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Eight-Year Postsecondary Outcomes of Career and Technical Education Students From the High School Class of 2004

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Eight-Year Postsecondary Outcomes of Career and Technical Education Students From the High School Class of 2004

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Office of Career, Technical, and Adult Education

NATIONAL CENTER FOR INNOVATION IN CAREER AND TECHNICAL EDUCATION

BY
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ABBREVIATIONS

CCSSO	Council of Chief State School Officers
CTE	career and technical education
ELS:2002	Education Longitudinal Study of 2002
GDP	gross domestic product
GPA	grade point average
NCES	National Center for Education Statistics
NELS:88	National Education Longitudinal Study of 1988
O*NET	Occupational Information Network
SES	socioeconomic status
SLMP	specific labor market preparation
SOC	standard occupational classification

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EXECUTIVE SUMMARY

This report examines the labor market outcomes of high school career and technical education (CTE) students. Using nationally representative data from the Education Longitudinal Study of 2002 (ELS:2002), the report analyzes a recent cohort of high school graduates (the class of 2004) as of 2012, eight years after they had completed high school. This group of students entered college and the labor force at a time of significant economic challenges—challenges that CTE has often been called upon to help address. By understanding the characteristics of these high school CTE participants and examining their employment status and earnings relative to nonparticipants, the report provides a portrait of the extent to which CTE may help high school students succeed in the workforce beyond the first few years of secondary school.

This report also takes a rare opportunity to compare the labor market outcomes of high school CTE students in two different decades by examining data from ELS:2002 and its predecessor study, the National Education Longitudinal Study of 1988 (NELS:88). This places the circumstances of the high school class of 2004 in a broader context in which the progress of CTE students can be measured against a prior cohort as well as against non-CTE students from their own graduating class.

This report provides national statistics about labor market outcomes of CTE participants at different levels, including those who concentrate on a particular field of study in high school, as well as detailed results for concentrators by their specific field. Results are presented overall and are often broken down by postsecondary education attainment and background factors, such as gender, race/ethnicity, and socioeconomic status. Key findings are summarized below.

It is important to note that the findings in this report cannot be used to draw conclusions about the *Carl D. Perkins Career and Technical Education Act of 2006*, the law that currently authorizes federal funding for career and technical education, because the students described in this report graduated from high school two years prior to its enactment. The *Carl D. Perkins Vocational and Technical Education Act of 1998* was the law in effect at the time the class of 2004 attended high school and participated in secondary career and technical education courses.

Characteristics of High School CTE Students

Students who earn CTE credits—especially students whose focus is CTE—differ from other students in terms of background and academic preparedness.

For the purposes of this report, high school CTE students are divided into four groups based on the number of occupational credits they earn during high school (Dalton et al. 2013). Occupational credits refer to credits in courses designed for specific labor market preparation in a field or area of study. Examples include business, computer and information sciences, manufacturing, and repair and transportation. The current report focuses on the following four groups:[1]

Nonparticipants:	Earned less than one occupational CTE credit
Samplers:	Earned one to two occupational CTE credits in one or more fields
Explorers:	Earned three or more occupational CTE credits, but no three credits in any single occupational CTE field
Concentrators:	Earned three or more occupational CTE credits in at least one occupational CTE field

The report focuses on comparing CTE concentrators to nonparticipants, although results are presented for all groups.[2]

- Eighteen percent of students from the high school class of 2004 concentrated in one or more CTE fields of study (table 1). Forty-two percent earned at least three CTE credits but did not concentrate in a single area.
- Among the largest group of CTE concentrators are those focusing on business studies, composing 16 percent of all concentrators, more than all areas except agriculture and natural resources, and communications and design (table 2). Among the smallest group of concentrators (1 percent) are those focusing on public services (e.g., protective services, legal studies, or teaching).
- The following groups were more likely to be CTE concentrators: males (57 percent versus 43 percent of females); students from the lowest socioeconomic

[1] Note that these are not official designations of the U.S. Department of Education.
[2] Only public school students are analyzed. The analysis sample consists of public high school completers with complete transcript data and who met minimum credit criteria. The total number of cases analyzed for this report was 6,988 for ELS:2002 and 7,046 for NELS:88. See the Data and Methods section in the main portion of the report for more information.

status (SES) quartile (26 percent vs. 17 percent from the highest SES quartile); and students who scored in the bottom quartile of ELS:2002's math assessment (31 percent vs. 18 percent who scored in the top quartile) (table 1).

- The most heavily female field of study is consumer and culinary services, with 89 percent of all concentrators being female; the most heavily male fields of study are repair and transportation, and manufacturing (both 95 percent male) (table 2).
- A lower percentage of CTE concentrators earned a bachelor's degree or higher within eight years of completing high school than nonparticipants (27 percent vs. 49 percent, respectively (table 3). CTE concentrators were more likely to have completed only a high school education than nonparticipants (17 percent vs. 6 percent).

Employment and Earnings Outcomes of High School CTE Students From the Class of 2004 in 2012

Employment and earnings were reported for those not currently enrolled in college.

- There were no statistically significant differences in employment status among students with different levels of high school CTE participation. Between 75 and 77 percent of high school completers from 2004, depending on CTE participation level, were working full time in 2012; another 8 to 11 percent either were working part time or unemployed (table 5).
- Labor force participation rates (the total of working full-time, part-time, or unemployed) were also high and consistent across CTE fields of study. However, some groups were more likely than others to have a particular employment status. For example, CTE concentrators in engineering technologies were more likely (92 percent) than peers in consumer and culinary services (54 percent) to be working full time (table 7).
- There was little variation in the percent of the high school class of 2004 that was ever unemployed, or in the average number of months unemployed since 2009, by CTE participation level or concentrator field of study (tables 10 and 11).
- Although results show that high school CTE concentrators have a nominally higher median income ($29,000) than nonparticipants ($26,000), the differences

are not statistically significant (table 13). Hourly wages were also no different across CTE participation levels (table 14).

- However, CTE concentrators who had earned an associate degree had a higher median annual income ($34,000) than nonparticipants with an associate degree ($22,000) (table 13).

The Class of 2004 Versus the Class of 1992

The high school class of 2004, surveyed in 2012, was compared to the high school class of 1992, surveyed in 2000. These cohorts experienced postsecondary life in the eight years after high school under very different circumstances.

- When comparing the class of 2004 to the class of 1992, there are no statistically significant differences in labor force participation rates by CTE participation level or concentrator field of study (table 19).
- There are some differences in the percent working full time and the percent unemployed, however. In 2012, 77 percent of CTE concentrators were working full time, compared to 85 percent in 2000. Computer and information science concentrators were also less likely to work full time in 2012 versus 2000 (75 percent vs. 99 percent). Computer and information science concentrators were the only concentrators for whom a significant difference was observed (table 19).
- Students at all CTE participation levels were more likely to be unemployed in 2012 than in 2000. Eight to 10 percent of the class of 2004 were unemployed in 2012, but only 2 to 4 percent of the class of 1992 were unemployed in 2000 (table 19).
- As with employment status, there were no differences in median annual income or median hourly wage by CTE participation level within the class of 1992 in 2000 or within the class of 2004 in 2012 (table 23). All CTE groups—nonparticipants and participants alike—saw a decline in their median annual income.

Implications

Overall, the report finds that, despite differences in background and postsecondary education and training, high school CTE participants are remarkably similar to nonparticipants in their employment and earnings outcomes. There are no significant differences in employment status, experiences of unemployment, or annual earnings by level of CTE participation.

These results are encouraging but also provide sober reminders that recent high school and postsecondary graduates face challenging economic conditions. In both cohorts studied, results clearly indicate that, despite less advantaged backgrounds, CTE students fare just as well as their nonparticipating counterparts. At the same time, the findings show that recent CTE students and nonparticipants face an unfriendly economic climate that is markedly worse than that experienced by their peers a dozen years before. Further, while it is encouraging that CTE participants from 2004 were not more adversely affected than nonparticipants by the Great Recession, as their skills age, they may be at risk of falling behind due to economic restructuring that favors high-skill, nonautomated work. To the extent that higher education can help protect high school CTE participants' achievements and improve their long-term outcomes—as seen in the wage premium observed for CTE concentrators with an associate degree—policy can be geared toward ensuring access to college and building on the futures that CTE students established for themselves in high school.

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INTRODUCTION

The pathway to completing higher education and finding success in a career depends on a variety of education, financial, and family factors that prepare students for college and work success. One critical part of this pathway is the role that high school serves in providing an academic and practical foundation to meet the challenges of postsecondary life. The transition from high school to college or to the world of work can be a financially challenging and intellectually and emotionally demanding process. Recent cohorts of high school and college graduates face a particularly daunting set of obstacles in a slowly recovering job market amid a transition in the labor force away from manual labor and low-skill manufacturing and toward medium-skill jobs and information-intense occupations (Goldin and Katz 2008). Students who build a foundation in career and technical education (CTE) in high school may be well prepared to weather these challenges and emerge with stable jobs and long-term prospects for a productive life (Bishop and Mane 2005; CCSSO 2014; Stone, Alfeld, and Pearson 2008).

This study uses nationally representative data from the Education Longitudinal Study of 2002 (ELS:2002) to provide a portrait of the successes and failures of a recent cohort of high school graduates (the class of 2004) who entered college and the labor force at a time of rapidly increasing costs for postsecondary education and a massive disruption in economic opportunities due to the Great Recession. These data represent one of the few sources of national-level information on the medium-term outcomes of high school CTE students. In combination with ELS:2002's predecessor study, the National Education Longitudinal Study of 1988 (NELS:88), this report also takes a rare opportunity to compare the labor market outcomes of high school CTE students in two different decades. This places the circumstances of the high school class of 2004 in a broader context in which the progress of CTE students can be measured against a prior cohort as well as against non-CTE students from their own graduating class.

It is important to note that the findings in this report cannot be used to draw conclusions about the *Carl D. Perkins Career and Technical Education Act of 2006*, the law that currently authorizes federal funding for career and technical education, because the students described in this report graduated from high school two years prior to its enactment. The *Carl D. Perkins Vocational and Technical Education Act of 1998* was the law in effect at the time the class

of 2004 attended high school and participated in secondary career and technical education courses.

The report builds on similar reports written for the National Center for Education Statistics (NCES) (Bersudskaya and Chen 2011; Ingels et al. 2002; Laird, Chen, and Levesque 2006; Staklis and Ho 2012). Like the prior analyses, this report documents variations in the education and workforce preparation of high school CTE students, their employment status and work intensity, unemployment experiences, earnings, and other outcomes related to the match between high school CTE focus and job field, perceptions of work, and educational and overall debt. Findings are generally reported both by overall CTE participation status—that is, the extent to which a student focused on a particular CTE field in high school—and, for those that concentrated in a CTE area, by high school CTE field. Results are further presented by highest education attainment level reached. In addition, for selected measures, the report compares the outcomes of 2004 graduates with CTE participants from the class of 1992, for whom similar data are available. Where sample sizes allow, the report also examines work outcomes by gender, race/ethnicity, and socioeconomic status.

Organization of the Report

The remainder of this report includes the following three sections:

- Data and Methods
- Results
    - Characteristics of Students Taking CTE Courses in High School
    - Education and Workforce Preparation of High School CTE Students
    - Employment and Earnings Outcomes of High School CTE Students
    - Changes Between the High School Classes of 2004 and 1992
- Conclusions and Implications for Policy and Practice

DATA AND METHODS

Data, Key Definitions, and Analysis Sample

Data. ELS:2002 began with a nationally representative survey of high school sophomores in the spring of 2002. The same students, along with additional students included to provide a representative sample of high school seniors, were surveyed again in 2004, and their high school transcripts were collected and systematically coded and standardized. A second follow up was conducted in 2006, when most were two years beyond high school graduation. The basis for the current proposed study is the third follow-up, conducted in 2012, when most study respondents were eight years beyond high school completion.

The third follow-up is a survey of study participants. Respondents provided information on their employment, training, occupation, and earnings, as well as information about postsecondary degrees, majors, minors, and enrollment histories. A subsequent data collection will obtain and code study participants' postsecondary transcripts.[3]

The report also uses data from NELS:88, which began with a survey of spring-term eighth-graders in 1988. These students, along with additional sample members added to ensure national representation of subsequent grades, were surveyed again in 1990 (when most were 10th-graders) and again in 1992 (when most were 12th-graders). As with ELS:2002, high school transcripts were then collected, coded, and standardized (both studies standardized to the same course classification system). Subsequent surveys were undertaken in 1994 and 2000. The 2000 survey, which was the fourth and final follow-up of NELS:88 participants, is the basis of NELS:88 analyses conducted for this report and likewise corresponds to a time eight years after students had completed high school.

