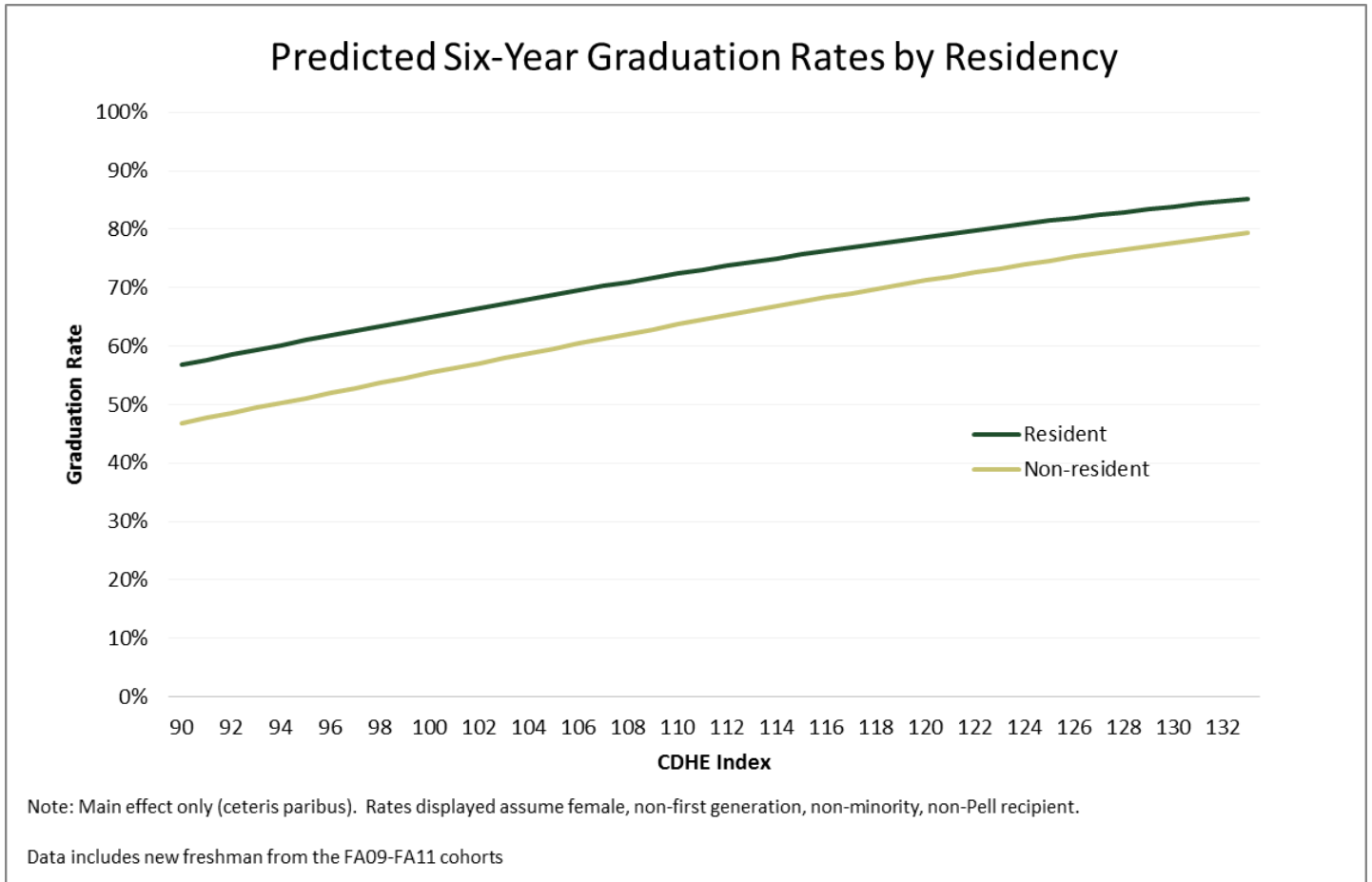




Figure 5. Predicted Freshman Retention Rates