
Investigating Graduation Outcomes at UT System Using Survival Analysis

INTRODUCTION

Survival analysis is a statistical technique used to examine the occurrence and timing of events. This method is used in favor of traditional statistical methods when the data is censored, meaning the event of interest hasn't been observed for all participants. This missing data often occurs when the study ends before the event was observed for some individuals.¹

Survival analysis is a valuable method for examining the likelihood of student dropout and graduation, as it enables researchers to explore the timing of key educational milestones.² Using traditional statistical analysis techniques when studying graduation outcomes can become complicated when including students who did not graduate in the time period. The appropriateness of using survival analysis to study completion in a higher education setting while handling the issue of censoring is outlined by Zhou et al. – in that it can account for both uncensored and censored events (i.e., students who graduate during the time frame under investigation, and students who don't).³

Building off numerous studies where survival analysis was successfully utilized to examine graduation outcomes, this study uses survival analysis to analyze the timing of graduation for University of Texas (UT) System students. Survival functions and survival curves will be examined to show the likelihood of graduation, and the covariates associated with graduation—such as student characteristics or academic factors—will also be presented to help explain which factors are associated with completion. The timing of dropout will also be explored.

KEY FINDINGS

- The analysis groups UT institutions together into Research Universities, Emerging Research Universities (ERUs), and Other Universities.
- For the Research group, 50% of first-time, full-time, degree-seeking (FTFTDS) students are expected to have graduated in semester 8 or prior, while this milestone occurs in semester 9 for the ERU and Other group.
- Generally, the Research group has the highest graduation outcomes across every semester examined, followed by ERUs; the Other group had the lowest graduation outcomes.
- The biggest uptick in graduation events happens in semester 8. It is estimated to be 28.6% likely that a FTFTDS student will make it past semester 8 from a Research institution without having graduated, 55.8% at an ERU, and 58.5% from the Other grouping.
- Of the variables examined, continuous/stop out enrollment pattern, gender, and Pell status were the three factors with the strongest relationship to graduation outcomes.
- Students are most likely to drop out after semester 2. For the Research group, it was estimated that 96.2% of the population would make it past semester 2 without dropping out, 78.7% at ERUs would make it past semester 2, and 76.1% would survive past semester 2 in the Other group.

METHODOLOGY

Survival analysis was leveraged to examine completion outcomes for students within eight years after entry. Cohorts included first-time, full-time, degree-seeking (FTFTDS) undergraduates starting in fall 2014, fall 2015, or fall 2016, allowing for an examination of graduation status in the long semesters (i.e., fall and spring semesters) for eight years.

¹ Allison, Paul D. *Survival Analysis Using SAS: A Practical Guide*. SAS Institute, 2012.

² Yang, Fan. *A Competing Risks Survival Analysis of High School Dropout and Graduation*, 2017, <https://doi.org/10.17077/etd.07s1pfsf>.

³ Zhou, Shulin, et al. "Survival analysis of transfer students." *AIR Professional File*, no. Winter 2025, 2025, <https://doi.org/10.34315/apf1772025>.

Only students from UT System academic institutions were included, and graduation outcomes were only tracked for the same university where the student started.

To account for differences by institution type, we utilized the institutional groupings established by the Texas Higher Education Coordinating Board⁴ which include Research Universities, Emerging Research Universities (ERU), Doctoral Universities, Comprehensive Universities, and Master's Universities. Within UT System, Research Universities include UT Austin; ERUs include UT Arlington, UT Dallas, UT El Paso, and UT San Antonio. Doctoral, Comprehensive, and Master's Universities were grouped for the purposes of this analysis and include UT Permian Basin, UT Rio Grande Valley, Stephen F. Austin, and UT Tyler.

The primary outcome of interest was time to graduation. Dropout was also examined as a secondary outcome as this is considered a competing risk under survival analysis methodology. These two outcomes are treated as competing risks because if a student drops out, they are no longer able to be observed as having graduated. As described by Allison, the defining feature of competing risk scenarios is that when one type of event occurs, it prevents the possibility of the other event occurring for that individual.⁵ To handle these competing risks, survival was first examined for graduation outcomes, where dropout events were treated as censored events; then survival was examined for dropout outcomes where graduation events were treated as censored events.

