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ABSTRACT

The High School Sophomore Cohort of 1980 followed nine different pathways to a 4-year college degree. These paths were formed by a combination of different levels of academic preparation secured in high school and the first type of postsecondary institution attended. The pathway most likely to lead to a 4-year degree is one defined by acquiring high academic resources in high school and entering at a 4-year institution on high school completion. Those who followed this path had a 78% chance of graduating within 11 years. Highest-socioeconomic status (SES) students followed this pathway, resulting in an 81% graduation rate. Not all paths are equally available to all SES groups. Lowest-SES students journeyed on a pathway defined by moderate academic resources and first enrollment in a 2-year institution. Only 3.3% of these students earned a 4-year degree. A 44% SES-based degree completion gap separating lowest-SES students from highest-SES students found using simple descriptive statistics is reduced to 24% when myriad factors are considered simultaneously. Degree completion is most affected by SES, high school-based academic resources, degree aspirations, enrollment patterns, taking college courses in mathematics and science, financial aid, and having children while attending college. (Contains 10 tables and 152 references.) (Author/SLD)

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# Pathways to a Four-Year Degree: Determinants of Degree Completion among Socioeconomically Disadvantaged Students

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**Pathways to a Four-Year Degree:**
**Determinants of Degree Completion among Socioeconomically Disadvantaged Students**


## Abstract

The High School Sophomore Cohort of 1980 followed nine different pathways to a 4-year college degree. These paths were formed by a combination of different levels of academic preparation secured in high school and the first type of postsecondary institution attended. The pathway most likely to lead to a 4-year degree is one defined by acquiring high academic resources in high school and entering at a 4-year institution upon high school completion. Those who followed this path had a 78% chance to graduate within 11 years. Highest-SES students followed this pathway, resulting in an 81% graduation rate. Not all paths are equally available to all SES groups. Lowest-SES student journeyed on a pathway defined by moderate academic resources and first enrollment in a 2-year institution. Only 3.3% of these students earned a 4-year degree. A 44% SES-based degree completion gap separating Lowest-SES students from Highest-SES students found using simple descriptive statistics is reduced to 24% when a myriad of factors are considered simultaneously. Degree completion is most affected by SES, high school-based academic resources, degree aspirations, enrollment patterns, taking college courses in math and sciences, financial aid, and having children while attending college.

**Pathways to a Four-Year Degree:**
**Determinants of Degree Completion among Socioeconomically Disadvantaged Students**

A bachelor's degree is no longer considered a *potential* stepping-stone to a better life. It is fully acknowledged as the *gatekeeper* to a myriad of social and individual benefits, ranging from income, employment stability, occupational prestige to engagement in civic and political activities (e.g., Bowen & Bok, 1998; Hossler, Braxton, & Coopersmith, 1989; Pascarella & Terenzini, 1991; Lin & Vogt, 1996; Leslie & Brinkam, 1986). Though the social and economic benefits of a college degree are numerous, acquiring them is tied to a single steppingstone: completing a college degree (Adelman, 1999).

As early as the 1960s, federal, state and local governments have recognized that completion of a 4-year degree can be an insurmountable step for individuals from disadvantaged socioeconomic backgrounds. Some student assistance programs like Chapter I, TRIO, and GEAR-UP recognize the importance that academic preparation, awareness of opportunities for college, and assistance in completing the college application process plays for low-income students whose parents are not college educated. Other efforts such as federal and state financial aid programs recognize the importance of ability-to-pay as a deterrent for access to higher education and persistence to degree completion. The importance our society places in making a college degree an affordable option for able and willing low-income individuals is evidenced even more when one examines the growth of college assistance programs during the last four decades. In the early 1980s, for instance, the cost of federal financial aid programs approached $20 billion per year (Lewis, 1989). By 2003, the tab for federally supported student aid programs amounted to $66 billion (College Board, 2003). As important as these need-based programs have been in facilitating access to and success in, college, economic need *per se* does not appear to explain fully why low-income individuals enroll in college (Hossler, Schmitt & Vesper, 1999). Nor do they explain why low-income students persist once enrolled (e.g., Adelman, 1999; Braxton, 2000, Cabrera, Nora, & Castañeda, 1992; Choy, 2002; Gladieux & Swail, 1999; Swail, 1995; Terenzini, Cabrera, & Bernal, 2001).

In addition to finances, we know access to and success in college is the product of a complex set of factors some of which can be traced back to the 8th grade, if not earlier, while others pertain to postsecondary experiences (e.g. Blecher, Michael, & Hagedorn, 2002; Braxton, 2000; Cabrera & La Nasa, 2001; Hossler, Schmitt & Vesper, 1999; McDonough, 1997; Paulsen & St. John, 2002; Tinto, 1992). In terms of what matters on the path to a four-year degree, we also know individuals from low SES backgrounds are most disadvantaged. Low SES students tend to be raised by parents who are less likely to be involved in school activities (Cabrera & La Nasa, 2001). Their parents are less knowledgeable about how to get ready and pay for college (Flint, 1992, 1993; King, Nunez & Carroll, 1998). The middle schools those students attend also compound to the problem with the lack of enough number of certified teachers, adequate career counseling and course offerings (Venezia, Kirst, & Antonio, 2003). By the end the senior year, low SES 12th graders students are less likely to have planned for and be academically prepared for college (Adelman; 1999; Cabrera & La Nasa, 2001; Terenzini, Cabrera & Bernal, 2001). If, and when, they enter college, they do so at readiness levels far below those of their better off counterparts while choosing public institutions and being clustered in community colleges. (e.g.

McPherson & Shapiro, 1998). Once enrolled in postsecondary education, low SES students' involvement with the institution is quite similar to that exhibited by their better off counterparts, with few exceptions: less involvement with faculty, other students, clubs, organizations and more prone to work longer hours (e.g. Cuccaro-Alamin & Choy, 1998; Terenzini, Cabrera & Bernal, 2001; Walpole, 2003). At the end of the freshman year, low SES students report greater learning gains in critical thinking and enjoyment of arts than those reported by better off students (Terenzini, Cabrera & Bernal, 2001). In spite of these similarities, low SES's degree completion rates lag substantially behind their more affluent counterparts (Carroll, 1989; Paulsen & St. John, 2002; Terenzini, Cabrera & Bernal, 2001).

This study seeks to further our understanding of why post-secondary degree attainment patterns differ markedly between socioeconomically disadvantaged students and their better off peers. In so doing, our study seeks to address three major shortcomings when examining socioeconomically disadvantaged students' path to a four-year degree. To begin, it examines the effect of financial aid along with other important determinants of degree completion. Second, it tries to bring a more comprehensive definition of persistence by focusing on degree completion rather than persistence at the end of the freshman year. Finally, it studies how determinants of degree completion vary across socioeconomic levels. When SES is brought to bear, with few notable exceptions (e.g., St. John et al, 1998; Paulsen & St. John, 2002; Terenzini, Cabrera & Bernal, 2001;Walpole, 2003), it is done with the purpose of controlling for an alternative explanation rather than with the explicit intention of highlighting differences between socioeconomically disadvantaged students and their better off peers. Simply put: we still do not know what specific factors lead some Lowest-SES students to succeed on their path to a college degree despite overwhelming odds. This study uses SES with the explicit intention of highlighting differences between socioeconomically disadvantaged students and their better off peers, an approach that has not received enough attention in the current body of literature (Paulsen & St. John, 2002; Walpole, 2003).

## Methodology

### Model

This study is based on the expanded college-choice persistence model (Blecher, Michael, & Hagedorn, 2002; St. John, Paulsen & Starkey, 1996; St. John, Cabrera, Nora & Asker, 2000). Merging the college choice with the economic and student-institution fit perspectives, the nexus model posits that college persistence is the by-product of a longitudinal process linking factors that predispose high school students to select a college with his/her collegiate experiences and ability to pay for college. Using a 1987 national sample of college students, Paulsen and St. John (2002) found that college-choice factors and college experiences factors had varying effects on persistence depending upon the specific income-group under consideration. Though the expanded college-choice persistence model has examined within-year persistence, it is logical to expect that this model can also help us understand determinants of degree completion among students of different socioeconomic backgrounds. Adelman's (1999) seminal work of determinants of degree completion among members of the 1980 Sophomore cohort also guided the selection of variables. However, this study expands upon Adelman's in two important areas. It includes measures of collegiate curriculum; and it desegregates the analyses for four distinct

SES-groups. This strategy facilities the identification of trends that may be unique to socioeconomically disadvantaged students (Paulsen & St. John, 2002; Walpole, 2003). Our data analyses strategy was twofold. First, we examined the path to a four-year degree followed by members of the 1980 High School Sophomore Cohort. Second, we examined determinants of degree completion among four distinct SES groups.

Weight

The NCES followed a stratified sample strategy in creating the HS&B/So whereby the original sample of 10th graders was adjusted to represent the 1980 census of all high school seniors (about 3.7 million). Subsequent weights reflect the number of individuals attending postsecondary institutions. In this study, we used the Postsecondary Education Participation Panel Weight (PSEWT1), which adjusts the HS&B/So data to reflect the number of 1980 high school sophomores who enrolled in postsecondary education (See Table 1).

Insert Table 1

As noted by Adelman (1999), standardized statistical packages such as SPSS significantly underestimate the sampling error when handling stratified samples. To correct for this problem we used the average design effect of 1.5 for adjusting the standard deviations of parameters used in logistic regression models. This value was chosen based on the recommendations contained in the High School and Beyond Fourth Follow-Up Methodology Report (Zahs et al., 1995). To minimize further type I error due to large sample sizes, all parameter estimates were tested using a $p$-value of 0.01.

Database

Analyses are based on the most recently released U.S. Department of Education National Longitudinal High School and Beyond: 1980 Sophomore Cohort database (HS&B/So). This database follows almost 15,000 high school sophomores over eleven-years. In 1980, data were collected from high school sophomore students attending 1,015 schools. Their parents were also surveyed. In the first follow-up (1982), high school seniors' data were complemented with high school transcripts. The third and fourth follow-ups took place in 1986 and 1992, respectively. In 1993, NCES collected college transcripts from all institutions student reported attendance between 1982 and 1992 (Zahs, Pedlow, Morrissey, Marnell, & Nichols, 1995).

The database contains extensive college transcripts, financial aid records, and other verifiable information regarding college destinations (see Adelman, 1999). Academic Preparation for college (ACRES), Academic Performance in College, Collegiate Curriculum, Financial Aid and Degree Completion variables were all derived from transcripts. Most of the variables selected have been shown by Adelman to be reliable and valid predictors of degree completion.

