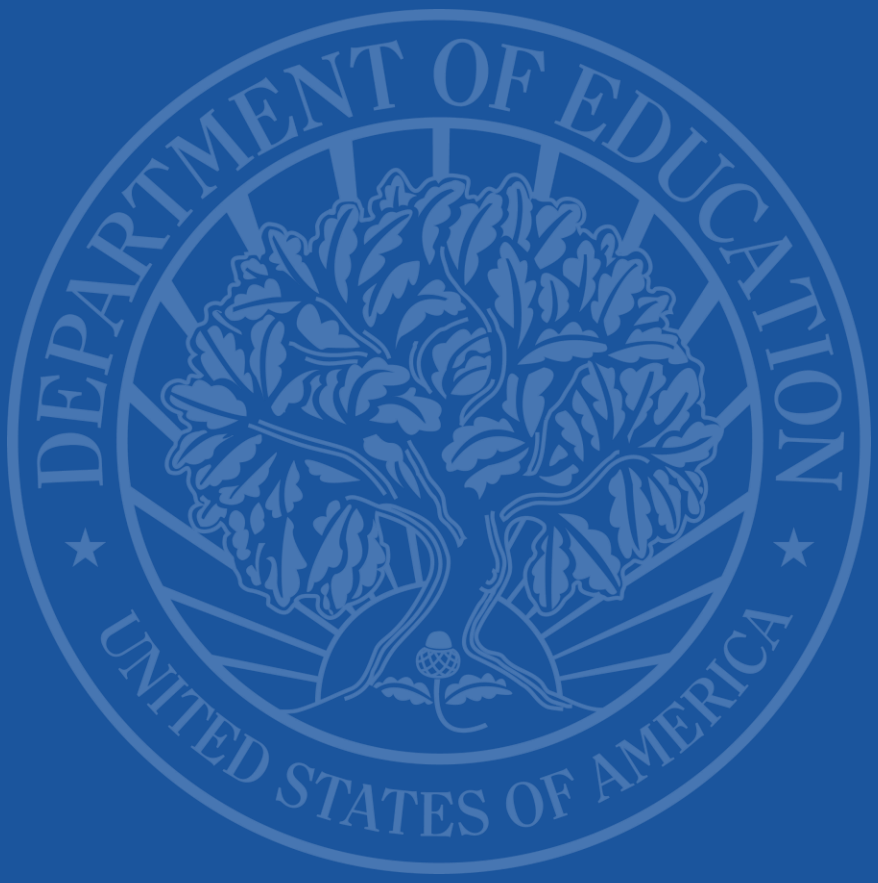

U.S. Department of Education

Postsecondary Career and Technical Education: Demographic Differences in Enrollment, Departure, and Completion

Postsecondary Career and Technical Education: Demographic Differences in Enrollment, Departure, and Completion

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NATIONAL CENTER FOR INNOVATION IN CAREER AND TECHNICAL EDUCATION

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U.S. Department of Education
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Secretary

Office of Career, Technical, and Adult Education
Kim R. Ford
Deputy Assistant Secretary
Delegated the duties of the Assistant Secretary

August 2017

This report is available on the Department's website at: http://cte.ed.gov and on the National Center for Innovation in Career and Technical Education's website at: http://ctecenter.ed.gov/index.php/page/our-research.

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CONTENTS

LIST OF FIGURES

FIGURE PAGE

LIST OF TABLES

ABBREVIATIONS

AY	academic year
BPS:12/14	2012/14 Beginning Postsecondary Students Longitudinal Study
CTE	career and technical education
FTB	first-time beginning postsecondary student
GPA	grade point average
NCES	National Center for Education Statistics
NPSAS:12	2011–12 National Postsecondary Student Aid Study

EXECUTIVE SUMMARY

Students who pursue postsecondary education in career and technical education (CTE) fields of study are often seeking to earn the necessary degree or certificate that will lead directly to employment.[1] However, the institutions in which students choose to enroll and their persistence at their first institution may differ according to students' demographic characteristics. Such differences raise questions about whether there is equitable access to and progress through postsecondary CTE programs.[2]

This report examines demographic differences in postsecondary enrollment, the likelihood of dropping out (referred to as departure in this report), and the likelihood of completion among students in CTE programs at the certificate or associate-degree level. Specifically, the study examines differences in the likelihood of enrolling at private for-profit institutions relative to public institutions, likelihood of departure, and likelihood of completion according to CTE students' sex, race/ethnicity, parents' highest educational attainment, Pell Grant receipt, disability status, and English proficiency. The data come from the 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14), a nationally representative sample of students who first entered postsecondary education in academic year 2011–12. The report presents statistics that describe the population of first-time beginning postsecondary students (FTBs) in CTE fields of study in 2011–12 and describes how key student demographic characteristics are associated with (1) enrollment in postsecondary CTE programs at for-profit institutions compared to enrollment at public institutions and (2) the likelihood of departure from and completion in postsecondary CTE programs.

Enrollment Among Subbaccalaureate CTE Students

To examine differences in enrollment among subbaccalaureate CTE students in public institutions and private for-profit institutions, we first reported the characteristics of FTBs who began a certificate- or associate-level CTE program at a public institution or private for-profit institution in 2011–12. As displayed in Table 1, among this population, the majority

[1] See the Key Definitions subsection of the Data and Methods section of the report for the definitions of "career and technical education" and "CTE fields of study" that are used in this study.
[2] Students are in a "CTE program" if they have a CTE field of study.

(71 percent) were enrolled at public institutions and the remainder at private for-profit institutions. A slight majority of the students were female (56 percent), and almost half were white (49 percent). Most did not have parents whose educational attainment was a bachelor's degree or higher, and most were Pell Grant recipients (students with low to moderate income). A minority (13 percent) had a disability, and 11 percent had low English proficiency.

There were differences between demographic groups in the proportions of CTE students who were enrolled in public institutions and private for-profit institutions (Table 2). Student groups with higher enrollment at for-profit institutions included females (35 percent), Hispanic students (36 percent), first-generation college students (students whose parents' highest educational attainment was high school) (38 percent), and Pell Grant recipients (41 percent).

Using statistical analyses, we examined the likelihood of enrollment at a private for-profit institution, relative to a public institution. The results, displayed in Table 3, show that after accounting for other demographic characteristics and field of study, female, Hispanic, Pell Grant–recipient, and first-generation college students were more likely to enroll at for-profit institutions, while Asian students and students with low English proficiency were less likely. The likelihood was particularly strong for Pell Grant recipients, who were 21 percent more likely to enroll at a for-profit institution than students who were not Pell Grant recipients. These findings reinforce other research that has found that for-profit institutions educate a larger proportion of low-income and minority students than public institutions (Deming, Goldin, and Katz 2012; IHEP 2011).

Taken together, these results suggest that public institutions offering subbaccalaureate CTE credentials could do more to recruit female, Hispanic, Pell Grant–recipient (low- to moderate-income), and first-generation college students or to structure their programs to be more appealing to these students. For example, community colleges could change the structure of their certificate and associate degree programs so that students can move through them more quickly, thereby narrowing the subbaccalaureate completion rate gap between for-profit institutions and community colleges (Lynch, Engle, and Cruz 2010; Mullin 2010).

Departure and Completion Outcomes in Subbaccalaureate CTE Programs

We examined variation in departure from and completion of subbaccalaureate CTE programs among FTBs. Not all FTBs who enrolled in subbaccalaureate CTE programs persisted through program completion at their first institution. Within the first three years of enrolling, among all subbaccalaureate CTE students, 83 percent attended only one institution, while 17 percent transferred to another institution. The 83 percent of FTBs who attended only one institution includes the 22 percent of students who completed a CTE degree or certificate, 16 percent who were still enrolled in CTE at the first institution, 32 percent who departed without reenrolling anywhere else, and 13 percent who changed to a non-CTE field of study. The 17 percent of FTBs who transferred to another institution includes the approximately 4 percent of students who completed a CTE degree or certificate at another institution, 7 percent who were still enrolled in CTE at another institution, 4 percent who switched to a non-CTE field of study at another institution, and 2 percent who departed and did not reenroll after attending at least two institutions as a CTE major (Table 4).

Next, we estimated the likelihood of departure from and completion at the first institution among first-time beginning postsecondary CTE students whose last reported field of study was also in CTE and who did not transfer to a different institution.[3] The likelihood of departure and completion varied according to demographic characteristics. The analytic results, displayed in Tables 6 and 7, show that there are different outcomes in postsecondary CTE programs. CTE students who were black, had a disability, were first-generation college students, or did not receive a Pell Grant (were not low- or moderate-income) were more likely to depart from their subbaccalaureate program without earning a degree or certificate. Students who were female, black, Asian, or had a disability were less likely to complete a CTE credential. These findings imply that institutions offering CTE fields of study could do more to help their female, black, disabled, Pell Grant–recipient, and first-generation CTE students with timely completion of their certificate- or associate-level program. Completion is critical because a degree or certificate increases earnings and lowers the likelihood of defaulting on one's student loans (College Board 2016; Wheary and Orozco 2010).

To increase the completion rate, institutions can provide CTE students with workspaces that are open on evenings and weekends, offer courses at a variety of times to help

[3] Although the term "likelihood" is used in the main body of the report to describe the probability that the event (departure or completion) will occur at a given time, given that it has not yet occurred, the statistically correct term for this probability is "risk" or "hazard."

students work around their employment and familial obligations, provide on-campus employment opportunities, provide on-campus child care services, and integrate family members into the campus community, for example, by inviting them to student orientation (Braxton, Hirschy, and McClendon 2004). Other reforms that can prevent students from departing from postsecondary programs prior to completing a degree or certificate are improvements to the structure of remedial/developmental education, which can hinder student progress (Complete College America 2011; Mangan 2015), and integrated planning and advising services, which involve the use of data analytics to improve student advising (Yanosky 2014). Reforms such as these would lead to improvements in the departure and completion rates of female, black, Pell Grant–recipient (low- to moderate-income), and first-generation students in CTE.

INTRODUCTION

At the high school level, career and technical education (CTE) provides career-focused and technical training to prepare students for the workforce or for further technical education (Dalton et al. 2013). While much of the research regarding CTE has been at the secondary level, many students also participate in CTE at the postsecondary level. In academic year (AY) 2011–12, 8 million students were seeking a subbaccalaureate[4] CTE degree or certificate, which represents 38 percent of all undergraduates (U.S. Department of Education 2014). Given these large numbers, more research is needed about the predictors of enrollment, departure, and completion in postsecondary CTE. Although postsecondary departure and completion have been studied by other researchers (e.g., Braxton, Hirschy, and McClendon 2004), there is little research about the topics of for-profit enrollment, departure, and completion among subbaccalaureate CTE students in particular, especially using multivariable analysis.

This study examines students' enrollment in and completion of subbaccalaureate postsecondary CTE programs by sex, race/ethnicity, parents' educational attainment, Pell Grant receipt, disability status, and English proficiency.[5,6] The data used in this analysis are from the 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14), a nationally representative sample of recent first-time beginning postsecondary entrants. These students were surveyed at the time they began postsecondary CTE programs in AY 2011–12 and were surveyed again in 2014.

The current study addresses the following research questions:

1. Among students enrolling in subbaccalaureate CTE programs, how does the likelihood of enrolling in a for-profit institution, relative to a public institution, vary according to sex, race/ethnicity, parents' educational attainment, Pell Grant receipt, disability status, and English proficiency?

[4] A subbaccalaureate-level degree program is one that leads to a certificate or associate degree, and a subbaccalaureate student is one who is in a certificate or associate-level degree program.
[5] This study expands upon research about equity among high school CTE students conducted by the Department of Education's National Center for Innovation in Career and Technical Education.
[6] See the Key Definitions subsection of the Data and Methods section of the report for the definition of "career and technical education" that is used in this study.

2. Among students enrolling in subbaccalaureate CTE programs, what are the various departure and completion outcomes within three years of enrolling, and what are the characteristics of the students who had each outcome?

3. Among students enrolled in subbaccalaureate CTE programs, how does the likelihood of departure from the first institution in which one enrolled, without completion and within three years of enrollment, vary according to students' sex, race/ethnicity, parents' educational attainment, Pell Grant receipt, disability status, and English proficiency?

4. Among students enrolled in subbaccalaureate CTE programs, how does the likelihood of completion at the first institution in which one enrolled, within three years of enrollment, vary according to sex, race/ethnicity, parents' educational attainment, Pell Grant receipt, disability status, and English proficiency?

The for-profit sector grew rapidly in the first decade of the millennium, and given its vocational orientation, nearly all students in this sector have a focus on CTE (Arbeit and Horn 2017; Deming, Goldin, and Katz 2012; IHEP 2011). Among undergraduates enrolled at for-profit institutions in 2011–12, 93 percent had a CTE field of study (Arbeit and Horn 2017). Students at for-profit institutions are disproportionately female, low-income, African American, Hispanic, older, and single parents (Deming, Goldin, and Katz 2012; IHEP 2011). In one of the few multivariable analyses on the subject of for-profit enrollment, Chung (2012) used nationally representative data from students in the mid-1990s and found that, all else being equal, characteristics that were associated with a higher likelihood of enrollment at a for-profit institution were being female, a low family income (under $25,000), parents with less than a high school education, low standardized test scores, high absenteeism in high school, and having children while a 10th grader.

The study of differences among CTE students in the likelihood of enrollment at a for-profit institution is important because of the implications of attending a for-profit institution rather than a public institution. There are advantages and disadvantages to attending a for-profit institution. Two-year for-profit institutions have higher completion rates than community colleges, partly because for-profit programs are structured to get students through quickly (Lynch, Engle, and Cruz 2010; Mullin 2010). However, there is conflicting evidence regarding the financial benefits of attending a for-profit institution (Cottom 2017). Cellini and Chaudhary (2014) found that students who enrolled in associate degree programs at for-profit colleges earned more than high school graduates, conditional on employment, but Denice (2015) found that students who completed an associate degree at a for-profit institution did not earn more than high school graduates. Low earnings can be disastrous for students of for-profit institutions because they have higher student loan debt than students

of public institutions; the combination of low earnings and high loan debt can lead to defaulting on one's student loans (Deming, Goldin, and Katz 2012; Lynch, Engle, and Cruz 2010; Mullin 2010).

Persistence in and completion of postsecondary programs is critical not only for students at for-profit institutions but for all subbaccalaureate CTE students who borrow money to attend. Students who do not earn a degree or certificate have lower earnings and higher loan default rates than completers (College Board 2016; Wheary and Orozco 2010). The negative consequences of noncompletion underscore the importance of understanding who does and does not complete subbaccalaureate CTE postsecondary programs in order to better craft policies that help students complete a degree or certificate. Research has shown that community college students in CTE fields of study have higher departure rates than their peers in academic majors (Bailey et al. 2004) and that college completion rates in general vary according to student characteristics such as sex and race (Ginder, Kelly-Reid, and Mann 2014; Ross et al. 2012).

In this study, we focus on a cohort of students in subbaccalaureate CTE programs and examine differences in the likelihood of enrollment at a for-profit institution, departure, and completion. We describe some of the different roads to departure and completion that CTE students take. We focus on the degree to which these outcomes vary according to student characteristics of interest to both policymakers and practitioners—sex, race/ethnicity, parents' educational attainment, Pell Grant receipt (based on income), disability status, and English proficiency. Our analyses also account for other student characteristics that have been shown to be associated with for-profit enrollment, departure, or completion, including age, dependent children, field of study, and remedial education (Braxton, Hirschy, and McClendon 2004; Complete College America 2011; Deming, Goldin, and Katz 2012; Hirschy, Bremer, and Castellano 2011).

The analyses consist of multiple descriptive tables and two sets of multivariable statistical models. Multivariable models are designed to estimate the relationship between a variable and an outcome while holding constant other variables that may affect that relationship. In the first set of models, binary logistic regression[7] analyses were performed to estimate the relationship between the characteristics of interest and the likelihood of enrollment in postsecondary CTE at for-profit institutions, relative to public institutions. In the second set, event history analyses,[8] which rely on monthly student enrollment data, demonstrate the relationship between the characteristics of interest and the likelihood of departing from or completing postsecondary CTE programs. Together, these analyses reveal differences in

[7] See the Glossary section of Appendix A for the definition of "binary logistic regression."
[8] See the Glossary section of Appendix A for the definition of "event history analysis."

postsecondary CTE enrollment and differences in degree or certificate completion by key characteristics of interest, including sex, race/ethnicity, and socioeconomic status. The findings have implications for CTE policy and practice, for example, with regard to outreach toward potential students from target populations.

This study complements other reports published by the National Center for Innovation in Career and Technical Education (Arbeit, Leu, and Dalton, forthcoming; Dalton 2015) by examining outcomes of students who participated in CTE at the postsecondary level rather than the secondary level. The study also complements reports published by the National Center for Education Statistics (NCES) that describe student and institutional behavior in postsecondary CTE, including Clery (2008); Horn and Li (2009); Hudson, Kienzl, and Diehl (2007); Hudson and Shafer (2004); and Roberts (2016). This report extends that line of research with a more recent sample of students who entered postsecondary education in 2011 and unique research questions and analyses. Although there are many subbaccalaureate CTE students, few multivariable analyses have addressed the enrollment, departure, and completion outcomes of this population.

Organization of the Report

The remainder of this report includes the following sections:

- Data and Methods
- Results
    - Enrollment Among Subbaccalaureate CTE Students: Student Characteristics
    - Enrollment Among Subbaccalaureate CTE Students: Differences in For-Profit Enrollment
    - Departure and Completion Outcomes in Subbaccalaureate CTE Programs: Student Characteristics
    - Departure and Completion Outcomes in Subbaccalaureate CTE Programs: Differences in Departure from and Completion at the First Institution
- Conclusion and Implications
    - Conclusion
    - Implications for Policy and Practice

DATA AND METHODS

Data, Analytic Samples, and Key Definitions

Data. The data source for this study is BPS:12/14, a nationally representative longitudinal study sponsored by NCES. The study's target population is first-time beginning postsecondary students (FTBs). Respondents were interviewed about their demographic characteristics, academic background, postsecondary enrollment, postsecondary experiences, postsecondary outcomes, and employment.

The BPS:12/14 sample was drawn from the larger 2011–12 National Postsecondary Student Aid Study (NPSAS:12). NPSAS, a cross-sectional study administered every four years, gathers information about how students finance their postsecondary education and a broad array of student demographic and enrollment characteristics. NPSAS uses a two-stage sampling design. Institutions are selected for inclusion in the first stage, and students are selected from these institutions during the second stage. The NPSAS target population consists of all eligible undergraduate and graduate students enrolled in the *Higher Education Opportunity Act* Title IV–eligible postsecondary institutions in the 50 states and the District of Columbia any time between July 1 and June 30 of the survey's academic year (AY). Approximately 85,000 undergraduates were interviewed in NPSAS:12. For BPS:12/14, approximately 37,000 sample members were identified in NPSAS:12 as potential FTBs. Of these potential FTBs, 35,540 were eligible, and approximately 24,770 responded to the 2014 interview, resulting in a weighted interview response rate of 68 percent (Hill et al. 2016).

