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ABSTRACT

This study investigated the departure behavior of college students in the United States. Previous attrition studies have typically focused on dropout at specific points in time, such as the first year of enrollment. In this study, the timing of departure was examined over a 5-year period. It was found that factors affecting student attrition had effects that changed over time. For instance, it was found that attrition rates varied depending on the amount and timing of student financial aid. Low-income students are more likely to depart from college, but in the second and third years being from a low-income family is even more detrimental than in the first year. Students whose mothers graduated from college are less likely to leave than other students, and this effect is strongest in year 2. Students who score high in the Scholastic Assessment Test are less likely to depart than lower scoring colleagues. Academic and social integration did not have the effects exhibited in other studies. (Contains 1 figure, 3 tables, and 26 references.) (Author/SLD)

A Longitudinal Investigation of Dropout from College in the United States

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ABSTRACT

This study investigated the departure behavior of college students in the United State. Previous attrition studies have typically focused on dropout at specific points in time, such as the first year of enrollment. In this study we examined the timing of departure over a five-year period and found that factors affected student attrition had effects that changed over time. For instance, we found that attrition rates varied depending on the amount and timing of student financial aid.

INTRODUCTION

Previous research documents the social and individual benefits of higher education. For instance, in 1998 the average earnings of individuals with a bachelor's degree was $43,782 whereas high school graduates earned only $23,594 (U.S. Census Bureau, 2000). Over one's lifetime, this annual earnings differential results in a $605,640 net premium to college graduates. These premiums also result in increased state and federal tax revenues thereby providing more resources for government.

There are also non-pecuniary social benefits from higher education. For instance, an educated populace is more likely to be involved in civic duties like voting in elections and volunteering. Fifty-four percent of individuals with a college education voted in congressional elections in 1998, while only 37.1 percent of high schools graduated did so in the same year (U.S. Census Bureau, 2000). In 1989, 38.4 percent of individuals with a college education performed unpaid volunteer work at hospitals, educational institutions, political organizations, or churches whereas only 18.8 percent of individuals with high school education participated in this type of volunteer work (Hayghe, 1991).

Even though the social and individual benefits of a college education are substantial, there may be room for improvement because some students who matriculate to institutions of higher education do not graduate (Bradford & Farris, 1991. Thus, it is important for us to understand why students do not graduate and whether there are ways in which we can intervene to promote higher graduation rates.

The purpose of this study is to introduce a longitudinal model that examines college student attrition behavior using a national survey data set sponsored by the National Center for Education Statistics (hereafter, NCES). By using national survey

data and a longitudinal approach, we hope to add to prior attrition and retention studies by providing more information about the factors that are related to student departure at specific points in time. This approach should help us gain a better perspective of the temporal nature of student departure from college.

ATTRTION AND RETENTION THEORIES

Tinto (1975, 1982, 1987, 1988) viewed dropout behavior as a longitudinal process. In his model, students enter institutions of higher education with a variety of characteristics and predispositions. Within the institutional environment, students follow academic and social tracks to develop important attributes that affect their enrollment decisions. In the academic track, students form commitment to the goal of graduating from college (goal commitment), which is initially influenced by student characteristics prior to matriculation. Goal commitment is further shaped by the quality of interactions between students and the academic elements of the institution (i.e., interaction with faculty or participating in a study group). With regard to the social track, students form commitment to the institution, which is initially affected by one's pre-college characteristics. Institutional commitment is further refined by the quality of students' social interaction, such as making friends, participating in school activities, and interacting with faculty outside of the classroom. The outcome of these series of interactions between students and the institutional ultimately impacts one's decision to persist in college or not.

Tinto explains that other things being equal, a higher degree of integration of students into the institutional environment contributes to a greater degree of institutional

commitment and to the goal of college completion. Tinto also emphasizes the longitudinal and interactional nature of the dropout process. His model contains temporal stages where students' perceptions regarding their enrollment status are continuously reformed and reevaluated. Development of a theoretical framework in conjunction with establishing the longitudinal and interactional nature of student departure was Tinto's most important contribution to the area of retention and attrition studies.

Bean (1978) initially developed his attrition theory based on a causal model of organizational turnover developed by Price (1977). In subsequent years, Bean has advanced his attrition model (1980, 1982, 1985). Bean borrowed the structure of his initial attrition model from Price's model but replaced variables related to the work environment with variables that would be more appropriate for studying student attrition behavior. In his 1983 paper, Bean explains that student satisfaction is similar to job satisfaction in Price's model and finds that satisfaction directly affects students' intentions to leave college. This cognitive element of intent is highly related to realized leaving behavior.

Bean (1983) finds that student satisfaction is influenced by several factors, including the grades that students receive and their belief about the prospects that a college education will lead to future employment. Two variables, courses and memberships in campus organizations are also assumed to have a direct effect on student satisfaction. Registering in desired courses and belonging to campus organizations are expected to have a positive effect on student's retention behavior. Bean further illustrates other exogenous variables included in the model are: routinization – the idea that being a student is felt to be routine; instrumental communication - the degree to which

information about being a student is transmitted by the institution to its students; participation - the degree of power that a student exercises in classroom decisions; integration - the degree that a student has close friends within the institution; and distributive justice - the degree to which the rewards and punishments a student receives for the amount of effort expended, such as higher grades for more time spending on studying.

Tinto and Bean's theories have been tested in an extensive body of research. Most researchers have used one of these models to explain student departure, but Cabrera, Nora, and Castaneda (1993) took a different approach when they developed a "convergent" model that linked Tinto and Bean's theories. They discovered that the two theories were complimentary rather than mutually exclusive. Combining these two theories was found to increase the explanatory power of student persistence modeling.

