

Longitudinal Effects of College Preparation Programs on College Retention

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Abstract

The effects of various college preparation programs, class ranking, and student background characteristics on college retention were studied. The data were obtained from the National Education Longitudinal Study:1988-2000 and NELS:88/2000 Postsecondary Education Transcript Study. The sample contained 4,445 first-time freshmen students who enrolled in four-year institutions between 1992 and 1994. Using survival analysis techniques, the focal point of the study was to examine longitudinal impact of high school programs on college retention. Participation in ACT/SAT preparation courses reduced the likelihood of departure by 42% or 55% in the second or third year in college, while receiving assistance in financial aid application increased the odds of departure by 89% in the second year.

Introduction

Educators are under increasing pressure to improve high school student preparation for college. Educational researchers suggest that high schools can enhance college enrollment and degree attainment by offering both academic preparation and college support programs (Adelman, 1999; Cabrera & La Nasa, 2001). For example, college counseling and availability of related information are found to be particularly important for low-income high school students in their decisions to attend college (King, 1996). However, the fact that students are most likely to leave college in their first year raises the question of whether the high school programs positively affect college retention. Using national data sets, this study examines whether participation in high school support programs is associated with persistence in college. In addition, it is widely recognized that demographics and academic ability are predictors of success in both enrolling and staying in college. What is less understood are the

longitudinal effects of these factors on college retention. It has been shown that effects of pre-college student characteristics on persistence behavior in college vary over time (Ishitani, 2003).

Using survival analysis, we examine the varying impact of high school support and other index variables on retention during a four-year period. Professionals in higher education will find attributes in this study, such as the impact of high school experiences on college retention and application of survival analysis for educational research, valuable. The results of this analysis reveal new information about the longitudinal impact of high school experiences, motivation, academic ability, and demographics on college retention.

Predisposition Toward College Enrollment

Although going to college may be viewed as a rite of passage for future career advancement and social mobility, a large percentage choose not to pursue education after high school. Using a sample of 11,316 eighth graders included in the National Education Longitudinal Study:1988-2000 (NELS:88/2000), only 6,687 of these eighth graders (59.1%) enrolled in some type of postsecondary institutions within two years after they graduated from high school. Of those who attended college, some began formalizing plans to attend as early as eighth grade (Hossler, Schmit, & Vesper, 1999).

Many studies have explored various factors that affect educational aspirations of attending college among high school students. The single most important factor that researchers have agreed on is parental support and encouragement (Stage & Hossler, 1989). The more encouragement students receive from their parents to attend college, the more likely they are to do so. According to Hossler and Stage (1989), higher educational attainment of parents increases the likelihood of college enrollment. Student academic achievement was also shown to have a

strong impact on college matriculation (Jackson, 1978). It is unclear whether students are encouraged by their parents, peers, and teachers to go to college because of their higher grades, or whether students attain higher grades because they are already motivated to attend postsecondary institutions. However, high school grades, as well as parental support and educational level, play a significant role in shaping one's educational aspirations after high school (Hossler, Schmit, & Vesper, 1999).

In addition to educational aspirations, Hossler, Schmit, and Vesper (1999) described the importance that the process of gathering college-related information plays in educational planning. They report that students rely mainly on their parents as sources for college-related information prior to their junior year in high school. During the junior year, information-gathering activities significantly increase, and students utilize other sources such as high school counselors. Students also participate in various programs, which assist them in the application process, such as admission test preparation courses through their junior and senior years. Given that participation in various programs reflects students' stronger commitment to higher education, the research question for this study is to inquire if participation in these college preparation programs is associated with their departure behavior after matriculation to college.

Factors Impact Student Departure

Various student background characteristics were previously addressed to explain college student attrition. Examples of these student characteristics include gender (Pascarella, Duby & Iverson, 1983; Stage & Hossler, 1989), race (Braxton, Duster, & Pascarella, 1988; Pascarella & Terenzini, 1978, 1983), and high school academic achievement (Braxton, Duster, & Pascarella, 1988). Braxton et al. (1988) identified that minority students were more likely to drop out of college than their counterparts. The role of students' educational expectations was also discussed in former studies (Metzner & Bean, 1987; Pascarella, 1980). Metzner and Bean found that educational goals and student attrition were negatively related. Additionally, family income was associated with student attrition behavior as well (Braxton, Brier, & Hossler, 1988; Hossler & Vesper, 1993; Pascarella & Chapman, 1983). For instance, Pascarella and Chapman suggested that a higher level of socioeconomic status had a positive effect on academic and social integration and ultimately influenced one's enrollment decision.