Key Definitions. For both ELS:2002 and NELS:88, high school CTE students are defined in two ways. First, students are defined by their levels of participation in occupational CTE courses. CTE courses are divided into three broad areas: family and consumer sciences (such as home economics); general labor market courses (such as keyboarding); and specific labor market preparation (SLMP) courses, also referred to as occupational courses. Occupational courses include classes in fields as diverse as agriculture, business, computer and information

[3] The transcript data will derive independent measures of postsecondary degrees and majors, and will contain detailed information about postsecondary course-level credits and grades. Prior NCES studies have typically relied on the transcript-derived measures of postsecondary degrees and majors when available (Adelman, Daniel, and Berkovits 2003; Laird, Chen, and Levesque 2006).

sciences, and manufacturing. Because occupational courses represent the most specific form of CTE, relating to preparation and training in specific career, technical, and vocational fields, the definition of a CTE student used in this report focuses on their involvement in these courses. High school students are classified in one of four categories based on their earned credit in occupational courses (Dalton et al. 2013)[4]:

1. Nonparticipants (less than one occupational CTE credit)
2. Samplers (one to two occupational CTE credits in one or more fields)
3. Explorers (three or more occupational CTE credits, but no three credits in any single occupational CTE field)
4. Concentrators (three or more occupational CTE credits in at least one occupational CTE field)

Second, CTE concentrators may be further classified by their high school CTE fields of study. Each course on respondents' high school transcripts can be classified into one of the 12 fields of study listed below (Bradby 2007):

1. Agriculture and natural resources
2. Business
3. Communications and design
4. Computer and information science
5. Construction and architecture
6. Consumer and culinary services
7. Engineering technologies
8. Health sciences
9. Manufacturing
10. Marketing;
11. Public services
12. Repair and transportation

[4] Note that these are not official designations of the U.S. Department of Education.

Analysis sample. ELS:2002 enables projections to the nationally representative population of 10th-graders in 2002 or 12th-graders in 2004. Because the focus of this report is on the occupational outcomes of high school CTE participants, and because CTE participation status is simplest to define at the end of high school, this report focuses on 12th-graders who graduated by the end of summer 2004. Thus, the report does not address issues related to the role of CTE in encouraging high school persistence and completion. In addition, to align with public policy interests, the analysis only includes students who attended a public school. Analysis sample members were in the 12th grade in 2004 (or 1992 for NELS:88 sample members); graduated from high school (with a regular diploma or alternative credential) by the end of August 2004 (or 1992); responded to both the end-of-high school survey and the eight-year follow-up survey; had complete high school transcript records; and met minimum credit requirements of at least 16 credits overall and a nonzero amount of English credits. The total number of cases analyzed for this report was 6,988 for ELS:2002 and 7,046 for NELS:88.[5]

Statistical Procedures

All results project to the national 12th-grade population in 2004 (for ELS:2002) or the national 12th-grade population of 1992 (for NELS:88). The analyses take into account the complex survey designs of both studies to generate estimates of the variability of a particular result. These estimates of variability, called standard errors, were then used when comparing two results (e.g., two percentages or two means) to determine whether the difference between them was due to chance or likely represented a real difference in the population—that is, whether it was statistically significant.

Comparisons of percentages and means used Student's *t* values to test for statistical significance. The statistical significance of each comparison was determined by calculating the *t* value for the difference between each pair of means or 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:

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

[5] The actual number of cases analyzed in any given table or figure, or portion of table or figure, varies due to patterns of missing or nonapplicable data for different variables.

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 a part-to-whole comparison, 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:

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

Statistical tests are designed to limit the risk of discovering a false positive (i.e., that a difference is identified as significant when it is actually not significant). Statistical testing uses a value denoted by α (alpha) to define 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. However, because multiple comparisons are made in this report simultaneously, which increases the likelihood of false positives, a lower alpha of 0.001 was chosen, representing a confidence level of 99.9 percent. This alpha level was chosen based on a Bonferroni correction for multiple comparisons, where the typical alpha (0.05) is divided by the number of comparisons made, *n*. In this case, *n* was set at 30, which is representative of the number of comparisons in the average figure in this report.

Values in the tables that do not meet minimum sample size criteria are suppressed in the tables and designated with a special symbol (‡). Values whose estimates are unstable are flagged with exclamation marks. For percentages, estimates are defined as unstable if the standard error is 5 or more (meaning that the true value lies in a range of about +/- 20 percentage points, based on an alpha level of 0.05). For means, estimates are defined as unstable if the standard error of the mean is one-third or more as large as the estimate.

For more detailed information on statistical procedures, see Appendix A.

Study Limitations

This report presents results by high school CTE participation level and high school field of study for CTE concentrators. CTE concentration, defined as having earned three or more credits in one or more occupational CTE areas, does not necessarily correspond to defined curricula or programs as experienced by students or designed by schools. For example,

students may have completed programs that involved taking courses across two or more occupational areas. The current study mitigates against this possibility by presenting results for CTE explorers, who earn at least three occupational CTE credits but do not do so in one particular area; these students may have completed a course of study as defined by the school or perceived by employers.

Results presented by field of study (for CTE concentrators) are limited by small sample sizes. When outcomes for students who concentrated in a field of study are broken down further (e.g., by highest education attainment level), results often must be suppressed due to small sample sizes or flagged as unstable, as defined earlier. For this reason, the focus of this report is on differences between CTE concentrators and nonparticipants.

Readers are advised that observational studies such as ELS:2002 and NELS:88 cannot support rigorous causal inferences. Students who participate in CTE in high school may differ on a variety of preexisting characteristics; differences in outcomes between participants and nonparticipants (or among concentrators in different CTE fields) may reflect the types of students who chose to pursue or not pursue CTE rather than the influence of CTE itself. Although care is taken in this report to show how high school CTE students differ from nonparticipants, no statistical adjustments have been made to estimate the extent to which outcomes derive from preexisting student characteristics. Even using such statistical adjustments, there may remain unmeasured heterogeneity in the population of high school CTE students for which observational surveys and data collections cannot account. Instead of establishing causality, the results presented here are intended to spark further investigation and conversation about the contribution of high school CTE to student outcomes in later life.

RESULTS

This section discusses findings in four subsections:

- Characteristics of Students Taking CTE Courses in High School
- Education and Workforce Preparation of High School CTE Students
- Employment and Earnings Outcomes of High School CTE Students
- Changes Between the High School Classes of 2004 and 1992

Key results are highlighted in figures, with detailed findings presented in tables.

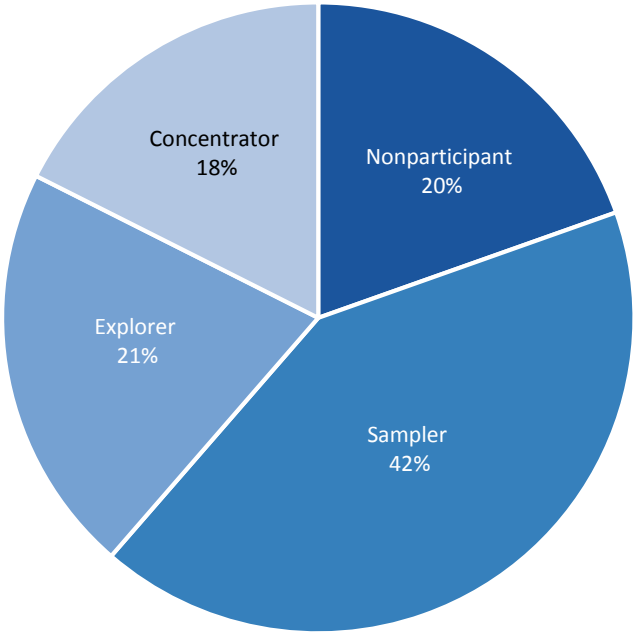
Characteristics of Students Taking CTE Courses in High School

Students focusing on CTE in high school may be different on a variety of characteristics from students taking a general education or academically focused course of study. To understand the outcomes of high school CTE students and how they compare to the outcomes of other high school students, it is important to understand how they differ on background characteristics and how they perform in academic subjects in high school. First, however, we look at the overall levels of participation in high school CTE and CTE fields of study.

High School CTE Participation and Fields of Study

As noted in the Data and Methods section, high school CTE students are defined in this report by their level of participation in occupational CTE courses (nonparticipant, sampler, explorer, or concentrator) and, for concentrators, their specific occupational field of study. Figure 1 shows the percentage of high school graduates from the class of 2004 by CTE participation level. A minority of students (18 percent) concentrated in a field of study; another 21 percent took at least three credits in occupational CTE courses but did not concentrate (explorer). Twenty percent of students took less than one credit in CTE (nonparticipant). Prior work has shown that the percentage of CTE concentrators among all high school students has declined over recent decades, but that the percentage of students "sampling" CTE courses has grown (Dalton et al. 2013). Among the class of 2004, 42 percent of all students did so.

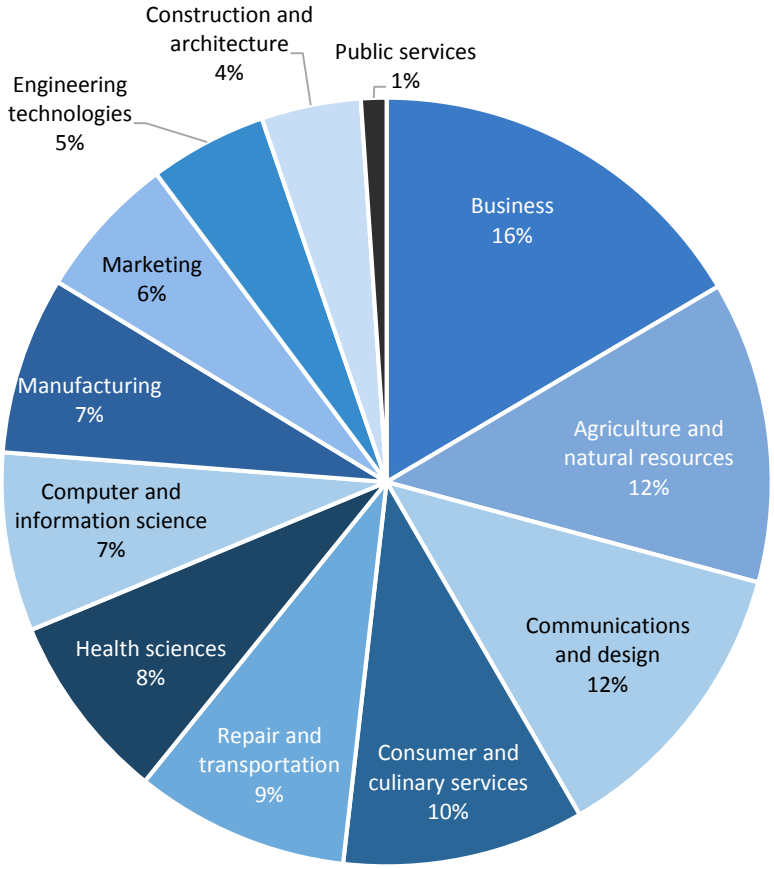
Figure 1. Percentage distribution of the high school class of 2004, by occupational career and technical education participation level



NOTE: Numbers do not sum to 100 due to rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Figure 2 shows the percentage of CTE concentrators (the 18 percent of all graduates from figure 1) by their field of study. Among the largest group of concentrators are those focusing on business studies, making up 16 percent of all concentrators, more than all areas except agriculture and natural resources (12 percent) and communications and design (12 percent) (these two percentages were not significantly different from that of the business field). Among the smallest groups of concentrators are those focusing on public services (e.g., protective services, legal studies, or teaching)—only 1 percent of all concentrators (and therefore less than one percent of all graduates) concentrated in this area.

Figure 2. Percentage distribution of the high school class of 2004 who concentrated in a career and technical education occupational area, by field of study



NOTE: Approximately 5 percent of the analysis sample concentrated in multiple fields of study. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

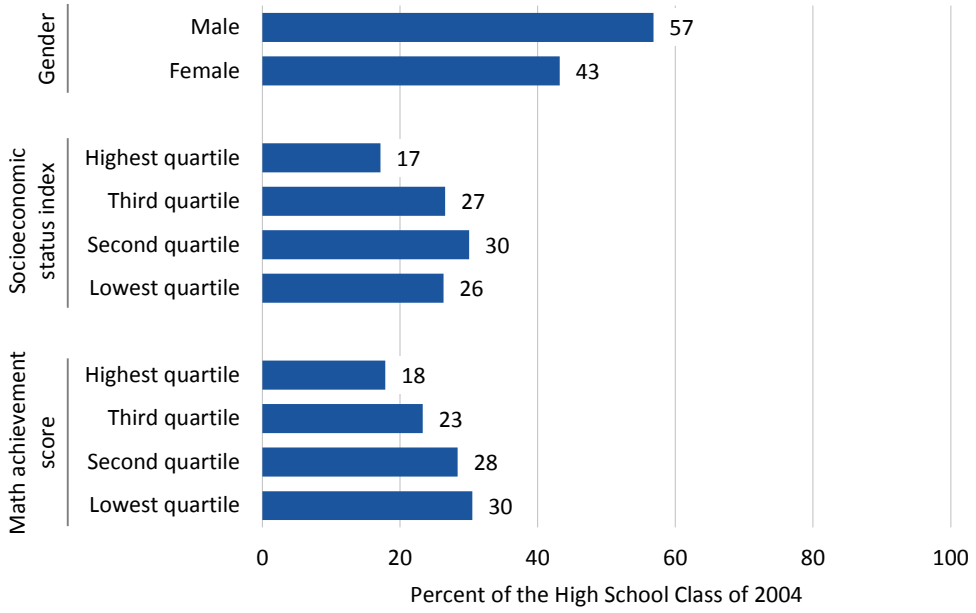
Understanding the Background of High School CTE Students

Background Characteristics

Figure 3 shows select comparisons of the percentage of high school students who concentrated in CTE by gender, socioeconomic status (SES) (a composite measure of parents' education, occupation, and earnings), and 12th-grade math achievement quartile. Males were more likely than females to concentrate in an occupational area (57 percent vs. 43 percent). Similarly, students from the lowest SES quartile (bottom 25 percent) were more likely than students from the highest SES quartile (top 25 percent) to concentrate in an occupational area as well (26 percent vs. 17 percent), although students from the second and

third SES quartiles were also more likely to be concentrators than the highest SES quartile. Repeating this pattern, students who scored in the bottom quartile of ELS:2002's 2004 math assessment were more likely to concentrate in a CTE field than students from the top quartile (30 percent vs. 18 percent).

