Educational Outcomes of Occupational Postsecondary Students

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Executive Summary

The Carl D. Perkins Vocational and Technical Education Act of 1998 was designed to improve vocational education (called “occupational education” henceforth) at both the secondary and postsecondary levels. For postsecondary occupational education, the Perkins legislation focuses particularly at the sub-baccalaureate level. The legislation requires institutions to measure and evaluate student outcomes. Therefore, an important factor to understand is whether students in occupational programs persist in postsecondary education and attain degrees at rates similar to their academic peers. Much of the literature on college persistence and completion is focused on baccalaureate students and pays little attention to sub-baccalaureate students, let alone their program of study. This report addresses both the research needs of the Perkins Act and helps fill the void in the literature by estimating the determinants of persistence and completion of educational goals at the sub-baccalaureate level, with particular emphasis on the effects of a student’s program of study.

Our research asked whether sub-baccalaureate occupational students are more or less likely than other types of postsecondary students to achieve their educational goals. We used three national longitudinal datasets, the Beginning Postsecondary Students Longitudinal Studies of 1989–1994 (BPS89; NCES 1996) and 1996–2001 (BPS96; NCES) and the National Education Longitudinal Study (NELS; NCES), all prepared by the National Center for Education Statistics. We identified three populations of postsecondary students according to their credential goal: certificate diploma, associate degree or bachelor’s degree. Students were categorized within these populations by both their stated goal and the type of institution in which they were enrolled. We further subdivided these populations into occupational and academic students. We then developed a model of the factors that predict outcome attainment for postsecondary students. This model includes student characteristics such as gender, race, age, socioeconomic status (SES), and academic skills as well as information about the timing and sequencing of a student's educational experience.[1] Therefore, in conjunction with the analysis of the outcomes of occupational education, we generated results about the effects of demographic, academic and pathway characteristics on educational goal achievement.

The definition of successful outcome attainment depends on students' goals. Certificate students are considered successful completers if they (a) earn a certificate or higher degree or (b) transfer to the baccalaureate level within the observed period of enrollment.[2] Associate students are successful if they (a) earn an associate or higher degree or (b) transfer to the baccalaureate level. Students in the baccalaureate group are considered completers only if they earn a bachelor's degree in the allotted period. Table I shows the rates of completion and noncompletion for the three postsecondary populations. Each group is also divided between academic and occupational students.

The first two columns in table I suggest that the three populations of postsecondary students attain their degree goals at different rates:

- Baccalaureate students are the most likely to achieve their goal, even though it is the most difficult to achieve when measured by length of program. For all baccalaureates,

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[1] Delayed enrollment, part-time attendance, interruptions and working while enrolled are all timing and sequencing factors. Collectively, we refer to them as pathway features.

[2] We observed students for five years in BPS89 and for six to eight years (depending on initial enrollment) in NELS.

completion rates are nearly 60 percent for BPS89 and almost 75 percent for NELS (higher rates in NELS are expected because of the longer period of observation).

Table I

Completion of Degree Goals

Certificates	All		Occupational		Academic	
	BPS	NELS	BPS	NELS	BPS	NELS
Non-Completers: No Degree/Certificate or Still Enrolled	46.8	32.0	46.0	31.7	--[1]	33.8
Completers: Certificate, Associate, Transfer, or Bachelor's	53.3	68.0	54.1	68.3	--[2]	66.2

Associates	All		Occupational		Academic	
	BPS	NELS	BPS	NELS	BPS	NELS
Non-Completers: No Degree or Still Enrolled	55.6	46.0	61.8	47.4	43.2	43.9
Completers: Associate, Transfer, or Bachelor's	44.4	54.0	38.2	52.6	56.9	56.1

Baccalaureates	All		Occupational		Academic	
	BPS	NELS	BPS	NELS	BPS	NELS
Non-Completers: No Bachelor's Degree or Still Enrolled	41.8	27.0	40.9	30.6	42.8	24.2
Completers: Bachelor's	58.2	73.0	59.1	69.5	57.2	75.8

Source: Authors' estimates based on BPS89 and NELS; column percents.
1. Low n for those still enrolled; cannot report totals. 2. Low n for those attaining bachelor's degrees; cannot report totals.

- Certificate students are the next most likely to achieve their goal or a higher goal. Slightly more than half of certificate students in BPS89 and two-thirds of those in NELS either (a) attain a certificate or higher degree or (b) transfer to the baccalaureate level.

- The group with the lowest completion rate is associate students. Among BPS89 students, only 44 percent completed within the five years, although a more promising, but still low, 54 percent of NELS associates complete their degree goal or a higher educational milestone.

The remaining four columns in table I split each student population by degree type—occupational and academic. Our findings indicate that the effect of enrollment in an occupational major on the probability of completing an educational milestone differs depending on the student's educational aspirations:

- Occupational status appears to have little influence on the educational success of certificate students, although this finding is not surprising because the large majority of certificate students are in occupational majors. By its nature, the certificate is an occupational degree—a degree that is more or less focused on preparation for a specific occupation.

- Occupational status also has no influence at the baccalaureate level. This finding is true even for community college students with baccalaureate aspirations. The distinction between occupationally-specific and broader, academic-oriented education has less meaning at the four-year level, perhaps because, at that level, even occupational programs have a strong academic content.

- Occupational students in associate programs attain an associate or higher degree or transfer to the baccalaureate level at lower rates than students in academic majors. Only

38 percent of occupational associate students in BPS89 completed within the observed period.[3]

This academic-occupational completion gap at the associate level is partly attributed to the background characteristics and enrollment patterns of occupational students. When compared with academic students, occupational students are more likely to:

- come from families with lower SES measures;
- delay enrollment;
- enroll part time;
- interrupt their education;
- cite job skills as their primary reason for enrolling.

All of these factors contribute to occupational associate students' lower likelihood of degree completion. However, after controlling for all the background and pathway differences between the two populations, the academic-occupational completion gap remains. Occupational associate students still have a probability of educational attainment that is between 7 percent

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[3] The completion rate discrepancy between occupational and academic students is less severe in NELS. This finding may be attributable to the restriction on the NELS sample to only students who, at most, delay postsecondary enrollment two years after high school graduation. This restriction creates a sample of students more traditional in their demographic characteristics and enrollment patterns and more likely to complete in a timely manner.

(NELS) and 11 percent (BPS89) lower than that of their academic peers.[4] Our analysis identified other factors that might help explain the gap in completion rates:

- Many occupational associate students who fail to achieve their stated associate degree goal do not leave postsecondary education empty-handed. Of the occupational associate population who do not complete a degree, 14 percent in BPS89 and 20 percent in NELS leave college with a certificate diploma. And most others acquire important job skills, which is the stated primary purpose for enrolling for one-third of all occupational sub-baccalaureate students.

- Associate students enrolled in occupational majors have a lower probability of transferring than of attaining an associate degree.

- Although occupational associate students cite job skills more often than academic students as their primary reason for enrolling, when controlling for the primary reason for enrolling, the completion gap between academic and occupational students does not shrink.

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[4] A comparison of the three-year retention rates of occupational and academic students in BPS89 and BPS96 indicates that the gap in persistence rates decreased between the two groups. This finding may suggest a similar convergence in completion rates between the two groups. Unfortunately, the shrinking persistence gap is attributed to lower retention rates for academic students and not to a measurable improvement in the retention rates of occupational students.

Because the Perkins Act emphasizes providing occupational education for disadvantaged groups, we analyzed the educational outcomes of subpopulations who are traditionally disadvantaged in postsecondary education. These subpopulations include students who are economically disadvantaged, students who are academically disadvantaged, single parents, students of nontraditional age, and females in a nontraditional occupational major. The following are significant findings about these students:

- Special population students tend to complete degrees less often than nonspecial population students.
- Special population students in occupational majors generally do not have significantly different completion rates than their peers in academic majors (which contrasts the findings for nonspecial population students).
- Economically disadvantaged students in occupational programs are as likely to complete their degree goals as their economically disadvantaged academic peers.

Overall, our findings suggest that community colleges have yet to determine and implement the optimal approach to providing direct occupational preparation within an institutional structure that continues to rest on a foundation oriented toward academic education. More effective remediation programs to improve students' academic skills and more intensive student counseling practices to generally increase students' attainment and to specifically promote employment opportunities are reforms indicated by our research. In addition, high schools can do more to help increase the academic achievement of their graduates who gain access to postsecondary education. High schools can provide the academic preparation that would help increase the educational achievement of their students, and they can fully inform potential occupational students about the expected academic rigors of college.

I. Introduction

The Carl D. Perkins Vocational and Technical Education Act of 1998 is designed to encourage and improve occupational education, with a particular emphasis on this kind of education at the sub-baccalaureate level. In evaluating the effectiveness of the current legislation and in developing ideas for reauthorization, Congress needs to understand how the educational experiences of occupational students compare with the experiences of students who are in academic programs.

This report addresses a specific issue within that broad question. It considers whether postsecondary occupational students, particularly at the sub-baccalaureate level, are more likely than other types of postsecondary students to achieve their educational goals. We first analyze what proportion of occupational students who set out to earn a particular certificate or degree actually complete that credential. We then compare these findings with similar findings about postsecondary students enrolled in academic programs.

The data for this report were provided primarily by two longitudinal studies conducted by the National Center for Education Statistics (NCES). The first is the Beginning Postsecondary Student Longitudinal Study (BPS89), which follows a sample of students who entered postsecondary school for the first time in 1989 from their enrollment through the 1993–94 academic year (NCES 1996). The second dataset is the National Education Longitudinal Study (NELS), which follows a sample of students from 1988, when they were in eighth grade, through the year 2000. (See appendix A for a brief description of these datasets and their survey design.)

Thus, we could evaluate students' progress in postsecondary education within a five-year window for BPS89 and within a six-to-eight-year window for NELS.[1] We also made use of a third dataset, BPS96, which follows a sample of students who entered postsecondary education in 1995 through the 1997–98 academic year (NCES 2000). Because this dataset provides only a three-year window, it is not well suited for an analysis of college completion. Nevertheless, BPS96 does provide more recent data than the other datasets, and it contains some interesting questions not found in NELS and BPS89. Therefore, when we used BPS96, we analyzed persistence rather than completion, and we argue that, to complete, students must at least persist.

To conduct our analysis of the educational outcomes of occupational sub-baccalaureate students, we developed a general model of the factors that predict educational attainment for first-time college students. The model includes student characteristics such as gender, race, age, socioeconomic status (SES), and academic skills as well as information about the timing and sequencing of a student's educational experience. (The sequencing factors account for whether students attend part time, interrupt their schooling, delay their enrollment or work while they are enrolled. We call them educational "pathway" features.) Therefore, as a by-product of this comprehensive analysis of the effects of occupational education, we also generate conclusions about the effects of demographic, educational and pathway characteristics on educational goal achievement as well as how those characteristics interact with the academic or occupational major. As a result, we can consider, for example, whether a student's race or enrollment interruptions have a different influence for occupational and academic students.

[1] Section III explains why we evaluate completion in a six-to-eight-year window for the NELS sample.

An important feature of our study took into account students' goals, and thus, we divided the datasets into three groups: students pursuing a certificate diploma, an associate degree or a baccalaureate degree. Students were categorized within these groups according to their degree expectations and the institutions where they were enrolled. We conducted separate analyses for each of these groups for two reasons. First, the demographics characteristics and goals of these groups differ significantly (Bailey et al. forthcoming). Second, we believe that the process and determinants of retention and completion for these groups differ.

The report develops as follows. Section II reviews the research literature related to postsecondary persistence and completion. We highlight what factors have been found to significantly affect degree attainment and what the previous research found with respect to how occupational students fare in relation to their academic peers. Section III discusses how we identified the three groups of students and briefly describes similarities and differences among the samples we used. Section IV provides a descriptive analysis of the student groups and describes retention and college completion for each group. We also describe the variables used in our analyses and the composition of the groups in terms of these features. Section V specifies our empirical approach, discusses our findings and extends the analysis to focus on the effect of occupational education on special populations such as academically and economically disadvantaged associate students. Section VI provides a thorough analysis of one- and three-year persistence rates, with an emphasis on occupational students seeking associate degrees. It also discusses the findings and integrates them with those from the completion analyses of section V. Finally, we summarize our findings and discuss policy implications in section VII.

II. Literature Review on the Educational Attainment of Postsecondary Students

The literature on college persistence and completion is extensive. Two of the most cited models of student persistence and completion are those of Tinto (1993) and Bean (1985). Tinto's (1993) *Student Integration Model* attributes attrition to the lack of congruency between students and institutions and, therefore, is a model for analyzing institutional persistence and completion, which focuses on whether a student persists or completes in a particular institution rather than on the experience of students in the higher education system as a whole. Tinto's model views college academic performance as an indicator of academic integration, and research seems to suggest that academic and social integration as well as institutional and goal commitment have the largest effects on persistence (Cabrera, Nora and Castañeda 1993).

In contrast, Bean's (1985) *Student Attrition Model* assumes that students' behavioral intentions and attitudes affect institutional attrition. Again, this model is one of institutional persistence. It views college performance as an outcome variable that depends on academic experiences and sociopsychological processes. Research on the Student Attrition Model suggests that the intention to persist, the attitudes, the institutional fit and external factors such as family approval of institutional choice have important effects on persistence (Cabrera et al. 1993).

In spite of these differences, both models have in common the view of persistence as the result of a complex set of interactions, and both suggest that a successful match between the student and the institution is what most affects persistence. Tinto's (1993) and Bean's (1985) models provide interesting insights on what affects students' persistence, and they have been used as a reference for constructing other models of educational attainment (see, for example, Astin, Tsui and Avalos 1996; Bers and Smith 1991; Cabrera et al. 1993; Pascarella and Terenzini 1991). However, these models have the serious limitation of being based on data from only one four-year institution. Therefore, they are not easily generalized to include the community college system in the study of systemwide persistence and completion. In addition, because recent studies suggest that multi-institutional attendance is increasing (Adelman 1999; Berkner, Cuccaro-Alamin and McCormick 1996), these models do not necessarily explain the full array of complexities affecting systemwide persistence and completion. For example, in an analysis of institutional persistence, a transfer student is considered a nonpersister whereas, in a systemwide analysis, a transfer student would still be considered enrolled. Therefore, our interest is in systemwide rather than institutional persistence and completion.

The extensive research on determinants of persistence and degree attainment at the four-year level indicates that the timing and sequencing of the postsecondary experience have significant effects on the number of years of college completed. Delaying enrollment, working off-campus while enrolled, and interrupting enrollment have negative effects on the probability of bachelor's degree completion. Other important determinants of degree attainment are the student's academic achievement and precollege academic records; living on or near campus; participating in extracurricular activities; and the availability of financial, educational and family resources such as receiving financial aid or coming from households of higher socioeconomic status (Astin et al. 1996; Pascarella and Terenzini 1991; Tinto 1993). This existing research in determinants of persistence and completion of four-year college students is therefore informative about what factors affect educational outcomes of relatively traditional students and serves as a base for selection of the variables for our study.

The research on determinants of persistence and completion at the sub-baccalaureate level has been rather scarce and has been built on studies focused on four-year institutions. For example, Pascarella and Terenzini (1991) indicate that attrition at a community college might be a function of the relatively low levels of prestige that are associated with community colleges and the absence of residence facilities, the first leading to a lack of student commitment to the institution and the latter inhibiting social integration. However, these authors do not provide evidence on how the characteristics and educational experiences of community college students affect their persistence and attainment. Bers and Smith (1991) analyze persistence of community college students from an institutional perspective, using social and academic integration as main predictors. Their analysis is based on one community college, and therefore, the results cannot be generalized. However, their results are informative. They find that students who worked full time were less likely to persist and that the students' purposes mattered. For example, they indicate that students taking courses with the purpose of receiving a degree or of transferring were more likely to persist than those taking courses for job-related or personal enrichment reasons. A major shortcoming of Bers and Smith's analysis is that they do not study whether students in occupational programs are less likely to persist; neither do they study the interactions between selection of a program of study and the effect of enrolling with a particular purpose. In spite of the rich research on educational attainment of four-year students, the state of research about what affects completion at the sub-baccalaureate level, and particularly in certificate programs, remains scarce.

What does the research have to say with respect to the effect of occupational education? Evidence from studies focused on four-year institutions seems to suggest that the net influence of the field of study on educational attainment is mixed (Astin et al. 1996; Pascarella and Terenzini 1991), but studies have not focused on the effect of the field of study on the educational attainment of sub-baccalaureate students.

This study will, therefore, fill part of the void in the literature by focusing mostly on students in certificate and associate degree programs as well as by analyzing them as a different group from the more traditional four-year students. It will also provide substantial evidence on the educational outcomes of occupational students by looking at whether starting postsecondary education in an occupational program significantly increases or decreases the educational attainment of students initially enrolled in less-than-four-year institutions.

III. The Three Categories of Postsecondary Students

We initially identified four mutually exclusive groups of postsecondary students: those with no stated degree goal and those with a certificate goal, associate degree goal or a baccalaureate degree goal. However, we excluded students with no stated degree goal or no degree program from most of our analysis, and throughout the majority of this report, we will be referring to three groups of postsecondary students: students with goals to achieve a certificate, an associate degree, or a baccalaureate degree. We classified postsecondary students by combining information on the institution where they were enrolled (four-year or two-year institutions), self-reported academic goals,[2] and institutionally reported program of study during the first year of postsecondary enrollment.[3] The approach for creating these groups is slightly different from that of previous research in this area. For example, NCES analyzed degree attainment of students with different objectives, distinguishing between students with a baccalaureate degree objective at a four-year college and students with the same goal at a two-year college (NCES 1997). However, when NCES researchers looked at community college

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[2] The self-reported academic goals are derived in BPS89 from the variable GOAL8990. This variable captures the question "Which type of degree are you working toward at this institution during the 1989–90 year?" Among the alternative answers are (1) not working toward a degree, (2) vocational certificate/license, (3) associate degree, (4) bachelor's degree. With NELS, we used the variable TYPDEGCT, which is related to the question "What type of degree or certificate are you studying for at this institution?" The alternative answers are the same as for the GOAL8990 variable.

[3] We should remark that about one-fifth of first-time beginners change their degree goals and that this change occurs mostly at the sub-baccalaureate level (Berkner et al. 1996). However, as will be explained in the next section, we concentrate on the determinants of attainment of first-degree objective.

students, they did not make distinctions between those with no degree goals and those with certificate or associate goals. Horn and Carroll (1996) analyzed the persistence and attainment of nontraditional undergraduates, and even though they found that nontraditional students with diverse goals attain degrees at different rates, they did not divide the students into groups according to goals and level of enrollment when constructing a model for analyzing the determinants of degree attainment.

Table 1 shows the composition of each of the groups in terms of its academic goals or programs. Because we used the degree program when first enrolled to categorize students into the different groups, the limitations of the NELS survey forced us to introduce a restriction to our sample. NELS did not identify the degree program or field of study for students who enrolled after August 1994 (that is, between the third and fourth follow-up waves of the survey). Thus, we had to restrict the NELS sample to include only those students who began their college enrollment, at most, up to two years after their expected high school graduation (June 1992). With this restriction, we were able to classify the students according to their degree program and field of study. This restriction had its drawbacks, however. Our analysis of the National Postsecondary Student Aid Study (NPSAS) indicated that students who delay enrollment are more likely to be found in occupational majors, particularly in certificate programs at the sub-baccalaureate level (Bailey et al. forthcoming). Therefore, as a result of this necessary sample restriction, we lost a disproportionate number of occupational sub-baccalaureate students, who are the students of most interest to us. (The effect of this restriction will become evident in table 2 where we show the percentage of students in each type of major.)

The certificate group includes first-enrollment, sub-baccalaureate students who say that they are pursuing certificates or are in a certificate program according to their institution.[4] In BPS89, 944 observations met these criteria. After deletions made because of missing values, the final sample size shrunk to 678 observations. In NELS, 480 observations met these criteria, and after deletions made because of missing values, the final sample consists of 233 observations.[5]

The associate group consists of first-enrollment students enrolled in either two-year or four-year institutions who stated that they are attempting to earn an associate degree (72.9 percent in BPS89, 97.9 percent in NELS) and all students in two-year institutions who stated that they are expecting to earn a bachelor's degree (27.1 percent in BPS89, 2.1 percent in NELS).[6]

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[4] Note the subtlety in the construction of the groups. If a student is enrolled at a two-year college in an associate degree program according to the institutional records but states that he or she is working toward a certificate, then he or she is classified into the certificate group.

[5] For the BPS89 certificate group, the variables that contain the most missing cases are the dummies related to parental education. By including these dummies, we lose 123 observations. The other variables that have large numbers of missing cases are the dummies for marital status (50 missing values) and the dummy for occupational field of study (44 missing values). In NELS, the variables with most missing cases are those related to the high school track, which reduces our sample by 157 observations. Other variables that have important number of missing cases are the dummies for the composite test score quartiles, for occupational students and for full-time enrollment (119 and 27 missing cases, respectively).