Variables

*Degree Completion.* Students who secured at least a bachelor's degree by 1993 were considered degree completers for this study. This variable was derived from NHDEG, which included a record of students' highest confirmed degree received by 1993 as indicated on college transcripts (Adelman, 1999).

*Socioeconomic Status.* Quartile coding of base year SES (SESQ). This variable was built upon respondent's socioeconomic status at the time he/she was a 10th grader in 1980. Socioeconomic status, as defined by variables within NCES datasets, includes the following measures: parental education, parental occupation, items in the home (i.e., dishwasher, books, etc.), and family income. This variable ranged from 1 (Lowest-SES) to 4 (Highest-SES). As shown in Table 1, estimates of subjects across SES categories vary as a function of the weight under consideration.

*Background.* Gender (PSEX) coded as 0 (Male) and 1 (Female) and ethnicity (RACE). Ethnic categories included White (1), African American (2), Hispanic (3), and Asian American (4). Native Americans, due to their small number, were excluded from the logistic regression analyses.

*High School Encouragement.* Three dummy coded indicators of whether the students felt were encouraged to go to college by parents (PARENTE), high school teachers or counselors (HSPROF), and friends (FRIENDE) were used for this construct. PARENTE was derived from two items indexing whether respondents felt the father (FY63a) or the mother (FY63b) expected them to go on college after high school graduation. Similar to parental encouragement, HSPROF was created from two items indicating whether the respondent felt teachers or counselors expected him/her to go on to college (FY63c and FY63d). FRIENDE was derived from highest expectations respondents' high school friends had for them in their education (FY63e). The selection of these variables is consistent with recent literature highlighting the role of family, high school teachers, high school counselors, and friends on a student's college-choice decisions (e.g. King, 1996; Cabrera & La Nasa, 2001; Perna, 2000).

*Academic Resources Index.* Created by Adelman (1999), the academic resources index (ACRES) is a composite of multiple indicators of a student's high school academic performance and curriculum. It brings together a reduced but enhanced version of the SAT test students took in the 12th grade along with high school rank, academic GPA, and measures of the intensity and quality of the high school academic curriculum. This index avoids problems associated with using "preparatory track" by capturing measures that are more valid of a student's effort and success in academically related areas. Furthermore, this measure is based on transcripts avoiding biases associated to self-reported data. Adelman (1999) found ACRES ranking second among the predictors of degree completion for members of the High School Sophomore Cohort of 1980. Originally conceived in quintiles, we collapsed the two categories of both extremes in the variables creating academic resources in thirds: (1) low academic resources, (2) medium, and (3) high academic resources.

*Degree Aspirations.* ASP82 is a dummy variable reflecting whether the high school senior aspired for a 4-year degree (1) or not (0).

*College Paths.* College paths were indexed using three separate variables: first type of institution attended, continuous enrollment (NONSTOP), and the ratio of courses dropped, withdrawn from, or left incomplete in relation to those attempted (DWI#3). First type of institution attended was derived from TRIFA by forming three categories: (1) Less than 2-year, (2) 2-year, and (3) 4-year. Used for the degree completion section, these variables were created from college transcripts (see Adelman, 1999).

*Collegiate Experiences.* Five indicators were used to measure the experiences of the student with the institution. The out-of-classroom experience scale is a composite of three likert items assessing the extent to which the student was satisfied with: the college's social life (TY28b), cultural activities (TY28g), and sports and recreation facilities (TY28k). The alpha reliability for this scale is 0.64. The instructional quality scale is a composite of five likert items indexing satisfaction with: curriculum (TY28i), acquisition of work skills (TY28c), quality of instruction (TY28j), quality of faculty (TY28a), and intellectual development (TY28h). The alpha reliability for this scale is 0.82. The Satisfaction with Campus Faculties (TY28f), Satisfaction with Counseling (TY28e), and Satisfaction with the Prestige of the Institution (TY28m) variables were each measured via a single likert-item. Using the High School Senior Cohort of 1980, Cabrera (1987) found these items to show moderate correlations with Pascarella and Terenzini's (1980) scales of academic and social integration.

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Insert Table 2

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*College Grade Point Average.* GPA measure was derived from college transcripts (see Adelman, 1999).

*Earned Credits Hours.* College transcripts were examined to ascertain the student's level of effort in earning credits. This variable measures the percent of credits earned in relation to credits attempted. This variable was collapsed into three categories: (1) earned less than ¾ of courses attempted, (2) earned ¾ or more, and (3) earned all credits attempted. This measured attempted to capture the Astin's (1993) quantitative component of his theory of academic effort.

*Number of college math and science course.* The number of college math and science courses taken by a student was derived through examination of transcript data. We accessed the Transcript file and located course descriptions (NCES 95-361). Next, we developed an algorithm incorporating date of first enrollment in a four-year institution in conjunction with the date the course was taken. All course data that could not be positively categorized were dropped from further analyses. Only courses where a student received credit were selected. Course repeats, incompletes, withdrawals, or no earned credit courses were dropped from analysis.

The type of math and science courses selected were those most likely to be taken by all students regardless of their major. In the case of science course, we examined the course titles and sought to include those courses primarily offered from the "pure" sciences such as the full range of offerings from biology, chemistry, and physics (e.g. general biology, anatomy, biochemistry, inorganic chemistry, general physics). Math courses included the full range of

math topics including college algebra, pre-calculus, finite mathematics, calculus, and statistics. Remedial and vocational courses were excluded.

*Financial Aid.* Three financial measures were used: receipt of educational loans (loan8286), grant-in-aid (schl8286), and satisfaction with cost. The first two measures were developed by Adelman (1999) from student aid records, and signify whether the student received loans and grants within the 1982-86 period. Satisfaction with cost was derived from an item indexing a student's satisfaction with the cost of attending (TY28l). This variable was dichotomized to indicate satisfaction (1) or dissatisfaction (0) according to practices outlined in Cabrera, Stampen, and Hansen (1990) and Nora, Cabrera, Hagedorn, & Pascarella (1996).

*Working On Campus.* This variables indexes the number of years the student reported working on campus on such activities as work-study, co-opt placements, and/or teaching-research assistantships (see Adelman, 1999).

*Children.* This variable signifies whether the student had children by 1986, six years after the first data collection (CHILD86).

Table 3 displays the descriptive statistics employed in the logistic regression analysis.

Insert Table 3

Logistic Regression

We relied on a series of logistic regression models to assess the effect of demographic, school-based, aspirations, collegiate experiences, college paths, and family responsibilities on the probabilities of securing a baccalaureate degree an within 11 years. Logistic regression is an ideal method to model the effect of independent variables when the dependent variable under consideration is dichotomous. Logistic regression not only captures the probabilistic distribution embedded in dichotomized measures, but it avoids violations to the assumption of homogeneity of variance and functional specification the direct application of Ordinary Least Squares (OLS) regression models are likely to produce (Aldrich & Nelson, 1986; Cabrera, 1994; Menard, 1995). Moreover, Press and Wilson (1979) proved the superiority of logistic regression for classification and prediction purposes in relation to discriminant analyses. Adjusted probabilities were used for data analysis and calculated using the mean values and the logistic parameter estimates depicted in Table 2 using the following formula developed by Petersen (1985). Table 4 reports the logistic regression results for determinants of degree completion, respectively. Table 5 reports the adjusted probabilities. Petersen (1985) formula estimates corrected probabilities by holding constant the dependent variables at their mean value (Cabrera, 1994; Menard, 1995). Each case was weighted by the NCES panel weight PSEWT1. To minimize the effect of large sample sizes standard errors were corrected using the design effect of 1.5. This adjustment procedure was similar to the one employed by Adelman's (1999).

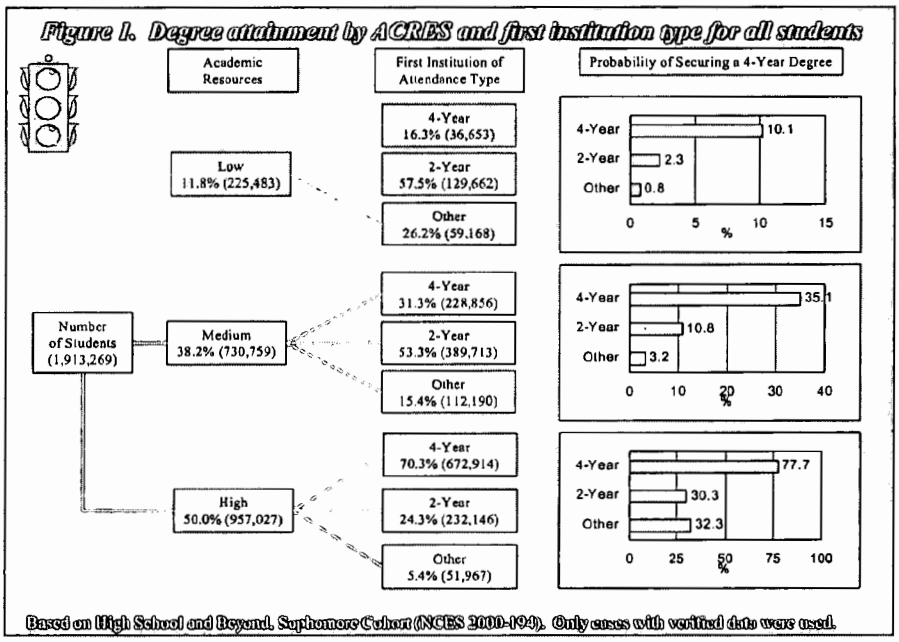
Insert Table 4

Insert Table 5

## Findings

*Pathways to a four-year degree.*

In examining the 1980 High School Sophomore Cohort, Adelman (1999) concluded that the quality and intensity of academic preparation secured in high school was one of the most important determinants of completing a 4-year degree. Velez (1985) and Caroll (1989) found that the postsecondary tracks also matter. Their findings suggest that high school students are more prone to obtain a bachelor's degree if their port of entry to postsecondary education was a 4-year institution. When these two concepts are combined (preparation for college and first time of postsecondary institution attended), it is possible to identify nine pathways to a college degree followed by the High School Sophomore Cohort of 1980 (see Figure 1).




