

Graduation Rates Data Analysis Report

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Graduation Rate Data Analysis Report

Institutional outcomes of student success, such as fall-to-fall freshmen retention and 6-year graduation rates, are a major concern to both internal and external TLU constituents. TLU's six year graduation rates for cohorts starting in fall 2003 through fall 2007 are lower than those of a national comparison group of not-for-profit schools. To help us improve these student success outcomes and fueled by the comparison data, Institutional Research (IR) explored retention and graduation data.

We posed several objective questions and employed a multi-faceted research approach using institutional class profiles of schools with relatively small enrollments and internal TLU student level data. By creating predictive models with this data we determined the institutional and student characteristics that project fall-to-fall freshmen retention and 6-year graduation rates for TLU. The institutional level data was used to create benchmarking models for 6-year graduation rates and retention rates. Internal (TLU) student- level data was used to predict the likelihood of a student retaining to the third term and graduating within six years from TLU.

The study's findings from the institutional class profile benchmark models showed that the level of academic preparedness and receipt of institutional aid were positive predictors of retention at both the institutional level and the student level. Surprisingly, the number of undergraduates enrolled (for retention) and the size of the incoming freshmen class (for graduation rates) were also positive institutional predictors.

Our research using TLU student level data found similar variables predict individual student outcomes. For both retention and graduation, we found that academic performance and credit hours attempted were the strongest predictors of student success.

The findings of our research project provide a strong base for creating plans and policies to improve TLU student success.

Problem Statement

TLU's 4 and 6-year graduation rates are lower than the mean and median of a national comparison group. The comparison group was chosen from the IPEDS data center using the following characteristics:

- U.S. only, Title IV participating
- Private, not-for-profit, 4-year or above
- Degree-granting, primarily baccalaureate or above
- Full-time undergraduates
- Carnegie basic classes of Master's smaller programs, Baccalaureate Arts & Sciences, Baccalaureate Diverse Fields (TLU is in this category)

Comparison of 6-Year Graduation Rates to National Group

Entering Freshman Cohort	TLU	N	Mean	25th Percentile	Median	75th Percentile	Standard Deviation
Cohort 2003	49%	360	59%	45	59	75	19.68
Cohort 2004	46%	360	59%	45	60	75	19.46
Cohort 2005	49%	359	59%	46	59	74	18.83
Cohort 2006	45%	359	59%	46	59	74	18.92
Cohort 2007	52%	359	59%	45	60	73	18.77

Disaggregating this data shows lower than desired 6-year graduation rates are across all ethnicities. See Appendix A.

Objectives

To determine what institutional and student characteristics influence graduation rates, IR undertook a series of analyses examining two different types of data. We modeled institutional level data of similar schools using freshmen class profile variables from IPEDS and internal TLU student data from the Jenzabar administrative software system. Because fall-to-fall freshmen retention has such a large effect on graduation rates, we also analyzed variables for this outcome using the same data sources. With these analyses we sought to answer several questions:

- What factors contribute the most power to fall-to-fall freshmen retention and to 6-year graduation rates?
- Which variables, if any, predict both retention and graduation?
- What policies and practices can positively affect retention and graduation rates?
- What are reasonable retention and graduation rate goals given the profile of the entering freshmen class?
- How much does retention contribute to graduation rate predictions?
- Using predictive modeling, what retention and graduation rates can we expect in the next 5 years?
- How do we discuss graduation rates with parents of potential students that gives a true picture of TLU?

Process

Using institutional level data from IPEDS, we created models to predict both fall-to-fall freshmen retention and 6-year graduation rates. These models have several institutional uses:

- Goal setting
- “What if” scenarios
- Benchmarking progress towards goals

Using TLU student level data across 5 cohorts of entering freshmen we created predictive models that assigned probability scores for each student's likelihood of retaining to their sophomore year. We used the same process to determine students' likelihood of graduating within 6 years.

We performed many reiterations of predictive analytics to create and refine the models. When we were satisfied that we had the best models for our data, we checked the accuracy by comparing predicted values and actual values, examined decile analysis, and explored frequency distributions.

See Appendix B for more details on methodology and process.

Findings from Institutional Class Profile Benchmark Models

Retention Rates: (See Appendix C)

- Academic preparedness predicts retention. The higher the 25th and 75th percentile composite SAT or ACT converted to SAT scale scores are the higher the institutional retention rate. These variables contribute 25.5% and 26.14%, respectively, to the model.
- The percent of freshmen receiving Pell grants negatively affects institutional retention rates. The more Pell freshmen, the lower the retention rate. This variable contributes 25.7% to the model.
- The total number of undergraduates is a positive predictor. The larger the number of undergraduates, the higher the freshmen retention rate is. Our original institutional group included schools with large enrollments. Analysis of the data showed that institutional retention improved with higher enrollments but only to approximately 2500 total undergraduate enrollment. At undergraduate total enrollment above 2500, retention rates declined. We ultimately reduced the institutional dataset to include only schools with 2500 or less total undergraduate population. One interpretation is that retention is higher for institutions on the high end of "small" undergraduate enrollment. This variable contributes 13.14% to the model.
- Institutional aid is a positive predictor of retention. The higher the percent of freshmen receiving institutional aid, the higher the institutional retention rate. This variable contributes 9.46% to the model.

6-Year Graduation Rates: (See Appendix D)

- Full-time freshmen cohort fall-to-fall retention was the strongest predictor of 6-year graduation rates and contributes 49.05% to the model. 6-year graduation rates are higher for schools with higher fall-to-fall freshmen retention rates.
- Academic preparedness predicts 6-year graduation rates. The higher the 25th and 75th percentile composite SAT or ACT converted to SAT scale scores are the higher the institutional 6-year graduation rate. These 2 variables contribute 23.34% and 10.12% respectively.
- The size of the entering freshmen cohort is a positive predictor of 6-year graduation rates. However, like the variable of undergraduate size in the institutional retention model, we interpret this to mean that larger entering freshmen classes in small institutions have higher 6-

year graduation rates. This variable contributes 9.56% to the model. The entering freshmen class size at which graduation rates begin to decline is larger than 550.

- Institutional aid is a positive predictor of 6-year graduation rates. The higher the percent of freshmen receiving institutional aid, the higher the institutional 6-year graduation rate. This variable contributes 7.93% to the model.

Findings for TLU Student Level Predictive Models

Retention: (See Appendix E)

- Term 1 TLU GPA is the strongest predictor of retention. The higher the first term TLU GPA, the higher the probability that the student will return for the next fall. This variable contributes 43.7% to the model.
- Term 1 TLU credit hours attempted is a positive predictor of fall-to-fall retention. The higher the number of hours attempted, the higher the probability of the student returning for the sophomore year. This variable contributes 18.96% to the model.
- The dollar amount of TLU scholarships a student receives is a positive predictor of retention. The higher the dollar amount of TLU scholarships, the more likely the student will retain to the next fall. This variable contributes 15.66% to the model.
- Women have a higher probability of retaining than do men. This variable contributes 11.58% to the model.
- First generation status students are not as likely to retain to the next fall as those students who are not first generation. This variable contributes 10.11% to the model.

6-Year Graduation: (See Appendix F)

- Term 1 TLU GPA is the strongest predictor of the probability of a student graduating within 6 years. The higher the first term GPA, the higher the probability of graduating within 6 years. This variable contributes 61.08% to the model.
- Term 1 TLU credit hours attempted positively predicts the likelihood of graduating within 6 years. The higher the number of credit hours attempted, the greater the probability of graduating within 6 years. This variable contributes 21.38% to the model.
- High School GPA is also a positive predictor of graduating within 6 years. The higher the high school GPA the more likely a student is to graduate from TLU within 6 years. This variable contributes 17.53% to the model.

There are several major themes running through these models.

- Academic preparedness, TLU academics, and TLU scholarships are critically important to both retention and graduation at both the institutional level and student level of analysis.
- Size does matter at the institutional level of analysis for both retention and 6-year graduation rates. It appears as if there is a “critical mass” needed to get to the highest retention and graduation rates among the smaller institutions.

- Another important finding from the exploration of descriptive statistics for student level data is that attempting 15 or more credit hours in term 1 leads to higher retention and graduation rates in every SAT or ACT converted to SAT scale quartile bucket (see Appendix G). This particular analysis replicated a study from the University of Hawaii, Indiana State University, and Nova Southeastern University that was presented at the Association for Institutional Research annual conference, May 2015.

Summary of Findings by Objective

- What factors contribute the most power to fall-to-fall freshmen retention and to 6-year graduation rates?
 - Academic preparedness for retention and retention for graduation
- Which variables, if any, predict both retention and graduation?
 - Academic performance/ preparedness, institutional scholarships, and term one credit hours attempted
- What are reasonable retention and graduation rate goals given the profile of the entering freshmen class?
 - 75% for fall-to-fall retention and 52% for 6-year graduation are reasonable goals based on the current profile of entering classes
- How much does retention contribute to graduation rate predictions?
 - Retention rates contribute 49% of the predictive power to the institutional level model.
- Using predictive modeling, what retention and graduation rates can we expect in the next 5 years?
 - Given no new interventions, 72%-74% for retention and 49%-51% for graduation rates
- How do we discuss graduation rates with parents of potential students that give a true picture of TLU?
 - Discuss the plans and policies we have implemented to improve student success
- What policies and practices can positively affect retention and graduation rates?
 - See below.

Policy Considerations

Based on our analysis and findings, the following suggestions and ideas are offered for discussion and consideration.

- Formalize, in writing, a plan to increase both fall-to-fall freshmen retention and 6-year graduation rates. The plan should be specific enough to include goals, timeline, action steps, and evaluation of progress towards goals but still flexible enough to make adjustments as needed.
- Find appropriate ways to motivate students to take advantage of all of the academic support services offered at TLU.
- Ask faculty to integrate academic support services, such as tutoring and SI, into their courses.

- Educate students, faculty, and staff on the importance of credit hour accumulation for student success. For instance, share the graphs from Appendix G and the cost to students in delaying graduation for one, two, or more semesters.
- Discuss the enrollment growth to reach the “critical mass” needed to improve student outcomes. Topics should include additional research questions, goal setting, and strategies.
- Share this report widely among TLU constituents.
- Continue to adjust the profile of entering classes to fulfill the TLU mission while admitting students that are more likely to be successful here.

Appendix A

Comparison of 6-Year Graduation Rates to National Group by Ethnicity

Entering Freshman Cohort	TLU Rate for Black/African American Graduates	National Grp Rate for Black/African American Graduates	TLU Rate for Hispanic Graduates	National Grp Rate for Hispanic Graduates	TLU Rate for White Graduates	National Grp Rate for White Graduates
Cohort 2003	45%	47%	47%	52%	52%	61%
Cohort 2004	39%	48%	37%	52%	48%	61%
Cohort 2005	45%	46%	39%	52%	52%	61%
Cohort 2006	31%	47%	39%	54%	49%	61%
Cohort 2007	56%	48%	39%	52%	60%	61%

Appendix B: Methodology

Institutional Level Data

Retention Rates

Data Collection

Created benchmark predictive models for retention rates using information gathered from the Integrated Post-Secondary Education Data System (IPEDS) Data Center. The criteria used to form the comparison group are listed below:

Criteria for the Comparison Group

- **Miscellaneous Indicators**
 - Title IV participating
 - U.S. only
- **Sector**
 - Private not-for-profit, 4-year or above
 - Public, 4-year or above
- **Degree-granting status**
 - Degree-granting
- **Has full-time first-time undergraduates**
 - Yes
- **Institutional category**
 - Degree-granting, primarily baccalaureate or above

A variety of academic readiness, demographic, and financial aid variables were gathered from the IPEDS Data Center.

All institutions that did not contain data for SAT Math and SAT Critical Reading or ACT score were removed in order to have a more complete dataset. Additionally, institutions that did not have data for retention rates were removed.

The comparison group was further reduced based on the class and undergraduate sizes to better fit the characteristics of Texas Lutheran University. It is believed that TLU is more similar to public universities based on the selectivity of incoming students. Because of this belief, public schools were incorporated into the group alongside public schools. However, after consulting with an *Analytics* expert, it was realized that having such large schools remain in the data set skewed our results. As a result, all institutions with an entering freshman class size of greater than 550 were removed, and all institutions with a total undergraduate population of greater than 2500 were removed.

Input Variables

- *Percent of full-time, first-time undergraduates receiving Pell grants
- *Percent of full-time, first-time undergraduates receiving institutional grant aid
- *SAT/ACT converted Composite 25th Percentile
- *SAT/ACT converted Composite 75th Percentile
- *Grand total (All undergraduate total)
- Full-Time Retention Rate
- Percent of tuition paid for by federal, state, local, or institutional grant aid
- Admissions yield
- Percent of full-time, first time undergraduates that are women
- Percent of full-time, first time undergraduates that are white
- Percent of full-time, first time undergraduates that are black or African American
- Percent of full-time, first time undergraduates that are Hispanic
- Percent of full-time, first time undergraduates that are of another ethnicity
- Number of students in cohort

*indicates variables that were predictors for the final model

Coding and Computations

$$\text{Percent White} = \frac{\text{White total}}{\text{Grand Total}} \times 100$$

$$\text{Percent Black} = \frac{\text{Black total}}{\text{Grand Total}} \times 100$$

$$\text{Percent Hispanic} = \frac{\text{Hispanic total}}{\text{Grand Total}} \times 100$$

$$\text{Percent Other} = \frac{N \text{ American} + \text{Asian} + N \text{ Hawaiian} + \text{Two or more} + \text{Unknown} + \text{International}}{\text{Grand Total}} \times 100$$

$$\text{Percent of Tuition Paid for by Aid} = \frac{\text{Tuition and Fees}}{\text{Average Fed, State, Inst'l Grant Aid}} \times 100$$

$$\text{Percent of Women} = \frac{\text{Grand total women (full time, first time)}}{\text{Grand total (full time, first time)}} \times 100$$

$$\text{SAT Composite 25th Percentile} = \text{SAT Critical Reading 25th Percentile} + \text{SAT Math 25th Percentile}$$

$$\text{SAT Composite 75th Percentile} = \text{SAT Critical Reading 75th Percentile} + \text{SAT Math 75th Percentile}$$

If there were any schools that did not have information for SAT Critical Reading, SAT Math, or both, then the ACT score was converted to SAT scale and was used as the composite score.