[6] The percentage of associate students in bachelor's degree programs in NELS is very small, almost negligible as compared with the 27.1 percent of BPS89, which is a consequence of how the question with respect to degree program was asked in each survey. In BPS89, students were asked what degree they were *working toward* during their first year of postsecondary education at that particular institution. In contrast, in NELS, students reported what

The assumption in the latter case is that, at most, an associate degree (AA or AS) may be obtained at a two-year school. The size of this group in BPS89 is 1,213 observations, but after deleting observations with missing variables, we ended up using only 871 observations. In NELS, there were initially 1,864 observations, but after deletions, we used only 1,101.[7]

Finally, the baccalaureate group comprises first-time enrollment baccalaureate students (99.1 percent in BPS89, 96.4 percent in NELS) and students in four-year schools who have missing, unknown or unspecified goals or who have graduate program goals (0.9 percent in BPS89, 3.6 percent in NELS). This group originally had 3,472 and 4,126 observations in BPS89 and NELS, respectively, which were reduced to 2,050 and 2,792 when we eliminated observations with missing values.[8]

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type of degree they were *studying for* at a particular institution. Because there are almost no "baccalaureate programs" at community colleges, the number of students *studying for* a bachelor's degree in NELS is very small.

[7] In BPS89, the variable that has the largest number of missing cases is the dummy for occupational program of study, with 216 missing cases; the other variables that contain large number of missing cases are the dummies for parental education and the dummies for marital status (60 and 45 missing values respectively). In NELS, the variables with the highest number of missing values are the dummies for high school track, with 369 missing cases. Other variables that have large number of missing values are the dummies for the composite test score quartiles (332 missing values) and the dummies for occupational status and disabilities (173 and 105, respectively).

[8] For the baccalaureate group, the largest missing values in the BPS89 sample come from the dummy for occupational majors, which includes 1,280 missing cases, and the second largest number of missing cases is found in the dummy for marital status, with 98 missing cases. In NELS, the highest number of missing cases is from the dummies for the composite test score quartiles, which add up to 630 missing values. The second largest number is found in the dummies for high school track, with 529 missing cases. Last, the dummies for occupational status and disabilities also have a large number of missing values (281 and 190, respectively).

Within each of these groups, we identified those students in occupational majors. We used the categorization developed by Choy and Horn (1992) and widely used by NCES to identify this group. (The Choy and Horn categorization is described in appendix B.) Although students can change their majors, we used the first declared major to identify occupational students. Table 2 displays the distribution of occupational and academic students as well as those students who have not declared a major. Among those who did declare a major, the large majority of certificate students are in occupational majors whereas the baccalaureate students are either more or less evenly divided or more likely to be found in academic majors. Among those associate students who declared a major, more than 60 percent are occupational, although in the BPS89 sample we find some difference between the students in this group who aspired to an associate degree and those who wanted a bachelor's degree (BA or BS). Community college students who aspired to a BA or BS are more likely than four-year college students to be in occupational fields but less likely than students who aspired to an associate degree. Interestingly, occupational students account for a smaller share of students in NELS than they do in BPS89, which occurs probably because we had to exclude any students in NELS who delayed college entry for more than two years after their expected date of high school graduation.

Another striking difference between the two datasets is that there are relatively more students with undeclared majors in BPS89 than in NELS. This occurrence, again, could be an effect of the restriction placed on the NELS sample. This evidence, therefore, suggests that students who generally do not delay their enrollment (if they do, they do it only for a maximum of two years) are more likely to have defined a field of study when they enroll.[9] This assumption is, however, somewhat counterintuitive. One would expect that an older person returning to college would do so for more specific reasons than an 18-year-old drifting into college faute de mieux, but one could also argue that starting college at an older age with a specific reason does not necessarily mean that older students are more likely to declare a major.

[9] From here on, we will consider for our analysis only the students with declared majors.

IV. Description of the Outcome and Independent Variables

Outcome Variables

This report is an analysis of successful completion of educational goals or objectives. Our focus on goals has led us to divide the sample according to either the stated goals of the students or the degree program in which they first enrolled. We carried out separate analyses for groups with different goals because we believe that the factors determining successful goal attainment differ for those students who set out to earn a one-year (or less) certificate and those who want a BA or BS. To simplify our analysis, we established a dichotomous definition of *completion* or *noncompletion* for each of the three groups in our analysis. The BPS89 dataset tracks students for five years after their initial enrollment, and we consider that students have met their goal if they completed their stated degree objective or a higher degree within the five years of data collection.[10] The restricted NELS dataset follows students for a period of six to eight years since first enrollment in college. Again, students are considered successful if they complete their stated degree objective or a higher degree by the end of the survey period in the year 2000. For students in the certificate or associate group, transfer to a baccalaureate program is considered completion, even if no degree is earned.[11]

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[10] Thus, for example, a student who is in the certificate group but completes an associate degree (and no certificate) would still be considered a "completer."

[11] Note that this interpretation is a generous definition of completion, especially for students at community colleges who state that they want a BA or BS. We use this weaker definition primarily because we suspect that many community college students who are on their way to earning a BA or BS do not have enough time to complete that

Students who are still enrolled at the end of each survey are in an ambiguous category.[12] Although they have not achieved their goal, they are at least still working toward it. As will be shown, this situation is not a problem for certificate students. Only 2 percent are still enrolled by the end of the BPS89 coverage, and about 4 percent are still enrolled by the end of the NELS study. However, about 13 percent of all BPS89 and 7 percent of all NELS associate students are still enrolled at the end of the respective survey period. Censoring is an even larger problem at the baccalaureate level, where 19 percent of BPS89 and 7 percent of NELS baccalaureate students are still enrolled at the end of the period.[13] We believe that, at least for students who state that they want an associate degree, between five and eight years is a reasonable amount of time to achieve it and that failure to complete a degree or even to transfer within that period of time is an indication of potential problems.

Thus, certificate students are considered completers if, within the respective survey periods, they earn a certificate diploma, associate degree, or bachelor's degree or if they transfer to baccalaureate status. Students in the associate group are considered completers if they attain an associate degree or a bachelor's degree or if they transfer to the baccalaureate level by the end

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degree within the survey's time frame, particularly given the relatively short-time coverage of the BPS89 study. But a successful transfer suggests that they have at least achieved an important milestone on the way to that degree.

[12] Students still enrolled at the end of each study are referred to as "censored." Being enrolled when the survey period ends is referred to as "censoring."

[13] As expected, the level of censoring is lower in NELS, where students have one to three extra years to finish their degree.

of each survey. Students who are in the baccalaureate group are considered completers only if they earn a BA or BS.

Table 3 shows the observed rates of completion for the three groups of postsecondary students and for occupational students within each of these groups.[14] The first number (no degree or still enrolled) in each section of this table is an indication of the percentage of noncompleters for the students in each group—students who have not attained their degree goal within five years (BPS89) or six to eight years (NELS).

Baccalaureate students are the most likely to achieve their goal, even though their goal is the most difficult to reach.[15] Fifty-eight percent of the BPS89 and 73 percent of the NELS baccalaureate students attain their degree goal, and of those who do not, one-half and one-quarter, respectively, were still enrolled in the last period of the survey. Thus, within the survey years, slightly over 77 percent of students who started out pursuing a BA or BS achieved that goal or were still on their way achieving it.[16] Notice that the BA or BS attainment rate with NELS is considerably higher than the one for BPS89. Two different explanations may account

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[14] An important note is that this table includes information only on the students' first degree (or transfer) that is considered as "completion" for their group. Therefore, if a certificate student first earns a certificate and then goes on to earn an AA or AS, we do not count the AA or AS. This table does not show all of the associate students who earned a BA or BS. Rather, it shows all of the associate students who earned a BA or BS as their first degree.

[15] This result reinforces that of NCES (1997), where researchers found that students seeking baccalaureate degrees are more likely than students seeking other degrees to attain a degree or to still be enrolled five years after their initial enrollment.

[16] This finding holds for both samples.

for this difference. First, the longer period of coverage of NELS favors the completion of BA or BS degrees within the survey time frame; however, within the BPS89 time frame, we observe a large number of students still enrolled in the last period of that survey. Second, the NELS sample includes only students who delay college enrollment for two years or less and who are therefore more "traditional" in age than some students in the BPS89 sample. Findings from Horn and Carroll (1996) indicate that undergraduates with bachelor's degree objectives who delay enrollment have lower rates of degree completion than those who do not delay their enrollment, so we would expect the NELS cohort to have higher graduation rates because it excludes students who delay for a significant number of years.

Certificate students were the next most likely to achieve their goal. We found that 48 percent of the BPS89 and 56 percent of the NELS students in the certificate group attained a certificate diploma as their first degree, and an additional 6 percent and 12 percent, respectively, went beyond their goal and have as a first outcome an associate degree, a bachelor's degree, or a transfer up. Censoring is not a problem for this analysis because only 2 percent of this group in BPS89 and 4 percent in NELS are still enrolled during the last semester of each survey. Thus, more than half of the students in this group (in both samples) achieved their goal, but of course the goals of these students are less difficult to achieve than those of the baccalaureate group. In a more negative light, almost one-half of all BPS89 certificate students and about one-third of all NELS certificate students failed to achieve their goal, even though certificates usually take a year or less of study. Again, the rate of degree attainment by certificate students is higher in NELS. However, in NELS, certificate students have a higher rate of not only certificate degree completion but also of associate degree and BA or BS completion. As in the case of baccalaureate students, the longer period of coverage of NELS and the exclusion of older, first-time beginners are two factors that can explain these higher rates of goal attainment.

Finally, the members of the associate group are the least likely to achieve their degree goal. Only about 30 percent of the students in this group, in both samples, attained an associate degree (for nearly all of them, this degree was their first), but 13 percent in BPS89 and 19 percent in NELS transferred to the baccalaureate level without first attaining an associate degree, and an additional 2 percent in both samples directly attained a bachelor's degree.[17] Thus, about 44 percent in BPS89 and 54 percent in NELS can be considered completers by our definition. But if students still enrolled at the end of the survey period are included as completers, then the associate degree group does almost as well as the certificate group. Only 35 percent and 32 percent (in BPS89 and NELS, respectively, as compared with 45 percent and 28 percent, respectively, for the certificate group) were no longer enrolled when the surveys ended and had left empty handed (at least as far as degrees are concerned). The rest were still enrolled and, we assume, pursuing a degree. Interestingly, the rate of completion in NELS is not much higher than the BPS89 rate, though in NELS, we have more years of postsecondary data.

How do occupational students differ from their academic peers within each of these groups? This comparison is also displayed in table 3. First, occupational certificate students do

[17] We presume that this group who directly attained a BA or BS consists of those students, first enrolled at a four-year institution, who stated that they were working toward an associate degree or were initially enrolled in an associate program. If they decide to go beyond their original expectations, this group does not need to transfer to attain a bachelor's degree.

considerably better than their academic peers. For example, 49 percent of occupational certificate students in BPS89 and 59 percent in NELS attained a certificate diploma whereas only 31 percent of academic certificate students in BPS89 and 39 percent in NELS attained a certificate diploma. This difference is not very surprising because 92 percent (BPS89) and 86 percent (NELS) of the students in the certificate group are in occupational fields. Thus, the certificate is, by its nature, an occupational degree; therefore, we expect these students to achieve their goals more often. However, we can also suggest that this difference may be attributed to the greater benefits of an occupational certificate compared with an academic certificate, the latter being a degree not highly rewarded in the labor market (Grubb 1997, 2002).

For the baccalaureate group, only negligible differences are evident between the occupational and academic students. The occupational baccalaureate students in BPS89 did slightly better than their academic peers whereas, in NELS, they did slightly worse, although these differences are not statistically significant. Perhaps the difference between occupational and academic students is less important at the baccalaureate level and, thus, explains the absence of any large differences in attainment.

In contrast, important differences are evident between the academic and occupational students among the associate group in the BPS89 sample, and these differences do not favor occupational students. Although 43 percent of academic associate students failed to attain their educational goal, close to 62 percent of the occupational students within the group did not complete. This difference is considerably smaller in NELS where 44 percent of academic associates and 47 percent of occupational associates failed to succeed. Interestingly, in the five years of BPS89, 22 percent of academic associate students compared with 42 percent of occupational associate students left with no degree of any kind. This difference goes in the opposite direction in NELS where 35 percent and 30 percent of academic and occupational associate students, respectively, left college without a degree. The finding that occupational students do better in NELS than in BPS89 could be partially attributed to the restriction that we had to place in our NELS sample. By including only students who delay, at most, for two years, we restricted the sample to the more traditional occupational associates, who are more likely to complete a degree than their nontraditional counterparts (Bailey et al. forthcoming).

The Determinants of Educational Achievement

Although these three groups of students have different completion rates, significant variation in completion rates also occurs within each of these groups, and our analysis attempts to find characteristics that either promote or thwart educational attainment. We are particularly interested in understanding why occupational students (primarily in the associate degree group) are less likely to achieve their educational goals. A growing body of research identifies characteristics that influence graduation rates, and we can draw on that literature to develop our models (see section II for references on existing research on determinants of persistence and attainment). We want to ascertain whether occupational students simply have more of those characteristics that discourage college completion.

For each group, we estimated four different models.[18] The models differ in the control variables that they include, but in each model, we included a dummy variable to indicate whether the student was in an occupational program. This variable received much of our attention because the main purpose of this research is to estimate the effect of being an occupational student and to analyze the changes in the occupational coefficient after we hold constant different sets of variables.

In the first model, we included only the demographic characteristics of the student. The variables included are an indicator for gender (with male as the reference group), race-ethnicity dummies (white is the reference), an indicator for disabilities of any type, and—only in the BPS89 models—the student's age at first enrollment (a dummy variable indicating that the student was age 26 or older when first enrolled). The second model adds a set of family composition and socioeconomic controls to the first model. We included a variable for marital status when first enrolled, a dummy for having a child when first enrolled, and an indicator for not having received financial aid (this variable is only available in NELS). As socioeconomic background controls, we used different variables according to the sample. The NELS study includes a composite variable of parental education, parental occupation and total household income to measure the socioeconomic status (SES) of the student. Therefore, in NELS, we used the quartiles of this composite SES variable with the lowest quartile as the reference. In BPS89, where there is no composite SES variable, we controlled for the highest educational level of the parents (with high school or less as the reference group), for whether the student was a

[18] With the BPS89 sample, we extended the fourth model into a fifth that allows for controlling for the pathway effects. An explanation of how we controlled for pathway effects is provided in the following discussion.

dependent on his or her family income in the 1989–90 academic year, and for the 1989 total household income (for dependent students, we considered parental income and, for independent students, their own income).

In the third model, we included a set of variables that relate to the educational background of the student. Here is where the two datasets differ the most. NELS follows students since they were in eighth grade and, therefore, has extensive information with respect to their schooling characteristics before college enrollment. Among these schooling characteristics are controls (a) for whether the student attended a private school or a school with a majority of white students in the eighth grade, (b) for the concentration in high school (dummies for enrollment in vocational and general tracks, with the academic concentrators as the reference) and (c) for the different 10th grade composite test score quartiles (with the lowest quartile as the reference). The selection of these independent variables is based on findings from previous research on persistence and attainment. In contrast, BPS89 has poor information with respect to the educational background of the student. At most, we could control for obtaining a General Education Development diploma (GED) and for having enrolled in remedial courses. However, these variables do not necessarily pick up lower academic skills, particularly when many certificate and occupational associate programs do not require remediation even though they generally attract the students with lower educational achievement.

The final model includes all the above factors and what we refer to as pathway features. By pathways, we mean the timing and sequencing of the postsecondary experience—whether the student interrupts enrollment, attends part time, delays enrollment or works while enrolled.

These pathway variables are specific to each group of postsecondary students (with the exception of delayed enrollment) and the variables used vary according to the dataset. One of the limitations of the NELS study is that it contains no monthly enrollment information after August 1994. Therefore, after this date, we know only whether a student has ever enrolled part time and whether the student ever interrupted his or her enrollment for at least six months; however, we do not know the extent of the part-time enrollment or the length of the interruption. As a consequence, we use the following variables when estimating the model with NELS: a dummy if the student was always enrolled full time, a dummy for interruptions, and a dummy indicating that the student delayed enrollment for at least a year after high school graduation. In contrast, BPS89 has rich monthly enrollment information, allowing us more precise computation of the extent of full-time enrollment and of the incidence of working while enrolled. We then used indicators for high levels of cumulative full-time enrollment,[19] an indicator for whether or not the student interrupted enrollment, and indicators for two different levels of working while enrolled.[20] Other research has shown that these pathway features influence postsecondary

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[19] For the certificate and baccalaureate sets, we included one variable that indicates full-time enrollment more than 50 percent of the time; for the associate group we used two indicators: one for between 25 percent and 75 percent and another for enrollments that are more than 75 percent full time.

[20] The indicators for working while enrolled are (a) for working between 25 percent and 75 percent of the enrollment time and (b) for working more than 75 percent of the enrollment time. One would expect full-time enrollment to be negatively correlated with working while enrolled. To test this assumption, we computed the correlation coefficients (correlations run only with the BPS89 sample; matrices not shown here). For the certificate set, only the correlation coefficient between the intensity dummy and the dummy for working more than 75 percent of the enrollment time is negative and not very high (-0.17). For the associate group, the only correlation coefficient that is negative is for full-time enrollment and working while enrolled (-0.09), but it is a low correlation. Finally, the negative correlation

persistence and attainment (Horn and Carroll 1996; Horn and Premo 1995).[21] Findings from Berkner et al. (1996), NCES (1997) and Adelman (1999) indicate that we should expect more full-time enrollment to promote retention and completion and that we should expect delaying, attending part time, interrupted enrollment and working while enrolled to reduce retention and completion. It is important to remark that, in this model, we are capturing what we refer to as "direct pathway effects." Thus, we can determine to what degree, for example, interrupting enrollment directly affects the probability of educational attainment. We also have interest in what we call the "indirect pathway effects," and they will be discussed presently.

As already stated, the BPS89 study has rich information with respect to the timing and sequencing of enrollments. However, the five-year limit of our dataset creates a potential problem for this analysis. One problem is that part-time students, or students who interrupt enrollment, simply have less time within the five-year window to achieve their goal. It is possible that students who interrupt for one year have exactly the same probability of finishing than students who do not interrupt, but they will simply take one year longer; however, in our time-limited dataset, the data collection period may end while these students are still enrolled

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between the dominance of full-time enrollment while working at the same time is even lower for the baccalaureate set (-0.07). Thus, we can conclude that full-time enrollment is only very weakly negatively correlated with working while enrolled, contrary to our expectations.

[21] Horn and Premo (1995) and Horn and Carroll (1996) consider these variables to be indicators of "risk factors." Other factors that are considered to increase the risk of attrition are not receiving a regular high school diploma, being financially independent of parents, having children and being a single parent. Most of them are included as covariates in the second and third models.

and we would conclude that they did not complete. We refer to this problem as the direct effect of the pathway variables.

We would also like to know whether interruptions or part-time attendance have an additional effect of thwarting enrollment by disrupting students' education and making it more difficult for them to concentrate on their studies and thereby complete their degree. We refer to this impact as the indirect effect of the pathway features. We measure this effect by further controlling for the number of full-time equivalent (FTE) semesters for which a student is enrolled.[22] For example, suppose that, considering two students who complete four semesters of school, one does it in two years continuously and the other in four years with interruptions; does the interrupter face a greater risk of noncompletion? We might explain an indirect effect as a consequence of incoherence in a "drawn out" program of study or as the effect of loss of continuity (retaking of courses, poor grades because the prerequisite material is not "fresh" in the student's mind). Whatever the mechanism, these are indirect effects of pathways, and they have a different interpretation and potential effect from a policy perspective.

[22] Actually, we use the square root of the number of FTE semesters. The square root was chosen both to reduce the skewness of that variable and because it captured the diminishing effect of FTE semesters at higher values. The latter was indicated in models using both the FTE semesters and its square. We have to note that the poor enrollment information available in NELS does not allow us to compute FTE semesters; therefore, this extended analysis is conducted only with BPS89.

Demographics of the Groups

Comparing the three groups, we see in tables 4 and 5 that the certificate group has a larger percentage of female students. Certificate students are also relatively older than students in the other sets when they start postsecondary education: Of the BPS89 certificates, 26 percent are at least 26 years old when they first enroll. A large percentage of them are not single when they first enroll, and they are the group most likely to have a child when first enrolled. They also come from a relatively disadvantaged background by SES measures. With respect to educational background, certificate students are the group most likely to have a GED and least likely to have enrolled in an academic concentration while in high school. In addition, they have the lowest composite test scores in grade 10. A substantial proportion of certificate students have full-time attendance, and finally, this group has low levels of interruptions to enrollment and the highest percentage of students with low levels of working while enrolled. We expect this group to be interested in obtaining job-related skills and credentials, but they apparently do so during a break from employment more often than might be expected.