Figure 3. Percentage of the high school class of 2004 who concentrated in a single career and technical educational occupational field, by gender, socioeconomic status index quartile, and math assessment score quartile



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Table 1 provides more detail about the differences in background participation by student characteristics, including additional differences by race/ethnicity, disability status, academic concentration, and academic course grade point average (GPA). The results are consistent with those presented in figure 3: High school CTE concentrators are more likely to come from disadvantaged student backgrounds and to be less academically prepared than students who are nonparticipants. This finding is worth emphasizing considering the number of outcomes to be explored later. CTE students—particularly CTE concentrators—begin postsecondary life disadvantaged with respect to personal background and academic achievement.

Table 1. Percentage distribution of student characteristics, average math assessment score rank, and average academic course grade point average (GPA) of the high school class of 2004 in 2012, by occupational career and technical education (CTE) participation level

		Occupational CTE participation level			
Characteristic	Total	Nonparticipant	Sampler	Explorer	Concentrator
Total	100.0	19.6	41.8	21.1	17.6
Sex					
Female	52.9	61.8	56.1	46.5	43.2
Male	47.1	38.2	43.9	53.5	56.8
Race/ethnicity					
Asian, non-Hispanic	4.4	5.4	5.3	3.4	2.3
Black, non-Hispanic	13.2	12.3	13.8	12.2	13.8
Hispanic	14.4	15.2	15.4	14.3	11.0
White, non-Hispanic	63.4	63.3	60.3	65.8	68.2
Other, non-Hispanic	4.6	3.8	5.1	4.4	4.6
Socioeconomic status (SES) quartile					
Lowest quartile	21.9	17.4	21.2	23.9	26.3
Second quartile	26.5	22.3	25.7	28.8	30.0
Third quartile	26.0	25.3	26.0	26.2	26.5
Highest quartile	25.6	35.0	27.0	21.0	17.1
Disability status					
No disability	93.5	94.4	94.3	94.0	90.0
Learning or other disability	6.5	5.6	5.7	6.0	10.0
Academic concentration					
Not an academic concentrator	71.0	61.4	68.1	77.2	81.5
Academic concentrator	29.0	38.6	31.9	22.8	18.5
2004 math assessment quartile					
Lowest quartile	23.2	18.5	21.7	24.3	30.5
Second quartile	24.7	18.2	24.8	27.7	28.4
Third quartile	25.1	25.1	25.5	26.0	23.3
Highest quartile	26.9	38.1	28.0	22.0	17.9
Average academic course GPA	2.7	2.9	2.8	2.6	2.6

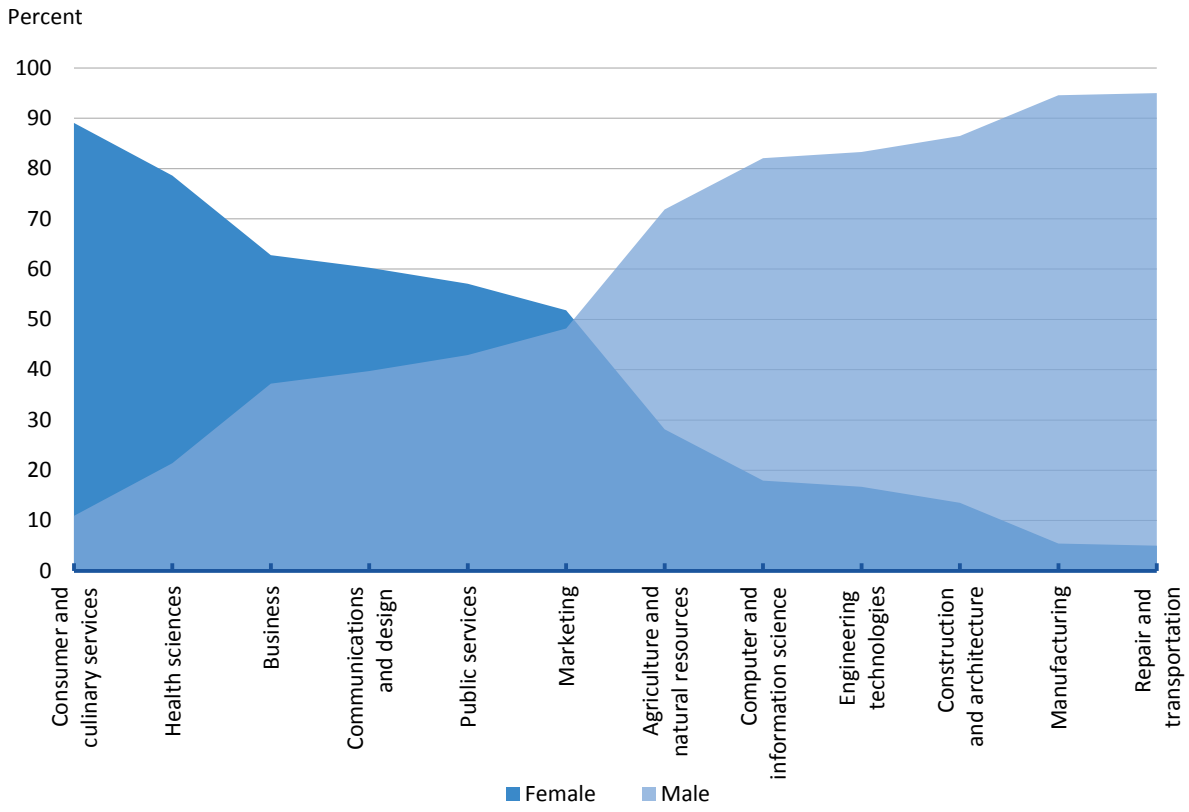
NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Characteristics of Concentrators in Different Fields

Additional differences in CTE students are apparent when considering the fields of study in which CTE students concentrate. Figure 4 shows one such example: the percentage of males versus females in each field of study. The most heavily female field of study is consumer and culinary services, with 89 percent of all concentrators being female, followed by health

sciences (79 percent) and business (63 percent). The most heavily male fields of study are repair and transportation and manufacturing (both 95 percent male), followed by construction and architecture (87 percent), engineering technologies (83 percent), computer and information science (82 percent), and agriculture and natural resources (72 percent). Fields in which there were no statistically significant differences between the percentage of females versus males were communications and design (60 percent female), marketing (52 percent female), and public services (57 percent female).

Figure 4. Percentage distribution of the high school class of 2004 who concentrated in a career and technical education occupational area, by gender and field of study



NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Table 2 shows additional results for students in the lowest SES quartile and lowest math assessment quartile, as well as differences in average academic course GPA, by field of study. There were few significant differences across fields for the percent in the lowest SES quartile, but consumer and culinary services students were more likely to be in the lowest math assessment quartile—indeed, 51 percent of them were—than students in agriculture

and natural resources, business, computer and information science, engineering technologies, and marketing. This is despite the fact that students in consumer and culinary services were overwhelmingly females, who typically perform better academically than males. Students in communications and design had among the highest average academic GPAs, at 2.80 (compared to, for example, 2.17 for concentrators in repair and transportation).

Table 2. Percentage distribution of high school career and technical education (CTE) field of study for CTE concentrators, by sex, lowest socioeconomic status (SES) quartile, lowest math assessment quartile, and academic course grade point average (GPA) for the high school class of 2004 in 2012

		Sex				
Field of study	Total	Female	Male	Lowest SES quartile	Lowest math assessment quartile	Academic course GPA
Total	100.0	52.9	47.1	21.9	23.2	2.7
Agriculture and natural resources	12.1	28.1 !	71.9 !	36.4	25.6	2.57
Business	15.7	62.8	37.2	22.7	26.5	2.73
Communications and design	11.8	60.3	39.7	18.5	31.2 !	2.80
Computer and information science	7.1	17.9	82.1	18.5	9.9	2.77
Construction and architecture	4.0	13.5 !	86.5 !	32.4 !	37.7 !	2.35
Consumer and culinary services	9.6	89.1	10.9	28.7	50.8	2.25
Engineering technologies	4.7	16.7 !	83.3 !	28.4 !	15.5 !	2.64
Health sciences	7.5	78.6 !	21.4 !	25.3	25.8 !	2.71
Manufacturing	7.1	5.4	94.6	28.1 !	38.5 !	2.35
Marketing	5.8	51.8 !	48.2 !	19.3	14.5	2.64
Public services	1.0	57.1 !	42.9 !	16.4 !	22.7 !	2.62
Repair and transportation	8.5	5.0	95.0	35.0 !	42.8 !	2.17

! Interpret data with caution. Standard error is 5 percentage points or greater.
NOTE: Approximately 5 percent of the analysis sample concentrated in multiple fields of study. SES refers to socioeconomic status. The math assessment was given in 2004. Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

These results reinforce the important point that CTE students, both overall and in any given field, differ from non-CTE students in significant ways. Any interpretation of the outcomes of high school students must consider the ways in which CTE concentrators (or those with other levels of CTE participation) hail from less advantaged backgrounds and how concentrators in specific fields differ from those in other fields. Although this report does not attempt to account for these differences statistically, the remainder of the discussion will point to this key finding as valuable context in understanding the outcomes of high school students who engage in CTE.

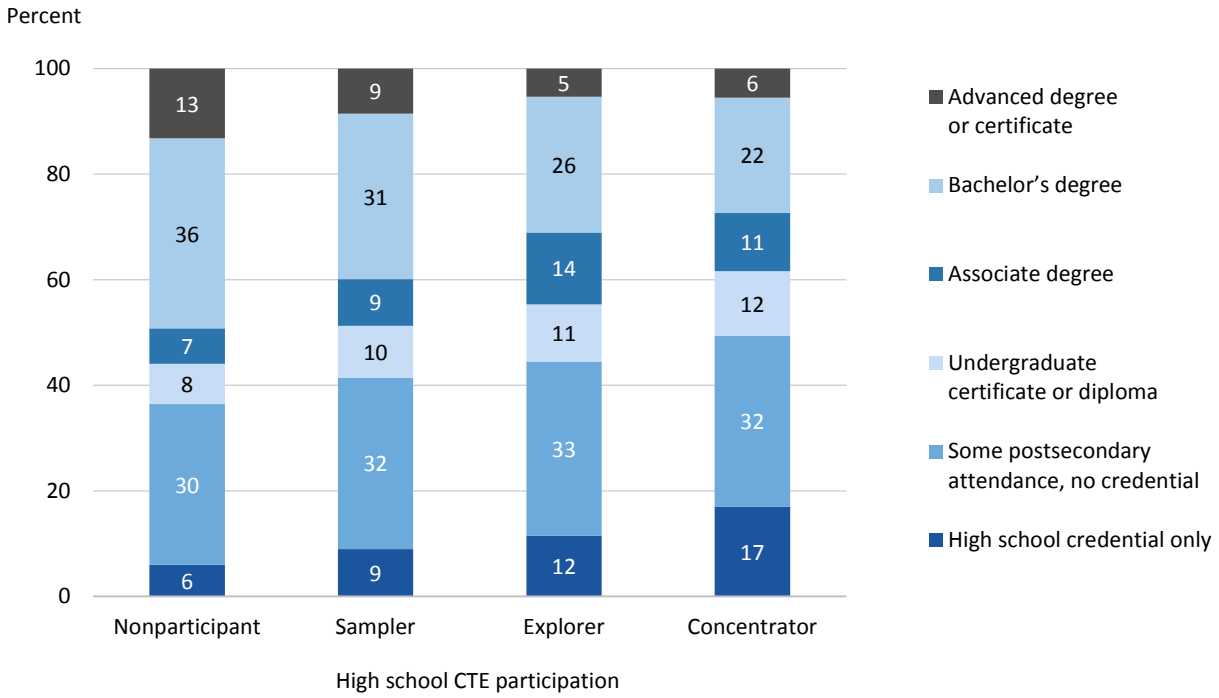
Education and Workforce Preparation of High School CTE Students

Before considering the labor force outcomes of CTE students—the main focus of this report—it is critical to also consider the postsecondary educational and training experiences of high school CTE students. High school CTE students may pursue different paths through postsecondary school and into the workforce, which can strongly influence their subsequent occupational outcomes and earnings.