The website below offers a table of the conversions; ACT composite score and SAT CR+M (single score) were used

<http://www.act.org/solutions/college-career-readiness/compare-act-sat/>

Analysis

IR Analyzed all models in Rapid Insight Analytics using ordinary least squares regression at a p-value of .01. Frequencies, comparison of predicted results to actual results, decile analysis were also calculates. See Appendix C for output.

6-Year Graduation Rates

Data Collection

Collected data based on the same criteria as institutional retention rates.

Input Variables

- *SAT/ACT converted Composite 25th Percentile
- *SAT/ACT converted Composite 75th Percentile Full-Time Retention
- *Number of students in cohort
- *Percent of full-time, first-time undergraduates receiving institutional grant aid
- *Full-Time Retention
- Percent change in average tuition after 6 years
- Percent change in average tuition after 4 years
- Percent of tuition paid for by institutional grant aid
- Admissions yield
- Grand total (All Undergraduate total)
- Percent of full-time, first time undergraduates that are white
- Percent of full-time, first time undergraduates that are black or African American
- Percent of full-time, first time undergraduates that are Hispanic
- Percent of full-time, first time undergraduates that are of another ethnicity
- Percent of full-time, first time undergraduates that are women

*indicates variables that were predictors for the final model

Coding and Computations

$$\text{Percent White} = \frac{\text{White total}}{\text{Grand Total}} \times 100$$

$$\text{Percent Black} = \frac{\text{Black total}}{\text{Grand Total}} \times 100$$

$$\text{Percent Hispanic} = \frac{\text{Hispanic total}}{\text{Grand Total}} \times 100$$

$$\text{Percent Other} = \frac{N \text{ American} + N \text{ Asian} + N \text{ Hawaiian} + \text{Two or more} + \text{Unknown} + \text{International}}{\text{Grand Total}} \times 100$$

$$\text{Percent of Tuition Paid for by Aid} = \frac{\text{Tuition and Fees}}{\text{Average Fed, State, Inst'l Grant Aid}} \times 100$$

$$\text{Percent of Women} = \frac{\text{Grand total women (full time, first time)}}{\text{Grand total (full time, first time)}} \times 100$$

SAT Composite 25th Percentile = SAT Critical Reading 25th Percentile + SAT Math 25th Percentile

SAT Composite 75th Percentile = SAT Critical Reading 75th Percentile + SAT Math 75th Percentile

$$\text{Percent Change In Average Tuition After 6 Years} = \frac{\text{Average Tuition Year 6} - \text{Average Tuition Year 1}}{\text{Average Tuition Year 1}} \times 100$$

$$\text{Percent Change In Average Tuition After 4 Years} = \frac{\text{Average Tuition Year 4} - \text{Average Tuition Year 1}}{\text{Average Tuition Year 1}} \times 100$$

If there were any schools that did not have information for SAT Critical Reading, SAT Math, or both, then the ACT score was converted to SAT scale and was used as the composite score.

The website below offers a table of the conversions; ACT composite score and SAT CR+M (single score) were used

<http://www.act.org/solutions/college-career-readiness/compare-act-sat/>

Analysis

IR Analyzed all models in Rapid Insight Analytics using ordinary least squares regression at a p-value of .01. Frequencies, comparison of predicted results to actual results, decile analysis were also calculated. See Appendix D for output.

Student Level Data

Retention

Data Collection

We collected student level data from the TLU system Jenzabar. A variety of academic readiness, demographic, and financial aid variables were gathered based on each individual student.

Input Variables

*Texas Lutheran University scholarship amount
*First term GPA
*Number of hours attempted in the first term
*First generation status (Y/N)
*Gender
Number of days accepted prior to September 1
Number of days paid prior to September 1
AAA Admit
Academic probation
ACT Composite Score
Student athlete (Y/N)
Ethnicity
Federal grant aid amount
Federal loan aid amount
Financial aid award year
Number of hours enrolled
High school GPA
High school ranking (as a percentage of high school class)
Major 1
Living on campus
Other loan aid amount
Outside scholarship amount
Pell eligibility
Parent loan aid amount
Religion
SAT composite value
SAT math score
SAT verbal score
SAT writing score
Service social organizations
Sport code
Student grant aid amount
Number of hours earned in the first term
Work Study
Student Status

*indicates variables that were predictors for the final model

Coding and Computations

Certain variables were recoded as binary.

- Attempted 15 or more credit hours in the first term
- Earned 15 or more credit hours in the first term
- First Generation status
- Student Athlete
- Gender
- Academic Probation
- AAA Admit

Categorical Variables were recoded

- Ethnicity
- Gender
- Major 1 into groups
- Sport code
- Computed ratio of earned credit hours to attempted credit hours

Analysis

IR Analyzed all models in Rapid Insight Analytics using logistic regression at a p-value of .01. Frequencies, comparison of predicted results to actual results, decile analysis, and probability scoring were also calculated. See Appendix E for output.

Graduation

Data Collection

The data collection method is the identical to that of student level retention.

Input Variables

- *High school GPA
- *Term one GPA
- *Number of hours attempted in term one
- Average term one and term two GPA
- Average term one and term two GPA Quartiles
- Degree code
- Ethnicity
- First generation status
- Gender
- Group major 1
- High school GPA quartile
- Major 1

Major 2
SAT composite value
SAT composite value quartiles
Term one – attempt at 15 or more hours (Y/N)
Term two – attempt at 15 or more hours (Y/N)
Term one GPA quartiles
Term one ratio
Number of hours earned in term one
Term two – earned 15 or more hours (Y/N)
Term two GPA quartiles
Number of hours attempted in term two
Number of hours earned in term two
Year code

*indicates variables that were predictors for the final model

Coding and Computations

Certain variables were recoded as binary.

15 or more credit hours attempted
15 or more credit hours earned
First Generation Status

Categorical variables were recoded.

Degree Code into groups
Ethnicity
Gender
High School GPA Quartiles
Major 1 into groups

Calculated ratio of earned credit hours to attempted credit hours

Analysis

IR Analyzed all models in Rapid Insight Analytics using logistic regression at a p-value of .01. Frequencies, comparison of predicted results to actual results, decile analysis, and probability scoring were also calculated. See Appendix F for output.

Appendix C: Retention Rates – Institutional Level

Predicting: FT retention rate

Variable	Coef	S.E.	t-value	p-value
Intercept	3.642	5.935	0.6137	0.5394
SquareRoot(SAT/ACT Converted Composite 25th (1600))	1.428	0.2396	5.961	0.000000
SquareRoot(Percent FF_U Pell Grants)	-2.345	0.2319	-10.12	0.000000
Grand total (All Undergraduate total)	0.00253	0.000330	7.666	0.000000
SAT/ACT Converted Composite 75th (1600)	0.02313	0.00363	6.363	0.000000
LOGe(Percent FF_U Inst'l Grant Aid)	2.440	0.4350	5.609	0.000000

Diagnostics

R Square	0.5419
SSE	111,040.16
CTSS	242,412.48
MSE	62.70
RMSE	7.918
DFE	1,771
F	419.06
N	1,777

Covariance of Estimates:

	Intercept	SquareRoot(SAT/ACT Converted Composite 25th (1600))	SquareRoot(Pe rcent FF_U Pell Grants)
Intercept	35.22	-1.074	-0.9704
SquareRoot(SAT/ACT Converted Composite 25th (1600))	-1.074	0.05741	0.01642
SquareRoot(Percent FF_U Pell Grants)	-0.9704	0.01642	0.05376
Grand total (All Undergraduate total)	-0.000054	-0.000009	0.000011
SAT/ACT Converted Composite 75th (1600)	0.00638	-0.000708	0.000133
LOGe(Percent FF_U Inst'l Grant Aid)	-0.8382	0.01198	-0.00843

	Grand total (All Undergraduate total)	SAT/ACT Converted Composite 75th (1600)	LOGe(Percent FF_U Inst'l Grant Aid)
Intercept	-0.000054	0.00638	-0.8382
SquareRoot(SAT/ACT Converted Composite 25th (1600))	-0.000009	-0.000708	0.01198
SquareRoot(Percent FF_U Pell Grants)	0.000011	0.000133	-0.00843
Grand total (All Undergraduate total)	0.000000	0.000000	-0.000014
SAT/ACT Converted Composite 75th (1600)	0.000000	0.000013	-0.000250
LOGe(Percent FF_U Inst'l Grant Aid)	-0.000014	-0.000250	0.1892

Correlation of Estimates:

	Intercept	SquareRoot(SAT/ACT Converted Composite 25th (1600))	SquareRoot(Per cent FF_U Pell Grants)
Intercept	1.000	-0.7555	-0.7052
SquareRoot(SAT/ACT Converted Composite 25th (1600))	-0.7555	1.000	0.2956
SquareRoot(Percent FF_U Pell Grants)	-0.7052	0.2956	1.0000
Grand total (All Undergraduate total)	-0.02783	-0.1108	0.1459
SAT/ACT Converted Composite 75th (1600)	0.2956	-0.8128	0.1583
LOGe(Percent FF_U Inst'l Grant Aid)	-0.3247	0.1150	-0.08360

	Grand total (All Undergraduate total)	SAT/ACT Converted Composite 75th (1600)	LOGe(Percent FF_U Inst'l Grant Aid)
Intercept	-0.02783	0.2956	-0.3247
SquareRoot(SAT/ACT Converted Composite 25th (1600))	-0.1108	-0.8128	0.1150
SquareRoot(Percent FF_U Pell Grants)	0.1459	0.1583	-0.08360
Grand total (All Undergraduate total)	1.000	0.1226	-0.09635
SAT/ACT Converted Composite 75th (1600)	0.1226	1.000	-0.1583
LOGe(Percent FF_U Inst'l Grant Aid)	-0.09635	-0.1583	1.0000

XPX:

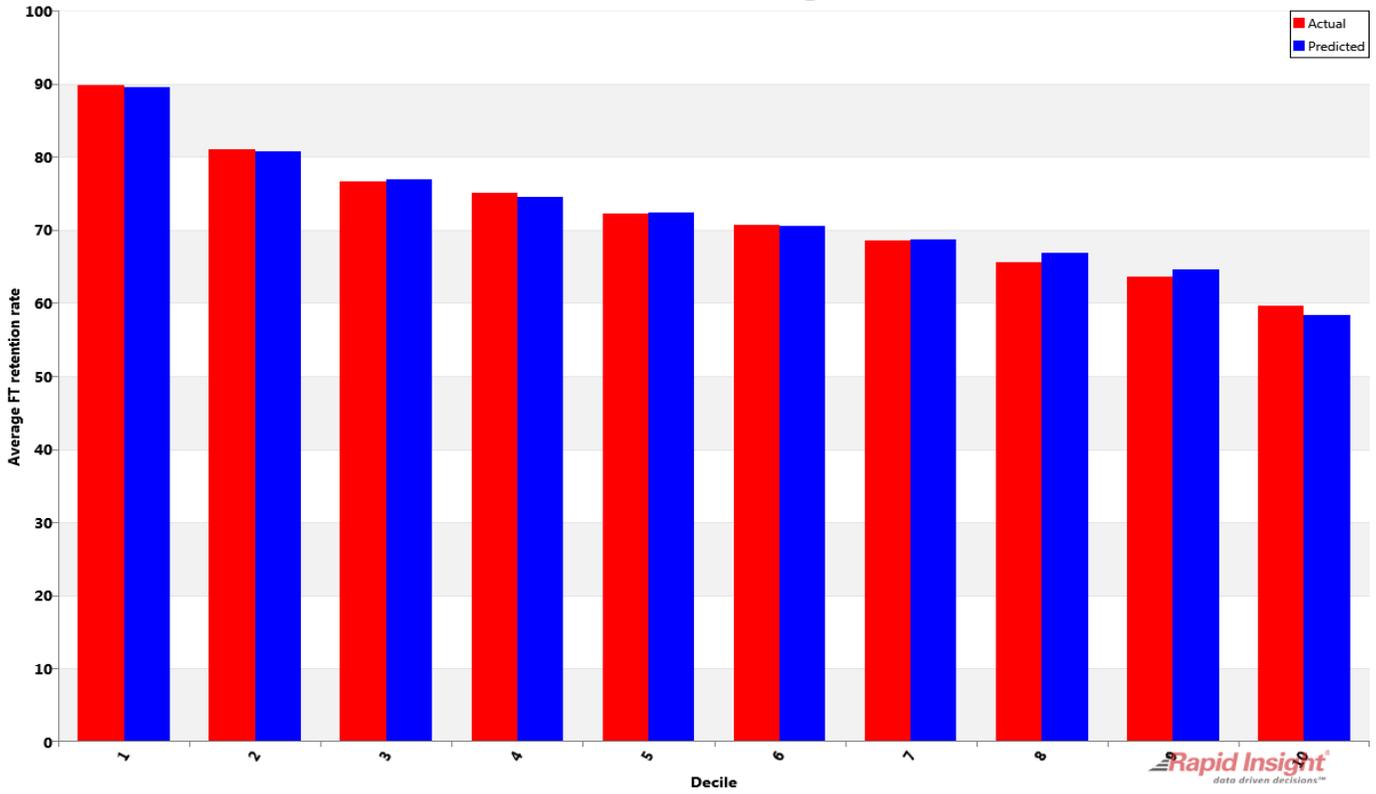
	Intercept	SquareRoot(SAT/ACT Converted Composite	SquareRoot(Per cent FF_U Pell
Intercept	1,777.00	53,753.74	11,370.65
SquareRoot(SAT/ACT Converted Composite 25th (1600))	53,753.74	1,633,308	340,618.81
SquareRoot(Percent FF_U Pell Grants)	11,370.65	340,618.81	75,512
Grand total (All Undergraduate total)	2,304,288	70,062,832.64	14,473,003.81
SAT/ACT Converted Composite 75th (1600)	2,030,565	61,842,935.75	12,790,256.64
LOGe(Percent FF_U Inst'l Grant Aid)	7,829.45	236,809.48	50,144.99