By 1993, 58% of the High School Sophomore Cohort of 1980 had enrolled in postsecondary education. Of those enrolled, 47% first attended a 4-year institution, 41% first opted for a 2-year institution, and 12% first selected another type of institution. Only half were fully qualified for college. The type of institution students first enter correlates strongly with academic resources secured in high school ($r$=.412, $p$ <.001). Seventy-percent of those students highly prepared academically first enrolled at 4-year institutions. In contrast, only 16% of the lowest prepared first enrolled at a 4-year institution. For these academically deficient students,



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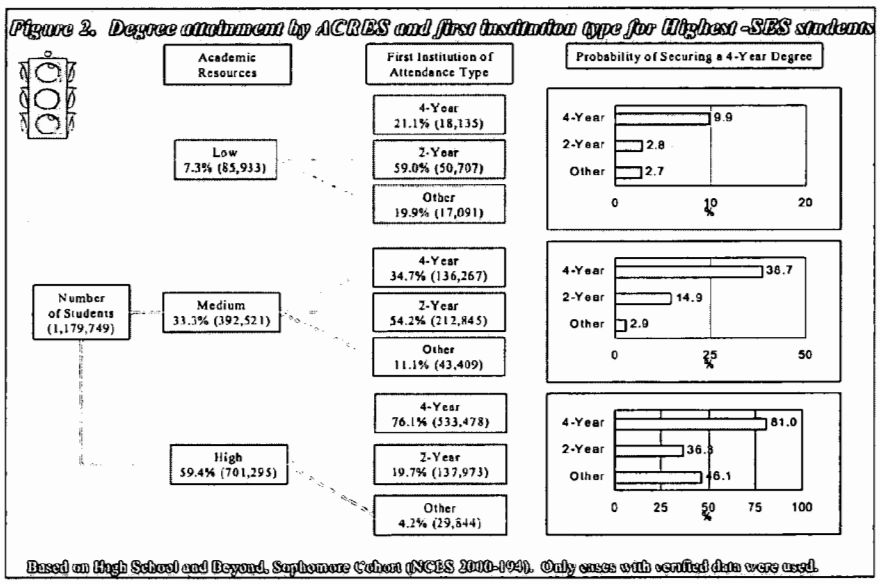
first institutional choice appears almost exclusively confined to institutions offering the associates degree or less.

Academic Resources-Institutional Choice paths vary in their likelihood to produce a 4-year degree. In the aggregate, successful pathways to a bachelor's degree appear to follow a logical progression: students that obtain the highest academic preparation and enter a 4-year institution tend to secure a 4-year degree. Those students who are poorly qualified and choose institutions other than colleges and universities see their chances to graduate diminished. Seventy-eight percent of those students who pursued the first path graduated within 10 years. In contrast, just 2.3% of those who were poorly qualified and entered at 2-year institutions graduated in the same timeframe. Although enrolling in a 4-year institution exerts a powerful effect, academic preparation seems to provide better chances to graduate from college regardless of port of entry. Even when students begin their post-secondary careers in the 2-year sector, those that are highly prepared have a 30% chance to earn a 4-year degree (see Figure 1).

Research indicates a pervasive national trend whereby postsecondary access and degree attainment is determined, to a large extent, by an individual's socioeconomic status (e.g., Astin, 1975, Breneman & Nelson, 1981, Cabrera & La Nasa, 2001; Horn & Kojaku, 2001; Terenzini, Cabrera & Bernal, 2001). Paths pursued by students to earn a bachelor's degree do, in fact, vary by socioeconomic status (see Figures 2 and 3). In sharp contrast to lowest-SES students, 59% of students from the highest SES background secured high academic resources. Additionally, 58% of all highest SES students first entered a 4-year institution regardless of their academic resources. Highest SES students are most likely to journey on the path of high academic resources and entrance at a 4-year institution. For them, the chances of degree completion are almost certain at 81%.




Socioeconomically disadvantaged sophomores follow pathways opposite to those traveled by their affluent counterparts. They are 35% less likely to be highly academically prepared for college. Of those with high academic resources, less than half enter a 4-year



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institution, and only 59% of these students earn a 4-year degree. In other words, compared to equally-prepared Highest-SES students who followed the same path, the chances of Lowest-SES sophomores to complete a degree are 22% less. Lowest-SES high school sophomores, however, are most likely to follow the pathway defined by medium academic resources and entrance at a 2-year institution; a pathway where the chance of securing a 4-year degree is less than 1%.

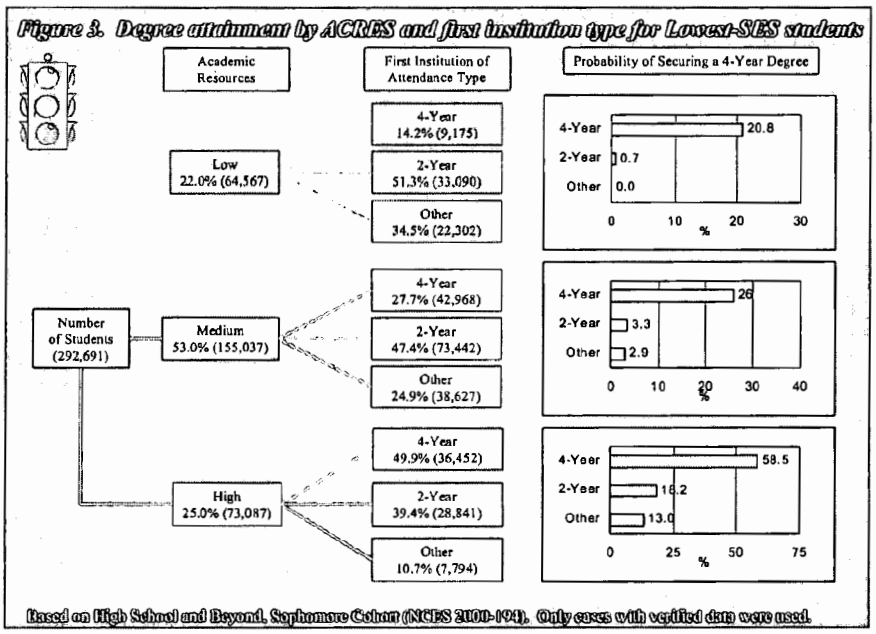

*Figure 3. Degree attainment by ACRES and first institution type for Lowest-SES students*

Based on High School and Beyond, Sophomore Cohort (NCES 2001-191). Only cases with verified data were used.

Students from high socioeconomic backgrounds appear to have a relative advantage over students from the lowest socioeconomic levels for most of the pathways to a college degree. In all but one path, students from the highest socioeconomic backgrounds are more likely to secure a 4-year degree than their disadvantaged peers, regardless of academic preparation or port of entry.

Nevertheless, the results are not entirely dismal for disadvantaged students—because these students display remarkable success along a very important path. Lowest-SES students who secure only minimal academic resources and enter a 4-year institution are approximately 11% more likely to secure a 4-year degree than their better-off peers that follow the same path. This fact speaks highly to these students' resilience to overcome the high hurdles they face.

While our descriptive examination of the High School Class of 1982 confirms an SES-based gap in postsecondary opportunities, the pathways to a four-year degree does not help us to form firm conclusions as to what helps Lowest-SES students overcome their substantially low odds of degree completion. We know that collegiate experiences and curricular choices matter, irrespective of a student's SES (e.g., Adelman, 1999; Montodon & Eikener, 1997). Yet, the nature and role of those collegiate experiences and their contribution to degree completion among socioeconomically disadvantaged students' remains to be examined (Terenzini, Cabrera & Bernal, 2001; Walpole, 2003).



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## Degree Completion

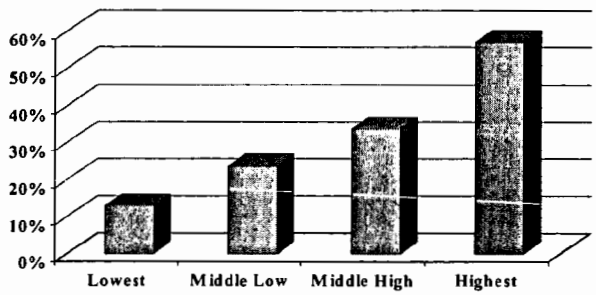
A growing body of literature indicates what happens to students *before and after* they enroll in college helps explain 4-year degree completion (e.g., Adelman, 1999; Astin, 1993; Cabrera, Nora, & Castaneda 1992; Gladieux & Swail, 2000; Horn & Kojaku, 2001; Pascarella & Terenzini, 1991; Terenzini, Cabrera, & Bernal, 2001; Swail, 1995; Tinto, 1997). This section examines degree completion by providing a synopsis of past research, descriptive statistics of the High School Sophomore Cohort of 1980, and results of our regression analysis for each factor.

Terenzini, Cabrera, and Bernal's (2001) comprehensive review of the literature informs us that low-income students are already handicapped by a variety of adverse factors while attending college. These factors include: low participation rates at the 4-year sector; enrolling on a part-time basis; delayed enrollment after high school completion; working full-time; dropping, withdrawing from, or not completing college credits; and being a parent. Of the 1980 High School Sophomores who went on to postsecondary education, almost half first enrolled at a 4-year institution (see Table 6). However, the 4-year participation rate among Lowest-SES students in this group is strikingly low compared to students for all other SES categories. The 4-year college participation rates for Lowest-SES students lags behind that of Highest-SES students by 37% (see Table 6).

Insert Table 6

As we examine degree completion rates for the 1980 High School Sophomore Cohort, we a find a moderate, but positive association between a student's socioeconomic background and her chances of earning a bachelor's degree ($r$=.335). Two important trends underlying degree completion rates across SES quartiles are evident: 1) the gap in degree completion rates across SES quartiles substantially increases as one moves up the SES ladder, and 2) Highest-SES students are 44% more likely to earn a college degree than Lowest-SES students (see Figure 4).

**Figure 4. Observed probabilities of degree completion by 1993 for the High School Sophomore Cohort of 1980 (by SES).**




Note: Estimates are based on the High School and Beyond:80 (sophomore cohort). Panel weight PSEWT1. ($r$=.335).

Encouragement

Development of degree aspirations as early as the 8th grade, securing high school academic qualifications, applying for college, and successful adjustment to college are related to the extent to which the student receives encouragement from parents, high school personal, and important high school friends (e.g., Cabrera, Nora & Castaneda, 1992; Cabrera & La Nasa, 2001; Flint, 1992; Hossler, Schmitt & Vesper, 1999). This type of encouragement takes different forms, including motivational support, saving for college, and being involved in school activities (Cabrera & La Nasa, 2001). Encouragement received while in high school is key for subsequent college enrollment. Perna (2000), for instance, noted that parental involvement in school activities predicts whether the student would enroll at a 4-year college or university following high school graduation.