Parent's educational attainment revealed an effect on college student attrition (Pascarella & Terenzini, 1983; Stage, 1988). Particularly, lower persistence rates among first-generation students were highlighted in previous studies (Horn, 1998; Ishitani, 2003; Nunez & Cuccaro-Alamin, 1998; Riehl, 1994). Using institutional data, Ishitani (2003) discovered a higher risk of departure among first-

generation students in their first year of college. Nunez and Cuccaro-Alamin (1998) examined national data, and noted that first-generation college students persisted and attained degrees at lower rates than their counterparts.

Previous research studies have assessed the effect of financial aid on college attrition behavior (Hochstein & Butler, 1983; Ishitani & DesJardins, 2002; Iwai & Churchill, 1982; James, 1988). In some of these studies, different types of aid were found to impact students' dropout behavior in different ways. For example, Hochstein and Butler (1983) identified that loans were negatively associated with college persistence. They also advised that grants had a positive effect on student retention, whether awarded alone or in conjunction with a loan. Using a National Center for Education Statistics (NCES) data set, Ishitani and DesJardins (2002) recently discussed longitudinal effects of financial aid amounts on college student departure. They suggested that various aid amounts impacted student attrition behavior differently depending on the timing of departure.

Student background characteristics have been particularly recognized as one of the major components in existing college retention models (Pascarella, 1980; Spady, 1971; Tinto, 1975). These theoretical models also emphasize the importance of interactions between students and institutional environments (e.g., academic and social integration), which ultimately affect one's departure decision. However, conducting research studies that address the effects of time-varying factors, such as on-going interactions between student and institutions, becomes difficult for various reasons. This is apparent in the case of using national data sets. For instance, questionnaire items designed to assess academic and social integration (Tinto, 1975) in the national data sets were asked once in the first year. When one assumes that the level of academic and social integration changes over time, frequent inquiries of these items are needed to estimate their longitudinal effects on attrition behavior.

It makes logical sense that the greatest benefits for explaining student departure behavior result from thorough examination of both pre-college characteristics of students and the quality of their interactions with institutions of higher education. However, this study will only focus on the effects of pre-college characteristics of students on their college attrition behavior, mainly because of a lack of available time-varying items in the study data, such as academic and social integration. We believe that a lack of student-institution interaction items does not nullify the value of this study. In fact, given that pre-college attributes of students are considered as an important component in explaining student attrition in many attrition theories (e.g., Tinto, 1975), the outcome of the study is still believed to remain influential for decision-makers to discuss student success in college.

Data and Methodology

Data

Data used in this study were derived from NELS:88/2000 and NELS:88/2000 Postsecondary Education Transcript Study (PETS:2000) sponsored by NCES. The NELS:88/2000 began its collection of various information on students, their parents, and schools when students were in the eighth grade in 1988. Data were collected every two years until 1994. In 2000 NCES completed its fifth wave of the data collection for the data set. The PETS:2000 includes transcript information on students who participated in the NELS:88/2000.

The effective sample for this study includes 4,445 first-time freshmen students who matriculated into four-year institutions between 1992 and 1994. Table 1 exhibits descriptive statistics of the sample. Forty-seven percent of the sample was male, and 73%, 9%, 8%, and 8% were Caucasian, Asian/Pacific Islander, Hispanic, and Black students. As for parents' highest educational attainment, 40% of the parents had high school diplomas or less (first-generation), while 34% of them were both college-educated parents. Annual family incomes of 39% of the sample were more than \$40,000. More than 90% of the students