Education Attainment

On average, 38 percent of all graduates from the high school class of 2004 earned a bachelor's degree or advanced degree by 2012, eight years after they had completed their secondary education (table 3). Figure 5 presents the highest level of education attained by students with different levels of CTE participation. The percentage of nonparticipants who earned a bachelor's or higher degree or certificate was higher (49 percent) than the percentage of CTE concentrators (27 percent [total from unrounded values]), with CTE samplers and explorers falling in between. At the lower end of postsecondary education attainment, 6 percent of nonparticipants completed only a high school education compared to 17 percent of CTE concentrators. Overall, figure 5 clearly shows that higher levels of CTE participation in high school are associated with lower levels of education attainment within eight years of completing high school.

Figure 5. Percentage distribution of postsecondary education attainment of the high school class of 2004 in 2012, by high school career and technical education participation level



NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Table 3 presents an additional breakdown of education attainment by high school CTE field of study. Computer and information science concentrators were more likely to earn a bachelor's degree (33 percent) than concentrators in construction and architecture (8 percent), consumer and culinary services (11 percent), and repair and transportation (3 percent). Repair and transportation concentrators were more likely to earn only a high school credential (35 percent) than concentrators in a number of other areas, including business (12 percent), health sciences (10 percent), and marketing (6 percent).

Table 3. Percentage distribution of postsecondary education attainment for the high school class of 2004 in 2012, by high school career and technical education (CTE) participation level and CTE concentration field of study

High school CTE participation	High school credential only	Some postsecondary attendance, no credential	Under-graduate certificate or diploma	Associate degree	Bachelor's degree	Advanced degree or certificate
Total	10.4	32.1	10.1	9.8	29.4	8.3
Occupational CTE participation level						
Nonparticipant	6.0	30.4	7.6	6.7	36.0	13.2
Sampler	9.0	32.4	9.8	8.9	31.3	8.6
Explorer	11.5	33.0	10.9	13.6	25.7	5.4
Concentrator	17.0	32.3	12.3	11.0	21.9	5.5
CTE concentration						
Agriculture and natural resources	18.4	33.8	14.9	7.9	21.6	3.5
Business	11.8	27.1	9.0	10.5	32.3	9.3
Communications and design	11.4	19.5	10.0	18.1	32.6	8.3
Computer and information science	5.8	44.7 !	6.7	5.5	33.3 !	3.9
Construction and architecture	22.6 !	37.4 !	17.5 !	11.3 !	7.5	‡
Consumer and culinary services	14.8	47.7 !	19.3	6.8	10.7	‡
Engineering technologies	10.8	34.0 !	7.4	15.4 !	24.0 !	8.4
Health sciences	10.4	26.7 !	13.1	9.9	29.4 !	10.5
Manufacturing	33.8 !	28.5 !	11.5	10.1	16.1 !	#
Marketing	6.3	37.8 !	13.2	10.7	23.8 !	8.2
Public services	‡	59.4 !	‡	‡	19.5 !	‡
Repair and transportation	34.9 !	29.7 !	15.8	15.3	3.4	‡

Rounds to zero.
! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Certifications and Licenses

Much like educational degrees, occupational certifications and licenses can provide credentials that are important to the employment and earnings outlook of workers. About 30 percent of high school completers from the class of 2004 earned an occupational certification or license by 2012 (table 4). Among those with a current job in 2012, 70 percent reported that their job required a certification or license. However, there were no statistically significant differences across CTE participation levels or CTE fields of study for earning a certification or license, or for holding a current job requiring a certification or license.

Table 4. Percentage of the high school class of 2004 that earned a certification or license by 2012, and whether current job requires a certification or license, by high school career and technical education (CTE) participation level and CTE concentration field of study

High school CTE participation	Earned a certification or license	Current job requires certification or license
Total	29.8	69.5
Occupational CTE participation level		
Nonparticipant	32.4	71.0
Sampler	28.9	71.6
Explorer	28.8	67.4
Concentrator	30.0	65.1
CTE concentration		
Agriculture and natural resources	37.2 !	71.5
Business	22.9	74.1 !
Communications and design	21.9	68.0 !
Computer and information science	23.4 !	49.5 !
Construction and architecture	36.6 !	45.2 !
Consumer and culinary services	30.9	66.8 !
Engineering technologies	20.8 !	57.8 !
Health sciences	47.3 !	66.1 !
Manufacturing	28.0 !	61.1 !
Marketing	20.4 !	74.6 !
Public services	‡	‡
Repair and transportation	47.5 !	59.7 !

! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Employment and Earnings Outcomes of High School CTE Students

This section presents the main findings for the report concerning employment, unemployment, earnings, and other outcomes for the high school class of 2004 (the subsequent section compares many of these outcomes to those from the high school class of 2000). Results are presented for CTE students overall and broken down by highest level of education attained by 2012. It is important to remember that these outcomes are not adjusted for preexisting differences between CTE students and nonstudents.

It is also important to consider the general economic environment of the high school class of 2004 in the years between their high school completion and 2012. This was a period

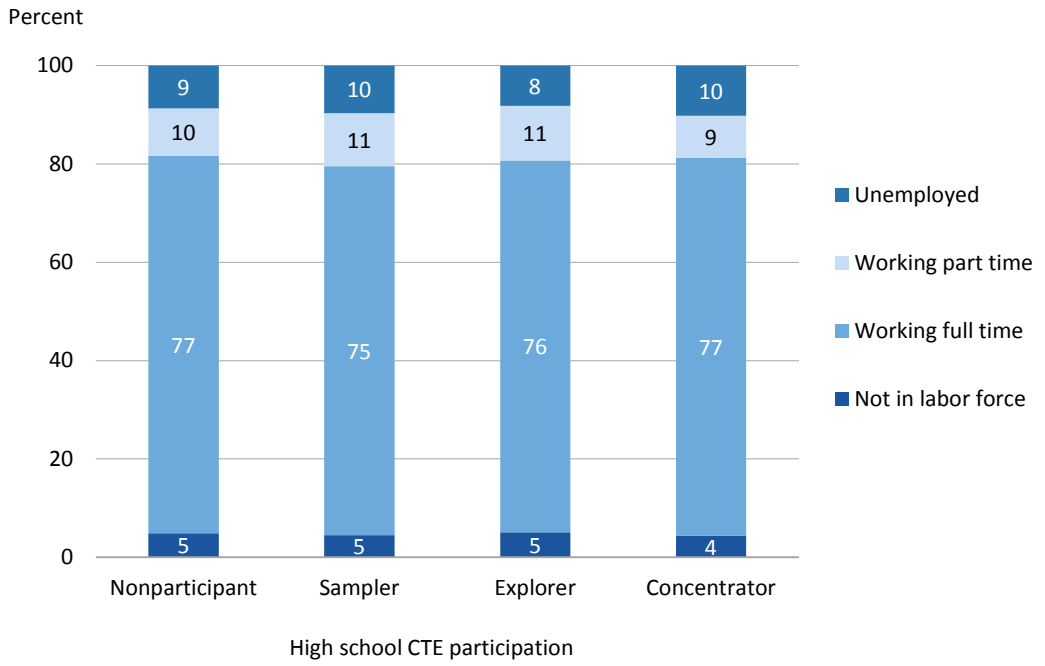
marked by strong growth in the gross domestic product (GDP) from 2004–08, followed by the largest economic disruption in U.S. history since the Great Depression. Although economic growth resumed in 2010, the after-effects of the Great Recession continued to linger. These effects were especially long and pronounced for specific industries, such as housing, related to the fields of study of many high school CTE students. The year 2012 represents the culmination of years of disruption followed by slow growth; for four-year college graduates who typically completed a bachelor's degree in 2008 or later, the timing of these events could exert an especially profound negative effect on employment and earnings opportunities. With this in mind, this section considers employment outcomes as well as experiences with unemployment; per-hour wages as well as annual income; and various other outcomes related to perceptions of work and education.

Employment and Unemployment

Employment Status

Figure 6 presents the 2012 employment status of high school CTE participants and nonparticipants from the class of 2004. The figure only presents results for those that were not currently enrolled in a postsecondary education institution. Perhaps surprisingly, there was very little variation in employment status among students with different levels of high school CTE participation. Between 75 and 77 percent of high school completers from 2004 were working full time in 2012; another 8 to 11 percent each were working part time or unemployed. This results in a labor force participation rate of 95 to 96 percent. None of the small differences evident in this figure are statistically significant.

Figure 6. Percentage distribution of employment status among non-college-enrolled members of the class of 2004 in 2012



NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

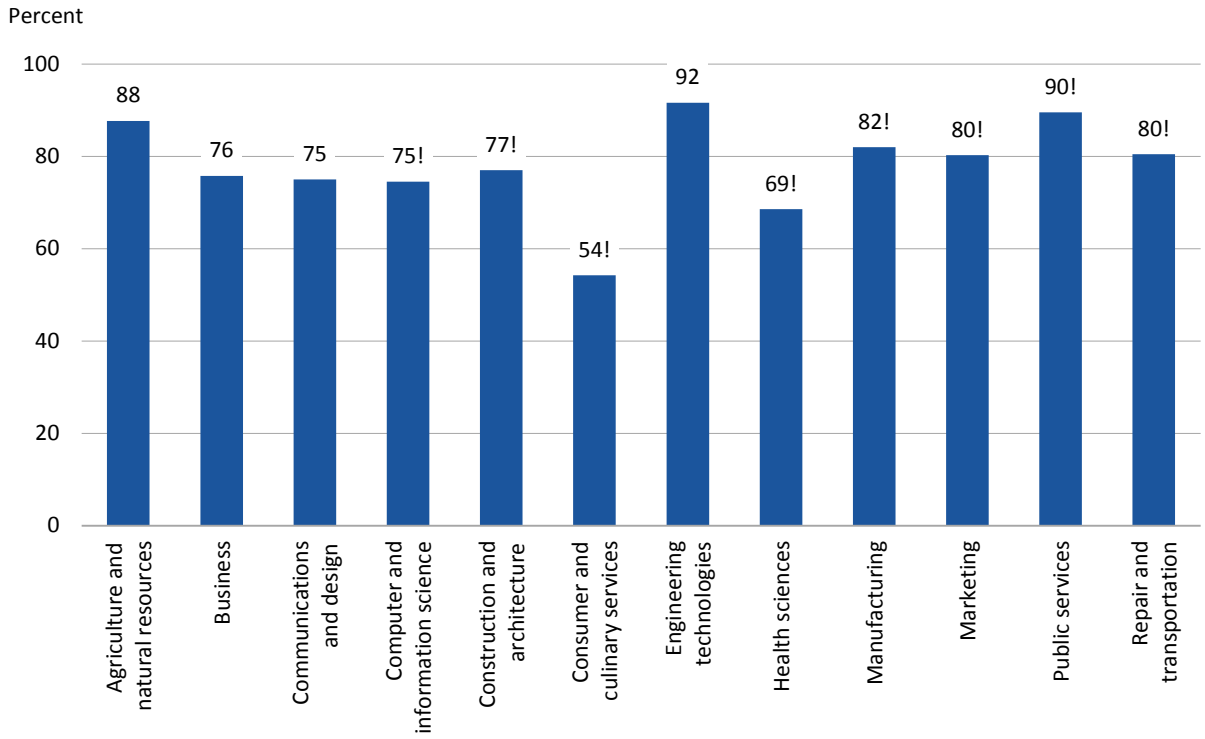
Table 5, which presents the same outcomes broken down by field of study, is consistent with these results, showing high rates of labor force participation and few detectable differences across CTE fields of study. Figure 7 illustrates part of table 5, showing the percentage of the non-college-enrolled class of 2004 that was working full time, by high school CTE field of study. Again, few statistically significant differences are detectable across high school fields of study. The high school CTE concentrators most likely to be working full time were those in engineering technologies at 92 percent and public services at 90 percent. They were more likely than their peers in consumer and culinary services (54 percent) to be working full time.

Table 5. Percentage distribution of employment status of the high school class of 2004 in 2012 who were not currently enrolled in postsecondary education, by high school career and technical education (CTE) participation level and CTE concentration field of study

	In labor force				
High school CTE participation	Total	Working full time	Working part time	Unemployed	Not in labor force
Total	95.3	75.8	10.2	9.3	4.7
Occupational CTE participation level					
Nonparticipant	95.1	76.7	9.7	8.7	4.9
Sampler	95.5	75.1	10.7	9.7	4.5
Explorer	94.9	75.6	11.1	8.2	5.1
Concentrator	95.6	76.8	8.6	10.2	4.4
CTE concentration					
Agriculture and natural resources	97.0	87.7	5.1	4.1	3.0
Business	90.1	75.8	5.9	8.4	9.9
Communications and design	96.5	75.0	15.8	5.7	3.5
Computer and information science	97.9	74.5 !	12.3	11.1 !	‡
Construction and architecture	97.5	77.0 !	8.6	11.9 !	‡
Consumer and culinary services	93.7	54.3 !	14.6 !	24.8 !	6.3
Engineering technologies	100.0	91.6	‡	5.4	#
Health sciences	95.5	68.6 !	12.8 !	14.2 !	4.5
Manufacturing	96.7	82.0 !	3.6	11.0	3.3
Marketing	95.3	80.3 !	4.2	10.8 !	4.7
Public services	100.0	89.6 !	‡	‡	#
Repair and transportation	99.0	80.5 !	6.8	11.8	‡

Rounds to zero.
! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Figure 7. Percentage of the high school class of 2004 working full time in 2012, for those not currently enrolled in postsecondary education, by high school career and technical education concentration field of study



! Interpret data with caution. Standard error is 5 percentage points or greater.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

From the perspective of CTE, these results are encouraging when the aforementioned differences in the backgrounds of high school CTE students are considered. Recall that CTE concentrators, for example, were less likely to earn higher levels of postsecondary education, left high school with lower levels of academic preparation, and hailed from less advantaged socioeconomic backgrounds than their peers with less or no CTE involvement. The extent to which high school CTE may have improved CTE participants' prospects, or led to postsecondary education programs that did the same, cannot be determined from these findings, but the results are consistent with such an interpretation and suggest a potentially powerful role for CTE in early career outcomes.

