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WORKING HARD FOR THE DEGREE:
AN EVENT HISTORY ANALYSIS OF THE IMPACT OF WORKING WHILE
SIMULTANEOUSLY ENROLLED

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The conclusions of this research do not necessarily reflect the opinions or official position of the Texas Education Agency, the Texas Higher Education Coordinating Board, or the State of Texas.

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Introduction

The success of college students, and particularly those beginning at the community college, has become a focus for many policymakers. Completion rates paint a sad story, particularly at the community college where less than twenty-five percent of full-time students receive a bachelor's degree within six years (Snyder & Dillow, 2010). These completion statistics have remained relatively unchanged despite the deep investment made by state governments, federal programs, and institutional investments in higher education as a means to reduce the financial burden on students (Singell, 2004). It is, therefore, paramount that we better understand the factors associated with degree completion, particularly for community college students who represent a growing—though vulnerable—segment of American higher education (Wirt et al., 2000).

In this study, I model the factors that, over time, influence baccalaureate degree attainment, with a particular focus on working while simultaneously enrolled. In addition to the ability to track students over a number of years, one of the prime benefits of using a longitudinal student-level dataset is the ability to include individual-level covariates that change over time. I am particularly interested in the role of wages earned while currently enrolled and the influences

these wages have on degree attainment. As Cohen and Brawer (2008) report, community college students tend to have higher numbers of working hours and also tend to be less likely to complete as a result of increased demands in the workplace. Working is a large component of the lives of many community college students and, as such, I probe the role of relative wages earned in order to tell a more complete story of the degree completion for community college students. In order to better inform the field of the factors influencing degree attainment for community college students, with a particular focus on wages earned, I ask: “What are the factors that, over time, contribute to bachelor degree attainment for community college?”

What follows is a background and context section as well as a detailed research design. I then present results with a series of tables before offering a discussion and conclusion.

Background and Context

Student Success

A number of studies have explored the factors associated with student success, each with a particular focus or determinant of completion behavior. These determinants include such factors as financial aid (Singell, 2004; DesJardins, Ahlburg, & McCall, 2006a), economic disadvantage (Vignoles & Powdthavee, 2009), academic readiness (see Kerkvliet & Nowel, 2005), academic and social integration (Tinto, 1993), composition of the faculty (Eagen & Jaegar, 2009; Bettinger & Long, 2010), and expected future earnings (Kerkvliet & Nowell, 2005). Results have often been mixed; however, many studies have begun to unearth more information

through the use of both richer datasets and more highly sophisticated statistical techniques.

For example, using data collected from the University of Minnesota, DesJardins et al. (2002) estimate the effect of changes in financial aid on student persistence by following students for 22 terms. The authors benefit from the use of a hazard model enabling them to control for time-varying covariates, such as financial aid. After accounting for temporal influences and unobserved heterogeneity, the authors find a positive relationship between different forms of financial aid and student persistence, with debt-free scholarships having the largest impact.

In a more recent study, Powdthavee et al. (2009) focus on the effect of socioeconomic gap on student success. The authors compare attrition between students with a low socioeconomic background with their wealthier counterparts. Using a probit model and controlling for self-selection by predicting the likelihood of entering higher education, the authors report that wealthier students and students whose parents hold professional positions have a lower likelihood of dropping out. Overall, however, the authors find that this gap decreases significantly after conditioning on prior academic preparation.

In a study focused on graduation rates, DesJardins et al. (2006b) implement a multiple spells-competing risks model to simultaneously study the instances of stopout, re-enrollment, and graduation. This powerful statistical tool is able to study both the cumulative effects of stopout behavior as well as the effects of student covariates on both stopout and graduation. The authors find that those

students who experience one instance of stopping out are more likely to experience subsequent stopout periods and are less likely to graduate. Furthermore, the authors simulate the impact of various student characteristics, such as race, and find that the influence over student performance often attributed to race is actually the result of income, age at entry, and high school preparation. This study is one of the few examples of modeling that allows for multiple events (repeated stopouts) as well as competing risks (stopout and graduation modeled simultaneously).

Studies with a Focus on the Role of Working on Student Success

Early studies focusing on the role of wages on student success have tended to be at a single institution and focused on grade point average outcomes. These studies have yielded incredibly mixed results ranging from negative effects (Astin, 1993; King & Bannon, 2002; Gleason, 1993; Ma & Wooster, 1979; DeSimone, 2008), to no effects (Canabal, 1998; Curtis & Nummer, 1991; Ehrenberg & Sherman, 1987; High, 1999; Kalenkoski & Pabilonia, 2004), and even positive effects (Augenblick, Van De Water & Associates, 1987; Hammes & Haller, 1983; Parsons, 1977). Mixed results have also been found in studies with persistence towards graduation as the outcome. Studies using large-scale, national datasets find that working has a negative effect on persistence (Choy, 2002; Ehrenberg & Sherman, 1987; King, 2002), while some smaller studies find that working has a positive effect (Curtis & Nummer, 1991; Kulm & Cramer, 2006). In a recent study on the effects of working on student outcomes at liberal arts colleges, Salisbury et al. (2009) find that, overall, students who work suffer no consequences on grade point average or completion

outcomes. The authors go on to conclude that working may actually help students in terms of other measures of success, including leadership.