Baccalaureate students are on the other end of the postsecondary spectrum. The percentage of racial-ethnic minorities is the lowest for this group, although Asians tend to be overrepresented in comparison to the other groups. They are also the youngest, and only a negligible percentage of baccalaureate students were married or had a child when first enrolled in college. Further, they come from relatively advantaged households, having highly educated parents and the highest average household income. Interestingly, even though baccalaureates come from high SES backgrounds, they constitute the group most likely to receive financial aid. This group has superior middle school and high school records in terms of high school track, test scores and type of diploma attained. A considerable percentage of baccalaureate students are enrolled in occupational majors (52 percent in BPS89, 45 percent in NELS). This important percentage is indicative of a trend toward occupationalization, even at the baccalaureate level. Finally, these students are most likely to attend full time, only between one-fifth and one-quarter of them interrupt their enrollment, and a relatively high 40 percent of them spend more than 75 percent of their enrollment working.

The students in the associate group are between the certificate and baccalaureate extremes. In BPS89, associate students had a lower percentage of minority students than the certificate group but higher than the baccalaureate. In NELS, however, the percentage of blacks and Hispanics was slightly higher than both other groups. The associate group has, on average, a higher percentage of older students than the baccalaureate group but a lower percentage than the certificate group. They are also in the middle in terms of family composition, socioeconomic and educational background, and percentage of occupational students. However, they are the most likely to interrupt enrollment, to attend part time and to have high levels of working while enrolled. Differences in these characteristics may help explain why these students are the least likely to attain their educational goals within the survey periods.

Within each of these groups, do occupational students stand out as unique? Here, we will focus on the associate group because, as we have shown, occupational students comprise the overwhelming majority of certificate students and because, among the baccalaureate students, occupational students have more or less the same outcomes as other students in the group. Furthermore, among the associate group, the occupational students are less likely to attain an associate degree, less likely to transfer to a baccalaureate program and more likely to leave college with no degree or certificate (although this finding holds only in the case of BPS89). Tables 4 and 5 also compare the characteristics of occupational and academic students in the associate group. Here is where the differences between the two samples, BPS89 and NELS, emerge. The occupational students in BPS89 tend to be older, are more likely to be married, and are less likely to be dependent as compared with their academic peers. They are more likely to have a GED but less likely to have taken at least one remediation course.[23] Occupational students are less likely to attend full time and, on average, have accumulated fewer FTE semesters than their academic counterparts. In contrast, the differences in characteristics between the academic and occupational associate groups are not that large in NELS. However, we can see that the percentages of students with disabilities, students who are married when first enrolled, or students with children are considerably higher for the NELS occupational students when compared with their academic peers.

Therefore, occupational students in the associate group do tend to have characteristics (particularly delayed enrollment, part-time intensity and family responsibilities) that are associated with lower retention and completion rates. In the next sections, we rely on a

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[23] This fact illustrates why incidence of remediation is a poor measure of academic preparedness. We would expect occupational students to be less well prepared, but occupational programs in community colleges are less likely to require remediation for underprepared students. Therefore, the incidence of remediation confuses differences in student preparedness with differences in program entry requirements.

multivariate logistic approach to determine whether these characteristics explain the lower completion levels of all associate students and, specifically, of those in occupational programs.

V. Educational Outcomes for the Three Groups of Postsecondary Students

The Logistic Model and Interpretation of Coefficients

Tables 6 to 11 show the results of our logistic estimations for the three groups of postsecondary students and the two datasets. Before analyzing them, we would like to comment on how the models were estimated and on how the estimates should be interpreted.

The logistic model is:

$$\mathrm{Prob}(Y_i = 1) = \Lambda(\boldsymbol{\beta}'\mathbf{x}_i)$$

where
$$\Lambda(\boldsymbol{\beta}'\mathbf{x}_i) = \frac{e^{\beta' x_i}}{1 + e^{\beta' x_i}}$$

and where Y_i is the outcome variable, $\boldsymbol{x_i}$ is a vector of k covariates and $\boldsymbol{\beta}$ is a vector of coefficients for the group. It is important to note that, in contrast to the more common Ordinary Least Squares (OLS) regression analysis, the parameters of the logistic models are not necessarily the marginal effects—that is, the effect on the dependent variable of an increase of one unit of the independent variables. A relatively simple way of interpreting the coefficients is by expressing them in terms of the "odds ratio":

$$\frac{\mathrm{Prob}(Y_i = 1)}{\mathrm{Prob}(Y_i = 0)} = e^{\beta_j'}$$

The odds ratio for a specific term β_j reflects the ratio of the probability that outcome 1 occurs to the probability that outcome 1 does not occur when there is a unitary change in the independent variable x_j.

We are also interested in the marginal effects of independent variables, which provide a more straightforward interpretation of the effect of a change in one of the variables, holding the others constant. The marginal effect is the change in the estimated probability of attaining a "positive" outcome. The marginal change in $\Lambda(\boldsymbol{\beta}'\mathbf{x}_i) = Pr(Y_i = 1)$, given an incremental change in the value x_j of the jth covariate, is:

$$\frac{\partial\Lambda(\boldsymbol{\beta}'\mathbf{x}_i)}{\partial x_j} = \beta_j\Lambda(\boldsymbol{\beta}'\mathbf{x}_i)[1 - \Lambda(\boldsymbol{\beta}'\mathbf{x}_i)]\boldsymbol{\beta}$$

The results presented in Tables 6 to 11 include coefficients and marginal effects. Presenting these two measures allows for a better interpretation of the determinants of educational attainment.

Our analysis focuses on differences between occupational and academic students in the probability of attaining educational objectives. One interpretation of this analysis could be whether enrollment in an occupational (or academic) program increases or decreases students' likelihood of attaining their objectives. In other words, would encouraging students to enroll in occupational programs lead to higher (or lower) completion rates? The problem with answering this question is that students are not randomly assigned to occupational or academic programs, and therefore, any differences in completion rates might result from initial differences rather than from any influence of the program itself. We have addressed this problem by controlling for observable student characteristics. However, we have not taken account of unobservable initial differences between academic and occupational students. On the one hand, techniques exist to address this problem, but they require the use of variables that influence a student's choice of program without influencing the likelihood of completion (Card 1999; Greene 2000; Griliches 1977; Heckman 1979; Willis and Rosen 1979). We do not have available variables that plausibly meet this requirement. On the other hand, many analysts use student academic skills and SES to control for this type of selection bias, and we do have measures of SES in BPS89 and NELS as well as measures of initial academic skills in NELS. In the end, the possibility that initial differences might influence any variation in outcomes for occupational and academic students needs to be considered in the interpretation of our results.

Determinants of Educational Attainment for the Certificate Group

Tables 6 and 7 present the results for the certificate group, for BPS89 and NELS respectively. The first column in each table provides the coefficients for the model that has only the demographics and the occupational dummy. As we can see, blacks and students with disabilities have a marginally lower probability of completing a degree, but this result holds only in BPS89.[24]

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[24] In this model, we excluded Native Americans (BPS89) and "other races" (NELS). The reason is that only a small number of students are in each of these ethnic groups. For comparison purposes with the other groups, we reestimated the same models with the Native American covariate and found that this variable has no significant effect in the first model. In models two to five (BPS89), Native American ethnicity predicts failure perfectly, so the covariate is automatically dropped by STATA™ and the observation with that characteristic is not used. With NELS, we also find that being of "other races" predicts failure perfectly in all models, so the covariate and the observations for which "other races" equals 1 are not used.

In the second model, we added the socioeconomic and family background variables. In BPS89, dependent students have a marginally higher probability of attaining a degree whereas the total household income affects this probability marginally negatively, and the effects of the demographics no longer hold. In contrast, in NELS, students with a child when they first enroll see their chances of completing a degree significantly reduced. This finding seems to suggest that having children has a larger negative effect when the student is younger. The third model controls for the educational background of the student. None of these variables have any effect on the educational success of certificate students. In addition, their inclusion does not modify the findings from the models that exclude them.

The final model includes the pathway variables. The effects of the variables differ by the dataset used, differences that could be attributed to how the variables are defined in each dataset. In BPS89, interrupting enrollment had a significant negative effect on the probability of success, reducing the estimated probability of completion by 23 percent. Working "too much" while enrolled also had a negative, although marginal, effect on the probability of educational success, reducing the estimated probability of educational attainment by 16 percent. Note that all of these findings are direct effects. Interestingly, attending part time does not lower the probability of achieving a student's educational goal. In NELS, we found that delaying enrollment in postsecondary education for a year after the expected high school graduation reduced the probability of certificate attainment by 25 percent. The inclusion of the pathway variables erases all effects of other variables. This finding holds for both datasets.

Finally, in BPS89, we added the pathway control (square root of FTE semesters). Under the FTE control, all the pathway variables, with the exception of the "middle" working category, are significant, indicating that they exert an indirect effect on the probability of educational success. Interrupting enrollment keeps its strong negative effect, but the magnitude increases. The highest category of working while enrolled reduces the probability of completion by 16 percent. The square root of FTE semesters has the expected positive effect. Having two FTE semesters of enrollments instead of one increases the estimated probability of educational success by 20 percent, but increasing FTE semesters from two to three augments this probability by only 16 percent. This measures a direct effect: Going to school longer increases a student's chance of completing *something*. This effect is also an indication that accumulating FTE semesters increases the probability of completion, but in a diminishing fashion. One unexpected result is that having a majority of full-time enrollments actually marginally decreases the estimated probability of educational success.[25]

Whether certificate students are in an occupational major or not has no influence on their probability of attaining their educational goals, a result that holds in both datasets. This finding is probably attributed to three factors. First, the distinction may not be meaningful for students at this level. The distinction between academic and occupational majors at the associate level is closely related to a student's interest in transferring, and most certificate students do not expect

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[25] We found that full-time enrollment decreases the probability of completion primarily for students who both interrupt and work a large percentage of their enrollment time. The negative full-time effect can then be interpreted as being driven by differentials that appear when students have been around much more than is traditionally expected in their program.

to transfer. Second, Choy and Horn's occupational/non-occupational categorization was developed primarily with two-year programs in mind; therefore, it may be less relevant to certificate students. Finally, approximately 90 percent of the certificate students are in occupational majors, and as a result, there simply may not be enough academic (or even non-occupational) students in the certificate group to have a significant effect on outcome differentials.

Determinants of Educational Attainment for the Baccalaureate Group

Tables 8 and 9 present the estimated coefficients for the baccalaureate group. Although the focus of this report is on sub-baccalaureate occupational students, we present these results on baccalaureate students to provide a context for our primary analysis. This context is important because most of the discussion about postsecondary students focuses on baccalaureate students and attainment of the bachelor's degree (see the discussion of the existing literature in section II). We are interested in knowing whether factors that lead to degree attainment of sub-baccalaureate students differ from the much more widely studied baccalaureate group.

The only demographic variable that is significant with both datasets and across all specifications is being female. Being female increases the estimated probability of bachelor's degree attainment by a range between 4 percent and 10 percent. Black students have significantly lower odds of attaining a baccalaureate degree in the first two models, an effect that does not hold with the addition of the educational background (NELS) and pathway (BPS89) variables.

The socioeconomic background of the student is an important predictor of the probability of completing a BA or BS degree. Having a parent with at least a bachelor's degree and coming from a family with higher income are important determinants of the probability of baccalaureate attainment in three of the BPS89 models, but income ends up being insignificant and parental education only marginally significant when we control for FTE enrollments, indicating that something about those variables is related to how a student progresses through school. Being a dependent in the first year of postsecondary enrollment has a significant and positive effect. This finding holds in all BPS89 specifications, with very large marginal effects (the smallest one increases the estimated probability of attainment by 19 percent). Being a dependent as an undergraduate conforms to our notion of a traditional student, so this finding is extremely relevant. In NELS, students from the highest two SES quartiles have significantly higher probabilities of attaining a BA or BS, with marginal effects that range from 8 percent to 29 percent, depending on the controls used. Thus, we can conclude that direct and indirect measures of socioeconomic background seem to be important determinants of baccalaureate attainment, with higher SES students having a much higher estimated probability of completion.

In contrast to certificate students, all the pathway-related variables have a significant effect on the probability of bachelor's degree attainment. Full-time intensity has a very large coefficient in both samples. Without controlling for FTE semesters, BPS89 indicates that enrolling full time at least 50 percent of the time increases the estimated probability of completing a bachelor's degree by 53 percent, and even when the full specification is used, this effect is still relatively large at 34 percent. In NELS, attending full time increases BA or BS attainment by 16 percent. Interruptions to enrollment have a larger effect for this group compared with the other groups of students. In BPS89, this finding is expected because any interruption could make the time needed for baccalaureate attainment out of reach of the student within the five-year window. Interrupting enrollment decreases the estimated probability of BA or BS attainment by 41 percent and, when controlling for FTE semesters, by 33 percent in BPS89. In NELS, interrupting enrollment reduces the probability of attainment by 32 percent. Delaying enrollment also has a significant negative effect on BA or BS attainment, reducing the probability by 11 percent. Working while enrolled has the expected negative effect of decreasing chances for attainment by 10 percent and 9 percent for middle and high amounts of working, respectively. As in the certificate group, the number of FTE semesters has significant effects on the probability of educational success. Increasing FTE enrollments from one to two semesters increases the probability of attainment by 15 percent whereas increasing FTE enrollments from two to three semesters increases this probability by 11 percent.

Whether a student is in an occupational or academic program at the baccalaureate level does not appear to make a difference in educational outcomes. In contrast to the certificate group where the large majority of students are in occupational majors, baccalaureate degree students are split almost evenly between occupational and academic students. We suspect that, at the baccalaureate level, this distinction is less meaningful because occupational students are usually required to take a considerable amount of academic-content courses and are generally indistinguishable from their academic peers. Furthermore, the effect of transferring is irrelevant for baccalaureates because all of the students in this group start out in four-year schools. [26]

Determinants of Educational Attainment for the Associate Group

The estimated coefficients for the associate group are presented in tables 10 and 11. In contrast to the other sub-baccalaureate group, a larger number of the covariates actually have an effect on the outcome. However, the results are slightly different for each dataset. Among the demographics, being female and being black have significant effects, the first positive and the latter negative, on the probability of an associate student's educational attainment in the BPS89 sample. In contrast, being black has a negative effect in NELS, but the effect disappears once we

[26] Following our definition of the associate group, we included in that group those students who are enrolled at a community college but who state that they want to earn a bachelor's degree. To determine whether being an occupational student would hurt these students' chances of earning a bachelor's degree (rather than of earning an associate degree or transferring, as we have done in the analysis so far), in an additional analysis, we included these students in the baccalaureate group and added a dummy variable to indicate whether the student started at a two-year school (note that we added this variable only with BPS89, given the small percentage of students at two-year schools that are in a four-year program in NELS). That analysis indicates that starting at a two-year school has a strong negative effect on earning a bachelor's degree (for students who state that they want a bachelor's degree), but the coefficient on the occupational variable is insignificant. An additional variable that measured the interaction between occupational status and starting in a two-year school was insignificant in all models. Thus, although starting in a community college does lower a student's chances of earning a bachelor's degree, enrolling in an occupational major has no additional negative effect.

control for educational background. Presumably, some of the detrimental effects for black students are more heavily correlated with their previous schooling experience.[27]

Among the socioeconomic and family background variables, having a parent with at least a bachelor's degree and being a dependent in the first year of postsecondary enrollment significantly increase the probability of educational success for the BPS89 sample. However, these effects became insignificant when we held the pathway variables constant. In the NELS sample, coming from the highest SES quartile and receiving financial aid both increase the probability of educational attainment. These effects remain even after controlling for pathways.

The educational background of a student is a significant determinant of his or her chances of completion. (Note that this affirmation holds only for NELS, where the educational controls are much richer than they are in BPS89.) Attending a private school and a majority-white school in eighth grade increases the probability of associate attainment whereas high school students who concentrate on vocational and general high school tracks do significantly worse in terms of educational attainment than those who enroll in an academic track.

Finally, all the pathway variables and the FTE control (with the exception of the dummies for working while enrolled) have significant direct and indirect effects on the probability of educational attainment for associate degree seekers. In the most complete

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[27] This finding implies that a group effect, in this case for black students, is being driven by a compositional difference in their educational background (they have lower test scores, lower rates of participation in the academic track, and lower percentages of attendance at private and mostly white schools).

specifications, enrolling full time increases the estimated probability of completion by 28 percent and 35 percent in BPS89 (for enrolling between 25 percent and 75 percent of the time and for enrolling more than 75 percent of the time as full time, respectively) and by 8 percent in NELS. Interrupting enrollment reduces the probability by approximately 10 percent in both datasets. Delaying enrollment for a year also reduces the chances of successfully completing an educational milestone, with a marginal effect of 23 percent.[28] In contrast, we find that associate students who work, even those who work many hours, do not have a lower probability of achieving their educational goals. It should be remembered that we are controlling for part-time status, so if working causes students to go part time, then their chances of completing their degree objectives will fall, but the problem is with the part-time status, not with the work. Finally, and as expected, accumulation of FTE semesters has a positive and significant effect (we control for FTE semesters only with BPS89). Having two FTE semesters instead of one increases the probability of success by 10 percent, but increasing FTE enrollments from two to three semesters augments the estimated probability by 7 percent. The accumulation of FTE semesters increases the probability of success, but in a diminishing fashion.

The most important finding overall concerns occupational students. Our analysis suggests that occupational students have a lower probability of achieving their educational goals. Even after controlling for demographic, educational, socioeconomic and pathway variables, occupational students in the associate group have a lower probability of attaining their educational goals than their academic peers. Certainly, some of the average differences shown in table 3 can be accounted for by differences in background characteristics and pathways.

[28] Recall that delayed enrollment is used only in NELS.

Occupational students are more likely to be older, to come from lower SES households and to have more family responsibilities. Most of these factors reduce the probability of educational success, but a gap remains even after taking account of these differences.

Given the relative strength of the effect of being an occupational student, we extended our analysis in three ways. First, we tested whether important differences exist between students in this group who aspire to a bachelor's degree and those who seek an associate degree. To conduct this test, we added a variable indicating which degree the student was working toward. (This analysis was done for the BPS89 sample only, and the results are not shown here.) The coefficient for this variable is not significant, and including it has only small effects on the size but does not alter the significance of other coefficients.

Second, we tested whether the occupational effect varies when changing the definition of completion to include the attainment of a certificate and to exclude transfer to a four-year institution. (The results are not shown here.) We found that occupational students in BPS89 are still significantly less likely to attain a degree of any type, although the magnitude of the negative effect is reduced to –10 percent in the most complete specification. In contrast, the negative occupational effect in NELS becomes insignificant. What this finding implies is that occupational students complete degrees as often as their academic counterparts do, but they are more likely to attain a degree that requires fewer years of education than they originally expected to attain. We can conclude, therefore, that some occupational associate students who fail to achieve their stated goals do not leave empty-handed. Either, in the course of their studies, they lower their goals and leave with a certificate instead of an associate degree or, when they leave short of an associate degree, they realize that they had completed the requirements for a certificate and therefore leave with a formal certification of completion.

Finally, we carried out an additional analysis to determine whether the determinants of success are different for transferring and for completing an associate degree.[29] In our analysis so far, associate students are considered completers either if they attain that degree or if they transfer. To differentiate between transfer and associate completion, we carried out a multinomial logistic regression that could differentiate among more than two outcomes—in this case, transfer or BA-BS attainment, attainment of an associate degree and neither (either continued enrollment or nonenrollment). We concluded that the negative effect of being an occupational student seems to be mostly driven by the lower probability of transferring or by attaining a BA or BS. The occupational enrollment effect is negative for both transfer and AA-AS attainment, but it is not significant for AA-AS attainment. The finding that being an occupational student as opposed to an academic student has a stronger negative effect on the probability of transfer than the probability of attaining an AA or AS is corroborated by an

[29] To understand the distinction between the graduation and transfer process better, we ran a multinomial logistic model in which two outcomes (attaining an associate degree and transferring or achieving a bachelor's degree) compete and are modeled using the same set of covariates (results not shown here). From these analyses, we claim that, with NELS, the "driving" factors for the different associate outcomes are quite similar to those for the pooled single outcome logistic model. The exceptions are the pathway effects, which apparently have more to do with the AA or AS attainment process. In contrast, the factors that affect educational attainment in BPS89 do vary by the type of outcome considered. The positive effect of being female holds only for the attainment of an AA or AS whereas being black affects negatively processes to transfer or attain a BA or BS. In concordance with the NELS findings, the pathway effects are much less important for the transfer process.

analysis we did using a more comprehensive statistical methodology—Event History Analysis[30] (see appendix D).