Analytic samples. BPS:12/14 is a nationally representative sample of students who began postsecondary education for the first time in AY 2011–12. This study constructs two analytic samples from this data set: one that will be used to answer research questions 1 and 2, and another for research questions 3 and 4.[9] The first analytic sample is used to answer research question 1, which addresses differences in the likelihood of enrolling at a for-profit institution, and research question 2, which addresses CTE students' various departure and completion outcomes. The first sample is a subset of the larger BPS:12/14 data set and was restricted to students whose AY 2011–12 program was at the subbaccalaureate level, that is, a certificate or associate degree program. The sample was also restricted to students who had

[9] For a visual description of the characteristics of the analytic samples and how they relate to the research questions, see Table A-1 in Appendix A.

chosen a major field of study, although they need not have formally declared this major at their institution. The chosen field of study must have been CTE.[10] Finally, the sample was restricted to students enrolled at either a private for-profit institution or public institution; students enrolled at private nonprofit institutions are excluded from the sample because of their small sample size.[11] With these restrictions, the size of the sample was 11,210.[12]

To answer research questions 3 and 4, which address differences in the likelihood of departure and completion at the first institution at which CTE students enrolled, we use the same subset of BPS:12/14 from research questions 1 and 2 but impose two additional restrictions. In these analyses, the sample is further restricted to consist not only of students in subbaccalaureate programs whose field of study was CTE when they began postsecondary education, but also those whose last field of study through June 2014 was CTE. This restriction eliminates from the sample 1,660 students who transitioned out of a CTE field of study after their first year in postsecondary education, thereby maintaining the focus of the analysis on students who remain in CTE fields of study.[13] In addition, the sample is restricted to those students who never transferred from their first institution, removing an additional 1,340 students. The resulting sample size for the departure and completion analyses is 8,220 students.

Key Definitions

Career and technical education field of study

The respondents in this study reported that they had chosen a major in a CTE field of study in 2011–12, which means that they either intended to declare or had formally declared a CTE major. The respondents in the second sample, used only to examine departure and completion outcomes, had also formally declared a CTE field of study by the time of their last enrollment as of June 2014. Respondents were identified as having a CTE field of study with categorical variables indicating one of 23 fields of study.[14] From among these 23 fields of study, CTE fields of study were selected based on a taxonomy used by NCES (U.S.

[10] See the Key Definitions subsection of this report for the definition of "career and technical education field of study."
[11] Students who were enrolled at private nonprofit institutions are excluded from this report because of their small sample size. For more detail, see Appendix A.
[12] Because of U.S. Department of Education data security practices, unweighted sample sizes are rounded to the nearest tenth.
[13] Although students who transition out of CTE fields of study by switching to another major could be considered to have departed from or "dropped out" of CTE, this group of students could not be included in the analytic sample because the timing of their transition out of CTE was unknown. The smaller analytic sample focuses the results on those students who intended to stay in CTE and either completed, were still enrolled, or departed entirely.
[14] The BPS variables that were used to indicate field of study were MAJORS23 and MAJ14.

Department of Education, National Center for Education Statistics n.d.). The following fields of study are classified as CTE:

- Computer and information sciences
- Engineering and engineering technology
- Agriculture and natural resources
- Personal and consumer services
- Manufacturing, construction, repair, and transportation
- Military technology and protective services
- Health care fields
- Business
- Education
- Architecture
- Communications
- Public administration and human services
- Design and applied arts
- Law and legal studies
- Library sciences
- Theology and religious vocations

Completion

In this study, CTE students who were identified as having completed were those who earned any level of undergraduate postsecondary credential: certificate, associate degree, or bachelor's degree. Because the sample is limited to students whose first enrollment in AY 2011–12 was in a certificate- or associate-level degree program, and because the respondents were followed only through June 2014, there are only four students in the sample who earned a bachelor's degree.

Departure

Departure refers to the phenomenon that is known colloquially as "dropping out." Students in this study are considered to have experienced a departure if they left their first institution without completing a certificate, associate degree, or bachelor's degree and did not reenroll in another institution from AY 2011–12 through June 2014. The term "departure" is used instead of "dropout" because "dropout" has a negative connotation and implies permanence, which may not be accurate. Respondents may have reenrolled after the end of the study period in 2014.

Subbaccalaureate students

The samples used in this study consist of postsecondary students whose first enrollment, in AY 2011–12, was in a subbaccalaureate program. Subbaccalaureate programs refer to programs that lead to a certificate or an associate degree.

Institutional control

The first research question addresses differences in the likelihood of enrolling at a private for-profit institution relative to a public institution—that is, differences in students' institutional control. Institutional control refers to the governance and legal status of postsecondary institutions, which can be private nonprofit, private for-profit, or public.

How to Interpret Results

The first results presented in this study are descriptive statistics,[15] followed by analyses that were conducted in two sets of multivariable models. We rely on binary logistic regression to examine the relationship between key demographic characteristics and the likelihood of enrollment at a private for-profit institution, relative to a public institution (research question 1). The results from this analysis are displayed in Table 3, which has three columns. The columns each represent a different model. Additional control variables were added to each model in sequence. Model 1 (column 1) includes only the primary demographic characteristics of interest as independent variables. Model 2 (column 2) adds age and an indicator of whether respondents had dependent children, and Model 3 (column 3) adds field of study.

The analyses were structured in this manner for a few reasons. First, we wanted to isolate the influence of the primary demographic characteristics of interest, which is achieved in Model 1 (Table 3, column 1). Second, we wanted to include age and children because they are known to be associated with the likelihood of enrollment at a for-profit institution and to determine whether these characteristics help explain the relationship between the primary demographic characteristics of interest and the outcome. Third, we wanted to account for field of study because it is also known to be associated with institutional control and—as with age and children—to determine whether field of study helps explain the relationship between the primary demographic characteristics of interest and the outcome (Deming, Goldin, and Katz 2012).

[15] See the Glossary section of Appendix A for the definition of "descriptive statistics."

For ease of interpretation, results for the likelihood of for-profit enrollment are presented as marginal effects[16] showing the predicted probability of enrollment at a for-profit institution that is associated with one value of a student characteristic relative to another, holding other characteristics constant. For example, the marginal effects show that being female, relative to being male, is associated with a higher predicted probability of enrolling at a for-profit institution, holding all other variables in the model constant.

To answer research questions 3 and 4, we separately examine two outcomes for subbaccalaureate CTE students: departing from the first institution in which they enrolled (Table 6) and completing a certificate or degree at that first institution (Table 7). The analyses focus on differences in departure or completion by student sex, race/ethnicity, parental education, Pell Grant receipt, disability status, and English proficiency. The estimates[17] presented in this report are from Cox proportional hazards models.[18] Hazard models are used when we are interested in understanding whether an event occurs (e.g., completion or departure) and the factors that increase or decrease the likelihood of the event's occurrence (Singer and Willett 1991).[19] They are more appropriate than standard regression techniques when not all individuals in the data have experienced the event by the end of the study (e.g., they may still be enrolled) but may still experience it in the future.[20]

The results, presented in Tables 6 and 7, are exponentiated coefficients, also known as hazard ratios,[21] from the Cox proportional hazards model. Estimates that are significantly[22] greater than 1 indicate that a given value of a student characteristic (e.g., male) is associated with an increase in the rate of a particular event occurring (departing or completing) relative to another value of that characteristic (e.g., female). Estimates that are less than 1 indicate that the given value of the characteristic is associated with a decrease in the rate of departing or completing relative to another value of that characteristic. For readability, the report describes characteristics that increase or decrease the probability of departure or completion occurring as affecting the "likelihood," but readers should note that coefficients from Cox proportional hazards models are typically interpreted as the effect of a covariate on the "hazard" or "risk" of an event occurring—defined as the probability that the event will occur in a specific period given that it has not occurred up to that point in time.

The statistics shown in the tables and discussed in this report are estimates because they are generated from sample survey data. The statistics reported include proportions of a group

[16] See the Glossary section of Appendix A for the definition of a "marginal effect."
[17] See the Glossary section of Appendix A for the definition of an "estimate."
[18] See the Glossary section of Appendix A for the definition of a "Cox proportional hazards model."
[19] See the Glossary section of Appendix A for the definition of an "event."
[20] See the Event History Analysis section of Appendix A for additional details.
[21] See the Glossary section of Appendix A for the definition of a "hazard ratio."
[22] See the Glossary section of Appendix A for the definition of "statistical significance."

(e.g., the proportion of females enrolled in a for-profit institution), predicted probabilities that take into account multiple factors (e.g., the predicted probability that a woman is enrolled at a for-profit institution, while accounting for other demographic characteristics), and hazard ratios estimated from Cox regression (e.g., the estimated likelihood of departure for females relative to the likelihood of departure for males, accounting for other student characteristics).

In the descriptive tables (Tables 1, 2, 4, and 5), the Student's *t* test[23] was used to detect differences between estimates that were larger than would be expected because of sampling variation. These tests were conducted in cases in which a comparison was made regarding the proportions of students having a certain outcome (e.g., the proportion of females enrolled at a for-profit institution was greater than the proportion of males enrolled at a for-profit institution). All differences reported in the text, whether tested by a *t* test or a statistic in a multivariable regression model, are statistically significant at an alpha level[24] of 0.05. This means that the chance that differences cited in the text are due to random variation among the sample is no greater than 5 percent. The text also points out some instances when no statistically significant difference was measured.

For more detailed information about the statistical procedures used in this study, see Appendix A.

Study Limitations

Although this study is broad in scope because the sample is nationally representative, the scope is also limited. The analytic samples are composed of students who began their postsecondary education in certificate- or associate-level programs at public institutions or private for-profit institutions. There are, however, postsecondary CTE students who begin their studies at the bachelor's level and receive bachelor's degrees in CTE fields of study. In addition, a minority of CTE students begin their studies at private nonprofit institutions. The findings presented in this report are not applicable to those students.

BPS:12/14 does not offer a direct indicator of English proficiency. In this study, students are described as having low English proficiency if their first language as a child was not English *and* they spoke a language other than English all or most of the time with their primary caregiver at the start of high school. This is the best indicator of English proficiency that could be constructed using BPS:12/14, but it may not capture students' true level of English proficiency.

[23] See the Glossary section of Appendix A for the definition of "*t* test."
[24] See the Glossary section of Appendix A for the definition of "alpha level."

Field of study is included as a control variable with dummy variables for the top five CTE fields of study among our sample and another dummy variable for the other fields of study. The other fields of study were collapsed into one group to avoid small subsample sizes and because field of study is not a primary independent variable of interest in this report. Some limitations of this approach are that we allow for unexplained variation in the dependent variables and do not show the relationships between each CTE field of study and the dependent variables.

The relationships between student characteristics and outcomes presented in this report cannot be assumed to be causal. For example, although having a Pell Grant is associated with a higher probability of being enrolled at a for-profit institution instead of a public institution, being low-income or having a Pell Grant may not cause one to enroll at a for-profit institution, at least not from the student's point of view. Rather, other factors that are not measured by BPS:12/14 and are therefore statistically unaccounted for may be involved. For example, for-profit colleges' efforts to recruit low-income students may contribute to a higher likelihood that low-income students will enroll in a for-profit rather than a public institution. Although other relevant factors were statistically accounted for when predicting the relationship between a characteristic and an outcome, the possibility remains that there are other variables that predict the outcome but were not included in the models.

Finally, this study included some valid "don't know" responses and missing data that were not imputed. Six percent of the students reported that they did not know their parents' highest level of education (Tables 1 and 5). Two other variables used to examine departure and completion outcomes have missing values: For 18 percent of respondents, there is no record of high school grade point average (GPA), and for 2 percent of respondents, there is no record of whether they delayed entry into postsecondary education (Table 5). While these variables were properly handled and retained in the analyses, the results for these missing value categories are not displayed because of difficulty of interpretation. For additional information on these variables, see Appendix A: Technical Appendix.

RESULTS

This section provides the findings of the study, which describe the characteristics of subbaccalaureate CTE students and address demographic differences in institution type, departure, and completion. The findings are presented in four subsections:

- Enrollment Among Subbaccalaureate CTE Students: Student Characteristics
- Enrollment Among Subbaccalaureate CTE Students: Differences in For-Profit Enrollment
- Departure and Completion Outcomes in Subbaccalaureate CTE Programs: Student Characteristics
- Departure and Completion Outcomes in Subbaccalaureate CTE Programs: Differences in Departure from and Completion at the First Institution

Enrollment Among Subbaccalaureate CTE Students: Student Characteristics

This section presents the characteristics of students who began postsecondary education for the first time in AY 2011–12. They were in a certificate- or associate-level program at a public institution or private for-profit institution, and their field of study was CTE.[25] This field of study could be either officially declared with the institution or intended.[26] Table 1 displays the percentage distribution of the sample by selected demographic and enrollment characteristics. This is the sample that is used to examine differences in the likelihood of enrolling at a for-profit institution (research question 1).

In AY 2011–12, most first-time beginning postsecondary CTE students were enrolled in public institutions, about 71 percent. Thirty percent were enrolled at for-profit institutions. A slight majority of students in the sample were female (56 percent), and almost half were

[25] For the list of fields of study treated as CTE, see the Data and Methods section.
[26] The survey asked respondents for their declared or intended field of study in 2011–12.

white (49 percent). Twenty-six percent were Hispanic, 17 percent were black, 3 percent were Asian, and 5 percent belonged to other racial/ethnic categories.[27]

Most of the students in subbaccalaureate CTE programs had parents whose highest educational attainment was less than a bachelor's degree; 45 percent had parents whose attainment was high school or less, indicating that they were first-generation college students. Sixteen percent had at least one parent with some college (but no certificate or degree). Nor were subbaccalaureate credentials common among the samples' parents: only 14 percent had a parent with vocational/technical training or an associate degree. Another 20 percent of the students had at least one parent with a bachelor's or higher degree.[28]

Most of the CTE students (65 percent) received Pell Grants in 2011–12, indicating that they came from low- to moderate-income households. Thirteen percent of the students in the sample had a disability, and 11 percent had low English proficiency, defined in this study as having first learned a language other than English as a child and having spoken a language other than English always or most of the time with the primary caregiver at the start of high school.

In addition to the aforementioned demographic characteristics, which are the primary variables of interest in this report, the analyses include control variables for other characteristics: level of program, age, whether the student had dependent children, and CTE field of study. These variables indicate that 75 percent of first-time beginning postsecondary CTE students were in an associate-level, rather than a certificate-level, program, and the majority (72 percent) were between the ages of 15 and 23. Twenty-three percent of the students had at least one dependent child. The most popular field of study was health care (32 percent), followed by business (16 percent); personal and consumer services (9 percent); manufacturing, construction, repair, and transportation (8 percent); and military technology and protective services (8 percent).

[27] Black includes African American, Hispanic includes Latino, and Other includes American Indian or Alaska Native, Native Hawaiian/other Pacific Islander, and more than one race. Students who indicated both Hispanic and another race category are in the Hispanic category.

[28] Six percent of the students reported that they did not know either parent's educational attainment (Tables 1 and 5). This category of the parents' education variable is not displayed in Tables 2, 3, 4, 6, or 7 because of difficulty of interpretation, but the cases are retained in the analytic sample. For more information about the decision to keep these students in the sample, see Appendix A.

Table 1. POSTSECONDARY CTE STUDENTS: Percentage of first-time subbaccalaureate career and technical education students who had various characteristics: academic year 2011–12

Characteristics	All students
Total	**100.0**
Institutional control	
Public	70.5
Private for-profit	29.5
Sex	
Male	43.8
Female	56.2
Race/ethnicity[1]	
White	49.0
Black	16.8
Hispanic	25.6
Asian	3.3
Other	5.3
Parents' highest educational attainment	
High school or less	44.8
Some college	16.0
Vocational/technical training or associate degree	13.6
Bachelor's degree or higher	20.1
Do not know either parent's educational attainment	5.6
Pell Grant	
Received Pell Grant	64.5
Did not receive Pell Grant	35.5
Disability	
Has disability	13.4
Does not have disability	86.6
English proficiency[2]	
Low proficiency	11.4
High proficiency	88.6
Level of program	
Certificate	25.4
Associate	74.6
Age as of 12/31/2011	
15–23	72.4
24–29	12.6
30 or older	15.1
Dependent children	
Has dependent children	23.4
Does not have dependent children	76.6

See notes at end of table.

Table 1. POSTSECONDARY CTE STUDENTS: Percentage of first-time subbaccalaureate career and technical education students who had various characteristics: academic year 2011–12—Continued

Characteristics	All students
Field of study[3]	
Health care	32.3
Business	15.8
Manufacturing, construction, repair, transportation	8.3
Personal and consumer services	9.4
Military technology and protective services	7.7
Other	26.5

[1] Black includes African American, Hispanic includes Latino, and Other includes American Indian or Alaska Native, Native Hawaiian/other Pacific Islander, and more than one race. Students who indicated Hispanic and another race category are in the Hispanic category.
[2] Students are described as having low English proficiency if their first language as a child was not English and they spoke a language other than English all or most of the time with their primary caregiver at the start of high school.
[3] These five fields of study are the most popular among the sample of career and technical education (CTE) students used in this study. The Other category includes all other CTE fields of study. The other CTE fields of study are computer and information sciences, agriculture and natural resources, engineering and engineering technology, education, architecture, communications, public administration and human services, design and applied arts, law and legal studies, library sciences, and theology and religious vocations.
NOTE: Table represents only first-time beginning postsecondary students with CTE fields of study who were enrolled in subbaccalaureate (certificate- or associate-level) programs at public institutions or private for-profit institutions. Number of observations is 11,210. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Table 2 displays the percentage distribution of the control of students' institution, disaggregated by the same set of demographic and enrollment characteristics. The table shows that there were differences in the proportion of students who were enrolled in public institutions and private for-profit institutions according to demographic characteristics.[29] Student groups with higher enrollment at for-profit institutions include females, Hispanic students, first-generation college students, and students who received a Pell Grant.

The proportions of students enrolled at public institutions or private for-profit institutions vary in relation to one another. For example, among first-time beginning postsecondary CTE students in 2011–12, a larger proportion of females (35 percent) than males (23 percent) were enrolled at for-profit institutions, and a larger proportion of males (77 percent) than females (65 percent) were enrolled at public institutions.

The racial/ethnic group with the largest proportion of students enrolled at private for-profit institutions was Hispanic. Thirty-six percent of Hispanic students were enrolled at for-profit institutions, followed by 35 percent of black students, 34 percent of students in the other race category, 25 percent of white students, and 10 percent of Asian students. Conversely, the category with the largest proportion of students enrolled at public institutions was Asian

[29] All differences reported in the text, whether tested by a *t* test or a statistic in a multivariable regression model, are statistically significant at an alpha level of .05.

(90 percent), followed by white (75 percent), other (66 percent), black (65 percent), and Hispanic (64 percent).

The proportion of students who enrolled at private for-profit institutions was inversely related to their parents' highest educational attainment. Among first-generation college students, 38 percent enrolled at for-profit institutions, compared with 17 percent of students whose parents had a bachelor's or higher degree. Sixty-two percent of first-generation college students were enrolled at public institutions, compared to 83 percent of students whose parents' education was a bachelor's degree or higher. The proportion of students enrolled at for-profit institutions was similarly related to income status. A greater proportion of students who received a Pell Grant were enrolled at for-profit institutions, relative to those who did not (41 percent relative to 9 percent), and a greater proportion of students who did not receive a Pell Grant were enrolled at public institutions, relative to those who did (92 percent relative to 59 percent). The differences in the proportions of CTE students enrolled at for-profit institutions and public institutions according to disability status or English proficiency were very small.

Regarding the other student characteristics that are included as control variables in the regression models, a much larger proportion of certificate-level than associate-level students were enrolled at for-profit institutions (70 percent relative to 16 percent), and a larger proportion of associate-level than certificate-level students were enrolled at public institutions (84 percent relative to 30 percent). Traditional-age college students in the 15–23 age category were enrolled at public institutions at higher proportions than older students (76 percent relative to 55 percent of students in the 24–29 category and 58 percent in the 30 or older category). The 24–29 age category had the highest proportion of students enrolled at for-profit institutions (45 percent), compared to 42 percent of students who were 30 or older and 24 percent of students who were 15–23 years old.