Tables 6 through 9 present detailed results for percentages of the class of 2004 in 2012 in the labor force (i.e., full time, part time, or unemployed combined), working full time, working part time, and unemployed, by high school CTE participation level and concentrator field of

study. These detailed results confirm that there are few differences across CTE participants and nonparticipants in employment status in 2012.

Table 6. Percentage of the high school class of 2004 in 2012 in the labor force, for those not currently enrolled in postsecondary education, by education attainment, high school career and technical education (CTE) participation level, and CTE concentration field of study

		Education attainment				
High school CTE participation	Total	High school credential only	Some postsecondary attendance, no credential	Under-graduate certificate or diploma	Associate degree	Bachelor's degree or higher
Total	95.3	90.5	94.7	93.0	95.8	97.9
Occupational CTE participation level						
Nonparticipant	95.1	90.4	94.4	90.3	94.2	97.0
Sampler	95.5	87.5	95.8	93.6	95.4	98.1
Explorer	94.9	91.4	91.7	94.4	97.9	98.3
Concentrator	95.6	93.5	95.9	92.6	94.7	98.6
CTE concentration						
Agriculture and natural resources	97.0	100.0	92.2 !	95.3	100.0	100.0
Business	90.1	74.3 !	89.1 !	100.0	68.2 !	97.9
Communications and design	96.5	100.0	100.0	75.5 !	100.0	98.4
Computer and information science	97.9	100.0	100.0	73.7 !	100.0	100.0
Construction and architecture	97.5	100.0	94.6 !	100.0	100.0	91.9 !
Consumer and culinary services	93.7	89.6 !	94.1	95.4	100.0	91.5 !
Engineering technologies	100.0	100.0	100.0	100.0	100.0	100.0
Health sciences	95.5	91.0 !	100.0	87.0 !	84.3 !	100.0
Manufacturing	96.7	94.1	100.0	92.5 !	100.0	100.0
Marketing	95.3	83.3 !	99.1	97.8	89.6 !	96.1
Public services	100.0	‡	100.0	‡	‡	100.0
Repair and transportation	99.0	100.0	100.0	94.4 !	100.0	100.0

! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
NOTE: In the labor force includes employed full time, employed part time, or unemployed.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Table 7. Percentage of the high school class of 2004 in 2012 working full time, for those in the labor force and not currently enrolled in postsecondary education, by education attainment, high school career and technical education (CTE) participation level, and CTE concentration field of study

		Education attainment				
High school CTE participation	Total	High school credential only	Some postsecondary attendance, no credential	Under-graduate certificate or diploma	Associate degree	Bachelor's degree or higher
Total	75.8	72.1	74.0	74.2	81.3	86.6
Occupational CTE participation level						
Nonparticipant	76.7	68.4 !	73.5	73.2 !	80.4 !	87.2
Sampler	75.1	68.2	73.9	69.6	78.9	86.3
Explorer	75.6	78.4	75.2	76.3	83.5	83.4
Concentrator	76.8	73.1	73.3	81.2	82.9	90.8
CTE concentration						
Agriculture and natural resources	87.7	86.3 !	90.8	95.8	90.5 !	90.4 !
Business	75.8	71.3 !	73.9 !	89.0 !	79.6 !	92.1
Communications and design	75.0	32.0 !	74.5 !	73.5 !	84.1 !	93.7
Computer and information science	74.5 !	47.7 !	67.1 !	65.7 !	87.4 !	90.0
Construction and architecture	77.0 !	73.1 !	78.5 !	72.3 !	100.0	89.1 !
Consumer and culinary services	54.3 !	59.8 !	50.4 !	59.7 !	51.6 !	90.0 !
Engineering technologies	91.6	68.2 !	87.5 !	100.0	100.0	100.0
Health sciences	68.6 !	22.8 !	65.0 !	86.5 !	66.0 !	87.8 !
Manufacturing	82.0 !	86.8 !	70.7 !	72.5 !	100.0	94.8 !
Marketing	80.3 !	100.0	81.5 !	75.1 !	79.4 !	87.9 !
Public services	89.6 !	‡	100.0	‡	‡	78.6 !
Repair and transportation	80.5 !	82.3 !	72.1 !	86.7 !	80.7 !	100.0

! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Table 8. Percentage of the high school class of 2004 in 2012 working part time, for those in the labor force and not currently enrolled in postsecondary education, by education attainment, high school career and technical education (CTE) participation level, and CTE concentration field of study

		Education attainment				
High school CTE participation	Total	High school credential only	Some postsecondary attendance, no credential	Under-graduate certificate or diploma	Associate degree	Bachelor's degree or higher
Total	10.2	14.4	11.9	14.2	8.5	8.3
Occupational CTE participation level						
Nonparticipant	9.7	85.8	88.4	86.3	89.2	91.7
Sampler	10.7	81.0	88.9	83.1	89.9	91.7
Explorer	11.1	88.2	85.4	87.4	91.2	89.7
Concentrator	8.6	88.8	88.8	88.9	96.1	93.8
CTE concentration						
Agriculture and natural resources	5.1	3.9	6.9	#	‡	‡
Business	5.9	10.1 !	‡	‡	‡	5.3
Communications and design	15.8	59.0 !	‡	26.5 !	#	6.3
Computer and information science	12.3	‡	17.3 !	#	#	10.0
Construction and architecture	8.6	#	‡	‡	#	‡
Consumer and culinary services	14.6 !	18.1 !	15.9 !	22.7 !	#	‡
Engineering technologies	‡	#	‡	#	#	#
Health sciences	12.8 !	‡	‡	‡	#	‡
Manufacturing	3.6	#	‡	‡	#	#
Marketing	4.2	#	‡	‡	‡	#
Public services	‡	#	#	#	100.0	#
Repair and transportation	6.8	7.0	‡	#	#	#

Rounds to zero.
! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Table 9. Percentage of the high school class of 2004 in 2012 unemployed, for those in the labor force and not currently enrolled in postsecondary education, by education attainment, high school career and technical education (CTE) participation level, and CTE concentration field of study

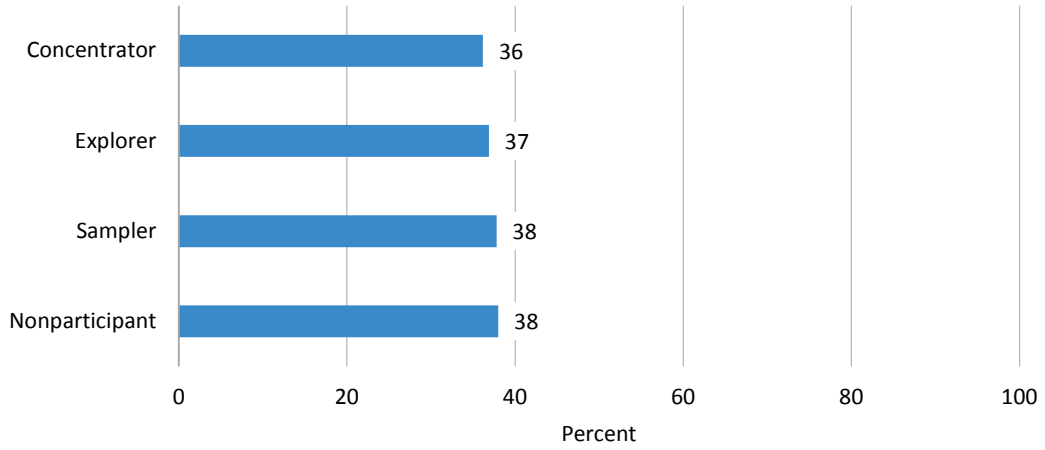
		Education attainment				
High school CTE participation	Total	High school credential only	Some postsecondary attendance, no credential	Under-graduate certificate or diploma	Associate degree	Bachelor's degree or higher
Total	9.3	13.5	14.1	11.6	10.2	5.1
Occupational CTE participation level						
Nonparticipant	8.7	17.3 !	14.9	13.1	8.7 !	4.5
Sampler	9.7	12.9	15.0	13.5	11.0	5.5
Explorer	8.2	9.9	10.2	11.1	7.8	6.3
Concentrator	10.2	15.7	15.5	7.7	13.2	3.1
CTE concentration						
Agriculture and natural resources	4.1	9.8 !	‡	‡	#	‡
Business	8.4	18.6 !	21.4 !	#	‡	‡
Communications and design	5.7	‡	‡	#	15.9 !	#
Computer and information science	11.1 !	‡	‡	‡	‡	#
Construction and architecture	11.9 !	‡	‡	#	#	#
Consumer and culinary services	24.8 !	22.1 !	33.7 !	17.6 !	48.4 !	#
Engineering technologies	5.4	31.8 !	‡	#	#	#
Health sciences	14.2 !	52.5 !	‡	#	‡	‡
Manufacturing	11.0	‡	20.0 !	‡	#	‡
Marketing	10.8 !	#	‡	‡	#	‡
Public services	‡	#	#	#	#	‡
Repair and transportation	11.8	10.7	10.8 !	‡	‡	#

Rounds to zero.
! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Unemployment Experiences

If employment status at a given point in time might make it difficult to detect differences in employment experiences, a cumulative measure of having ever been unemployed may show any differences. Figure 8 shows the percentage of the (non-college enrolled) class of 2004 that had ever been unemployed. Between 36 and 38 percent of students with different CTE levels of participation reported having ever been unemployed (differences not statistically significant). Results further broken down by highest level of education attainment also show no statistically significant differences (table 10). There were very few differences by concentrator field of study, as well.

Figure 8. Percentage of the high school class of 2004 in 2012 ever unemployed since 2009, for those not currently enrolled in postsecondary education, by high school career and technical education participation level



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Table 10. Percentage of the high school class of 2004 in 2012 ever unemployed since 2009, by education attainment, high school career and technical education (CTE) participation level, and CTE concentration field of study

		Education attainment				
High school CTE participation	Total	High school credential only	Some postsecondary attendance, no credential	Under-graduate certificate or diploma	Associate degree	Bachelor's degree or higher
Total	37.4	38.5	40.7	40.3	34.3	34.3
Occupational CTE participation level						
Nonparticipant	38.0	45.1 !	36.2	48.3 !	42.2 !	36.2
Sampler	37.8	38.7	42.0	39.5	34.9	34.4
Explorer	36.9	34.6	40.8	39.9	34.4	33.6
Concentrator	36.2	38.9	42.1	36.7	27.7	30.8
CTE concentration						
Agriculture and natural resources	33.6 !	29.8 !	40.7 !	39.9 !	19.2 !	28.1 !
Business	35.5	31.1 !	45.2 !	36.1 !	21.5 !	33.8 !
Communications and design	33.7 !	‡	44.1 !	24.6 !	32.0 !	35.0 !
Computer and information science	35.5 !	60.5 !	46.2 !	34.8 !	‡	23.2 !
Construction and architecture	49.0 !	64.4 !	45.9 !	‡	‡	89.0 !
Consumer and culinary services	47.4 !	23.8 !	56.2 !	50.4 !	83.3 !	‡
Engineering technologies	29.4 !	41.3 !	25.5 !	#	39.5 !	31.5 !
Health sciences	30.3	56.1 !	18.8 !	23.4 !	‡	35.2 !
Manufacturing	46.3 !	48.3 !	58.7 !	61.9 !	‡	18.0 !
Marketing	30.1 !	‡	25.6 !	57.4 !	‡	31.9 !
Public services	36.7 !	#	42.9 !	#	#	‡
Repair and transportation	38.6 !	42.7 !	43.5 !	41.5 !	22.6 !	‡

Rounds to zero.
! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Tables 11 and 12 provide similar results for the average number of months members of the class of 2004 in 2012 were unemployed since 2009 (between eight and 10 months, depending on CTE participation level, with no statistically significant differences) and the average number of months of the longest unemployment spell experienced (seven to eight months, also no statistically significant differences).