Associate Degree Completion Rates for Special Populations

As shown in tables 4 and 5, postsecondary occupational programs serve a diverse student population. Moreover, the Perkins Act emphasizes service to students in special populations such as those who are economically disadvantaged, those who are academically disadvantaged, single parents, displaced homemakers, and those who have limited English proficiency. Both BPS89 and NELS allow investigation of whether students in these special populations who are seeking associate degrees have higher or lower odds of completing their desired degree. However, sample sizes for some of these populations (displaced homemakers and students with limited English proficiency) are small and, consequently, their educational outcomes cannot be analyzed in much detail.

The results for the analyses of these populations are displayed in tables 12 and 13. Before discussing the findings, we describe who is considered an economically or an

[30] Event History Analysis has several advantages over the simple logistic regressions used in most of this report. It can take account of several outcomes, it can address the censoring problem and it analyzes the timing of events rather than merely whether or not they happen. Unfortunately, its data requirements are more demanding, and the only appropriate dataset available to us is High School and Beyond (HS&B). HS&B is from the 1980s, so we do not use it for most of our analysis, but we do use it to augment out findings based on BPS89. The analysis is fully explained in appendix D.

academically disadvantaged student. For purposes of this study, an "economically disadvantaged" student is an individual who comes from a household whose annual income is below $20,000. An "academically disadvantaged" student is an individual who scored in the two lowest quartiles in the grade 10 NELS test. With the BPS89 sample, we also looked at the effects of being of "young age" when first enrolled[31] and of being a single parent in the first year of postsecondary education. With the NELS sample, we additionally determine the effect of being a female student enrolled in a traditionally male-dominated occupational major.[32] Finally, we should note that, to understand whether students from these subpopulations have a different completion rate when they enroll in occupational programs, we added interaction terms between the occupational dummy and the different dummies that indicate belonging to one of these populations.

Table 12 shows the results using BPS89. The first two columns of the table have the full model of table 9 with the addition of the specific variables for the subpopulations. Single parent associate students are 28 percent less likely to complete their educational goals than their non-single parent peers whereas economically disadvantaged students see their probability of completing reduced by 13 percent. Younger students have, statistically, no advantage for completion as compared with their older counterparts. Controlling for these populations reduces the occupational effect only slightly, but it remains statistically significant.

[31] In this analysis, a "young" postsecondary student is under age 24 when first enrolled, and an "old" student is 24 years or older when first enrolled.

[32] See table E.1 in appendix E for a list of traditionally male-dominated occupational fields of study.

The third to sixth columns emphasize the effect of being an economically disadvantaged student. When we controlled for the interaction between occupational status and economically disadvantaged status, we found that economically disadvantaged students still attain degrees at a rate significantly lower than their non-economically disadvantaged peers and that all occupational students still have a probability of attainment that is 22 percent lower than that of all academic associate students. However, economically disadvantaged students enrolled in an occupational major have a probability of completion that is approximately 12 percent higher than that of similar students enrolled in academic majors.[33] And when looking at the sample restricted only to economically disadvantaged students, we found that low-income occupational students do at least as well as low-income academic students. Thus, it appears that economically disadvantaged students in occupational programs complete their educational goals at minimally the same rate as similar students in academic programs.

Columns seven to 10 have the analyses of the effect of being "young" when first enrolled. Comparing the first two columns in table 12 to columns seven to 10, we see that there is not an important difference between the younger and the older students with respect to the relationship between occupational status and completion; the coefficients on the occupational variable are very close, and both are negative and significant. But caution is needed in interpreting this finding because 760 out of 891 observations are "young." In addition, the interaction between young age and occupational status is insignificant, suggesting that there is not a strong age effect.

[33] This finding is derived by subtracting the negative occupational coefficient from the coefficient for the interaction between occupational and economically disadvantaged status, which is positive. Because we could not test whether this difference was statistically significant, we cannot draw definitive conclusions about this positive difference.

The last two columns of table 12 analyze the effect of being a single parent. When the interaction between single parent status and occupational status is added, the single parent dummy loses significance and the interaction is not significant. But the sum of the single parent dummy and the interaction term adds up to more than the coefficient for the dummy from column one. A problem with this analysis is the size of the sample; there are only 46 single parents, and 41 of them are in an occupational program. Thus, we simply do not have enough information to measure a difference between academic and occupational completion rates for this population.

The results for the NELS dataset are shown in table 13. We find that economically disadvantaged students have a probability of attaining an associate degree or higher degree that is 12 percent lower than that of higher-income students whereas academically disadvantaged students have a completion probability that is statistically similar to that of nonacademically disadvantaged associate students. Controlling for these special populations slightly reduces the occupational effect, which now becomes statistically insignificant.

The third to sixth columns of table 13 focus on the analysis of educationally disadvantaged students. When using only the subpopulation of academically disadvantaged students, the effect of being an occupational student is insignificant. Therefore, no significant effect was found for enrolling in an occupational major for academically disadvantaged students. This finding is confirmed by looking also at the interaction term between academically disadvantaged and occupational status, which is statistically insignificant. Notice, however, that the negative effect of being economically disadvantaged disappears for the academically disadvantaged subpopulation. Thus, the disadvantage posed by low household income disappears among students in the lower academic quartiles.

The analysis of the effect of being economically disadvantaged is found in columns seven to 10 of table 13. When we controlled for the interaction between occupational and economically disadvantaged statuses, we found that low-income students are no longer significantly less likely to complete their degree goal than their higher income peers. Further, the interaction term is insignificant, indicating that there is no difference between economically disadvantaged students in academic and occupational programs in terms of completion. For the economically disadvantaged subpopulation, the occupational effect is slightly less negative than for the whole population, but it remains insignificant. Similarly, academic disadvantage confers no significant effect on the outcome for low-income students.

The last two columns of table 13 incorporate a dummy that indicates whether the student is a female enrolled in a traditionally male-dominated occupational major. This variable is insignificant, indicating that females in these nontraditional majors are just as likely to complete their expected degree than their counterparts who are enrolled in more traditional majors.

In summary, low-income students are at a clear disadvantage for degree completion, but if they enroll in an occupational program, their chances of success increase considerably. In contrast, academically disadvantaged students are less likely than non-disadvantaged students to attain their degree objective, but no difference occurs by program of study. Occupational education does not seem to provide any additional advantage for other subpopulation groups such as older students, single parents or females in nontraditional occupational majors. Whether or not these students enroll in occupational programs does not affect their chances of completing their degree objectives.

VI. The Likelihood of Persistence Among Occupational Associate Students

To complement the analysis of the determinants of educational attainment described so far in this report, we conducted two additional analyses. In addition to the BPS89 survey, we used a more recent BPS study (BPS96) covering the academic years 1995–96 to 1997–98. This dataset includes additional information about student objectives that can provide insights into the reasons why outcomes might be different for academic and occupational students. Because only three years of data are available, the censoring problems for the analysis of completion of associate and bachelor's degrees were more serious than they were with BPS89. But because persistence is one requirement for completion, a comparative analysis of three-year persistence also can provide some insights about completion.

The first additional analysis looked at the determinants of one-year or short-term persistence, and the second analysis focused on the determinants of three-year or mid-run persistence. Both analyses were restricted to associate students since we found no negative occupational effect for certificate or baccalaureate students.[34]

One of the purposes of these extensions is to see whether the disadvantage of being an occupational associate student, in terms of degree attainment, starts as early as the first year of postsecondary education. Several researchers remarked that the students' postsecondary experience during their first year of enrollment has a considerable influence on persistence and

[34] We also conducted these analyses for certificate students, and the results are available on request.

attainment (Horn and Carroll 1996; Pascarella and Terenzini 1991; Tinto 1993). Thus, we looked at whether associate occupational students attain a degree or are continuously enrolled more often than their academic peers by the beginning of the third semester.[35] In addition, we were interested in analyzing whether occupational students persist or complete degrees in the mid-run less often than their academic counterparts. For this analysis, we used a three-year persistence definition that allows for discontinued enrollment but considers as successful outcomes the attainment of a degree or being still enrolled by the end of the third year of postsecondary education.

Another objective was to determine whether persistence rates increased or decreased during the 1990s, given that our datasets include students who started college at the beginning and at the middle of that decade. The use of the two BPS datasets allowed us to determine whether or not occupational persistence rates are catching up with those of academic students.

The last goal of these additional analyses was to study the effect of students' objectives on persistence toward a degree. BPS96 includes a question about reasons for enrolling, which can provide useful insights on what students expect to gain from their postsecondary experience. We assume that persistence rates vary among students who cite different reasons for enrolling.

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[35] We selected the end of second semester as the critical period for defining short-term persistence for associate students after taking into account the theoretical duration of the associate program, which is two academic years. Then, by looking at whether students were still enrolled, without interruptions, or whether they attained a degree by the beginning of the third semester, we were capturing persistence through half of their expected program duration.

Short-Term and Three-Year Persistence Rates

Associate students are said to persist into the third semester (short-term persistence) of postsecondary education if they attain a degree or transfer up by the end of the second semester or if they enroll continuously up to the beginning of the third semester. Here, we are not restricting degree completers to having continuous enrollment, but because of the short period for which we define persistence, we do expect degree completers to have been enrolled without interruptions. Conversely, when defining three-year persistence (mid-run persistence), we allow associate students to interrupt their enrollment. Thus, a mid-run persister is a student either who is still enrolled by the end of the third year, independently of whether or not the enrollment was interrupted, or who attained a degree or transferred up by that time.

Are associate students in general, and occupational associates in particular, during the mid-1990s more likely to persist than those who started postsecondary education in 1989–90? Table 14 contains the one-year and three-year persistence rates of associate students. Associate students increased their one-year persistence rate between 1989 and 1995. Of the 1989 first-time beginner associate students, 41 percent did not persist before the beginning of the third semester whereas, of the 1995 associate students, only 35 percent failed to persist. Are occupational students also exhibiting higher short-term persistence rates? Table 14 indicates that occupational associate students in 1995 were more likely than their 1989 counterparts to persist in the short run and that both continuous enrollment and degree attainment were higher for the 1995 students. Academic students persist at higher rates than occupational students, and their persistence rates also grew between 1989 and 1995, so a considerable one-year persistence gap still exists between the two groups at the later date.

Table 14 also shows the three-year persistence rates. The overall success rate of 1989 associate students was 59 percent, which slipped to 56 percent for the 1995 entrants. Even though the data for both years indicate that slightly more than half of the associate students persist, the degree attainment rates in a three-year period are low. Only 19 percent of 1989 and an even smaller 11 percent of the 1995 associate students earned their degree in three years. However, 31 percent of 1989 associates and 33 percent of 1995 associate students were still enrolled at the end of three years. Another area where 1995 associate students performed better than their 1989 counterparts was in transferring to the baccalaureate level or attaining a bachelor's degree within three years. Compared with the 1989 group, fewer associate students in 1995 completed their degrees within three years, but slightly more transferred to a baccalaureate program (or earned a BA or BS) within that period.

An important note to consider is that the three-year nonpersistence rate for associate students covers those who leave school after attending for only two semesters or less and those who leave after attending for three or more semesters (but for less than three years). Using this definition allowed us to determine the proportion of the nonpersisters from the short-term analysis (one year) who completely ceased enrollment within three years and the proportion who returned to school within the three years. We already stated that, after one year of enrollment, 41 percent of associate students in 1989 failed to persist. We also found that 24 percent of all associate students did not persist in the short term. This finding suggests that, of the 41 percent of students who did not persist in 1989, 17 percent returned to school within three years.[36] Some of these students continued to be enrolled, others earned degrees, and still others dropped out again.

The 1995 data exhibit lower rates of short-term nonpersisters returning within three years. Specifically, the short-term analysis indicates that 35 percent of associate students failed to persist after one year. The three-year analysis, in contrast, indicates that 27 percent failed to persist within the first two semesters. Therefore, only 8 percent of 1995 students were early stopouts who returned to school within three years,[37] a much smaller proportion than in 1989. Furthermore, although 1995 associate students had a lower nonpersistence rate in the short term (35 percent compared with 41 percent for 1989), they exhibited a higher nonpersistence rate over three years (44 percent compared with 41 percent for 1989). Although the conclusions from the short-term analysis suggest the positive trend of a smaller proportion of students dropping or stopping out in 1995, the conclusions from the three-year analysis are the converse. Because a much smaller proportion of 1995 students were actually stopouts who returned within three years and a larger proportion of the 1995 students dropped out within the three years, we could conclude that the enrollment outcomes for associate students were worse in 1995 than in 1989.

The data on occupational and academic students suggest that this deterioration in three-year persistence rates is entirely attributable to academic students. In 1995, occupational students persisted at the same rate as they did in 1989, and although fewer attained an associate degree,

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[36] The 17 percent is calculated by subtracting 24 percent from 41 percent.

[37] This percentage is computed by subtracting 27 from 35 percent.

the decrease is made up almost entirely by an increase in the share of those who transferred to a baccalaureate program or actually earned a BA or BS. The overall "success" rate (still enrolled, transferred or earned a degree) dropped significantly for academic students, and the large decrease in the proportion of these students who earned an associate degree accounted for most of that drop. In this case, the drop was not made up for by an increase in the transfer rate. Thus, this comparison over time indicates that persistence rates for occupational associate students did not deteriorate whereas they did for academic students. By the middle of the 1990s, academic students still persisted at higher rates than occupational students, but that gap decreased from about 20 percentage points to 6 points.

Determinants of Short-Term and Three-Year Persistence

In this section, we analyze the determinants of one- and three-year persistence. These analyses provide insight into the changes in persistence rates reported above and in table 14. For each of the surveys, we ran the same models we used in the 1989 completion analysis presented in section V. Thus, we used identical demographic, family background, educational background and pathway covariates and added them in the same step-wise manner. However, in this section, we concentrate only on the results from the most complete specification, which are shown in table 15.

Although being female had a marginally significant positive effect in the short-term 1989 estimates, it failed to be significant over the three-year outcome in either 1989 or 1995. In contrast, being black had a strong and significantly negative effect on persistence in the 1989 three-year estimates as it did in the 1989 short-term persistence model. Both female (positive) and black (negative) variables had significant effects on educational attainment, as found in the five-year completion models.

In 1995, more background variables showed significant effects on success for the one-year and three-year outcomes than in 1989. In 1995, the logarithm of total household income had a small positive effect (approximately 7 percent) on one- and three-year persistence. Students who had a parent with a bachelor’s degree or higher also were more likely to have a persisted into both one and three years. One minor contrast between the short-term and three-year outcome estimates is the weaker effect that dependent status had on three-year persistence among associate students in both 1989 and 1995. It is strongly positive in the short-term model in both surveys, but it exhibits an insignificant effect in the 1989 and 1995 three-year estimations. The income and parents’ education variables indicate the benefits of high SES on the persistence rate of associate students.

As with the five-year estimates, pathway variables significantly affected the attainment of successful outcomes over the one-year and three-year time periods. In both the 1989 and 1995 surveys, part-time enrollment reduced the likelihood of retention. Thus, attending part time significantly increased the likelihood of associate students dropping out within one and three years. In surprising contrast, interrupted enrollment increased the likelihood of three-year success. The only explanation we have for this positive effect is that many students who interrupted their postsecondary education would be enrolled during the last semester of observation and thus flagged as having persisted.

The most notable and relevant difference between the short-term and three-year outcome estimations is the significant negative effect that being an occupational student (as opposed to academic student) has on three-year persistence in the 1989 data. The occupational dummy is marginally significant for short-term persistence, but it significantly decreases the likelihood of three-year success by 19 percent. Thus, associate students in academic majors were more likely to continue their enrollment, obtain a degree or transfer to a baccalaureate program by three years than their peers in occupational majors. Notably, this effect was no longer significant in the 1995 data. The significance of the type of major variable in 1989 coincides with the finding from the five-year estimates that occupational students are less likely to attain an educational milestone than their academic peers.

As noted above, according to the 1989 data, occupational status significantly reduces a student's likelihood of success over three years whereas the 1995 data show no significant detrimental effect. Because we are very interested in the educational success of occupational students, this shift appears to be a positive trend, suggesting that occupational students are catching up to their academic peers in rates of success. However, the rates of persistence shown in table 12 indicate otherwise. Indeed, from 1989 to 1995, the data show that academic students' retention rates declined rather than that occupational students' retention rates increased. Although 72 percent of all academic students in 1989 persisted through the end of the third year of enrollment, only 58 percent did so in 1995. Occupational student persistence rates increased only slightly from 51.5 percent to 52 percent between the two surveys. The drop in the success rates of academic students is mostly because of a drop in the proportion of students who earned an associate degree in the three-year time period, down from 26 percent to 14 percent. The percentage of academic associates still enrolled dropped by 3 percentage points whereas the proportion of the students who earned a BA or BS degree or who transferred to a baccalaureate program actually increased slightly (from 10 percent to 11 percent). Therefore, the lack of significant effect of a student's major (occupational or academic) in BPS96 is because of a convergence in persistence rates as the retention rates of academic students fell to more closely match the lower rate of their occupational peers.

What might explain this deterioration of persistence rates for academic sub-baccalaureate students? During the period between the two surveys, the gap between the earnings of high school students and of BA or BS holders grew significantly (Murphy and Welch 2002). It is not surprising that, during the 1980s and early 1990s, the share of high school students who stated that they aspired to a bachelor's degree grew. These students were likely to enroll directly either in a baccalaureate program or in an academic, transfer-oriented program at a community college. Thus, it is possible that the students who were most convinced that they wanted a BA or BS degree tended to shift their enrollment from community colleges to four-year colleges or universities. Because these students may have been more certain of their goals, they may also have been more likely to persist and complete, and therefore, their shift to four-year institutions would leave less directed students in community colleges' academic programs. Further, the overall emphasis on earning a BA or BS degree may also have encouraged more marginal high school students to enroll in college, and these students would be more likely to start at a community college. If the goal of these students were to attain a BA or BS degree, then they would probably have enrolled in an academic program. Both of these factors would suggest that the overall level of academic preparation and direction of community college students in academic programs weakened during the early 1990s, and they might explain the deterioration of persistence rates during that period.

Reasons for Enrolling and Their Effect on Persistence

One possible explanation for the low completion rates among occupational associate students is that they are not seeking degrees but, rather, are attending a community college to learn specific skills and leave when they have learned those skills. In many cases, they may learn those skills before completing any degree or certificate. After all, the underlying notion of an occupational major is that it is closely tied to particular jobs or occupations. If in fact there is an obvious link between specific skills and specific jobs, then both the student and the potential employer may have a strong sense of whether the student has learned the required skills, even if the student does not have a degree. Because the relationship between specific skills and jobs is less evident for academic programs, employers may have to rely on the award of a degree to signal the general abilities of the student.

The hypothesis that occupational students have different objectives can be tested using data from BPS96 because the survey includes a very interesting variable that is available only for students enrolled at a two-year college. The variable concerns "the primary reason for enrolling at that school" and the survey question lets students choose among "job skills," "degree attainment/transfer" and "personal enrichment." We assume (a) that students who enroll with the purpose of acquiring job skills would be less likely to persist and to complete a degree and that they are concentrated mostly in occupational majors and (b) that students enrolling for personal enrichment would also be less likely to persist. Both types of students have reasons that suggest a lower "attachment" to a degree objective.

Bailey et al. (forthcoming) observed that students' majors are correlated to their primary reason for enrolling. Specifically, occupational students are more likely to cite job skills as their primary reason for enrolling whereas academic associates more often cite earning a degree or transferring. It appears then that "occupational students may be more utilitarian in their objectives, which might be expected given the practical nature of occupational majors" (Bailey et al. forthcoming). Conversely, academic associate students are more likely to cite transfer than degree or certificate as their reason for enrolling. The large number of academic associate candidates who cite transfer is an indication that students may be using the two-year institution as a stepping-stone toward a bachelor's degree. (See Bailey et al. forthcoming for a discussion of the stepping-stone argument.)

Although this finding allows us to confirm the hypothesis that occupational students are less interested in earning degrees than their academic counterparts, it does not say that the diverse motivations significantly affect persistence and completion (holding demographic, SES and educational background, and pathway variables constant). So, to understand fully the effect of having different goals, we ran logistic regressions that have as outcomes one-year and three-year persistence and that include as covariates the reasons for enrolling, with degree or transfer as the reference category. Table 15 shows that, in the one-year analysis, personal enrichment was negatively correlated with associate students' persistence, and a job skills goal reduced marginally the probability of persistence by 11 percent whereas the three-year analysis indicates that citing job skills significantly reduced the likelihood of three-year persistence by 18 percent. Controlling for these reasons for enrolling does not, however, influence the effect of occupational enrollment status. Although in neither case (with or without reasons for enrollment) is the coefficient on occupational status significant, the point estimate actually goes up slightly when the reasons-for-enrolling controls are added. These findings suggest that, although occupational students may have somewhat different goals, controlling for the differences in those goals would not explain the gap between academic and occupational completion rates that we found in our analysis of BPS89.