Students with dependent children enrolled at for-profit institutions in higher proportions than students without children (50 percent relative to 23 percent). Among the five most popular CTE fields of study in this population of FTBs, the one with the largest proportion of students enrolled at a for-profit institution was personal and consumer services (62 percent), followed by manufacturing, construction, repair, and transportation (42 percent); health care (36 percent); military technology and protective services (20 percent); and business (18 percent). The field of study with the largest proportion of students enrolled at public institutions was business (82 percent), followed by military technology and protective services (80 percent); health care (64 percent); manufacturing, construction, repair, and transportation (58 percent); and personal and consumer services (38 percent).

Table 2. INSTITUTIONAL CONTROL AMONG CTE STUDENTS: Percentage distribution of first-time subbaccalaureate career and technical education students' institutional control, by various characteristics: academic year 2011–12

Characteristics	Institutional control	
	Public	Private for-profit
Sex		
Male	77.0	23.0
Female	65.4	34.6
Race/ethnicity[1]		
White	75.2	24.8
Black	65.2	34.8
Hispanic	63.5	36.5
Asian	89.6	10.4
Other	66.0	34.0
Parents' highest educational attainment		
High school or less	62.5	37.5
Some college	74.9	25.1
Vocational/technical training or associate degree	76.6	23.4
Bachelor's degree or higher	83.0	17.0
Pell Grant		
Received Pell Grant	58.9	41.1
Did not receive Pell Grant	91.5	8.5
Disability		
Has disability	69.3	30.7
Does not have disability	70.7	29.3
English proficiency[2]		
Low proficiency	71.3	28.7
High proficiency	70.4	29.6
Level of program		
Certificate	29.8	70.2
Associate	84.4	15.6
Age as of 12/31/2011		
15–23	75.8	24.2
24–29	54.9	45.1
30 or older	58.2	41.8
Dependent children		
Has dependent children	50.0	50.0
Does not have dependent children	76.8	23.2

See notes at end of table.

Table 2. INSTITUTIONAL CONTROL AMONG CTE STUDENTS: Percentage distribution of first-time subbaccalaureate career and technical education students' institutional control, by various characteristics: academic year 2011–12—Continued

Characteristics	Institutional control	
	Public	Private for-profit
Field of study[3]		
Health care	64.1	35.9
Business	81.7	18.3
Personal and consumer services	37.8	62.2
Manufacturing, construction, repair, transportation	57.6	42.4
Military technology and protective services	79.7	20.3
Other[3]	84.5	15.5

[1] Black includes African American, Hispanic includes Latino, and Other includes American Indian or Alaska Native, Native Hawaiian/other Pacific Islander, and more than one race. Students who indicated Hispanic and another race category are in the Hispanic category.
[2] Students are described as having low English proficiency if their first language as a child was not English and they spoke a language other than English all or most of the time with their primary caregiver at the start of high school.
[3] These five fields of study are the most popular among the sample of career and technical education (CTE) students used in this study. The Other category includes all other CTE fields of study. The other CTE fields of study are computer and information sciences, agriculture and natural resources, engineering and engineering technology, education, architecture, communications, public administration and human services, design and applied arts, law and legal studies, library sciences, and theology and religious vocations.
NOTE: Table represents only first-time beginning postsecondary students with CTE fields of study who were enrolled in subbaccalaureate (certificate- or associate-level) programs at public institutions or private for-profit institutions. Number of observations is 11,210. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Enrollment Among Subbaccalaureate CTE Students: Differences in For-Profit Enrollment

This section addresses the first research question: Among students enrolling in subbaccalaureate CTE programs, how does the likelihood of enrolling in a for-profit institution, relative to a public institution, vary according to sex, race/ethnicity, parents' educational attainment, Pell Grant receipt, disability status, and English proficiency?

Table 3 presents the results of a binary logistic regression of institutional control on student characteristics. Results are presented as marginal effects showing the predicted probability of enrollment at a private for-profit institution that is associated with one value of a student characteristic relative to another. The three model specifications represent a progressive series of models in which additional control variables were added to each model in sequence. In model specification 1, the independent variables include only the primary demographic characteristics of interest. Model specification 2 includes the aforementioned plus age and dependent children, and model specification 3 adds field of study.

In Model Specification 1, the demographic characteristics that were associated with a higher probability of enrollment at a for-profit rather than a public institution, after controlling for

the other characteristics in the model, were sex (females were 4 percent more likely than males), race/ethnicity (Hispanic students were 4 percent more likely than white students), Pell Grant receipt (Pell Grant recipients were 23 percent more likely than nonrecipients), and disability status (students with a disability were 3 percent more likely than those without a disability). Asian students had a 9 percent lower likelihood of enrolling at a for-profit institution than white students, while students whose parents' educational attainment was higher than high school had a 5 to 7 percent lower likelihood of enrolling at a for-profit institution, depending on the reference category. Students with low English proficiency had a 4 percent lower likelihood of enrolling at a for-profit institution.

After control variables for age and dependent children were added in Model Specification 2, having a disability was no longer associated with a higher probability of enrollment at a for-profit institution. The other demographic variables, however, still predicted enrollment at a for-profit institution in the same direction and with similar effect sizes as they did in Model Specification 1. Results were also very similar in Model Specification 3, to which control indicators for the five most popular fields of study were added.

In Model Specification 3, which adds controls for field of study, the demographic characteristics that were associated with a higher probability of enrollment at a for-profit rather than a public institution, after controlling for the other characteristics in the model, were sex (females were 3 percent more likely than males), race/ethnicity (Hispanic students were 7 percent more likely than white students), and Pell Grant receipt (Pell Grant recipients were 21 percent more likely than nonrecipients). Relative to white students, Asian students had a 7 percent lower likelihood of enrolling at a for-profit institution, while students whose parents' highest educational attainment was some college, vocational/technical training or an associate degree, or a bachelor's degree or higher had a 3 to 6 percent lower probability of enrolling at a for-profit institution relative to those whose parents had attained high school or less. Students with low English proficiency had a 4 percent lower likelihood of enrolling at a for-profit institution. Disability status was not associated with the probability of enrollment at a for-profit institution in Model Specification 3. Although effect sizes changed little when adding control variables for age, dependent children, and field of study, one of the notable changes was the decrease in the percent greater likelihood that females would enroll in for-profit institutions (from 3.5 percent to 3 percent when controlling for age and children, to 2.5 percent when controlling for field of study). This result suggests that age, whether or not they have dependent children, and preferred field of study play a role in explaining females' greater likelihood of enrollment at a for-profit institution.

Table 3. FACTORS ASSOCIATED WITH ENROLLMENT AT A PRIVATE FOR-PROFIT INSTITUTION: Average marginal effects of various characteristics on the probability of first-time subbaccalaureate career and technical education students being enrolled at a private for-profit institution rather than a public institution: academic year 2011–12

Characteristics	Model 1: Demographic characteristics only		Model 2: + age and children		Model 3: + field of study	
Sex						
Male	†		†		†	
Female	3.5	*	2.9	*	2.5	*
Race/ethnicity[1]						
White	†		†		†	
Black	2.6		2.8		2.4	
Hispanic	4.3	*	6.8	***	6.8	***
Asian	-8.5	**	-6.7	*	-7.0	*
Other	6.1	*	6.3	*	6.8	*
Parents' highest educational attainment						
High school or less	†		†		†	
Some college	-5.0	*	-3.7	*	-3.3	*
Vocational/technical training or associate degree	-6.9	***	-5.7	***	-5.5	***
Bachelor's degree or higher	-6.9	***	-5.1	***	-5.0	***
Pell Grant						
Received Pell Grant	23.4	***	21.6	***	21.1	***
Did not receive Pell Grant	†		†		†	
Disability						
Has disability	3.3	*	2.4		2.5	
Does not have disability	†		†		†	
English proficiency[2]						
Low proficiency	-3.7	*	-3.9	*	-4.2	*
High proficiency	†		†		†	
Level of program						
Certificate	45.1	***	43.5	***	39.4	***
Associate	†		†		†	
Age as of 12/31/2011						
15–23	–		†		†	
24–29	–		8.6	***	8.6	***
30 or older	–		5.7	**	5.7	**
Dependent children						
Has dependent children	–		5.7	**	6.2	**
Does not have dependent children	–		†		†	

See notes at end of table.

Table 3. FACTORS ASSOCIATED WITH ENROLLMENT AT A PRIVATE FOR-PROFIT INSTITUTION: Average marginal effects of various characteristics on the probability of first-time subbaccalaureate career and technical education students being enrolled at a private for-profit institution rather than a public institution: academic year 2011–12—Continued

Characteristics	Model 1: Demographic characteristics only	Model 2: + age and children	Model 3: + field of study	
Field of study[3]				
Health care	–	–	†	
Business	–	–	-0.4	
Personal and consumer services	–	–	12.0	***
Manufacturing, construction, repair, transportation	–	–	3.2	
Military technology and protective services	–	–	2.4	
Other	–	–	-3.4	

† Not applicable because of the comparison group.

– Not applicable because variable not included in the model.

* = $p < .5$; ** = $p < .01$; *** = $p < .001$.

[1] Black includes African American, Hispanic includes Latino, and Other includes American Indian or Alaska Native, Native Hawaiian/other Pacific Islander, and more than one race. Students who indicated Hispanic and another race category are in the Hispanic category.

[2] Students are described as having low English proficiency if their first language as a child was not English and they spoke a language other than English all or most of the time with their primary caregiver at the start of high school.

[3] These five fields of study are the most popular among the sample of career and technical education (CTE) students used in this study. The Other category includes all other CTE fields of study. The other CTE fields of study are computer and information sciences, agriculture and natural resources, engineering and engineering technology, education, architecture, communications, public administration and human services, design and applied arts, law and legal studies, library sciences, and theology and religious vocations.

NOTE: Table represents only first-time beginning postsecondary students with CTE fields of study who were enrolled in subbaccalaureate (certificate- or associate-level) programs at public institutions or private for-profit institutions. Marginal effects represent the average percentage point change in the predicted probability of enrollment at a private for-profit institution that is associated with a one unit change in an independent variable after controlling for the covariation of the other variables in the model. Model fit results for model 1: $F(13,320) = 47.17$, $p < .001$. Model fit results for model 2: $F(16,320) = 41.86$, $p<.001$. Model fit results for model 3: F(21,320) =3 7.14, $p < .001$. The italicized category for each variable is the reference group. Number of observations is 11,210.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Departure and Completion Outcomes in Subbaccalaureate CTE Programs: Student Characteristics

This section moves from examining how enrollment decisions are associated with different student characteristics to investigating the program outcomes of AY 2011–12 FTBs in subbaccalaureate CTE fields of study. The section addresses research question 2: Among students enrolling in subbaccalaureate CTE programs, what are the various departure and completion outcomes within three years of enrolling, and what are the characteristics of the students who had each outcome?

FTBs who enrolled in subbaccalaureate CTE programs experienced a variety of outcomes during the three years following initial enrollment. Some students attended just one institution, while others transferred. Some remained in a CTE field of study through program completion or until the study period concluded; others left CTE for different fields of study.

All Subbaccalaureate CTE Students

Table 4 presents the departure and completion outcomes in CTE programs among FTBs between AYs 2011–12 and 2013–14.

The majority of first-time beginning CTE students attended just one institution during the first three years after initial enrollment. Within three years of beginning postsecondary education, about 22 percent of students in subbaccalaureate CTE programs completed a degree or certificate at their first institution, 16 percent were still enrolled in their first institution, and 32 percent departed from their first institution and did not subsequently enroll anywhere else during the three years after initial postsecondary enrollment. The remaining 30 percent either remained at their first institution but changed to another field of study (13 percent) or transferred to another institution (17 percent).

Transfer students also had a variety of outcomes. About 4 percent of first-time beginning CTE students transferred and were able to complete a degree or certificate, while less than 2 percent transferred and subsequently departed without earning a credential. Seven percent of the students transferred and were still enrolled three years after initial enrollment, which is unsurprising, given that they may have changed their program of study when transferring institutions and may not have had sufficient time to earn the credits needed for a credential. About 4 percent of students transferred and changed to a non-CTE field of study.

Table 4 also shows how the distribution of CTE students who completed, continued enrollment, or departed varied according to selected demographic and enrollment characteristics. Select statistically significant differences are discussed below, with a focus on the report's key demographic variables of interest.[30]

Students Who Never Transferred

Among students who never transferred out of their first institution, student completion outcomes varied by student background characteristics. Lower percentages of black students completed a degree or certificate at their first institution than white and Hispanic students (17 percent compared to 22 and 26 percent, respectively). Higher percentages of first-generation college students completed a degree or certificate at their first institution, relative to students whose parents had a bachelor's degree or higher (25 percent for high school or less and 22 percent for students whose parents had vocational training/an associate degree, compared to 16 percent for bachelor's degree or higher). A higher percentage of students who received a Pell Grant in their first year of postsecondary education completed a CTE degree or certificate within three years (26 percent), compared to those who did not receive a Pell Grant (14 percent). Students with a disability completed a degree or certificate at their first institution less often than those without a disability (16 compared to 23 percent).

Differences were also present for departure outcomes. Higher percentages of black students than white and Hispanic students departed from their first institution and did not subsequently reenroll anywhere (41 percent compared to 32 and 26 percent, respectively). Thirty-five percent of those whose parents had attained a high school education or less departed without completion, compared to 29 percent of students whose parents had vocational training or an associate degree and 26 percent of those whose parents completed a bachelor's degree. Students with a disability departed from their first institution more often (42 compared to 30 percent). Among students with high English proficiency, about a third (32 percent) had departed from their first institution and had not subsequently reenrolled anywhere. This was the case for closer to a fourth (25 percent) of their peers with low English proficiency.

Although not a primary variable of interest, we note that departure and completion outcomes differed according to the level of CTE credential that students pursued when they first enrolled: 54 percent of CTE certificate seekers completed a CTE credential at their first institution within three years of beginning, compared to just 11 percent of associate-degree seekers. Approximately 21 percent of associate-degree seekers were still enrolled after three

[30] Statistically significant according to *t* tests.

years, compared to just 3 percent of certificate seekers. Thirty-three percent of associate-degree seekers departed entirely, as did 27 percent of certificate seekers.

Students Who Transferred

Approximately 17 percent of subbaccalaureate CTE students transferred out of their first institution. There were several differences in completion after a transfer by student background characteristics. Black students transferred and completed a CTE credential (3 percent) less often than white (5 percent) or Hispanic students (5 percent). A lower proportion of first-generation college students transferred and completed than students whose parents had a bachelor's degree or higher. Three percent of students whose parents had attained a high school education or less transferred and completed a CTE credential, compared to 6 percent of students whose parents had a bachelor's degree or higher. Only 3 percent of students with a disability transferred and completed a CTE credential, and 5 percent were still enrolled after the first three years, fewer than those without disability (5 percent completed, and 8 percent were still enrolled).

Differences in departure after having transferred also varied by student background characteristics. Black students more often departed from the latter institution and did not enroll again compared to white and Hispanic students, with differences in proportion ranging from 2 to 4 percent, depending on the comparison group.

Some students transferred and were still enrolled three years after enrolling at their first institution. Compared to white and black students, Hispanic students remained enrolled after three years less often, with a 3-percentage-point difference. Five percent of students whose parents had attained a high school education or less transferred and were still enrolled after three years, compared to 10 percent of students whose parents had a bachelor's degree or higher. Regarding income level, 10 percent of students who did not receive a Pell Grant transferred and were still enrolled after three years, compared to 6 percent of students who did receive a Pell Grant.

Table 4. DEPARTURE AND COMPLETION OUTCOMES, WITH TRANSFER: Percentage distribution of first-time subbaccalaureate career and technical education students' departure and completion outcomes, with transfer students, by various characteristics: academic year 2011–12 through 2014

	Departure and completion outcomes							
	Never transferred to another institution				Transferred to another institution			
	Stayed in CTE field of study[1]				Stayed in CTE field of study			
Characteristics	Completed CTE credential	Still enrolled	Departed	Changed to other field of study	Completed CTE credential	Still enrolled	Departed	Changed to other field of study
Total	**21.9**	**16.4**	**31.7**	**13.1**	**4.5**	**7.2**	**1.6**	**3.6**
Sex								
Male	19.9	16.5	34.9	13.2	4.0	7.0	1.2	3.2
Female	23.6	16.3	29.2	13.0	4.8	7.4	1.9	3.9
Race/ethnicity[2]								
White	21.9	16.0	32.2	12.6	4.9	7.6	1.6	3.2
Black	16.7	12.5	41.2	11.1	2.9	8.4	3.5	3.8
Hispanic	26.4	18.6	25.8	14.6	4.8	5.1	0.8	3.9
Asian	9.4	24.3	22.8	22.1	‡	12.3	‡	5.8 !
Other	25.0	16.9	31.1	10.4	3.9 !	7.6	1.2 !	3.9 !
Parents' highest educational attainment								
High school or less	25.1	15.2	34.7	12.5	3.4	5.1	1.6	2.3
Some college	20.7	17.1	30.2	12.1	5.3	8.8	1.3	4.5
Vocational/technical training or associate degree	22.3	16.4	29.4	13.7	4.9	7.7	1.0 !	4.6
Bachelor's degree or higher	15.5	18.8	26.2	15.8	5.9	10.3	2.4 !	5.1
Pell Grant AY 2011–12								
Received Pell Grant	26.3	15.0	31.9	12.4	4.0	5.8	1.6	3.1
Did not receive Pell Grant	14.1	18.9	31.3	14.3	5.3	9.9	1.6	4.6
Disability								
Has disability	15.7	13.3	41.6	15.9	2.8	4.8	2.7	3.2
Does not have disability	22.9	16.9	30.2	12.6	4.7	7.6	1.5	3.7
English proficiency[3]								
Low proficiency	23.1	21.3	25.1	16.3	4.3	6.0	0.6 !	3.4
High proficiency	21.8	15.7	32.5	12.7	4.5	7.4	1.8	3.6

See notes at end of table.

Table 4. DEPARTURE AND COMPLETION OUTCOMES, WITH TRANSFER: Percentage distribution of first-time subbaccalaureate career and technical education students' departure and completion outcomes, with transfer students, by various characteristics: academic year 2011–12 through 2014—Continued

	Departure and completion outcomes							
	Never transferred to another institution				Transferred to another institution			
	Stayed in CTE field of study [1]				Stayed in CTE field of study			
Characteristics	Completed CTE credential	Still enrolled	Departed	Changed to other field of study	Completed CTE credential	Still enrolled	Departed	Changed to other field of study
Level of program AY 2011–12								
Certificate	53.8	3.0	27.2	5.3	5.5	2.4	0.8	1.9
Associate	11.1	20.9	33.2	15.7	4.1	8.9	1.9	4.2
Age as of 12/31/2011								
15–23	19.6	16.3	29.8	14.2	5.4	8.5	1.9	4.2
24–29	27.9	14.5	36.7	10.9	2.1	4.5	1.1 !	2.2 !
30 or older	28.0	18.5	36.8	9.5	1.8 !	3.1	0.5 !	1.7 !
Dependent children								
Has dependent children	30.6	14.4	36.6	9.3	2.9	3.4	1.3	1.5
Does not have dependent children	19.3	17.0	30.2	14.2	4.9	8.4	1.7	4.2
GPA in high school								
Below C	18.7	15.7	35.7	15.7	3.3	4.2	2.3 !	4.4
C or above, but below B	20.9	16.6	31.6	14.5	3.8	7.1	1.6	4.0
B or above	21.3	15.6	29.2	12.7	6.2	9.4	1.9	3.8
Delayed enrollment into postsecondary education								
No delay	19.4	16.5	26.3	14.6	6.9	9.4	1.8	5.0
1–5 years delay	21.9	15.9	35.2	13.2	2.8	6.5	1.7	2.9
>5 years delay	27.4	17.7	37.0	9.4	1.9	4.0	0.7 !	1.9
Confidence in ability to succeed at first institution								
Strongly disagree	23.5	21.1	32.0	12.7	0.7 !	5.7 !	0.4 !	4.0 !
Somewhat disagree	18.7	18.5	32.2	10.3	‡	11.0	2.5 !	3.3 !
Neither Disagree nor agree	18.7	19.1	33.9	14.6	2.8	5.4	2.7 !	2.8 !
Somewhat agree	22.4	15.9	33.7	14.8	3.6	6.1	0.8	2.6
Strongly agree	22.5	15.7	30.3	12.2	5.4	7.8	1.8	4.2

See notes at end of table.