Table 11. Average number of months the high school class of 2004 members in 2012 were unemployed since 2009, by education attainment, high school career and technical education (CTE) participation level, and CTE concentration field of study

		Education attainment				
High school CTE participation	Total	High school credential only	Some postsecondary attendance, no credential	Under-graduate certificate or diploma	Associate degree	Bachelor's degree or higher
Total	9.1	10.8	10.7	10.3	9.1	6.6
Occupational CTE participation level						
Nonparticipant	8.3	13.4	9.9	10.1	6.6	6.5
Sampler	9.2	11.6	10.6	10.5	10.6	6.5
Explorer	8.9	7.9	10.2	8.6	9.4	7.4
Concentrator	10.1	10.7	12.2	11.9	7.7	6.4
CTE concentration						
Agriculture and natural resources	12.1	15.1	14.8	11.2 !	‡	6.2
Business	8.2	6.1	10.2	17.2 !	6.1	5.4
Communications and design	8.0	‡	8.8	7.2 !	12.3	6.2
Computer and information science	8.1	14.7 !	6.6	13.2 !	‡	7.6 !
Construction and architecture	11.7	13.7	13.9	‡	‡	9.0
Consumer and culinary services	14.4	3.6	17.4	14.5	9.1 !	‡
Engineering technologies	8.7	7.3 !	15.8	#	5.3	5.3
Health sciences	8.0	15.5	14.7 !	4.8	‡	3.7
Manufacturing	9.9	12.0	8.7	10.8 !	‡	9.9
Marketing	11.4 !	‡	15.7 !	8.3 !	‡	10.5 !
Public services	9.1 !	#	9.3 !	#	#	‡
Repair and transportation	9.9	11.1	8.3 !	12.0	6.7	‡

Rounds to zero.
! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Table 12. Average number of months of longest unemployment spell of the high school class of 2004 in 2012 since 2009, by education attainment, high school career and technical education (CTE) participation level, and CTE concentration field of study

		Education attainment				
High school CTE participation	Total	High school credential only	Some postsecondary attendance, no credential	Under-graduate certificate or diploma	Associate degree	Bachelor's degree or higher
Total	7.5	9.6	8.5	8.7	8.3	5.6
Occupational CTE participation level						
Nonparticipant	6.9	12.5	7.2	9.9	6.0	5.6
Sampler	7.7	10.5	8.8	9.2	9.4	5.2
Explorer	7.6	7.6	8.5	6.8	8.8	6.2
Concentrator	8.0	8.7	9.2	8.8	7.3	5.7
CTE concentration						
Agriculture and natural resources	8.0	16.0	9.9	6.0 !	‡	3.9
Business	6.9	5.8	10.6	8.2 !	6.1	4.6
Communications and design	6.6	#	6.3	3.6	11.7	5.0
Computer and information science	7.2	13.8 !	5.7	8.1 !	‡	7.7 !
Construction and architecture	10.2	12.1 !	11.7	‡	‡	9.0
Consumer and culinary services	10.8	3.6	12.0	12.7	8.3 !	‡
Engineering technologies	6.6	1.8 !	13.7 !	#	4.8	5.3
Health sciences	6.1	‡	12.0 !	2.7	‡	3.5
Manufacturing	8.5	9.7	7.8	10.3 !	‡	8.6
Marketing	8.8 !	#	5.2 !	8.2 !	‡	12.2 !
Public services	5.5 !	#	‡	#	#	‡
Repair and transportation	8.0	8.5	4.8 !	11.4	6.7	‡

Rounds to zero.
! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

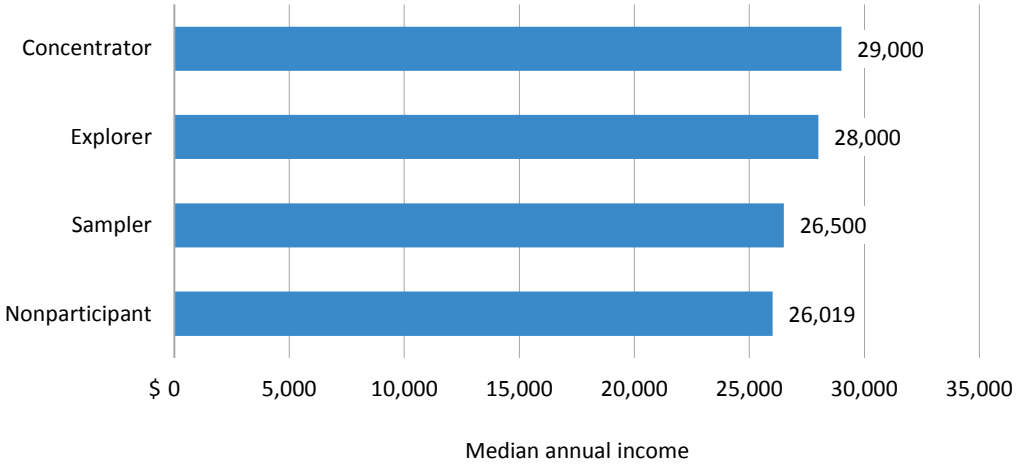
Earnings

Annual Income

The results from figure 9, which show the median annual income earned by the (non-college-enrolled) class of 2004 in 2012, continue the theme of few differences in employment outcomes for CTE versus non-CTE students. Although the figure shows that high school CTE concentrators have a nominally higher median income of $29,000 compared to CTE nonparticipants with about $26,000, the differences are not statistically significant. Table 13 shows additional detail by highest educational level attained, where there were also few detectable differences. One difference is that concentrators who had

earned an associate degree had higher median annual income ($34,000) than nonparticipants with an associate degree ($22,000). Agriculture and natural resources concentrators were among the highest earners, with a higher median annual income ($35,000) than consumer and culinary services ($20,000) or health sciences concentrators ($25,000).

Figure 9. Median annual income of the class of 2004 in 2012, for those not currently enrolled in postsecondary education, by high school career and technical education participation level



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Table 13. Median annual income for high school class of 2004 in 2012 individuals not currently enrolled in postsecondary education, by education attainment, high school career and technical education (CTE) participation level, and CTE concentration field of study

		Education attainment among non-collge enrolled				
High school CTE participation	Total	High school credential only	Some postsecondary attendance, no credential	Under-graduate certificate or diploma	Associate degree	Bachelor's degree or higher
Total	$27,000	$22,000	$22,500	$24,000	$26,500	$33,000
Occupational CTE participation level						
Nonparticipant	26,019	20,000	20,000	23,000	22,000	32,000
Sampler	26,500	20,000	23,000	20,000	27,000	33,000
Explorer	28,000	25,000	24,000	25,000	26,000	34,000
Concentrator	29,000	23,000	25,000	30,000	34,000	35,000
CTE concentration						
Agriculture and natural resources	35,000	28,000	25,000	39,000	37,000	37,500
Business	28,000	23,000	23,000	24,000 !	14,000	37,000
Communications and design	30,000	19,000	20,000	22,000	45,893	35,000
Computer and information science	30,000	12,000 !	25,000	12,000 !	55,000	42,000
Construction and architecture	25,000	15,000 !	26,000	21,000 !	19,000 !	25,000 !
Consumer and culinary services	20,000	17,500	18,000	17,000	35,000	27,000
Engineering technologies	35,000	22,000	35,000	42,000	44,000	35,000
Health sciences	25,000	13,000 !	17,000	27,000	26,000	30,000
Manufacturing	25,000	34,000	17,000	30,000	36,000	20,000
Marketing	30,000	15,000 !	25,000	20,000	32,000	37,000
Public services	34,000	‡	34,000	‡	‡	23,000
Repair and transportation	35,000	28,000	28,000	35,000	41,000	35,000

! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Hourly Wage

Annual income is affected both by the rate of pay and the number of hours a person works. To see if the lack of differences in income is related to differences in hours worked, results for hourly wage in the current or most recent job were computed. However, the median hourly wage, at $14.80 for study participants in 2012, showed no differences across CTE participation level overall or when further broken down by highest postsecondary attainment level (table 14). Some differences across concentrator fields of study were evident: The median high school CTE concentrator in engineering technologies earned more per hour ($19.00) than those in business ($14.00), consumer and culinary services ($11.36), or health

sciences ($13.85). These results are consistent with the results for annual income, indicating that the number of hours worked did not noticeably affect the lack of differences in income.

Table 14. Median hourly wage of the high school class of 2004 in 2012 in current or most recent job for those not currently enrolled in postsecondary education, by education attainment, high school career and technical education (CTE) participation level, and CTE concentration field of study

		Education attainment among non-collge enrolled				
High school CTE participation	Total	High school credential only	Some postsecondary attendance, no credential	Under-graduate certificate or diploma	Associate degree	Bachelor's degree or higher
Total	$14.80	$11.00	$12.00	$12.50	$14.60	$18.03
Occupational CTE participation level						
Nonparticipant	15.00	10.80	11.27	12.50	13.50	18.27
Sampler	14.75	10.91	12.00	11.50	14.55	18.00
Explorer	15.00	12.30	12.00	14.00	15.00	17.79
Concentrator	14.42	11.50	12.00	14.50	15.50	18.50
CTE concentration						
Agriculture and natural resources	15.65	16.04 !	12.00	15.00	15.58	18.00
Business	14.00	10.50	12.00	11.35	9.75	18.47
Communications and design	14.00	12.00	10.50	12.00	10.50	16.11
Computer and information science	16.50	9.50	11.11	9.00	27.24	25.00
Construction and architecture	13.50	12.00 !	15.00	16.50	11.88	16.00
Consumer and culinary services	11.36	9.25	10.50	14.73	15.39	19.23
Engineering technologies	19.00	14.00	13.00	19.00	25.00	23.67
Health sciences	13.85	8.00	10.50	16.75	15.60	15.87
Manufacturing	16.25	16.25	15.00	17.00	18.00	24.00
Marketing	17.31	15.00	12.00	12.50	17.00	24.04
Public services	14.35	‡	15.38	‡	‡	‡
Repair and transportation	15.00	13.00	15.00	14.10	20.00	21.63

! Interpret data with caution. Standard error is one-third as or larger than the estimate.
‡ Reporting standards not met.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

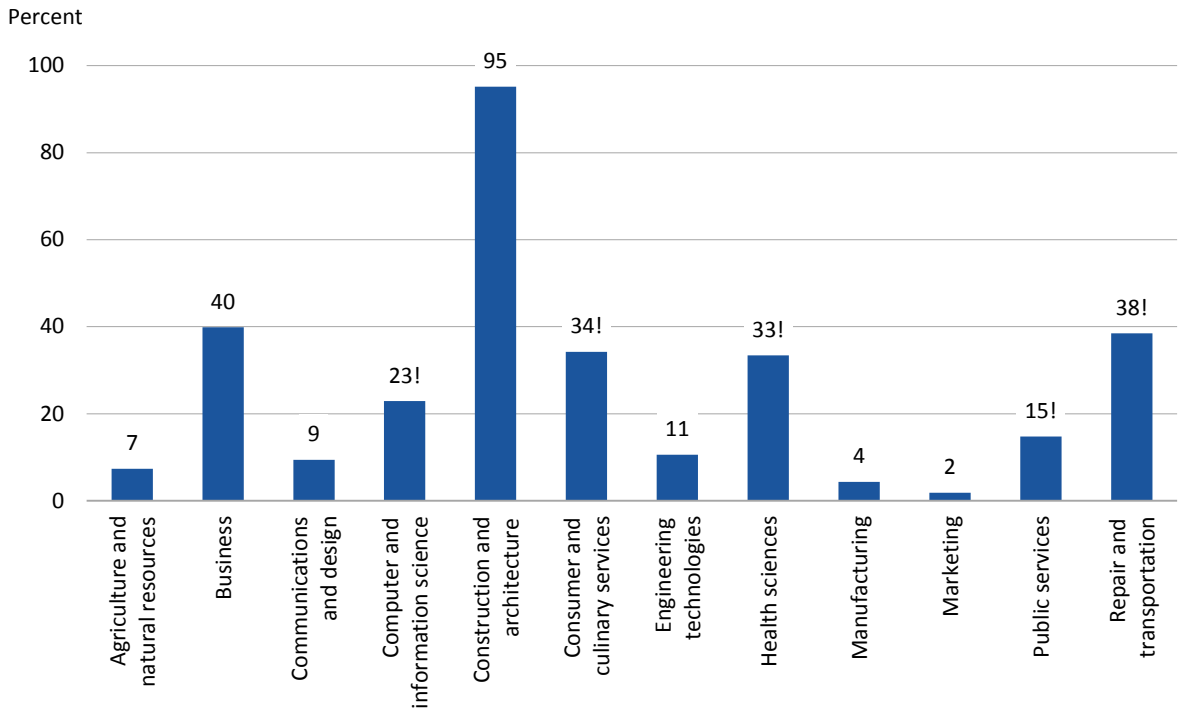
Other Outcomes

The employment and earnings outcomes of CTE participants and nonparticipants eight years after completing high school are remarkably similar, and few differences were seen in these outcomes across concentrator fields of study. However, other outcomes related employment and earnings may reveal differences.

Match Between High School CTE Field of Study and Occupational Field

High school students who complete a CTE concentration may or may not go on to work in occupations in those fields. Figure 10 and table 15 present the percentage of the class of 2004 whose job in 2012 matches their high school field of study. The one large and noticeable finding is that construction and architecture concentrators were significantly more likely than all other concentrators to be working in their field. Indeed, 95 percent of all high school construction and architecture concentrators who were working in 2012 were in that field. This is important evidence for the efficacy of high school CTE in either attracting students whose long-term interests are in construction or architecture, or shaping their interests and pathways to the degree that they go into that line of work as adults.