Dropout was defined as students who have not graduated and were also not enrolled in the latest four semesters examined for their respective cohort (i.e., fall/spring in years 7 and 8). If a student was still enrolled in one or more semester of year 7 or year 8, their records were treated as censored events.

Numerous variables, or, covariates, were explored to assess characteristics associated with the timing of graduation:

- Continuous enrollment was examined to flag stop out behavior. This flag indicates whether a student was enrolled continuously prior to separation (i.e., semester of graduation or dropout) from their home institution.
- Gender
- Underrepresented minority (URM) status (grouped into international, non-URM which included White and Asian, and URM which included African American, Hispanic, American Indian or Alaskan Native, Native Hawaiian or Other Pacific Islander, and unknown or not reported)
- Pell status
- Need-based institutional grant/scholarship recipient status
- Working while enrolled (grouped into zero earnings, quartile 1 earnings, quartile 2 earnings, quartile 3 earnings, and quartile 4 earnings). To create the working while enrolled categorical variable, working status was assessed for every enrolled semester using CBM 001 and Texas Workforce Commission Unemployment Insurance (UI) Wages. Those who did not work were categorized under zero earnings. For those who did work while enrolled, a median per semester wage was calculated and then grouped into quartiles based off that metric.

RESULTS

Before we examine results from the survival analysis, it is helpful to understand the distribution of completion status at the end of the eight-year period, seen in **Table 1**. The largest proportion within each institution type is the status of graduated – representing 88.8% of FTFTDS students in the Research group, 57.5% in the ERU group, and 51.2% in the Other group. Dropout is the second largest group, representing 10.7%, 39.5%, and 45.2% of students in the Research, ERU, and Other group, respectively. A small proportion of students are considered still enrolled for the purposes of this study, defined as enrolled in one or more semester of year 7 and/or 8.

⁴ Texas Higher Education Coordinating Board. (2025, January). *University peer group categories*. Texas Higher Education Coordinating Board. <https://reportcenter.highered.texas.gov/reports/data/university-peer-group-categories/>

⁵ Allison, Paul D. *Survival Analysis Using SAS: A Practical Guide*. SAS Institute, 2012.

Table 1. Final Completion Status at Year 8, by Institution Type

Status	Research		ERU		Other	
	Count	Percent	Count	Percent	Count	Percent
Graduated	20,556	88.8%	22,774	57.5%	11,106	51.2%
Dropout	2,478	10.7%	15,649	39.5%	9,807	45.2%
Enrolled	125	0.5%	1,155	2.9%	798	3.7%

Source: Texas Higher Education Coordinating Board CBM 001 & 009

The survival function for graduating is displayed in **Table 2**, shown separately for the three institution types. The survival function provides the estimated probability of surviving—remaining enrolled and not graduating—beyond each time point examined. In our case, this is the estimated probability of persisting past a given semester without having graduated. As a reminder, only long semesters were examined across eight years after entry, meaning semester 1 is fall of year 1, semester 2 is spring of year 1, semester 3 is fall of year 2, and so on. High survival probabilities in earlier semesters is a good thing, as it means students are persisting, and we expect to see a drop in survival rates at semester 8 and beyond as students reach the traditional four-year graduation timepoint. To provide an example of how to interpret the survival function, we can look to semester 6 for the Research group, which has a value of 0.9597, indicating that it is 95.97% likely that a student will make it past semester 6 and have not yet graduated.

Table 2. Survival Function of Graduation Outcomes, by Institution Type

Semester	Research	ERU	Other
Semester 1	1.0000	1.0000	1.0000
Semester 2	1.0000	0.9999	1.0000
Semester 3	1.0000	0.9995	0.9998
Semester 4	0.9992	0.9957	0.9959
Semester 5	0.9949	0.9861	0.9788
Semester 6	0.9597	0.9496	0.9275
Semester 7	0.8792	0.8621	0.8224
Semester 8	0.2862	0.5582	0.5850
Semester 9	0.1415	0.3693	0.3992
Semester 10	0.0707	0.2551	0.2931
Semester 11	0.0408	0.1752	0.2063
Semester 12	0.0295	0.1359	0.1691
Semester 13	0.0197	0.1019	0.1318
Semester 14	0.0146	0.0838	0.1127
Semester 15	0.0093	0.0628	0.0879
Semester 16	0.0054	0.0485	0.0737