Many of other studies of student departure that have tested Tinto and Bean's models have used logistic regression or structural equation modeling to test the links among the factors hypothesized to affect student departure behavior. However, using these cross-sectional techniques to study student attrition and retention lacks a more practical implication in that these techniques do not provide us with information about the *timing* of student departure. Although many authors have noted that student departure is a longitudinal process, arbitrary points of time are typically chosen to assess students' enrollment status. For instance, many studies examine dropout behavior in the freshman or sophomore year. These empirical specifications do not, however, allow us to specifically examine how factors affect students who drop out in subsequent years. It is reasonable to suspect that the magnitude and even direction of the effects of the variables

influencing dropout behavior may differ over time. For instance, DesJardins, Ahlburg, and McCall (1999) found that a student's college GPA may have a very strong influence on dropout behavior early in a student's career, but this effect may become less pronounced over time. To accurately examine the temporal nature of student departure it is important to use analytic techniques specifically designed to study longitudinal events.

METHODOLOGY

Event History Modeling

One such method that is specifically designed to study longitudinal processes is event history modeling. Although this technique has been used infrequently in institutional research, DesJardins, Ahlburg, and McCall (1999) demonstrate how this analytic approach can be used to examine the role of time in attrition and retention studies. Their research indicates that event history models are particularly useful for examining the relationship between the timing of events (e.g., dropout, stopout, graduation) and the factors thought to affect these events. By focusing on the time dimension of the events, one can focus attention on the time periods when students are most at-risk of leaving the institution. Knowing more about the specific times at which students are at-risk is important if institutions hope to implement effective retention programs.

Modeling Different Types of Events.

The factors affecting different types of departure, such as graduation, dropout, stopout, transfer, or academic dismissal, are quite different (Mallette & Cabrera, 1991; Tinto, 1987). However, these different types of events are difficult to incorporate into a

model when one uses a logistic regression approach (Stage, 1988), since it only allows the analyst to specify one type of event in the dependent variable. Event history modeling is well suited to handle different types of events. Indicators that identify the various types of student departure allow the researcher to examine how factors differentially affect departure over time. This is a unique advantage of event history modeling.

Timing and Longitudinal Analysis.

Even though researchers have long noted that departure is a longitudinal process (Bean, 1978; Tinto, 1975), few have modeled it as such. The technique is specifically designed to study longitudinal events and is also useful for examining repeated events, such as stopout behavior.

When studying student attrition and retention, event history models are clearly more appropriate than logistic regression. For example, when using logistic regression it is difficult to incorporate variables whose effect and values change over time (e.g., GPA or financial aid). But event history models allow for the inclusion of these time-varying variables. Studying multiple years (first, second, third, fourth-year) of dropout behavior using cross-sectional techniques like logistic regression or path models requires the analyst to create separate samples for each time period and run a series of models on each of these samples. Event history models allow the analyst to model all time periods in one model. Also, logistic regression techniques do not allow the researcher to jointly estimate correlated events, like stopout and graduation. However, competing risks event history techniques allow the researcher to model related events.

In this study discussed herein, an event history model is used to examine the temporal dimension of attrition in the United States. The focal point of this investigation is to examine whether the effects of independent variables hypothesized to influence attrition behavior vary at different points of a student's academic career.

DATA AND EXPLANATORY VARIABLES

Sample Data

We used the Beginning Postsecondary Student Longitudinal Study: Second Follow-up (hereafter, BPS: 90/94) sponsored by NCES. Included in the effective sample were first-time freshman, U. S. citizens who were 18 to 25 years of age and matriculated to a public or private four-year institution between August of 1989 and October of 1989. The total number of students composing the effective sample is 3,450, about 51 percent of which were female. The racial backgrounds of students included were White (84.2 %), Black (7.4 %), Hispanic (5.0 %), Asian or Pacific Islanders (3.4 %). American Indian or Alaska Native subjects were excluded from the sample due to the small number of these individuals in the sample (a total of 20 subjects).

The BPS data set includes the monthly enrollment status of subjects from August of 1989 to June of 1994. However, the beginning and ending months of academic years vary depending on the type of calendar system an institution is on (i.e., semester, quarter, and trimester systems). Therefore, subjects who were enrolled in institutions with quarter and trimester calendar systems were converted into a semester system. Inclusion of summer enrollment status, however, causes problems when estimating time to departure since many students temporally leave their institutions for the summer. Given these

estimation problems, summer enrollments were excluded from the sample. Therefore, in this study student departure is defined as the first departure from the initial institution of enrollment within the five-year observation period.

Explanatory Variables

The explanatory variables include gender, race, family income, mother's highest level of education, subject's educational aspiration, first-year GPA, aptitude, the institutional type and size of the institution attended, academic and social integration, financial aid, and hours of employment. Descriptive statistics of the explanatory variables are presented in Table 1. Gender is a dichotomous variable with the reference group being male. The race variable is comprised of a set of three dummy variables, which were intended to measure the effects of being African-American, Hispanic, and Asian (Caucasian subjects are the reference group).

The mean of family income in the sample was $49,151 per year. The income variable was broken into quartiles, and the reference group was students whose family incomes were more than $60,286 a year (n = 862). Eight hundred sixty-two subjects were from families with annual incomes up to $25,000, 861 subjects were from families with annual incomes between $25,001 and $41,869, and 865 subjects were from families with annual income between $41,870 and $60,286. A dichotomous variable indicating whether the student's mother completed a bachelor's degree or more was included (n = 1,065, 30.9%) with the reference group being mothers who did not complete a four-year college education (n = 2,385, 74.9%).

A set of three dummy variables was used to assess the effects of students' educational aspirations. These three dummy variables included a group of students whose aspiration was to obtain less than a bachelor's degree (n = 141, 4.1%), a category indicating whether students aspired to obtain a master's degree (n = 1,519, 56.0%), and a category for students who aspired to obtain a Ph.D. (n = 715, 20.7%). The reference group for this construct was students whose educational aspiration was to complete a bachelor's degree (n = 1,075, 31.2%).