In a study tightly linked to longitudinal working data and student success is that by Jepsen et al. (2010) that explores the stopout behavior of a sample of community college students while conditioning on the wages earned while concurrently enrolled. The authors make use of a single-spell hazard model to study the influence of earnings on initial stopout, finding that a percentage increase in earnings reduces time to stopout with a probability of 1.767%. Their study, while unique in its own right, does not allow students to re-enter the analysis after a first stopout and does not ultimately model degree attainment. I expand upon analysis of Jepsen et al. (2010) by utilizing methods set forth by DesJardins et al. (2006) in order to account for both repeated stopout behavior and the competing risks of stopout and degree attainment. In doing so, I illuminate a clearer picture of the degree attainment process for community college students with a particular focus on wage earned while enrolled. To the best of my knowledge, no other study has undertaken such an investigation.

Research Design

Analytic Model

To conduct this analysis, I utilize a method known as event history analysis (EHA) in order to examine the factors determining whether a student beginning at a community college successfully completes a bachelor's degree. This approach has its roots in the biomedical literature where it was used to study time-to-death investigations. More recently, EHA was brought into the social sciences by Berry and Berry (1990) who used EHA to study the factors associated with state lottery adoptions. Since that time, EHA has been used to study state-level, education-related public policies such as charter school legislation, merit-based student grants, prepaid tuition and savings plans, and student unit-record systems (Renzulli & Roscigno, 2005, Doyle, 2006; Doyle, McLendon, & Hearn, 2005; Hearn, McLendon, & Mokher, 2008).

With a focus on individual students as the unit of analysis as opposed to states, DesJardins (2003), in a methodological piece containing a study on college student departure, demonstrates the power of event history analysis in such a circumstance in that longitudinal data can remedy many of the problems associated with cross-sectional data analysis in that dynamic outcomes in educational research are best explained with variables that are recorded in a way that also reflects change over time. Student degree attainment is a process that takes place over time and can be affected by an array of variables that also change with time. As such, it is ideally suited for event history analysis.

Event history analysis provides at least two benefits over traditional logistic regression (Bennett, 1999; Box-Steffensmeier & Jones, 2004). First, logistic regression can only be used to associate a set of cross-sectional covariates with

whether an event occurs. EHA, however, is able to include information not only whether, but also *when* an event (degree attainment) occurs relative to other students. Second, traditional logistic regression techniques omit any cases that have not experienced the event by the end of the time period under study, which could lead to selection bias. In EHA, however, any individual that has not attained a baccalaureate degree by the end of the study period is considered to be a censored observation. This method is then able to incorporate information about uncensored individuals as well as these so-called censored observations in order to obtain unbiased coefficient estimates.

The additional dimensions to this analysis, however, are that of repeated events and competing risks. Community college students may enroll in a given semester, not enroll in the following semester (or several semester), and then reappear enrolled later in postsecondary education. This period of non-enrollment followed by re-enrolling is known as “stopping out” as opposed to “dropping out” whereby the student would never re-enroll. I am interested in modeling the relationship between these events. More specifically, I am interested in the relationship not only between a set of observables and degree attainment, but also the relationship between student stopout behavior and graduation (competing risks). Furthermore, as students can stopout and re-enter higher education more than once I am interested in the relationship between these multiple stopouts and degree attainment (repeated events). As such, I follow a similar procedure to that of Desjardins, Ahlburg, and McCall (2006b) who implement a “multiple spells/competing risks” model.

Model Specification

More formally, I specify the initial model as follows; this model has become the standard to analyze time duration until an event and is known as discrete-time equivalent of the proportional hazards model (Cox, 1972; McCall, 1994):

$$\begin{aligned}\lambda(t | \mathbf{x}(t), \theta) &= \Pr(T = t | T \geq t - 1, \mathbf{x}(t), \theta) \\ &= 1 - \exp(-\exp(\alpha(t) + \mathbf{x}(t)' \boldsymbol{\beta}) \theta)\end{aligned}$$

The vast majority of earlier studies have modeled duration only until a single event occurs. For instance, DesJardins et al. (1999, 2002) estimate the probability of first stopout where $\Pr(T = t | T \geq t - 1, \mathbf{x}(t), \theta)$ is the probability of an individual student stopping out in discrete period t ; T is a discrete variable measure the number of terms of continuous enrollment until stopout occurs; $\mathbf{x}(t)$ is a vector of covariates for each student and $\boldsymbol{\beta}$ is a vector of the coefficients estimated for $\mathbf{x}(t)$; θ is an unobserved covariate assumed to be orthogonal to $\mathbf{x}(t)$; and $\alpha(t)$ is a time-varying constant-term interpreted as the base-line hazard rate or base-line risk of experiencing the event.

The modeling of multiple durations (as a result of stopout behavior) adds another dimension to the model by incorporating information on the history of previous enrollment spells. In other words, I am able to incorporate information on multiple enrollment spells (separated by a period of stopout). This information includes both the number and length of stopout periods. In a statistical model, this involves adding an index k and the term \mathbf{h}_{t-1} (representing the length of previous durations) that can then affect future durations. I define this model as:

$$\begin{aligned}\lambda_k(t_k | \mathbf{x}(t_k), \mathbf{h}_{k-1}, \theta_k) &= \Pr(T_k = t_k | T_k \geq t_k - 1, \mathbf{x}(t_k), \mathbf{h}_{k-1}, \theta_k) \\ &= 1 - \exp(-\exp(\alpha_k(t_k) + \mathbf{x}(t_k)' \boldsymbol{\beta}_k + \mathbf{h}'_{k-1} \boldsymbol{\delta}_k) \theta_k)\end{aligned}$$

where $\boldsymbol{\delta}_k$ is a vector of parameters that gauge the influence of past variables.