Source: Texas Higher Education Coordinating Board CBM 001 & 009

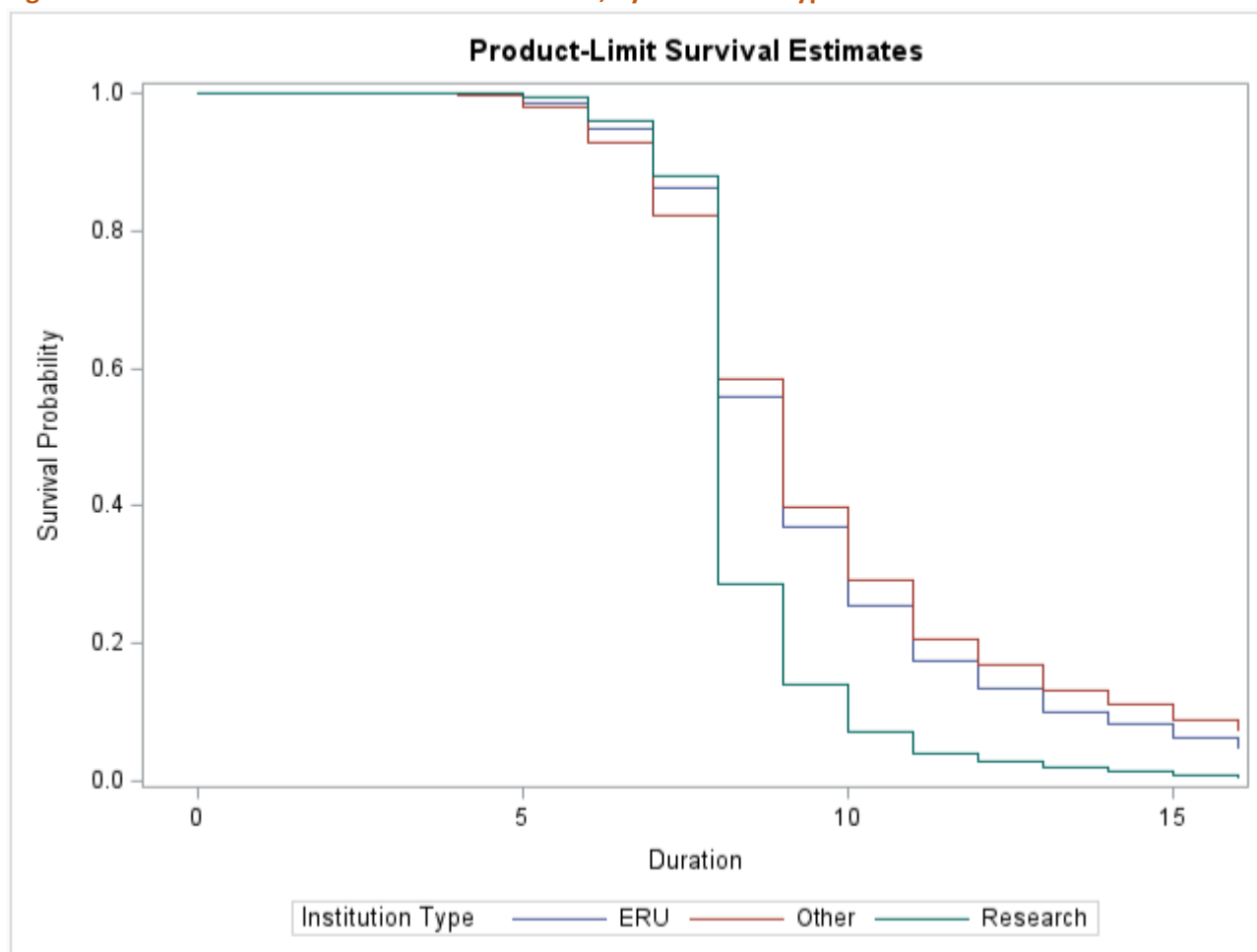
Across all three institutional groupings, a large drop in survival probabilities is seen in semester 8, reflecting the traditional four-year graduation mark. The analysis estimates that, at the end of semester 8, it is 28.6% likely that a student from the Research group will have not yet graduated, 55.8% likely that a student from an ERU will have not yet graduated, and 58.5% likely that a student from the Other group will have not yet graduated. Generally, the Research group has the lowest survival rates (i.e., highest graduation outcomes) across every semester examined, followed by ERUs, then the grouping of Other with the highest survival rates (i.e., lowest graduation outcomes). Note that ERUs and the Other group performed similarly, while the Research group had a distinct pattern.