Some research suggests encouragement varies by SES. King (1996) observed that low-income high school seniors uncertain of whether their parents approved of their postsecondary plans were less likely than their better off peers to aspire to attend a 4-year institution. Saving for college provides the student a clear indication their parents are committed to their postsecondary education (Flint 1992, 1993). The amount of saving correlates with SES, as well. Miller (1997) reported that less than 33% of low-income parents saved enough money to cover more than 10% of their children's college education costs. Parental involvement also varies by SES. Cabrera and La Nasa (2000) reported that Lowest-SES parents were less likely to participate in school activities.

Our analysis of the 1980 High School Sophomore Cohort reveals that a student's likelihood to receive encouragement to secure a college degree from parents, high school personnel, and high school friends was related to his/her socioeconomic background. As a whole, Highest-SES students received more encouragement, while the reverse is true for Lowest-SES students. This encouragement-SES association ranged from .13 to .248. Ninety-three percent of Highest-SES students reported their parents encouraged them to pursue a college degree. In contrast, 69% of Lowest-SES students were similarly encouraged. While 77% of Highest-SES students reported encouragement from high school professionals, only 61% of Lowest-SES students reported receiving this sort of encouragement. The SES-based encouragement gap is even more pronounced when encouragement originates from high school friends. Less than 50% of Lowest-SES students were encouraged by their high school friends to earn a college degree, whereas over three-fourths of Highest-SES students were encouraged by their friends to become a college graduate (see Table7). Given the connection between encouragement and success in college, this SES-encouragement association is troublesome.

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Insert Table 7

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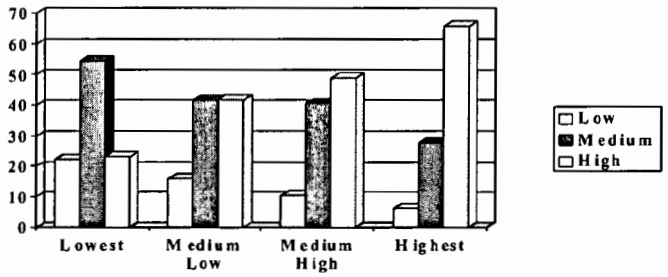
Academic Resources

Adelman (1999) demonstrated that securing high school-based academic resources substantially increases a student's chance to complete a bachelor's degree within eleven years of

high school graduation. We find a moderate association between SES and the level of academic resources among 1980 High School Sophomores who enrolled in higher education ($r$=.216). Lowest-SES students were less prepared. While 66% of Highest-SES students were highly prepared academically for college, merely 23% of Lowest-SES students enjoyed the same level of academic preparation (see Figure 5).

Figure 5. Academic resources among 1980 High School Sophomores across SES.



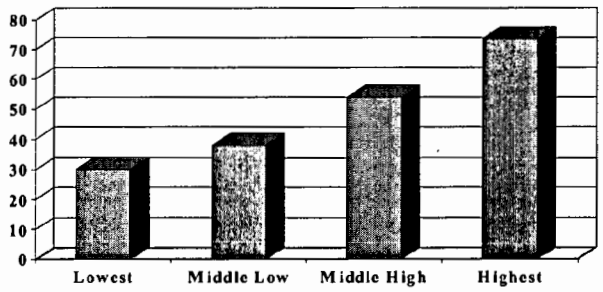

Note: Estimates based on 1980 High School Sophomores (r=.216).

Degree Aspirations

Aspiring for a 4-year college degree as early as the 8th grade enables middle school students, high school students, and their families to ready themselves for college (Cabrera & La Nasa, 2001). Students aspiring for at least a 4-year degree are predisposed to take the appropriate course curriculum, complete high school, apply to college, enroll, and eventually graduate (e.g. Adelman, 1999, Cabrera & La Nasa, 2001; St. John et. al, 2000). Some research indicates SES can moderate degree aspirations. While examining degree aspirations among 1988 middle school students, Terenzini, Cabrera, and Bernal (2001) found a difference of 29% between Lowest-SES and Highest-SES students' aspirations for at least a college degree.

As is the case for the 1988 middle school student cohort, we find significant SES-based differences in aspiring for a 4-year degree among 1980 High School Sophomores who entered post secondary education during the 1982-83 academic year (r=.335). As the SES level increases, so does the chance to develop college degree aspirations by the senior year in high school. The SES-based gap in degree aspirations is astounding. Seventy percent of the Lowest-SES students who attended postsecondary education did not aspire for a college degree while a high school senior. This pattern is reversed among Highest-SES students, whereby 74% of them had developed college aspirations before entering postsecondary education. In other words, Lowest-SES students were 44% less likely to aspire to a four degree than Highest-SES students (see Figure 6).

**Figure 6. Degree aspirations by SES for the 1980 High School Sophomores.**




Note: Estimates are based on the High School and Beyond:80 (sophomore cohort). Panel weight PSEWT1. (r=.335).

SES and Curricular Choice, Academic Success, and Collegiate Experiences

The degree to which a student engages with the different components of a college or university plays a key role in her cognitive and affective development (e.g. Kuh, Douglas, Lund, & Ramin-Gyurnek, 1994). These positive collegiate experiences shape the extent to which a student successfully adjusts to college (e.g. Cabrera, Nora, & Castaneda, 1992; Nora, Cabrera, Hegedorn, & Pascarella; 1996; Pascarella & Terenzini, 1991). Research has singled out several defining elements including: classroom experiences, interactions with faculty, interaction with peers, working on campus, involvement with college curriculum, and maintaining adequate academic performance (Pascarella & Terenzini, 1991). The effort a student spends on academically related issues, such as maintaining adequate academic performance, seeking out and engaging faculty inside and outside the classroom, and curricular choices, is an important determinant of educational outcomes (Astin, 1993; Cabrera, Colbeck, & Terenzini, 2001; Kuh, Douglas, Lund, Ramin-Gyurnek, 1994). These important outcomes include critical thinking, gains in competencies, clarity in vocational aspirations, and persistence.

Associated with these purely academic related activities, on-campus work positively impacts persistence and degree completion (Hossler, 1984; Stampen and Cabrera, 1986, 1988; Olivas, 1985). Students who work on campus are more likely to interact with faculty and peers, develop transferable work skills, and become more integrated into the academic and social components of the institution. How the above factors play a role in degree completion is largely unknown. However, given the connection between persistence and collegiate experience, on the one hand, and persistence and degree completion, on the other, the connection between these collegiate experiences and degree completion is plausible.

The degree of association between SES and collegiate experiences ranges from .007 to .239, signifying a relationship ranging from non-existent to moderately low (see Table 8). The degree of association between GPA and SES is significant, but rather small ($r = .112$). As a whole, Lowest-SES students had a GPA one quarter lower than the one exhibited by Highest-SES students. Of the non-academically related collegiate experiences, whether the student had

an on-campus work position was found to be somewhat significant ($r$=.119). SES-based differences are noted here as well, with Lowest-SES students being 13% less likely to work on campus than Highest-SES students. SES-based differences with out-of-classroom experiences, quality of instruction, counseling and institutional prestige, though significant in absolute value are, almost non-existent. What defines the nature of collegiate experiences between Lowest-SES students and their better off counterparts the most is the intensity of curriculum in math and sciences. The gap in the likelihood of taking at least one math and science course between Lowest-SES and Highest-SES is striking; on average, a Lowest-SES student is 36% less likely to take college math courses and 32% less likely to take college sciences courses than his/her Highest-SES counterpart.

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Insert Table 8

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College Path

Popular belief holds that most students follow the same, straightforward path through college. Dubbed the "persistence track" by Carroll (1989), this path assumes entrance into a 4-year institution the fall following high school graduation, enrolling full-time for four years, and then graduating with a 4-year degree. Mounting research challenges this belief. Examining the college paths among members of the high school class of 1980, Carroll (1989) reported that one out of five students delayed entry into postsecondary education, entered less than 4-year institutions, and enrolled part-time. Using the same cohort of students, Hearn (1992) identified 13 college path patterns based on the combinations of three factors: delayed entrance, part- versus full-time enrollment, and first type of institution attended. Furthermore, he reported that the choice of one of these paths was highly conditioned by a student's socioeconomic background, degree aspirations, and academic preparation for college. In general, nontraditional college paths were chosen most by socioeconomic disadvantaged students, poorly prepared for collegiate work, and with low degree aspirations.

Adelman's (1999) analysis of the college path patterns followed by the High School Sophomore Cohort of 1980 further proves students' trek through higher education for a rather large number of students is quite complex. Having examined college transcripts, Adelman found most college students do not graduate within four years. Moreover, a considerable proportion of high school students delay college entrance. Taking into account only those students who earned a minimum of 10 college credits, Adelman reported that 19 % of all high school graduates do not enroll in college immediately following high school graduation. Further examination by Adelman of the High School Sophomore Cohort of 1980 showed that only 53% initially enroll at a 4-year institution, and only 46% remain solely within the 4-year sector.

While a variety of college paths to degree completion exist (Adelman, 1999; Carroll, 1989; Hearn, 1992), some are riskier. Challenging commonly held perceptions, Adelman (1999) did not find transfer *per se* to be a problematic college path behavior. He found many members of the High School Sophomore Cohort of 1980 transferred or alternated enrollment among institutions, yet still managed to secure a college degree within 10 years of high school

graduation. What matters, though, are part-time enrollment and the effort spent in earning college credits. Adelman demonstrated that failing to maintain continuous enrollment along with dropping, withdrawing from, and not completing college courses are the two riskiest college paths to a 4-year degree.

Our examination of the college paths followed by members of the 1980 High School Sophomore Cohort shows Lowest-SES students are indeed more prone to follow at-risk paths. Only 30% of Lowest-SES students enter higher education at the 4-year sector, a trend in sharp contrast to the 67% participation rate exhibited by Highest-SES students (see Table 5). Slightly less than half of Lowest-SES students enroll on a continuous basis, while 71 % of Highest-SES do. Forty-one percent of Lowest-SES students dropped, withdrew from, or left incomplete 10% or more of their college courses. This is in contrast to the 32% of Highest-SES students who engaged in this at-risk behavior (see Table 9).