Table 4. DEPARTURE AND COMPLETION OUTCOMES, WITH TRANSFER: Percentage distribution of first-time subbaccalaureate career and technical education students' departure and completion outcomes, with transfer students, by various characteristics: academic year 2011–12 through 2014—Continued

	Departure and completion outcomes							
	Never transferred to another institution				Transferred to another institution			
	Stayed in CTE field of study[1]				Stayed in CTE field of study			
Characteristics	Completed CTE credential	Still enrolled	Departed	Changed to other field of study	Completed CTE credential	Still enrolled	Departed	Changed to other field of study
Took remedial course AY 2011–12								
Yes	9.9	25.6	33.2	15.4	3.0	7.7	2.0	3.2
No	26.4	13.0	31.1	12.2	5.0	7.1	1.5	3.8
Work Intensity AY 2011–12								
No job	24.0	14.7	32.2	13.5	4.1	6.6	1.8	3.2
Part-time	20.2	18.5	26.7	12.6	6.2	8.9	1.4	5.6
Full-time	16.7	19.9	36.5	12.0	3.4	7.4	1.4 !	2.7
Control of first institution								
Public	11.0	21.3	32.8	15.6	4.4	8.9	1.7	4.2
Private for-profit	48.0	4.7	29.1	7.0	4.5	3.2	1.5	2.1

! Interpret data with caution. Estimate is unstable because the standard error is between 30 and 50 percent of the estimate.
‡ Reporting standards not met.
[1] This is the sample used in this report to examine differences in departure and completion (research questions 3 and 4).
[2] Black includes African American, Hispanic includes Latino, and Other includes American Indian or Alaska Native, Native Hawaiian/other Pacific Islander, and more than one race. Students who indicated Hispanic and another race category are in the Hispanic category.
[3] Students are described as having low English proficiency if their first language as a child was not English and they spoke a language other than English all or most of the time with their primary caregiver at the start of high school.
NOTE: AY = academic year. Table represents only first-time beginning postsecondary students with CTE fields of study who were enrolled in subbaccalaureate (certificate- or associate-level) programs at public institutions or private for-profit institutions. For both the group who never transferred from their first institution and the group who transferred to (enrolled in) another institution, "completed credential" means completed a degree or certificate in a CTE field of study, "still enrolled" means still enrolled in a postsecondary institution in 2014, "departed" means not enrolled in any postsecondary institution in 2014, and "changed to other field of study" means that the field of study at the time of last enrollment was not CTE. Number of observations is 9,500 for the never transferred group and 1,710 for the transferred group. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Departure and Completion Outcomes in Subbaccalaureate CTE Programs: Differences in Departure from and Completion at the First Institution

This section focuses on students who had a CTE field of study when they began their postsecondary education, whose last reported field of study was also CTE, and who did not transfer out of their first institution. The analyses examine differences in the likelihood of departure from the first institution (without completion or transfer) and completion of any credential in a CTE field of study at the first institution. The results answer research questions 3 and 4:

3. Among students enrolled in subbaccalaureate CTE programs, how does the likelihood of departure from the first institution in which one enrolled, without completion and within three years of enrollment, vary according to students' sex, race/ethnicity, parents' educational attainment, Pell Grant receipt, disability status, and English proficiency?
4. Among students enrolled in subbaccalaureate CTE programs, how does the likelihood of completion at the first institution in which one enrolled, within three years of enrollment, vary according to sex, race/ethnicity, parents' educational attainment, Pell Grant receipt, disability status, and English proficiency?

Table 5 shows the percentage distribution of students who had various characteristics among the subsample. Among these students, over half (55 percent) were female, and 45 percent were male. The three largest racial/ethnic groups in the sample were white students (49 percent), Hispanic students (26 percent), and black students (17 percent). Nearly half (48 percent) of all students had parents whose highest educational attainment was high school or less, indicating the prevalence of first-generation college students within the sample. About two-thirds (67 percent) of the students received a Pell Grant during their first year of postsecondary enrollment, 14 percent reported a disability, and about one-tenth (11 percent) spoke primarily a language other than English with their primary caregiver at the beginning of high school. Using event history analysis, the findings presented in the following two sections describe how key student characteristics influence the likelihood of departure and completion at the first institution within three years after initial enrollment.

Table 5. POSTSECONDARY CTE STUDENTS, SAMPLE 2: Among students who remained in CTE fields of study and never transferred, percentage distribution of first-time subbaccalaureate career and technical education students who had various characteristics: academic year 2011–12 through 2014

Characteristics	Estimate
Total	**100.0**
Sex	
Male	44.6
Female	55.4
Race/ethnicity[1]	
White	49.1
Black	16.9
Hispanic	25.9
Asian	2.6
Other	5.5
Parents' highest educational attainment	
High school or less	48.0
Some college	15.5
Vocational/technical training or associate degree	13.2
Bachelor's degree or higher	17.4
Do not know either parent's educational attainment	5.9
Pell Grant AY 2011–12	
Received Pell Grant	67.4
Did not receive Pell Grant	32.6
Disability	
Has disability	13.6
Does not have disability	86.4
English proficiency[2]	
Low proficiency	11.3
High proficiency	88.7
Level of program	
Certificate	30.5
Associate	69.5
Age as of 12/31/2011	
15–23	67.9
24–29	14.2
30 or older	17.9
Dependent children	
Has dependent children	27.3
Does not have dependent children	72.7
GPA in high school	
Below C	7.3
C or above, but below B	36.0
B or above	38.8
No record	17.9
Delayed enrollment into postsecondary education	
No delay	40.0
1–5 years delay	34.4
>5 years delay	23.7
No record	1.9

See notes at end of table.

Table 5. POSTSECONDARY CTE STUDENTS, SAMPLE 2: Among students who remained in CTE fields of study and never transferred, percentage distribution of first-time subbaccalaureate career and technical education students who had various characteristics: academic year 2011–12 through 2014—Continued

Characteristics	Estimate
Confident in ability to succeed at first institution	
Strongly disagree	2.6
Somewhat disagree	4.8
Neither disagree nor agree	10.4
Somewhat agree	27.2
Strongly agree	55.0
Took remedial course AY 2011–2012	
Yes	26.4
No	73.6
Work intensity AY 2011–12	
No job	62.0
Part-time	20.3
Full-time	17.7
Control of first institution	
Public	65.5
Private for-profit	34.5

[1] Black includes African American, Hispanic includes Latino, and Other includes American Indian or Alaska Native, Native Hawaiian/other Pacific Islander, and more than one race. Students who indicated Hispanic and another race category are in the Hispanic category.
[2] Students are described as having low English proficiency if their first language as a child was not English and they spoke a language other than English all or most of the time with their primary caregiver at the start of high school.
NOTE: AY = academic year. Table represents only first-time beginning postsecondary students enrolled in subbaccalaureate (certificate- or associate-level) programs at public institutions or private for-profit institutions, whose first and last reported major was in a CTE field of study, and who attended only one institution (i.e., did not transfer). Number of observations is 8,220. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Departure from First Institution

Table 6 presents the results from the full Cox proportional hazards model for departure from the first institution. The model includes the key variables and additional covariates as statistical controls that have been shown in prior research to be related to postsecondary persistence or completion in general and among students pursuing subbaccalaureate credentials. The additional covariates are level of program (certificate or associate degree), student age, whether the student had dependent children, high school GPA,[31] years between high school completion and postsecondary enrollment,[32] student self-reported confidence in

[31] For 18 percent of students in the sample, there is no record of high school GPA (Table 5). Missing values in high school GPA are treated as a distinct category in the high school GPA variable, though the category is not displayed in Tables 6 and 7. For more information about this approach to handling missing data, see Appendix A.
[32] For 2 percent of students in the sample, there is no record of whether they delayed enrollment into postsecondary education after high school (Table 5). Missing values in delayed enrollment are treated as a distinct category in the delayed enrollment variable, though the category is not displayed in Tables 6 and 7. For more information about this approach to handling missing data, see Appendix A.

academic ability,[33] remedial coursetaking during AY 2011–12, work intensity, and control of institution (Braxton, Hirschy, and McClendon 2004; Complete College America 2011; Hirschy, Bremer, and Castellano 2011).

The ways in which each key variable (i.e., sex, race/ethnicity, parental education, disability status, Pell Grant receipt, and English proficiency) increases or decreases the likelihood of departure are discussed below.[34] Estimates larger than 1 indicate that a student characteristic increases the likelihood of departure, and estimates smaller than 1 indicate that the student characteristic reduces the likelihood.

Table 6. FACTORS ASSOCIATED WITH DEPARTURE: Cox proportional hazard estimates of effect of various characteristics on risk of departure for first-time subbaccalaureate career and technical education students: academic year 2011–12 through 2014

	Hazard Ratio	
Sex		
Male	†	
Female	0.88	
Race/ethnicity[1]		
White	†	
Black	1.50	***
Hispanic	0.80	*
Asian	0.75	
Other	0.99	
Parents' highest educational attainment		
High school or less	†	
Some college	0.79	*
Vocational/technical training or associate degree	0.77	*
Bachelor's degree or higher	0.76	**
Pell Grant AY 2011–12		
Received Pell Grant	0.62	***
Did not receive Pell Grant	†	
Disability		
Has disability	1.41	***
Does not have disability	†	
English proficiency[2]		
Low proficiency	0.84	
High proficiency	†	
Level of program AY 2011–2012		
Certificate	†	
Associate	1.08	

See notes at end of table.

[33] Confidence in academic ability is indicated by respondents' level of agreement with the following statement: "Before I attended my first institution, I was confident I had the ability to succeed there as a student."

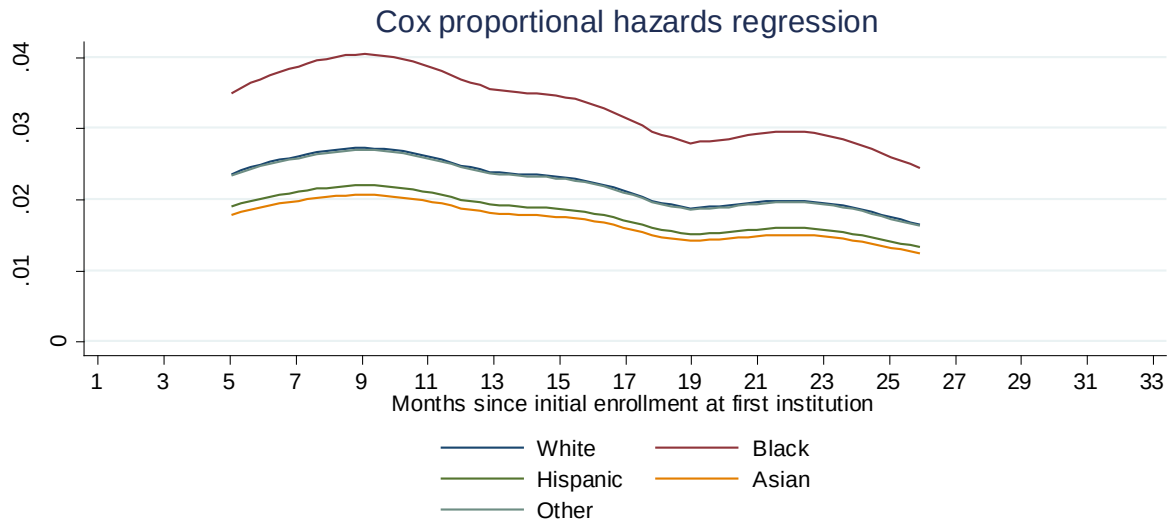
[34] The term "likelihood" in this context refers to "risk" or "hazard," defined as the probability that a student departs from the first institution ("drops out") in a given period, conditional on the student not having departed until that point in time.

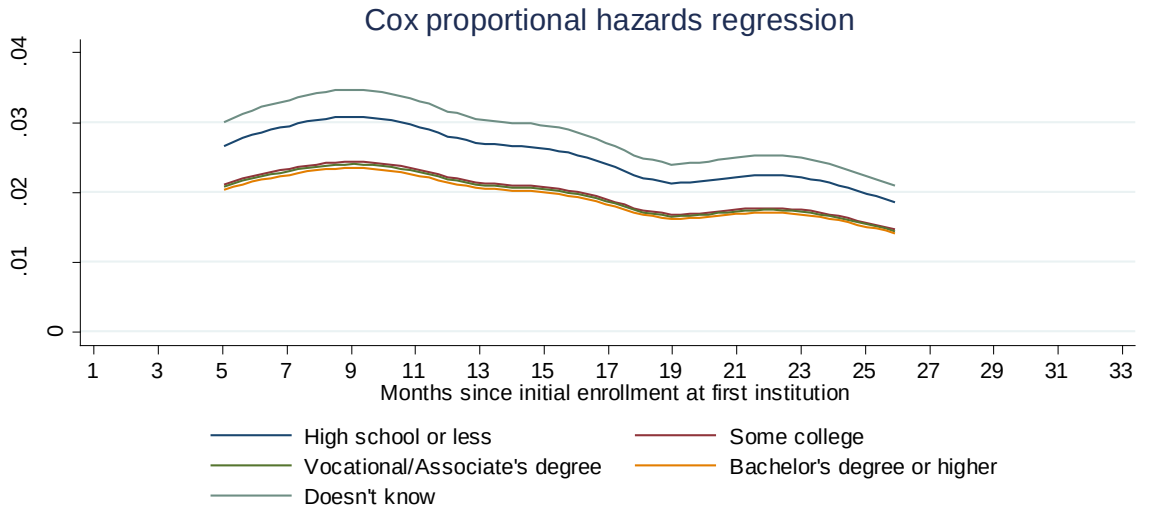
Table 6. FACTORS ASSOCIATED WITH DEPARTURE: Cox proportional hazard estimates of effect of various characteristics on risk of departure for first-time subbaccalaureate career and technical education students: academic year 2011–12 through 2014—Continued

	Hazard Ratio	
Age as of 12/31/2011		
15–23	†	
24–29	0.93	
30 or older	0.70	*
Dependent children		
Has dependent children	1.14	
Does not have dependent children	†	
GPA in high school		
Below C	†	
C or above, but below B	0.92	
B or above	0.86	
Delayed enrollment into postsecondary education		
No delay	†	
1–5 years delay	1.35	***
>5 years delay	1.19	
Confident in ability to succeed at first institution		
Strongly disagree	†	
Somewhat disagree	0.99	
Neither disagree nor agree	1.20	
Somewhat agree	1.19	
Strongly agree	1.09	
Took remedial course AY 2011–2012		
Yes	0.85	*
No	†	
Work intensity AY 2011–2012		
No job	†	
Part-time	0.68	***
Full-time	0.88	
Control of first institution		
Public	†	
Private for-profit	0.88	

† Not applicable because of the comparison group.
* = $p < .05$; ** = $p < .01$; *** = $p < .001$.
[1] Black includes African American, Hispanic includes Latino, and Other includes American Indian or Alaska Native, Native Hawaiian/other Pacific Islander, and more than one race. Students who indicated Hispanic and another race category are in the Hispanic category.
[2] Students are described as having low English proficiency if their first language as a child was not English and they spoke a language other than English all or most of the time with their primary caregiver at the start of high school.
NOTE: AY = academic year. Table represents only first-time beginning postsecondary students enrolled in subbaccalaureate (certificate- or associate-level) programs at public institutions or private for-profit institutions, whose first and last reported major was in a CTE field of study, and who attended only one institution (i.e., did not transfer). The italicized category for each variable is the reference group. Number of observations in analytic sample is 8,220, but 40 observations exited the same month they entered and are not included in the model. Model fit results: $F(29,260) = 6.33$, $p < .001$
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

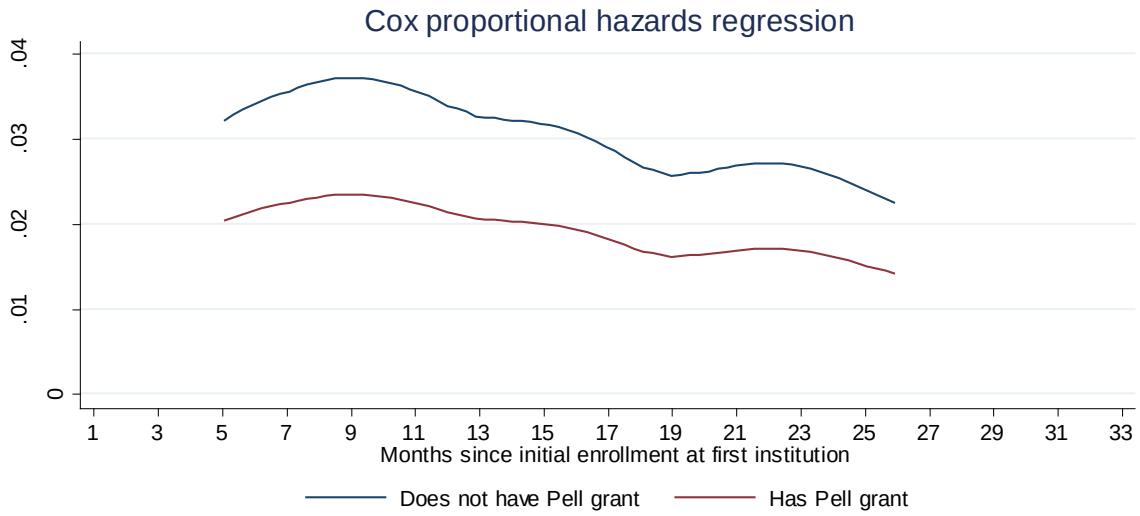
Figure 1. Cox proportional hazards regression for departure from first institution, by race/ethnicity, parents' highest educational attainment, Pell Grant receipt, and disability status

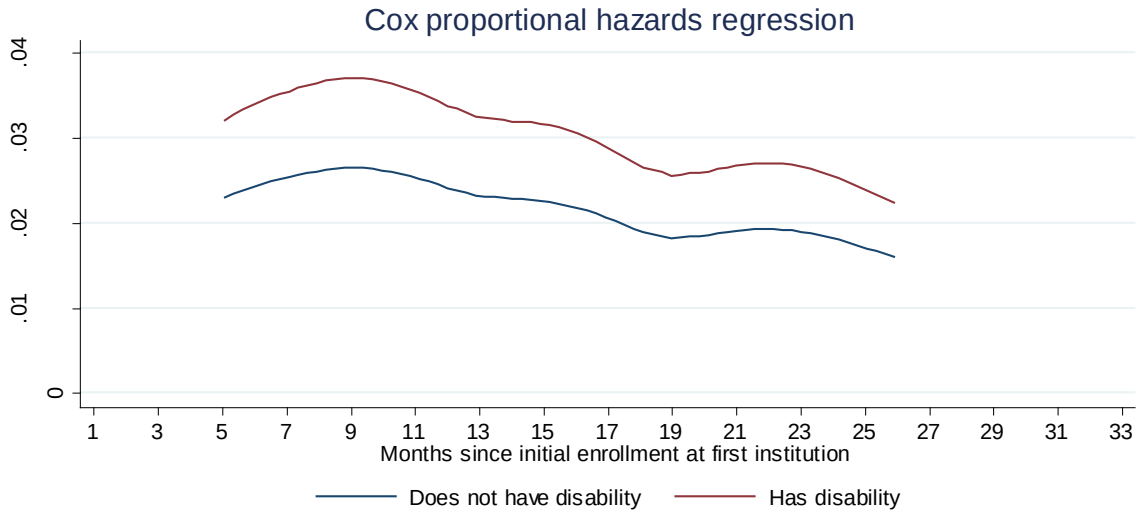




See notes at end of figure.