Finally, I model not only stopout behavior, but also the main event of interest: graduation. As such, I add a competing risks component to the model such that Y_k is a variable that equals j if the enrollment spell ended for reason j . In the case of this analysis j consists of only two options: stopout or graduation. In periods of enrollment, I define Y_k to be equal zero. Thus, a final model is specified as:

$$\begin{aligned}\lambda_k^j(t_k | \mathbf{x}(t_k), \mathbf{h}_{k-1}, \theta_k^j) &= \Pr(T_k = t, Y_k | T_k \geq t_k - 1, \mathbf{x}(t_k), \mathbf{h}_{k-1}, \theta_k^j) \\ &= 1 - \exp(-\exp(\alpha_k(t_k) + \mathbf{x}(t_k)' \boldsymbol{\beta}_k^j + \mathbf{h}'_{k-1} \boldsymbol{\delta}_k^j) \theta_k^j)\end{aligned}$$

where $\boldsymbol{\beta}_k^j$ and $\boldsymbol{\delta}_k^j$ estimate the effect of $\mathbf{x}(t_k)$ and \mathbf{h}_{k-1} on the likelihood of that the enrollment spell ends at time t due to the j th reason. This approach allows not only for the individuals factors influencing degree completion ($\mathbf{x}(t_k)$) with a focus on wages, but also accounts for the competing risk of stopout behavior and the repeated events of re-enrollment. Both of these behaviors are common to the experiences of community college students and will undoubtedly better inform the field after taking into consideration the role of stopout behavior, re-enrollment, and individual characteristics such as wages earned while enrolled.

Data

To conduct this analysis, I follow a cohort of students who initially began at the community college in the fall 2000 semester. I construct the time-varying

outcome variable in a multinomial fashion indicating whether a student is (0) currently enrolled in postsecondary education (1) stopping out, or (2) reached graduation. Thus, the dataset is in the form of a student-semester format whereby each student has an individual record for every semester he or she is enrolled. Additionally, data on the length of time (in semesters) spent unenrolled is calculated using enrollment data. Other variables include student characteristics: race and sex; high school academic preparation: whether the student took a trigonometry or AB/IB course, and performance on the state math exam; high school text variables: enrollment and pupil-teacher ratio; economic variables: economic status (whether a student qualified for a free or reduced lunch program in high school and county employment rates; wages; and two postsecondary characteristics: percentage of tenured faculty and percentage of part-time faculty. Data on logged wages and postsecondary characteristics are time-varying. As an additional control, I include an indicator for whether the student is enrolled in a four-year institution in any given semester.

Data on race, sex, economic status, AP/IB coursework, trigonometry coursework, dual enrollment, math test score, and faculty information are available from the TSMP. Data on unemployment and wage data are available from the Texas Comptroller. All remaining community context variables are available from the CCD. Descriptive statistics for the semester of initial enrollment are provided in Table 14.

Table 14
Descriptive Statistics for Event History Analysis of Degree Completion
at Initial Enrollment

	Mean	Std. Dev.
<u>Bachelor's Degree</u>		
Completion	0.162	0.369
<u>Student Characteristics</u>		
Hispanic	0.319	0.466
Black	0.100	0.299
Asian	0.024	0.153
Other	0.013	0.111
Male	0.460	0.498
<u>HS Academic Prep</u>		
Trig Course	0.273	0.445
AP/IB Course	0.264	0.441
Math Score	46.275	11.436
<u>HS Context</u>		
HS Enrl.	1552.543	919.859
HS Pupil:Teacher	14.447	2.544
<u>Economic Situation</u>		
Economic Status	0.249	0.432
County Unemployment	4.642	1.616
<u>Wages</u>		
Wage (logged)	5.042	3.454
<u>PS Characteristics</u>		
PS Percent Tenure	0.063	0.110
PS Percent Part-time	0.389	0.145
N	38222	

Results

The results are organized into three broad categories: a flow analysis, a focus on graduation, and then multiple iterations of the full model examining the factors influencing stopout, re-enrollment, and eventual degree attainment. In the flow analysis, I present the overall enrollment patterns for community college students. Then, I present a basic model predicting graduation as well as more complex models that condition upon different enrollment patterns. Finally, I present models that examine the factors influencing initial stopout, the likelihood of returning, and then repeat this pattern for another iteration allowing for a more flexible and informative

model of overall degree attainment. Following the results section, I offer a discussion of the most prominent findings.

Flow Analysis

To better understand the enrollment patterns of community college students, I first present a flow analysis detailing the number of students who stop out, drop out, re-enroll, and/or graduate; these patterns are depicted in Figure 4. The vast majority of community college students (94%) experience at least one period of non-enrollment, including those students who are successful in eventually completing a bachelor's degree. Indeed, of those students who eventually complete a bachelor's degree, only 13% do so without first stopping out. While most students experience at least one session of non-enrollment, many students return; of those students who initially stop out, 72% return for a second period of enrollment. During this second period of enrollment, the majority (76%) of all who students who complete a bachelor's degree do so without an additional period of non-enrollment. After stopping out after a second enrollment spell, the percentage of returning students completing a bachelor's degree decreases substantially. Finally, while roughly 84% of students have failed to complete a bachelor's degree within the six-year timeframe, 21% of these students remain enrolled at the end of the timeframe.