Table 1: Descriptive Statistics of the Study Sample

Sample Size: n = 4,445		
Variable	Label	Percent
Cohort	1992	96.2%*
	1993/1994	3.8%
Gender	Male	46.5%*
	Female	53.5%
Race	Asian	9.4%
	Hispanic	7.7%
	Black	8.0%
	Caucasian	72.9%*
	Native American	2.0%
Parent's Education	First-generation	40.2%
	One parent with BA	26.2%
	Both college-educated parents	33.6%*
Income	0 - \$19,999	14.1%
	\$20,000-\$34,999	24.7%
	\$35,000-\$49,999	23.1%
	\$50,000 or higher	38.2%*
Educational Expectation	Unsure	4.6%
	Won't graduate from college	4.2%
	Graduate from college	39.7%*
	Finish graduate school	51.5%
Parent's Highest Educational Expectation	Unsure	6.5%
	Won't graduate from college	3.4%
	Graduate from college	41.2%*
	Finish graduate school	48.9%
High School Ranking	1st quintile	38.7%*
	2nd quintile	26.1%
	3rd quintile	18.1%
	4th quintile	10.9%
	lowest quintile	6.2%
High School Programs	Received special ACT/SAT prep. course	21.1%
	Received assistance in financial aid application	41.8%
	Received assistance in writing college admission essays	37.3%
	Parents are contacted for college selection	42.2%
	Teachers contacted colleges for students	66.2%
Parental Involvement	Often talked about college education	52.1%
First-Yr. Financial Aid	Grant	52.9%
	Loan	36.2%
	Work-study	15.4%

* = reference group analysis

predicted in the twelfth grade that they would graduate from college.

High school ranking was included to control for academic aptitudes of the students. Approximately 65% of the students were either in the top or second quintile. Five items with dichotomous values were included to assess the effects of high school programs on college retention. Three items were related to the types of assistance offered by schools. These three items asked if students took special courses to prepare for the ACT/SAT, received assistance in financial aid, and received help in preparing college admission essays. The last two items were related to teachers' behavior in supporting college decision-making. These two items asked if teachers contacted parents to help select colleges and if teachers contacted colleges on behalf of their students.

One item was included to address parent's involvement in the college decision-making process, which asked if parents and their children frequently discussed educational opportunities beyond high school.

Three dichotomous variables were included to examine the effects of different types of financial aid on retention. Given that aid recipient status was only available for the first year in the NELS: 88/2000, this study was not able to address how changes in recipient status would affect retention over time. About 53%, 36%, and 15% of the sample received grants, loans, and work-study placements for their first year in college.

Table 2 includes enrollment status of students in the sample over time. Attrition contains three types of departure, such as dropout, transfer, and graduation. Because these types of departure are different in nature (Metzner & Bean, 1987), these need to be examined separately. Dropout was defined as students who either left their initial institution and never returned, or left their initial institution but returned after a period of discontinuation in enrollment. Students left their initial institutions at an average of 1.9 years. Transfer was interpreted as students who transferred to other institutions from their initial

**Table 2
Enrollment Status of the Study Sample**

Departure Type	Average		Time to Event
	Count	Percent	
Dropout	862	19.4%	1.9 yrs
Transfer	1,102	24.9%	1.5 yrs
Graduate	2,251	50.6%	4.2 yrs
Still Enrolled after Stopout	223	5.1%	

institutions, and who never returned to the initial institution within six years.

Methodology

Survival analysis has many unique advantages compared to other statistical approaches when one estimates the

occurrence of certain events. For instance, college student departure includes different types of departure behaviors, such as dropout, stopout, transfer, and graduation. By designating codes for these different departure behaviors in the data, survival analysis estimates parameters for each departure by switching designated codes in the analysis. Although different types of departure were coded in the study data, this study only discusses the result of dropout behavior. This particular statistical method also controls for the subjects in the analysis who did not experience the event before the observation period was complete. For instance, data include enrollment status of students over a period of six years. Students who were still enrolled at the end of the sixth year would be censored. In reality, whether or not one can identify different types of departure in given data becomes more challenging.