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Insert Table 9

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Financial Aid

Some researchers have examined persistence in college as the by-product of economic decisions (e.g. Manski & Wise, 1983; St. John, 1990; St. John, Andrieu, Oescher, & Starkey 1994; Stampen & Cabrera, 1986, 1988). Under this scenario, a student persists to the extent social and economic benefits of attending college outweigh the costs and benefits associated with alternative activities (e.g. working full-time). Higher costs of attendance relative to students' perceptions of their ability to pay could influence their decision to drop out, particularly if the costs of attending college far exceed future benefits (Becker, 1964). Reduced tuition, direct grants, low interest loans, and subsidized work-study programs all seek to equalize (if not increase) the benefits of attending college relative to its costs (Bowen, 1977; Cabrera, Stampen, & Hansen, 1990; St. John, 1994).

Research into the effect financial aid plays on degree completion is contradictory. Nora (1990), Voorhees (1987), and St. John (1990) found all forms of federal support equally effective in preventing students from dropping out. However, Stampen and Cabrera (1986, 1988) found persistence rates were highest when student aid packages included work-study programs. More recently, Adelman (1999) reported grant-in-aid and loans had a small but positive contribution to the probability of securing a college degree. On the other hand, Astin (1975) found grants and work-study programs had positive effects on persistence, while loans had negative effects when directed to low-income students. St. John's (1991) comprehensive review of 25 years of research on the effect of financial aid led him to conclude reception of financial aid has a positive effect on persistence to graduation regardless of the type of financial aid. He also noted inconstancies could be attributed to methodological problems in terms of analytical models followed, the use of institutional databases versus national databases and levels of controls.

We find SES-differences in terms of financial aid received. Slightly more than half of the Lowest-SES students received grants-in-aid, whereas 36% of Highest-SES students received this

kind of aid (see Table 10). This finding is consistent with Stampen & Cabrera's (1988) study of the manner student aid was targeted in the early 1980s. SES-based differences in the reception of loans are also noted ($r$=.059); however, these differences are rather small, and a clear trend is not seen. While Lowest-SES students are as likely to rely on loans as are students from the middle two SES groups, Highest-SES students receive loans to a lesser degree. Regarding satisfaction with cost of attending, the same mixed effect is seen: differences among SES groups are rather small, and no clear trend unfolds.

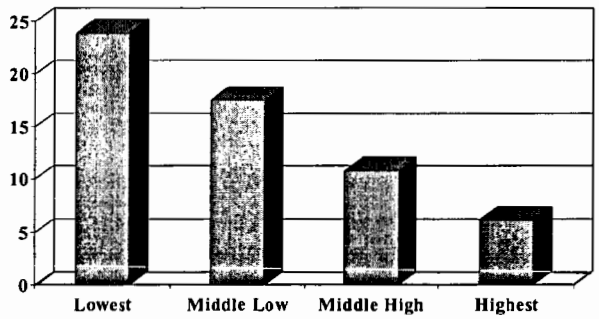
Insert Table 10

Parental Responsibilities

Having children while attending college has been identified out as another risk factor for persisting in college to degree completion. Nora, Cabrera, Hagedorn, and Pascarella (1996) reported family responsibilities had the effect of competing with the academic and social components of the institution, thereby lessening a student's engagement in the college experience, intellectual development, and subsequent persistence. Adelman (1999) adds that having children while attending college lessens one's chances of completing a college degree within ten years upon high school graduation. While the above findings are true for all students, the extent to which this at-risk behavior is present among Lowest-SES students has not been examined.

For our student population, we find Lowest-SES students are indeed more prone to having children prior to receiving a college degree. Twenty four percent of Lowest-SES students reported having at least one child by age 23 (see Figure 7). This number is 18%, 11%, and 5% greater than the ones reported by Highest-SES, Middle-High SES, and Middle-Low SES students, respectively.

**Figure 7. Percentage of 1980 High School Sophomore Cohort enrolled in college who had parental responsibilities by 1986 (by SES).**



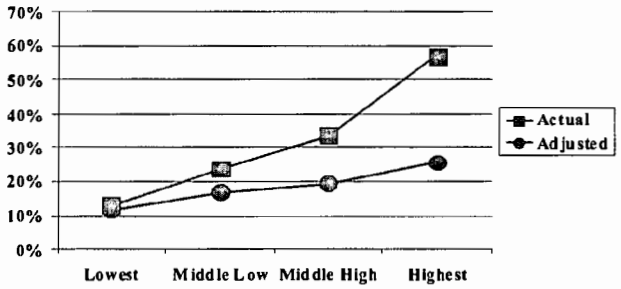

Note: Estimates are based on the High School and Beyond:80 (sophomore cohort). Panel weight PSEWT1. (r=.191).

**Degree Completion**
Logistic Regression Analysis

SES

By 1993, 35% of the 1980 High School Sophomore Cohort earned a college degree. Among Lowest-SES students, merely 13% managed to do so. In contrast, 57% of Highest-SES students completed their college degree. Descriptive statistics underscore other significant differences between Lowest-SES and Highest-SES students in factors known or presumed to be critical in securing a 4-year college degree. Once the effect of these degree-related factors is taken into account in a simultaneous manner, the 44% degree completion gap between Highest- and Lowest-SES students is reduced to 24% (see Table 5 and Figure 8).

**Figure 8. Adjusted probabilities of degree completion by 1993 for the 1980 High School Sophomore Cohort (by SES).**




Note: Estimates are based on the High School and Beyond: 80 (sophomore cohort). Panel weight PSEWT1. (r=.335).

Encouragement

Encouragement matters in a student's chances of getting a college degree. Irrespective of SES, students who received encouragement from parents and friends to pursue a college degree while in high school were more likely to complete this goal. Compared with students whose parents did not encourage them to pursue a college degree, those who did receive parental encouragement increased their chance of degree completion by 4%. The impact of high school peer encouragement is similar, increasing degree completion chances by 5% (see Table 5).

Academic Resources

Consistent with Adelman (1999), we find academic resources to have a substantial effect on degree completion across all SES groups. Compared to students poorly prepared academically, moderately and highly prepared students were 4% and 12% more likely to complete a college degree within 10 years of graduating from high school, respectively (see Table 5). The effect of academic preparation among Lowest-SES students is even more

pronounced. Being moderately prepared or highly prepared for college increased their chances to secure a degree by 19% and 32% for this SES group, respectively (see Table 5).

College Aspirations

Aspiring for a college degree is a good predictor of eventual college degree completion. Across all SES quartiles, students with college degree aspirations while still in high school were 23% more likely to do so, as compared with students without such aspirations. SES moderates the effect of collegiate aspirations. While all students benefit from this factor, Middle Low-SES students benefit the most. Lowest-SES students holding degree aspirations while in high school increase their chances of completing a degree by 22%. Middle Low-SES, Middle High-SES, and Highest-SES students increase their degree completion chances by 43%, 16%, and 26%, respectively (see Table 5).

Curricular Choice, Academic Success, and Collegiate Experiences

While most collegiate experiences increase the rate of degree completion across all students, academic performance in college (GPA) is the most significant factor. Across all students, every increasing grade change in GPA increases the chances to complete a college degree by 32%. SES also moderates the effect of GPA. For example, among Lowest-SES students, changes in GPA increase degree completion rates by 28%, while among Middle Lowest-SES students the size of the effect is 49% (see Table 5).

Curricular choices are crucial. Students who take only one college math course increase their degree completion chances by 27%. Those who take only one-college science courses increase their degree completion chances by 21%. The impact of taking college math courses is particularly noteworthy. For all students, taking three college math courses increases degree completion rates by 42%. Additionally, the impact of taking college math and science courses among Lowest-SES students is striking. For this group, taking one, two, or three or more college science course increases their chances of degree completion by 25%, 26%, and 42%, respectively. Lowest-SES students taking one, two, or three or more college math courses increase their chances of degree completion by 3%, 34%, and 57%, respectively (see Table 5).

Out-of-classroom experiences, quality of instruction, counseling, institutional prestige, and working on campus have small, but significant effects on degree completion. For all students, positive out-of-classroom activities increases degree completion chances by 8%, and exposure to good classroom instruction does so by 8% as well. The quality of instruction is particularly relevant for Lowest-SES students whose probability to persist to graduation increases by 15% when taught effectively. Working on campus also helps. Every additional year of on-campus work increases his or her chances of completing a degree by 2% (see Table 5).

College Path

The first type of postsecondary institution attended, continuous enrollment in college, and maintaining enrollment in college courses are also important factors in degree completion. For

all students, those who first enroll in a 2-year institution are 18% more likely to earn a college degree than those who enroll at a proprietary school. Those who enroll in a 4-year institution are 46% more likely to earn a college degree. The effect of the first type of institution attended is particularly strong for Lowest-SES students. For this group, enrollment at a 2-year institution helps, but starting at a 4-year institution helps even more. Lowest-SES students who started in a 2-year institution increase their chances by 46%. Lowest-SES students who first enroll in a 4-year institution saw their chances to complete their 4-year degree by 69%. Students who do not maintain continuous college enrollment are 23% less likely to earn a bachelor's degree. Those who drop, withdraw from, or fail to complete between 10%-20% of their coursework are 13% less likely to secure a baccalaureate degree. Dropping, withdrawing from, or failing to complete more than 20% of the coursework reduces a student's chances to complete a degree by 27% (see Table 5).

Financial Aid

For all students, receiving grants-in-aid and loans increases chances of completing a 4-year degree. Recipients of grants-in-aid are 7% more likely to earn a degree, while loan recipients are 10%. SES also moderates the impact of financial aid, particularly for loan recipients. Lowest-SES and Middle Low-SES students receiving loans increase their degree completion chances by 11% and 30%, respectively (see Table 5).

Parental Responsibilities

Incurring parental responsibilities while pursuing a college degree hampers ones chances of degree completion by 22%. This negative effect is felt most by Highest-SES students for whom having children by age 23 decreases their degree completion chances by 46% (see Table 5).

## Discussion

Pathways to a Four-Year Degree

A high school graduate faces nine pathways to a college degree. These pathways result from several degrees of academic preparation for college and the type of postsecondary institution first attended. Not all these paths are equally effective in leading to a 4-year degree. When students follow the pathway of having high academic resources and choosing a 4-year institution as their port of entry, their chances of eventually securing a 4-year degree within a decade are considerable (78%). No other pathway is nearly as effective. When a student enters postsecondary education at the 4-year sector and is only moderately academically prepared, his or her chances of earning a 4-year degree are only 35%. Even more difficult is the pathway for those students with poor academic preparation who enter at a 2-year institution. Their chance of earning a degree is only 10%.