Figure 1 shows the survival curve for graduation outcomes, broken out by institution type. The survival curve is a step function and is a graphical representation of the survival function explored in **Table 2**. Steep drops on the survival curve

indicate a higher estimated event rate for graduating at that time point, while a smaller drop indicates a lower event rate. Across all institution types, a large drop is seen at semester 8, indicating a high estimation of graduation events at that time point. Successively smaller drops are seen in semester 9 and semester 10 for the Research group, and a flattening occurring after that point with less notable drops in each semester. For the Research group, there is an estimated 7.1% likelihood of surviving past semester 10.

For ERUs and the Other institutional grouping, successively smaller drops are seen after semester 8. By semester 12 – the end of year 6 – there is an estimated 13.6% likelihood of surviving past that time point for students at ERUs, and 16.9% for the Other group.

Figure 1. Survival Curve for Graduation Outcomes, by Institution Type



Source: Texas Higher Education Coordinating Board CBM 001 & 009

Mean, median, and percentiles can be derived from the survival function. Here we look at the 25th percentile, 75th percentile, and 90th percentile of survival in addition to the median and mean, as seen in **Table 3**. Note that the median is widely preferred over the mean as the measure of central tendency in survival analysis since survival data is commonly skewed and censored.

The median reports the interval of time at which 50% of the population is estimated to have graduated. For the Research group, 50% of the population is expected to have graduated in semester 8, while the median is semester 9 for ERUs and the Other group. Comparing the median to the 25th percentile, which is the estimated time where 25% of the population has graduated, the estimate is one semester earlier for the ERU and Other groups, and the same semester for the Research group, illustrating the skew of the survival curve. The 90th percentile, the time at which 90% of the

population is expected to have graduated, occurs at semester 10 for the Research group, semester 14 for the ERU group, and semester 15 for the Other group.

Table 3. Mean, Median, and Percentiles of Survival Function of Graduation Outcomes, by Institution Type

Measure	Research	ERU	Other
25th Percentile	8 semesters	8 semesters	8 semesters
50th Percentile (Median)	8 semesters	9 semesters	9 semesters
75th Percentile	9 semesters	11 semesters	11 semesters
90th Percentile	10 semesters	14 semesters	15 semesters
Mean	8.4 semesters	9.5 semesters	9.7 semesters

Source: Texas Higher Education Coordinating Board CBM 001 & 009

Next, we explore covariates to determine which factors may be related to graduation, and to what extent. **Table 4** displays the odds ratios and significance of several covariates. As an example of the interpretation, the odds ratio for continuous enrollment compared to a stop out enrollment pattern for the Research group was 4.482, meaning the odds of graduating for students with continuous enrollment was 4.482 times higher than the odds for students who stopped out, holding all other variables constant.

Table 4. Odds Ratios for Covariates of Graduation Outcomes, by Institution Type

Comparison	Research	ERU	Other
Continuous Enrollment vs Stop Out	4.482**	7.058**	8.263**
Female vs Male	1.497**	1.475**	1.549**
International vs Non-URM	0.886	0.506**	0.490**
URM vs Non-URM	0.841**	0.717**	0.675**
Non-Pell vs Pell Recipient	1.398**	1.731**	1.460**
Non-Recipient vs Recipient of Need-based Institutional Grant/Scholarship	0.976	0.703**	1.010
Quartile 1 Earnings While Enrolled vs Zero Earnings	0.947	0.931	1.021
Quartile 2 Earnings While Enrolled vs Zero Earnings	0.916*	0.892**	0.938
Quartile 3 Earnings While Enrolled vs Zero Earnings	0.919	0.809**	0.850**
Quartile 4 Earnings While Enrolled vs Zero Earnings	0.837**	0.669**	0.686**

*P-value <0.01

**P-value <0.001

Source: Texas Higher Education Coordinating Board CBM 001, 009, FADS, Texas Workforce Commission UI Wage Records