The greatest advantage of this particular statistical technique compared to other statistical methods, such as a logistic regression technique, is its ability to incorporate the time dimension in the analysis. Unlike logistic regression where its dependent variable only specifies the occurrence of the event in the dichotomous form, survival analysis additionally requires the analyst to specify *when* the event occurred in the data. Let $P(t)$ denote the conditional probability of departure at discrete-time interval t , given that departure did not occur before time t . One can describe $P(t)$ as a linear function of the independent variables:

$$P(t) = \alpha + b_1 \chi_1 \quad (1)$$

where α is a constant coefficient, b is a coefficient for an independent variable and x is a value associated with that variable. The specification of $P(t)$ is problematic, because it is a probability, which cannot be greater than one or less than zero. This problem can be resolved by taking the logit transformation of $P(t)$:

$$\log(P(t)/1-P(t)) = \alpha + b_1 \chi_1 \quad (2)$$

Formula (2) is referred to as the exponential model in the literature (e.g., Allison, 1995). Formula (2) is, however, restrictive because the effect of b is assumed to be constant over time. Formula (2) can be improved by including the time-varying effects as:

$$\log(P(t)/1-P(t)) = \alpha(t) + b_1(t) \chi_1 \quad (3)$$

where the departure probability depends on the value of b_1 at time t , and the value of a at time t . Formula (3) is sometimes referred to as the piecewise exponential model with period-specific effects (period-specific model). Given that effects of independent variables in previous studies using structural equation modeling were assumed to be constant over time, this period-specific modeling becomes

extremely useful when the analyst attempts to investigate if the effects of such independent variables vary over time (e.g., is the effect of gender on departure the same for the first and second years?).

In this study both an exponential model and a period-specific model were applied to the data analysis. The exponential model assumes that effects of explanatory variables on student departure exponentially increase or decrease over time. To examine if this directional assumption of the exponential model is consistent with attrition behavior, we used the period-specific model, which is designed to assess departure at discrete points in time, and looked at the coefficients for the independent measures at the different points of time.

Empirical Results

Exponential Model

The results of the exponential model are shown in Table 3.¹ Interpretation of the coefficients produced by the model is made easier by applying formula (4) below.

$$\Delta r_{(t)} = (\exp(\beta_i)^{\Delta A(t)} - 1) * 100\% \quad (4)$$

where $\exp(\beta_i)$ is the antilogarithm of the unstandardized coefficient (β_i) and known as the "relative risk". ΔA is the change in the variable under consideration at time t , and Δr is, therefore, the percentage change in the relative risk of departure (column, "Prob." in tables) at time t . To demonstrate, the coefficient estimate for first-generation students (from Table 3) was 0.60 indicating that first-generation students had a departure rate higher than students with both college-educated parents. In this study, positive coefficient estimates indicate that the variable increased the risk of departure, while negative estimates indicate that the variable reduced departure risks. Using formula (4), one can obtain the relative risk for first-generation students as $\Delta r = (\exp(0.60) - 1) * 100\% = (1.82 - 1) * 100\% = 82\%$. Thus, first-generation students had the rate of departure that was 82% higher than students of college-educated parents.

Log likelihood parameters are listed at the bottom in each table, and a log likelihood ratio test was used to examine the model fit. In the case of the exponential model in the study, the ratio was computed as 711.29 ($LR = 2 \times ((-2930.60) - (-3286.24))$). Given a significant level of 0.01 in a χ^2 table with 30 degrees of freedom (31-1 (constant)), the variables included in the exponential model significantly improved the model fit.

Overall, the results indicate that this model is consistent with those of prior studies in that student demographics impact retention. Ethnicity was found to be significant as Asian students were 32% less likely to drop out than Caucasian students, while Hispanic, Black, and Native American students were 32%, 32%, and 42% more likely to leave their institutions than their counterparts. As would