VII. Conclusions

Students are changed in many ways by their experiences in college. Nevertheless, most students attend postsecondary school with some occupational expectations, even though the importance of their career goals among other possible plans varies from student to student. This study has focused on the experience of students who are categorized by the Choy and Horn (1992) and the National Center for Education Statistics as occupational students. This categorization roughly distinguishes between programs that prepare students more or less directly for a well-defined occupation (occupational majors) and programs that provide a somewhat broader education with a stronger general education or academic component (academic majors). Our goal was to evaluate whether postsecondary occupational students are more or less likely than academic students to attain their educational goals.

After dividing students into three groups—students pursuing a certificate, an associate degree (AA or AS) and a bachelor's degree (BA or BS)—we measured educational achievement relative to the student's stated educational goals and initial program of study. This effort was complicated by the varied objectives of community college students. To help simplify development of some conclusions, we put all community college students who stated that they were pursuing either an associate or a bachelor's degree in the associate category, and for this group, we counted either attainment of an associate degree or transfer to a four-year school as an educational milestone.

Summary of Findings

Although our focus was on the outcomes of occupational education, we had to consider all other determinants of education achievement to estimate these outcomes accurately. Thus, we built a broader model using demographic characteristics, SES background, educational background and pathway information (the timing and intensity of the educational experience) as control variables. The estimation of this model also yielded some interesting insights. We will review the most important of those before returning to our discussion of occupational education.

We found that the demographic, SES and educational background variables had almost no significant effect on the success of certificate students. Among the baccalaureate group, women have a higher chance of completion. Dependent students, those who have at least one parent with a BA or BS, and students from middle-high and high SES backgrounds have a higher chance of attaining a bachelor's degree. Also, the educational background of baccalaureate students has significant effects on their probability of success. The demographic variables have little effect on associate students' chances of achieving their educational goals.

Taken together, the most striking result is the importance of the pathway variables, that is, the attendance patterns of the students. They are the only factors that are important for certificate students. For baccalaureate and associate students, attending part time, interrupting enrollment and delaying enrollment after high school all have negative effects on achieving educational goals. This finding is true even after we control for the total number of FTE semesters in which the student is enrolled.

What was the effect of being an occupational student? We found that the effect differs depending on the student's educational aspirations. It has no influence on the educational success of certificate students, although this finding is not surprising because the large majority of certificate students are in occupational majors. By its nature, the certificate is an occupational degree—a degree that is more or less focused on preparation for a specific occupation. Occupational status also had no influence at the baccalaureate level. This finding was true even for community college students with baccalaureate aspirations. The distinction between occupationally specific and broader, academic-oriented education has less meaning at the four-year level, perhaps because, at that level, even occupational programs have a strong academic content.[38]

We focused most of our attention on occupational students in the associate group. First, we found that, after five years, 53 percent had not completed any degree and about three-fourths of those who did not complete were no longer enrolled. Another 9 percent had completed a certificate, a degree less ambitious than the original objectives. We also found that, for students enrolling in the late 1980s and early 1990s, occupational students in the associate group had a lower probability of achieving their educational goals than did academic students.

The Carl D. Perkins Vocational and Technical Education Act of 1998 emphasizes providing occupational education for disadvantaged groups. Therefore, we looked at the effect of

[38] Also, as we have pointed out, the Choy and Horn (1992) categorization of occupational fields of study was developed primarily with the two-year level in mind.

being an associate student from these groups such as those who are economically disadvantaged, those who are academically disadvantaged, single parents, those of nontraditional age, and females in a nontraditional occupational major. We found that disadvantaged groups tend to complete their degrees less often than other student population groups, but generally, they have no different educational completion rates if they enroll in an occupational major instead of in an academic major. Only for economically disadvantaged students does enrollment in occupational education increase their chances of meeting their degree goal.

A significant finding with respect to the effect of occupational education is that the gap between the completion rates of occupational and academic associate students appeared to have declined between the end of the 1980s and the mid-1990s, although we had to make this judgment based on persistence rates rather than on completion rates. Analyses we carried out on the determinants of one- and three-year persistence rates in the mid-1990s that controlled for personal, family and pathway characteristics showed no statistically significant difference between occupational and academic students. However, the convergence of the two groups did not result from an improvement in persistence and completion among occupational students but, rather, from a deterioration in those rates for academic students.

What might explain the low persistence and completion rates for occupational students? Lower persistence and completion rates for occupational students are partly related to these students' characteristics. Sub-baccalaureate occupational students are more likely to be older, to have family responsibilities when they first enroll, and to come from lower SES backgrounds. These are all characteristics associated with lower college persistence and completion levels.

Nevertheless, in the 1989–1994 Beginning Postsecondary Student Longitudinal Study (BPS89) analysis, the negative occupational effect remained even after controlling for these variables. We also know from the National Education Longitudinal Study (NELS) data that, when compared with academic students, occupational students have lower scores on assessment tests taken in high school and are less likely to have taken a rigorous academic high school program. All these factors are associated with lower levels of success in college. When we controlled for these variables using NELS from the early 1990s, the occupational effect on completion was weaker, but there was still some evidence of its presence.

Another possible explanation for the low completion rates of occupational students is that they do not want degrees. We explored this hypothesis in detail in section VI where we pointed out that occupational students were more likely than academic students to cite gaining job skills rather than earning a degree or transferring as their primary reason for enrolling. Moreover, we found that, after controlling for demographic, SES, educational and pathway characteristics, students who cited jobs skills as their primary objective for enrolling were about 11 percent less likely to persist into their second year and 18 percent less likely to complete three years (or earn a degree before completing three years). Therefore, goals may explain part of the low raw occupational completion rates shown on table 3, but our complete analysis indicated that including variables for reasons for enrolling does not influence the persistence gap between academic and occupational students.

A final explanation for the differences in persistence and completion between occupational and academic students is that the colleges in some way work less effectively with occupational students. For example, Grubb (1996) argues that the academic model, values and processes, which are more consistent with an academic-oriented education, still dominate community colleges. Therefore, institutional support in community colleges is less than optimal for occupational students. Perhaps effective pedagogy, advising or other student services are different for occupational students. Although this possibility is a plausible hypothesis, testing it would require more fine-grained information on the differences between the experiences of the two types of students and the services made available to them. Unfortunately, the datasets used for this project did not include this type of information.

In most of our analysis of students seeking associate degrees, we considered either attainment of an AA-AS degree or transfer to a BA-BS program (or attainment of a BA or BS) as indications of “completion.” When we carried out a more comprehensive analysis that differentiated between degree completion and transfer, we found that the strongest difference between outcomes for academic and occupational students was in the probability of transfer. Occupational students still had a lower probability of completing an AA or AS degree, but that difference was not statistically significant.

Policy Implications

What policies do these findings and explanations suggest? The evidence seems to indicate that better high school preparation would not necessarily close the educational attainment gap between occupational and academic students. However, improving the high school preparation would be a key to increasing the educational attainment of students in general.

In addition, policies that do a better job of informing potential occupational students about the academic demands of college are crucial. It seems likely that many students enter postsecondary occupational programs because they believe that these programs have fewer or weaker academic requirements. Indeed, many occupational programs do have weaker academic prerequisites and are less likely to require remediation for students with deficient academic skills.[39] Given the lower completion rates for occupational students, a policy that does not require remedial help for these students seems misguided. While the Perkins legislation does not provide for remediation, community colleges need to strengthen their remediation requirements regardless and improve the delivery of that remediation.

We have also argued that the colleges may work less effectively with occupational students, but any definitive policy recommendation concerning this issue must await a better understanding of this problem. If it does turn out that the colleges do not serve their occupational students well, then several possible new policy approaches might be implemented. For example, the integration of academic and occupational instruction, both for college-level and developmental courses may be more successful for occupational students. A variety of

[39] We found, using NELS, that academic students have higher test scores and higher incidence of remediation as compared with occupational students. These indicate that those with higher academic skills are, on average, more likely to receive remediation.

approaches to advisement and counseling, including increased focus on job placement, may also be more effective in addressing the special needs of occupational students.

In conclusion, associate occupational students achieve their stated goals less often than their academic counterparts. Moreover, their record is particularly problematic compared with baccalaureate students. Part of this difference can be explained by differences in student characteristics and expectations, but the gap still remains after controlling for many of those factors. Our research therefore suggests that community colleges have yet to figure out and implement the optimal approach to providing direct occupational preparation within an institutional structure that continues to rest on a foundation oriented toward academic education.

Tables

Table 1

Definition of the Groups of Postsecondary Students

	Degree Goal - First Postsecondary Enrollment				
	Missing Goal	**No Degree Goal**	**Certificate Goal**	**AA/AS Goal**	**BA/BS Goal**
All Students					
BPS:89–94	1.76%	3.86%	15.72%	30.69%	47.97%
NELS:88–00	7.32%	8.67%	6.71%	26.16%	51.14%
Certificate					
BPS:89–94	0.00%	0.00%	100.00%	0.00%	0.00%
NELS:88–00	0.00%	0.00%	100.00%	0.00%	0.00%
Associate					
BPS:89–94	0.00%	0.00%	0.00%	72.89%	27.11%
NELS:88–00	0.00%	0.00%	0.00%	97.90%	2.10%
Baccalaureate					
BPS:89–94	0.91%	0.00%	0.00%	0.00%	99.09%
NELS:88–00	3.64%	0.00%	0.00%	0.00%	96.36%

Source: Authors' estimates based on Beginning Postsecondary Student Longitudinal Study 1989–1994 and National Education Longitudinal Study 1988–2000.

Table 2

Occupational, Academic and Undeclared Students

	Occupational	Academic	Undeclared/Missing
All Students			
BPS:89–94	47.78%	25.93%	26.29%
NELS:88–00	34.94%	32.70%	32.37%
No Degree Goal			
BPS:89–94	35.57%	38.29%	26.14%
NELS:88–00	39.88%	36.11%	24.01%
Certificate			
BPS:89–94	80.34%	7.08%	12.58%
NELS:88–00	79.55%	12.86%	7.59%
Associate			
BPS:89–94	51.75%	25.45%	22.80%
NELS:88–00	53.77%	37.96%	8.27%
AA/AS Goal			
BPS:89–94	55.21%	23.14%	21.65%
NELS:88–00	52.96%	38.59%	8.45%
BA/BS Goal			
BPS:89–94	42.98%	31.64%	25.38%
NELS:88–00	91.36%	8.64%	0.00%
Baccalaureate			
BPS:89–94	34.37%	31.72%	33.91%
NELS:88–00	40.75%	52.18%	7.08%

Source: Authors' estimates based on Beginning Postsecondary Student Longitudinal Study 1989–1994 and National Education Longitudinal Study 1988–2000.

Table 3

Degree Completion-Attainment of Stated Goal[1]

Two-Year Students with No Degree or Missing Program	All		Occupational		Academic	
	BPS	NELS	BPS	NELS	BPS	NELS
No Degree/Still Enrolled	83.00%	32.47%	93.79%	35.52%	73.60%	29.32%
Still Enrolled in Last Period	23.20%	7.13%	23.91%	7.40%	22.97%	6.85%
No Degree and No Transfer	59.80%	25.34%	69.88%	28.12%	50.63%	22.47%
Certificate	***low n***	***8.18%***	***low n***	***10.47%***	***low n***	***5.82%***
Associate Degree	low *n*	12.70%	low *n*	15.97%	low *n*	9.31%
Transfer to Baccalaureate Level	10.77%	39.89%	4.85%	30.91%	15.92%	49.19%
Bachelor’s Degree	low *n*	6.75%	low *n*	7.13%	0.00%	6.37%

Certificate Students	All		Occupational		Academic	
	BPS	NELS	BPS	NELS	BPS	NELS
No Degree or Still Enrolled	46.75%	31.99%	45.95%	31.70%	—[2]	33.82%
Still Enrolled in Last Period	2.25%	3.86%	2.10%	4.48%	low *n*	0.00%
No Degree and No Transfer	44.50%	28.13%	43.85%	27.22%	53.03%	33.82%
Certificate	***47.74%***	***55.85%***	***49.11%***	***58.63%***	***30.60%***	***38.50%***
Associate Degree	3.46%	4.67%	3.07%	3.85%	8.03%	low *n*
Transfer to Baccalaureate Level	1.24%	3.73%	1.08%	3.29%	3.12%	low *n*
Bachelor’s Degree	0.82%	3.75%	0.79%	2.53%	low *n*	11.41%

Baccalaureates	All		Occupational[3]		Academic	
	BPS	NELS	BPS	NELS	BPS	NELS
No degree, Certificate, Associate, Still Enrolled	41.78%	27.01%	40.90%	30.55%	42.79%	24.19%

Certificate (no BA or BS)	1.66%	2.01%	1.31%	2.69%	2.04%	1.47%
Associate Degree (no BA or BS)	2.03%	3.58%	1.32%	5.51%	2.78%	2.03%
Still Enrolled in Last Period	19.14%	6.79%	20.41%	6.86%	17.68%	6.74%
No Degree	18.95%	14.63%	17.86%	15.49%	20.29%	13.95%
Bachelor's Degree	***58.22%***	***72.99%***	***59.10%***	***69.46%***	***57.21%***	***75.82%***
En route Certificate (plus BA or BS)	0.31%	1.20%	0.49%	1.15%	0.11%	1.24%
En route Associate (plus BA or BS)	0.97%	0.85%	1.13%	0.74%	0.79%	0.94%
Bachelor's Degree (first event)	56.94%	70.94%	57.48%	67.57%	56.31%	73.64%

(Continued on next page)

Table 3, Continued: Degree Completion - Attainment of Stated Goal[1]

Associates	All		Occupational		Academic		AA/AS Goal All		AA/AS Goal Occupational		AA/AS Goal Academic		BA/BS Goal All	BA/BS Goal Occupational	BA/BS Goal Academic
	BPS	NELS	BPS	NELS	BPS	NELS	BPS	NELS	BPS	NELS	BPS	NELS	BPS	BPS	BPS
No Degree/Still Enrolled/Certificate	55.63%	45.99%	61.77%	47.40%	43.16%	43.87%	58.16%	45.15%	63.33%	46.12%	47.17%	43.73%	48.85%	56.91%	35.00%
Certificate (and No Higher Event)	7.86%	6.95%	8.77%	9.52%	5.82%	3.10%	9.87%	7.12%	10.28%	9.86%	8.68%	3.13%	2.47%	4.07%	0.00%
Still Enrolled in Last Period	12.73%	6.89%	11.23%	7.63%	15.54%	5.77%	10.14%	6.97%	9.65%	7.90%	11.26%	5.61%	19.70%	16.12%	24.23%
No Degree and No Transfer	35.04%	32.15%	41.77%	30.25%	21.80%	35.00%	38.15%	31.06%	43.40%	28.36%	27.23%	34.99%	26.68%	36.72%	10.77%
Associate Degree	***29.57%***	***32.41%***	***25.69%***	***31.08%***	***38.02%***	***34.40%***	***31.92%***	***33.20%***	***26.81%***	***32.19%***	***43.04%***	***34.68%***	***23.27%***	***22.24%***	***27.82%***
Enroute Certificate (plus AA/AS)	0.70%	1.50%	1.04%	2.46%	0.00%	0.05%	0.90%	1.53%	1.28%	2.55%	0.00%	0.05%	0.18%	0.30%	0.00%
Associate Degree (first event)	28.87%	30.91%	24.65%	28.62%	38.02%	34.35%	31.02%	31.67%	25.53%	29.64%	43.04%	34.63%	23.09%	21.94%	27.82%
Transfer to Baccalaureate Level	12.88%	19.20%	10.86%	18.80%	16.54%	19.80%	8.28%	19.32%	8.03%	19.10%	8.61%	19.64%	25.26%	19.63%	32.62%
Bachelor's Degree	1.90%	2.40%	1.68%	2.71%	2.30%	1.93%	1.64%	2.32%	1.82%	2.59%	1.18%	1.94%	2.61%	1.23%	4.56%

Source: Authors' estimates based on Beginning Postsecondary Student Longitudinal Study 1989-1994 and National Education Longitudinal Study 1988-2000.

[1] Attainment of stated goal refers only to the lines in italics and bold. [2] Since the number of academic certificates that are still enrolled is below the threshold for publication of confidential data, we cannot compute the percentage associated of academic certificates with a no degree/still enrolled outcome. [3] This distinction is based on Choy and Horn's classification of majors, which was originally created to categorize two-year programs.

Table 4

Descriptive Statistics for Certificates,

Associates and Baccalaureates,

BPS: 89–94

Covariates	Certificates	Associates			Baccalaureates
		All	Occupational	Academic	
Educational Attainment-Outcome	***53.2%***	***44.4%***	***38.2%***	***57.0%***	***58.2%***
Demographics					
Female	60.2%	51.1%	51.8%	49.6%	51.9%
White	75.7%	76.8%	77.3%	75.7%	83.2%
Black	13.3%	9.3%	10.1%	7.6%	8.0%
Hispanic	6.9%	10.1%	9.3%	11.7%	4.2%
Asian	4.0%	2.9%	2.9%	3.0%	4.3%
Native American	0.0%	1.0%	0.5%	2.0%	0.2%
Has any disability	10.7%	7.6%	7.5%	7.7%	5.3%
26 years old or older in 1989	26.6%	12.7%	15.4%	7.0%	1.4%
Family and SES Background					
Ever married when first enrolled	36.5%	16.8%	20.4%	9.4%	2.3%
Has children when first enrolled	34.9%	13.0%	15.9%	6.9%	1.8%
Parent educ.: High school or less	65.6%	48.9%	48.6%	49.5%	28.1%
Parent educ.: Some college	22.8%	22.0%	24.6%	16.5%	25.5%
Parent educ.: BA or BS or higher	11.6%	29.2%	26.8%	34.0%	46.4%
Dependent in 1989–90	34.4%	57.5%	52.8%	67.3%	87.6%
Ln of total income	9.720	10.178	10.148	10.239	10.445
Educational Background					

GED	15.2%	6.3%	7.1%	4.8%	1.2%
Took remediation courses	13.6%	19.7%	18.0%	23.4%	11.9%
Occupational major	92.4%	67.4%	—	—	52.1%
Professional	49.5%	54.0%	80.0%	—	47.5%
Technical	42.9%	13.5%	20.0%	—	4.6%
Pathways					
Mid-level intensity[1]	—	27.3%	24.1%	33.9%	—
High level intensity[2]	60.1%	52.2%	50.8%	55.1%	92.8%
Interruptions	13.4%	35.5%	35.4%	35.6%	24.3%
Mid-level working while enrolled	19.0%	27.6%	26.4%	30.3%	40.5%
High level working while enrolled	48.3%	56.3%	57.4%	54.1%	39.6%
FTE semesters	2.272	4.462	4.021	5.373	8.892
FTE semesters (square root)	1.407	2.002	1.890	2.234	2.924
Unweighted observations	678	871	639	232	2,050

Notes: [1] Mid-level intensity is defined only for associate students and indicates full-time intensity attendance between 25% and 75% of the enrollment time.

[2] High level intensity indicates full-time attendance of at least 75% of the enrollment time for associates, and of 50% for certificates and baccalaureates.

Source: Authors' estimates based on Beginning Postsecondary Student Longitudinal Study 1989–1994.

Table 5: Descriptive Statistics for Certificates, Associates and Baccalaureates, NELS: 88–00

Covariates	Certificates	Associates			Baccalaureates
		All	Occupational	Academic	
Educational Attainment - Outcome	***68.0%***	***54.0%***	***52.6%***	***56.1%***	***73.0%***
Demographics					
Female	57.0%	50.8%	50.7%	51.0%	53.3%
White	76.6%	74.9%	75.0%	74.7%	80.8%
Black	8.9%	11.3%	10.6%	12.5%	8.4%
Hispanic	8.7%	10.6%	12.1%	8.4%	5.9%
Asian	3.3%	2.1%	1.5%	3.1%	4.7%
Other Race	2.5%	1.0%	0.8%	1.4%	0.3%
Has any disability	13.1%	14.5%	16.0%	12.3%	13.8%
Family and SES Background					
Married when first enrolled	3.5%	1.6%	1.6%	1.8%	0.2%
Has children when first enrolled	5.8%	2.2%	3.1%	1.0%	0.3%
SES: Quartile 1 in 1992	26.4%	17.8%	20.8%	13.2%	6.4%
SES: Quartile 2 in 1992	35.2%	28.5%	28.4%	28.6%	15.8%
SES: Quartile 3 in 1992	25.5%	29.4%	27.0%	33.0%	28.8%
SES: Quartile 4 in 1992	12.8%	24.4%	23.8%	25.2%	49.1%
No financial aid	44.6%	47.0%	47.9%	45.7%	32.3%
Educational Background					
Private school, grade 8	7.6%	8.9%	10.0%	7.3%	17.9%
Majority whites in school, grade 8	62.4%	62.0%	64.5%	58.2%	72.2%
Composite test score, 1st quartile, grade 10	36.2%	26.1%	30.9%	18.9%	5.5%
Composite test score, 2nd quartile, grade 10	38.7%	33.2%	29.9%	38.1%	14.7%

Composite test score, 3rd quartile, grade 10	18.6%	27.0%	24.6%	30.5%	32.6%
Composite test score, 4th quartile, grade 10	6.5%	13.7%	14.5%	12.5%	47.2%
Occupational concentrator in HS	37.9%	27.9%	29.8%	25.1%	9.9%
General concentrator in HS	41.5%	39.9%	36.7%	44.8%	25.9%
Academic concentrator in HS	20.5%	32.1%	33.5%	30.1%	64.2%
Occupational major	86.2%	60.0%	—	—	44.5%
Professional	33.2%	39.0%	64.9%	—	37.5%
Technical	53.0%	21.0%	35.1%	—	7.0%
Pathways					
Delayed enrollment for one semester	26.4%	20.2%	19.8%	20.9%	4.0%
Delayed enrollment for one year	17.6%	14.2%	13.4%	15.5%	2.6%
Full-time intensity	49.3%	48.1%	49.4%	46.1%	72.4%
Interruptions	27.7%	36.3%	34.7%	38.6%	20.5%
Unweighted observations	233	630			2,792

Source: Authors' estimates based on National Education Longitudinal Study 1988–2000.