For this study, a subject's first-year cumulative GPA was used to create a set of three GPA dummy variables to examine its effect on dropout behavior over time. A dummy variable specification for first-year GPA was used because it is easier to compare the relative risks of dropout between groups rather that using GPA as a continuous variable. Also, it might be that GPA is non-linearly related to dropout and a dummy variable specification allows us to more readily assess this hypothesis. The GPA scale used for GPA dummy variables included 0.00-0.99 (n = 66, 1.9%), 1.00-1.99 (n = 462, 13.4%), 2.00-2.99 (n = 1,723, 50.1%). Students whose GPAs were between 3.00 and 4.00 were used as the reference group. The number of subjects included in the reference group was 1,195 (34.6%).

ACT and SAT scores were included in the BPS:90/94, but since not all the subjects in the sample took both the ACT and SAT, a conversion from ACT composite scores to SAT total scores was necessary. The concordance table was adapted from a table created by Dorans, Lyu, Pommerich, and Houston (1997). SAT total scores were grouped into quartiles and a set of three dummy variables was included in the model. Students whose SAT scores were less than 860 are used as the reference group. Three

dummy variables included a group of students with SAT scores between 860-976 (n = 946), a group of students with SAT scores between 977-1100 (n = 887), and a group of students with SAT scores higher than 1101 (n = 838).

Institutional type and size variables were included and operationalized as a set of five dummy variables. The group of subjects in public institutions with more than 20,000 students enrolled was used as the reference group. These five dummy variables were designed to measure how attrition behavior differs across different types of institutions. Two types of public institutions included in this study were four-year institutions with less than 1,000 students enrolled (n = 620, 18.0%) and four-year institutions with enrollment between 1,000 and 19,999 students (n = 449, 13.0%). Three types of private institution variables were included: four-year institutions with less than 2,500 enrollees (n = 855, 24.8%), four-year institutions with 2,500 to 9,999 students (n = 651, 18.9%), and four-year private institutions with more than 10,000 students (n = 423, 12.3%).

Defined by Tinto (1975), academic integration is defined as students' perception of their academic experiences and activities to stimulate intellectual development, while social integration is defined as students' social involvement with their college peers and the faculty. Considering academic and social integration as a result of continuous interactions between students and the institutional environment, it is reasonable to suspect that levels of academic and social integration may vary over time. However, subjects in the sample were asked these questions once in their first year of college. Thus, levels of academic and social integration were assumed to be constant during the observation period. A set of eight dichotomous variables is created to examine each construct of academic and social integration.

Two time-dependent explanatory variables, financial aid and hours of employment, were included in the study. These time-dependent variables values (X's) can change over time, but even more importantly, their effects (betas) can change over time. Although it would be preferable to have yearly amounts for different types of financial aid over time, the BPS: 90/94 has this information for the first year only. However, *total* yearly amounts of financial aid (from 1989 through 1993) were available in the data set and we included these variables assess how different amounts of financial aid would affect attrition behavior over time. Quartiles of annual financial amounts are used to create a set of four dummy variables for each academic. The reference group is defined as non-aid recipients. For the first year, 67.0 percent of the sample received financial aid and the amounts ranged from $50 to $56,000 with a mean being $5,617. About 44 percent of students received aid in the second year and the aid ranged from $100 to $45,000 with a mean of $5,777. In the third-year aid was distributed to 38.9 percent of students in the sample and the range was $100 to $40,000 with a mean of $4,912. In year four38.6 percent of the sample received financial aid ranging from $100 to $40,000 with a mean of $5,803.

The relation between hours of employment and dropout behavior has been examined in previous studies (Iwai and Churchill, 1982; Terenzini, Springer, Yaeger, Pascarella, and Nora, 1996). Iwai and Churchill (1982) found that persisters tended to engage in part-time employment instead of full-time employment and worked longer hours during summer than dropouts. On the contrary, dropouts tended to work longer hours than persisters. We too, examine the relationship between employment and dropout. In our sample students averaged 13.9 hours of employment in the first year,

11.7 hours in the second year, 12.7 hours in the third year, and 11.6 hours in year four. In this study, the effect of full-time employment (more than 20 hours a week) on dropout behavior for each academic year was estimated by using a dummy variable where "1" = more than 20 hours per week and "0" = otherwise (for each year).

EMPIRICAL RESULTS

Exponential Models

The first model tested was a simple exponential model, which assumed that the parameters of the explanatory variables were constant but the effects of these variables would either increase or decrease (exponentially) over time. This model was included as a benchmark to examine whether the inclusion of time-varying effects in the subsequent model would improve the model fit. Estimation results for the exponential model are displayed in Table 2.

The results of the exponential model suggest that the effects of family income, mother's educational attainment, self-educational aspiration, first-year GPA, SAT total scores, and institutional type are statistically significant.

Keep in mind that positive coefficient estimates represent negative effects on retention, while negative coefficient estimates show negative effects on attrition. For example, the results in Table 2 indicate that students from families with higher incomes were less likely to depart, even though their coefficient estimates are positive (and range from 0.248 to 0.456; the reference group is students from families with yearly incomes more than $60,286). One can obtain a relative risk of departure for a variable easily by using (exp(coefficient parameter) - 1) * 100. For example, the parameter for students

from families with incomes less than $25,000 a year is $\beta = 0.456$, and the relative risk of departure for these student is 57.8 percent ((exp(0.456) - 1)*100) higher than students from families with incomes greater than $60,286 a year. Students with family incomes in the $25,001 to $41,869 ranges had a risk of departure about 28.2 percent ($\beta = 0.248$) higher than the reference group. Given these results, it appears that there is a negative monotonic relation between attrition and family income.