Figure 10. Percentage of the class of 2004 in 2012 whose occupation matches their high school field of study, by high school career and technical education concentration field of study



! Interpret data with caution. Standard error is 5 percentage points or greater.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Table 15. Percentage of the class of 2004 in 2012 whose occupation matches their high school field of study, by high school career and technical education (CTE) concentration field of study

High school CTE field of study	Total
Total	4.2
CTE concentration	
Agriculture and natural resources	7.3
Business	39.9
Communications and design	9.4
Computer and information science	22.9 !
Construction and architecture	95.2
Consumer and culinary services	34.2 !
Engineering technologies	10.6
Health sciences	33.4 !
Manufacturing	4.4
Marketing	1.9
Public services	14.8 !
Repair and transportation	38.5 !

! Interpret data with caution. Standard error is 5 percentage points or greater.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

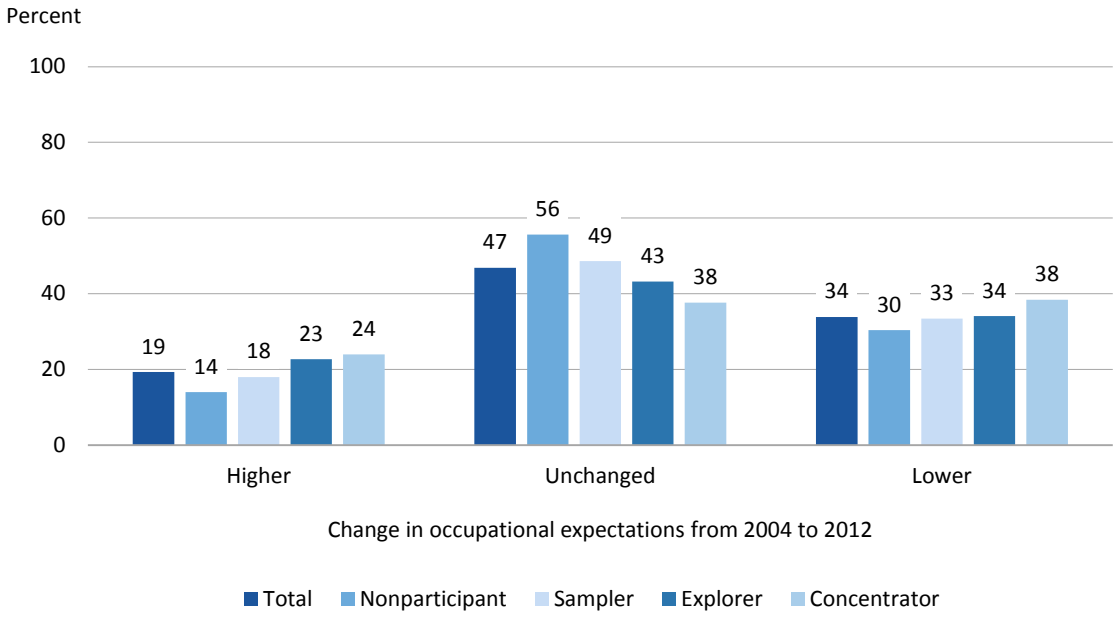
Business, consumer and culinary services, health sciences, and repair and transportation concentrators were among the other groups with higher levels of matching between high school field of study and occupation eight years after high school completion. Manufacturing and marketing concentrators, however, exhibited very low rates of matching (4 and 2 percent, respectively).

Changes in Occupational Expectations and Perceptions of Importance of Postsecondary Degree

Occupational expectations and perceptions of the importance of education are two other important markers of how high school CTE may affect work-related postsecondary outcomes. Figure 11 shows changes in occupational expectations (defined as occupation the respondent expects to have at age 30) between high school completion in 2004 and 2012, by CTE participation level. High school CTE concentrators were more likely to have changed their occupational expectations than nonparticipants: 56 percent of nonparticipants did not experience a change in occupational expectations, while 38 percent of CTE concentrators saw no change. Not only were their expectations more likely to change, but CTE concentrators were more likely to see their occupational expectations increase after high school than nonparticipants (24 percent vs. 14 percent, respectively). Although they were nominally more likely to have lowered expectations as well (38 percent vs. 30 percent of

nonparticipants), that difference was not statistically significant. (Few differences by CTE field of study were statistically significant; table 16 has the details.) This suggests that, while in high school, CTE students have relatively unformed occupational expectations, despite their focus on CTE.

Figure 11. Percentage change in occupational expectations since high school completion for the high school class of 2004 in 2012, by high school career and technical education participation level



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Table 16. Percentage change in occupational expectations since high school completion for the high school class of 2004 in 2012, by high school career and technical education (CTE) participation level and CTE concentration field of study

High school CTE participation	Change in occupational expectations from 2004 to 2012		
	Higher	Unchanged	Lower
Total	19.3	46.9	33.9
Occupational CTE participation level			
Nonparticipant	14.0	55.6	30.4
Sampler	18.0	48.6	33.4
Explorer	22.7	43.2	34.0
Concentrator	24.0	37.7	38.4
Occupational CTE participation level			
Agriculture and natural resources	33.4 !	23.3	43.3 !
Business	18.4	46.3	35.3
Communications and design	19.0	35.4 !	45.6 !
Computer and information science	13.1 !	53.5 !	33.5 !
Construction and architecture	26.5 !	29.3 !	44.1 !
Consumer and culinary services	26.7 !	45.5 !	27.8 !
Engineering technologies	6.6	43.1 !	50.3 !
Health sciences	27.9 !	30.8 !	41.2 !
Manufacturing	15.3 !	52.7 !	32.0 !
Marketing	20.6 !	44.6 !	34.8 !
Public services	23.0 !	‡	72.1 !
Repair and transportation	45.2 !	21.0 !	33.8 !

! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

ELS:2002 respondents also reported the relative importance of their postsecondary degrees in preparing them for work and careers, and whether their jobs were related to their postsecondary degrees. Results are presented in table 17. There were no statistically significant differences by CTE participation level and few differences by CTE field of study.

Table 17. Percentage of the high school class of 2004 in 2012 reporting the importance of their postsecondary degrees in preparing for a career, and reporting a relationship between their postsecondary education and most recent or current job, by high school career and technical education (CTE) participation level and CTE concentration field of study

	Importance of postsecondary degree in preparing for work and career		Current or most recent job related to postsecondary major	
High school CTE participation	Very or somewhat important	Not at all important	Closely or somewhat related	Not related
Total	90.8	9.2	58.7	41.3
Occupational CTE participation level				
Nonparticipant	91.9	8.1	60.3	39.7
Sampler	91.6	8.4	57.4	42.6
Explorer	89.2	10.8	57.5	42.5
Concentrator	89.4	10.6	61.9	38.1
CTE concentration				
Agriculture and natural resources	89.0	11.0	64.3 !	35.7 !
Business	94.3	5.7	68.0	32.0
Communications and design	92.6	7.4	65.0 !	35.0 !
Computer and information science	79.6	20.4	64.4 !	35.6 !
Construction and architecture	85.8 !	14.2 !	52.1 !	47.9 !
Consumer and culinary services	94.4	5.6	40.6 !	59.4 !
Engineering technologies	86.7 !	13.3 !	58.4 !	41.6 !
Health sciences	95.0	5.0	63.7 !	36.3 !
Manufacturing	82.3 !	17.7 !	49.3 !	50.7 !
Marketing	89.6	10.4	77.8 !	22.2 !
Public services	82.7 !	‡	71.3 !	‡
Repair and transportation	80.4 !	19.6 !	62.2 !	37.8 !

! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Debt and Debt-to-Earnings Ratio

The debt that students accrue in pursuing postsecondary education, as well as debt incurred elsewhere, can be large burdens, especially for individuals working in less remunerative fields. The total amount borrowed for postsecondary education, the total nonmortgage debt (which includes education loans), and the total debt-to-income ratio were computed for CTE students at different participation levels and in different fields of study, by education attainment level. The results, presented in table 18, showed no statistically significant differences by CTE participation level and scattered association with CTE fields of study.

Table 18. Average amount borrowed for postsecondary education, total nonmortgage debt, and debt/income ratio for the high school of class of 2004 in 2012, by education attainment level, high school career and technical education (CTE) participation level, and CTE concentration field of study

	High school credential only			Some postsecondary attendance, no credential			Undergraduate certificate or diploma			Associate degree			Bachelor's degree or higher		
High school CTE participation	Average amount borrowed	Total non-mortgage debt	Debt/ income ratio	Average amount borrowed	Total non-mortgage debt	Debt/ income ratio	Average amount borrowed	Total non-mortgage debt	Debt/ income ratio	Average amount borrowed	Total non-mortgage debt	Debt/ income ratio	Average amount borrowed	Total non-mortgage debt	Debt/ income ratio
Total	†	$12,372	1.1	$9,606	$20,528	4.6	$9,539	$20,499	8.3 !	$13,986	$26,421	2.9	$32,714	$44,562	3.8
Occupational CTE participation level															
Nonparticipant	†	10,292	1.0 !	11,004	22,365	2.2	13,001	23,360	51.6 !	13,385	27,933	2.9 !	36,911	49,487	4.5
Sampler	†	12,953	1.5 !	10,234	21,659	6.0 !	9,396	18,094	1.3	16,513	28,029	4.2 !	32,237	43,627	3.5
Explorer	†	13,473	0.6	8,398	18,174	6.5 !	7,659	18,374	1.5	13,028	24,750	2.1 !	29,157	41,618	2.6
Concentrator	†	11,510	0.9	8,087	18,795	1.6	9,428	25,455 !	1.2	10,930	24,916	1.7	30,816	41,823	5.0 !
CTE concentration															
Agriculture and natural resources	†	11,324	0.6 !	8,530	23,480	1.7	7,154 !	23,464 !	0.6	8,145	13,969	0.5	20,069	30,098	0.8
Business	†	17,677	0.7 !	8,757	19,598	2.6 !	19,331	33,898	2.1	17,190	26,974	2.4 !	38,094	47,807	8.2 !
Communications and design	†	3,193 !	0.1 !	20,988	29,155	2.5	8,331 !	14,538	3.0 !	12,735	29,007	3.0 !	33,605	32,739	3.4 !
Computer and information science	†	7,299 !	4.2 !	6,049	19,515	0.7	4,063 !	33,033 !	2.1 !	11,548 !	23,084 !	1.7 !	24,785	39,417	3.7 !
Construction and architecture	†	19,967 !	1.4 !	5,677 !	19,996 !	0.9	9,797 !	18,572 !	0.8 !	2,937 !	9,362 !	0.2 !	5,258 !	6,627 !	0.2 !
Consumer and culinary services	†	6,257	0.7 !	8,302	9,656	1.1 !	8,849	8,574	0.4	8,763 !	22,967 !	1.6 !	29,212	47,510	8.3 !
Engineering technologies	†	15,316 !	0.7 !	6,964 !	20,747	1.2 !	859 !	36,128 !	1.7 !	8,266 !	14,797	1.2 !	35,001	33,879	1.7 !
Health sciences	†	1,299 !	0.1 !	7,993	23,278	3.7 !	8,470 !	12,064	0.7 !	7,013 !	11,424 !	0.6 !	34,673	52,542	2.9
Manufacturing	†	13,420 !	1.1 !	7,542	20,060	1.8 !	2,271 !	11,990	0.5	7,631 !	53,596 !	3.3 !	10,054 !	17,040	1.6 !
Marketing	†	27,230	2.7 !	6,705	15,850	0.8	7,645 !	16,655 !	3.2 !	9,814	19,163 !	0.7	36,335	68,705	16.7 !
Public services	†	‡	‡	2,202 !	16,855 !	1.2 !	‡	‡	‡	‡	‡	‡	28,864 !	47,351	3.3 !
Repair and transportation	†	9,992	0.9 !	3,917	17,924 !	0.4 !	14,707 !	76,305 !	0.4	10,529	29,930 !	0.8	26,227	54,022	1.6

† Not applicable.
! Interpret data with caution. Standard error is one-third as or larger than the estimate.
‡ Reporting standards not met.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002/12), Base Year through Third Follow-Up.

Changes in Employment and Earnings Between the High School Classes of 2004 and 1992

The contrast between the economic environment faced by the high school class of 2004 and the one faced by the class of 1992 in the eight years after their respective high school completions is stark. Between 1992 and 2000, the U.S. economy grew at an average annual rate of 3.9 percent, with no year of near-zero or negative growth. Between 2004 and 2012, however, the U.S. economy grew at an average annual rate of 1.8 percent, with no growth in 2008 and -3 percent growth in 2009 (World Bank 2015). In other words, the U.S. economy was expanding at about half the rate in the latter period as in the former.

This contrasting environment may have resulted in very different outcomes for high school CTE students, both for those who pursued postsecondary education and those who did not. This section compares the employment status, earnings, and work experiences of the class of 2004 (using results from ELS:2002) to the class of 1992 (using results from NELS:88). All earnings data have been adjusted to 2012 dollars.