Figure 1. Cox proportional hazards regression for departure from first institution, by race/ethnicity, parents' highest educational attainment, Pell Grant receipt, and disability status—Continued





NOTE: Figure represents only first-time beginning postsecondary students enrolled in subbaccalaureate (certificate- or associate-level) programs at public institutions or private for-profit institutions, whose first and last reported major was in a CTE field of study, and who attended only one institution (i.e., did not transfer). Number of observations in analytic sample is 8,220, but 40 observations exited the same month they entered and are not included in the model.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Among the six key variables, student race/ethnicity, parental educational attainment, Pell Grant receipt, and disability status are all significantly associated with the likelihood of departing from the first institution. Compared to white students, black students had a departure likelihood that was 50 percent higher (hazard ratio is 1.50), while Hispanic students' likelihood of departure was 20 percent lower than that of their white peers (hazard ratio is .80). These differences are plotted in Figure 1.

Higher levels of parental education were associated with a reduced likelihood of departure. First-generation postsecondary students experienced the highest likelihood of departure. For instance, compared to students whose parents' educational attainment was high school or below, the estimated likelihood of departure for those whose parents' attainment was some college was 21 percent less (hazard ratio is .79). For those whose parents had vocational/technical training or an associate degree, the likelihood was 23 percent less (hazard ratio is .77), and for those whose parents had a bachelor's degree or higher, the likelihood was 24 percent less (Figure 1).

Pell Grant recipients had a reduced likelihood of departure, suggesting that the Pell Grant may provide a protective effect for persisting in postsecondary programs. Compared to students without a Pell Grant, students who received a Pell Grant had a 38 percent lower likelihood of departing from the first institution. The opposite is true for students with a disability: The likelihood of departure for students with a disability was 41 percent higher than that for students without a disability (Figure 1).

Given all other student characteristics included in the model, the coefficients for student sex and English language proficiency were not statistically significant.

Completion at First Institution

This part of the analysis shifts to examine *completion* as the key event of interest.

Table 7 presents the results from the full Cox proportional hazards model for likelihood of completion among first-time beginning postsecondary CTE students. The model includes all key variables and additional covariates as statistical controls.[35] Below, we discuss how each key variable (i.e., sex, race/ethnicity, parental education, disability status, Pell Grant receipt, and English proficiency) predicts students' likelihood of completion at the first institution within three years of enrolling.

[35] The term "likelihood," in this context, refers to "risk" or "hazard" of completion, which are defined as the probability that the event (completion) will occur at a given time, given that it has not yet occurred.

Table 7. FACTORS ASSOCIATED WITH COMPLETION: Cox proportional hazard estimates of effect of various characteristics on risk of completion for first-time subbaccalaureate career and technical education students: academic year 2011–12 through 2014

	Hazard Ratio	
Sex		
Male	†	
Female	0.87	*
Race/ethnicity[1]		
White	†	
Black	0.52	***
Hispanic	0.98	
Asian	0.47	**
Other	1.08	
Parents' highest educational attainment		
High school or less	†	
Some college	1.05	
Vocational/technical training or associate degree	1.11	
Bachelor's degree or higher	0.84	
Pell Grant AY 2011–12		
Received Pell Grant	0.84	
Did not receive Pell Grant	†	
Disability		
Has disability	0.75	**
Does not have disability	†	
English proficiency[2]		
Low proficiency	1.09	
High proficiency	†	
Level of program AY 2011–2012		
Certificate	†	
Associate	0.18	***
Age as of 12/31/2011		
15–23	†	
24–29	0.99	
30 or older	1.34	
Dependent children		
Has dependent children	1.03	
Does not have dependent children	†	
GPA in high school		
Below C	†	
C or above, but below B	0.99	
B or above	1.19	
Delayed enrollment into postsecondary education		
No delay	†	
1–5 years delay	0.97	
>5 years delay	0.84	

See notes at end of table.

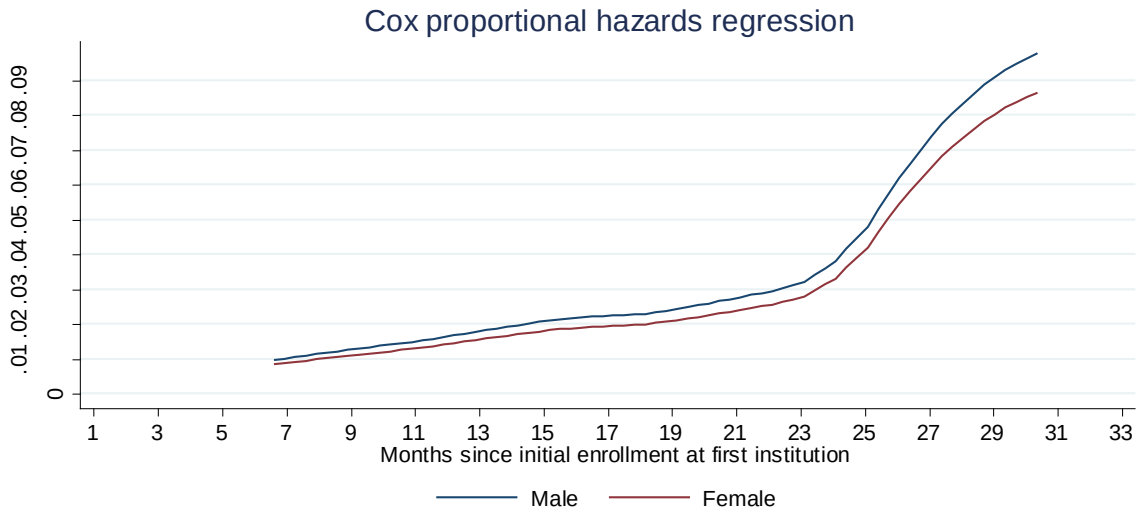
Table 7. FACTORS ASSOCIATED WITH COMPLETION: Cox proportional hazard estimates of effect of various characteristics on risk of completion for first-time subbaccalaureate career and technical education students: academic year 2011–12 through 2014—Continued

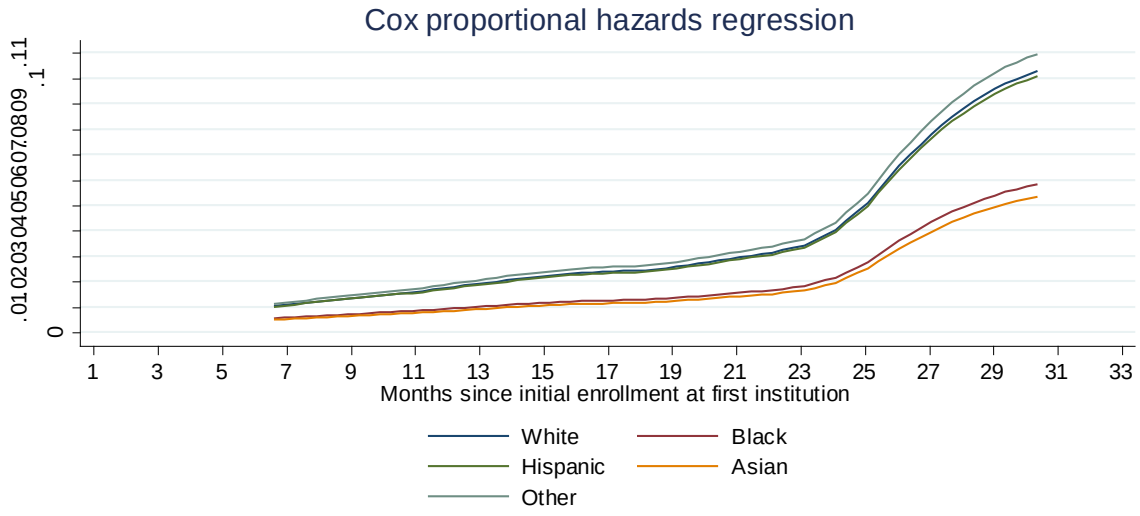
	Hazard Ratio	
Confident in ability to succeed at first institution		
Strongly disagree	†	
Somewhat disagree	1.09	
Neither disagree nor agree	0.77	
Somewhat agree	0.99	
Strongly agree	0.80	
Took remedial course AY 2011–2012		
Yes	0.59	***
No	†	
Work intensity AY 2011–2012		
No job	†	
Part-time	0.93	
Full-time	0.71	***
Control of first institution		
Public	†	
Private for-profit	3.32	***

† Not applicable because of the comparison group.
* = $p < .05$; ** = $p < .01$; *** = $p < .001$.
[1] Black includes African American, Hispanic includes Latino, and Other includes American Indian or Alaska Native, Native Hawaiian/other Pacific Islander, and more than one race. Students who indicated Hispanic and another race category are in the Hispanic category.
[2] Students are described as having low English proficiency if their first language as a child was not English and they spoke a language other than English all or most of the time with their primary caregiver at the start of high school.
NOTE: AY = academic year. Table represents only first-time beginning postsecondary students enrolled in subbaccalaureate (certificate- or associate-level) programs at public or private for-profit institutions, whose first and last reported major was in a CTE field of study, and who attended only one institution (i.e., did not transfer). The italicized category for each variable is the reference group. Number of total observations in analytic sample is 8,220, but 40 observations exited the same month they entered and are not included in the model. Model fit results: $F(29, 260) = 53.41$, $p < .001$.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Student sex, race/ethnicity, and disability status are all significantly associated with the likelihood of completing a CTE degree at the first institution after controlling for other characteristics. Figure 2 presents the hazard rate of completion by the values of each statistically significant variable of interest. Female students have a 13 percent lower likelihood of completing than male students. There is not a statistically significant difference in the likelihood of completing between white and Hispanic students; however, relative to white students, black students have a 48 percent lower likelihood of completing, and Asian students have a 53 percent lower likelihood.

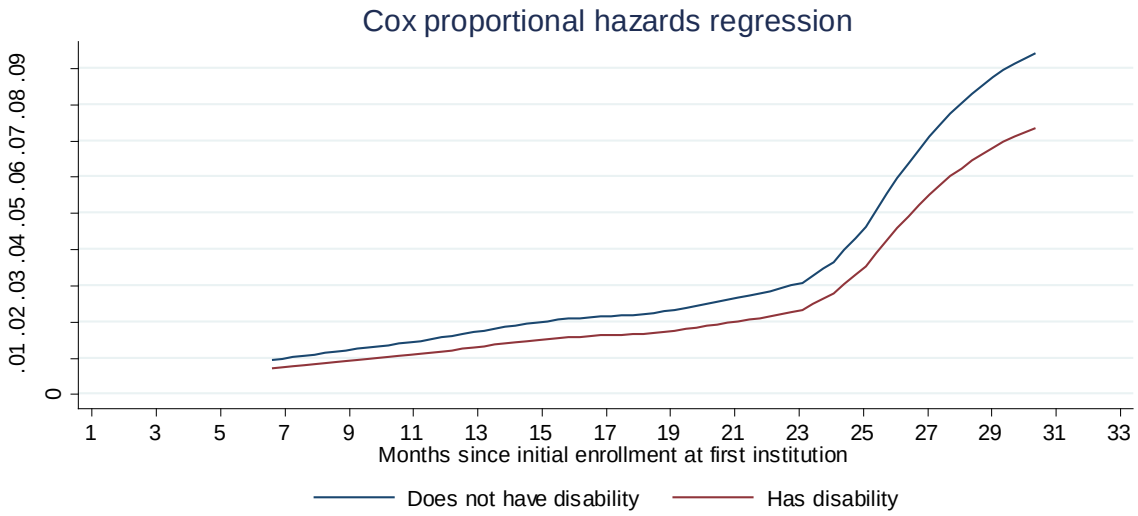
Figure 2. Cox proportional hazards regression for completion at first institution, by sex, race/ethnicity, and disability status





See notes at end of figure.

Figure 2. Cox proportional hazards regression for completion at first institution, by sex, race/ethnicity, and disability status—Continued



NOTE: Figure represents only first-time beginning postsecondary students enrolled in subbaccalaureate (certificate- or associate-level) programs at public or private for-profit institutions, whose first and last reported major was in a CTE field of study, and who attended only one institution (i.e., did not transfer). Number of observations in analytic sample is 8,220, but 40 observations exited the same month they entered and are not included in the model.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Controlling for all other characteristics, students with a disability have a 25 percent lower likelihood than those who do not have a disability.

Some of the findings presented above differ from previous studies on postsecondary persistence and completion. In particular, the finding that female and Asian CTE students have a lower likelihood of completion is counter to national data that show that a greater proportion of females than males complete college and that a greater proportion of Asian than white students complete college (Ginder, Kelly-Reid, and Mann 2014; Ross et al. 2012). The findings presented here may be explained, in part, by the sample (subbaccalaureate CTE students are different from other undergraduates) and by the study design. Students who have not yet completed (i.e., who have a lower likelihood of completion over the three-year period) include both students who have not completed because they have struggled to earn sufficient credits to graduate (e.g., those who may have family and paid work responsibilities) and students who have not completed *yet* because they are on a slightly slower road to a two-year degree or are working toward a four-year degree. Distinguishing between these groups of noncompleters is beyond the scope of this study, but it should be kept under consideration that having a lower likelihood for completion should not necessarily be interpreted as a disadvantage.

CONCLUSION AND IMPLICATIONS

Conclusion

This study examined demographic differences in the postsecondary enrollment, departure, and completion of students in subbaccalaureate career and technical education (CTE) programs who began their postsecondary education in academic year (AY) 2011–12.[36] The results show that there are differences in these postsecondary outcomes according to sex, race/ethnicity, parents' educational attainment, Pell Grant receipt, disability status, and English proficiency.

The first research question addressed the topic of enrollment at for-profit institutions:

1. Among students enrolling in subbaccalaureate CTE programs, how does the likelihood of enrolling in a for-profit institution, relative to a public institution, vary according to sex, race/ethnicity, parents' educational attainment, Pell Grant receipt, disability status, and English proficiency?

The results showed differences between demographic groups in the likelihood of enrollment at a for-profit institution. Student groups who were more likely to be enrolled at a for-profit institution, even after accounting for other demographic characteristics and field of study, were females, Hispanic students, and students with a Pell Grant (low- to moderate-income students). Student groups with a lower likelihood of enrollment at a for-profit institution were Asian students (relative to white students); students whose parents' highest educational attainment was some college, vocational/technical training or an associate degree, or a bachelor's degree or higher (relative to an education level of high school or less); and students with low English proficiency. Disability status was not associated with the probability of enrollment at a for-profit institution after controlling for age, dependent children, and field of study.

[36] See the Key Definitions subsection of the Data and Methods section of the report for the definition of "career and technical education" that is used in this study.

Next, we explored student outcomes in subbaccalaureate CTE programs and addressed the following questions:

2. Among students enrolling in subbaccalaureate CTE programs, what are the various departure and completion outcomes within three years of enrolling, and what are the characteristics of the students who had each outcome?
3. Among students enrolled in subbaccalaureate CTE programs, how does the likelihood of departure from the first institution in which one enrolled, without completion and within three years of enrollment, vary according to students' sex, race/ethnicity, parents' educational attainment, Pell Grant receipt, disability status, and English proficiency?
4. Among students enrolled in subbaccalaureate CTE programs, how does the likelihood of completion at the first institution in which one enrolled, within three years of enrollment, vary according to sex, race/ethnicity, parents' educational attainment, Pell Grant receipt, disability status, and English proficiency?

Postsecondary CTE students can take a variety of roads through postsecondary education, including departure from or completion at the first institution or at another institution. After showing that the majority of subbaccalaureate CTE students do not transfer to another institution, no matter their demographic characteristics, we examined the likelihood of departure from or completion at the first institution. The results indicate that CTE students' characteristics are associated with the likelihood of departing from and completing a degree or certificate at the first postsecondary institution in which they enrolled. These findings suggest that there continue to be inequalities among who does and does not successfully navigate program completion among the subbaccalaureate CTE population. In terms of departure, black students (relative to white students) and students with a disability (relative to those without a disability) faced an increased likelihood of departure. Hispanic students (relative to white students), students whose parents had some postsecondary education (relative to those whose parents did not), and Pell Grant recipients (relative to nonrecipients) had a lower likelihood of departure. In terms of program completion, the results from the Cox proportional hazards model indicated that the following student characteristics were associated with a lower likelihood of completion: sex (female students relative to male students), race/ethnicity (black and Asian students relative to white students), and students with a disability.

In summary, among subbaccalaureate CTE students, those who were more likely to be enrolled at a for-profit institution were female, Hispanic, had a Pell Grant (were low- to moderate-income), or were first-generation college students. Students who were more likely

to depart within three years without enrolling at another institution were black, had a disability, were first-generation college students, or did not have a Pell Grant. Students who were less likely to complete a CTE credential within three years were female, black, Asian, or had a disability.

Implications for Policy and Practice

Regarding institutional control, the findings indicate that female, Hispanic, Pell Grant–recipient (low- to moderate-income), and first-generation college students were more likely to enroll at a private for-profit institution, instead of a public institution, than their peers who were male, white, had a higher income, and had parents with a postsecondary education. Although they were not among the primary characteristics of interest, the findings also indicate that students over the age of 23 and students with dependent children had a higher likelihood of enrolling at a for-profit institution. This phenomenon may be due to greater family and child care responsibilities. In addition to the positive association of greater age and having dependent children with enrollment at a for-profit institution, controlling for these characteristics reduced the effect size for females. However, these responsibilities do not fully explain why females were more likely than males to enroll at for-profit institutions.

The largest effect size, according to the logistic regression models, was for Pell Grant recipients, who were 21 percent more likely to enroll at a for-profit institution than students who were not awarded Pell Grants, even after controlling for demographic characteristics, such as race and age, and for field of study. This finding reinforces other research that has found that for-profit institutions educate a larger proportion of low-income and minority students than public institutions (Deming, Goldin, and Katz 2012; IHEP 2011). Taken together, these results suggest that public institutions offering subbaccalaureate CTE credentials could do more to recruit female, Hispanic, Pell Grant–recipient, and first-generation college students or to structure their programs to be more appealing to these students. For example, community colleges could change the structure of their certificate and associate degree programs so that students can move through them more quickly, thereby narrowing the subbaccalaureate completion rate gap between for-profit institutions and community colleges (Lynch, Engle, and Cruz 2010; Mullin 2010).

This study also showed that CTE students who were black, had a disability, were first-generation college students, or did not have a Pell Grant (were not low- or moderate-income) were more likely to depart from their subbaccalaureate program. Students who were female, black, Asian, or had a disability were less likely to complete a CTE credential. These findings imply that institutions offering CTE fields of study could do more to help their female, black, disabled, Pell Grant–recipient, and first-generation CTE students with timely

completion of their certificate- or associate-level program. Completion is critical, because a degree or certificate increases earnings and lowers the likelihood of defaulting on one's student loans (College Board 2016; Wheary and Orozco 2010).