Students whose mothers obtained at least a bachelor's degree are less likely to leave their first institutions than students whose mothers did not complete a college education (the reference group). The risk of departure for students with college-educated mothers is about 25 percent ($\beta = -0.286$) lower than the reference group.

The risk of departure for students whose educational aspirations were less than a college degree is about 112 percent ($\beta = 0.752$) higher than the attrition rate for students whose educational aspiration is a bachelor's degree. Conversely, students whose educational aspiration is to obtain a Ph.D. had a departure risk about 26 percent lower than students who aspired to obtain a bachelor's degree.

First-year GPAs is monotonically and negatively related to attrition. That is, the higher a student's GPA in the first year, the less likely he or she is to drop out. The risk of departure for students with GPAs less than 1.00 is about 3.6 times ($\beta = 1.525$) higher than the reference group (3.00 to 4.00 GPAs). As GPA increases, the risk of departure substantially decreases. For instance, the departure rate for students with GPAs between 1.00 and 1.99 was "only" about 97 percent ($\beta = 0.675$) higher than the reference group, whereas the departure rate for students with GPAs between 2.00 to 2.99 was only about 30 percent ($\beta = 0.265$) higher than the reference group.

The higher the SAT total score a student has, the less likely he/she is to leave. Using students whose SAT total scores are less than 860 as the reference group, the risk of departure is about 25 percent (β = -0.286) lower for students whose scores are between 860 and 976, 28 percent (β = -0.334) lower for students whose scores are between 977 and 1100, and 42 percent (β = -0.544) lower for students whose scores are higher than 1101. Finally, after controlling for other factors included in the model, students attending public institutions with less than 10,000 students had a 30 percent higher attrition rate than students attending public institutions with more than 20,000 students.

Time-Varying Model with Time-Dependent Variables

The exponential model above assumes that the effects of the explanatory variables on student attrition either increase or decrease exponentially over time. This notion indeed adds a time-dimension factor to student departure, since most attrition and retention studies done to date assume the effects of the independent variables are constant over time. However, it is reasonable to suspect that the parameters for the explanatory variables may vary over time, or longitudinal effects of the explanatory variables may have shapes that are not simply increasing or decreasing exponentially. In order to relax the exponential assumption, a second model was estimate. This model, a time-varying model with time-dependent variables, was implemented to investigate more complicated time-varying effects of the explanatory and time-dependent variables.

Table 3 presents the results of the time-varying model with time-dependent variables. Log-likelihood statistics for the exponential model and the time-varying model

with time-dependent variables were –12682 and –9251, respectively, revealing that the latter model significantly improves the model fit.

Statistically significant variables include being an Asian-American student, family income, mother's educational attainment, self-educational aspiration, first-year GPA, SAT total scores, institutional types, academic and social integration, and financial aid. In year one, the risk of departure for Asian-American students is estimated to be about 59 percent ($\beta = -0.876$) lower than that of white students. Using the coefficient parameter for Asian American students produced by the exponential model (Table 2) would underestimate the impact of this variable in year one.

Students from lower income families are more likely to depart throughout the observation period. The risk of departure for students with annual family incomes less than $25,000 is the highest in year three ($\beta = 1.071$) followed by year two ($\beta = 0.949$). Students from families with annual incomes between $25,001 and $41,869 also have the highest risk of departure in year three ($\beta = 0.813$), but unlike students from the lowest income quartile families, their second highest risk time period is in the first year ($\beta = 0.555$). Using coefficient parameters from the exponential model would underestimate the effects of family income on student dropout.

The effect of mother's educational attainment had the largest impact on student attrition in the second year. In the second year, students with college-educated mothers have a 57 percent ($\beta = -0.825$) lower attrition rate than students whose mothers did not complete a college education. This lower attrition rate for students with college-educated mothers was less prominent in the third year ($\beta = -0.426$) than their reference group counterparts.

Low educational aspirations have the strongest negative effect on student retention in the first year ($\beta = 0.862$), but higher educational aspirations have the largest impact on student dropout at different times. For example, students who aspire to complete a master's degree have their lowest attrition rates in year two ($\beta = -0.538$), which was 42 percent lower than students with an educational goal of completing a bachelor's degree. On the other hand, students with an educational aspiration of finishing a doctorate degree had a 49 percent lower attrition rate ($\beta = -0.672$) in year one, compared to students with an educational goal of completing a bachelor's degree.

As expected, how well students perform in college in their first-year is strongly related to dropout behavior, especially early in one's academic career. Students with first-year GPAs between 1.00 and 1.99 are the most at-risk group and have risks of dropping out that are 1.5 times higher than students with GPAs above 3.00 ($\beta = 0.923$). In year one, students with GPAs between 2.00 and 2.99 have 67 percent higher attrition rates than students with GPAs above 3.00 ($\beta = 0.513$). An interesting finding is that there are lingering effects of poor first-year performance, as indicated by the very high risks of dropping out in year two among students who had first-year GPAs in the 1.00 to 1.99 range ($\beta = 2.044$). It may be that these students are actually dismissed in year-two for academic reasons but the data does not include an indicator of dismissal so we cannot verify this. Overall, the effects of GPAs on student attrition wane over time. However, this is not surprising because only the first-year GPAs were used to estimate the risk of departure over time. A more appropriate specification would be to include GPAs for each year, however this data was not available.

As noted above, event history models allow researchers to uncover how the magnitudes of the effects of explanatory variables change over time. For instance, it is well documented that high ability students are less likely to drop out of college. However, we find that over time high ability students (as measured by SATs in the highest quartile) have even lower risks of dropout relative to their lower scoring counterparts. For instance, students in the highest SAT quartile have attrition rates 35 percent (β = -0.432) lower than the reference group (lowest quartile) in year one, but by year three, high ability students' dropout risks were *41 percent* lower than the reference group. Also of interest was that students with SAT scores between 860-976 had the lowest attrition rate (β = -0.543) in the second year, which was about 42 percent lower than students with SAT scores less than 860.