Table 6

Logistic Regressions for Educational Attainment of Certificate Students, BPS: 89–94

Covariates	Demographics		Family & SES		Educational Background		Pathways		Full Model	
	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect
Occupational	***0.3460***	***0.0860***	***0.3999***	***0.0996***	***0.4421***	***0.1101***	***0.2693***	***0.0672***	***0.8238***	***0.1998***
Demographics										
Female	0.0149	0.0037	0.0795	0.0198	0.1013	0.0253	0.0467	0.0117	-0.0084	-0.0021
Black	-0.5117*	-0.1272*	-0.3280	-0.0818	-0.3845	-0.0958	-0.3802	-0.0944	-0.4246	-0.1049
Hispanic	0.2219	0.0541	-0.3195	-0.0797	-0.3095	-0.0772	0.1836	0.0457	0.1842	0.0460
Asian	0.7159	0.1644	0.9533	0.2183	0.9181	0.2109	1.0943	0.2499	0.3053	0.0758
Has any disability	-0.5890*	-0.1462*	-0.3408	-0.0850	-0.3071	-0.0766	-0.3732	-0.0927	-0.1138	-0.0284
26 years old or older in 1989	0.1306	0.0321	0.4022	0.0992	0.4146	0.1022	0.2678	0.0667	0.2876	0.0717
Family & SES Background										
Ever married when first enrolled	—	—	-0.4633	-0.1153	-0.4236	-0.1054	-0.5475	-0.1360	-0.7069*	-0.1744*
Has children when first enrolled	—	—	0.1634	0.0406	0.1302	0.0324	0.1607	0.0401	0.2090	0.0522
Parent educ.: Some college	—	—	0.3428	0.0847	0.3543	0.0874	0.3099	0.0771	0.3616	0.0900

Parent educ.: BA or BS or higher	—	—	-0.2808	-0.0701	-0.2499	-0.0624	-0.1981	-0.0495	-0.2782	-0.0692
Dependent in 1989–90	—	—	0.5513*	0.1359*	0.5127*	0.1264*	0.3048	0.0759	-0.1787	-0.0446
Ln of total income	—	—	-0.2385*	-0.0595*	-0.2649*	-0.0660*	-0.2340	-0.0585	-0.2625	-0.0656*
Educational Background										
GED	—	—	—	—	-0.3241	-0.0808	-0.4170	-0.1035	-0.5334	-0.1312*
Took remediation courses	—	—	—	—	-0.0697	-0.0174	-0.0293	-0.0073	-0.2115	-0.0527
Pathways										
Intensity (more than 50% FT)	—	—	—	—	—	—	0.3598	0.0897	-0.6302*	-0.1563**
Interruptions	—	—	—	—	—	—	-0.9416**	-0.2280**	-1.6629**	-0.3738**
Mid-level working while enrolled	—	—	—	—	—	—	-0.0802	-0.0200	-0.3677	-0.0913
High level working while enrolled	—	—	—	—	—	—	-0.6569*	-0.1627**	-0.6285*	-0.1558*
FTE semesters (square root)	—	—	—	—	—	—	—	—	1.9735**	0.4934**
Constant	-0.0259	—	1.8737	—	2.1426	—	2.4040	—	0.4422	—
Unweighted observations	900		678		678		678		678	
Pseudo R-squared	0.0178		0.0340		0.0362		0.0790		0.1615	

Notes: ** Significant at the .05 level; * significant at the .10 level.

Source: Authors' estimates based on Beginning Postsecondary Student Longitudinal Study 1989–1994.

Table 7

Logistic Regressions for Educational Attainment

of Certificate Students,

NELS: 88–00

	Demographics		**Background**		**Educational Background**		**Full Model**	
	Coeff.	**Marg. Eff.**	**Coeff.**	**Marg. Eff.**	**Coeff.**	**Marg. Eff.**	**Coeff.**	**Marg. Eff.**
Occupational	***-0.1590***	***-0.0342***	***0.0046***	***0.0010***	***0.2958***	***0.0640***	***0.4881***	***0.1030***
Demographics								
Female	0.1762	0.0383	0.2026	0.0440	0.1854	0.0396	0.2410	0.0497
Black	0.0175	0.0038	0.1968	0.0414	0.5443	0.1048	0.3468	0.0669
Hispanic	0.3032	0.0628	0.2260	0.0474	0.0003	0.0001	-0.0351	-0.0073
Asian	0.7534	0.1404	0.9124	0.1638	0.6031	0.1139	0.5436	0.0999
Has any disability	-0.0736	-0.0161	-0.1717	-0.0381	-0.2745	-0.0607	-0.0440	-0.0092
Family & SES Background								
Married	—	—	0.3541	0.0719	-0.3867	-0.0878	-0.0135	-0.0028
Has Children	—	—	-0.9714**	-0.2319**	-1.1863**	-0.2843**	-0.9450	-0.2216
SES quartile 2	—	—	0.2535	0.0539	-0.0348	-0.0075	-0.0535	-0.0111
SES quartile 3	—	—	-0.5053	-0.1138	-0.6457	-0.1437	-0.5734	-0.1235
SES quartile 4	—	—	0.0727	0.0157	-0.0660	-0.0142	-0.4913	-0.1065
No financial aid	—	—	-0.1757	-0.0380	0.0114	0.0024	-0.0027	-0.0005
Educational Background								
Private school, grade 8	—	—	—	—	0.1794	0.0373	0.0429	0.0088
Mostly white school, grade 8	—	—	—	—	0.2286	0.0494	0.0054	0.0011
Vocational concentrator, HS	—	—	—	—	-0.3340	-0.0732	-0.1427	-0.0299

General concentrator, HS	—	—	—	—	-0.0270	-0.0058	0.1049	0.0216
Grade 10 test scores, quartile 2	—	—	—	—	0.0536	0.0114	0.0438	0.0090
Grade 10 test scores, quartile 3	—	—	—	—	0.6712	0.1332	0.7015	0.1336
Grade 10 test scores, quartile 4	—	—	—	—	-0.0625	-0.0134	0.6065	0.1138
Pathways								
Delayed enrollment	—	—	—	—	—	—	-1.0764**	-0.2497**
Enrolled full time	—	—	—	—	—	—	0.5281	0.1082
Interrupted enrollment	—	—	—	—	—	—	0.6193	0.1226
Constant	0.7133*	—	0.7736	—	0.4963	—	0.0929	—
Unweighted observations	421		419		242		233	
Pseudo R-squared	0.0059		0.0344		0.0502		0.0882	

Notes: ** Significant at the .05 level; * significant at the .10 level.

Source: Authors' estimates based on National Education Longitudinal Study, 1988–2000.

Table 8

Logistic Regressions for Educational Attainment of Baccalaureate Students,

BPS: 89–94

Covariates	**Demographics**		**Family & SES**		**Educational Background**		**Pathways**		**Full Model**	
	Coeff.	**Mg. Effect**	**Coeff.**	**Mg. Effect**	**Coeff.**	**Mg. Effect**	**Coeff.**	**Mg. Effect**	**Coeff.**	**Mg. Effect**
Occupational	***0.2048****	***0.0503****	***0.1383***	***0.0336***	***0.1242***	***0.0302***	***0.0728***	***0.0178***	***0.0525***	***0.0128***
Demographics										
Female	0.3161**	0.0775**	0.3183**	0.0772**	0.3142**	0.0762**	0.3583**	0.0875**	0.4064**	0.0992**
Black	-0.7554**	-0.1865**	-0.5246**	-0.1299**	-0.4561**	-0.1129**	-0.3751	-0.0930	-0.4409*	-0.1095*
Hispanic	-0.3654	-0.0909	-0.1590	-0.0390	-0.1339	-0.0328	0.0567	0.0138	-0.0789	-0.0194
Asian	0.0363	0.0089	0.0612	0.0148	0.0724	0.0175	0.0099	0.0024	-0.3232	-0.0802
Native American	0.8407	0.1854	0.2741	0.0647	0.3381	0.0791	-0.2141	-0.0530	-0.4331	-0.1077
Has any disability	-0.3362	-0.0836	-0.2469	-0.0608	-0.2223	-0.0547	-0.3758	-0.0933	-0.3418	-0.0848
26 years old or older in 1989	-1.6304**	-0.3653**	-0.0745	-0.0182	0.0991	0.0238	1.3322	0.2643	1.6574	0.3060**
Family & SES Background										
Ever married when first enrolled	—	—	0.1620	0.0387	0.1035	0.0249	0.7715	0.1715	0.8181	0.1807
Has children when first enrolled	—	—	-0.1384	-0.0339	-0.0421	-0.0103	-1.3578	-0.3179*	-1.1836	-0.2825

Parent educ.: Some college	—	—	0.2143	0.0515	0.2182	0.0524	0.2815*	0.0680*	0.1503	0.0366
Parent educ.: BA/BS or higher	—	—	0.5249**	0.1264**	0.5189**	0.1250**	0.5123**	0.1243**	0.3071*	0.0749*
Dependent in 1989–90	—	—	1.1459**	0.2784**	1.1192**	0.2723**	0.8643**	0.2127**	0.7638**	0.1887**
Ln of total income	—	—	0.1667**	0.0405**	0.1618**	0.0393**	0.1299*	0.0318*	0.1014	0.0248
Educational Background										
GED	—	—	—	—	-1.0811	-0.2617*	-0.7678	-0.1894	-0.7186	-0.1776
Took remediation courses	—	—	—	—	-0.3110*	-0.0767*	-0.3428*	-0.0849*	-0.2972*	-0.0736*
Pathways										
Intensity (more than 50% FT)	—	—	—	—	—	—	2.8401**	0.5348**	1.4789**	0.3449**
Interruptions	—	—	—	—	—	—	-1.7281**	-0.4052**	-1.3736**	-0.3302**
Mid-level working while enrolled	—	—	—	—	–	—	-0.2973*	-0.0729*	-0.4110**	-0.1008**
High level working while enrolled	—	—	—	—	—	—	-0.2670	-0.0655	-0.3514*	-0.0862*
FTE semesters (square root)	—	—	—	—	—	—	—	—	1.4653**	0.3586**
Constant	0.1229	—	-2.8811**	—	-2.7586**	—	-4.2546**	—	-6.7778**	—
Unweighted observations	2192		2050		2050		2050		2050	
Pseudo R-squared	0.0204		0.0538		0.0571		0.1930		0.2486	

Notes: ** Significant at the .05 level; * significant at the .10 level.

Source: Authors' estimates based on Beginning Postsecondary Student Longitudinal Study 1989–1994.

Table 9

Logistic Regressions for Educational Attainment

of Baccalaureate Students,

NELS: 88–00

	Demographics		Background		Educational Background		Full Model	
	Coeff.	Marg. Eff.	Coeff.	Marg. Eff.	Coeff.	Marg. Eff.	Coeff.	Marg. Eff.
Occupational	***-0.1599****	***-0.0325****	***-0.0981***	***-0.0196***	***-0.1904****	***-0.0361****	***-0.1496***	***-0.0262***
Demographics								
Female	0.3494**	0.0711**	0.4363**	0.0872**	0.3728**	0.0707**	0.2214*	0.0388*
Black	-1.0014**	-0.2294**	-0.7074**	-0.1560**	-0.3053	-0.0611	-0.1163	-0.0208
Hispanic	-0.6586**	-0.1478**	-0.3212	-0.0677	-0.2511	-0.0499	-0.1387	-0.0250
Asian	0.1225	0.0242	0.1311	0.0254	-0.0899	-0.0173	-0.1774	-0.0323
Other races	-0.4208	-0.0923	-0.2583	-0.0542	-0.6639	-0.1435	-0.3803	-0.0731
No disabilities	-0.0572	-0.0117	-0.0389	-0.0078	0.0181	0.0034	0.1040	0.0178
Family Background								
Married	—	—	-0.0017	-0.0003	-0.0914	-0.0176	0.1748	0.0291
Has Children	—	—	-1.8340**	-0.4284**	-1.0281*	-0.2329	-1.4334*	-0.3239
SES quartile 2	—	—	0.3695*	0.0690**	-0.0178	-0.0034	-0.0403	-0.0071
SES quartile 3	—	—	0.8738**	0.1577**	0.6149**	.1082**	0.5129**	0.0842**
SES quartile 4	—	—	1.4711**	0.2864**	0.9926**	0.1853**	0.9557**	0.1657**
No financial aid	—	—	-0.2533**	-0.0513**	-0.1934	-0.0371	-0.0930	-0.0164
Educational Background								
Private school, grade 8	—	—	—	—	0.4292**	0.0753**	0.4967**	0.0791**
Mostly white school, grade 8	—	—	—	—	0.1542	0.0296	0.1909	0.0341
Vocational concentrator, HS	—	—	—	—	-0.4859**	-0.0999**	-0.5135**	-0.0995**

General concentrator, HS	—	—	—	—	-0.5116**	-0.1020**	-0.4903**	-0.0910**
Grade 10 test scores, quartile 2	—	—	—	—	0.1194	0.0220	0.1939	0.0326
Grade 10 test scores, quartile 3	—	—	—	—	0.1946	0.0361	0.3842	0.0646
Grade 10 test scores, quartile 4	—	—	—	—	0.8044**	0.1494**	0.8943**	0.1538**
Pathways								
Delayed enrollment	—	—	—	—	—	—	-0.5430**	-0.1076**
Enrolled full time	—	—	—	—	—	—	0.8491**	0.1627**
Interrupted enrollment	—	—	—	—	—	—	-1.5247**	-0.3188**
Constant	0.9622**	—	-0.0549	—	-0.0438	—	-0.2929	—
Observations (unweighted)	3658		3644		2814		2792	
Pseudo R-squared	0.0269		0.0678		0.0844		0.2020	

Notes: ** Significant at the .05 level; * significant at the .10 level.

Source: Authors' estimates based on National Education Longitudinal Study, 1988–2000.

Table 10

Logistic Regressions for Educational Attainment of Associate Students, BPS: 89–94

Covariates	Demographics		Family & SES		Educational Background		Pathways		Full Model	
	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect
Occupational	***-0.6057*****	***-0.1463*****	***-0.6828*****	***-0.1681*****	***-0.7017*****	***-0.1726*****	***-0.6412*****	***-0.1559*****	***-0.4482****	***-0.1086****
Demographics										
Female	0.2299	0.0547	0.5164**	0.1259**	0.5126**	0.1250**	0.4855**	0.1161**	0.5491**	0.1309**
Black	-1.1445**	-0.2318**	-1.1821**	-0.2524**	-1.1708**	-0.2502**	-1.0031**	-0.2117**	-0.8449**	-0.1823**
Hispanic	-0.6020*	-0.1337**	-0.3930	-0.0935	-0.3659	-0.0873	-0.3715	-0.0861	-0.5343	-0.1210
Asian	0.2772	0.0676	0.5881	0.1460	0.6483	0.1606	0.6524	0.1614	0.5015	0.1238
Native American	-1.0113	-0.2030	-1.1924	-0.2454	-1.2448	-0.2531	-0.7399	-0.1596	-1.0892	-0.2175
Has any disability	-0.6095*	-0.1347**	-0.6153	-0.1424*	-0.5617	-0.1308	-0.5875	-0.1319	-0.4246	-0.0972
26 years old or older in 1989	-1.4238**	-0.2835**	-0.6048	-0.1412	-0.6605	-0.1531*	-0.2148	-0.0507	-0.4802	-0.1099
Family & SES Background										
Ever married when first enrolled	—	—	-0.3900	-0.0934	-0.3547	-0.0851	-0.3860	-0.0900	-0.1720	-0.0407
Has children when first enrolled	—	—	0.2922	0.0724	0.4484	0.1113	0.1785	0.0434	0.0781	0.0188

Parent educ.: Some college	—	—	0.1289	0.0318	0.1209	0.0298	0.0885	0.0214	0.0161	0.0039
Parent educ.: BA/BS or higher	—	—	0.5634**	0.1391**	0.5728**	0.1414**	0.4407	0.1073	0.3200	0.0776
Dependent in 1989–90	—	—	0.5301**	0.1286**	0.5064**	0.1229**	0.1298	0.0311	0.0284	0.0068
Ln of total income	—	—	0.1749	0.0429	0.1659	0.0407	0.1927	0.0463	0.2262	0.0543
Educational Background										
GED	—	—	—	—	-0.5871	-0.1360	-0.5413	-0.1222	-0.3358	-0.0777
Took remediation courses	—	—	—	—	-0.1740	-0.0423	-0.0107	-0.0026	-0.0379	-0.0091
Pathways										
Intensity (between 25% and 75% FT)	—	—	—	—	—	—	1.7346**	0.4084**	1.1673**	0.2825**
Intensity (more than 75% FT)	—	—	—	—	—	—	2.3745**	0.5138**	1.5235**	0.3485**
Interruptions	—	—	—	—	—	—	-0.4698*	-0.1109**	-0.4547*	-0.1072*
Mid-level working while enrolled	—	—	—	—	—	—	-0.1401	-0.0335	-0.2194	-0.0520
High level working while enrolled	—	—	—	—	—	—	-0.0736	-0.0177	-0.1667	-0.0401
FTE semesters (square root)	—	—	—	—	—	—	—	—	0.9749**	0.2339**
Constant	0.2786	—	-2.0626	—	-1.9030	—	-3.5916**	—	-5.2820**	—
Unweighted observations	997		871		871		871		871	
Pseudo R-squared	0.0766		0.1105		0.1136		0.2032		0.2361	

Notes: ** Significant at the .05 level; * significant at the .10 level.

Source: Authors' estimates based on Beginning Postsecondary Student Longitudinal Study 1989–1994.

Table 11

Logistic Regressions for Educational Attainment of Associate Students, NELS: 88–00

	Demographics		Background		Educational Background		Full Model	
	Coeff.	**Marg. Eff.**	**Coeff.**	**Marg. Eff.**	**Coeff.**	**Marg. Eff.**	**Coeff.**	**Marg. Eff.**
Occupational	***-0.1091***	***-0.0272***	***-0.0536***	***-0.0134***	***-0.2788***	***-0.0687***	***-0.3040****	***-0.0748****
Demographics								
Female	-0.0346	-0.0086	0.0870	0.0217	0.1947	0.0482	0.1078	0.0267
Black	-1.0516**	-0.2442**	-0.7151**	-0.1716**	-0.5011	-0.1246	-0.2271	-0.0565
Hispanic	-0.4315**	-0.1058**	-0.2184	-0.0541	0.0611	0.0151	0.2414	0.0590
Asian	-0.1464	-0.0364	-0.1402	-0.0348	0.1194	0.0294	0.2553	0.0621
Other races	-0.3831	-0.0937	-0.1087	-0.0270	0.1337	0.0329	0.4598	0.1095
Has any disability	-0.1902	-0.0472	-0.1049	-0.0261	0.0346	0.0086	0.0308	0.0076
Family Background								
Married	—	—	-0.4452	-0.1083	-0.9750	-0.2347*	-0.7832	-0.1919
Has children	—	—	-0.9654**	-0.2215**	-0.4748	-0.1181	-0.4849	-0.1206
SES quartile 2	—	—	0.3605	0.0899	0.0924	0.0228	0.1158	0.0286
SES quartile 3	—	—	0.4379**	0.1090**	0.2722	0.0669	0.3784	0.0925
SES quartile 4	—	—	1.2231**	0.2928**	0.9344**	0.2195**	1.1027**	0.2548**
No financial aid	—	—	-0.6351**	-0.1570**	-0.4783**	-0.1181**	-0.4328**	-0.1068**
Educational Background								
Private school, grade 8	—	—	—	—	0.5560**	0.1323**	0.5167*	0.1232*
Mostly white school, grade 8	—	—	—	—	0.6166**	0.1524**	0.5788**	0.1431**
Vocational concentrator, HS	—	—	—	—	-0.8492**	-0.2092**	-0.7807**	-0.1927**
General concentrator, HS	—	—	—	—	-1.3412**	-0.3231**	-1.3008**	-0.3138**
Grade 10 test scores, quartile 2	—	—	—	—	-0.1825	-0.0453	-0.1894	-0.0470
Grade 10 test scores, quartile 3	—	—	—	—	0.4466*	0.1088*	0.4070	0.0992

Grade 10 test scores, quartile 4	—	—	—	—	0.3061	0.0747	0.1632	0.0401
Pathways								
Delayed enrollment	—	—	—	—	—	—	-0.9245**	-0.2262**
Enrolled full time	—	—	—	—	—	—	0.3373*	0.0832**
Interrupted enrollment	—	—	—	—	—	—	-0.4110**	-0.1018**
Constant	0.2244	—	-0.1186	—	0.4662	—	0.5113	—
Observations (unweighted)	1,583		1,577		1,121		1,101	
Pseudo R-squared	0.0231		0.0626		0.1408		0.168	

Notes: ** Significant at the .05 level; * significant at the .10 level.