Inequities in departure and completion are not unique to CTE students, of course, and the extant literature provides numerous suggestions for addressing these issues. Braxton, Hirschy, and McClendon (2004) recommend that commuter institutions provide students with workspaces that are open on evenings and weekends, offer courses at a variety of times to help students work around their employment and familial obligations, provide on-campus employment opportunities, provide on-campus child care services, and integrate family members into the campus community, for example, by inviting them to student orientation. Institutions around the country are implementing innovative solutions to prevent students from departing from postsecondary programs prior to completing a degree or certificate. Recent trends include reforms to remedial/developmental education, which can hinder student progress (Complete College America 2011; Mangan 2015), and integrated planning and advising services, which involve the use of data analytics to improve student advising (Yanosky 2014). Reforms such as these should lead to improvements in the departure and completion rates of female, black, Pell Grant–recipient , and first-generation students in CTE.

REFERENCES

Allison, Paul D. 2000. "Multiple Imputation for Missing Data: A Cautionary Tale." *Sociological Methods and Research* 28: 301–309.

Allison, Paul D. 2002. "Missing Data: Quantitative Applications in the Social Sciences." *British Journal of Mathematical and Statistical Psychology* 55 (1): 193–196.

Arbeit, Caren A., Katherine Leu, and Benjamin Dalton. Forthcoming. *Educational Equity in Secondary Career and Technical Education: Evidence from Two National Studies*. Washington, DC: Office of Career, Technical, and Adult Education, U.S. Department of Education.

Arbeit, Caren A., and Laura Horn. 2017. *A Profile of the Enrollment Patterns and Demographic Characteristics of Undergraduates at For-Profit Institutions* (NCES 2017-416). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Accessed April 7, 2017. https://nces.ed.gov/pubs2017/2017416.pdf.

Bailey, Thomas, Mariana Alfonso, Marc Scott, and D. Timothy Leinbach. 2004. *Educational Outcomes of Occupational Postsecondary Students* (CCRC Brief No. 22). New York: Columbia University, Teachers College, Community College Research Center. Accessed April 7, 2017. http://ccrc.tc.columbia.edu/publications/educational-outcomes-occupational-postsecondary-students.html.

Braxton, John M., Amy S. Hirschy, and Shederick A. McClendon. 2004. *Understanding and Reducing College Student Departure, AHSE-ERIC Higher Education Report*. San Francisco: Jossey-Bass.

Cellini, Stephanie Riegg, and Latika Chaudhary. 2014. "The Labor Market Returns to a For-Profit College Education." *Economics of Education Review* 43: 125–40.

Chung, Anna S. 2012. "Choice of For-Profit College." *Economics of Education Review* 31 (6): 1084–1101.

Clery, Sue. 2008. *Issue Brief: Postsecondary Career/Technical Education: Changes in the Number of Offering Institutions and Awarded Credentials from 1997 to 2006* (NCES 2008–001). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Accessed August 29, 2016. http://nces.ed.gov/pubs2008/2008001.pdf.

Cohen, Jacob, and Patricia Cohen. 1975. *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. New York: Lawrence Erlbaum Associates.

College Board. 2016. *Trends in Student Aid.* New York: College Board. Accessed February 20, 2017. https://trends.collegeboard.org/student-aid.

Complete College America. 2011. *Time is the Enemy: The Surprising Truth about Why Today's College Students Aren't Graduating and What Needs to Change*. Washington, DC: Complete College America.

Cottom, Tressie McMillan. 2017. *Lower Ed: The Troubling Rise of For-Profit Colleges in the New Economy*. New York: The New Press.

Dalton, Ben. 2015. *Eight-Year Postsecondary Outcomes of Career and Technical Education Students from the High School Class of 2004*. Washington, DC: Office of Career, Technical, and Adult Education, U.S. Department of Education.

Dalton, Ben, Erich Lauff, Robin Henke, Martha Alt, and Xiaojie Li. 2013. *From Track to Field: Trends in Career and Technical Education Across Three Decades*. Report prepared for the National Assessment of Career and Technical Education. Submitted to the U.S. Department of Education, Policy and Program Studies Service. Research Triangle Park, NC: RTI International. Accessed August 29, 2016. http://www.rti.org/pubs/cte-trends_final.pdf.

Deming, David J., Claudia Goldin, and Lawrence F. Katz. 2012. "The For-Profit Postsecondary School Sector: Nimble Critters or Agile Predators?" *The Journal of Economic Perspectives* 26 (1): 139–63.

Denice, Patrick. 2015. "Does it Pay to Attend a For-Profit College? Vertical and Horizontal Stratification in Higher Education." *Social Science Research* 52: 161–78.

Ginder, Scott A., Janice E. Kelly-Reid, and Farrah B. Mann. 2014. *Graduation Rates for Selected Cohorts, 2005–10; and Student Financial Aid in Postsecondary Institutions, Academic Year 2012–13. First Look (Provisional Data)* (NCES 2014-105). Washington, DC: National Center for Education Statistics, U.S. Department of Education.

Hill, Jason, Nichole Smith, David Wilson, and Jennifer Wine. 2016. *2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14): Data File Documentation* (NCES 2016-062). Washington, DC: National Center for Education Statistics, U.S. Department of Education. Accessed August 29, 2016. http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2016062.

Hirschy, Amy S., Christine D. Bremer, and Marisa Castellano. 2011. "Career and Technical Education (CTE) Student Success in Community Colleges: A Conceptual Model." *Community College Review* 39 (3): 296–318.

Horn, Laura, and Xiaojie Li. 2009. *Stats in Brief: Changes in Postsecondary Awards Below the Bachelor's Degree: 1997 to 2007* (NCES 2010-167). Washington, DC: National Center for Education Statistics, U.S. Department of Education. Accessed August 29, 2016. http://nces.ed.gov/pubs2010/2010167.pdf.

Hudson, Lisa, and Linda Shafer. 2004. *Issue Brief: Undergraduate Enrollments in Academic, Career, and Vocational Education* (NCES 2004–018). Washington, DC: National Center for Education Statistics, U.S. Department of Education. Accessed August 29, 2016. http://nces.ed.gov/pubs2004/2004018.pdf.

Hudson, Lisa, Gregory Kienzl, and Juliet Diehl. 2007. *Students Entering and Leaving Postsecondary Occupational Education: 1995–2001* (NCES 2007–041). Washington, DC: National Center for Education Statistics, U.S. Department of Education.

IHEP (Institute for Higher Education Policy). 2011. *Portraits: Initial College Attendance of Low-Income Young Adults*. Washington, DC: IHEP. Accessed October 7, 2016. http://www.ihep.org/sites/default/files/uploads/docs/pubs/portraits-low-income_young_adults_attendance_brief_final_june_2011.pdf.

Jones, Michael P. 1996. "Indicator and Stratification Methods for Missing Explanatory Variables in Multiple Linear Regression." *Journal of the American Statistical Association* 91 (433): 222–230.

King, Gary, James Honaker, Anne Joseph, Kenneth Scheve, Mike Alvarez, John Barnard, Neal Beck et al. 1998. "List-Wise Deletion Is Evil: What to Do About Missing Data in Political Science." Presented at the Annual Meeting of the American Political Science Association, Boston, MA, July 1998.

Liao, Tim F. 1994. *Interpreting Probability Models: Logit, Probit and Other Generalized Linear Models*. Thousand Oaks, CA: Sage.

Long, J. Scott. 1997. *Regression Models for Categorical and Limited Dependent Variables*. Thousand Oaks, CA: Sage.

Lynch, Mamie, Jennifer Engle, and Jose L. Cruz. 2010. *Subprime Opportunity: The Unfulfilled Promise of For-Profit Colleges and Universities.* Washington, DC: The Education Trust.

Mangan, Katherine. 2015. "One State's Big Shift Away From Remedial Courses Leaves Questions for Colleges Everywhere." *The Chronicle of Higher Education,* November 01.

Marsden, Peter V., and James D. Wright. 2010. *Handbook of Survey Research*. Bingley, England: Emerald Group.

Mood, Carina. 2010. "Logistic Regression: Why We Cannot Do What We Think We Can Do, and What We Can Do About It." *European Sociological Review* 26 (1): 67–82.

Mullin, Christopher M. 2010. *Just How Similar? Community Colleges and the For-Profit Sector.* Washington, DC: American Association of Community Colleges.

Pampel, Fred C. 2000. *Logistic Regression: A Primer*. Thousand Oaks, CA: Sage Publications.

Roberts, Ashley. 2016. *Data Point: Persistence and Attainment Among Postsecondary Subbaccalaureate Students* (NCES 2016-083). Washington, DC: National Center for Education Statistics, U.S. Department of Education. Accessed August 29, 2016. http://nces.ed.gov/pubs2016/2016083.pdf.

Ross, Terris, Grace Kena, Amy Rathbun, Angelina KewalRamani, Jijun Zhang, Paul Kristapovich, and Eileen Manning. 2012. *Higher Education: Gaps in Access and Persistence Study* (NCES 2012-046). Washington, DC: National Center for Education Statistics, U.S. Department of Education.

Singer, Judith D., and John B. Willett. 1991. "Modeling the Days of Our Lives: Using Survival Analysis When Designing and Analyzing Longitudinal Studies of Duration and the Timing of Events." *Psychological Bulletin* 110 (2): 268.

Singer, Judith D., and John B. Willett. 2003. *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence*. New York: Oxford University Press.

U.S. Department of Education, Office of Planning, Evaluation and Policy Development, Policy and Program Studies Service. 2014. *National Assessment of Career and Technical Education: Final Report to Congress*. Washington, DC: U.S. Department of Education.

U.S. Department of Education, National Center for Education Statistics. n.d. *Career/Technical Education (CTE) Statistics*. Exhibit 1. Postsecondary taxonomy categories and Classification of Instruction Programs (CIP) 2000 codes, for academic education and career education: 2007. Accessed October 6, 2016. http://nces.ed.gov/surveys/ctes/tables/postsec_tax.asp.

Wheary, Jennifer, and Viany Orozco. 2010. *Graduated Success: Sustainable Economic Opportunity Through One- and Two-Year Credentials*. New York: Dēmos.

Williams, Richard. 2012. "Using the Margins Command to Estimate and Interpret Adjusted Predictions and Marginal Effects." *The Stata Journal* 12 (2): 308–31.

Yanosky, Ronald. March 2014. *Integrated Planning and Advising Services: A Benchmarking Study*. Louisville, KY: EDUCAUSE.

APPENDIX A. TECHNICAL APPENDIX

Overview

This technical appendix provides additional details about the analytic samples, measures/variables, and statistical procedures used in this report. The appendix also includes a glossary of statistical terms that are used in the report.

Analytic Samples

The 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14) is a nationally representative sample of students who began postsecondary education for the first time in academic year (AY) 2011–12. This study constructs two analytic samples from this data set: one that will be used to answer research questions 1 and 2, and another for research questions 3 and 4. The first analytic sample is used to answer research question 1, which addresses differences in the likelihood of enrolling at a for-profit institution, and research question 2, which addresses CTE students' various departure and completion outcomes. The first sample is a subset of the larger BPS:12/14 data set and was restricted to students whose AY 2011–12 program was at the subbaccalaureate level, that is, a certificate or associate degree program. The sample was also restricted to students who had chosen a major field of study, although they need not have formally declared this major at their institution. The chosen field of study must have been CTE.[37] Finally, the sample was restricted to students enrolled at either a private for-profit institution or public institution; students enrolled at private nonprofit institutions are excluded from the sample because of their small sample size.[38] With these restrictions, the size of the sample was 11,210.[39]

The issue of small subsample sizes complicated the examination of differences in outcome according to institutional control. In the early stages of this study, we included students enrolled at private nonprofit institutions. However, we encountered a sample size issue with

[37] See the Key Definitions subsection of this report for the definition of "career and technical education field of study."
[38] Students who were enrolled at private nonprofit institutions are excluded from this report because of their small sample size. For more detail, see Appendix A.
[39] Because of U.S. Department of Education data security practices, unweighted sample sizes are rounded to the nearest tenth.

this subpopulation, because only a small minority of subbaccalaureate CTE students attended private nonprofit institutions. In that sample of 11,600 respondents, just 390 were enrolled in private nonprofit institutions in 2011–12. When these 390 respondents were broken down according to demographic characteristics such as race, the subsample sizes shrank to statistically powerless levels. For example, among subbaccalaureate CTE students in 2011–12, just three Asian students were enrolled at private nonprofit institutions. By contrast, 100 Asian students were enrolled at for-profit institutions, and 190 were enrolled at public institutions. For these reasons, students enrolled at private nonprofit institutions are not included in the study.

To answer research questions 3 and 4, which address differences in the likelihood of departure and completion at the first institution at which CTE students enrolled, we use the same subset of BPS:12/14 from research questions 1 and 2, but impose two additional restrictions. In these analyses, the sample is further restricted to consist not only of students in subbaccalaureate programs whose field of study was CTE when they began postsecondary education, but also those whose last field of study through June 2014 was CTE. This restriction eliminates from the sample 1,660 students who transitioned out of a CTE field of study after their first year in postsecondary education, thereby maintaining the focus of the analysis on students who remain in CTE fields of study.[40] In addition, the sample is restricted to those students who never transferred from their first institution, removing an additional 1,340 students. The resulting sample size for the departure and completion analyses is 8,220 students. For a visual description of the characteristics of the analytic samples and how they relate to the research questions, see Table A-1.

[40] Although students who transition out of CTE fields of study by switching to another major could be considered to have departed from or "dropped out" of CTE, this group of students could not be included in the analytic sample because the timing of their transition out of CTE was unknown. The smaller analytic sample focuses the results on those students who intended to stay in CTE and completed, were still enrolled, or departed entirely.

Table A-1. Characteristics of the analytic samples

Research Question	(1) Likelihood of enrollment in private for-profit institution, relative to public institution	(2) Various departure and completion outcomes within first three years after enrolling	(3) Differences in likelihood of departure from first institution within first three years after enrolling	(4) Differences in likelihood of completion at first institution within first three years after enrolling
Sample Restrictions	Students who: • Enrolled in certificate or associate degree program • Had chosen major in a CTE field of study during AY 2011–12 • Enrolled in private for-profit or public institution		Students who: • Enrolled in certificate or associate degree program • Had chosen major in a CTE field of study during AY 2011–12 • Enrolled in private for-profit or public institution • Had chosen major in CTE field of study when last enrolled • Never transferred	
Sample Size	11,210		8,220	

The distribution of departure and completion outcomes among the analytic samples is presented in Table A-2. These estimates are not presented in the Results section because it would be somewhat redundant considering the overlap with Table 4. However, Table 4 does not display the distribution of outcomes among the particular analytic sample used for the event history analyses, which does not include students who transferred to another institution or students who switched to a non-CTE field of study.

Table A-2. DEPARTURE AND COMPLETION: Among students who remained in CTE fields of study and never transferred, percentage distribution of first-time subbaccalaureate career and technical education students' departure and completion outcomes, by various characteristics: academic year 2011–12 through 2014

	Departure and completion outcomes		
Characteristics	Completed CTE credential	Still enrolled	Departed
Total	31.3	23.4	45.3
Sex			
Male	27.9	23.2	49.0
Female	34.1	23.6	42.3
Race/ethnicity[1]			
White	31.2	22.8	45.9
Black	23.8	17.7	58.5
Hispanic	37.4	26.2	36.4
Asian	16.6	43.0	40.4
Other	34.3	23.1	42.6
Parents' highest educational attainment			
High school or less	33.4	20.3	46.2
Some college	30.4	25.2	44.4
Vocational/technical training or associate degree	32.8	24.1	43.1
Bachelor's degree or higher	25.6	31.1	43.3
Pell Grant AY 2011–12			
Received Pell Grant	35.9	20.5	43.6
Did not receive Pell Grant	21.9	29.4	48.7
Disability			
Has disability	22.2	18.9	58.9
Does not have disability	32.8	24.1	43.1
English proficiency[2]			
Low proficiency	31.1	22.5	46.4
High proficiency	33.2	30.6	36.1
Level of program AY 2011–2012			
Certificate	64.1	3.6	32.4
Associate	17.0	32.1	50.9
Age as of 12/31/2011			
15–23	29.9	24.8	45.3
24–29	35.2	18.4	46.4
30 or older	33.6	22.2	44.2
Dependent children			
Has dependent children	37.5	17.7	44.9
Does not have dependent children	29.0	25.5	45.4
GPA in high school			
Below C	26.7	22.4	50.9
C or above, but below B	30.2	24.0	45.8
B or above	32.2	23.6	44.2

See notes at end of table.

Table A-2. DEPARTURE AND COMPLETION: Among students who remained in CTE fields of study and never transferred, percentage distribution of first-time subbaccalaureate career and technical education students' departure and completion outcomes, by various characteristics: academic year 2011–12 through 2014—Continued

Characteristics	Departure and completion outcomes		
	Completed CTE credential	Still enrolled	Departed
Delayed enrollment into postsecondary education			
No delay	31.2	26.5	42.2
1–5 years delay	30.1	21.7	48.2
>5 years delay	33.4	21.5	45.1
Confident in ability to succeed at first institution			
Strongly disagree	30.7	27.5	41.8
Somewhat disagree	26.9	26.7	46.4
Neither disagree nor agree	26.1	26.6	47.3
Somewhat agree	31.1	22.1	46.8
Strongly agree	32.9	22.9	44.2
Took remedial course AY 2011–2012			
Yes	14.4	37.3	48.3
No	37.4	18.4	44.2
Work intensity AY 2011–2012			
No job	33.9	20.7	45.4
Part-time	30.9	28.3	40.8
Full-time	22.8	27.2	49.9
Control of first institution			
Public	17.0	32.7	50.3
Private for-profit	58.7	5.7	35.6

[1] Black includes African American, Hispanic includes Latino, and Other includes American Indian or Alaska Native, Native Hawaiian/other Pacific Islander, and more than one race. Students who indicated Hispanic and another race category are in the Hispanic category.
[2] Students are described as having low English proficiency if their first language as a child was not English and they spoke a language other than English all or most of the time with their primary caregiver at the start of high school.
NOTE: AY = academic year. Table represents only first-time beginning postsecondary students enrolled in subbaccalaureate (certificate- or associate-level) programs at public or private for-profit institutions, whose first and last reported major was in a CTE field of study, and who attended only one institution (i.e., did not transfer). Number of observations is 8,220. "Completed credential" means completed a degree or certificate in a CTE field of study, "still enrolled" means still enrolled in the first postsecondary institution in 2014, "departed" means not enrolled in any postsecondary institution in 2014, and "changed to other field of study" means that the field of study at the time of last enrollment was not CTE. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Statistical Procedures

The study uses descriptive statistics (univariate and bivariate[41] cross-tabulations), binary logistic regression, and event history analysis to examine differences in the enrollment, departure, and completion of first-time beginning postsecondary students (FTBs) in subbaccalaureate CTE programs. This section provides information about the study's

[41] See the Glossary section for the definition of "bivariate statistics."

rounding procedures, use of survey weights, methods to establish statistical significance for descriptive results, binary logistic regression, and event history analysis. A glossary of statistical terms used in this report follows.

Rounding

In the tables, percentages and marginal effects estimates are reported to the tenth decimal place, that is, the first digit after the decimal point (e.g., 46.7), but when referred to in the text, they are rounded to whole numbers. Standard errors for percentages and marginal effects are rounded to the nearest hundredth, that is, the second digit after the decimal place. Hazard ratio estimates are reported to the hundredth, and their standard errors are reported to the thousandth, that is, the third digit after the decimal place.

Rounding was conducted according to the following rules:

1. If the first digit to be dropped is less than 5, the last retained digit is not changed.

   Example: 6.1473 is rounded to 6.1 in a table and to 6 in the text.