Not all pathways are equally accessible to all students. Those traveling on the most successful pathways are most often Highest-SES students. Almost 60% of all Highest-SES sophomores have secured the highest level of academic resources before college enrollment. Of

those, 76% enroll in a 4-year institution. Overall, 45% of Highest-SES 1980 High School Sophomores followed the pathway defined by having high academic resources and enrolling at a 4-year institution. For them, the chances of degree completion are almost certain (81%). Lowest-SES sophomores follow pathways opposite to those traveled by Highest-SES sophomores. They are 35% less likely to be highly academically prepared for college. Of those with high academic resources, less than half enter a 4-year institution, and only 59% of these students earn a 4-year degree. In other words, compared to equally prepared Highest-SES students who followed the same path, the chances of Lowest-SES sophomores to complete a degree are 22% less. However, Lowest-SES high school sophomores are most likely to follow the pathway defined by medium academic resources and entrance at a 2-year institution; a pathway where the chance of securing a 4-year degree is only 3%.

Determinants of Degree Completion

By 1993, 3 out of 10 members of the 1980 High School Sophomore Cohort graduated from college with a baccalaureate degree. Out of 100 Lowest-SES students, merely 13 graduated with a 4-year degree by 1993. In the same period, 57 out of 100 Highest-SES students graduated. The 44% SES-based gap between Lowest- and Highest-SES students decreased to 24% once demographic, collegiate aspirations, academic resources, collegiate experiences, college path, college curriculum, and financial aid factors are taken into account along with SES. Despite mitigating high school and college based-factors, an SES-based effect persists. However, factors other than SES help equalize chances to earn a bachelor's degree between Lowest-SES students and their better off counterparts. These mitigating factors produce significant effects for degree completion, regardless of SES.

Pre-college factors, college path factors, and collegiate-related factors play significant roles in facilitating degree completion. Of pre-college factors, high school-based academic resources and degree aspirations are the defining ones. The net added probability of earning a college degree by securing high school-based academic resources and aspiring for at least a bachelor's degree is 31%, irrespective of socioeconomic background.

Consistent with the literature (Carroll, 1989; Hearn, 1991, 1992; Adelman, 1999), paths followed in postsecondary education greatly affect a 1980 High School Sophomore's chances of getting a 4-year degree. Opting for a 4-year institution as the port of entry to postsecondary education yields a net benefit of 46% in one's chances of completing a degree, regardless of socioeconomic background. Among Lowest-SES students, the effect of attending a 4-year institution is more pronounced, yielding a 69% increase in the likelihood of graduating with a bachelor's degree within a decade (see Table 5).

Of the collegiate experiences factors, continuous enrollment, academic performance, and a curricular emphasis on math and science are the most important determinants of degree completion. The effort a student spends in maintaining continuous enrollment in both postsecondary institutions and in his/her program courses enhances chances to graduate by 23% and 27%, respectively (see Table 5). For example, if a student maintains continuous enrollment and does not drop, withdraw from, or leave incomplete more than 10% of his or her courses, chances of degree completion increase 35%.

For every unit increase in GPA, a student's chances to secure a degree increase by 32%. Taking one, two, or three or more college math courses increases this probability by 27%, 29%, and 42%, respectively. For science courses, the corresponding effects are 21%, 21%, and 29% for one, two, or three or more courses, respectively (see Table 5). The joint effect of academic performance and curricular choices is particularly noteworthy. For example, a student who was academically prepared, aspired for college, maintained a 'C" average, and took one math and science course has a net increase in the probability of degree completion of 36%. If that same student had maintained a "B" average, his/her chances of securing a degree increase to 68%. This is in stark contrast to a student who did not take any math or science courses while still maintaining a "B" average. His/her degree completion chances drop to only 23%. "C" average students with no math or science courses have only a 7% chance of graduating with a degree.

We also find financial aid policies enhanced 1980 High School Sophomores' chances of securing a bachelor's degree by 1993. Net of SES, receiving loans increases the chances to complete a bachelor's degree by 10%, while grants had a net added benefit of 7%. Interestingly, the effect of loans is particularly strong among Middle Low-SES sophomores. For this group, receiving loans increased the probability of completing a degree by 30% (see Table 5).

Positive experiences with the academic and social domains of the postsecondary institutions contributed to the students' chances of earning a 4-year degree. Students satisfied with their out-of-classroom experiences are 8% more likely to persist to graduation. Students satisfied with the quality of instruction feel the same level of benefit. Every year of working on campus yields a net benefit on this probability by 4% (see Table 5).

Limitations

Our conclusions are based on just one generation of students, those who were high school sophomores in 1980. During the last 20 years, school reform initiatives, changes in the composition of financial aid, and substantial technological and economic transformations have produced new generations for which the determinants of transfer and degree completion may be qualitatively different. We can tell the story of one single cohort; we cannot presume all their experiences to be applicable to subsequent cohorts.

Our study does not take into account some factors that affect the adjustment of the student with the institution, including the frequency and quality of the interactions with faculty and peers, exposure to different teaching practices, and out-of-classroom experiences (Astin, 1993; Checkering & Raiser, 1993; Tinto, 1993, 1997; Pascarella & Terenzini, 1991; Hurt ado, Milam, Clayton-Pedersen, & Allen, 1999; Kuh, Douglas, Lund, & Ramin-Gyurnek, 1994). The lack of measures on these factors may lead to an underestimation of the effect of collegiate experiences on transfer and degree completion.

During the last 20 years, a number of valid measures of collegiate experiences have emerged. These measures capture academic and intellectual development, commitments to the institution, engagement with different elements of the campus life, student effort, campus and classroom climates, and classroom experiences (Pace, 1980; Kuh, 2000; Pascarella & Terenzini,

1980; Cabrera & Nora, 1994; Nora & Cabrera, 1993; Kuh, Pace, & Vesper, 1997; Cabrera, Colbeck, & Terenzini, 2001). Though most of those measures were not available at the time the database was designed, future designers of national databases should consider their incorporation.

Our analyses highlight some characteristics of students who graduate; and at most, they offer just a glimpse as to why. Future research should include qualitative components to paint a more thorough picture of these phenomena.

Strengths

All factors included in the study were selected after a careful review of the literature. This literature review led us to conclude that studies seeking to bring a comprehensive perspective in examining persisting to degree completion ought to consider the following factors: a) demographic characteristics of the high school student, b) encouragement and support provided in high school, b) a high school student's early degree aspirations, c) acquisition of high school-based academic resources, d) performance in college, e) collegiate experiences, f) remediation courses taken, g) satisfaction with cost of attendance and type of financial aid received, and f) acquiring family responsibilities before completing a college degree.

Our study uses degree completion as the measure of collegiate success. As shown by Adelman (1999) persistence to degree completion is a more valid and reliable measure of a student's success in college than is year-to-year persistence rates. The economic and social benefits a student receives due to his or her collegiate experience is predicated on his/her completing a degree, not persisting from the first to second year of college.

Our use of a national database allowed us to track students from their sophomore year in high school to ten years post-high school graduation. The HS&B/So database contains a sufficiently large number of student cases allowing for generalization of results on a national level.

Our measures of academic resources, enrollment patterns, curricular choices, financial aid, and academic performance are based on verifiable student records, such as high school and college transcripts and financial aid records (Adelman, 1999). This feature increases the internal validity of our study while also ensuring the reliability of the relationships observed between these performance measures and transfer and degree completion.

Our conclusions regarding the nexus between SES and transfer and degree completion rest on sophisticated statistical analyses, rather than on simple descriptive statistics. Descriptive statistics tend to overestimate the connection between variables and fail to take into account the simultaneous effects of those factors also known to affect transfer and degree completion.

Data regarding satisfaction and student engagement with postsecondary education institutions were secured while the student was enrolled. We included statistical controls to make certain this was the case.

## Conclusions and Implications

This study underscores the importance of understanding the complex interaction of those factors shaping degree completion decisions as a precondition to developing intervention strategies. It also draws attention to the value of advanced statistical methods that single out the net effects of each of these factors. Though commonly used to inform policymaking, descriptive statistics may blind policy makers as to the importance of socioeconomic status as the sole determinant degree completion. The real danger of using descriptive statistics as the basis of policy analysis is that the choice of variables automatically defines the problem and the possible solutions.

Our study suggests factors other than SES play a larger role in successfully navigating the pathway to a college degree. As with countless generations, the path to a 4-year degree for members of the 1980 High School Sophomore Cohort began as early as the 8th grade (Cabrera & La Nasa, 2001; Wallace, Abel, & Ropers-Huilman, 2000). At this time, aspirations for college triggered the need to secure the academic preparation necessary to succeed in college. Those who met this task had ample choices in their quest for a college degree, regardless of their socioeconomic status. In view of the fact that preparation for college and degree aspirations are so intertwined (Cabrera & La Nasa, 2001), it makes sense that strategies addressing these two critical factors simultaneously are more likely to enable students and their families to navigate the right path to a college degree. Programs, such as TRIO and GEAR-UP, recognizing the fact academic readiness and degree aspirations is the by-product of the connections between a student's family with peers, the K-16 school system, and the larger community, seem most appropriate (Cabrera & La Nasa, 2001; Gladieux & Swail, 2000).

Curriculum is at the heart of academic preparation for college (Adelman, 1999). Policies geared at securing academic resources for college during the last few years of high school are inadequate. Rather, academic preparation for college should begin as early as the 8th grade. Our results suggest curriculum should be articulated to foster the development of critical competencies, values, and skills known to prepare the student to successfully undertake collegiate work. The competencies acquired through math and science courses made a difference for members of the 1980 High School Sophomore Cohort by fostering their chances to earn a college degree. Current emphasis on the use of testing to hold elementary and secondary institutions accountable will be successful only if tests themselves are valid measures of collegiate academic resources (National Research Council, 1999). Without this orientation, the testing regime will produce countless children able to answer test questions, but unable to perform successfully in college. Though our conclusions regarding the important nexus between high school and college is based on a single cohort who began its path to a four-year degree more than two decades ago, its story is remarkably similar to the one recently told by the most comprehensive study on the condition of k-12 across six states: middle high school students aspire to college, but lack the adequate preparation for college. In addition, those who attend are more prone to dropout out. Venzia, Kirst and Antonio (2003) blame the disconnections between k-12 and postsecondary education as the main culprit for the low levels of academic preparation found among economically disadvantaged and underrepresented students.