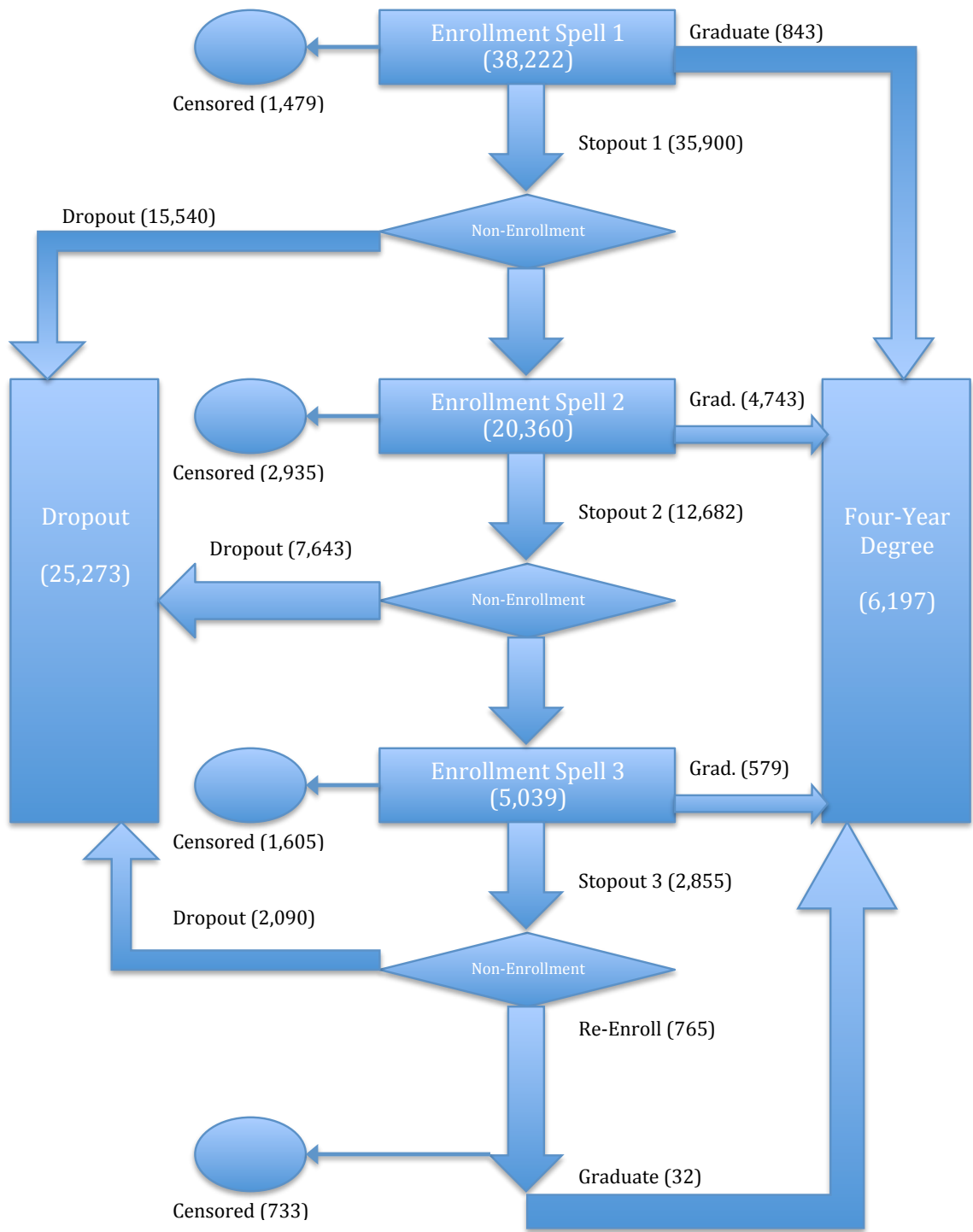


Figure 4: Flow Analysis for Degree Attainment

A Focus on Graduation

What could explain these enrollment patterns? To answer this sweeping question, I first turn to a basic event history model predicting overall graduation using pre-college, student-level covariates as well as wage and institutional data; I allow for re-enrollment, but do not yet account for information about the length of previous enrollment spells. Results from this analysis are presented in Table 15. For ease of interpretation, I present both the coefficients as well as the transformed change on the odds of graduation. Both Hispanic and Black students are less likely to graduate, as are males. In addition, all of the high school academic preparation variables have a positive impact on graduation while the economic factors show a negative impact. Not surprisingly, the estimate for the indicator of being at four-year institution is incredibly large, statistically significant, and positive; however, perhaps more interestingly, the percent tenure shows a positive estimate and the percent part-time shows a negative estimate. Wages, even in this early model, seem to disproportionately—and negatively—affect overall graduation. For a percent increase in wages earned while concurrently enrolled, we see nearly a four percent decrease in the odds of completing a degree. While these estimates begin to shed light on the graduation story of community college students, I have already shown that the vast majority of students experience spells of non-enrollment. As such, I now turn to graduation models that examine the factors affecting degree attainment allowing for different enrollment patterns.

Table 15
Event History Analysis Predicting Overall Graduation

	Estimate [SE]	Change in Odds
<u>Student Characteristics</u>		
Hispanic	-0.4594*** [0.04]	-37%
Black	-0.2214*** [0.06]	-20%
Asian	0.0037 [0.07]	0%
Other	-0.0777 [0.12]	-7%
Male	-0.4091*** [0.03]	-34%
<u>HS Academic Prep</u>		
Trig Course	0.2175*** [0.03]	24%
AP/IB Course	0.1591*** [0.03]	17%
Math Score	0.0194*** [0.00]	2%
<u>HS Context</u>		
HS Enrl	0.0229 [0.02]	2%
HS Pupil:Teacher	-0.009 [0.01]	-1%
<u>Economic Situation</u>		
Economic Status	-0.2920*** [0.04]	-25%
County Unemployment	-0.0263** [0.01]	-3%
<u>Wages</u>		
Wages (logged)	-0.0368*** [0.00]	-4%
<u>PS Characteristics</u>		
Four-Year Institution	1.7585*** [0.14]	480%
PS Percent Tenure	0.6585*** [0.12]	93%
PS Percent Part-time	-0.6915*** [0.13]	-50%
Constant	-79.2155*** [4.50]	-100%
chi2	25664.0705	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 16 depicts graduation as an outcome conditional on different enrollment patterns. The first column is a replication of Table 15, for comparison purposes. Column 2 depicts graduation with no stops while Columns 3 and 4 depict graduation with one and two stops, respectively. With graduation in the first enrollment spell without any stops (column 2) being so rare, it is not surprising that so many of the student-level covariates shown to be predictive in the first model are no longer statistically significant. It appears as though remaining continuously enrolled, in itself, is the strongest predictor of whether a student graduates. Males, however, show a lower likelihood of graduating, even if remaining continuously enrolled.