by First-Generation Status

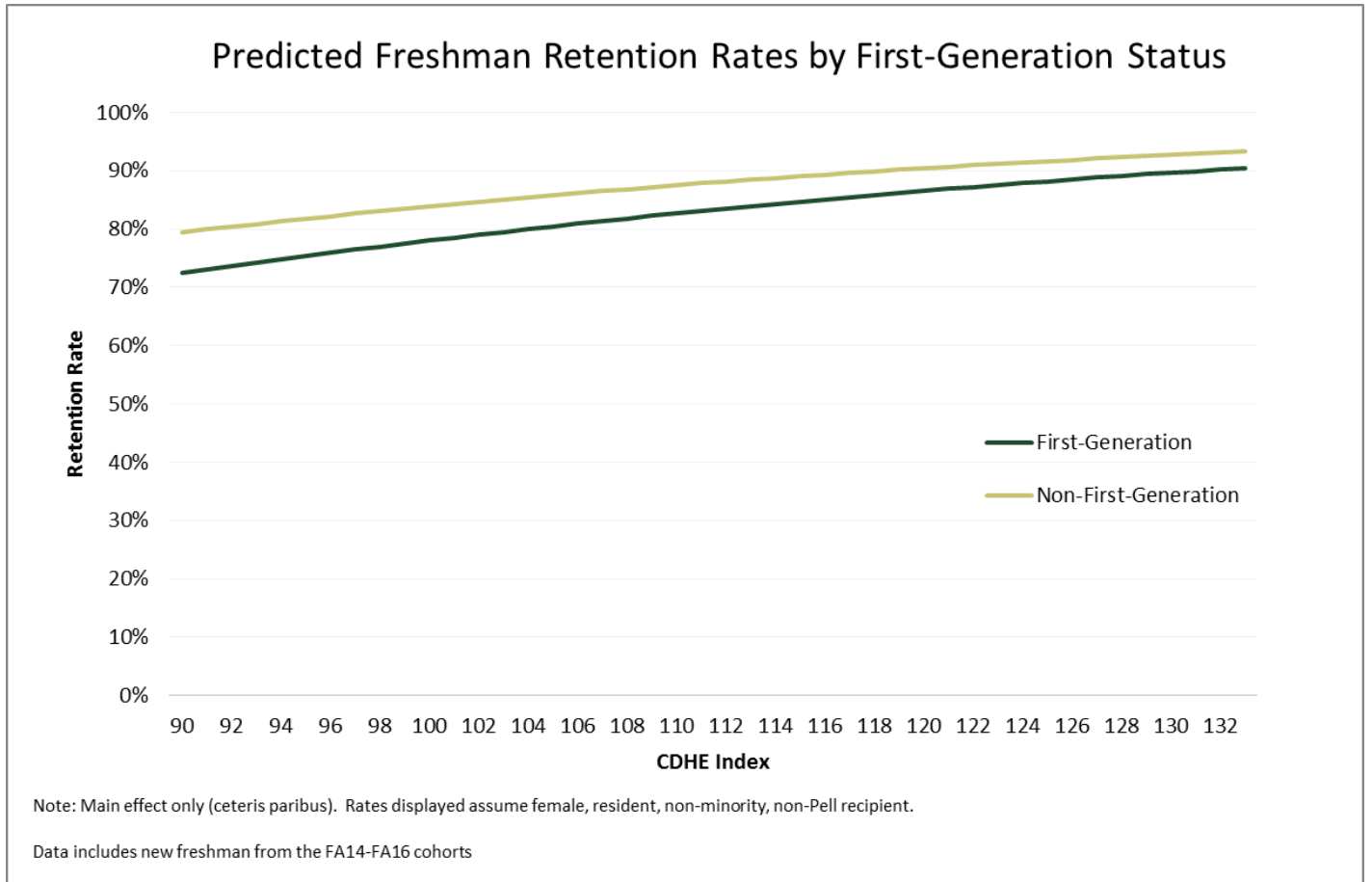