	Grand total (All Undergraduate total)	SAT/ACT Converted Composite 75th (1600)	LOGe(Percent FF_U Inst'l Grant Aid)
Intercept	2,304,288	2,030,565	7,829.45
SquareRoot(SAT/ACT Converted Composite 25th (1600))	70,062,832.64	61,842,935.75	236,809.48
SquareRoot(Percent FF_U Pell Grants)	14,473,003.81	12,790,256.64	50,144.99
Grand total (All Undergraduate total)	3,605,020,140.0	2,648,790,937.00	10,183,649.08
SAT/ACT Converted Composite 75th (1600)	2,648,790,937.0	2,349,461,103.00	8,950,786.45
LOGe(Percent FF_U Inst'l Grant Aid)	10,183,649.08	8,950,786.45	34,839.50

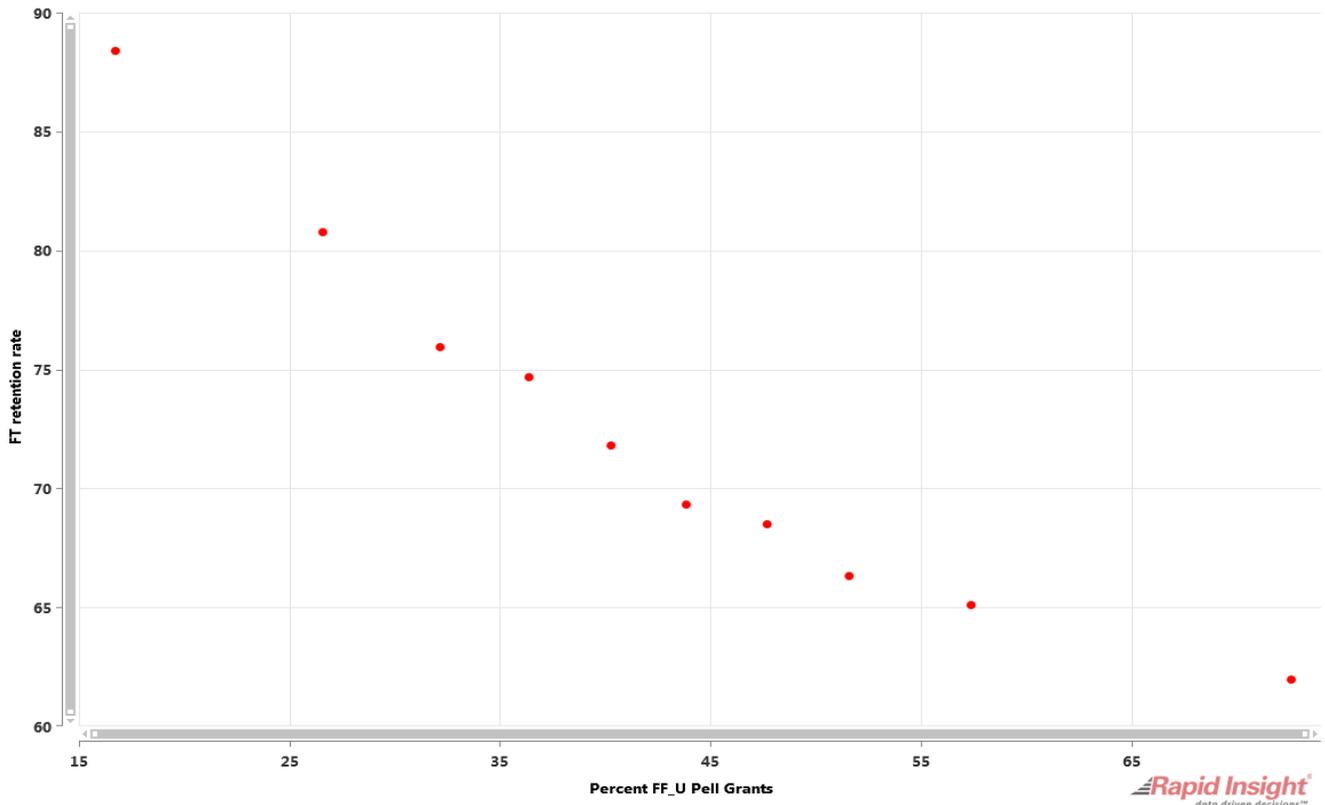
Variable Contribution

Variable	Percentage Model Contribution
SAT/ACT Converted Composite 75th (1600)	26.14 %
SquareRoot(Percent FF_U Pell Grants)	25.77 %
SquareRoot(SAT/ACT Converted Composite 25th	25.50 %
Grand total (All Undergraduate total)	13.14 %
LOGe(Percent FF_U Inst'l Grant Aid)	9.46 %

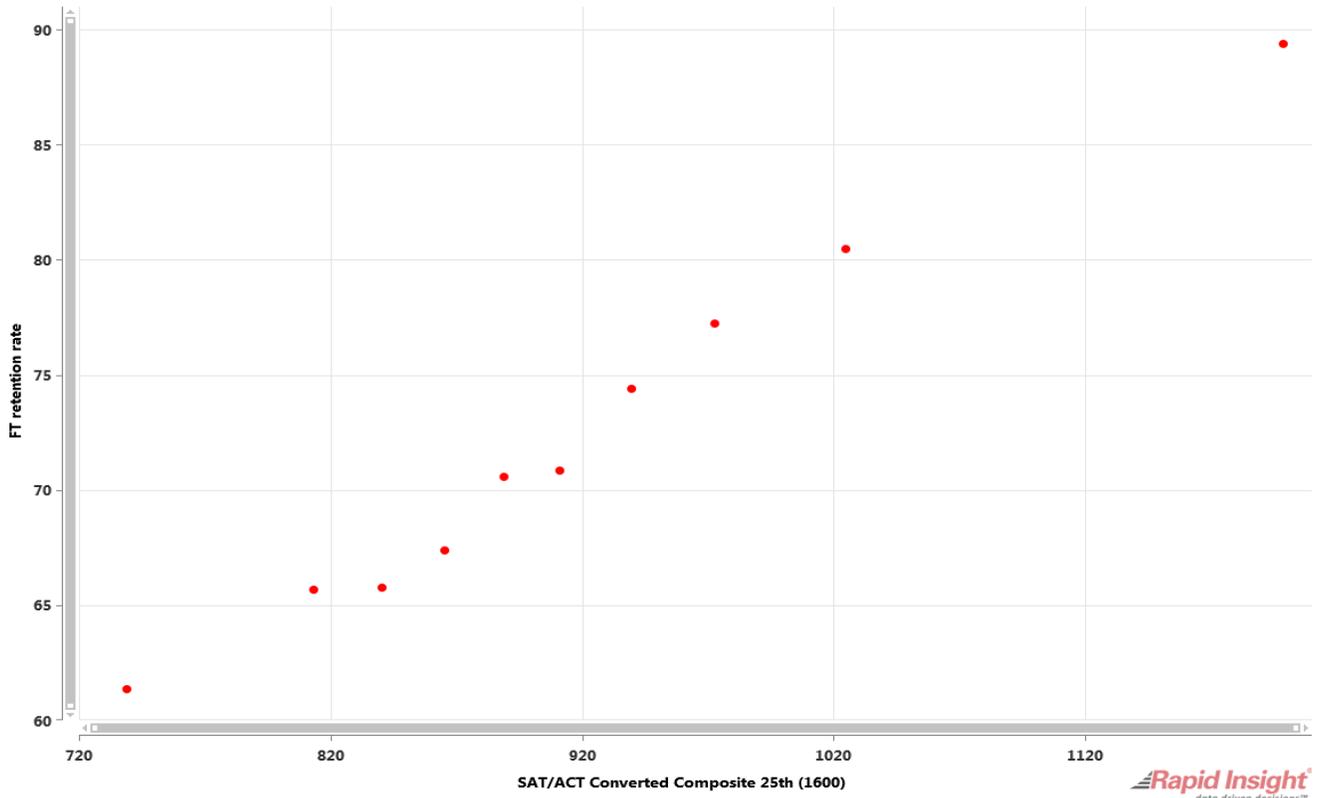
Decile Analysis



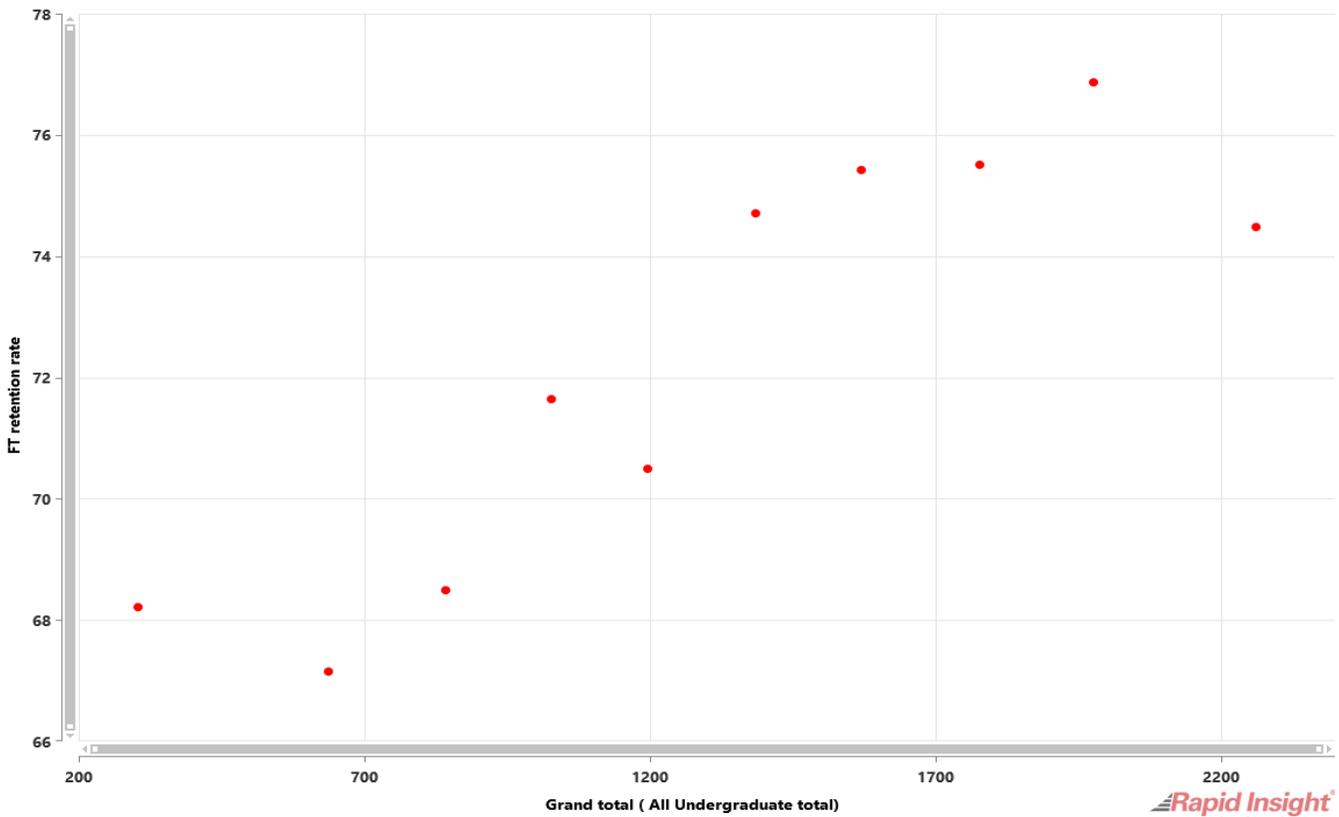
Relationship between 'FT retention rate' and 'Percent FF_U Pell Grants'