Table 3: Parameters Estimates of the Exponential Model

Variable	Label	Coeff.	p	Prob.
Constant		-3.96	**	
Cohort	1993/1994	0.63	**	0.89
Gender	Female	-0.07		-0.07
Race	Asian	-0.39	*	-0.32
	Hispanic	0.28	*	0.32
	Black	0.28	**	0.32
	Native American	0.35	*	0.42
Parent's Education	First-generation	0.60	**	0.82
	One parent with BA	0.34	**	0.40
Income	0 - \$19,999	0.82	**	1.27
	\$20,000-\$34,999	0.75	**	1.11
	\$35,000-\$49,999	0.31	**	0.36
Educational Expectation	Unsure	0.26		0.29
	Won't graduate from college	0.81	**	1.25
	Finish graduate school	-0.09		-0.09
Parent's Highest Educational Expectation	Unsure	0.12		0.13
	Won't graduate from college	0.28		0.32
	Finish graduate school	0.05		0.06
High School Ranking	2nd quintile	0.55	**	0.73
	3rd quintile	1.05	**	1.85
	4th quintile	1.25	**	2.51
	Lowest quintile	1.32	**	2.75
High School Programs	Special ACT/SAT prep. course	-0.41	**	-0.33
	Assistance in financial aid application	0.19	**	0.21
	Assistance in writing college admission essays	-0.11		-0.10
	Parents are contacted for college selection	-0.15	*	-0.14
	Contact college for students	-0.03		-0.03
Parental Involvement	Often talked about college education	-0.25	**	-0.22
First-Yr. Financial Aid	Grant	-0.17	*	-0.15
	Loan	-0.05		-0.05
	Work-study	-0.45	**	-0.36
** = p < 0.01, * = p < 0.05 Log likelihood (starting values): -3286.24 Log likelihood (final estimates): -2930.60				

be expected, given the other results, lower levels of parental educational attainment negatively impacted students' retention behavior. First-generation students and students with one college-educated parent were 82% and 40% more likely to drop out than students with both college-educated parents. These findings are consistent with those suggested by Pascarella and Terenzini (1983) and Stage (1988). Students from lower income families were exposed to greater chances of departure. For instance, students with family income less than \$19,999 were 1.27 times more likely to drop out than students with family incomes of \$50,000 or higher.

Not surprisingly, this model also indicated that academic ability has an impact on retention. Students in the lowest high school ranking quintile were 2.8 times more likely to leave their institutions, while students in the 4th quintile were 2.5 times more likely to do so.

This study is unique in that it raises the question of

whether high school experiences impact retention in college. Given that students who took ACT/SAT preparation courses in high school were 33% less likely to drop out than those who did not, the ACT/SAT preparation course in high school, as well as motivation, may serve as a proxy to enroll in college and persist. Interestingly, students who received assistance in financial aid applications were 21% more likely to drop out than those who did not receive any assistance. Perhaps, this may evidence late planning for a college education, or indecisiveness in attending college.

The results indicate that parental involvement in high school impacts a student's ability to remain in college. Specifically, high school students whose parents were involved in the selection process and/or discussed college with them were less likely to depart from college (14% and 22%, respectively).

Finally, other variables can also be considered as indicators for motivation to persist in college. Grants and work-study may fall into this category because these are awarded to students based either on their academic ability, commitment to continue, or willingness to work while in school in the first place. The likelihood of attrition was reduced by 15% or 36% when students received a grant or work-study placement. Another type of indicator to assess one's commitment to college education is the timing of matriculation. Students who matriculated later were 89%

more likely to depart the institution than counterparts who entered college immediately after high school.

Period-Specific Model

Table 4 displays the analysis results of departure behavior by year. As presented in the table, parameters of many variables did not change exponentially as assumed in the exponential model. In addition, the differing impact of these variables on attrition over time contributed to improving the model fit. The likelihood ratio for the exponential model was 711.29, while the one for the period-specific model was 997.56. Clearly, we can advance our understanding of student attrition by including the time-varying effects of variables in the model.

The effect of taking the ACT/SAT preparation courses did not achieve statistical significance in the first-year. However, this particular high school program reduced the odds of attrition by 42% or 55% in the second or third

years. Students whose parents were contacted by high school teachers were 30% less likely to drop out only in the fourth year. Although the results of the exponential model suggested assistance in the financial aid application had a negative impact on retention, the results of the period-specific model indicate that this particular program actually increased the attrition rate of students by 89% in the second year. While the positive effect of the ACT/SAT preparation courses on college retention was generally noted in the exponential model, the positive effect of this program was actually much stronger in years two and three. Frequent discussion between parents and students on college planning reduced the odds of departure during the first two years in college.