No differences in attrition rates were found among public institutions. However, in year-three students who attended private institutions with less than 2,500 students had greater risks of dropout (77% higher; β = 0.569) than students who were enrolled in large public institutions. In year-three students enrolled in middle-sized private institutions also had higher risks of dropout (β = 0.736) than students attending large public institutions. This finding deserves closer examination.

Overall, the academic and social integration measures used in the model were for the most part not significantly related to dropout. However, in year-one, students who had interactions with faculty outside of classroom had dropout risks that were 25 percent *higher* (β = 0.225) than their counterparts who did not have contact with faculty. This finding is in contrast to much of the earlier retention research that demonstrates that faculty contact increases retention. Academic integration, as defined in the BPS data,

does not appear to be related to dropout early in one's academic career. However, in year-four we found that attending career lectures (β = -0.457) and talking to faculty regarding academic plans (β = -0.659) had positive effects on retention. These results should be treated with suspicion given that academic integration was only collected in year one and it is not clear how or why those effects would linger until year four. Thus, it is questionable to conclude that the effects of first-year academic integration are the strongest in the fourth year.

Although the financial aid variables yielded interesting results, no statistically significant differences were found between students who worked more than 20 hours per week and their cohorts who worked less than that. With regard to financial aid effects, in year one the risk of departure for students with aid amounts in the 51-75 percentile were 39 percent (β = -0.499) lower than for students who received no-aid in the first-year. The attrition rate for students who received high amounts of aid (top quartile) have risks of dropout in the first year 51 percent (β = -0.707) lower than students who received no aid in year one. These results suggest there may be threshold effects in which a minimum amount of aid is required to reduce dropout behavior in year one.

In year two we do not observe such threshold effects. All year-two aid recipients have dropout rates lower than students who received no year-two aid. There are, however, differences in the relative risks of departure depending on how much aid was received. For instance, in the second year, students with financial aid amounts in the bottom quartile had a departure rate that was 55 percent (β = -0.787) lower than non-aid students. However, the risk of dropout was 89 percent (β = -2.163) lower for students with aid amounts in the 26-50 percentile, 91 percent (β = -2.444) lower for students with

aid awards in the 51-75 percentile, and 94 percent (β = -2.861) lower for students with aid amounts in the top quartile.

Our results indicate that the financial aid reduced the risk of departure the most in the third year. In the third year, students with financial aid the 51-75 percentile aid awards were the least likely to depart (β = -4.882, 99% lower risks than non-aided students). Students with financial aid awards in the 25-50 percentile had the second lowest chances of departure, (β = -3.786, a 98% lower risk than non-aided students), and students with aid in the bottom percentile had risks of departure 93 percent lower (β = -2.692) than their non-aided counterparts. Thus, we see that the provision of aid in year-three substantially reduces dropout behavior relative to the non-receipt of aid.

In the fourth year the only significant result was for students with financial aid awards in the 51-75 percentile. These students had a rate of attrition that was about 53 percent lower (β = -0.759) than students who receive no financial aid.

SUMMARY

The main purpose of this study is to advance our understanding of college student departure behavior. Most retention and attrition studies done to date used either structural equation models or logistic regression models to examine student departure behavior. A significant contribution of this study is the application of event history techniques to the study of student departure. Even though the application of this type of modeling is relatively new to educational research, the *idea* of using a longitudinal approach to study student dropout is not new. It has long been known that departure is a longitudinal process, but we have generally not modeled it as such. We now have a tool

that is specifically designed to model temporal events and the continued application of this method should provide researchers and administrators with much more information about how factors known to affect departure behave over time.

The results produced by the time-varying model discussed above indicate that lower income students are much more likely to depart from college than their higher income counterparts. The interesting finding is that the effect of being from a low-income family changed over time. For instance, in the second and third years being from a low-income family is even more detrimental than in the first year. As noted above, this result was not apparent until we used a model in which the explanatory variables were permitted to vary over time. So it is important to use an approach that allows for time-dependent variables.

Students whose mothers graduated from college are less likely to leave than other students, and this effect was the strongest in year two. Students with high educational aspirations are less likely to leave their initial institutions, however, this effect was (generally) only significant in the first year.

Students who score high on the SAT test are less likely to depart than their lowering scoring colleagues. Moreover, SAT score effects behaved differently over time. For instance, students whose SAT scores are 1101 or higher are the least likely to leave and this beneficial effect is actually the strongest in year three.

Financial aid is generally helpful in reducing dropout and also exhibits time varying effects. Students with financial aid are less likely to depart, especially in the second and third years, even after controlling for other (possibly) confounding effects. It is also important to include aid-related variables in studies of student departure because

when not included, other variables (SAT and income) may account for some of this source of variation.

Academic and social integration did not have effects exhibited in other studies. Although weak effects of academic and social integration were noted in a previous study of student departure (e.g., Cabrera et al., 1993), the non-significance of this construct in our study may be due to measurement error. First, questions regarding academic and social integration in the BPS:90/94 asked students the frequency of their interactions with faculty, and did not ask them about the *quality* of these interactions. It may be that students visited their academic advisors often because they were required to do so, but it may be that the quality of their interactions are actually more important than the number of times students met with faculty. Moreover, the quality of advising services might vary *across* institutions. Students might receive closer attention from their advisors at smaller institutions than at larger institutions. Therefore, questions concerning the quality of interactions need to be added to the questionnaire to assess academic and social integration more effectively. Second, questions about academic and social integration were asked only once, in the first year of enrollment. It may be that some students are not well adjusted academically or socially until later in their academic careers. It would seem more appropriate to ask integration questions *every* academic year to assess how levels of academic and social integration affect students' attrition behavior over time.