The factors influencing graduation for students with one stop out period (column 3) are remarkably similar to those in the overall model (column 1). Again, however, this is not incredibly surprising given that the vast majority of community college students who successfully complete a bachelor's degree do so after one period of non-enrollment. In this model, however, I now include a covariate for the length of time (in semesters) a student had previously spent non-enrolled. In other words, I control for the number of semesters between the semesters in which a student is actively enrolled. The estimate for this variable is statistically significant and negative (though small), suggesting that students who had previously been non-enrolled are less likely to graduate. Finally, for students who experience two period of non-enrollment, there is a stronger effect of the length of time previously spent non-enrolled, with 28% and 21% negative changes in the odds for the semester spent non-enrolled in non-enrollment periods 1 and 2, respectively. Just as in the

basic model, percent changes in wages appear to have a negative and disproportional relationship to graduation. With these estimates in mind, I turn now to models that incorporate stopout behavior and allow for the competing risk of stopout and graduation.

Table 16
Event History Analysis Predicting Graduation by Enrollment History

	1		2		3		4	
	Overall Graduation		Graduation with No Stops		Graduation with One Stop		Graduation with Two Stops	
	Estimate [SE]	Change in Odds	Estimate [SE]	Change in Odds	Estimate [SE]	Change in Odds	Estimate [SE]	Change in Odds
Student Characteristics								
Hispanic	-0.4594*** [0.04]	-37%	-0.1158 [0.10]	-11%	-0.4919*** [0.05]	-39%	-0.6101*** [0.13]	-46%
Black	-0.2214*** [0.06]	-20%	0.1237 [0.15]	13%	-0.2640*** [0.07]	-23%	-0.4013* [0.20]	-33%
Asian	0% [0.07]	0%	-0.1081 [0.18]	-10%	0.092 [0.09]	10%	0.3411 [0.24]	41%
Other	-8% [0.12]	-7%	-0.1229 [0.32]	-12%	-0.0214 [0.14]	-2%	0.0456 [0.31]	5%
Male	-0.4091*** [0.03]	-34%	-0.1945** [0.08]	-18%	-0.4007*** [0.03]	-33%	-0.3394*** [0.09]	-29%
HS Academic Prep								
Trig Course	0.2175*** [0.03]	24%	-0.0188 [0.08]	-2%	0.2706*** [0.03]	31%	-0.0088 [0.10]	-1%
AP/IB Course	0.1591*** [0.03]	17%	0.0261 [0.08]	3%	0.1582*** [0.03]	17%	0.2200* [0.10]	25%
Math Score	0.0194*** [0.00]	2%	0.0222*** [0.01]	2%	0.0149*** [0.00]	2%	0.0132* [0.01]	1%
HS Context								
HS Enrl	2% [0.02]	2%	0.0228 [0.06]	2%	-0.0014 [0.02]	0%	0.0361 [0.07]	4%
HS Pupil:Teacher	-1% [0.01]	-1%	-0.0196 [0.02]	-2%	-0.0009 [0.01]	0%	0.0064 [0.03]	1%
Economic Situation								
Economic Status	-0.2920*** [0.04]	-25%	-0.0456 [0.10]	-4%	-0.3278*** [0.05]	-28%	-0.2577 [0.14]	-23%
County Unemployment	-0.0263** [0.01]	-3%	-0.0418 [0.03]	-4%	-0.0153 [0.01]	-2%	0.0017 [0.03]	0%
Wages								
Wages (logged)	-0.0368*** [0.00]	-4%	-0.0313** [0.01]	-3%	-0.0340*** [0.00]	-3%	-0.0487*** [0.01]	-5%
PS Characteristics								
Four-Year Institution	1.7585*** [0.14]	>100%	1.3945*** [0.36]	>100%	1.7129*** [0.16]	>100%	2.5680*** [0.48]	>100%
PS Percent Tenure	0.6585*** [.12]	93%	.4291*** [.39]	54%	.8980*** [.18]	145%	.9271*** [.44]	153%
PS Percent Part-time	-0.6915*** [0.13]	-50%	-5.509*** [0.38]	-42%	-0.7144*** [0.15]	-51%	-1.2974*** [0.42]	-73%
Stopout Length								
Stop Out Length 1					-0.0250* [0.01]	-2%	-0.3253*** [0.06]	-28%
Stop Out Length 2							-0.2347*** [0.05]	-21%
Constant	-79.2155*** [4.50]	-100%	-163.1274*** [47.13]	-100%	-64.2024*** [4.46]	-100%	-63.6978* [29.90]	-100%
chi2	2566407%		5301.4459		18105.73		2770.7921	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Stopout Behavior as a Competing Risk with Graduation

The likelihood of completing an undergraduate degree without any stopout behavior is very low for community college students. As such, I model only the factors influencing stopout in the first iteration of the analysis; Table 17 presents these estimates for initial stopout behavior. Interestingly, there is no statistically significant difference between White and Hispanic students with respect to initial stopout. Surprisingly, students identified as free or reduced lunch eligible are less likely to stopout (and, thus, more likely to remain enrolled). Furthermore, only the trigonometry course indicator is significant with respect to academic preparation—those students who took trigonometry are less likely to stopout. Also, those students who successfully enrolled in a four-year institution after beginning in a community college are less likely to stopout. Again, however, working appears to have a negative impact on educational outcomes, with a percent increase in wages earned resulting in a disproportional increase in the odds of stopping out.