The positive effect of grants to reduce the amount of departure was only significant in the first year. Grants were associated with lowering attrition by 44% in the first year, rather than 15% (Table 3). Work-study students lowered their attrition rate by 47% in the second year. Interestingly, female students were 23% less likely than males to drop out in the first year of college. However, they were 52% more likely to depart than their male counterparts in year two.

The negative effect of delayed matriculation into college on retention was statistically significant in each year except for the second year. The negative impact of delayed matriculation increased in magnitude over time and exhibited its strongest impact in the fourth year. Asian students were the least likely to drop out in the first year. This is similar to previous research findings (DesJardins, Ahlburg, & McCall, 1999; Ishitani & DesJardins, 2002). Analysis results of the exponential model indicated that Hispanic and Black students were more likely to leave their institution than their counterparts. These minority students were actually most likely to depart in year two. Hispanic students were 91% more likely to depart in the year two, while Black students were 63% more likely to drop out than Caucasian students in their second year in college.

Higher rates of attrition among first-generation students were statistically significant in each year except for year three. The highest risk period of dropout among first-generation students was the second year, followed by the fourth and first years. Students from family incomes less than \$19,999 were most likely to depart in the first year. They were about five times more likely to drop out in the first year than students from family incomes of \$50,000 or

Table 4: Parameter Estimates of the Period-Specific Model

Variable	Label	First Year		Second Year		Third Year		Fourth Year +	
		Coe	p Prob.	Coe	p Prob.	Coe	p Prob.	Coe	p Prob.
Constant		-3.98 **		-5.18 **		-4.46 **		-3.14 **	
Cohort	1993/1994	0.42 *	0.52	0.43	0.54	0.82 **	1.28	1.28 **	2.61
Gender	Female	-0.26 *	-0.23	0.42 **	0.52	-0.05	-0.05	-0.28 *	-0.25
Race	Asian	-0.96 *	-0.62	-0.02	-0.02	-0.28	-0.24	-0.33	-0.28
	Hispanic	0.40 *	0.50	0.65 **	0.91	-0.19	-0.17	-0.23	-0.20
	Black	-0.04	-0.04	0.49 *	0.63	0.32	0.38	0.27	0.32
	Native American	-0.17	-0.15	0.74 *	1.10	0.23	0.26	0.75 *	1.12
Parent's Education	First-generation	0.48 *	0.62	0.95 **	1.58	0.40	0.50	0.56 **	0.74
	One parent with BA	0.37	0.45	0.33	0.39	0.32	0.38	0.35	0.42
Income	0 - \$19,999	1.83 **	5.21	0.37	0.44	0.38	0.47	0.48 *	0.62
	\$20,000-\$34,999	1.32 **	2.76	0.67 **	0.96	0.64 *	0.89	0.40 *	0.49
	\$35,000-\$49,999	0.70 **	1.02	0.30	0.35	0.59 *	0.80	-0.14	-0.13
Educational Expectation	Unsure	0.20	0.22	1.18 **	2.25	-0.73	-0.52	-0.55	-0.42
	Won't graduate from college	0.84 **	1.32	0.78 **	1.18	0.96 **	1.62	0.75 **	1.12
	Finish graduate school	0.00	0.00	-0.20	-0.18	-0.08	-0.07	-0.18	-0.17
Parent's Highest Educational Expectation	Unsure	-0.03	-0.03	0.83 **	1.30	-0.79	-0.55	-0.15	-0.14
	Won't graduate from college	-0.19	-0.17	0.74 **	1.10	0.77 *	1.15	0.04	0.04
	Finish graduate school	-0.20	-0.18	0.06	0.06	0.01	0.01	0.42 *	0.52
High School Ranking	2nd quintile	0.72 **	1.04	0.82 **	1.28	0.82 *	1.28	0.07	0.07
	3rd quintile	1.23 **	2.44	1.17 **	2.23	1.50 **	3.48	0.63 **	0.87
	4th quintile	1.37 **	2.95	1.38 **	2.99	1.30 **	2.66	1.03 **	1.80
	Lowest quintile	1.70 **	4.45	1.57 **	3.79	2.24 **	8.36	0.29	0.33
High School Programs	Special ACT/SAT prep. course	-0.31	-0.27	-0.55 **	-0.42	-0.79 **	-0.55	-0.16	-0.15
	Assistance in financial aid application	0.01	0.01	0.64 **	0.89	0.05	0.05	0.09	0.10
	Assistance in writing college admission essays	-0.22	-0.19	-0.11	-0.11	-0.36	-0.30	0.05	0.05
	Parents are contacted for college selection	-0.13	-0.12	-0.01	-0.01	-0.06	-0.05	-0.35 *	-0.30
	Contact college for students	-0.18	-0.17	0.10	0.10	0.28	0.32	-0.10	-0.09
Parental Involvement	Often talked about college education	-0.32 *	-0.28	-0.42 **	-0.34	0.00	0.00	-0.14	-0.13
First-Yr. Financial Aid	Grant	-0.57 **	-0.44	0.28	0.32	-0.05	-0.05	-0.16	-0.15
	Loan	-0.12	-0.11	-0.13	-0.12	-0.20	-0.18	0.12	0.13
	Work-study	-0.40	-0.33	-0.63 **	-0.47	-0.44	-0.36	-0.28	-0.24