POLICY IMPLICATIONS

At the institutional level, the application of event history modeling has implications for enrollment management at institutions of higher education. By

incorporating commonly available data, such as admission applications and questionnaires filled out by students when they take the ACT/SAT entrance exams into an event history model, enrollment managers can obtain temporal profiles of at-risk students. For example, assume there are two hypothetical students ("Student A" and "Student B"). Student A (B) is an Asian male (Hispanic female) student, from a family with an income of $59,000 ($23,000), has a college-educated mother (a mother without a college education), has a SAT total score of 920 (1000), and who received no financial aid (aid in the bottom percentile). Using the results from the time-varying model (Table 3) in this study, we can graphically display longitudinal effects of departure risks for Students A and B (see Figure 1). Overall, Student A has lower risks of departure than Student B in years one and two. However, in year-three, the risk of attrition for Student A dramatically increases. Student B has the highest risk of attrition in year two, even though the attrition rate for Student B in the first year was higher than Student A. This graph displays evidence of the time-varying nature of the factors that affect college student attrition behavior. It also illustrates how one can display the longitudinal effects of attrition risks. Doing so may enable enrollment managers to compare the risk profiles of subgroups of students and then target interventions to the times they are at the greatest risk.

Other possible applications are that the results of event history models could be used in student counseling centers to examine if and when clients depart from counseling services. Alumni offices could use event history modeling to investigate the timing of postgraduate employment and institutional development administrators could also study if and when alumni donate to their alma mater.

Researchers such as Iwai and Churchill, (1982), James (1988), Jensen (1981), and Stampen and Cabrera (1986) emphasize the role of financial aid and finances on student departure. The findings of the study conducted herein also indicate lower attrition rates for students who received aid. More importantly, however, is the finding that financial aid and student departure behavior not only varies depending on whether a student is awarded aid, but dropout risks also vary by *when* a student received aid. An area in need of more research, and one with huge policy considerations, is how unmet need and student departure are related, especially temporally. Students use a multitude of ways to finance their education. Some students work on- or off-campus, some take out loans, others get assistance from their parents. Clearly there are interactions between unmet need, the type of aid one is offered or chooses, and when aid is offered. At the state and federal levels, we may need to begin to think not only about the amount of aid students are awarded, but also more importantly about how, when, and why students finance their educations the way they do.

At the state level, time to degree is becoming a priority for some legislators and the general public. A number of states have introduced legislation that limits the subsidies to students who exceed a certain time without completing a degree (Gorman, 1996). This type of legislation is largely based on anecdotal evidence (see the Gorman article for an example) and not on sound institutional or system-wide research. In a similar vein, the Chronicle of Higher Education details how Virginia intends to tie institutional funding to graduation rates, and a number of other outcomes (Hebel, 1999). Event history models can help to provide empirical evidence about why students are taking more than four years to graduate.

REFERENCES

Bean, J. (1978). *Dropouts and turnover: The synthesis of a causal model of student attrition*. Doctoral Dissertation, University of Iowa, Iowa City, IA.

Bean, J. (1980). Dropouts and turnover: The synthesis and test of a causal model of student attrition. *Research in Higher Education*, 12(2), 155-187.

Bean, J. (1982). Student attrition, intentions, and confidence: Interaction effects in a path model. *Research in Higher Education*, 17(4), 291-320.

Bean, J. (1983). The application of model of turnover in work organizations to the student attrition process. *Review of Higher Education*, 6(2), 129-148.

Bean, J. (1985). Interaction effects based on class level in an exploratory model of college student dropout syndrome. *American Educational Research Journal*, 22(1), 35-64.

Bradford, C., and Farris, E. (1991). *Survey on retention at higher education institutions: higher education surveys report*. Rockville, MD: Westat.

Cabrera, A. F., Nora, A., and Castaneda, M. B. (1993). College persistence: Structural equations modeling test of an integrated model of student retention. *Journal of Higher Education*, 64(2), 123-139.

DesJardins, S. L., Ahlburg, A. A., & McCall, B. P. (1999). An event history model of student departure. *Economics of Education Review*, 18, 375-390.

Dorans, N., Lyu, C. F., Pommerich, M., and Houston, W. M. (1997). Concordance between ACT assessment and recentered SAT I sum scores. *College and University*, 73(2), 24-34.

Gorman, S. (1996, August 16). Lawmakers try to deter students from dawdling in state colleges. *The Chronicle of Higher Education*, p. A27.

Hayghe, H. V. (1991). Volunteers in the U.S.: Who donates the time [Electronic version]? *Monthly Labor Review*, 114(2), 17-23.

Hebel, S. (1999, May 28). Virginia Board wants to link state aid for colleges to their performance in key areas. *The Chronicle of Higher Education*, p. A33.

Iwai, S. I., and Churchill, W. D. (1982). College attrition and the financial support systems of students. *Research in Higher Education*, 17(2), 105-113.

James, E. (1988). Student aid and college attendance: Where are we now and where do we go from here? *Economics of Education Review*, 7(1), 1-13.

Jensen, E. L. (1981). Student financial aid and persistence in college. *Journal of Higher Education*, 52(3), 280-293.

Mallette, B. I., and Cabrera, A. F. (1991). Determinants of withdrawal behavior: An exploratory study. *Research in Higher Education*, 32(2), 179-194.

Price, J. L. (1977). *The study of turnover.* Ames, IA: Iowa State University Press.

Stampen, J. O., and Cabrera, A. F. (1986). Exploring the effects of student aid on attrition. *Journal of Student Financial Aid*, 16(2), 28-37.

Stage, F. K. (1988). University attrition: LISREL with logistic regression for the persistence criterion. *Research in Higher Education*, 29(4), 343-357.

Terenzini, P., Springer, L., Yaeger, P., Pascarella, E. T., and Nora, A. (1996). First-generation college students: Characteristics, experiences, and cognitive development. *Research in Higher Education*, 37(1), 1-22.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, 45(1), 89-125.