Figure 6. Predicted Six-Year Graduation Rates by First-Generation Status

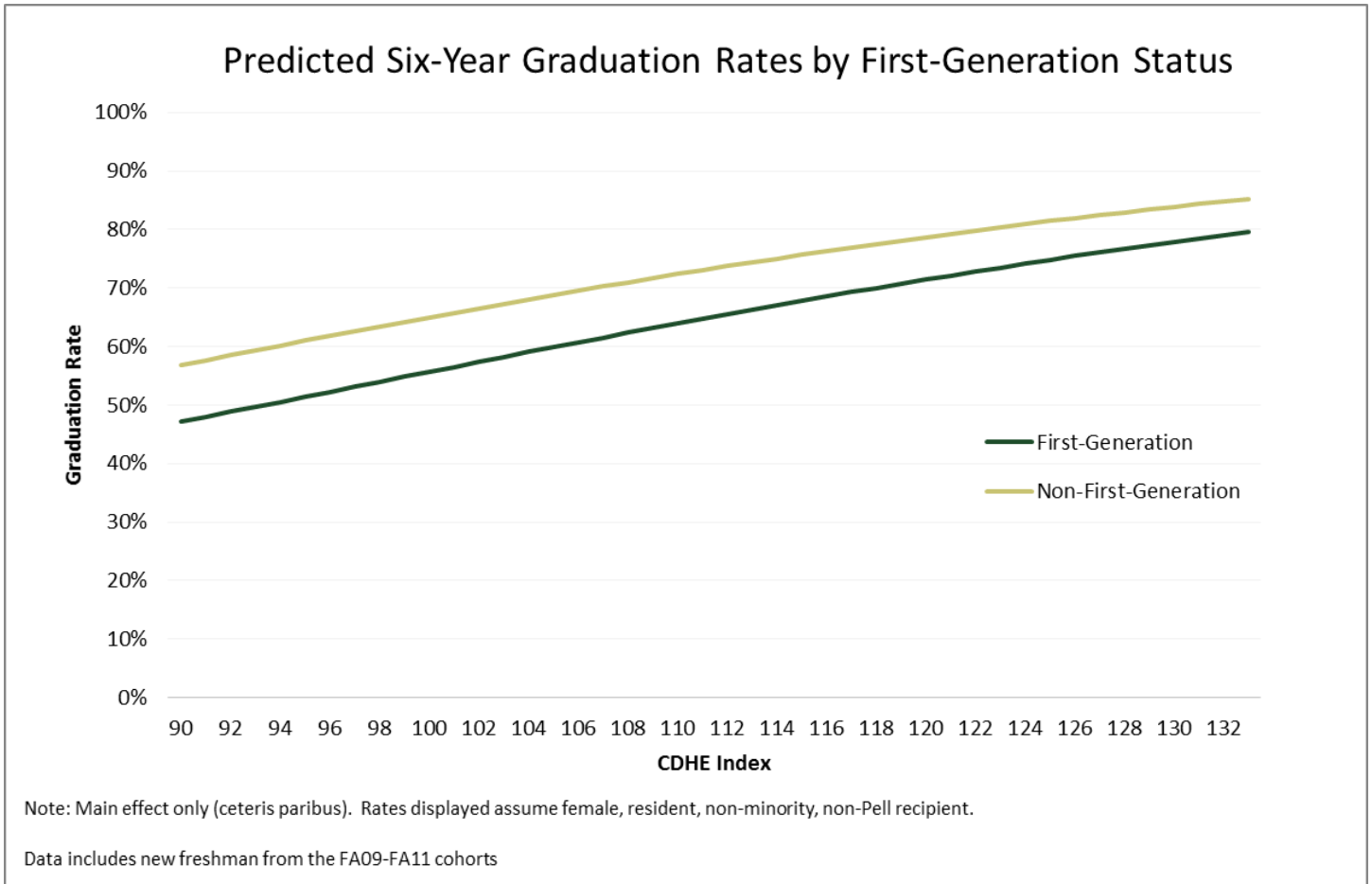