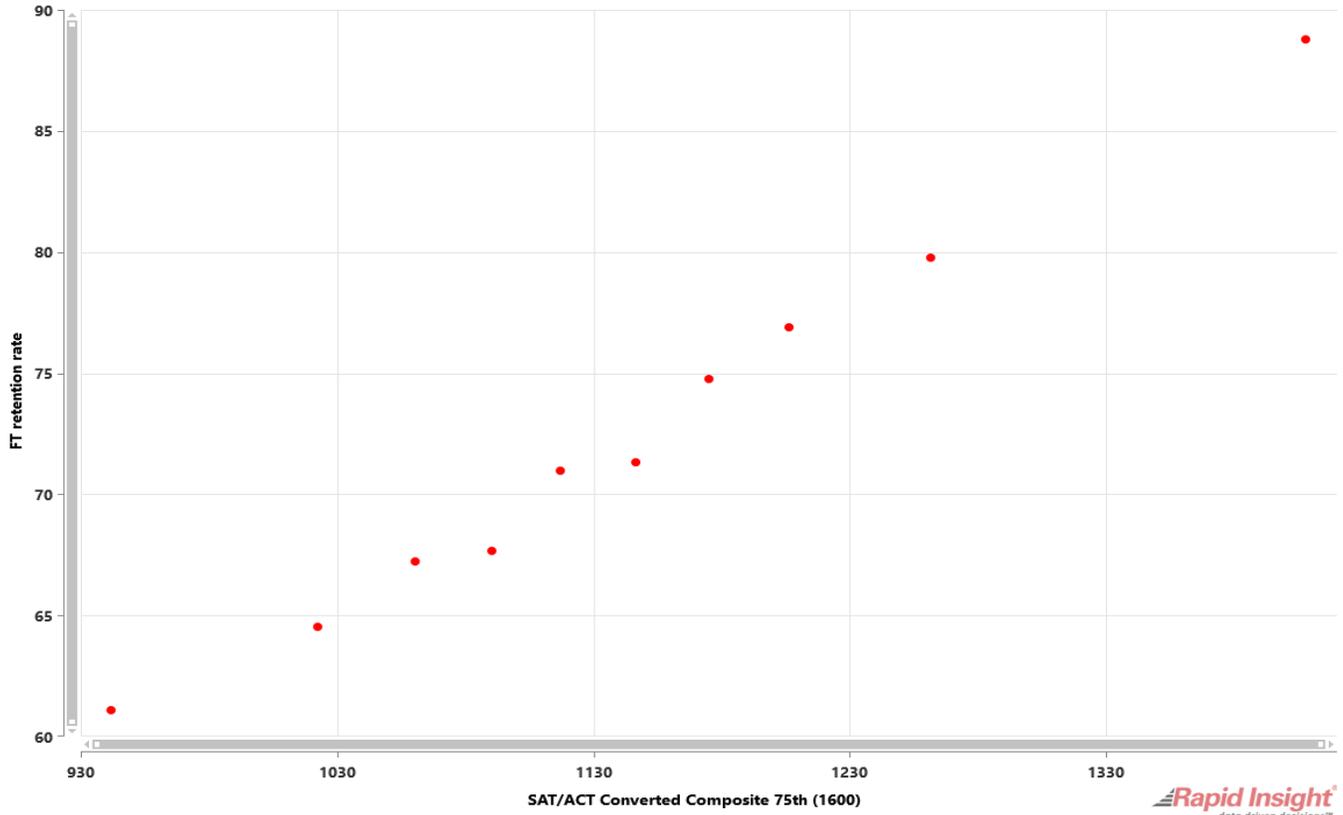
Relationship between 'FT retention rate' and 'SAT/ACT Converted Composite 25th (1600)'



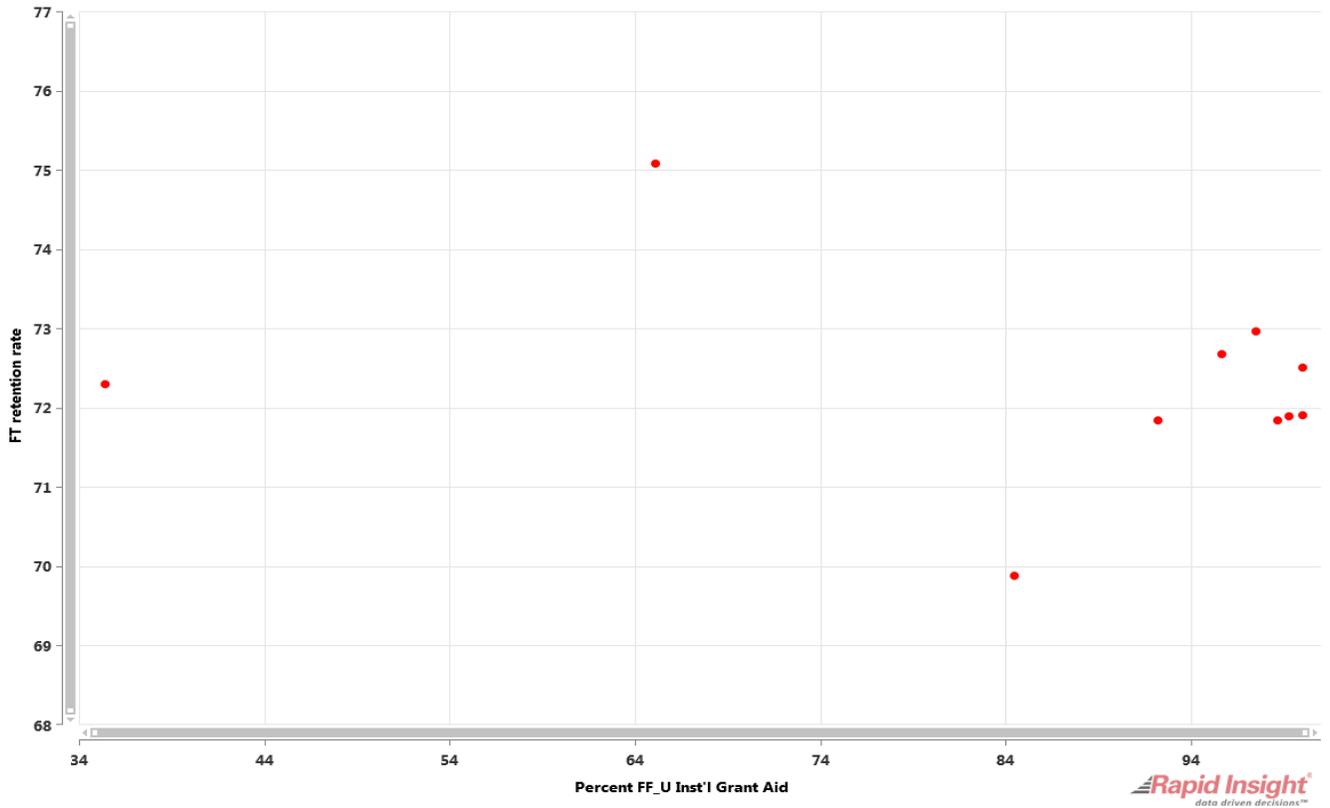
Relationship between 'FT retention rate' and 'Grand total (All Undergraduate total)'



Relationship between 'FT retention rate' and 'SAT/ACT Converted Composite 75th (1600)'



Relationship between 'FT retention rate' and 'Percent FF_U Inst'l Grant Aid'



Appendix D: 6-Year Graduation Rates - Institutional Level

Predicting: 6 Yr Grad Rate

Variable	Coef	S.E.	t-value	p-value
Intercept	-31.68	1.767	-17.93	0.000000
Square(FT Retention)	0.00536	0.00014	37.87	0.000000
SAT Composite (1600) / ACT Converted 25th	0.03245	0.00277	11.71	0.000000
# FA Cohort	0.01287	0.00137	9.403	0.000000
% Rec. inst'l Aid	0.06166	0.00736	8.375	0.000000
SAT Composite (1600) / ACT Converted 75th	0.01465	0.00270	5.425	0.000000

Diagnostics

R_Square	0.7356
SSE	193,473.81
CTSS	731,680.22
MSE	76.26
RMSE	8.733
DFE	2,537
F	1,411.49
N	2,543

XPX

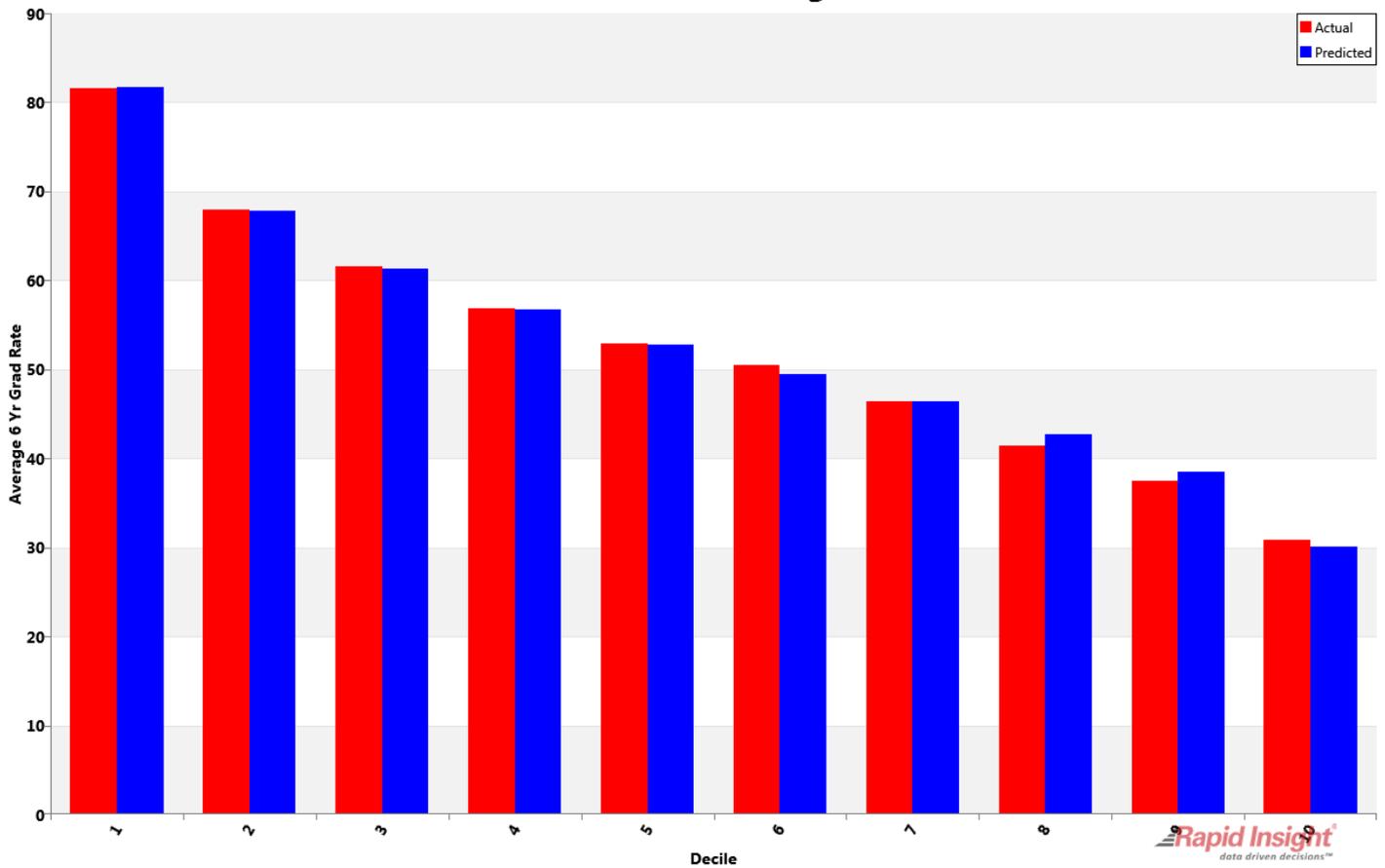
	Intercept	Square(FT Retention)	SAT Composite (1600) / ACT Converted 25th
Intercept	2,543.00	13,716,479.64	2,368,962
Square(FT Retention)	13,716,479.64	81,203,635,765.16	13,158,384,757.36
SAT Composite (1600) / ACT Converted 25th	2,368,962	13,158,384,757.36	2,251,392,208.00
# FA Cohort	663,461	3,773,512,071.91	633,476,595
% Rec. inst'l Aid	204,327	1,098,205,526.82	190,107,764
SAT Composite (1600) / ACT Converted 75th	2,948,522.47	16,241,455,167.45	2,783,574,431.27

	% Rec. inst'l Aid	# FA Cohort	SAT Composite (1600) / ACT Converted 75th
Intercept	204,327	663,461	2,948,522.47
Square(FT Retention)	1,098,205,526.	3,773,512,071.91	16,241,455,167.45
SAT Composite (1600) / ACT	190,107,764	633,476,595	2,783,574,431.27
# FA Cohort	53,830,242	220,595,361	781,165,147.80
% Rec. inst'l Aid	17,842,797	53,830,242	236,945,208.38
SAT Composite (1600) / ACT Converted 75th	236,945,208.38	781,165,147.80	3,459,853,308.80