** = p < 0.01, * = p < 0.05

Log likelihood (starting values): -3286.2413

Log likelihood (final estimates): -2787.4592

higher. Although the magnitude of effect waned over time, the negative effect of family income between \$20,000 and \$34,999 was statistically significant over four years.

Students with unsure educational expectations were most vulnerable to attrition in the second year. They were 2.3 times more likely to drop out in the second year than those who had expressed in high school that they would graduate from college. Students whose parents had uncertain educational expectations had the highest attrition rate in the second year. Both of these likelihoods are conditional on the students not dropping out in the first year.

Not surprisingly, high school ranking had a significant effect on college student attrition behavior. Students from lower high school ranking quintiles were more likely to drop out of college. However, the highest risk periods of departure varied across different quintiles over time. For instance, students in the lowest or 3rd quintiles had the highest likelihood of departure in the third year, while students in the 4th quintile had the highest risk of dropout in the second year. Students in the lowest or 3rd quintiles were 8.4 and 3.5 times more likely to leave than students from the first quintile in the third year. As for attrition rates for the first and second years, students in lower high school ranking quintiles were more likely to depart than students in the first quintile.

In summary, after controlling for various student characteristics and high school ranking, a few of the high school programs measured in the study presented an effect on college attrition. The results of the exponential model identified that two positive factors, preparation courses for admission tests and teachers contacting parents for college selection, were effective in reducing attrition rates. Furthermore, the findings from the period-specific model indicated the time-varying nature of these factors. For instance, the positive influence of college preparation courses was most effective in reducing the dropout rate in the second and third years, while students whose parents were contacted by high school teachers were least likely to depart in year four.

Receiving assistance in filing financial aid applications indeed showed a negative effect on retention in the exponential model. As noted earlier, this may imply that students needed assistance in applying for financial aid because of indecisiveness in their college decisions or poor college planning. However, the negative effect of this particular factor was only applicable to the second year retention. Thus, commitment to college education among students who received assistance in filing financial aid from their high schools may need to be reevaluated early to reduce the odds of departure in the second year.

Parental involvement in the college decision-making process was identified to be vital to improve college matriculation (Hossler, Schmit, and Vesper, 1999). This factor was shown to have a positive impact, particularly

reducing the likelihood of departure in years one and two. However, the effect of this factor in reducing attrition rates diminished in years three and four.

Conclusion

High school personnel strive to assist students in their college planning through various programs. Some of these programs are mainly designed to increase the student's odds of matriculating into postsecondary institutions. The study herein did not examine how the programs increased or decreased the likelihood of matriculation, but investigated if the programs might be associated with college retention behavior.