Source: Authors' estimates based on National Education Longitudinal Study, 1988–2000.

Table 12

Logistic Regressions for Educational Attainment of Associate Students, Focus on Subpopulations, BPS:89–94

Covariates	Full Model		Economically Disadvantaged				Young Age When First Enrolled				Single Parent in 1989–90	
			Full Sample		Restricted Sample		Full Sample		Restricted Sample			
	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect
Occupational	***-0.4375****	***-0.1052****	***-0.8933*****	***-0.2153*****	***0.3347***	***0.0691***	***-0.3259***	***-0.0782***	***-0.5044*****	***-0.1230*****	***-0.4243****	***-0.1019****
Demographics												
Female	0.5159**	0.1218**	0.4976**	0.1178**	0.6359	0.1334	0.5148**	0.1216**	0.6477**	0.1551**	0.5164**	0.1218**
Black	-0.7971*	-0.1705**	-0.9263**	-0.1945**	-0.5763	-0.1096	-0.7951*	-0.1702**	-0.7858	-0.1733*	-0.7941*	-0.1698**
Hispanic	-0.5019	-0.1126	-0.5070	-0.1139	-0.4169	-0.0820	-0.5018	-0.1126	-0.9083**	-0.1969**	-0.5033	-0.1127
Asian	0.6315	0.1557	0.6333	0.1562	2.6677**	0.5660**	0.6424	0.1584	0.4791	0.1186	0.6281	0.1548
Native American	-1.1971	-0.2287	-1.3461	-0.2492	-0.9371	-0.1585	-1.1978	-0.2290	-1.1751	-0.2339	-1.1957	-0.2282
Has any disability	0.4774	0.1134	0.5597	0.1332	-0.4957	-0.1048	0.4809	0.1143	0.5359	0.1295	0.4728	0.1123
Age under 24 in 1989	-0.1095	-0.0262	-0.0535	-0.0128	-0.7237	-0.1648	-0.0151	-0.0036	—	—	-0.0871	-0.0208

Occup. & age under 24 in 1989			—	—	—	—	-0.1243	-0.0296	—	—	—	—
Family & SES Background												
Ever married when first enrolled	-0.5009	-0.1136	-0.3995	-0.0918	-1.8880**	-0.2933**	-0.4997	-0.1134	-0.4158	-0.0973	-0.5202	-0.1176
Has children when first enrolled	0.2062	0.0497	0.2111	0.0510	1.2911*	0.3029*	0.2059	0.0496	1.4180	0.3388	0.2446	0.0591
Single parent in 1989–90	-1.5762**	-0.2804**	-1.7296**	-0.2981**	-2.3601**	-0.2796**	-1.5697**	-0.2799**	-2.5463**	-0.3757**	-0.9550	-0.1947
Occup. & single parent in 1989–90			—	—	—	—	—	—	—	—	-0.8283	-0.1729
Parent educ.: Some college	0.0505	0.0120	0.0236	0.0056	0.3647	0.0800	0.0491	0.0117	-0.1238	-0.0297	0.0523	0.0125
Parent educ.: BA or higher	0.4095	0.0987	0.4333	0.1047	0.0066	0.0014	0.4091	0.0986	0.3363	0.0820	0.4088	0.0985
Dependent in 1989–90	0.0724	0.0172	0.0896	0.0213	0.1572	0.0331	0.0731	0.0174	0.0510	0.0123	0.0696	0.0165
Family income < $20K in 1988	-0.5520*	-0.1275**	-1.4463**	-0.3123**	—	—	-0.5493*	-0.1269**	-0.6772**	-0.1584**	-0.5526*	-0.1275**
Occup. & family income < $20K in 1988			1.4160**	0.3398**	—	—	—	—	—	—	—	—
Educational Background												
GED	-0.0931	-0.0219	-0.0886	-0.0209	0.3534	0.0788	-0.0989	-0.0233	-0.7467	-0.1646	-0.1131	-0.0265
Took remediation courses	-0.0271	-0.0064	-0.0413	-0.0098	-1.3329**	-0.2313**	-0.0272	-0.0065	0.0377	0.0091	-0.0228	-0.0054

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Table 12 (Continued) Logistic Regressions for Educational Attainment of Associate Students, Focus on Subpopulations, BPS: 89–94

Covariates	Full Model		Economically Disadvantaged				Young Age When First Enrolled				Single Parent in 1989-90	
			Full Sample		Restricted Sample		Full Sample		Restricted Sample			
	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect	Coeff.	Mg. Effect
Pathways												
Intensity (between 25% and 75% FT)	1.1629**	0.2806**	1.1558**	0.2791**	1.4147*	0.3212*	1.1641**	0.2809**	1.2328**	0.2983**	1.1582**	0.2794**
Intensity (more than 75% FT)	1.5316**	0.3468**	1.5449**	0.3502**	1.6576**	0.3350**	1.5343**	0.3475**	1.6386**	0.3747**	1.5234**	0.3449**
Interruptions	-0.4662*	-0.1086*	-0.4788*	-0.1117*	0.0100	0.0021	-0.4654*	-0.1085*	-0.5539**	-0.1310**	-0.4674*	-0.1088*
Mid-level working while enrolled	-0.2855	-0.0667	-0.2945	-0.0689	0.4383	0.0959	-0.2842	-0.0664	-0.2272	-0.0543	-0.2797	-0.0653
High level working while enrolled	-0.2203	-0.0525	-0.1578	-0.0376	0.9301*	0.1906*	-0.2207	-0.0526	-0.3277	-0.0793	-0.2173	-0.0517
FTE semesters (square root)	0.9332**	0.2217**	0.9329**	0.2221**	0.6266*	0.1325*	0.9303**	0.2211**	0.8809**	0.2129**	0.9374**	0.2226**
Constant	-3.6082**		-3.5418**	—	-2.6441*	—	-3.6981**	—	-3.6073**	—	-3.7199**	—
Unweighted observations	891		891		337		891		760		891	
Pseudo R-squared	0.2422		0.2536		0.2275		0.2422		0.2323		0.2425	

Notes: ** Significant at the .05 level; * significant at the .10 level.

Source: Authors' estimates based on Beginning Postsecondary Student Longitudinal Study 1989–1994.

Table 13

Logistic Regressions for Educational Attainment of Associate Students, Focus on Subpopulations, NELS: 88–00

Covariates	Full Model		Educationally Disadvantaged				Economically Disadvantaged				Females in Nontraditional Majors	
			Full Sample		Restricted Sample		Full Sample		Restricted Sample			
	Coeff.	Mg. Effect	Coeff.	Marg. Eff.	Coeff.	Marg. Eff.	Coeff.	Marg. Eff.	Coeff.	Marg. Eff.	Coeff.	Marg. Eff.
Occupational	***-0.2541***	***-0.0626***	***-0.0572***	***-0.0141***	***-0.4173***	***-0.1036***	***-0.2746***	***-0.0676***	***-0.1331***	***-0.0311***	***-0.2306***	***-0.0568***
Demographics												
Female	0.0571	0.0141	0.0617	0.0153	0.0030	0.0007	0.0585	0.0145	0.1451	0.0338	0.0812	0.0201
Black	0.0626	0.0154	0.0680	0.0168	0.0593	0.0148	0.0714	0.0176	-0.4322	-0.0956	0.0609	0.0150
Hispanic	0.1504	0.0369	0.1500	0.0368	-0.0488	-0.0122	0.1524	0.0374	0.0233	0.0054	0.1597	0.0391
Asian	0.2936	0.0710	0.3038	0.0735	-0.3691	-0.0918	0.2901	0.0702	0.1614	0.0384	0.3197	0.0772
Other races	-0.2195	-0.0547	-0.2352	-0.0586	0.0506	0.0126	-0.2114	-0.0526	0.1959	0.0467	-0.1792	-0.0446
Has any disability	0.1637	0.0402	0.1620	0.0398	-0.1953	-0.0488	0.1655	0.0406	-1.0241**	-0.2100*	0.1583	0.0388
Family Background												
Married	-0.6152	-0.1523	-0.5562	-0.1381	-0.9428	-0.2238	-0.5982	-0.1482	-0.1071	-0.0246	-0.6464	-0.1598
Has children	-0.6421	-0.1588	-0.6406	-0.1584	-0.6615	-0.1616	-0.6400	-0.1583	0.2890	0.0695	-0.6771	-0.1672

Family income < $20K in 1991	-0.4964**	-0.1234**	-0.5024**	-0.1249**	-0.1715	-0.0428	-0.5716	-0.1419	—	—	-0.5005**	-0.1244**
Occup. & family income < $20K in 1991	—	—	—	—	—	—	0.1198	0.0294	—	—	—	—
No financial aid	-0.4011**	-0.0990**	-0.3945**	-0.0974**	-0.4780*	-0.1189*	-0.4000**	-0.0988**	-1.5057**	-0.3316**	-0.4151**	-0.1025**
Educational Background												
Private school, grade 8	0.7163**	0.1667**	0.6991**	0.1631**	0.6813*	0.1637*	0.7189**	0.1673**	2.3250*	0.5057**	0.6997**	0.1632**
Mostly white school, grade 8	0.5780**	0.1428**	0.5449**	0.1347**	0.6117**	0.1518**	0.5813**	0.1437**	-0.1768	-0.0415	0.5878**	0.1452**
Vocational concentrator, HS	-0.7066**	-0.1747**	-0.6855**	-0.1695**	-0.8289**	-0.2039**	-0.7110**	-0.1757**	-0.8120	-0.1788*	-0.7011**	-0.1733**
General concentrator, HS	-1.0839**	-0.2639**	-1.0680**	-0.2602**	-0.9929**	-0.2432**	-1.0866**	-0.2646**	-1.1975*	-0.2640**	-1.0642**	-0.2593**
Grade 12 test scores quartiles 1 & 2	-0.2566	-0.0634	-0.0125	-0.0031	—	—	-0.2564	-0.0634	0.2585	0.0604	-0.2774	-0.0686
Occup. & low grade 12 test scores	—	—	-0.4235	-0.1051	—	—	—	—	—	—	—	—

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Table 13 (Continued) Logistic Regressions for Educational Attainment of Associate Students, Focus on Subpopulations, NELS: 88–00

Covariates	Full Model		Educationally Disadvantaged				Economically Disadvantaged				Females in Nontraditional Majors	
			Full Sample		Restricted Sample		Full Sample		Restricted Sample			
	Coeff.	Mg. Effect	Coeff.	Marg. Eff.	Coeff.	Marg. Eff.	Coeff.	Marg. Eff.	Coeff.	Marg. Eff.	Coeff.	Marg. Eff.
Pathways												
Delayed enrollment	-0.9693**	-0.2368**	-0.9886**	-0.2412**	-1.1509**	-0.2733**	-0.9734**	-0.2377**	-0.8311	-0.1752	-0.9156**	-0.2244**
Enrolled full time	0.5397**	0.1325**	0.5435**	0.1335**	0.2549	0.0635	0.5395**	0.1325**	-0.2994	-0.0697	0.5556**	0.1364**
Interrupted enrollment	-0.3882*	-0.0962*	-0.3997*	-0.0991*	-0.4285	-0.1067	-0.3869*	-0.0959*	-0.3255	-0.0748	-0.3926*	-0.0973*
Female in nontrad. occup. major	—	—	—	—	—	—	—	—	—	—	-1.0008	-0.2408
Constant	0.8966**	—	0.7967*	—	1.0019**	—	0.9059**	—	1.2252	—	0.8713*	—
Observations (unweighted)	956		956		457		956		183		956	
Pseudo R-squared	0.1062		0.1370		0.1140		0.1355		0.1383		0.1068	

Notes: ** Significant at the .05 level; * significant at the .10 level.

Source: Authors' estimates based on National Education Longitudinal Study, 1988–2000.

Table 14

Persistence Rates

Short-Term Persistence

	1989–94			1995–98		
Associates	**All**	**Occupational**	**Academic**	**All**	**Occupational**	**Academic**
Success	**58.51%**	**54.45%**	**67.00%**	**64.63%**	**61.43%**	**70.07%**
Still Enrolled Without Interruption	58.42%	54.32%	67.00%	63.22%	59.75%	69.13%
Associate or Bachelor's Degree	0.09%	0.13%	0.00%	1.41%	1.68%	0.94%
Did Not Persist	**41.49%**	**45.55%**	**33.00%**	**35.37%**	**38.57%**	**29.93%**

Three-Year Persistence

	1989–94			1995–98		
Associates	**All**[2]	**Occupational**	**Academic**	**All**[2]	**Occupational**	**Academic**
Success[1]	**58.8%**	**51.5%**	**71.5%**	**55.9%**	**52.0%**	**58.2%**
Still Enrolled	31.4%	27.1%	35.5%	32.5%	27.9%	32.5%
Associate Degree	18.5%	17.6%	25.8%	10.6%	12.7%	14.3%
Bachelor's Degree or Transfer	8.8%	6.9%	10.2%	12.8%	11.5%	11.4%
Did Not Persist	**41.3%**	**48.5%**	**28.5%**	**44.1%**	**48.0%**	**41.8%**
After Two Semesters or Less	24.0%	28.5%	15.7%	27.0%	29.7%	20.9%
After Three Semesters or More	17.3%	20.0%	12.8%	17.1%	18.3%	20.9%

Notes: [1] Success includes still enrolled, certificate (for certificate-seekers), degree, or transfer to baccalaureate.

[2] All includes occupational, academic and undeclared majors.

Source: Authors' estimates based on Beginning Postsecondary Study 1989–94 and 1995–98.

Table 15

Logistic Regressions for Persistence of Associate Students,[1] BPS: 89–94 and 95–98

	Short-Term Persistence			Three-Year Persistence		
	1989	**1995**	**1995[2]**	**1989**	**1995**	**1995[2]**
Occupational	***-0.0965****	***-0.0339***	***-0.0427***	***-0.1884*****	***-0.0320***	***-0.0367***
Demographics						
Female	0.0992**	-0.0162	-0.0157	0.0432	0.0198	0.0198
Black	-0.3155**	-0.0491	-0.0384	-0.2996**	-0.0905	-0.0920
Hispanic	0.0424	0.1753**	0.1727**	-0.0050	0.1197	0.1220
Asian	-0.2062*	0.2167	0.1917	0.0072	0.1525	0.0967
Native American	-0.1082	0.1930	0.2263	0.2668	0.2026	0.2144
Has any disability	0.1641*	—	—	0.1162	—	—
26 years old or older in 1989 or 1995	0.0838	0.1076	0.1435*	0.0470	-0.0865	-0.0713
Family & SES Background						
Ever married when first enrolled	-0.1097	-0.0596	-0.0989	-0.1011	-0.0540	-0.0852
Has children when first enrolled	0.0578	0.1185**	0.1158*	-0.0675	0.1131	0.1205
Parent educ.: Some college	0.0457	-0.0784	-0.1070*	-0.0310	-0.0380	-0.0630
Parent educ.: BA, BS or higher	0.0512	0.0906*	0.0661	0.0725	0.1028*	0.0852
Dependent in 1989–90	0.1470**	0.1931**	0.1705*	-0.0068	0.1136	0.0747
Ln of total income	-0.0077	0.0665**	0.0707**	-0.0119	0.0699**	0.0626*
Educational Background						
GED	-0.2164**	0.0114	0.0082	-0.2964**	-0.0267	-0.0310
Took remediation courses	0.1140*	-0.0328	-0.0269	0.0657	-0.1551**	-0.1769**
Pathways						
Enrolled part time	-0.2392**	-0.2005**	-0.2027**	-0.2141**	-0.2124**	-0.2400**
Worked while enrolled	0.0736	-0.0893	-0.0902	0.0515	0.0527	0.0596

Interrupted enrollment	—	—	—	-0.0127	0.1730**	0.1884**
Reasons for Enrolling						
Job skills	—	—	-0.1091*	—	—	-0.1814**
Personal enrichment	—	—	-0.1978**	—	—	-0.1135
Observations (unweighted)	919	1,228	923	879	1,238	932
Pseudo R-squared	0.1256	0.1212	0.1423	0.1270	0.1252	0.1505

Notes: [1] Marginal effects. [2] Includes controls for reasons for enrolling.

** Significant at the .05 level; * significant at the .10 level.

Source: Authors' estimates based on Beginning Postsecondary Student Longitudinal Study 1989–94 and 1995–98.

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Appendix A: Notes on the Design of the Datasets

Beginning Postsecondary Student Longitudinal Study

The Beginning Postsecondary Student Longitudinal Study 1989–1994 (BPS89) is based on the National Postsecondary Student Aid Study (NPSAS90) conducted in 1989. BPS89 followed first-time beginning students from NPSAS90 who started postsecondary education at any time between July 1, 1989, and June 30, 1990. The survey design of BPS89 was integrated with the design, weighting and estimation procedures implemented for NPSAS90. NPSAS90 consisted of a multistage probability sample of students enrolled in postsecondary institutions between July 1, 1989, and June 30, 1990:

> In the first stage of sampling, 121 geographic areas called primary sampling units (PSUs) were selected. In the second stage, 1,533 institutions located in the NPSAS PSUs were selected, of which about 80 percent of them were eligible and 1,130 participated. The third stage of sampling was the selection of more than 70,000 students enrolled in the sampled institutions from sampling frames constructed to represent students enrolled at four distinct points in time: August 1, 1989; October 15, 1989; February 15, 1990; and June 15, 1990. The students enrolled at these four time points effectively represented all students enrolled during the 1989–90 academic year. (NCES, 1996, p. 5)

To participate, institutions had to meet certain conditions. During the 1989–90 academic year, the institution (located in one of the 50 states, Puerto Rico or the District of Columbia) had to offer

(1) an educational program designed for people who have completed secondary education;
(2) programs of study that were "academic," "vocational/occupational," or "continuing professional" (institutions offering only recreational or adult basic education were excluded, and institutions that offered only correspondence courses were also excluded);
(3) access to people other than those employed by the institution;
(4) at least one program lasting a minimum of three months or 300 contact hours.

Further, the institutions could not be U.S. service academies.

From the selected institutions, students who enrolled during the 1989–90 academic year were chosen to participate in the study according to the following criteria that required them

(1) to be taking course(s) for credit;
(2) to be enrolled in a degree or formal award program of at least three months duration; or
(3) to be enrolled in an occupationally or vocationally specific program of at least three months duration.

An important note is that students enrolled solely in a high school program at an eligible postsecondary institution were excluded. Also excluded were students enrolled only in correspondence courses or programs of less than three months duration as well as those taking only courses for remedial or avocational purposes without receiving credit. Finally, only those who were identified as first-time beginning students were included in the BPS89 sample.

Given the complex survey design of the BPS89 study, we relied on the “survey design correction” included with STATA™ statistical software for estimating the models presented here. This command allows us to take into account the cluster sampling and the stratification of the BPS89 survey when estimating standard errors.

National Education Longitudinal Study

The National Education Longitudinal Study (NELS) is a major longitudinal study designed to provide data about student characteristics, activities and experiences from the last year of elementary school through high school, postsecondary education and work force activities. A nationally representative sample of eighth graders was first surveyed in spring 1988. A sample of these respondents was then resurveyed through four follow-ups in 1990, 1992, 1994 and 2000.

The survey questionnaires asked students about a range of topics, including school, work and home experiences; educational resources and support; the role of their parents and peers in their education; neighborhood characteristics; educational and occupational aspirations; and other student perceptions. Data were also collected from parents, teachers and high school principals as well as from existing school records such as high school transcripts. For the first three waves of data collection (when most students were eighth graders, sophomores and seniors in high school), achievement tests in reading, social studies, mathematics and science were administered to the students.