Tinto, V. (1982). Defining dropout: A matter of perspective. In E. T. Pascarella(Ed.), *Studying Student Attrition.* San Francisco, CA: Jossey-Bass.

Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of student attrition.* Chicago, IL: The University of Chicago Press.

Tinto, V. (1988). Stages of student departure: Reflections on the longitudinal character of student leaving. *Journal of Higher Education,* 59(4), 438-455.

U.S. Census Bureau. (2000, August). Educational attainment in the United States. *Current Population Reports.* Retrieved April 5, 2002 from http://www.census.gov/prod/2000pubs/p20-528.pdf

U.S. Census Bureau. (2000, August). Voting and registration in the election of November 1998. *Current Population Reports.* Retrieved April 5, 2002 from http://www.census.gov/prod/2000pubs/p20-523.pdf

TABLE 1: Descriptive Statistics of the Explanatory Variables

Variable	Description	Value	Label	Freq.	Range	Mean
Total Subjects				3,450		
Duration	Total number of semesters attended			3,450	1.0 -10.0	6.0
Gender	Sex	1	females	1,770		0.513
		0	males	1,680		
Race	Race1	1	black, not white	255		0.074
		0	else	3,195		0.926
	Race2	1	Hispanic, not white	173		0.050
		0	else	3,277		0.950
	Race3	1	Asian	117		0.034
		0	else	3,333		0.966
Family Income	Famdumy1	1	$143-$25,000	862		0.250
(Ref. = income>$60,286)		0	else	2,589		0.750
	Famdumy2	1	$25,001-$41,869	861		0.250
		0	else	2,585		0.750
	Famdumy3	1	$41,870-$60,286	865		0.251
		0	else	2,588		0.749
Mothers' Education		1	BA degree or more	1,065		0.309
		0	else	2,385		0.691
Educational	Edself1	1	Less than BA degree	141		0.041
Aspiration		0	else	3,309		0.959
(Ref.= BA degree)	Edself2	1	Master's degree	1,519		0.560
		0	else	1,931		0.440
	Edself3	1	Ph.D. or more	715		0.207
		0	else	2,735		0.793
GPA	GPA1	1	0.00-0.99	66		0.019
(Ref.= GPA>2.99)		0	else	3,384		0.981
	GPA2	1	1.00-1.99	462		0.134
		0	else	2,988		0.866
	GPA3	1	2.00-2.99	1,727		0.499
		0	else	1,723		0.501
SAT Total	SAT1	1	860-976	946		0.245
(Ref.= SAT Total<860)		0	else	2,604		0.755
	SAT2	1	977-1100	887		0.257
		0	else	2,563		0.743
	SAT3	1	1101 or higher	838		0.243
		0	else	2,612		0.757
Inst. Types & Sizes	SizTyp1	1	Public, <10k	620		0.180
(Ref.= Public, >19.9k)		0	else	2,830		0.820
	SizTyp2	1	Public, 10k-19.9k	449		0.130
		0	else	3,001		0.870
	SizTyp3	1	Private, <2,500	855		0.248
		0	else	2,595		0.752
	SizTyp4	1	Private, 2.5k-9.9k	651		0.189
		0	else	2,799		0.811
	SizTyp5	1	Private, >10k	423		0.123
		0	else	3,027		0.877

TABLE 1: (continued)

Academic Integration	Attend career lectures					
		1	Sometimes or often	1,495		0.433
		0	else	1,955		0.567
	In study group with other students					
		1	Sometimes or often	2,521		0.731
		0	else	929		0.269
	Met advisor concerning academic plans					
		1	Sometimes or often	2,489		0.721
		0	else	961		0.279
	Talked about academic matter with faculty					
		1	Sometimes or often	2,655		0.770
		0	else	795		0.230
	Contact with faculty outside class					
Social Integration		1	Sometimes or often	1,913		0.554
		0	else	1,537		0.446
	In student assist. centers/program					
		1	Once or often	1,321		0.383
		0	else	2,129		0.617
	Participated in school clubs					
		1	Sometimes or often	1,547		0.448
		0	else	1,903		0.552
	Go places with friends from school					
		1	Sometimes or often	2,223		0.646
		0	else	1,227		0.356
Financial Aid (in dollars)	Total fin. aid received 89-90	1		2,311	$50-$56k	5,617
	Total fin. aid received 90-91	1		1,506	$100-$45k	5,777
	Total fin. aid received 91-92	1		1,342	$100-$40k	4,912
	Total fin. aid received 92-93	1		1,333	$100-$40k	5,803
Employment	Avg. weekly hrs. first yr.	1		3,450	0-70	13.9
	Avg. weekly hrs. second yr.	1		3,450	0-61	11.7
	Avg. weekly hrs. third yr.	1		3,450	0-60	12.7
	Avg. weekly hrs. fourth yr.	1		3,450	0-60	11.6

TABLE 2: Exponential Model

Variable	Label	Coeff.	Sig.
Constant		-3.122	***
Gender	Female	-0.023	
Race	Black	-0.184	
	Hispanic	-0.142	
	Asian	-0.259	
Income(in dollars)	0 - 25,000	0.456	***
	25,001-41,869	0.248	*
	41,870-60,286	0.067	
Mother's Education	BA or higher	-0.286	***
Self Educational Asp.	Less than BA	0.752	***
	Master's	-0.146	
	Ph.D.	-0.295	**
First Yr. College GPA	0.00-0.99	1.525	***
	1.00-1.99	0.675	***
	2.00-2.99	0.265	***
SAT Total	860-976	-0.286	***
	977-1100	-0.334	***
	1101 or higher	-0.544	***
Inst. Size & Type	Public <10,000	0.259	*
	Public 10,000-19,999	0.182	
	Private <2,500	-0.095	
	Private 2,500-9,999	0.034	
	Private >10,000	0.035	
Academic Integration	Career Lecture	0.036	
	Study Group	-0.036	
	Academic Plans	-0.087	
	Talked to Faculty	0.043	
Social Integration	Contact with Faculty	0.031	
	Student Assistance	0.088	
	School Clubs	-0.018	
	Go Places with Friends	0.033	