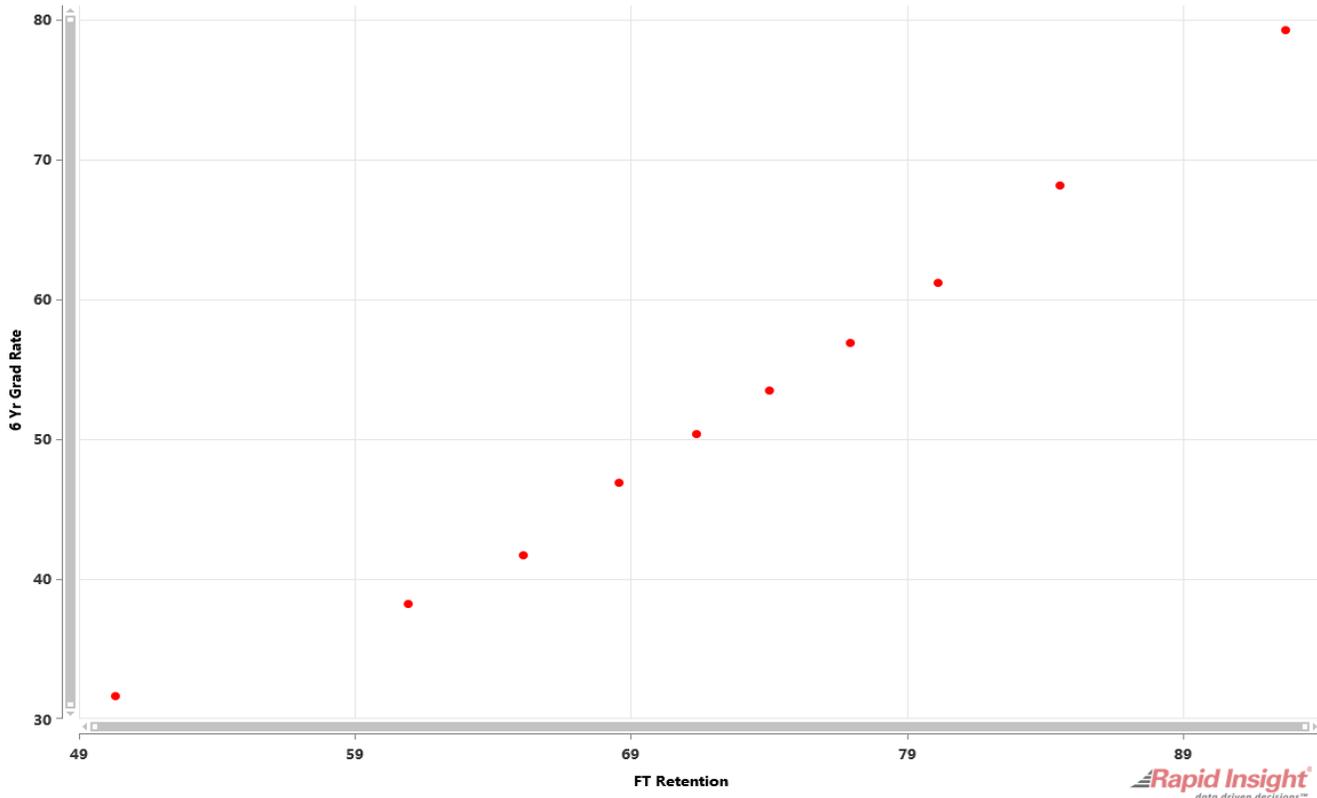
Variable Contribution

Variable	Percentage Model Contribution
Square(FT Retention)	49.05 %
SAT Composite (1600) / ACT Converted 25th	23.34 %
SAT Composite (1600) / ACT Converted 75th	10.12 %
# FA Cohort	9.56 %
% Rec. inst'l Aid	7.93 %

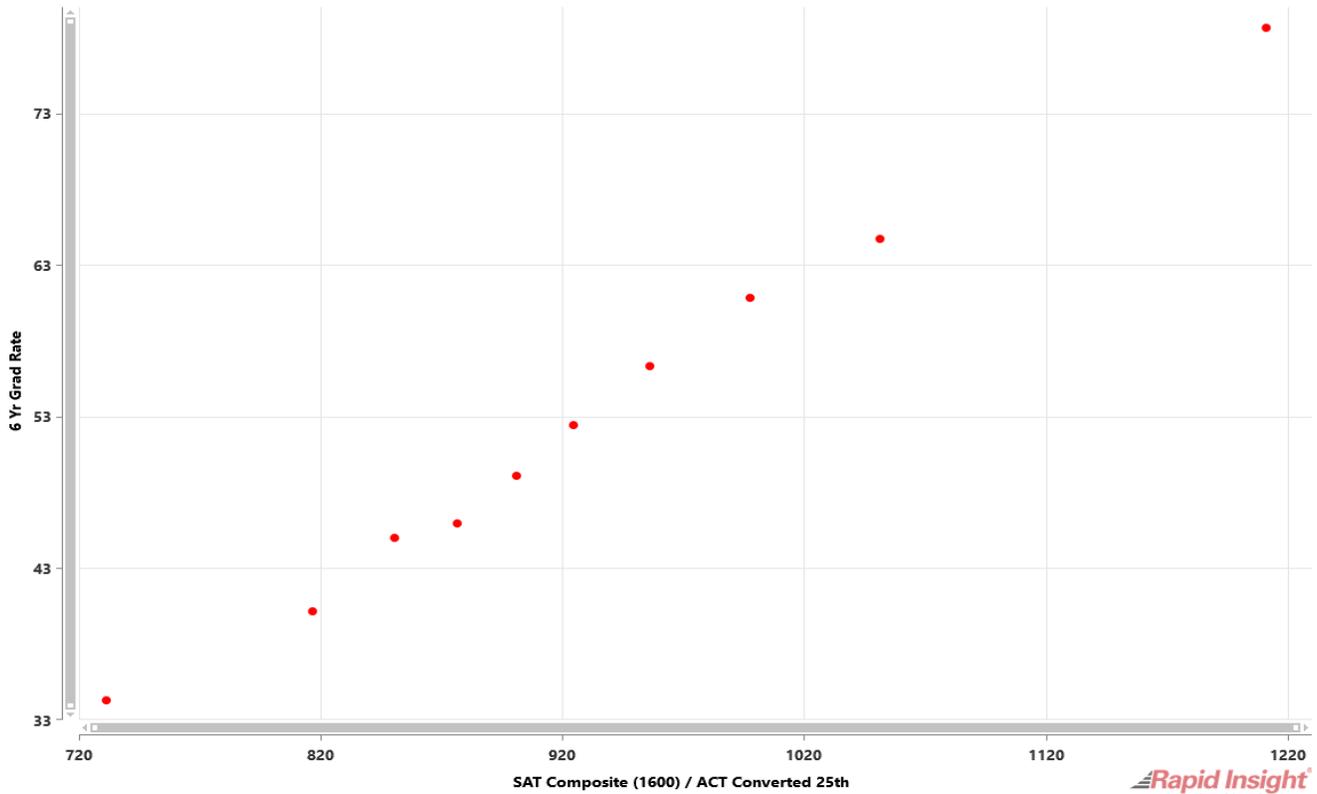
Decile Analysis



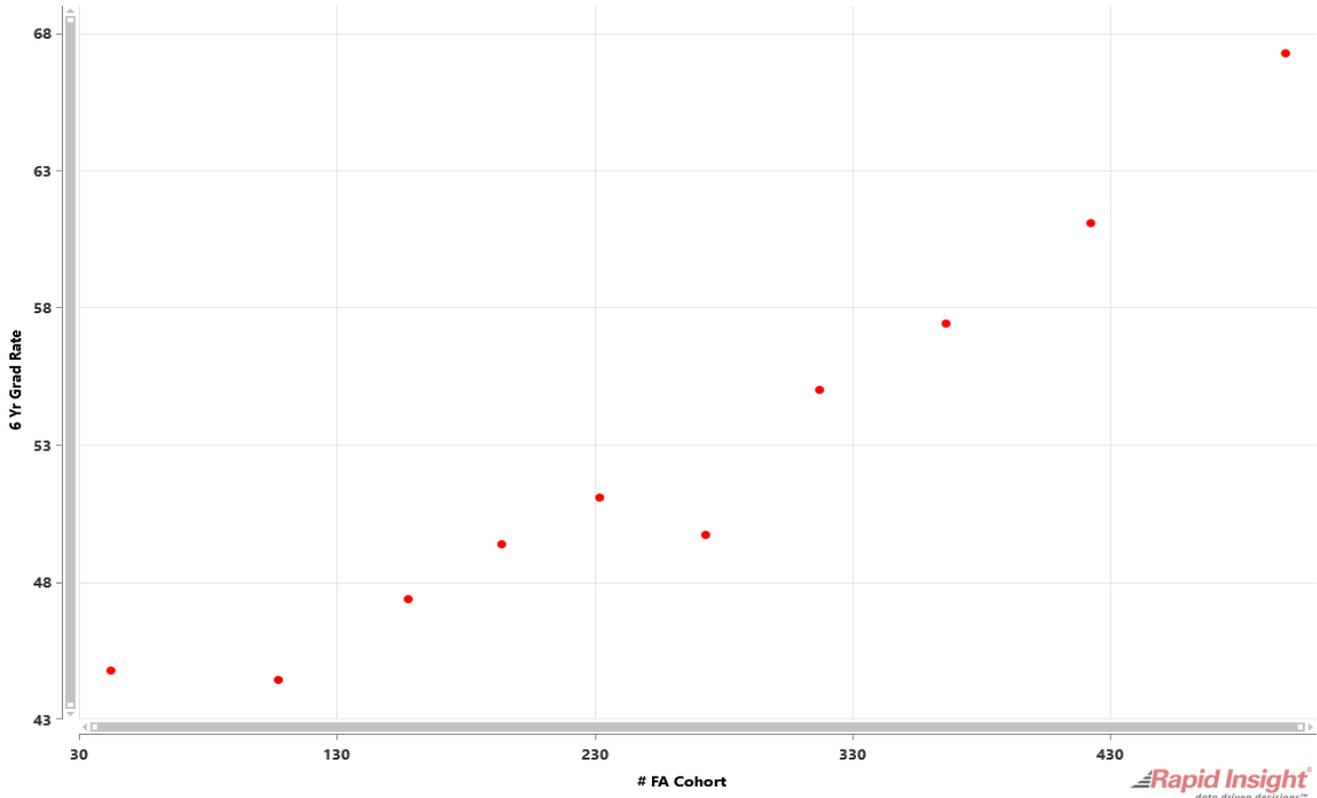
Relationship between '6 Yr Grad Rate' and 'FT Retention'



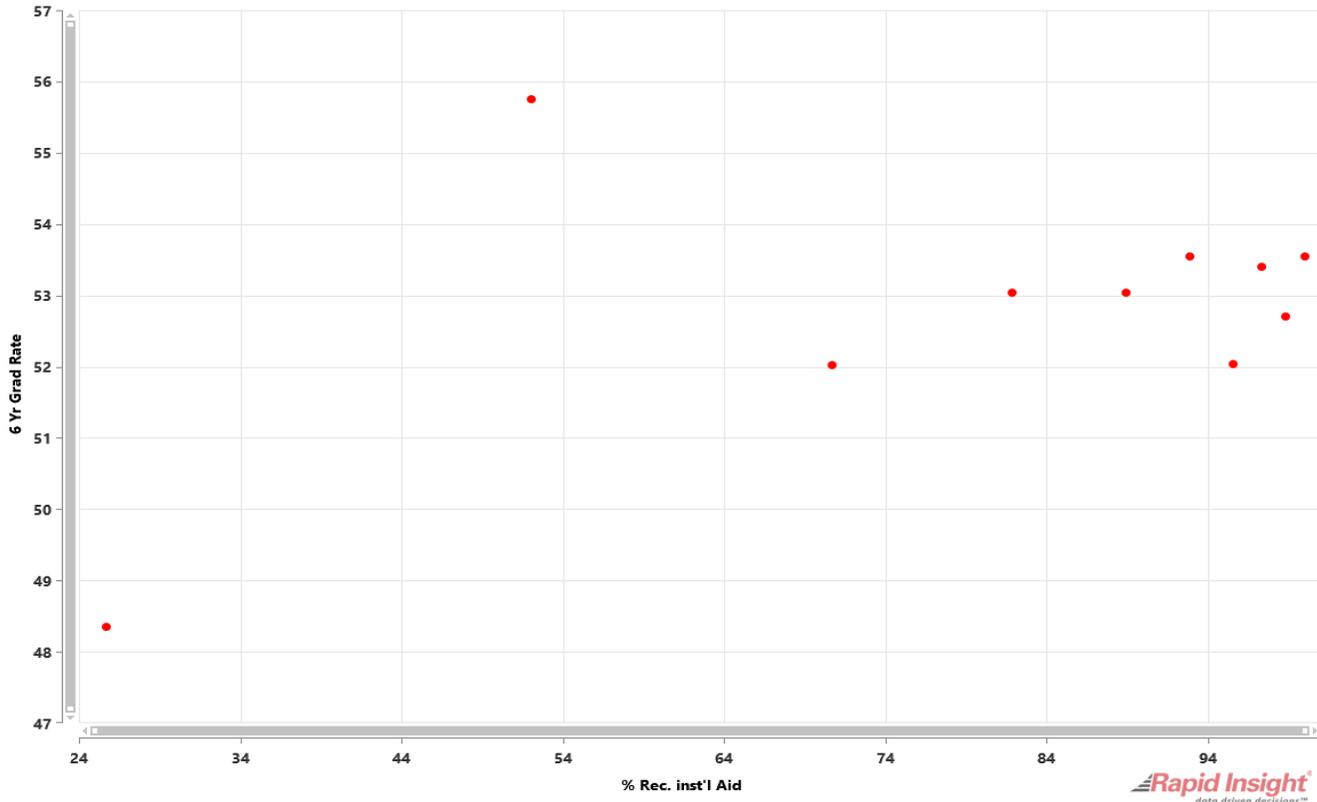
Relationship between '6 Yr Grad Rate' and 'SAT Composite (1600) / ACT Converted 25th'