Policies that stress year-to-year persistence within one institution should be revised to emphasize persistence to degree completion across the entire higher education system. We join Adelman (1999) in this recommendation. After all, the benefits of a college degree are universal, regardless of where the degree was obtained (Pascarella & Terenzini, 1991). This change in policy would also recognize the increasingly transient nature of today's college student population. As Adelman (1999) noted, only 43% of all college students remained at the first institution attended; however, 63% of the same students persisted to degree completion in the entire higher education system.

The use of the of the year-to-year persistence rate as a criterion of success leads institutions to enact intervention strategies with short-term gains which miss the real causes of disengagement with the postsecondary system. Simply counting all students who failed to return to a specific institution for their sophomore year as dropouts ignores the multidimensional nature of college withdrawal behavior (Tinto, 1987, 1993). Mallette and Cabrera (1991) estimate that about two-thirds of all students counted as dropouts actually transferred to another institution. Counting non-returnees as dropouts also ignores the fact that factors influencing withdrawal, transfer, and stop-out decisions are different (Mallette and Cabrera, 1991). Emphasis on freshman persistence has another drawback: it detracts attention from the realization that degree completion is the result of a longitudinal process. For many students, the roots of the freshman dropout rate go back as far as the 8th grade (Adelman, 1999; Cabrera & La Nasa, 2001).

Enrollment management should begin in grade school. Interventions can be designed with at least three groups in mind: students, their families, and K-12 school personnel. Community colleges and 4-year institutions can help educate students and their parents about the benefits associated with college degree completion. They can advise students and parents about K-12 curricular choices that position a student to be academically prepared for college. College personnel can best provide information about the college application process, including financial aid. Colleges and universities are also best equipped to tell parents and children what college is all about. Summer camps, summer bridge programs, and targeted visits are some strategies already in place for 11th and 12th graders. Making these opportunities available as early as the 8th grade is one mechanism to bring early awareness for college, particularly among Lowest-SES students and their families.

Intervention strategies aimed at K-12 can touch several key domains. To begin, colleges and universities can work with elementary and secondary schools in aligning curriculum with competencies, experiences, values, and skills deemed essential for future collegial work. Universities can also assist impoverished school districts with faculty and resources to teach higher-level math as well as foundations in sciences (Adelman, 1999). K-12 personnel can also profit from the research and technical assistance colleges and universities can provide regarding effective instructional techniques and parental support mechanisms. These and other collaborative efforts are currently facilitated by initiatives such as GEAR-UP, a federal program that supports multiple partnership initiatives targeted to low-income 7th graders.

Learning and academic performance in college leads to degree completion. These outcomes are best fostered when university personnel create contexts and environments that enhance student engagement with the academic and social components of the institution (Astin,

1993: Kuh, Douglas, Lund, Ramin-Gyurnek, 1994; Tinto, 1987, 1993). Learning communities are one of the promising intervention strategies. They seek to maximize student engagement in academically purposeful ways by increasing academic and social involvement through collaborative learning (Gablenick, MacGregor, Matthews, & Smith, 1990; Lenning & Ebbers, 1999; Tinto, 1987, 1993). Our study shows that taking college level math and science courses significantly influences degree completion. What better way to foster a student's involvement with math and sciences than incorporating these two disciplines as part of the block scheduling underlying the use of learning communities?

Providing grants and loans on a need basis eases the pursuit of a 4-year degree. Because involvement in academic and social areas matters, institutions should develop finance mechanisms to help pay for college which also increase opportunities for student involvement (St. John, Cabrera, Nora, & Akser, 2000). Our results indicate that well-crafted forms of working on campus can be a viable way for students to pay for college while simultaneously being involved in academically purposeful activities.

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TABLES

Table 1. Weighted and unweighted sample sizes and proportions.

| SES | Postsecondary Education Participation Panel Weight (PSEWT1) | | UNWEIGHTED | |
|---|---|---|---|---|
| | N | % | N | % |
| Lowest | 407,772 | 17.3 | 3967 | 27.9 |
| Middle-Lowest | 526,214 | 22.3 | 3347 | 23.5 |
| Middle-High | 661,478 | 28.0 | 3443 | 24.2 |
| Highest | 764,332 | 32.4 | 3464 | 24.4 |
| Total | 2,359,796 | 100% | 14,914 | 100% |

Table 2. Concurrent Validity Matrix of Student Integration Model.

| | Academic Integration | | | Social Integration | Institutional Commitment |
|---|---|---|---|---|---|
| Variables | Academic & Intellectual Development | Faculty Concern | Interactions with Faculty | Peer-Group interactions | |
| Ability, Knowledge, and Professional Quality of Teachers | .389** | .452** | .274** | .075 | |
| Development of Work Skills | .418** | .398** | .367** | .091 | |
| Intellectual Growth | .489** | .319** | .221** | .194** | |
| Counseling or Job Placement | .094 | .193** | .151* | .132* | |
| Cultural Activities | .143* | .159* | .116 | .175 | |
| School Intellectual Life | .416** | .319** | .218** | .182** | |
| Course Curriculum | .345** | .297** | .237** | -.027 | |
| Quality of Instruction | .470** | .478** | .334** | .148* | |
| School Social Life | .218** | .134* | .149* | .551** | |
| Sports & Recreational Facilities | .010 | .099 | -.002 | .052** | |
| Buildings & Library Equipment | .156* | .225** | .132* | .052 | |
| School Prestige | .162* | .162* | .106* | .107 | .234** |
| Financial Cost of Attending | .219** | .140* | -.065 | .262** | .187** |

Source: Cabrera, A. F. (1987). Ability *to pay and college persistence.* Unpublished doctoral dissertation. University of Wisconsin – Madison, Madison, WI.

Table 3. Descriptive statistics for the variables employed in the degree completion logistic regression model.

| Variable | N | % Cell | Mean | S.D. |
|---|---|---|---|---|
| Degree completers | | | | |
| Yes | 842,493 | 35% | | |
| No | 1,566,633 | 65% | | |
| SES | | | | |
| Lowest | 407,772 | 17.3% | | |
| Middle Low | 526,214 | 22.3% | | |
| Middle High | 661,478 | 28.0% | | |
| Highest | 764,332 | 32.4% | | |
| Gender | | | | |
| Male | 1,104,772 | 45.9% | | |
| Female | 1,304,354 | 54.1% | | |
| Ethnicity | | | | |
| Hispanic | 148,991 | 6.3% | | |
| African American | 284,054 | 12.0% | | |
| Asian American | 43,241 | 1.8% | | |
| White | 1,893,474 | 79.9% | | |
| High School Encouragement | | | | |
| From parents | 1,732,304 | 81.3% | | |
| From high school professionals | 1,462,415 | 68.9% | | |
| From friends | 1,340,736 | 63.1% | | |
| Academic resources | | | | |
| Low | 264,253 | 12.6% | | |
| Medium | 821,194 | 39.2% | | |
| High | 1,010,646 | 48.2% | | |
| Degree aspirations | | | | |
| Aspired for a college degree | 1,245,822 | 52.4% | | |
| Type of first institution attended | | | | |
| Less than 2-year | 267,170 | 12.2% | | |
| 2-year | 894,437 | 40.8% | | |
| 4-year | 1,030,255 | 47.0% | | |
| Continuous enrollment | 1,309,733 | 61.8% | | |
| DWI Index | | | | |
| Less than 10% | 1,421,202 | 64.1% | | |
| 10%-20% | 331,286 | 14.9% | | |
| More than 20% | 465,666 | 21.0% | | |
| Number of math courses | | | | |
| None or missing | 1,402,992 | 58.2% | | |
| One | 344,003 | 14.3% | | |
| Two | 255,648 | 10.6% | | |
| Three or more | 406,483 | 16.9% | | |
| Number of science courses | | | | |
| None or missing | 1,416,027 | 58.8% | | |
| One | 267,874 | 11.1% | | |
| Two | 241,731 | 10.0% | | |
| Three or more | 483,496 | 20.1% | | |
| Collegiate experiences | | | | |
| Out-of-classroom experiences | 1,797,614 | | 3.70 | 0.778 |
| Instruction quality | 1,790,114 | | 4.08 | 0.699 |
| Counseling or job placing | 1,808,262 | | 3.39 | 1.078 |
| Campus facilities | 1,808,653 | | 4.00 | 0.971 |
| Institutional prestige | 1,811,500 | | 3.85 | 0.988 |
| Satisfied with cost | 1,074,637 | 59.3% | | |
| Financial aid | | | | |
| Loans 1982-86 | 887,943 | 36.9% | | |
| Grant-in-aid 1982-86 | 1,011,355 | 42.0% | | |
| Worked on campus | 1,397,574 | | 1.31 | 1.261 |
| Overall College GPA | 2,261,439 | | 2.52 | 0.895 |
| Had Children in 1986 | 301,067 | 13.1% | | |



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Table 4. Effects of background, encouragement, academic resources, performance in college, remediation, collegiate experiences, financial aid, and family responsibilities on the probability of degree completion.