The following trends were observed across all institution types:

- students with continuous enrollment had higher odds of graduating than those with a stop out pattern of enrollment;
- female students had a higher odds of graduating than males;
- URM students had a lower odds of graduating than non-URMs;
- non-Pell recipients had a higher odds of graduating than Pell recipients; and
- students who worked while enrolled and had median semester earnings in quartile 4 had a lower odds of graduating than their non-working counterparts. Note that the odds ratios for working while enrolled compared to non-working students were not significant for quartile 2 or quartile 3 earners in some of the institution types, but there did seem to be a general relationship with higher median semester wages and lower odds of graduating.
- continuous/stop out enrollment pattern, gender, and Pell status were the three factors with the strongest relationship with graduation, of the set of covariates examined.

As a reminder, dropout was treated as a competing risk, as students who drop out are no longer able to be observed as having successfully graduated, our primary outcome of interest. We conducted a limited analysis with dropout as the outcome to enhance our understanding of persistence and completion patterns. As introduced in the methodology section, dropout was defined as students who have not graduated and were also not enrolled in the latest four semesters examined for their respective cohort (i.e., fall/spring in years 7/8).

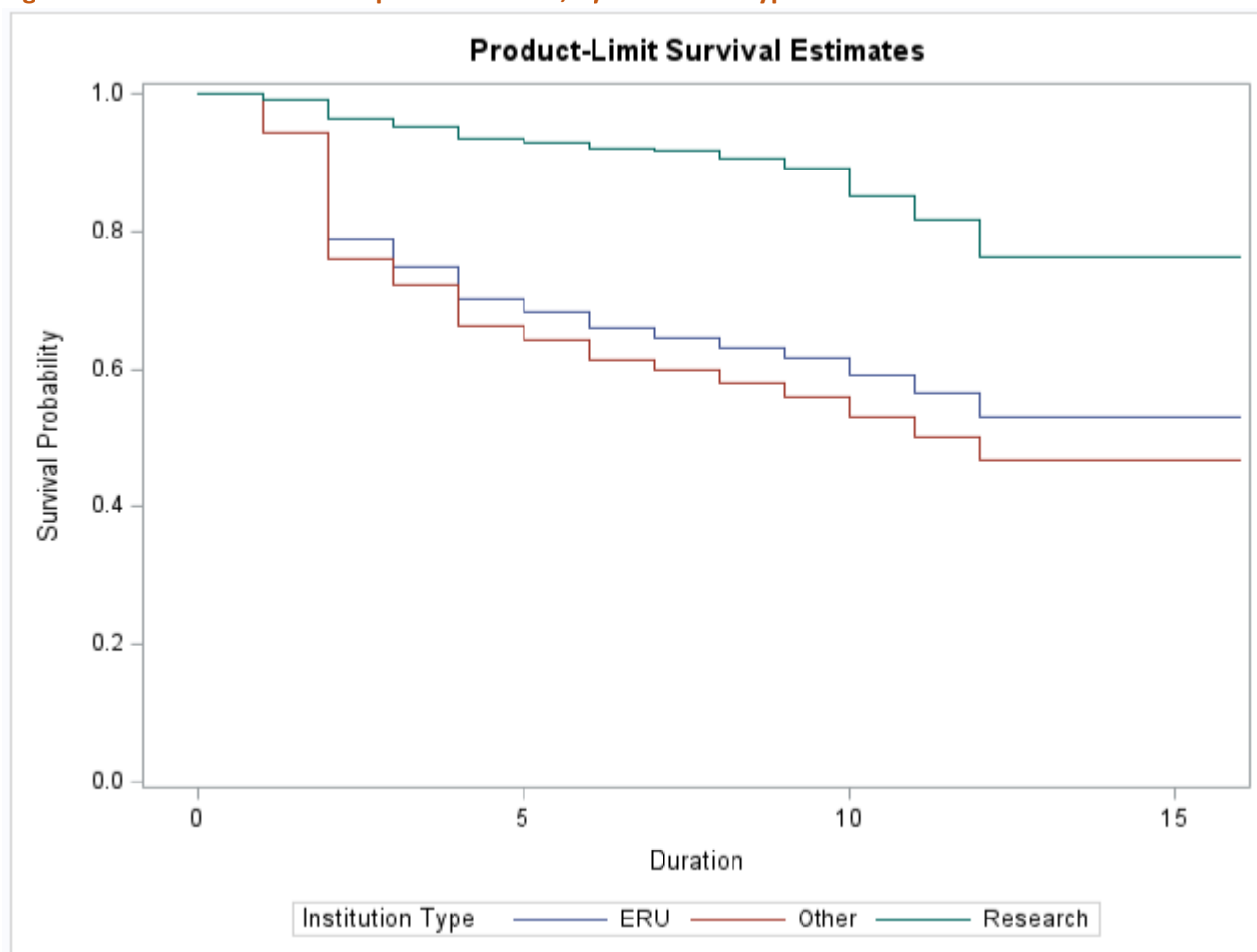
Table 5 shows the survival function of dropout and **Figure 2** shows the survival curve. For the Research group, the survival curve is fairly flat with no time period with a large drop, which if present would be indicative a high estimated dropout event. For the ERU and Other group however, semester 2 shows a marked drop in their survival curve, indicating that students are most likely to drop out after their first year (i.e., after semester 2). For the Research group, it was estimated that 96.2% of the population would make it past semester 2 without dropping out, 78.7% at ERUs would make it past semester 2, and 76.1% would survive past semester 2 in the Other group. Generally, the Research group has the lowest dropout risk across every semester examined, followed by ERUs, with the Other group having the highest dropout risk. Note that ERUs and the Other group performed somewhat similarly, while the Research group had a distinct pattern.