*** = p <0.005, ** = p <0.01, * = p < 0.05

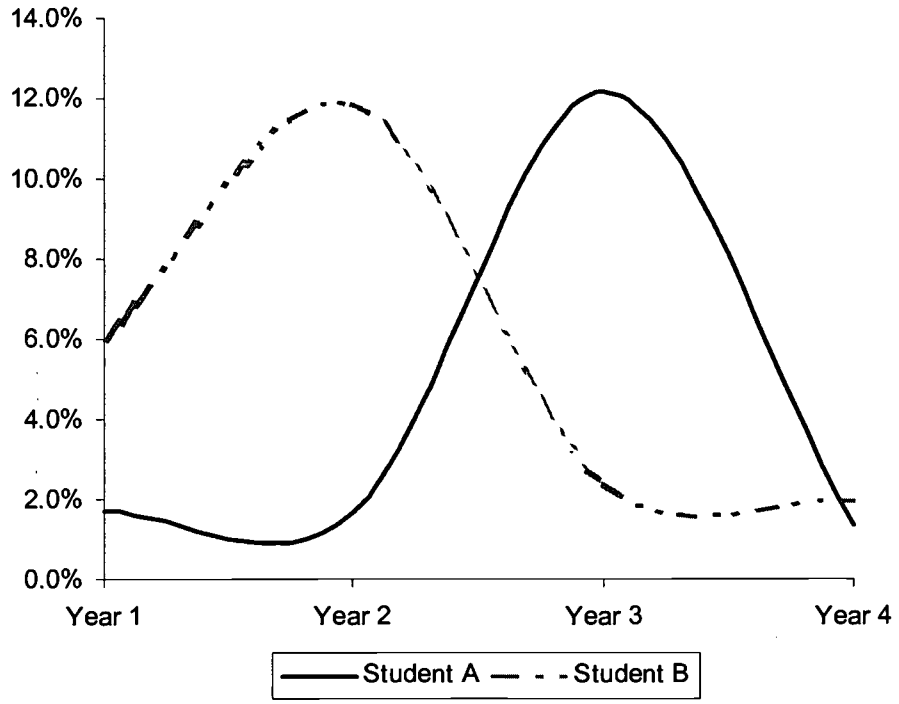
TABLE 3: Time-Varying Model with Time-Dependent Variables

Variable	Label	Year 1 Coeff. Sig.	Year 2 Coeff. Sig.	Year 3 Coeff. Sig.	Year 4+ Coeff. Sig.
Constant		-3.683 ***	-3.153 ***	-2.371 ***	-4.581 ***
Gender	Female	0.047	0.073	-0.097	-0.184
Race	Black	-0.187	-0.064	0.245	-0.745
	Hispanic	-0.399	0.563	-0.069	-0.474
	Asian	-0.876 *	-0.367	0.023	-0.921
Income(in dollars)	0 - 25,000	0.733 ***	0.949 ***	1.071 ***	0.782 *
	25,001-41,869	0.555 ***	0.430	0.813 ***	0.395
	41,870-60,286	0.164	0.083	0.300	0.354
Mother's Education	BA or higher	-0.163	-0.825 ***	-0.426 ***	-0.058
Self Educational Asp.	Less than BA	0.862 ***	0.585	0.453	1.055
	Master's	-0.410 ***	-0.538 ***	0.193	0.422
	Ph.D.	-0.672 ***	-0.220	-0.102	0.681 *
First Yr. College GPA	0.00-0.99	1.913 ***	2.044 ***	0.991	-11.465
	1.00-1.99	0.923 ***	0.548 *	0.491 **	0.498
	2.00-2.99	0.513 ***	0.357	0.028	0.235
SAT Total	860-976	-0.209	-0.543 *	-0.329 *	0.213
	977-1100	-0.323 *	-0.469	-0.256	0.120
	1101 or higher	-0.432 *	-0.455	-0.518 *	0.166
Inst. Size & Type	Public <10,000	0.057	0.386	0.331	0.418
	Public 10,000-19,999	0.124	0.493	0.194	-0.460
	Private <2,500	0.060	0.380	0.569 **	-0.564
	Private 2,500-9,999	0.154	0.283	0.736 ***	-0.340
	Private >10,000	-0.112	-0.027	0.336	0.575
Academic Integration	Career Lecture	0.109	-0.058	0.083	-0.457 *
	Study Group	-0.081	-0.008	0.012	0.374
	Academic Plans	0.086	-0.053	-0.109	-0.659 ***
	Talked to Faculty	0.156	-0.154	0.147	0.048
Social Integration	Contact with Faculty	0.225 *	-0.070	-0.111	0.110
	Student Assistance	0.017	0.092	0.205	0.267
	School Clubs	0.018	0.096	-0.200	0.009
	Go Places with Friends	-0.036	0.236	-0.010	0.356
Time-Dependent Variabels					
Financial Aid	Bottom	0.120	-0.787 **	-2.692 ***	-0.286
	26-50 percentile	-0.031	-2.163 ***	-3.785 ***	0.120
	51-75 percentile	-0.499 *	-2.444 ***	-4.882 ***	-0.759 *
	Top	-0.707 ***	-2.741 ***	-2.861	-0.464
Employment	20 hrs or more	-0.060	-0.233	0.064	-0.187

*** = p <0.005, ** = p <0.01, * = p < 0.05

Log Likelihood (Exponential Model): -12682
Log Likelihood (Time-Varying Model): -9251

FIGURE 1: Longitudinal Effects of Departure Risks between Students A and B



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