Figure 7. Predicted Freshman Retention Rates by Pell Recipient Status

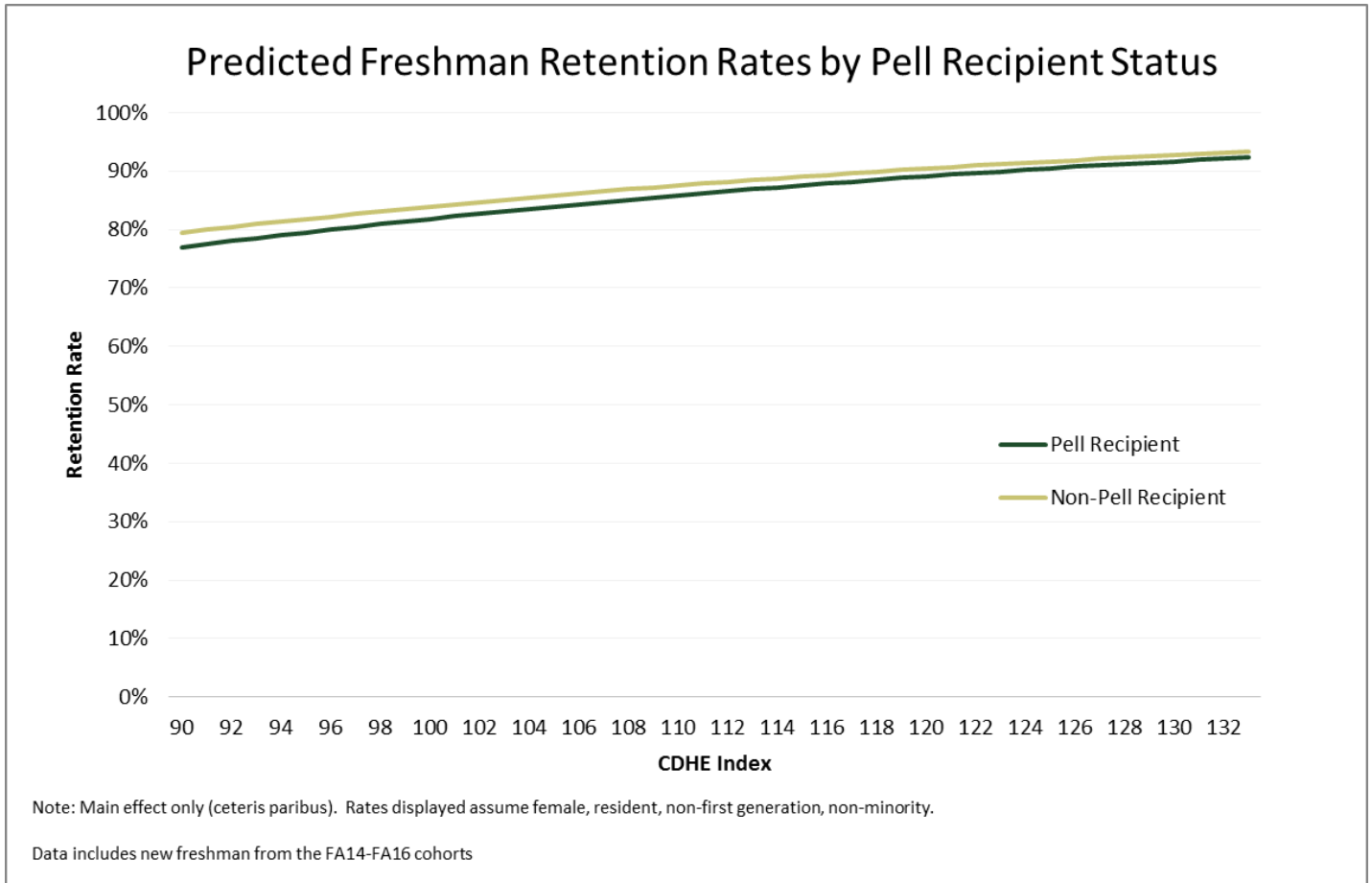
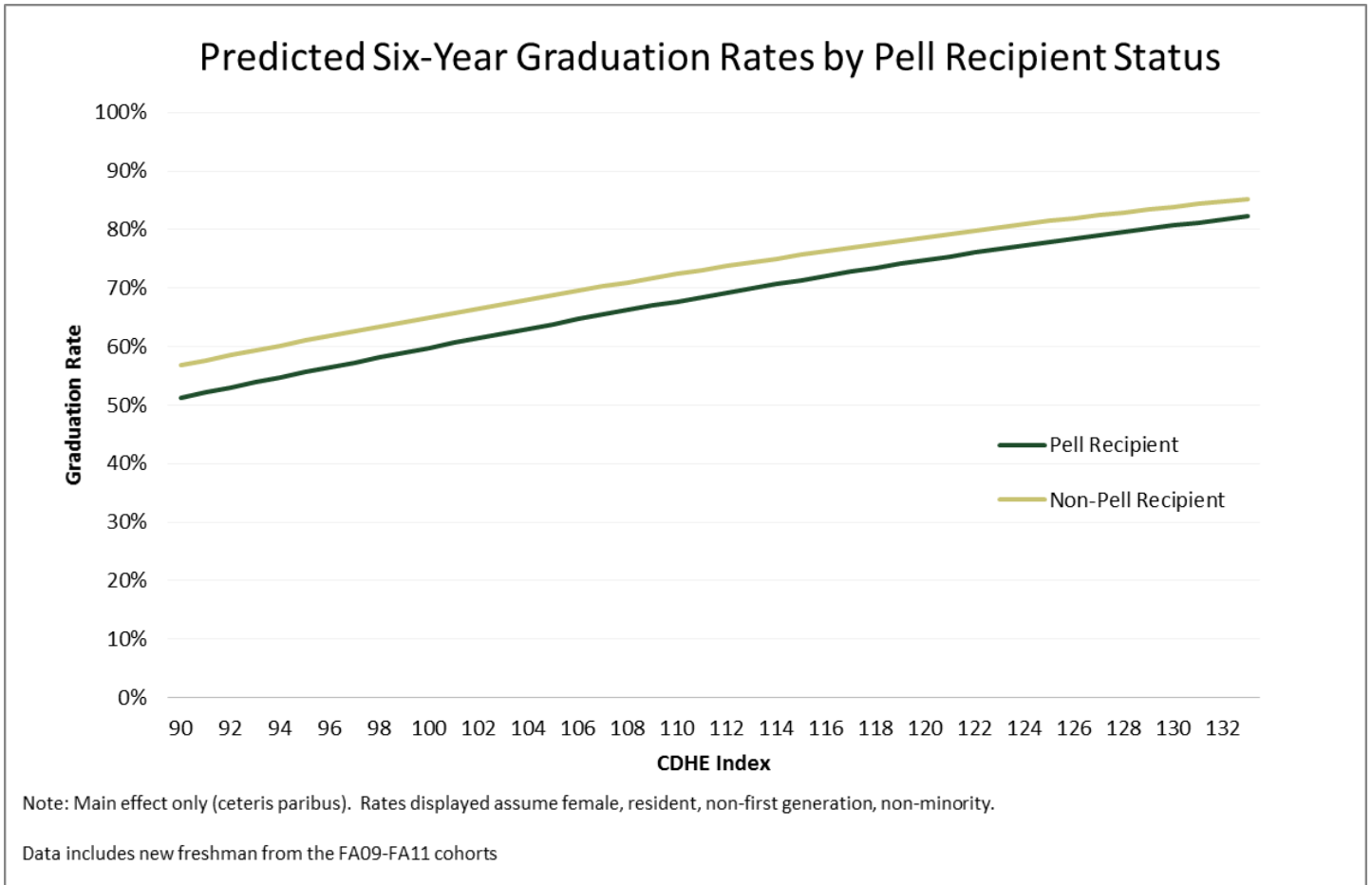