Table 17
Event History Analysis Predicting Initial Stopout

	Estimate [SE]	Change in Odds
<u>Student Characteristics</u>		
Hispanic	0.0114 [0.02]	1%
Black	0.0719** [0.03]	7%
Asian	-0.1786*** [0.05]	-16%
Other	0.0532 [0.07]	5%
Male	-0.0186 [0.02]	-2%
<u>HS Academic Prep</u>		
Trig Course	-0.1291*** [0.02]	-12%
AP/IB Course	-0.0278 [0.02]	-3%
Math Score	0.0013 [0.00]	0%
<u>HS Context</u>		
HS Enrl	-0.0091 [0.01]	-1%
HS Pupil:Teacher	-0.002 [0.00]	0%
<u>Economic Situation</u>		
Economic Status	-0.0382 [0.02]	-4%
County Unemployment	-0.002 [0.01]	0%
<u>Wages</u>		
Wages (logged)	0.0327*** [0.00]	3%
<u>PS Characteristics</u>		
Four-Year Institution	-0.6410*** [0.05]	-47%
PS Percent Tenure	.5491*** [.03]	73%
PS Percent Part-time	-0.1152* [0.06]	-11%
Constant	2.0545*** [0.08]	
chi2	1495.9234	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

After students have initially stopped out, they have two options: (1) re-enroll in a subsequent term in the analysis or (2) dropout altogether (never return during the study time period). As such, I next model the factors associated with never returning to higher education after one period of non-enrollment; Table 18 presents these estimates. In other words, I model the observable characteristics that are associated with never re-enrolling after an initial spell of non-enrollment. Again, there is no statically significant difference between White and Hispanic students; Black students, however, are more likely to never re-enroll, while Asian students are less likely. Males are also more likely to never re-enroll. Students with strong indicators of academic preparation are less likely to never re-enroll (and, thus, more likely to re-enroll in a later semester). Additionally, those students who successfully enrolled in a four-year institution are less likely to never re-enroll. Increased earnings, again, seem to inhibit success as a percent increase in earnings is shown to have a positive impact on the odds of never re-enrolling. Collectively, the factors influencing never re-enrolling appear to be similar to the factors predicting overall graduation, though opposite in direction. In both instances, increases in wages appear to decrease the likelihood of academic success. Of those students who return for a second period of enrollment, there is substantially more variation in their eventual outcomes. These students either: (1) stop out again, (2) graduate or (3) remain continuously enrolled. Using option (3) as a base comparison group, I next model the competing risks of stopping out again and graduating for students in their second enrollment spell; these results are presented in Table 19.

Table 18
 Logistic Regression: Risk of Never Returning After 1 Stopout

	Estimate [SE]	Change in Odds
Student Characteristics		
Hispanic	0.0009 [0.02]	0%
Black	0.0961** [0.03]	10%
Asian	-0.2632*** [0.06]	-23%
Other	-0.1249 [0.08]	-12%
Male	0.1264*** [0.02]	13%
HS Academic Prep		
Trig Course	-0.2618*** [0.02]	-23%
AP/IB Course	-0.0918*** [0.02]	-9%
Math Score	-0.0071*** [0.00]	-1%
HS Context		
HS Enrl	-0.0987*** [0.01]	-9%
HS Pupil:Teacher	-0.0015 [0.00]	0%
Economic Situation		
Economic Status	-0.0281 [0.02]	-3%
County Unemployment	0.0086 [0.01]	1%
Wages		
Wages (logged)	0.0230*** [0.00]	2%
PS Characteristics		
Four-Year Institution	-2.0615*** [0.06]	-87%
PS Percent Tenure	-0.3464*** [.07]	-31%
PS Percent Part-time	-0.4613*** [0.07]	-37%
Constant	8.9696*** [0.17]	>100%
chi2	34751.5517	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 19 shows the first two multiple spells-competing risks models. Hispanic students are shown to be less likely to stop out, yet also less likely to graduate; Hispanic students, it appears, are the most likely to remain continuously enrolled after returning for a second enrollment spell. Black students, however, are both more likely to stop out again and less likely to graduate; males follow a similar pattern. Measures of pre-college academic preparation behave in a manner consistent with previous models: improving academic success by decreasing the likelihood of another stop out period and increasing the likelihood of graduation. Economic factors do not appear to be an influence on stop out, yet while the free or reduced lunch designation of the student has a negative effect on graduation, the county unemployment where the student went to high school has a positive effect. Successfully transitioning to a four-year institution also has a positive effect on academic outcomes: students enrolled in a four-year institution are less likely to stop out and (not surprisingly) more likely to graduate. Finally, wages tell precisely the opposite story, though greater magnitude than in previous models—while a percent increase in wages has a roughly 4% effect on the odds of stopping out again, we see a whopping 13% decrease in the odds of graduation.