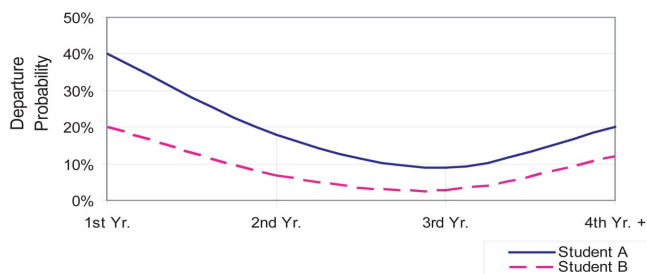
Given that the ACT/SAT preparation program showed positive effects on college retention after controlling for the parental involvement variable, it is reasonable to believe that participating in this specific program by itself enhances not only academic knowledge and test-taking skills, but also commitment and motivation to attain a college education. The notion of stronger educational commitment among students who are academically well prepared in high school may not be new to the educational literature. Participation in the admission test preparation courses provides students with a positive environment shared by their common educational goal. However, what the results of this study suggest is how the participation status in the ACT/SAT preparation longitudinally impact college persistence. This information becomes particularly valuable to examine the level of students' commitment to completing a college education, as it becomes difficult to assess varying strength of commitment to higher education among students with the same educational expectation of graduating from college.

As for the utilitarian aspect of this study, personnel in high school can compute the overall risk of college attrition of their students using parameters presented in Table 3. High school guidance counselors may be able to advise their students more effectively if they are aware of predicted future risks of departure from college. This may be particularly beneficial to first-generation students, because their parents are not able to share with their children their own experiences of hardship entailed in graduating from college. College admission counselors can also recommend various levels of intensity of institutional interventions for individual in-coming freshman students based on departure risks estimated from Table 3. Using parameters from Table 4, academic advisors can assess period-specific departure risks of their students and adjust their interventions accordingly.

Let us assume Students A and B, are both male, Hispanic, first-generation students, from families with annual incomes of \$32,000, have the same educational expectation of graduating from college, and graduated from high school in the 2nd high school ranking quintile. However, Student B and his parents often talked about

going to college, and he participated in college admission preparation courses and received assistance with the college admission essay, while Student A and his parents did not discuss going to college, and he did not participate in any of those programs attended by Student B. Figure 1 illustrates their college retention behaviors over time. Although the pattern of risk curves is similar between Students A and B, Student B is clearly less likely to depart than Student A over time.

Figure 1
Predicted Departure Risks for
Students A and B



Editor's Note

This article by Ishitani and Snider offers an excellent example of how to use and interpret the Discrete-Time Hazard Model. In addition to demonstrating the value of event modeling this article also demonstrates some of the issues that must be dealt with when doing appropriate research in a complex and comprehensive area such as student retention. For example, there are different types of departure behaviors. There is not a methodology commonly available that allows all of these types of departure behavior; dropout, stop out, transfer, and graduation, to be modeled in one specific methodology. If the intent were to look at stop-outs or transfers, then additional analyses would have to be run. At some point in the future hopefully methodology will enable us to look at multiple outcomes in a single analysis that identifies the "risk" associated with different factors as these factors differentiate between alternative final states. Also another "desirable" methodology would be a way to determine if the use of period-specific equations, which use more degrees of freedom, produce a statistically significant improvement over the single equation with its constant relationship of risk factors to the estimated risk.

There are at least two other points for consideration. The first is one of methodology. Ishitani and Snider show the value of the Discrete-Time Hazard Model. With this methodology they were able show that the importance of various measures changes over time. As Ishitani and Snider show, an assumption of a constant importance may not be appropriate for factors such as help in filling out financial aid forms.

This leads to the second point that is important to consider. When we use variables such as obtaining help in filling out financial forms, our interpretations are vulnerable to the fact that these questions do not have a clear and mutually exclusive alternative. For example, not seeking help on filling out financial forms can come either from higher income which means that there is no need for financial aid or from the ability to do the forms oneself, or from going to institutions which were much less expensive were financial aid was not seen as necessary. As pointed out in the article this is a limitation that prevents definitive interpretations of which does generate alternatives that can be investigated by further research.

The preceding comments are related to the methodologies employed to look at the issues of retention. This focus of my discussion should not in any way detract from the fact that the methodology allowed the researchers to discover results that inform us on what factors are related to the success of our students. It is the fact that the results were observed that reinforces the value of applying the methodology.

Endnotes

¹. F4PNLWT was used as a sample panel weight for the analyses. Furthermore, as suggested by Perna (2000), the estimates in event history modeling were adjusted by the panel weight divided by the average weight in the sample.

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