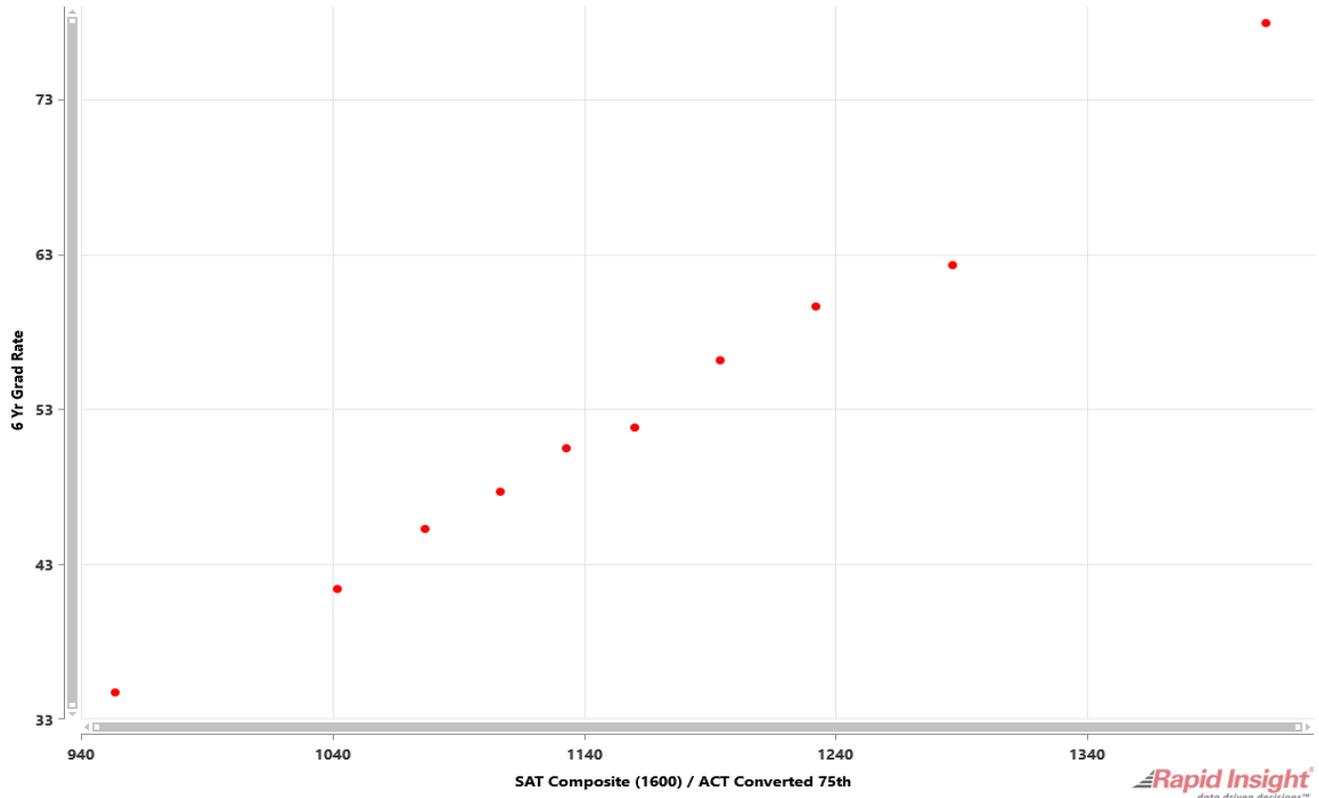
Relationship between '6 Yr Grad Rate' and '# FA Cohort'



Relationship between '6 Yr Grad Rate' and '% Rec. inst'l Aid'



Relationship between '6 Yr Grad Rate' and 'SAT Composite (1600) / ACT Converted 75th'



Appendix E: Retention – Student Level

Note: Attrition, not retention, was used as the variable to be predicted because it is the smallest group.

Predicting: Attritted Term 3 (Fall)

Variable	Coef	S.E.	Wald chi-sqr	p-value
Intercept	7.093	0.5848	147.11	0.000000
SquareRoot(trm_gpa)	-2.672	0.2319	132.77	0.000000
trm_hrs_attempt	-0.1937	0.03453	31.45	0.000000
SquareRoot(tluschola)	-0.01195	0.00256	21.74	0.000003
Binary(gender,M)	0.4239	0.1201	12.45	0.000418
firstgen	0.3701	0.1180	9.830	0.00172

Diagnostics

	-2 Log L	AIC	BIC (SC)	N
Intercept only	2,190.96	2,192.96	2,198.45	1,784
Intercept and Covariates	1,775.64	1,787.64	1,820.56	1,784

ODDS RATIO ESTIMATES

Variable	Estimate	95% Confidence Limits: Lower
SquareRoot(trm_gpa)	0.06914	0.04389
trm_hrs_attempt	0.8239	0.7700
SquareRoot(tluschola)	0.9881	0.9832
Binary(gender,M)	1.528	1.207
firstgen	1.448	1.149

Upper
0.1089
0.8816
0.9931
1.934
1.825

Association of Predicted Probabilities and Actual Responses

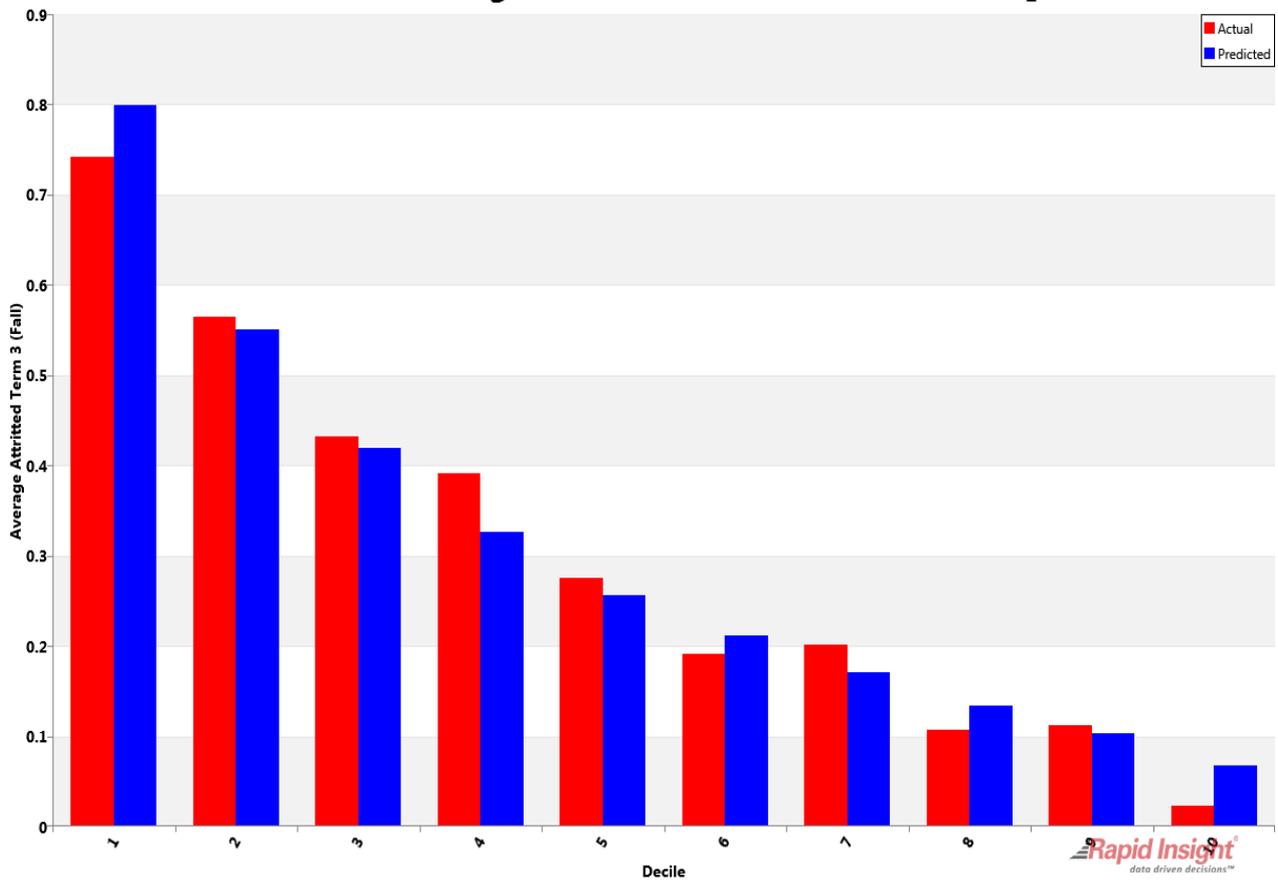
Percent Concordant	78.49 %
Percent Discordant	21.33 %
Percent Tied	0.18 %
Total # of Pairs	673,164
Cox & Snell Pseudo R ²	0.2077
Somers' D	0.5716
G-K Gamma	0.5726
Kendall's Tau-a	0.2419

C	0.7858
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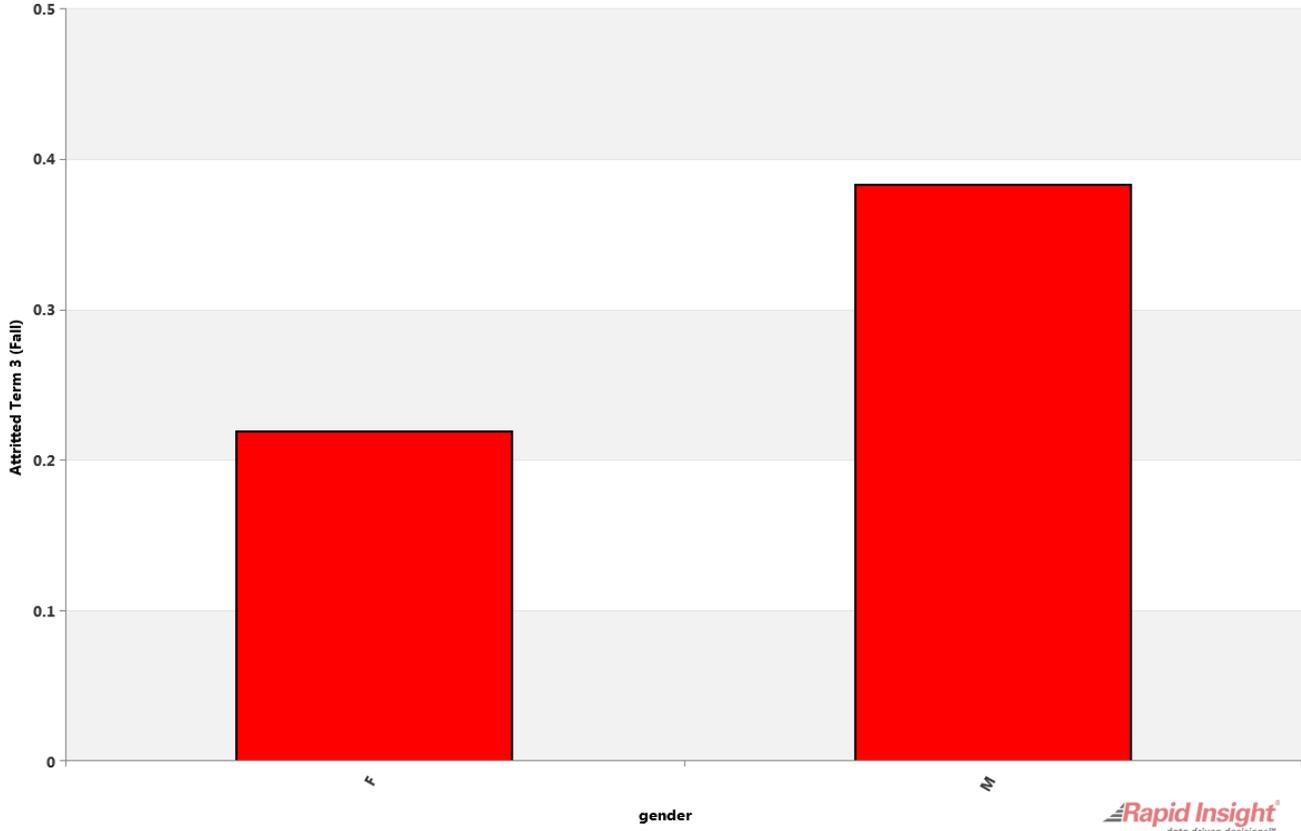
Variable Contribution

Variable	Percentage Model Contribution
SquareRoot(trm_gpa)	43.70 %
trm_hrs_attempt	18.96 %
SquareRoot(tluschola)	15.66 %
Binary(gender,M)	11.58 %
firstgen	10.11 %