The second follow-up took place early in 1992 when most sample members were in the second term of their senior year of high school. It provides a culminating measurement of learning in the course of secondary school and facilitates investigation of the transition into the labor force and postsecondary education after high school. The third follow-up survey took place from February through June 1994 when most sample members had been out of high school for two years and many had started postsecondary education. The third follow-up questionnaire featured detailed questions on education histories, work experience histories, work-related training, family formation, income, opinions and other experiences.

The fourth and final follow-up survey was undertaken from January to August 2000, the year when most respondents turned 26 and had been out of high school for eight years. Many had already completed postsecondary education, had started or even changed careers and had started families. Major topics of the questionnaire were experiences and outcomes of postsecondary education, labor market participation, job-related training, community integration, and marriage and family formation. Transcripts were collected from all postsecondary institutions where attendance was reported by the respondents. However, the NELS transcript data were unavailable at the time of our research and, therefore, were not used in this analysis.

The NELS base year sample design began with a nationally representative, two-stage stratified probability sample of 1,052 eighth grade schools and 26,432 sampled students in the schools, of whom 24,599 students participated. The base year sample was reduced in size by subsampling in the first and the third follow-ups as well as two times in the fourth follow-up to reach a final sample size of 12,144 students who participated in all waves of the survey. Because the NELS sample design involved stratification, the disproportionate sampling of certain strata and clustered (i.e., multistage) probability sampling, we used the STATA™ statistical software to correct for the survey design when calculating the standard errors.

Appendix B: Classification of Program of Study

Table B.1 displays the categorization of fields of study developed by Choy and Horn (1992) and widely used by the National Center for Education Statistics.

Table B.1

Field of Study

Field of Study	Classification
African-American Studies	Academic
Agricultural Science	Occupational
Agriculture	Occupational
American Civilization	Academic
Anthropology/Archaeology	Academic
Architecture	Academic
Area Studies	Academic
Art, Art History/Fine Arts	Academic
Art, Commercial	Academic
Art, Design	Academic
Art, Film Arts	Academic
Art, Music	Academic
Art, Speech/Drama	Academic
Art, Visual/Performing	Academic
Biological Sciences	Academic
Business, Accounting	Occupational
Business, Administration/Management	Occupational
Business, Finance	Occupational

Business, Marketing	Occupational
Business, Secretarial/Bookkeeping	Occupational
Business, Other	Occupational
City Planning	Academic
Clinical Pastoral Care	Academic
Communication Technology	Occupational
Communications	Academic
Computer and Information Sciences	Occupational
Computer Technology	Occupational
Construction	Occupational
Consumer/Personal Services, Cosmetology	Occupational
Economics	Academic
Adult Education	Academic
Elementary/Secondary Education	Academic
Education, Other	Academic
Engineering, Civil	Occupational
Engineering. Electrical	Occupational
Engineering, Other	Occupational
Engineering Technology	Occupational
Ethnic Studies	Academic
Foreign Language	Academic
Forestry	Academic
Park Recreation	Academic
Geography	Academic
Health Technology	Occupational
Health, Allied	Occupational
Health, Audiology	Occupational
Health, Clinical Health Science	Occupational
Health, Dentistry	Occupational
Health, Dietetics	Occupational

Health, Health/Hospital Administration	Occupational
Health, Medicine	Occupational
Health, Nursing	Occupational
Health, Optometry	Occupational
Health, Other	Occupational
Health, Pharmacy	Occupational
Health, Practical Nurse	Occupational
Health, Public Health	Occupational
Health, Veterinary Medicine	Occupational
History	Academic
Home Economics	Occupational
Industrial Arts	Occupational
Interdisciplinary Studies	Academic
International Relations	Academic
Journalism	Academic
Court Reporter	Academic
Law	Academic
Legal Assisting	Academic
Leisure Studies, Recreation	Academic
Letters, Creative/Technical Writing	Academic
Letters, English/American Literature	Academic
Letters, Other	Academic
Liberal Arts	Academic
Library/Archival Science	Academic
Mathematics	Academic
Mechanics	Occupational
Military Science	Academic
Natural Resources	Academic
Philosophy	Academic
Physical Science Technology	Occupational

Physical Sciences	Academic
Political Science	Academic
Precision Production/Craftsman	Occupational
Protective Services	Occupational
Psychology	Academic
Public Administration	Academic
Social Work	Academic
Sociology	Academic
Social Science, Other	Academic
Textiles	Occupational
Theology	Academic
Transportation	Occupational
Women's Studies	Academic

Appendix C: Definition of *Full-Time Equivalent* (FTE)

The measure of full-time equivalent (FTE) was constructed in the following way from the "intensity" variable ENRyymm. We assigned a weight of 1 (or 100 percent) to the months with full-time attendance intensity. Months with part-time intensity were given a weight of 0.5 (or 50 percent), and enrollment months with less than part-time intensity were weighted as 0.25 (or 25 percent). The months for which student intensity of enrollment was missing were given a weight of 0.75 (or 75 percent). The assignment of this weight was based on a secondary variable (MNSTAT1 through MSNTAT12), which included enrollment and working intensity. A cross-tabulation between this secondary variable and the main one indicated that most of students with missing intensity tended to indicate "full-time enrollment with no employment" or "full-time enrollment with employment."

Table C.1 shows the distribution of total FTE months for each group of postsecondary students. At the sub-baccalaureate level, academic students tend to have longer FTE enrollments than their occupational peers. This finding is true for both certificate and associate students. In contrast, the difference in total FTE months of enrollment does not appear to be significant between academic and occupational baccalaureate students.

Table C.1

Total Full-Time Equivalent Months, BPS: 89–94

	FTE Months			
	Less than or equal to 8	**Between 8.1 and 16**	**Between 16.1 and 32**	**More than 32**
All Sub-Baccalaureates	***36.2%***	***26.9%***	***30.1%***	***6.8%***
Vocational	40.4%	29.9%	24.3%	5.4%
Academic	25.4%	19.4%	45.0%	10.2%
No Degree Goal	*62.5%*	*22.6%*	*10.9%*	*4.0%*
Vocational	74.9%	17.0%	3.1%	5.0%
Academic	50.9%	27.7%	18.2%	3.1%
Certificates	*54.6%*	*33.8%*	*10.1%*	*1.6%*
Vocational	55.6%	34.9%	8.8%	0.7%
Academic	43.1%	21.0%	24.7%	11.2%
Associates	*25.5%*	*24.8%*	*40.6%*	*9.2%*
Vocational	29.0%	28.3%	34.7%	8.0%
Academic	18.5%	17.6%	52.4%	11.6%
Baccalaureates	***4.0%***	***6.3%***	***20.2%***	***69.6%***
Vocational	3.9%	6.2%	18.7%	71.1%
Academic	4.0%	6.5%	21.7%	67.9%

Source: Authors' estimates based on Beginning Postsecondary Longitudinal Study 1989–94.

Appendix D: Event History Analysis—Application to Associate Students

In this appendix, we complement previous analyses by using a more nuanced modeling strategy known as Event History Analysis (EHA; see Willett and Singer 1991). With this method, we were able to detect both the occurrence of an event of interest (such as obtaining a degree) and its timing. For example, using EHA, we could identify *when* a student is more likely to dropout. We also take a "competing risks" analysis perspective. In most of the analyses in this report, we evaluated the probability that a student would achieve one of two outcomes: completion or noncompletion in some analyses and persistence or nonpersistence in others. A competing risks approach allowed us to consider more than two outcomes simultaneously. Thus, rather than simply consider whether a student completes or not, we could differentiate between completion of an associate degree, transfer to a baccalaureate program (both considered completion in our previous analysis), leaving college without returning or continued enrollment (both considered noncompletion in our previous analysis). An event history framework is not essential for the analysis of competing risks because carefully defined multinomial logistic models can be used instead. However, the advantage of the EHA approach is that it handles the issue of "censoring," allowing us, for example, to include students who substantially delay enrollment after high school without concern over their potentially shorter observational period. As mentioned, it also provides information about when the outcomes are most likely to occur for different types of students.

There would have been some advantages to carrying out the entire analysis in this report using EHA. Unfortunately, the High School and Beyond (HS&B) dataset was the only one available to us that could be used for EHA. The BPS datasets did not have long enough time series, and NELS did not have adequate enrollment data for the years after 1994. The problem with HS&B is that the data are already more than a decade old, but we include this appendix to explore in greater detail some of the differences between academic and occupational students that we found in our analysis of BPS89.

The group that we examined in detail is the associate group, defined in section III. These students indicate a clear intent to obtain a degree (as opposed to just taking a few courses), so failure to do so needs to be thoroughly understood. The different (competing) end points of dropout, associate degrees without transfer to a baccalaureate program and transfer to a baccalaureate program are defined and developed in this section. The findings were derived exclusively from HS&B because this dataset is the only available one with sufficient duration and detail for the type of analysis we undertake.[1]

Definition of the Period of Observation, the Competing Outcomes and the Independent Variables

A student comes under our observation at his or her first postsecondary enrollment and stops being observed either immediately after the period when the first outcome of interest occurs (dropout, AA-AS degree without transfer, or transfer) or when the student's enrollment information is censored (i.e., the data on the subject run out before any event of interest occurs). Our time periods are four-month spans roughly corresponding to academic semesters (September–December and February–May). We need to emphasize that every student's "enrollment clock" may reflect a different real-world time. Our data span from 1980 to 1990, but a student's first semester may occur, say, in 1986 (four years after the bulk of the cohort graduated high school).

We defined our three distinct outcomes as follows. A student drops out if, at some point after initial enrollment, he or she shows two years (four consecutive periods) of no enrollment.[2]

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[1] The NELS dataset, with student transcripts, may be sufficiently rich in detail for a similar analysis, but that complete dataset was unavailable at the time of this report.

[2] The definition of dropout deserves special mention. To identify dropouts, we need to be able to "look ahead" by the length of time we have chosen to signify a dropout. Thus, we cannot correctly identify any dropouts in the last four periods of our data. Accordingly, we drop these periods (except in so far as we use them to identify dropouts in earlier periods). The resulting loss of information is an important consideration in defining a dropout standard: ideally, a dropout standard should be long enough so, in the first place, we deem it unlikely that the student will return to school and, in the second place, even if the student does return to school after "dropping out," the break

A student gets a terminal associate degree if he or she gets an associate degree followed by two years without any baccalaureate enrollment. Last, a student transfers if he or she moves to a baccalaureate program (without dropping out), whether or not he or she attains an associate degree along the way. We also classified students who are found to have BA or BS degrees at some later period (without necessarily showing prior baccalaureate enrollment) as transfers. In any given period, it is also possible that a student simply remains "in the running"—that is, no outcome of interest occurs. The EHA approach allowed us to identify the time points in which most outcomes take place and what factors are related to such outcomes.

The covariates that we included in our model are classified into three groups. The first group is related to the demographic characteristics of the student, for example, gender (male is the reference) and race-ethnicity (we controlled for being black and for being Hispanic). The second group controls for the educational and socioeconomic background of the student. We included indicators for a student's high school track (general or vocational, with academic as the reference category) and for whether the student began postsecondary schooling by enrolling in an occupational major. We also controlled for whether a student was in the lowest or highest quartile in the base-year composite test score (the middle 50 percent constitutes the reference) and for whether a student was in the lowest or highest SES quartile in the base year (with the middle 50 percent constituting the reference). The final group of covariates is related to the timing and sequencing of the student's postsecondary experience, that is, the pathway features. We included an indicator for whether a student's initial enrollment was at age 21 or later (delayed entry), a variable that measures the ratio of not-enrolled to enrolled periods (with higher values meaning less attachment), a dummy indicating whether a student has had a "non-outcome" or lateral transfer (i.e., a student switched to another institution without transferring up to baccalaureate status), the proportion of enrollment periods that the student is full time and the proportion of enrollment periods that a student works.

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will have been long enough to be conceptually distinct from a mere break or "stop out." We chose our two-year dropout standard as a reasonable compromise: a dropout definition long enough to be meaningful, but not so long as to force us to discard a large portion of our data.

A comparison of means for these variables in the associate group with those pursuing a bachelor's degree is shown in table D.1. This comparison confirms findings from our other analyses about the characteristics of students who pursue sub-baccalaureate degrees. These students are more likely than those in the baccalaureate group to be Hispanic and female, they have lower test scores and SES, they delay enrollment, and are more nontraditional in the sense that more of their enrollments are part time and that they work more while in school. Although they appear to interrupt schooling less often, their programs are supposed to last only two years, so if this fact is taken into consideration, they interrupt enrollment more often than students in the baccalaureate group.

Table D.1

Characteristics of Associate and Baccalaureate Students, HS&B

Covariates	Associates	Baccalaureates
Demographics		
White [reference category]	79.9%	83.1%
Black	11.1%	10.1%
Hispanic	7.1%	4.1%
Asian	1.0%	2.0%
American Indian	0.8%	0.7%
Male [reference category]	45.4%	50.6%
Female	54.6%	49.5%
Disabilities (not learning)	25.0%	25.4%
Educational Background		
Low base-year test quartile	16.8%	6.7%
High base-year test quartile	25.1%	56.3%

Low base-year SES quartile	18.8%	9.8%
High base-year SES quartile	24.6%	48.9%
Learning disability	1.5%	7.2%
Pathways		
Initial enrollment age (mean)	20.73	20.07
Initial enrollment at age 21+	31.46	10.75
Number of periods enrolled (mean)	4.12	7.82
Periods not enrolled/periods enrolled (mean)	0.032	0.032
Interrupted at all	8.43%	12.01%
Had an interruption of more than one period	4.22%	5.82%
Proportion of periods full-time (mean)	0.763	0.932
Percentage always full-time	71.4%	88.2%
Percentage never full-time	19.5%	3.2%
Proportion of periods working (mean)	0.717	0.651
Percentage always working	53.1%	25.2%
Percentage never working	14.0%	6.1%
Had non-outcome transfer	13.9%	26.2%

Source: Authors' estimates based on High School and Beyond.

Findings

EHA analyses result in multinomial logit coefficients—one set for each outcome. Rather than discuss these directly, we summarize them in two ways. First, we discuss whether one subgroup of students (distinguished by the value of one covariate) is "much more likely" to graduate, transfer or drop out, ceteris paribus.[3] Thus, we discuss whether occupational associate students fare worse or better than their academic counterparts and exactly which outcomes are more predominant in each subgroup. We also looked at some demographic and pathway characteristics associated with different outcomes to determine whether they shed light on the occupational student experience, which is often more nontraditional. Second, we made predictions on how many students with a particular set of characteristics may be expected to graduate, transfer or dropout at the point at which the bulk of the cohort has done something of interest. To make a comparison, we started with a prototypical "reference individual"[4] and changed one personal feature. We then looked at the proportions for each outcome. So for example, prototypical occupational students are predicted to transfer about 39 percent of the time whereas the comparable academic student transfers almost 57 percent of the time. The absolute level of each prediction is driven in part by all of the other features of a prototypical student, so the fact that academic students transfer nearly 50 percent more often is the salient point.[5]

Occupational students do not have a greater risk of dropping out. They are more successful at obtaining associate degrees than at transferring. As just mentioned, occupational students are predicted to transfer about 39 percent of the time whereas their academic counterparts transfer almost 57 percent of the time. Terminal associate degrees account for 36 percent of the occupational outcomes but only for 19 percent of the academic outcomes.[6] Taken

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[3] Strictly speaking, we report whether the odds of some outcome are much larger for a particular subgroup. Odds are approximately equal to occurrence probabilities when values are reasonably small. In medical research, odds are equated with "risk."

[4] The reference individual takes on all reference categories: white, male, no disability, middle test score and SES, non-delayer, non-interrupter, and does not work while in school.

[5] For example, occupational students may have lower SES on average than academic students, but the reference individual is defined with the same SES for both groups to make the single comparison (occupational compared with academic) possible.

[6] These rates are adjusted to reflect the common reference individual; the unadjusted rates are smaller but show the same trends, relative to each other.

together, occupational students are about as successful at obtaining *some* level of positive achievement; they just seem to target the terminal AA-AS degree more often. By the way that the terminal associate degree is defined, we can say that occupational students pursue transfer substantially less often because they have only a two-year window in which to do so, and most do not.

With respect to the other covariates, we highlight the following findings. General and vocational tracks in high school, though distinct, lead to similar postsecondary outcomes, namely, a greater risk of dropout and terminal AA-AS degree, with these differences being more pronounced in general track students. These students have, overall, both significant potential for gain and increased risk of failure. Neither blacks nor Hispanics drop out more frequently, but blacks fail to complete AA-AS degrees whereas Hispanics appear not to transfer as often, compared with whites. Hispanics tend to remain enrolled longer because they are "slower to complete" in some sense.[7] Older students, with increased personal constraints, often pursue their education in a nontraditional fashion. But even controlling for these characteristics in our models, we still find that older students fare substantially differently compared with younger ones.[8]

As part of our examination of attachment and the dropout process, we looked at the unadjusted risk of dropout; that is, when does dropout occur in the whole population, without any controls? Using classical EHA techniques, we found the risk to remain fairly constant for an individual throughout his or her educational career. The risk is not particularly higher early on,

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[7] This characterization would be expected, for instance, in part-time students who simply accumulate credits more slowly. Yet the effect seen for Hispanics persists with controls for enrollment intensity, so we find that Hispanics encounter a more subtle risk: By taking longer, they have increased "exposure" and are thus more likely to drop out eventually, even though they are not more prone to do so in any given semester.

[8] The older student is about 50 percent more likely to drop out in the first two years of enrollment, and if transfer is a goal, it will rarely happen in that period. However, older students who make it through the hurdles of those initial years show increased attachment later on, where the risk of dropping out declines by about half.

as is often implied in the higher education literature. This discrepancy can best be understood as a difference in perspective. If we look at an individual, he or she still faces substantial risk throughout each enrollment. If we look at an institution full of these individuals, then the majority of dropouts, in absolute numbers, occur in the first terms. The person who stops out may later transfer, so from an individual perspective that student did not dropout. But the institution has already lost the investment in that student, so from that perspective, the student is a dropout.

This analysis is not to say that all students face the same risk of dropout. They certainly do not. We find that nontraditional students are more at risk early on for dropout. Interruptions are typical in that this occurrence is more damaging early on, with the effect fading over time. Perhaps the lack of attachment associated with the interruption remains active for some critical period. Full-time enrollment can be very helpful early on, in that the risk of dropout is low. In addition, terminal AA-AS degrees are expected about five times more often for full-time students as compared with part-time students.[9] The effect of working, for the most part, operates across all enrollment periods. Increased dropout risk and decreased likelihood of successful outcomes is what students can expect from working more often while enrolled. Increased dropout and decreased attainment are consistent with a lack of attachment to school, perhaps accompanied by an increased attachment to the labor market. It may also be the case that this group needs skills offered by courses more than the credential of a diploma (even though they have stated their intent to complete a degree). Once again, we found that the less traditional group, now growing in number, has a different relationship to schooling than has typically been explored in the literature on more traditional students.

We included this section on Event History Analysis both to illustrate how an analysis of this type might be carried out (note that the release of the NELS transcripts in spring 2003 will allow a similar but more up-to-date EHA analysis) and to explore further some of the differences between academic and occupational associate students that we found in BPS89 and, to some extent, in NELS. We found evidence in those two datasets that occupational students were less

[9] Here, the comparison is between someone who is always full time and someone who is always part time.

likely to “complete” than academic students when we defined “completion” as earning an AA-AS degree or a BA-BS degree or as transferring to the baccalaureate level. A subsidiary analysis that we carried out using a multinomial logistic regression indicated that that difference was stronger with respect to the probability of transfer than to the probability of earning an AA-AS degree. The EHA analysis further confirms that difference. As we have shown, occupational students are much more likely to earn an associate degree than to transfer whereas academic students are more likely to transfer than to earn an AA-AS degree.

Appendix E: Nontraditional Occupational Majors

Table E.1 displays the percentage of females enrolled in traditionally male-dominated occupational majors and the percentage of males in traditionally female-dominated occupational majors.

Table E.1

Nontraditional Occupational Majors, NELS: 88–00

Occupational Majors	**Males**	**Females**
Female Nontraditional Majors		
Agriculture (*n* = 26)	80.9%	19.1%
Engineering (*n* = 356)	84.3%	15.7%
Engineering Technologies (*n* = 76)	80.9%	19.1%
Construction (*n* = 32)	88.3%	11.7%
Mechanics/Electronics (*n* = 140)	98.7%	1.3%
Precision Production (*n* = 33)	96.8%	3.2%
Male Nontraditional Majors		
Business Support/Secretarial (*n* = 158)	23.3%	76.7%
Consumer Services (*n* = 74)	8.9%	91.1%
Nursing/Nurse Assisting (*n* = 148)	17.8%	82.2%

Source: Authors' estimates based on National Education Longitudinal Study, 1988–2000.