Table 5. Survival Function of Dropout Outcomes, by Institution Type

Semester	Research	ERU	Other
Semester 1	0.9899	0.9428	0.9418
Semester 2	0.9619	0.7871	0.7607
Semester 3	0.9516	0.7481	0.7207
Semester 4	0.9346	0.7025	0.6633
Semester 5	0.9280	0.6814	0.6414
Semester 6	0.9201	0.6578	0.6141
Semester 7	0.9153	0.6454	0.5999
Semester 8	0.9050	0.6311	0.5801
Semester 9	0.8907	0.6147	0.5600
Semester 10	0.8522	0.5903	0.5313
Semester 11	0.8169	0.5639	0.5021
Semester 12	0.7621	0.5303	0.4675

Source: Texas Higher Education Coordinating Board CBM 001 & 009

Figure 2. Survival Curve for Dropout Outcomes, by Institution Type



Source: Texas Higher Education Coordinating Board CBM 001 & 009

CONCLUSION

Survival analysis is a helpful technique to examine the occurrence and timing of graduation, since it makes appropriate adjustments for students who do not graduate within the timeframe as well as for students who drop out. Applying this technique to study graduation outcomes for three cohorts of FTFTDS students at UT System academic institutions, we identified several interesting findings.

For the Research group, the median time to degree is 8 semesters, while the median time to graduation is 9 semesters for both the ERU and Other institution groups. For the 90th percentile – the point at which 90% of students are estimated to graduate – this milestone occurs in semester 10 for the Research group, semester 14 for ERUs, and semester 15 for the Other group. The most notable increase in the likelihood of graduation occurs in semester 8. At that point, it is estimated to be 28.6% likely that a FTFTDS student will make it past semester 8 from a Research institution without having graduated, 55.8% at an ERU, and 58.5% from the Other grouping. Overall, the Research group consistently shows the highest graduation outcomes, followed by ERUs, with the Other group having the lowest graduation risk across all semesters analyzed. Among the covariates examined, enrollment pattern (continuous vs. stop out), gender, and Pell grant status were the strongest factors related to graduation outcomes. When analyzing the dropout data, we find that students are most likely to drop out after their first year (i.e., after semester 2). For the Research group, it was estimated that 96.2% of the population would make it past semester 2 without dropping out, 78.7% at ERUs would make it past semester 2, and 76.1% would survive past semester 2 in the Other group.

Survival analysis lends a unique approach to examining graduation and dropout outcomes, accounting for students who did not graduate or dropout within the study timeframe but remained enrolled, and adjusting for earlier dropout or graduation events. Differences exist in the occurrence and timing of dropout and graduation for the various institution types, and there is also variation in outcomes based on student characteristics, underscoring the importance of considering contextual variables when studying these educational milestones.