| Factor | All | Socioeconomic Status | | | |
|---|---|---|---|---|---|
| | | Lowest | Middle Low | Middle High | Highest |
| SES[1] | | | | | |
| Middle Low | 0.439* | | | | |
| Middle High | 0.613* | | | | |
| Highest | 0.962* | | | | |
| Female | -0.198** | -0.974** | -0.312** | -0.200** | -0.089* |
| Ethnicity | | | | | |
| African American | 0.004 | -0.180 | -0.404* | -0.323* | 0.480** |
| Hispanic | -0.172* | -0.622* | 0.270 | -0.426* | 0.042 |
| Asian American | 0.787** | 1.903** | -0.285 | 0.446* | 0.980** |
| High School Encouragement[1] | | | | | |
| From Parents | 0.176* | -0.744 | 0.171 | 0.391* | -0.138 |
| From High School Professionals | -0.036 | -0.491 | -0.376 | -0.035 | 0.320* |
| From Friends | 0.223* | -0.272 | 0.669* | 0.633* | -0.366 |
| Academic Resources[1] | | | | | |
| Moderately Prepared | 0.187* | 1.154* | -0.821 | 0.347* | 0.315* |
| Highly Prepared | 0.497* | 1.702* | -1.459 | 1.128* | 0.370* |
| Collegiate Aspirations[1] | 0.938* | 1.300* | 1.841* | 0.644* | 1.267* |
| Type of First Institution Attended[1] | | | | | |
| 2-year Institution | 0.748* | 2.274* | 1.689* | -0.075 | 1.257* |
| 4-year Institution | 2.074* | 3.395* | 2.177* | 1.288* | 2.916* |
| Continuous Enrollment[1] | 0.942* | 1.487* | 1.634* | 0.658* | 1.068* |
| DWI Index[1] | | | | | |
| 10-20% of courses | -0.653* | 0.897 | -0.561* | -0.949* | -0.847* |
| At least 20% of courses | -1.746* | -3.340* | -1.270* | -1.968* | -1.630* |
| Number of Math Courses[1] | | | | | |
| One Course | 1.125* | 0.254* | 1.829* | 1.410* | 0.886* |
| Two Courses | 1.203* | 1.786* | 1.302* | 0.911* | 1.583* |
| Three or more Courses | 1.826* | 2.740* | 2.971* | 2.291* | 1.358* |
| Number of Science Courses[1] | | | | | |
| One Course | 0.844* | 1.395* | 0.993* | 0.808* | 0.361* |
| Two Courses | 0.852* | 1.468* | 1.116* | 0.792* | 0.668* |
| Three or more Courses | 1.181* | 2.107* | 1.541* | 1.486* | 0.655* |
| Collegiate Experiences[1] | | | | | |
| Out-of-Classroom | 0.346* | 0.089 | 0.742* | 0.479* | 0.154* |
| Quality of Instruction | 0.319* | 0.951* | 0.072 | 0.616* | 0.113* |
| Counseling | 0.038* | 0.420* | -0.335 | 0.095* | 0.086* |
| Campus Facilities | -0.120 | -0.437 | 0.208* | -0.162 | -0.118 |
| Institutional Prestige | 0.054* | 0.433* | 0.126* | -0.102 | 0.074* |
| Satisfaction with Costs[1] | -0.309 | 0.525* | -0.415 | -0.552 | -0.390 |
| Financial Aid | | | | | |
| Loans | 0.433* | 0.763* | 1.304* | 0.157* | 0.213* |
| Grants/Scholarships | 0.297* | 0.561* | 0.489* | 0.341* | 0.358* |
| Worked on Campus[1] | 0.160* | 0.156* | 0.124* | 0.390* | 0.037* |
| College GPA[1] | 1.329* | 1.536* | 2.162* | 0.785* | 1.895* |
| Having Children[1] | -1.276* | -3.864* | 0.771 | -1.439* | -2.353* |
| Intercept | -11.341 | -17.616 | -14.980 | -10.366 | -10.439 |
| Number of cases | 2,359,795 | 407,772 | 526,213 | 661,478 | 764,332 |
| Baseline $p$ | 0.354 | 0.129 | 0.236 | 0.336 | 0.570 |
| Model $X^2$, $df$ | 675,788,35** | 78,422,32** | 155,395,32** | 209,674,32** | 209,081,32** |
| PCP | 87.2% | 92.8% | 88.6% | 86.4% | 88.0% |

*$p$<.01 **$p$<.001

1. Effects of the variable were directionally tested.



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Table 5. Changes in the probability of degree completion due to background, encouragement, academic resources, performance in college, remediation, collegiate experiences, financial aid, and family responsibilities.

| Factor | All | Socioeconomic Status | | | |
|---|---|---|---|---|---|
| | | Lowest | Middle Low | Middle High | Highest |
| SES | | | | | |
| Middle Low | 0.106* | | | | |
| Middle High | 0.149* | | | | |
| Highest | 0.235* | | | | |
| Female | -0.044** | -0.076** | -0.052** | -0.043** | -0.022* |
| Ethnicity | | | | | |
| African American | | | -0.065* | -0.068* | 0.112** |
| Hispanic | -0.038* | -0.055* | | -0.088* | - |
| Asian American | 0.192** | 0.369** | | 0.105* | 0.209** |
| High School Encouragement | | | | | |
| From Parents | 0.041* | | | 0.092* | |
| From High School Professionals | | | | | 0.076* |
| From Friends | 0.052* | | 0.140* | 0.152* | |
| Academic Resources | | | | | |
| Moderately Prepared | 0.044* | 0.191* | - | 0.081* | 0.075* |
| Highly Prepared | 0.120* | 0.319* | - | 0.274* | 0.087* |
| Collegiate Aspirations | 0.229* | 0.223* | 0.425* | 0.155* | 0.255* |
| Type of First Institution Attended | | | | | |
| 2-year Institution | 0.183* | 0.461* | 0.390* | | 0.253* |
| 4-year Institution | 0.459* | 0.686* | 0.496* | 0.311* | 0.391* |
| Continuous Enrollment | 0.230* | 0.267* | 0.377* | 0.158* | 0.224* |
| DWI Index | | | | | |
| 10-20% of courses | -0.132* | - | -0.086* | -0.172* | -0.208* |
| At least 20% of courses | -0.267* | -0.124* | -0.156* | -0.270* | -0.364* |
| Number of Math Courses | | | | | |
| One Course | 0.274* | 0.031* | 0.422* | 0.339* | 0.193* |
| Two Courses | 0.292* | 0.340* | 0.296* | 0.221* | 0.296* |
| Three or more Courses | 0.419* | 0.567* | 0.622* | 0.497* | 0.268* |
| Number of Science Courses | | | | | |
| One Course | 0.206* | 0.245* | 0.219* | 0.196* | 0.085* |
| Two Courses | 0.208* | 0.262* | 0.249* | 0.192* | 0.151* |
| Three or more Courses | 0.287* | 0.420* | 0.355* | 0.355* | 0.148* |
| Collegiate Experiences | | | | | |
| Out-of-Classroom | 0.083* | | 0.157* | 0.114* | 0.037* |
| Quality of Instruction | 0.076* | 0.148* | | 0.148* | 0.027* |
| Counseling | 0.009* | 0.055* | | 0.022* | 0.021* |
| Campus Facilities | | | 0.040* | | |
| Institutional Prestige | 0.012* | 0.057* | 0.023* | | 0.018* |
| Satisfaction with Costs | | 0.071* | | | |
| Financial Aid | | | | | |
| Loans | 0.104* | 0.112* | 0.296* | 0.036* | 0.051* |
| Grants/Scholarships | 0.070* | 0.077* | 0.099* | 0.080* | 0.085* |
| Worked on Campus | 0.037* | 0.019* | 0.023* | 0.092* | 0.009* |
| College GPA | 0.320* | 0.279* | 0.493* | 0.190* | 0.328* |
| Having Children | -0.221* | -0.126* | | -0.229* | -0.458* |

Note: Only delta-ps associated with significant betas are reported. See Table 4 for significant betas.
*$p<.01$ **$p<.001$



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Table 6. First type of postsecondary institution attended for the High School Sophomore Cohort of 1980.

| Socioeconomic Status | First Type of Postsecondary Institution Attended | | |
|---|---|---|---|
| | Other | 2-year | 4-year |
| Lowest | 22.3% | 47.8% | 29.9% |
| Medium Low | 14.4% | 49.5% | 36.1% |
| Medium High | 13.7% | 42.5% | 43.9% |
| Highest | 3.9% | 29.2% | 66.9% |
| Overall | 12.0% | 40.4% | 47.6% |

NOTE: Estimates are based on the HSB/So panel weight PSEWT1 that estimates participation in postsecondary education and degree attainment for the whole 1980 population cohort of high school sophomores (n=2,155,164).

Table 7. Differences in encouragement across SES (proportions comparison).

| Encouragement | Socioeconomic Status (in quartiles) | | | | | |
|---|---|---|---|---|---|---|
| | Lowest | Middle-Low | Middle-High | Highest | $F/X^2$ | $r$ |
| Parental | 68.8% | 71.1% | 83.6% | 92.7% | 131125.46, p<.001 | .248 |
| High School Professionals | 61.3% | 63.5% | 68.9% | 76.7% | 35994.37, p<.001 | .130 |
| Friends | 47.7% | 54.2% | 64.9% | 75.5% | 98,770.08, p<.001 | .216 |

Table 8. Differences in collegiate experiences and curriculum patterns across SES (means and proportions comparison).

| Variable | Socioeconomic Status (in quartiles) | | | | | |
|---|---|---|---|---|---|---|
| | Lowest | Middle Low | Middle High | Highest | $F/X^2$ | $r$ |
| GPA | 2.33 | 2.51 | 2.49 | 2.65 | 11143.99, p<.001 | .112 |
| Out of classroom experiences | 3.61 | 3.64 | 3.65 | 3.83 | 9114.92, p<.001 | .108 |
| Quality of instruction | 4.05 | 4.11 | 4.04 | 4.09 | 961.74, p<.001 | .007 |
| Counseling | 3.36 | 3.44 | 3.31 | 3.43 | 1472.62, p<.001 | .011 |
| Campus facilities | 3.97 | 3.97 | 9.97 | 4.06 | 1155.36, p<.001 | .035 |
| Institutional prestige | 3.81 | 3.81 | 3.81 | 3.94 | 2451.29, p<.001 | .051 |
| Worked on campus | 27.5% | 32.9% | 42.9% | 40.7% | 33522.06, p<.001 | .119 |
| Enroll in at least 1 Math course | 23.7% | 33.6% | 41.5% | 59.3% | 164,528.54, p<.001 | .264 |
| Enroll in at least 1 Science course | 24.4% | 33.9% | 41.1% | 56.7% | 134,332.16, p<.001 | .239 |



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Table 9. College paths of the 1980 High School Sophomore Cohort across SES.

| Variable | Lowest | Medium Low | Medium High | Highest | $X^2$ | $r$ |
|---|---|---|---|---|---|---|
| Continuous enrollment | 48.4% | 58.7% | 59.5% | 71.3% | 44989.59 $p < .001$ | 0.147 |
| Percentage of courses dropped, withdrew or left incomplete | | | | | | |
| Less than 10% | 58.9% | 64.3% | 62.0% | 68.3% | | |
| 10% - 20% | 14.7% | 15.8% | 14.8% | 15.0% | 17288.64 | |
| More than 20% | 26.4% | 19.9% | 23.2% | 16.7% | $p < .001$ | -.066 |

Table 10. Financial aid factors for the 1980 High School Sophomore Cohort across SES.

| Variable | Lowest | Medium Low | Medium High | Highest | $X^2$ | $r$ |
|---|---|---|---|---|---|---|
| Satisfied with Cost of Attending | 60.0% | 63.7% | 59.1% | 57.0% | 4475.84, $p<.001$ | .023 |
| Received Grants Between 1982-86 | 53.5% | 44.6% | 41.3% | 36.2% | 34095.21, $p<.001$ | -.118 |
| Received Loans between 1982-86 | 38.9% | 36.5% | 40.7% | 33.6% | 8343.610, $p<.001$ | .059 |



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