Table 19
Risks of Stopout and Graduation in Enrollment Period 2

	Stopout		Graduation	
	Estimate [SE]	Change in Odds	Estimate [SE]	Change in Odds
Student Characteristics				
Hispanic	-0.0718* [0.03]	-7%	-0.6774*** [0.05]	-49%
Black	0.1447*** [0.04]	16%	-0.7147*** [0.08]	-51%
Asian	-0.2268** [0.09]	-20%	-0.0478 [0.11]	-5%
Other	-0.2133 [0.11]	-19%	-0.2993 [0.18]	-26%
Male	0.2047*** [0.02]	23%	-0.4295*** [0.04]	-35%
HS Academic Prep				
Trig Course	-0.2384*** [0.03]	-21%	0.7365*** [0.04]	109%
AP/IB Course	-0.1135*** [0.03]	-11%	0.3836*** [0.04]	47%
Math Score	-0.0083*** [0.00]	-1%	0.0327*** [0.00]	3%
HS Context				
HS Enrl	-0.1255*** [0.02]	-12%	0.0729* [0.03]	8%
HS Pupil:Teacher	-0.0018 [0.01]	0%	-0.0118 [0.01]	-1%
Economic Situation				
Economic Status	0.0319 [0.03]	3%	-0.4055*** [0.06]	-33%
County Unemployment	-0.0108 [0.01]	-1%	0.0566*** [0.01]	6%
Wages				
Wages (logged)	0.0227*** [0.00]	2%	-0.0748*** [0.01]	-7%
PS Characteristics				
Four-Year Institution	-1.3686*** [0.08]	-75%	1.1154*** [.03]	>100%
PS Percent Tenure	-0.7435*** [.06]	-52%	-0.4548** [0.17]	-36%
PS Percent Part-time	-0.3470*** [0.09]	-29%	-0.2301 [0.15]	-21%
Stopout Length				
Stop Out Length 1	0.0421*** [0.01]	4%	-0.1414*** [0.01]	-13%
Stop Out Length 2				
Constant	-5.9916*** [0.19]		17.8081 [24.28]	
chi2	27107.3535			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

After a second enrollment spell ends by another stop out period, students are, again, in a situation with two options: (1) never return to higher education or (2) enroll in a later semester. I follow students a total of three enrollment spells and, thus, Table 20 reports the risks of never returning to higher education after a second period of non-enrollment. Interestingly, very few variables in the model are statistically significant. Asian students are less likely to never re-enroll, though no other differences by race or sex are observed. Students at a four-year institution are less likely to never re-enroll, suggesting that students who successfully make the transition to a four-year institution are more likely to return to higher education, even after two stop out periods. Also, the length of a student's first stop out period is positively related to the odds of never re-enrolling after a second stop out period. This model shows no statistically significant relationship between the odds of never re-enrolling and wages earned. For those students who do re-enroll, however, I present one final model that shows the competing risks of stop out and graduation for students in their third enrollment period.

Table 20
 Logistic Regression: Risk of Never Returning After 2 Stopouts

	Estimate [SE]	Change in Odds
<u>Student Characteristics</u>		
Hispanic	-0.0414 [0.04]	-4%
Black	0.0214 [0.06]	2%
Asian	-0.4470*** [0.12]	-36%
Other	-0.0409 [0.15]	-4%
Male	0.0539 [0.03]	6%
<u>HS Academic Prep</u>		
Trig Course	-0.0771 [0.04]	-7%
AP/IB Course	0.0219 [0.04]	2%
Math Score	0.0017 [0.00]	0%
<u>HS Context</u>		
HS Enrl	-0.0462 [0.03]	-5%
HS Pupil:Teacher	0.0006 [0.01]	0%
<u>Economic Situation</u>		
Economic Status	-0.0602 [0.04]	-6%
County Unemployment	0.0209 [0.01]	2%
<u>Wages</u>		
Wages (logged)	0.0056 [0.00]	1%
<u>PS Characteristics</u>		
Four-Year Institution	-0.9981*** [0.11]	-63%
PS Percent Tenure	-.1923*** [.09]	-17%
PS Percent Part-time	-0.3285** [0.13]	-28%
<u>Stopout Length</u>		
Length of Stopout 1	0.3591*** [0.01]	43%
Constant	31.1124*** [1.33]	>100%
chi2	62137	
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$	13816.7135	

Table 21 presents results for the competing risks-multiple spells model from enrollment period 3. As was the case in the model for enrollment period 2, Hispanic students are less likely to both stop out as well as graduate. While Black students are less likely to graduate, there is no statistically significant difference for Black students with respect to stop out. Males, however, remain more likely to stop out and less likely to graduate. Variables for high school academic preparation behavior act in similar ways as in previous models, both decreasing the odds of an additional stop out and increasing the odds of graduation. Interestingly, students qualifying for free or reduced lunch have decreased odds of stopping out, yet no effect on graduation. Just as before, those successfully transitioning to a four-year institution have increased odds of academic success: less likely to stop out and more likely to graduate. Finally, the length of time spent stopped out in the previous two non-enrollment spells has a negative effect on an additional stop out period, yet the length of time spent non-enrolled in the second non-enrollment spell also has a negative effect on graduation.