2. If the first digit to be dropped is greater than or equal to 5, the last digit retained is increased by 1.

   Example: 6.6888 is rounded to 6.7 in a table and to 7 in the text.

3. A percentage value that is reported to the tenth in a table but to a whole number in the text is rounded from the original value in both cases.

   Example: 5.451 is rounded to 5.5 in a table and to 5 in the text.

In accordance with U.S. Department of Education data security regulations, the reported sample sizes are rounded to the tenth place because they are unweighted.

Weighting

Analyses are conducted using a sample weight (WTA000) that accounts for differences in the probability of selection of institutions and students. The sample weight also accounts for subsampling, unknown student eligibility, and nonresponse. This weight ensures that the estimates represent the target population of FTBs in the United States in AY 2011–12 at the *Higher Education Opportunity Act* Title IV–eligible institutions.

Variances are estimated using Taylor series linearized variance estimation without replacement (variables used to define the strata and sampling units are FB14STR, FB14PSU,

FB14SSU, and B14PSUCT). This procedure accounts for the sampling of institutions without replacement and the finite population correction in the calculation of variances. In the analyses examining departure and completion outcomes, strata with one sampling unit are centered at the grand mean instead of the stratum mean.

Establishing Statistical Significance

The descriptive statistics include distributions (percentages, for categorical variables), along with their respective standard errors. All comparisons of the descriptive statistics that are stated in the report have been tested for statistical significance. Differences between descriptive percentages were tested using the Student's *t* statistic at the $p < .05$ level of significance. The Student's *t* test allows analysts to determine whether two estimates are different. It is recommended for testing differences between estimates generated from large samples, as, for example, in BPS:12/14. Adjustments for multiple comparisons are not made.

Differences between estimates were tested against the probability of a Type I error.[42] The statistical significance of each comparison was determined by calculating the *t* value for the difference between each pair of proportions and comparing the *t* value with published tables of significance levels for two-tailed hypothesis testing. Student's *t* values were computed to test differences between independent estimates using the following formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{SE_1^2 + SE_2^2}}$$

where $\bar{x}_1$ and $\bar{x}_2$ are the estimates to be compared, and se_1 and se_2 are their corresponding standard errors.

When making part-to-whole comparisons, for example, comparing the percentage of CTE concentrators who were employed full time to all students who were employed full time, the following formula was used. This formula takes the covariance of the two estimates into account when computing the *t* value:

$$t = \frac{\bar{x}_{subgroup} - \bar{x}_{whole}}{\sqrt{SE_{subgroup}^2 + SE_{whole}^2 - 2pSE_{subgroup}^2}}$$

There are hazards in reporting statistical tests for each comparison. First, comparisons based on large *t* statistics may appear to merit special attention. This can be misleading because the

[42] See the Glossary section for the definition of "Type I error."

magnitude of the *t* statistic is related to the observed differences in the estimates and the number of respondents in the categories used for comparison. Hence, a small difference compared across a large number of respondents would produce a large (and thus possibly statistically significant) *t* statistic.

A second hazard in reporting statistical tests is the possibility that one can report a false positive or Type I error. Statistical tests are designed to limit the risk of this type of error using a value denoted by α (alpha), which defines the level of confidence that a finding is statistically significant by chance. In a single, two-tailed test of statistical significance, an alpha level of 0.05 is commonly chosen, representing a confidence level of 95 percent.

Percentages in the tables are suppressed or flagged if they do not meet minimum sample size criteria or have high relative standard errors. Percentages are suppressed if the number of respondents in the denominator is less than 30 or the number of respondents in the numerator is less than 3. Percentages are also suppressed when the standard error represents more than 50 percent of the estimate (the standard error divided by the estimate is greater than .50). Suppressed percentages are removed from the table and replaced with the special symbol (‡), and their standard errors are replaced with the symbol (†). Percentages are flagged with the symbol (!) if the standard error represents more than 30 percent but less than 51 percent of the estimate.

Multivariable Methods

The analyses in this report consist of multivariable[43] techniques that take multiple characteristics (such as sex, race, and parents' educational attainment) into account at once and make appropriate adjustments for the survey design of BPS:12/14 (e.g., sample weights). Specifically, the analysis of the likelihood of enrolling at a for-profit institution consists of binary logistic regression models that are used with binomial/categorical dependent variables. This method describes the relationship between multiple factors and a categorical outcome and is thus an appropriate analytic approach for addressing research question 1. We use three models in which additional control variables are added to each model in sequence. Model 1 includes only the primary demographic characteristics of interest as independent variables. Model 2 adds age and an indicator of whether respondents had dependent children, and Model 3 adds field of study.

The analyses for research question 1 were structured in this manner for a few reasons. First, we wanted to isolate the influence of the primary demographic characteristics of interest, which is achieved in Model 1. Second, we wanted to include age and children because they

[43] See the Glossary section for the definition of "multivariable models."

are known to be associated with the likelihood of enrollment at a for-profit institution and to determine whether these characteristics help explain the relationship between the primary demographic characteristics of interest and the outcome. Third, we wanted to account for field of study because it is also known to be associated with institutional control and—as with age and children—to determine whether field of study helps explain the relationship between the primary demographic characteristics of interest and the outcome (Deming, Goldin, and Katz 2012).

To answer research questions 3 and 4, about the likelihood of departure and completion, we employ event history analysis (also commonly referred to as survival analysis). Event history analysis is appropriate because the research seeks to understand the timing of focal events (i.e., departing from or completing a degree program). Cox proportional hazards models, unlike traditional ordinary least squares, logistic, or multinomial regression models, allow key predictors to be time-varying and permit various lengths of exposure to risk among students.

The multivariable methods used in this study provide important perspectives on the relative relationship between multiple characteristics and outcomes. However, the estimates presented here do not support causal inferences. For ease of interpretation, the logistic regression results in this paper are presented as marginal effects, and the Cox proportional hazards model results are presented as hazard ratios for which the term "likelihood" is used instead of "risk."

Binary Logistic Regression

To examine differences in the likelihood of enrolling at a for-profit institution (research question 1), we use binary logistic regression to show the net association between each independent variable included in the model and the control of CTE students' institution. Binary logistic regression is used in cases in which the outcome variable has two categories, such as institutional control in this study: public or private for-profit. The outcomes are observed as discrete (nonlinear) categories.

Although the outcomes are observed as discrete categories, the models assume that there is an underlying or latent distribution, even though only discrete categories are observed, or y* (Long 1997).[44] These latent distributions are linearly related to the outcome, as expressed in the following formula:

$$y_i^* = x_i\beta + \varepsilon_i$$

[44] There are several different ways to describe and discuss logit models. For more information on the latent variable description described here, see Long (1997); for a generalized linear model approach to logistic regression models, see Liao (1994). This section is adapted from Long (1997).

where:
x_i = is a vector of values for the *i*th observation.
β = is a vector of parameters.
ε_i = unexplained error term.
y_i^* = the latent variable y* linked to the observed variable by the following equation:

$$y_i = \begin{cases} 1 \; if \; y_i^* > \tau \\ 0 \; if \; y_i^* \leq \tau \end{cases}$$

where:
τ = the cut point needed to be observed in a discrete category.

To estimate the variance of the errors for the unobserved y*, the errors (ε) are assumed to have a logistic distribution (mean[45] = 0 and variance = $\frac{\pi^2}{3}$).

The resulting probability density function is

$$\lambda(\varepsilon) = \frac{\exp(\varepsilon)}{[1 + \exp(\varepsilon)]^2}$$

while the cumulative distribution function is

$$\Lambda(\varepsilon) = \frac{\exp(\varepsilon)}{1 + \exp(\varepsilon)}$$

For more information on binary logistic regression, see Liao (1994), Long (1997), and Pampel (2000). The resulting models output logits, which are generally not presented. In this report, marginal effects are presented for ease of discussion.

Marginal Effects

Because the interpretation of the logits estimated as part of the binary logistic regression equations described above is not intuitive, the logits must be transformed in order to allow meaningful discussion of estimates. In this report, marginal effects are used. Marginal effects provide an estimate of x_i on the probability of $y = 1$, conditional on having the average characteristics of the analysis sample member[46] (Mood 2010). This method of controlling for covariates is referred to using the term "net of." Marginal effects are also considered more accurate than the traditionally used odds ratios for comparisons across models, because conditioning on average characteristics is a more meaningful baseline for comparisons (Mood 2010). Marginal effects represent the percentage point change in the predicated

[45] See the Glossary section for the definition of "mean."
[46] The marginal effects were estimated in Stata 14 using the margins with the dydx(*) option.

probability (or likelihood) of the outcome for the focal category, compared to the reference category (Williams 2012).

Event History Analysis

To examine differences in the likelihood of departure and completion (research questions 3 and 4), we employ event history analysis to estimate how key student characteristics (e.g., sex, race/ethnicity, parental education) are associated with the occurrence and timing of departure from or completion of a subbaccalaureate CTE program at the students' first institution of enrollment. Departure and completion are the two distinct events of interest.

Two key statistical concepts are critical to event history analysis: hazard function and survivor function. The hazard function, denoted by $h(t_{ij})$, describes the conditional probability that individual *i* will experience the event in time period *j,* given that he or she did not experience it in any earlier time period (Singer and Willett 2003), and can be denoted as follows:

$$h(t_{ij}) = \Pr[T_i = j | T_i \geq j],$$

where *T* represents a variable whose value T_i is the time period *j* when individual *i* experiences the event. Because the hazard is a probability, it will always be between 0 and 1, with higher values indicating a higher risk of the event occurring and lower values indicating a lower risk.

The survivor function cumulates risk over all of the time periods and provides the probability that an individual will "survive" or not experience the target event (e.g., if the target event is completion, the individual survives by *not* completing). For an individual *i,* the survival probability at time *t* is:

$$S(t_{ij}) = \Pr[T_i > j].$$

This report describes the hazard—referred to as "likelihood" in the main body of this report—of departing from or completing a degree program within three years of enrolling as an FTB in a subbaccalaureate CTE program. The results focus on differences in hazard rates according to student demographic characteristics to examine patterns of inequality in the population of students in subbaccalaureate CTE programs.

Cox Proportional Hazards Model

The event history results in this report are drawn from Cox proportional hazards models, or more simply, Cox regression models. Although the hazard and survivor functions described above are in terms of probabilities, the outcome for Cox regression is a continuous-time

variable, and thus the hazard is discussed in terms of rate. The log hazard[47] is expressed as the sum of two components: a baseline function (when all predictors are 0) and the linear combination of predictors. Because the Cox regression model does not make parametric assumptions about the shape of the baseline hazard function, one strength of the model is that it allows an estimate of the effects of predictors on the baseline hazard, a key goal of this report.

The Cox regression model is expressed as:

$$\log H\left(t_{ij}\right) = \log H_0\left(t_j\right) + \beta' x$$

In this study, $\log H_0\left(t_j\right)$ is the general baseline log cumulative hazard function, and β'x represents a linear function of a set of time-constant and time-varying student characteristics. This model treats time continuously (0–35 months) and models the instantaneous risk that an event will happen at time t_j, given that it has not occurred before. This model estimates the relationship between student and institutional characteristics and the hazard of departure from subbaccalaureate CTE programs for FTBs. The observed risk period begins with the first month in which an individual attends the first postsecondary institution and ends when the individual experiences either a departure or completion event. The period also ends if the individual is right-censored by still being enrolled during the final follow-up in spring 2014.

The results presented in Tables 6 and 7 are estimates of the effect of various parameters on the hazard of event occurrence. The estimates are exponentiated coefficients or hazard ratios—the ratio of hazard functions that correspond to unit differences in the value of the associated predictor. They describe the effect of a one-unit difference in the predictor on the raw hazard. For example, a hazard ratio of 3.0 for female students means that the estimated hazard of event occurrence is three times that of male students.

Missing Data

Six percent of students reported that they did not know their parents' highest level of education (Tables 1 and 5). This response category of the parents' education variable is not displayed in Tables 2, 3, 4, 6, or 7 because of difficulty of interpretation. However, respondents who did not know their parents' level of education are retained in the samples, and parents' education is not imputed. "Don't know parents' education" is a valid response category to the survey question, and students who selected this response could, in theory, have a distinct relationship with the outcome variables.

[47] As noted by Singer and Willett (2003), because continuous-time hazard is a rate, the dependent variable is the logarithm, so the log hazard is the sum of the baseline function and the linear combination of predictors.

Two other variables used to examine departure and completion outcomes have missing values. For 18 percent of respondents, there is no record of high school grade point average (GPA), and for 2 percent of respondents, there is no record of whether they delayed entry into postsecondary education (Table 5). For each of these variables, missing values are treated as a distinct category in the categorical variable. This is known as the dummy indicator approach to treating missing values (Cohen and Cohen 1975). These response categories are not displayed in Tables 4, 6, or 7 because of difficulty of interpretation.

There are several reasons for including respondents with missing values in the sample and treating missing values as a separate category. We ruled out listwise deletion of cases with missing high school GPA data because the percentage of respondents with no record is relatively high (18 percent), and listwise deletion would reduce the sample size significantly, weakening our ability to detect differences in the key variables of interest. Although the percentage missing for delayed enrollment is smaller (2 percent), we would still unnecessarily lose data if we eliminated cases. In addition, because neither high school GPA nor delayed enrollment are missing completely at random, listwise deletion could introduce bias into the estimates (King et al. 1998). We also ruled out mean substitution, another often used but problematic imputation strategy that can introduce bias (Allison 2002).

We recognize that the dummy indicator approach—advocated by Cohen and Cohen (1975) and others, and in wide use—has the potential to yield biased estimates of the effect of GPA and lesser but still biased estimates of delayed enrollment (Jones 1996). However, this potential bias is not particularly concerning for this study because of the way in which the data are missing and because of the role that the variables serve. First, multiple imputation or pairwise deletion methods would have been inappropriate for high school GPA and delayed enrollment because these methods assume that the data are missing at random, but we strongly suspect that they are not (Allison 2000, 2002). GPA is missing for respondents over age 30, and among those under 30, it is missing if it was not included in SAT or ACT records and the respondent did not report it in the interview. It is probable that respondents with a low GPA were less likely to report it. Delayed enrollment is missing for respondents if they did not complete high school or did not report their high school completion dates.

Another reason that the potential bias associated with using dummy indicators for missing values is not particularly concerning in this report is that GPA and delayed enrollment are not primary variables of interest and are not interpreted in the report; instead, they are used as control variables to account for differences in academic preparation and commitment (Marsden and Wright 2010). The inclusion of a category for missing data in these control variables may improve the precision of estimates of key variables of interest.

Glossary

Term	Definition
Alpha level	The minimum level of probability to conclude that a difference between findings is not due to chance, or the probability of rejecting the null hypothesis when it is true. Denoted by α (alpha).[1]
Binary logistic regression	A statistical analytic technique that is used to estimate the relationship between multiple independent variables and an outcome variable with two distinct values.[2]
Bivariate statistics	A comparison or model showing the relationship between two variables. Similarly, *univariate* refers to one variable.[3]
Cox proportional hazards model	A type of regression model often used in event history analysis. The model expresses log hazard as the sum of a baseline hazard function and the weighted linear combination of predictors. The parameters are estimates of the shift in the log hazard associated with unit differences in a given predictor.[4]
Descriptive statistics	Statistics such as means and percentages.[5]
Estimate (noun)	A statistic, calculated using sample data, that is meant to approximate that value in the larger population.[6]
Event	A discrete outcome that an individual experiences (e.g., departure from institution or completion of degree).[4]
Event history analysis	The study of patterns and correlates of event occurrence. Event history analysis models hazard rates. Statistical models describe the occurrence and timing of events and differences in the risk of event occurrence across various characteristics. Also referred to as failure-time models, life-time models, survival models, duration models, or hazard models. These models allow for censored observations (i.e., observations that contain partial information on timing of the event) and allow for covariates to change over time.[7]
Hazard function	The ratio of the unconditional instantaneous probability of having the event divided by the survivor probability (i.e., probability of not having the event prior to then).[7]
Hazard rate	The instantaneous probability of experiencing the event at a single moment in time given that the event did not occur before.[7]
Hazard ratio	The ratio of the hazard rates corresponding to two levels of a covariate (e.g., males and females).[4]

See notes at end of table.

Glossary—Continued

Term	Definition
Marginal effect	The percentage point change in the predicated probability (or likelihood) of the focal outcome compared to the reference category.[8]
Mean	A measure of central tendency for a data set, found by dividing the sum of the data entries by the number of entries.[5]
Multivariable models	Sometimes referred to as *multivariate* models, though not strictly the same. Analytic models that include multiple independent variables. In reference to logistic regression models, multivariable models estimate the relationship between multiple characteristics (e.g., race, sex, and family socioeconomic status) and the outcome.[2]
Null hypothesis	A hypothesis stating that any differences between estimates are due to chance or that there are no real differences between estimates.[1]
Percentage point (difference)	The simple difference between two percentages, which are also referred to as proportions.[5]
Smoothed	Statistical technique that allows one to visualize hazard rates across time.[9]
Standard deviation	A measure of variation across observations in a sample. A low standard deviation indicates that the observations in the sample tend to be very close to the mean. A high standard deviation indicates that the observations in the sample tend to be spread out over a large range of values.[10]
Standard error	The standard deviation of the sampling distribution;[6] also refers to the average amount of measurement error for an estimate.[3]
Statistical significance	The likelihood that a finding based on sample data is due to chance rather than a real difference in the population from which the sample was drawn. When the probability that a finding is due to random chance is less than 5 percent (also referred to as $p < .05$), the finding is often considered to be statistically significant. In the report, this is also referred to as a significant difference.[10]
Survivor function	The probability of not experiencing the event prior to a given time (i.e., the probability of "surviving").[4]
t test	A statistical significance test used to test hypotheses about one or two means when the population standard deviation is unknown.[1]
Type I error	Rejecting the null hypothesis when it is actually true. Also known as a false positive.[1]
Weight/Weighting	A statistical method used to generalize sample data to the target population.[6]

See notes at end of table.

Glossary—Continued

[1] Harris, Mary B. 1998. *Basic Statistics for Behavioral Science Research.* Upper Saddle River, NJ: Allyn and Bacon.
[2] Long, J. Scott. 1997. *Regression Models for Categorical and Limited Dependent Variables*. Thousand Oaks, CA: Sage.
[3] Wooldridge, Jeffrey M. 2009. *Introductory Econometrics: A Modern Approach.* 4th ed. Mason, OH: South-Western Cengage Learning.
[4] Singer, Judith D., and John B. Willett. 2003. *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence.* New York: Oxford University Press.
[5] Larson, Ron, and Betsy Farber. 2003. *Elementary Statistics: Picturing the World.* 2nd ed. Upper Saddle River, NJ: Prentice-Hall.
[6] U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. 2012. *2012 Revision of NCES Statistical Standards: Final.* Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. http://nces.ed.gov/statprog/2012/pdf/Glossary.pdf.
[7] Yamaguchi, Kazuo. (1991). *Event History Analysis.* Newbury Park, CA: Sage.
[8] Williams, Richard. 2012. "Using the Margins Command to Estimate and Interpret Adjusted Predictions and Marginal Effects." *The Stata Journal* 12 (2): 308–31.
[9] Cleves, Mario, William Gould, and Yulia Marchenko. 2016. *An Introduction to Survival Analysis Using Stata.* Stata Press.
[10] U.S. Department of Education, Institute of Education Sciences. "What Works Clearinghouse." Accessed June 30, 2015. http://ies.ed.gov/ncee/wwc/Glossary.aspx.