Figure 8. Predicted Six-Year Graduation Rates by Pell Recipient Status





Appendix B

Table 3. Descriptive Statistics for the Logistic Regression Predicting Freshman Retention (FA14, FA15, & FA16 cohorts)

Variable	Observations	Proportion	Standard Deviation	Min	Max
Retained	13,784	85.4%	0.353	0	1
CO Resident	13,786	70.1%	0.458	0	1
Asian American	13,786	3.2%	0.175	0	1
African American	13,786	2.5%	0.157	0	1
Hawaiian/Pac. Islander	13,786	0.2%	0.042	0	1
Hispanic	13,786	12.9%	0.335	0	1
Multi-Racial	13,786	2.8%	0.164	0	1
Native American	13,786	0.6%	0.080	0	1
Non-minority	13,786	77.8%	0.416	0	1
Female	13,786	54.8%	0.498	0	1
Index (mean)	13,590	115.3	11.873	61	146
First-Generation	13,786	23.9%	0.426	0	1
Pell Recipient	13,786	20.5%	0.403	0	1

Table 4. Descriptive Statistics for the Logistic Regression Predicting 4-Year Graduation (FA11, FA12, & FA13 cohorts)

Variable	Observations	Proportion	Standard Deviation	Min	Max
Graduated (4 years)	13,230	44.8%	0.497	0	1
CO Resident	13,241	75.3%	0.431	0	1
Asian American	13,241	2.0%	0.140	0	1
African American	13,241	2.1%	0.144	0	1
Hawaiian/Pac. Islander	13,241	0.1%	0.027	0	1
Hispanic	13,241	11.0%	0.313	0	1
Multi-Racial	13,241	4.0%	0.195	0	1
Native American	13,241	0.4%	0.004	0	1
Non-minority	13,241	80.4%	0.397	0	1
Female	13,241	55.4%	0.497	0	1
Index (mean)	13,078	115.1	11.529	76	146
First-Generation	13,241	25.3%	0.435	0	1
Pell Recipient	13,241	22.7%	0.419	0	1

**Table 5. Descriptive Statistics for the Logistic Regression Predicting 5-Year Graduation (FA10, FA11, & FA12 cohorts)**

Variable	Observations	Proportion	Standard Deviation	Min	Max
Graduated (5 years)	13,227	65.0%	0.477	0	1
CO Resident	13,237	77.2%	0.420	0	1
Asian American	13,237	1.9%	0.135	0	1
African American	13,237	2.3%	0.151	0	1
Hawaiian/Pac. Islander	13,237	0.1%	0.037	0	1
Hispanic	13,237	9.9%	0.299	0	1
Multi-Racial	13,237	3.7%	0.189	0	1
Native American	13,237	0.4%	0.061	0	1
Non-minority	13,237	81.7%	0.387	0	1
Female	13,237	55.7%	0.497	0	1
Index (mean)	13,093	114.8	11.483	76	146
First-Generation	13,237	25.0%	0.433	0	1
Pell Recipient	13,237	23.0%	0.421	0	1

Table 6. Descriptive Statistics for the Logistic Regression Predicting 6-Year Graduation (F09, FA10, & FA11 cohorts)

Variable	Observations	Proportion	Standard Deviation	Min	Max
Graduated (6 years)	12,975	67.5%	0.468	0	1
CO Resident	12,991	78.4%	0.412	0	1
Asian American	12,991	1.9%	0.136	0	1
African American	12,991	2.3%	0.149	0	1
Hawaiian/Pac. Islander	12,991	0.2%	0.046	0	1
Hispanic	12,991	9.1%	0.288	0	1
Multi-Racial	12,991	3.1%	0.174	0	1
Native American	12,991	0.4%	0.066	0	1
Non-minority	12,991	83.0%	0.376	0	1
Female	12,991	55.7%	0.497	0	1
Index (mean)	12,879	114.6	11.334	76	146
First-Generation	12,991	24.5%	0.430	0	1
Pell Recipient	12,991	21.5%	0.411	0	1