Table 21
Risks of Stopout and Graduation in Enrollment Period 3

	Stopout		Graduation	
	Estimate [SE]	Change in Odds	Estimate [SE]	Change in Odds
Student Characteristics				
Hispanic	-0.1304* [0.05]	-12%	-0.5434*** [0.13]	-42%
Black	-0.0225 [0.07]	-2%	-0.5448** [0.21]	-42%
Asian	-0.4598** [0.17]	-37%	0.4276 [0.26]	53%
Other	0.0638 [0.19]	7%	0.2804 [0.37]	32%
Male	0.1732*** [0.04]	19%	-0.3374*** [0.10]	-29%
HS Academic Prep				
Trig Course	-0.2823*** [0.05]	-25%	0.3818*** [0.11]	46%
AP/IB Course	-0.2016*** [0.05]	-18%	0.4284*** [0.10]	53%
Math Score	-0.0102*** [0.00]	-1%	0.0396*** [0.01]	4%
HS Context				
HS Enrl	-0.0363* [0.01]	-4%	0.0847** [0.03]	9%
HS Pupil:Teacher	0.006 [0.01]	1%	-0.0502*** [0.01]	-5%
Economic Situation				
Economic Status	-0.1716*** [0.03]	-16%	-0.0183 [0.07]	-2%
County Unemployment	-0.0216 [0.01]	-2%	-0.0142 [0.03]	-1%
Wages				
Wages (logged)	0.1456** [0.05]	16%	-0.2616 [0.15]	-23%
PS Characteristics				
Four-Year Institution	-0.8924*** [.14]	-59%	1.1123*** [.08]	204%
PS Percent Tenure	-1.0524*** [0.16]	-65%	-0.9777* [0.44]	-62%
PS Percent Part-time	-0.5440*** [0.16]	-42%	-0.4443 [0.39]	-36%
Stopout Length				
Stop Out Length 1	-1.2631*** [0.04]	-72%	-0.0375 [0.04]	-4%
Stop Out Length 2	-0.6363*** [0.03]	-47%	-0.1683*** [0.04]	-15%
Constant	6.5510*** [0.22]	>100%	18.4019 [135.71]	>100%
chi2	12054.5006			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Discussion

The results of this analysis have provided for at least five points of discussion. First, racial groups differentially experience the community college enrollment and graduation process. Second, the impact of pre-college factors yields strong predictive power of student success in the early stages of the enrollment story, yet has little effect later on. Third, and not completely surprising, students who are successful in transferring to a four-year institution are more likely to graduate, but are also more likely to remain enrolled and return to higher education after periods of non-enrollment. Fourth, wages earned tend to inhibit overall student success. Fifth, prior enrollment behavior tends to influence later stop out and graduation behavior. What follows is a brief discussion of each.

Hispanic students represent a sizeable portion (32%) of the sample, yet are shown to have lower odds of degree completion than their white peers. In several cases, however, Hispanic students show no statistically significant difference than white students—in the cases of initial stop out and never returning after one or two periods of non-enrollment. Furthermore, Hispanic students are *less* likely than white students to experience a second stop out period. Hispanic students are likely to re-appear in the higher education system after stop out and remain enrolled; however, graduation still suffers. Policy implementation seems to be warranted at allowing for flexibility in re-enrollment and a push for increased graduation after students, and particularly Hispanic students, re-enter the system. The story for Black students, however, is not the same. Black students are less likely to graduate overall, but also more likely to stop out and never re-enroll in higher education.

Unlike Hispanic students, Black students appear to depart from higher education and never return. Again, it appears as though programs designed to encourage re-enrollment seem to be warranted.

High school academic preparation in the form of a trigonometry course, an AP or IB course, and the state math exam score have a strong relationship with overall graduation rates as well as the propensity to remain enrolled and re-enroll after an initial stop out. Later in the process, however, academic preparation appears to have less of an impact on the odds of returning after two stop out periods. Students with a strong academic background from high school behave no differently than other students when it comes to enrolling in a third enrollment period. The key, it seems, is to keep these academically strong students enrolled with little, or no, periods of stop out behavior. Policy implementation appears to be warranted at keeping these students enrolled.

Students at a four-year institution are (not surprisingly) more likely to graduate, but are also more likely to stay enrolled and more likely to re-enroll in the event of a stop out period. Perhaps those students successful in transfer are able to “see the light at the end of the tunnel” in terms of degree completion and, even after a period of non-enrollment, are more likely to re-enroll. The successful transition between the two and four-year sectors, it appears, is important not only in graduating students, but also in keeping students in the pipeline towards eventual graduation.

Overall, wages appear to inhibit the academic success of students. This finding, however, must be tempered with the knowledge that working while

continuously enrolled is the reality of many community college students. Policies going so far as to discourage working altogether may not be feasible; however, policy geared at reducing the number of hours students work while enrolled may increase the overall graduation rate of community college students. This is especially important as the impact of working on inhibiting student success appears to increase with time and with additional periods of non-enrollment—the more times a student stops out, the more less likely he or she is to graduated while continuing to work.

Finally, previous periods of non-enrollment have an effect on future academic success and enrollment trends, though this effect is not always consistent. Students with longer previous non-enrollment periods are more likely to never return in future non-enrollment spells; however, the length of time spent non-enrolled has a different effect if a student is successful in re-enrolling. Students with longer previous non-enrollment spells are less likely to experience another stop out period. Perhaps these students who have returned for a third enrollment spell have a strong determination to succeed, despite the amount of time spent previously non-enrolled. Again, policy implementation geared at facilitating re-enrollment appears to be warranted.

Conclusions

Working is a large part of the lives of community college students, yet appears to inhibit overall academic success in terms of graduation and the propensity to re-enroll after a period of non-enrollment. The resounding message is one of “work less and study more;” however, this is simply not an option for many community college students. How could we improve student success with the understanding that many students are working? One mechanism through which this may be possible, and one limitation of this study in that it is not included, is financial aid. Future analyses would benefit from the use of financial aid data as well as earned wages to provide a more complete picture of the college completion process for community college students.

The journey to a four-year degree for those students beginning in the community college is undoubtedly a long one, marked by periods of transition and change. Through the use of a competing risks/multiple spells model I have shown the effect of race, sex, academic preparation, high school and economic context, wages, post-secondary characteristics, and previous enrollment histories on student success. While many factors influence overall success, it appears that those students who are working while continuously enrolled experience lower rates of academic success. Put differently, these students are working hard for the degree, yet not succeeding in attaining it.

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