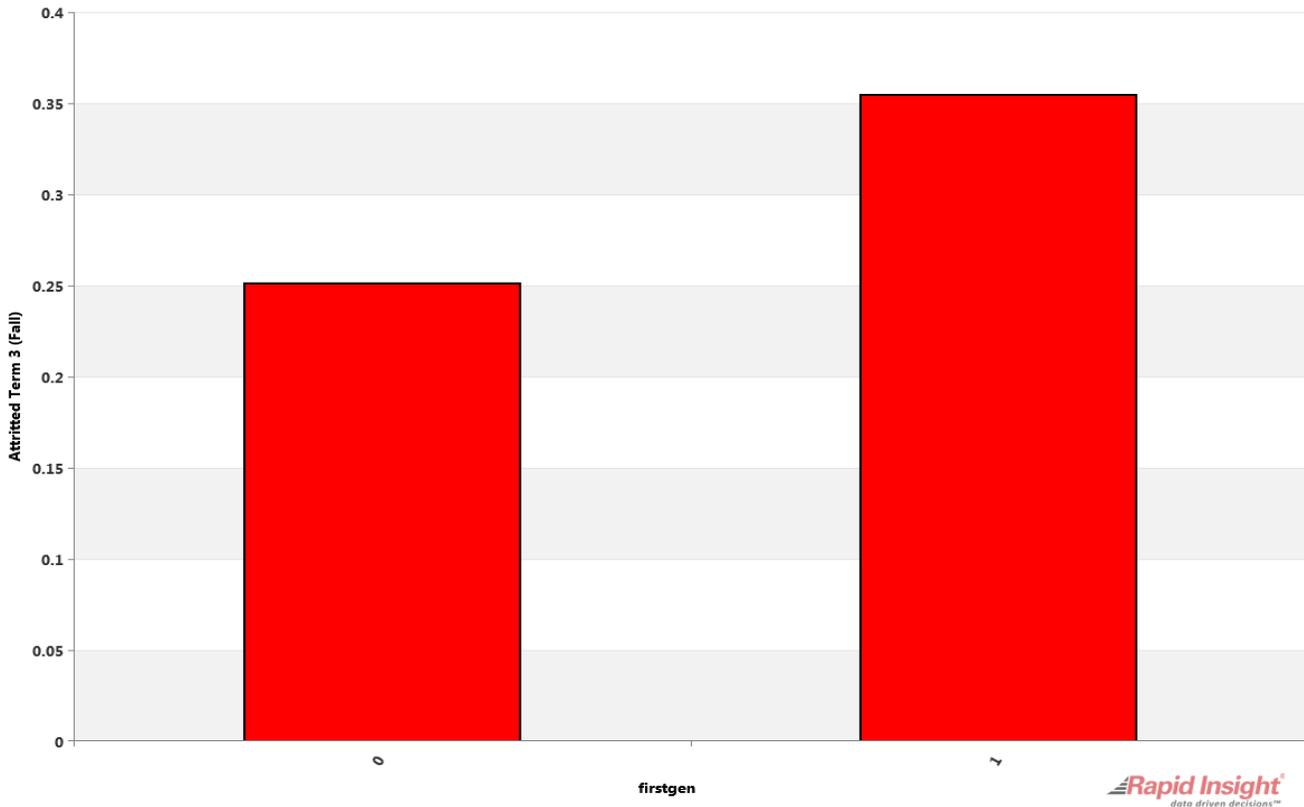
Decile Analysis on Model Sample



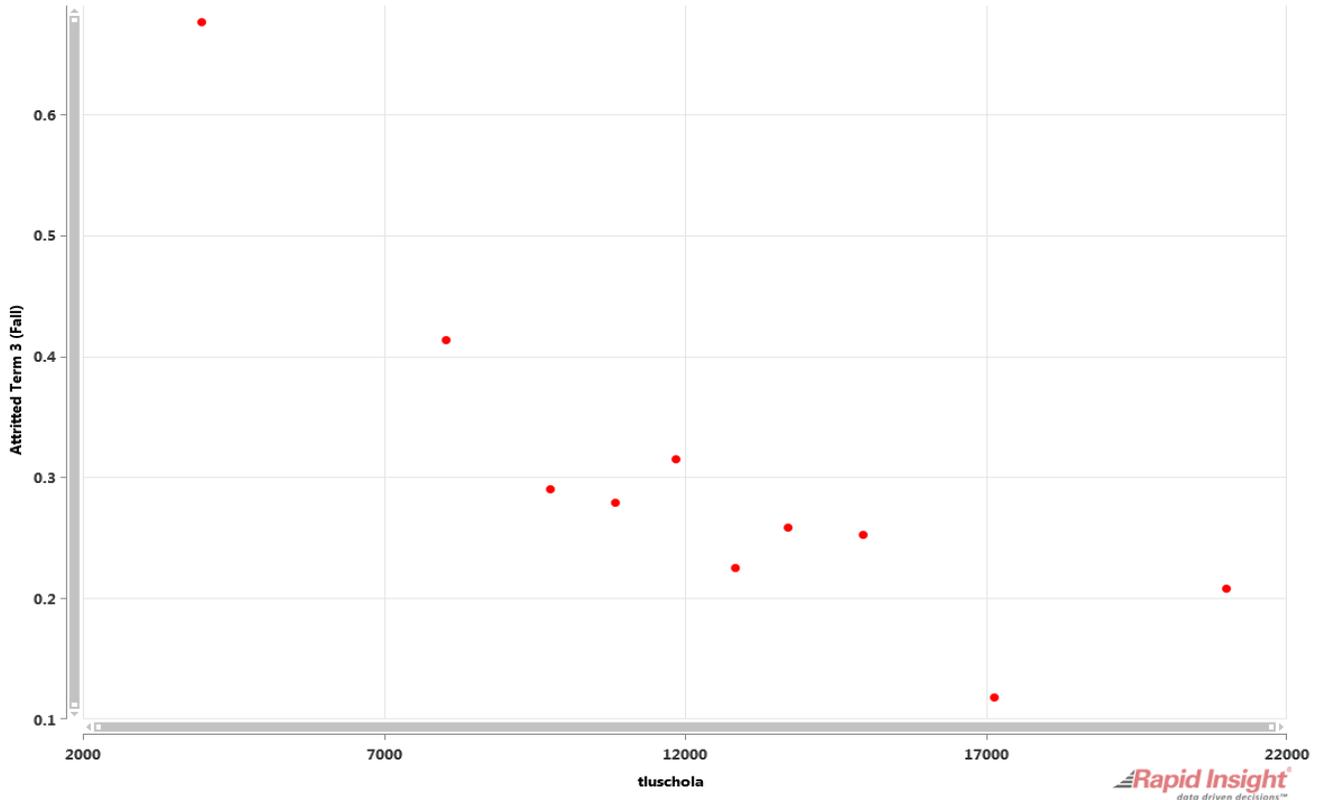
Relationship between 'Attritted Term 3 (Fall)' and 'gender'



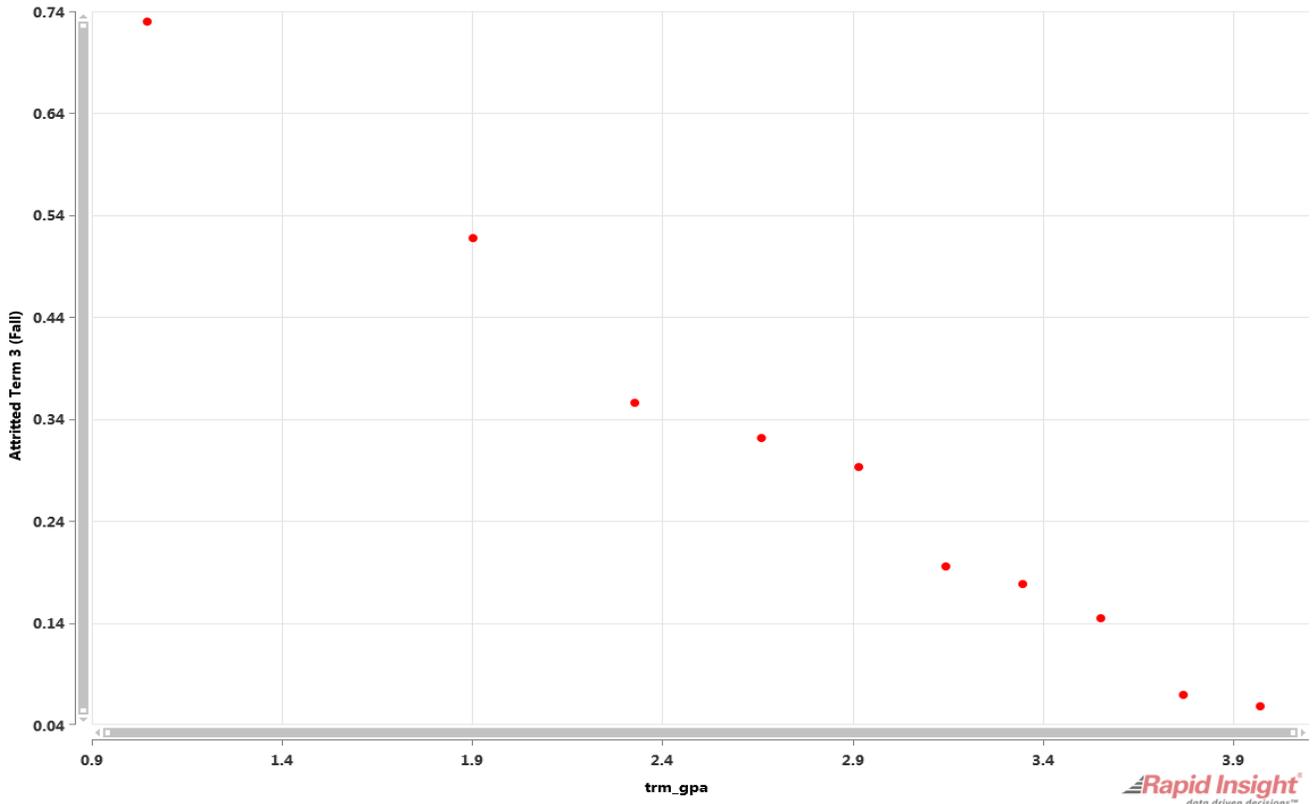
Relationship between 'Attritted Term 3 (Fall)' and 'firstgen'



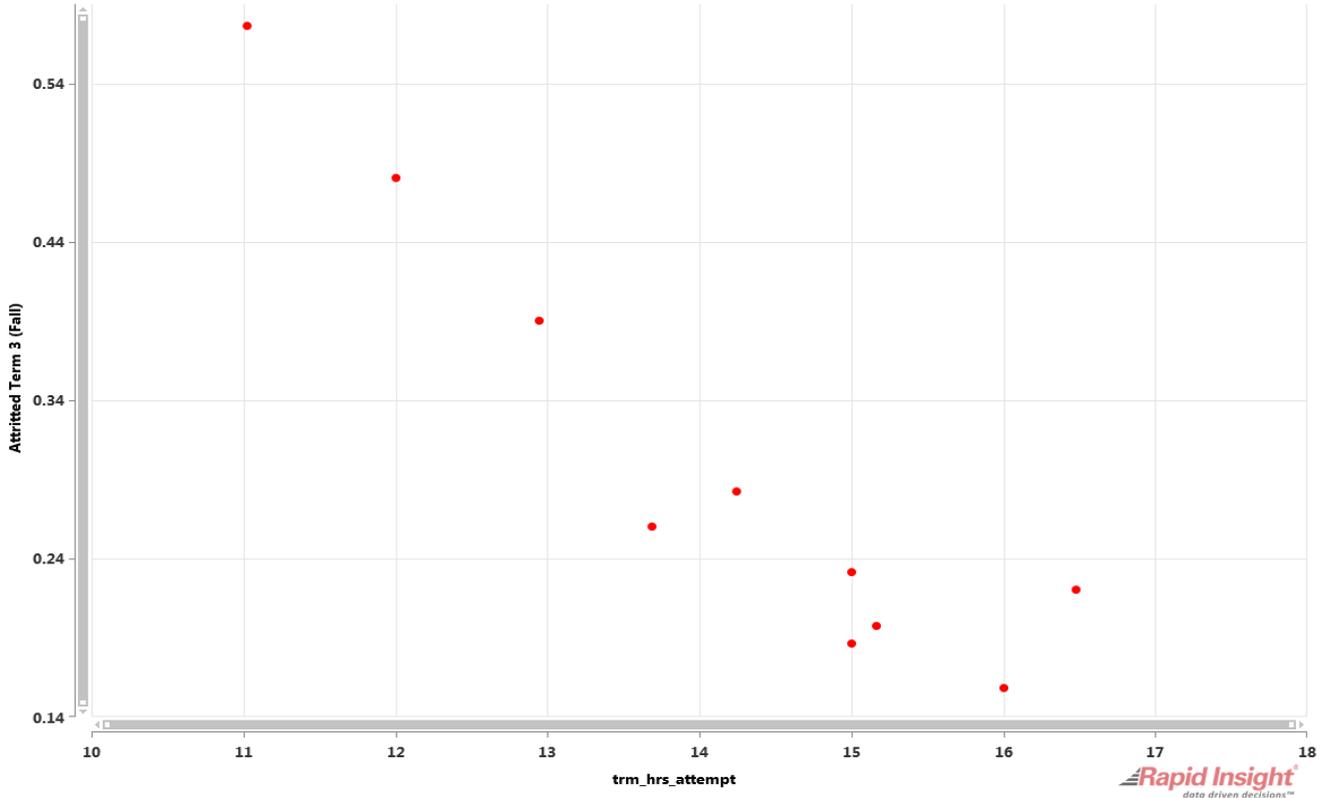
Relationship between 'Attritted Term 3 (Fall)' and 'tluschola'



Relationship between 'Attritted Term 3 (Fall)' and 'trm_gpa'



Relationship between 'Attritted Term 3 (Fall)' and 'trm_hrs_attempt'



Appendix F: Graduation – Student Level

Predicting: Grad w/l 6 yrs

Variable	Coef	S.E.	Wald chi-sqr	p-value
Intercept	-6.377	0.6798	87.98	0.000000
trm1_gpa	0.9076	0.1115	66.22	0.000000
trm1_hrs_attempt	0.1714	0.04693	13.34	0.000259
hs_gpa	0.3654	0.1361	7.213	0.00724

Diagnostics

	-2 Log L	AIC	BIC (SC)	N
Intercept only	1,375.48	1,377.48	1,382.39	1,004
Intercept and Covariates	1,130.30	1,138.30	1,157.94	1,004

ODDS RATIO ESTIMATES

Variable	Estimate	95% Confidence Limits: Lower	Upper
trm1_gpa	2.478	1.992	3.084
trm1_hrs_attempt	1.187	1.083	1.301
hs_gpa	1.441	1.104	1.882