APPENDIX B. STANDARD ERROR TABLES

Table B-1. Standard errors for Table 1. POSTSECONDARY CTE STUDENTS: Percentage of first-time subbaccalaureate career and technical education students who had various characteristics: academic year 2011–12

Characteristics	All students
Total	†
Institutional control	
Public	1.75
Private for-profit	1.75
Sex	
Male	1.16
Female	1.16
Race/ethnicity	
White	1.26
Black	0.83
Hispanic	1.20
Asian	0.36
Other	0.45
Parents' highest educational attainment	
High school or less	0.96
Some college	0.66
Vocational/technical training or associate degree	0.58
Bachelor's degree or higher	0.74
Do not know either parent's educational attainment	0.45
Pell Grant	
Received Pell Grant	1.11
Did not receive Pell Grant	1.11
Disability	
Has disability	0.64
Does not have disability	0.64
English proficiency	
Low proficiency	0.71
High proficiency	0.71
Level of program	
Certificate	1.67
Associate	1.67
Age as of 12/31/2011	
15–23	0.98
24–29	0.60
30 or older	0.75
Dependent children	
Has dependent children	1.03
Does not have dependent children	1.03
Field of study	
Health care	1.45
Business	0.77
Manufacturing, construction, repair, transportation	0.82
Personal and consumer services	0.80
Military technology and protective services	0.50
Other	0.92

† Not applicable.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Table B-2. Standard errors for Table 2. INSTITUTIONAL CONTROL AMONG CTE STUDENTS: Percentage distribution of first-time subbaccalaureate career and technical education students' institutional control, by various characteristics: academic year 2011–12

	Institutional control	
Characteristics	Public	Private for-profit
Sex		
Male	1.79	1.79
Female	2.32	2.32
Race/ethnicity		
White	1.73	1.73
Black	2.92	2.92
Hispanic	3.46	3.46
Asian	2.06	2.06
Other	5.19	5.19
Parents' highest educational attainment		
High school or less	2.23	2.23
Some college	2.99	2.99
Vocational/technical training or associate degree	1.94	1.94
Bachelor's degree or higher	1.61	1.61
Pell Grant		
Received Pell Grant	2.15	2.15
Did not receive Pell Grant	0.77	0.77
Disability		
Has disability	2.44	2.44
Does not have disability	1.85	1.85
English proficiency		
Low proficiency	3.25	3.25
High proficiency	1.87	1.87
Level of program		
Certificate	2.95	2.95
Associate	1.37	1.37
Age as of 12/31/2011		
15–23	1.74	1.74
24–29	3.07	3.07
30 or older	2.99	2.99
Dependent children		
Has dependent children	3.10	3.10
Does not have dependent children	1.37	1.37
Field of study		
Health care	3.66	3.66
Business	2.61	2.61
Personal and consumer services	3.98	3.98
Manufacturing, construction, repair, transportation	5.54	5.54
Military technology and protective services	2.63	2.63
Other	1.36	1.36

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Table B-3. Standard errors for Table 3. FACTORS ASSOCIATED WITH ENROLLMENT AT A PRIVATE FOR-PROFIT INSTITUTION: Average marginal effects of various characteristics on the probability of first-time subbaccalaureate career and technical education students being enrolled at a private for-profit institution, rather than a public institution: academic year 2011–12

Characteristics	Model 1: Demographic characteristics only	Model 2: + age and children	Model 3: + field of study
Sex			
Male	†	†	†
Female	1.50	1.48	1.19
Race/ethnicity			
White	†	†	†
Black	1.58	1.58	1.54
Hispanic	1.79	1.72	1.73
Asian	2.70	2.72	3.04
Other	2.73	2.62	2.63
Parents' highest educational attainment			
High school or less	†	†	†
Some college	1.59	1.54	1.47
Vocational/technical training or associate degree	1.52	1.56	1.54
Bachelor's degree or higher	1.53	1.43	1.39
Pell Grant			
Received Pell Grant	1.49	1.39	1.39
Did not receive Pell Grant	†	†	†
Disability			
Has disability	1.40	1.37	1.37
Does not have disability	†	†	†
English proficiency			
Low proficiency	1.65	1.68	1.66
High proficiency	†	†	†
Level of program			
Certificate	2.76	2.80	2.93
Associate	†	†	†
Age as of 12/31/2011			
15–23	–	†	†
24–29	–	2.01	1.98
30 or older	–	2.12	2.13
Dependent children			
Has dependent children	–	1.87	1.84
Does not have dependent children	–	†	†
Field of study			
Health care	–	–	†
Business	–	–	2.28
Personal and consumer services	–	–	3.24
Manufacturing, construction, repair, transportation	–	–	4.46
Military technology and protective services	–	–	2.55
Other	–	–	1.82

† Not applicable because of the comparison group.
– Not applicable because variable not included in the model.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Table B-4. Standard errors for Table 4. DEPARTURE AND COMPLETION OUTCOMES, WITH TRANSFER: Percentage distribution of first-time subbaccalaureate career and technical education students' departure and completion outcomes, with transfer students, by various characteristics: academic year 2011–12 through 2014

	Departure and completion outcomes							
	Never transferred to another institution				Transferred to another institution			
	Stayed in CTE field of study				Stayed in CTE field of study			
Characteristics	Completed CTE credential	Still enrolled	Departed	Changed to other field of study	Completed CTE credential	Still enrolled	Departed	Changed to other field of study
Total	**1.35**	**0.77**	**0.97**	**0.66**	**0.34**	**0.46**	**0.22**	**0.34**
Sex								
Male	1.20	1.18	1.36	0.88	0.53	0.69	0.23	0.50
Female	1.99	0.97	1.25	0.89	0.44	0.64	0.35	0.46
Race/ethnicity								
White	1.13	1.02	1.28	0.88	0.53	0.66	0.35	0.41
Black	1.41	1.28	1.97	1.28	0.54	1.31	0.67	0.85
Hispanic	2.94	1.65	1.68	1.39	0.65	0.78	0.24	0.76
Asian	2.14	4.53	4.09	4.58	†	2.60	†	2.21
Other	5.45	3.20	4.09	1.92	1.25	1.75	0.53	1.23
Parents' highest educational attainment								
High school or less	1.72	1.07	1.44	0.92	0.44	0.54	0.30	0.36
Some college	2.51	1.94	2.08	1.46	0.99	1.29	0.37	1.00
Vocational/technical training or associate degree	1.77	1.84	2.26	1.65	0.99	1.40	0.32	0.91
Bachelor's degree or higher	1.29	1.57	1.83	1.57	0.92	1.22	0.73	0.80
Pell Grant AY 2011–12								
Received Pell Grant	1.85	0.88	1.15	0.77	0.35	0.49	0.22	0.37
Did not receive Pell Grant	1.01	1.36	1.60	1.13	0.72	0.94	0.46	0.65
Disability								
Has disability	1.50	1.82	2.69	1.82	0.76	0.88	0.81	0.65
Does not have disability	1.50	0.84	1.03	0.69	0.38	0.52	0.22	0.37
English proficiency								
Low proficiency	3.22	2.42	2.70	2.07	0.87	1.41	0.28	1.01
High proficiency	1.31	0.78	1.00	0.70	0.37	0.49	0.24	0.34
Level of program AY 2011–2012								
Certificate	2.99	0.71	2.21	0.87	0.65	0.59	0.21	0.40
Associate	0.60	0.91	0.99	0.78	0.40	0.56	0.29	0.43
Age as of 12/31/2011								
15–23	1.38	0.87	1.02	0.79	0.45	0.60	0.29	0.43
24–29	2.68	2.04	2.78	1.58	0.48	1.02	0.45	0.77
30 or older	1.96	1.90	2.27	1.33	0.58	0.83	0.21	0.56
Dependent children								
Has dependent children	3.13	1.50	2.33	0.96	0.55	0.60	0.26	0.33
Does not have dependent children	0.97	0.86	0.97	0.76	0.42	0.57	0.27	0.42

See notes at end of table.

Table B-4. Standard errors for Table 4. DEPARTURE AND COMPLETION OUTCOMES, WITH TRANSFER: Percentage distribution of first-time subbaccalaureate career and technical education students' departure and completion outcomes, with transfer students, by various characteristics: academic year 2011–12 through 2014—Continued

	Departure and completion outcomes							
	Never transferred to another institution				Transferred to another institution			
	Stayed in CTE field of study				Stayed in CTE field of study			
Characteristics	Completed CTE credential	Still enrolled	Departed	Changed to other field of study	Completed CTE credential	Still enrolled	Departed	Changed to other field of study
GPA in high school								
Below C	2.58	2.22	2.90	2.03	0.97	1.25	1.06	1.43
C or above, but below B	1.59	1.21	1.50	1.14	0.47	0.76	0.33	0.57
B or above	1.57	1.10	1.34	0.95	0.68	0.80	0.39	0.49
Delayed enrollment into postsecondary education								
No delay	1.23	0.91	1.11	0.90	0.62	0.72	0.28	0.52
1–5 years delay	1.97	1.35	1.63	1.16	0.54	0.89	0.40	0.57
>5 years delay	2.05	1.68	2.89	1.08	0.48	0.85	0.22	0.56
Confident in ability to succeed at first institution								
Strongly disagree	4.11	4.98	4.98	3.18	0.29	2.00	0.19	1.95
Somewhat disagree	2.45	4.02	4.05	2.08	†	3.02	1.12	1.23
Neither disagree nor agree	1.76	2.60	3.14	1.76	0.71	1.28	0.84	0.85
Somewhat agree	1.90	1.31	1.83	1.38	0.64	0.78	0.20	0.56
Strongly agree	1.61	0.89	1.21	0.77	0.51	0.67	0.33	0.48
Took remedial course AY 2011–2012								
Yes	0.91	1.53	1.60	1.19	0.48	0.88	0.45	0.51
No	1.62	0.83	1.13	0.76	0.44	0.54	0.25	0.42
Work Intensity AY 2011–12								
No job	1.86	0.95	1.27	0.91	0.44	0.57	0.30	0.37
Part-time	1.50	1.49	1.64	1.14	0.93	1.11	0.31	0.98
Full-time	1.36	1.36	2.17	1.36	0.75	1.28	0.55	0.68
Control of first institution								
Public	0.68	0.96	1.08	0.83	0.45	0.61	0.28	0.45
Private for-profit	2.95	0.65	1.96	0.70	0.47	0.46	0.29	0.34

† Not applicable.

NOTES: AY = academic year; CTE = career and technical education.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Table B-5. Standard errors for Table 5. POSTSECONDARY CTE STUDENTS, SAMPLE 2: Percentage of first-time subbaccalaureate career and technical education students who had various characteristics, among students who remained in CTE fields of study and never transferred: academic year 2011–12 through 2014

Characteristics	Standard error
Total	†
Sex	
Male	1.41
Female	1.41
Race/ethnicity	
White	1.57
Black	0.94
Hispanic	1.45
Asian	0.35
Other	0.58
Parents' highest educational attainment	
High school or less	1.09
Some college	0.79
Vocational/technical training or associate degree	0.70
Bachelor's degree or higher	0.82
Do not know either parent's educational attainment	0.53
Pell Grant AY 2011–12	
Received Pell Grant	1.27
Did not receive Pell Grant	1.27
Disability	
Has disability	0.82
Does not have disability	0.82
English proficiency	
Low proficiency	0.87
High proficiency	0.87
Level of program AY 2011–12	
Certificate	2.05
Associate	2.05
Age as of 12/31/2011	
15–23	1.19
24–29	0.77
30 or older	0.94
Dependent children	
Has dependent children	1.23
Does not have dependent children	1.23
GPA in high school	
Below C	0.47
C or above, but below B	1.01
B or above	1.01
No record	0.94

See notes at end of table.

Table B-5. Standard errors for Table 5. POSTSECONDARY CTE STUDENTS, SAMPLE 2: Percentage of first-time subbaccalaureate career and technical education students who had various characteristics, among students who remained in CTE fields of study and never transferred: academic year 2011–12 through 2014—Continued

Characteristics	Standard error
Delayed enrollment into postsecondary education	
No delay	1.10
1–5 years delay	1.13
>5 years delay	1.10
No record	0.29
Confident in ability to succeed at first institution	
Strongly disagree	0.31
Somewhat disagree	0.50
Neither disagree nor agree	0.75
Somewhat agree	0.88
Strongly agree	1.01
Took remedial course AY 2011–12	
Yes	1.12
No	1.12
Work intensity AY 2011–12	
No job	1.22
Part-time	0.95
Full-time	0.93
Control of first institution	
Public	2.10
Private for-profit	2.10

† Not applicable.
NOTES: AY = academic year.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Table B-6. Standard errors for Table 6. FACTORS ASSOCIATED WITH DEPARTURE: Cox proportional hazard estimates of effect of various characteristics on risk of departure for first-time subbaccalaureate career and technical education students: academic year 2011–12 through 2014

	Standard error
Sex	
Male	†
Female	0.061
Race/ethnicity[1]	
White	†
Black	0.116
Hispanic	0.080
Asian	0.169
Other	0.158
Parents' highest educational attainment	
High school or less	†
Some college	0.077
Vocational/technical training or associate degree	0.078
Bachelor's degree or higher	0.073
Pell Grant AY 2011–12	
Received Pell Grant	0.044
Did not receive Pell Grant	†
Disability	
Has disability	0.136
Does not have disability	†
English proficiency	
Low proficiency	0.113
High proficiency	†
Level of program AY 2011–12	
Certificate	†
Associate	0.095
Age as of 12/31/2011	
15–23	†
24–29	0.113
30 or older	0.119
Dependent children	
Has dependent children	0.101
Does not have dependent children	†
GPA in high school	
Below C	†
C or above, but below B	0.104
B or above	0.098
Delayed enrollment into postsecondary education	
No delay	†
1–5 years delay	0.108
>5 years delay	0.163

See notes at end of table.

Table B-6. Standard errors for Table 6. FACTORS ASSOCIATED WITH DEPARTURE: Cox proportional hazard estimates of effect of various characteristics on risk of departure for first-time subbaccalaureate career and technical education students: academic year 2011–12 through 2014—Continued

	Standard error
Confident in ability to succeed at first institution	
Strongly disagree	†
Somewhat disagree	0.266
Neither disagree nor agree	0.292
Somewhat agree	0.243
Strongly agree	0.229
Took remedial course AY 2011–12	
Yes	*0.067*
No	†
Work intensity AY 2011–12	
No job	†
Part-time	0.057
Full-time	0.076
Control of first institution	
Public	†
Private for-profit	0.062

† Not applicable because of the comparison group.
NOTES: AY = academic year.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Table B-7. Standard errors for Table 7. FACTORS ASSOCIATED WITH COMPLETION: Cox proportional hazard estimates of effect of various characteristics on risk of completion for first-time subbaccalaureate career and technical education students: academic year 2011–12 through 2014

	Standard error
Sex	
Male	†
Female	0.061
Race/ethnicity	
White	†
Black	0.061
Hispanic	0.079
Asian	0.131
Other	0.169
Parents' highest educational attainment	
High school or less	†
Some college	0.087
Vocational/technical training or associate degree	0.109
Bachelor's degree or higher	0.087
Pell Grant AY 2011–12	
Received Pell Grant	0.081
Did not receive Pell Grant	†
Disability	
Has disability	0.074
Does not have disability	†
English proficiency	
Low proficiency	0.111
High proficiency	†
Level of program AY 2011–12	
Certificate	†
Associate	0.014
Age as of 12/31/2011	
15–23	†
24–29	0.098
30 or older	0.256
Dependent children	
Has dependent children	0.123
Does not have dependent children	†
GPA in high school	
Below C	†
C or above, but below B	0.152
B or above	0.194
Delayed enrollment into postsecondary education	
No delay	†
1–5 years delay	0.067
>5 years delay	0.092

See notes at end of table.

Table B-7. Standard errors for Table 7. FACTORS ASSOCIATED WITH COMPLETION: Cox proportional hazard estimates of effect of various characteristics on risk of completion for first-time subbaccalaureate career and technical education students: academic year 2011–12 through 2014—Continued

	Standard error
Confident in ability to succeed at first institution	
Strongly disagree	†
Somewhat disagree	1.09
Neither disagree nor agree	0.77
Somewhat agree	0.99
Strongly agree	0.80
Took remedial course AY 2011–12	
Yes	0.59
No	†
Work intensity AY 2011–12	
No job	†
Part-time	0.93
Full-time	0.71
Control of first institution	
Public	†
Private for-profit	3.32

† Not applicable because of the comparison group.
NOTES: AY = academic year.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

Table B-8. Standard errors for Table A-2. DEPARTURE AND COMPLETION: Percentage distribution of first-time subbaccalaureate career and technical education students' departure and completion outcomes, among students who remained in CTE fields of study and never transferred, by various characteristics: academic year 2011–12 through 2014

	Departure and completion outcomes		
Characteristics	Completed CTE credential	Still enrolled	Departed
Total	1.76	1.12	1.39
Sex			
Male	1.62	1.59	1.69
Female	2.54	1.49	1.93
Race/ethnicity			
White	1.55	1.39	1.59
Black	1.91	1.80	2.17
Hispanic	3.68	2.45	2.46
Asian	3.78	6.80	6.64
Other	6.78	4.58	5.67
Parents' highest educational attainment			
High school or less	2.18	1.40	1.83
Some college	3.36	2.80	3.00
Vocational/technical training or associate degree	2.53	2.52	2.97
Bachelor's degree or higher	2.02	2.39	2.49
Pell Grant AY 2011–12			
Received Pell Grant	2.25	1.25	1.71
Did not receive Pell Grant	1.58	1.94	2.12
Disability			
Has disability	2.15	2.48	3.10
Does not have disability	1.94	1.23	1.49
English proficiency			
Low proficiency	4.23	3.39	3.69
High proficiency	1.72	1.12	1.38
Level of program AY 2011–12			
Certificate	3.00	0.84	2.79
Associate	0.91	1.28	1.26
Age as of 12/31/2011			
15–23	1.89	1.34	1.49
24–29	3.24	2.53	3.35
30 or older	2.35	2.21	2.52
Dependent children			
Has dependent children	3.61	1.85	3.01
Does not have dependent children	1.37	1.24	1.28
GPA in high school			
Below C	3.48	3.04	3.81
C or above, but below B	2.12	1.77	2.03
B or above	2.18	1.59	1.95

See notes at end of table.

Table B-8. Standard errors for Table A-2. DEPARTURE AND COMPLETION: Percentage distribution of first-time subbaccalaureate career and technical education students' departure and completion outcomes, among students who remained in CTE fields of study and never transferred, by various characteristics: academic year 2011–12 through 2014—Continued

	Departure and completion outcomes		
Characteristics	Completed CTE credential	Still enrolled	Departed
Delayed enrollment into postsecondary education			
No delay	1.83	1.40	1.59
1–5 years delay	2.44	1.85	2.15
>5 years delay	2.45	1.98	2.43
Confident in ability to succeed at first institution			
Strongly disagree	5.25	6.25	6.18
Somewhat disagree	3.63	5.33	5.14
Neither disagree nor agree	2.60	3.51	3.79
Somewhat agree	2.49	1.80	2.30
Strongly agree	2.10	1.32	1.75
Took remedial course AY 2011–12			
Yes	1.30	2.04	2.11
No	2.06	1.19	1.65
Work intensity AY 2011–2012			
No job	2.37	1.37	1.86
Part-time	2.16	2.14	2.23
Full-time	1.83	2.58	2.74
Control of first institution			
Public	1.04	1.33	1.37
Private for-profit	3.06	0.82	2.63

NOTES: AY = academic year.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 2012/14 Beginning Postsecondary Students Longitudinal Study (BPS:12/14).

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