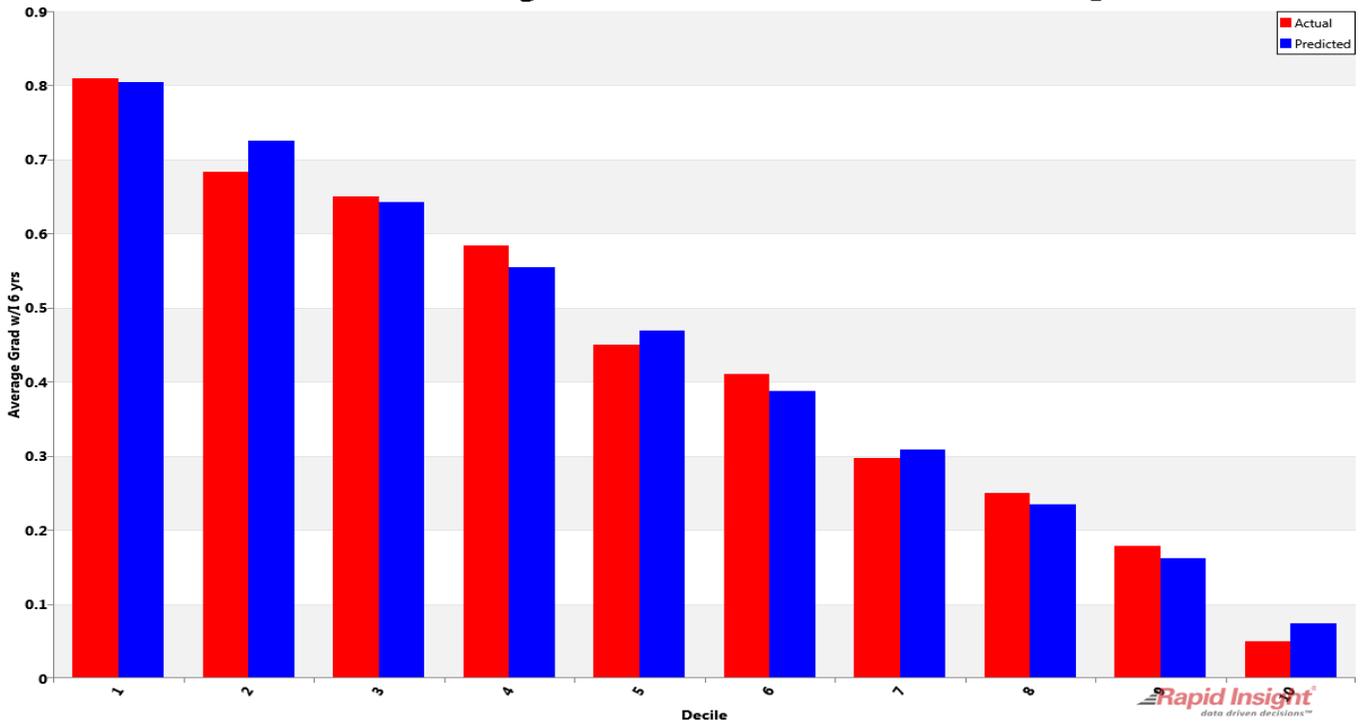
Association of Predicted Probabilities and Actual Responses

Percent Concordant	77.13 %
Percent Discordant	22.78 %
Percent Tied	0.09 %
Total # of Pairs	247,908
Cox & Snell Pseudo R ²	0.2167
Somers' D	0.5435
G-K Gamma	0.5439
Kendall's Tau-a	0.2676
C	0.7717

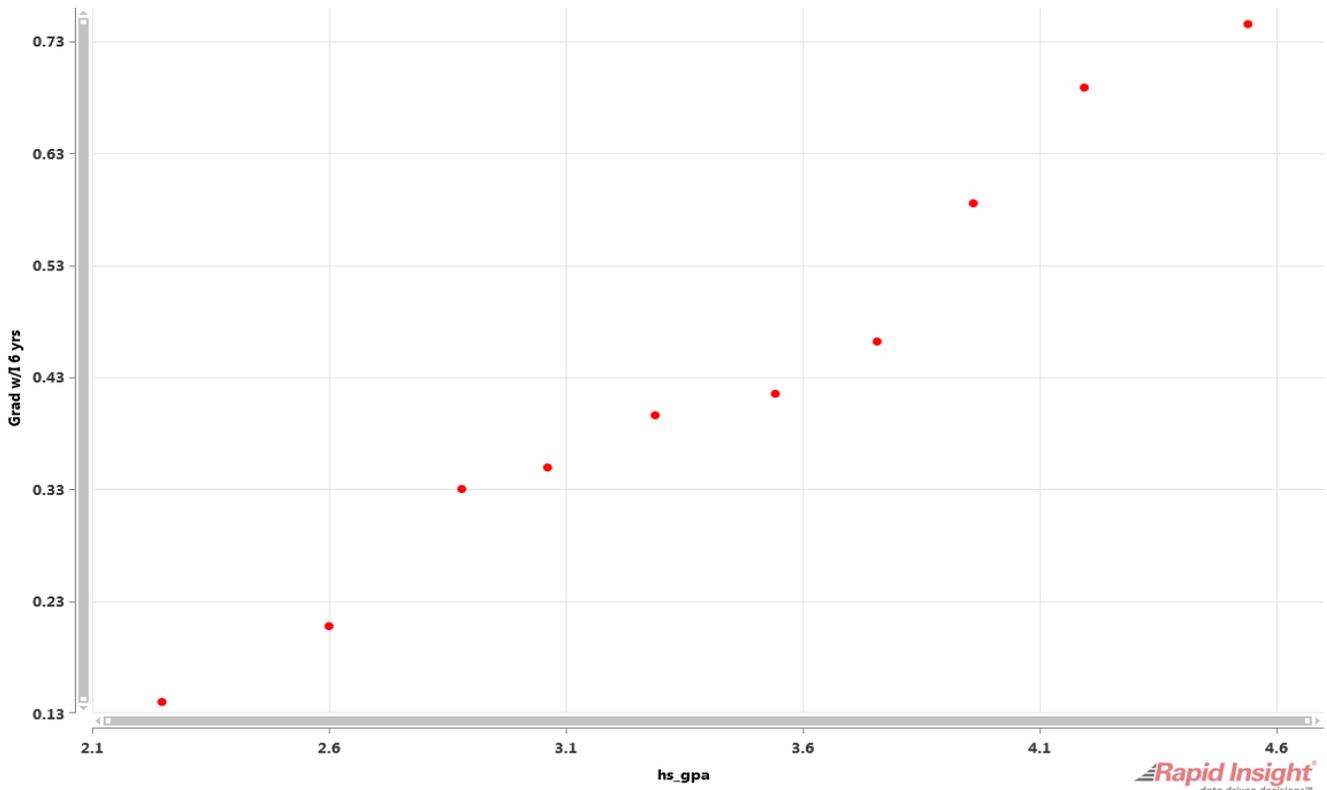
Variable Contribution

Variable	Percentage Model Contribution
trm1_gpa	61.08 %
trm1_hrs_attempt	21.38 %
hs_gpa	17.53 %

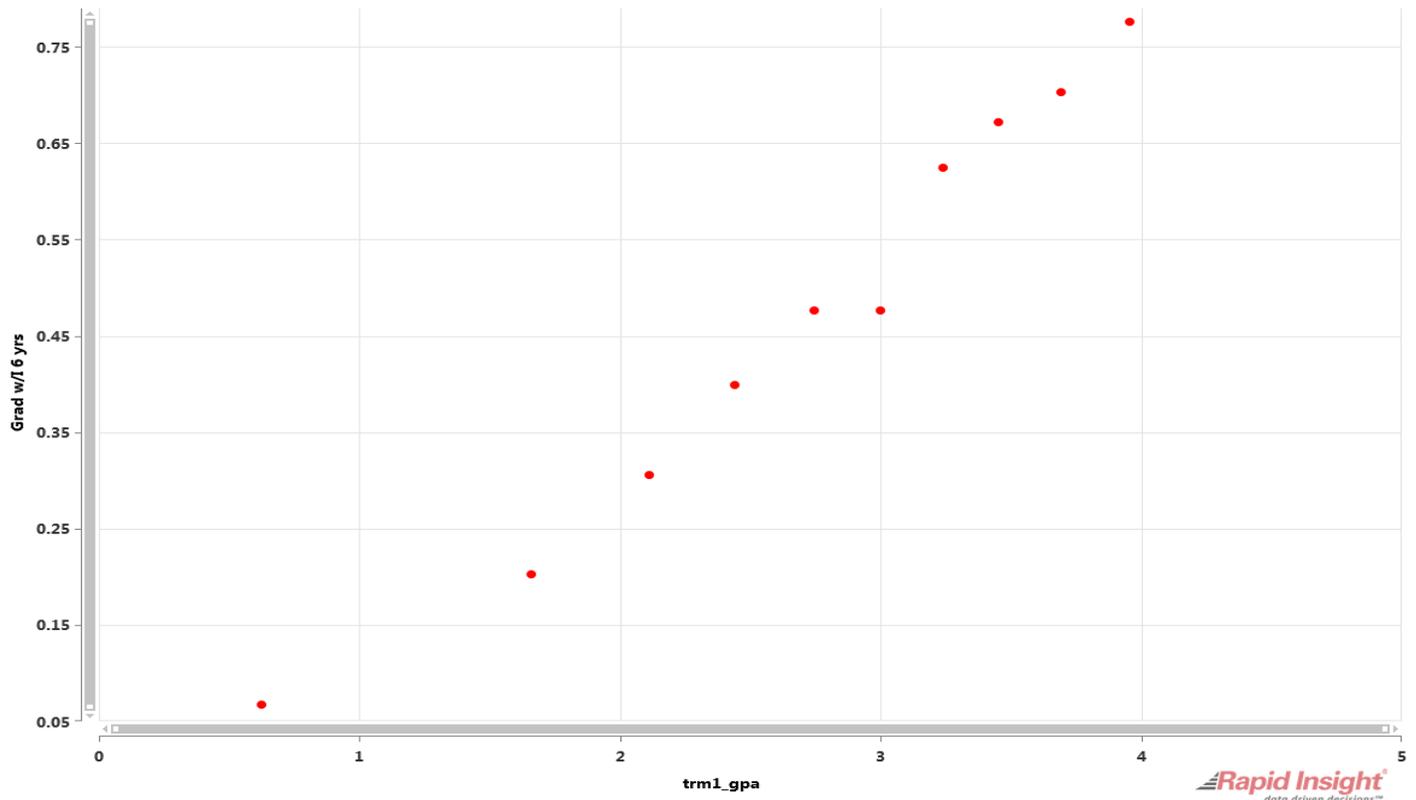
Decile Analysis on Model Sample



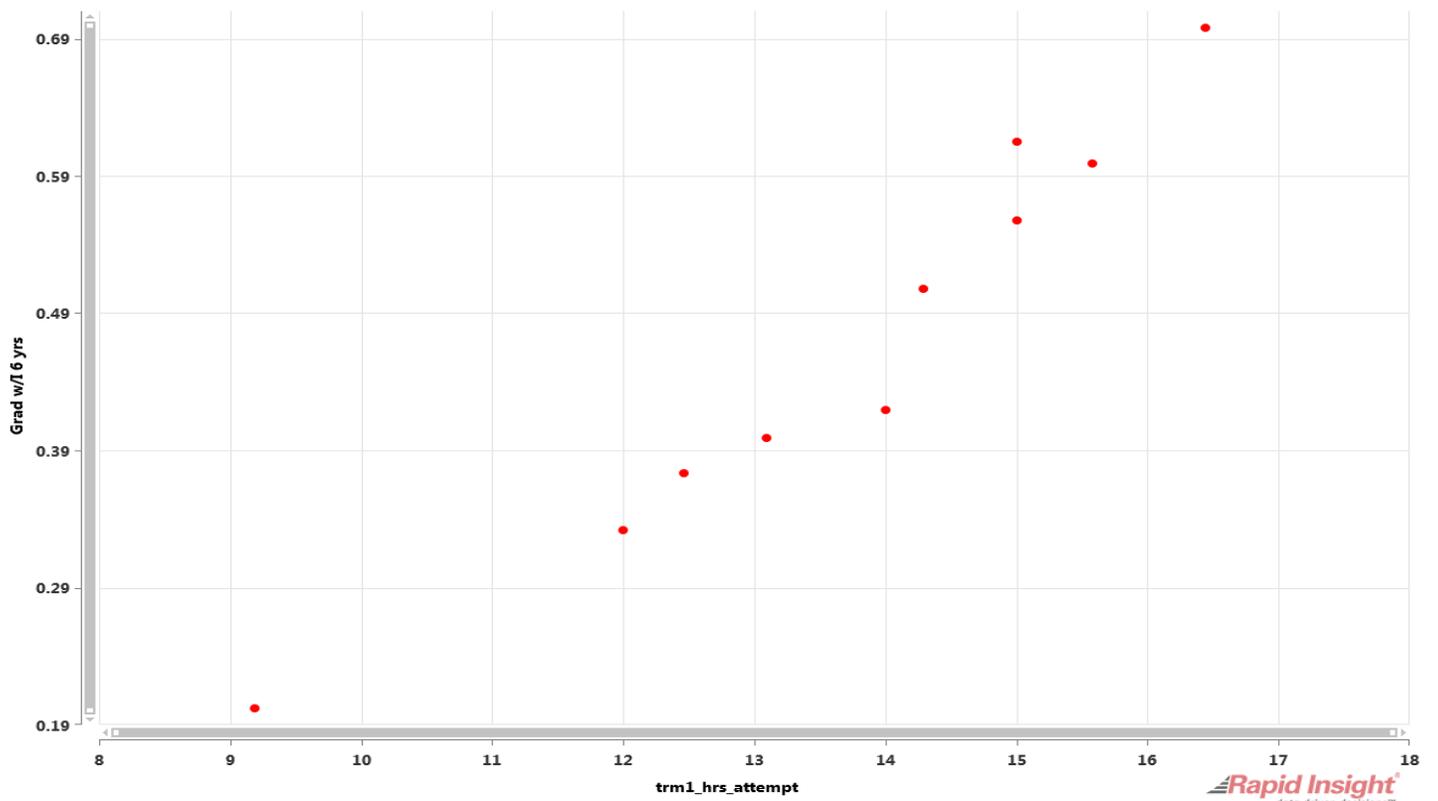
Relationship between 'Grad w/I 6 yrs' and 'hs_gpa'



Relationship between 'Grad w/I 6 yrs' and 'trm1_gpa'



Relationship between 'Grad w/I 6 yrs' and 'trm1_hrs_attempt'



Appendix G

Fall to Fall Retention Rates and 6-Year Graduation Rates by SAT Quartiles and Term 1 Hours Attempted