Employment Status

The results in the prior section indicate that, despite differences in background and academic preparedness, high school CTE students from the class of 2004 experienced employment and earnings outcomes that were not noticeably different from those of CTE nonparticipants. Table 19 compares these outcomes to those of the class of 1992 and shows that the same was true in 2000: high labor force participation rates, no statistically significant differences across levels of CTE participation, and few differences across CTE fields of study. When comparing the class of 2004 to the class of 1992, there are no statistically significant differences in labor force participation by CTE participation level or concentrator field of study.

Table 19. Percentage distribution of employment status of the high school class of 2004 in 2012 versus the high school class of 1992 in 2000, for those not currently enrolled in postsecondary education, by high school career and technical education (CTE) participation level and CTE concentration field of study

	Class of 2004 in 2012					Class of 1992 in 2000				
		In labor force			Not in labor force		In labor force			Not in labor force
High school CTE participation	Total	Working full-time	Working part-time	Unemployed		Total	Working full-time	Working part-time	Unemployed	
Total	95.3	75.8	10.2	9.3	4.7	95.1	81.7	10.5	2.9	4.9
Occupational CTE participation level										
Nonparticipant	95.1	76.7	9.7	8.7	4.9	96.3	77.9	15.0	3.5	3.7
Sampler	95.5	75.1	10.7	9.7	4.5	93.8	80.0	11.0	2.8	6.2
Explorer	94.9	75.6	11.1	8.2	5.1	95.7	86.0	8.1	1.6	4.3
Concentrator	95.6	76.8	8.6	10.2	4.4	95.9	85.1	7.2	3.6	4.1
CTE concentration										
Agriculture and natural resources	97.0	87.7	5.1	4.1	3.0	99.4	94.9	2.0	2.6	‡
Business	90.1	75.8	5.9	8.4	9.9	94.7	82.5	9.8	2.3	5.3
Communications and design	96.5	75.0	15.8	5.7	3.5	94.0	86.1 !	6.1	‡	‡
Computer and information science	97.9	74.5 !	12.3	11.1 !	‡	98.7	98.7	#	#	‡
Construction and architecture	97.5	77.0 !	8.6	11.9 !	‡	98.5	90.4 !	‡	‡	‡
Consumer and culinary services	93.7	54.3 !	14.6 !	24.8 !	6.3	86.9 !	70.6 !	11.1	5.2	13.1 !
Engineering technologies	100.0	91.6	‡	5.4	#	99.3	92.5	6.8	#	‡
Health sciences	95.5	68.6 !	12.8 !	14.2 !	4.5	91.2	65.5 !	‡	20.4 !	8.8
Manufacturing	96.7	82.0 !	3.6	11.0	3.3	100.0	92.9	2.6	4.5	#
Marketing	95.3	80.3 !	4.2	10.8 !	4.7	98.9	67.1 !	30.1 !	‡	‡
Public services	100.0	89.6 !	‡	‡	#	100.0	100.0	#	#	#
Repair and transportation	99.0	80.5 !	6.8	11.8	‡	97.7	91.7	‡	5.8	2.3

Rounds to zero.
! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88/2000), Third and Fourth Follow-Up; and Education Longitudinal Study of 2002 (ELS:2002/12), Second and Third Follow-Up.

There are some differences in the percentage working full time and the percentage unemployed however. In 2012, 77 percent of CTE concentrators and 76 percent of CTE explorers (who had earned at least three occupational credits but did not concentrate in a CTE area) were working full time, compared with 85 and 86 percent (respectively) in 2000. Computer and information science concentrators were also less likely to work full time in 2012 versus 2000 (75 percent vs. 99 percent)—the only concentrators for whom a significant difference was observed.

The more consistent result is that students of all CTE participation levels were more likely to be unemployed in 2012 than in 2000. Eight to 10 percent of the class of 2004 were unemployed in 2012, but only 2 to 4 percent of the class of 1992 were unemployed in 2000. This is direct evidence for the striking difference in economic opportunities facing the two cohorts. However, in no case were high school CTE participants more or less likely than their peers to have a given employment status when compared to nonparticipants from their own cohort. That is, CTE participation in high school may have had, at worst, no impact on employment status and, at best, a positive impact in helping students overcome their disadvantaged backgrounds.

Further breakdowns by gender, race/ethnicity, and SES are provided in tables 20, 21, and 22 (respectively). Male CTE concentrators and explorers were less likely in 2012 to work full time than their peers in 2000 (85 percent vs. 95 percent for concentrators; 84 percent vs. 93 percent for explorers); and male CTE concentrators, explorers, and samplers were all more likely to be unemployed (e.g., 8 percent vs. 2 percent for concentrators). There were no differences detected related to full-time work for female CTE concentrators when compared to their peers in 2000. Asian CTE concentrators were less likely to be working full time in 2012 than in 2000 (64 percent vs. 96 percent). White CTE participants at all levels (sampler, explorer, and concentrator) were more likely to be unemployed in 2012 than in 2000. Finally, the only differences for CTE concentrators by SES quartile were among those in the second quartile: in 2012, they were less likely to be working full time and more likely to be unemployed than in 2000.

Table 20. Percentage distribution of employment status of the high school class of 2004 in 2012 versus the high school class of 1992 in 2000, for those not currently enrolled in postsecondary education, by gender and high school career and technical education (CTE) participation level

Gender and high school occupational CTE participation level	Class of 2004 in 2012					Class of 1992 in 2000				
	In labor force				Not in labor force	In labor force				Not in labor force
	Total	Working full time	Working part time	Unemployed		Total	Working full time	Working part time	Unemployed	
Female - total	92.2	68.8	13.1	10.3	7.8	91.1	73.8	13.7	3.6	8.9
Nonparticipant	92.6	72.1	12.0	8.5	7.4	94.8	73.9	17.7	3.2	5.2
Sampler	92.7	69.7	12.8	10.2	7.3	89.4	74.0	11.7	3.7	10.6
Explorer	90.9	65.5	14.7	10.6	9.1	89.1	74.5	12.3	2.3	10.9
Concentrator	92.0	65.0	14.0	13.0	8.0	91.2	72.7	13.7	4.8	8.8
Male - total	98.6	83.4	7.1	8.2	1.4	99.4	90.1	7.1	2.2	0.6
Nonparticipant	98.8	83.7	6.2	8.9	1.2	98.9	84.8	10.2	4.0	1.1
Sampler	99.1	81.8	8.2	9.1	0.9	99.3	87.6	10.0	1.7	0.7
Explorer	98.2	83.8	8.2	6.2	1.8	99.5	92.7	5.7	1.1	0.5
Concentrator	98.2	85.4	4.6	8.2	1.8	99.6	94.8	2.1	2.6	0.4
Male-female difference	-6.4	-14.6	6.0	2.1	6.4	-8.3	-16.3	6.5	1.4	8.3
Nonparticipant	-6.2	-11.6	5.8	-0.4	6.2	-4.1	-10.9 !	7.6 !	-0.8	4.1
Sampler	-6.4	-12.0	4.6	1.1	6.4	-9.9	-13.6 !	1.7	2.0	9.9
Explorer	-7.3	-18.3	6.5	4.4	7.3	-10.5	-18.2	6.6	1.2	10.5
Concentrator	-6.3	-20.4	9.4	4.7	6.3	-8.4	-22.1	11.6	2.1	8.4

! Interpret data with caution. Standard error is 5 percentage points or greater.
NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88/2000), Third and Fourth Follow-Up; and Education Longitudinal Study of 2002 (ELS:2002/12), Second and Third Follow-Up.

Table 21. Percentage distribution of employment status of the high school class of 2004 in 2012 versus the high school class of 1992 in 2000, for those not currently enrolled in postsecondary education, by race/ethnicity and high school career and technical education (CTE) participation level

Race/ethnicity and high school occupational CTE participation level	Class of 2004 in 2012					Class of 1992 in 2000				
		In labor force			Not in labor force		In labor force			Not in labor force
	Total	Working full time	Working part time	Unemployed		Total	Working full time	Working part time	Unemployed	
Asian, non-Hispanic - total	95.8	73.8	11.9	10.1	4.2	95.5	86.5	5.2	3.7	4.5
Nonparticipant	96.1	74.4	9.8	11.8	3.9	89.2 !	78.9 !	7.4	3.0	10.8 !
Sampler	96.6	75.8	11.4	9.4	3.4	96.8	87.7	4.0	5.1	3.2
Explorer	96.9	72.7	15.6	8.6	3.1	100.0	89.4 !	7.0	‡	#
Concentrator	89.5 !	64.2 !	13.5 !	11.8 !	10.5 !	97.6	96.3	‡	#	‡
Black, non-Hispanic - total	97.7	68.4	14.6	14.8	2.3	98.6	80.4 !	13.1 !	5.1	1.4
Nonparticipant	97.0	62.4 !	18.3	16.4	‡	97.2	87.3	7.4	2.5	2.8
Sampler	98.9	70.6	15.1	13.1	1.1	98.4	70.7 !	21.2 !	6.6	1.6
Explorer	97.8	69.9 !	13.3	14.7	2.2	100.0	84.5 !	14.3 !	‡	#
Concentrator	95.6	67.4	11.1	17.1	4.4	99.1	90.7 !	1.9	6.5	‡
Hispanic - total	95.7	70.4	11.3	13.9	4.3	95.9	72.9 !	19.9 !	3.1	4.1
Nonparticipant	94.3	73.9	10.9	9.4	5.7	94.9	51.1 !	40.2 !	3.6	5.1
Sampler	95.6	67.6	11.3	16.7	4.4	97.1	74.4 !	19.6 !	3.1	2.9
Explorer	97.6	70.8	14.0	12.8	2.4	98.9	86.7	10.6	1.5	1.1
Concentrator	95.2	73.5 !	8.0	13.7	4.8	90.3	81.7	4.5	4.2	9.7
White, non-Hispanic - total	94.9	79.3	8.6	7.0	5.1	94.3	83.1	8.9	2.3	5.7
Nonparticipant	95.7	81.2	7.5	6.9	4.3	96.7	80.3	13.0	3.5	3.3
Sampler	94.8	78.4	9.4	7.0	5.2	92.3	82.9	7.8	1.6	7.7
Explorer	93.5	78.7	9.0	5.8	6.5	94.5	85.6	7.2	1.7	5.5
Concentrator	95.8	79.7	7.7	8.4	4.2	95.4	84.3	8.2	3.0	4.6

See notes at end of table.

Table 21. Percentage distribution of employment status of the high school class of 2004 in 2012 versus the high school class of 1992 in 2000, for those not currently enrolled in postsecondary education, by race/ethnicity and high school career and technical education (CTE) participation level—Continued

Race/ethnicity and high school occupational CTE participation level	Class of 2004 in 2012					Class of 1992 in 2000				
		In labor force			Not in labor force		In labor force			Not in labor force
	Total	Working full time	Working part time	Unemployed		Total	Working full time	Working part time	Unemployed	
Other, non-Hispanic - total	93.1	64.1	16.5	12.6	6.9	93.8	74.0 !	12.5	7.3	6.2
Nonparticipant	79.8 !	54.7 !	16.2 !	8.9 !	20.2 !	90.4 !	62.8 !	25.5 !	‡	‡
Sampler	94.0	66.6 !	13.6	13.7	6.0	92.3	70.0 !	12.0 !	10.3	7.7
Explorer	98.3	61.2 !	24.4 !	12.7 !	‡	91.6 !	87.7 !	‡	#	‡
Concentrator	95.8	69.2 !	14.2 !	12.5 !	4.2	100.0	81.2 !	9.1 !	9.7 !	#
White-black difference	2.8	-10.9	5.9	7.7	-2.8	4.3	-2.7	4.2	2.8	-4.3
Nonparticipant	1.3	-18.9	10.7	9.5	†	0.5	7.0	-5.6	-1.0	-0.5
Sampler	4.0	-7.8	5.7	6.1	-4.0	6.1	-12.2	13.4	5.0	-6.1
Explorer	4.3	-8.7	4.2	8.8	-4.3	5.5	-1.1	7.1	†	†
Concentrator	-0.2	-12.3	3.4	8.7	0.2	3.7	6.5	-6.3	3.6	†

† Not applicable.
# Rounds to zero.
! Interpret data with caution. Standard error is 5 percentage points or greater.
‡ Reporting standards not met.
NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88/2000), Third and Fourth Follow-Up; and Education Longitudinal Study of 2002 (ELS:2002/12), Second and Third Follow-Up.

Table 22. Percentage distribution of employment status of the high school class of 2004 in 2012 versus the high school class of 1992 in 2000, for those not currently enrolled in postsecondary education, by socioeconomic status (SES) and high school career and technical education (CTE) participation level

SES quartile and high school occupational CTE participation level	Class of 2004 in 2012					Class of 1992 in 2000				
		In labor force			Not in labor force		In labor force			Not in labor force
	Total	Working full time	Working part time	Unemployed		Total	Working full time	Working part time	Unemployed	
Lowest quartile - total	92.0	68.6	11.6	11.8	8.0	94.9	77.4	13.4	4.0	5.1
Nonparticipant	91.0	66.2	11.9	13.0	9.0	96.0	80.8	10.9	4.3	4.0
Sampler	92.6	68.1	10.7	13.8	7.4	93.6	70.7 !	17.8	5.1	6.4
Explorer	91.0	66.3	16.3	8.4	9.0	96.6	84.1	10.7	1.7	3.4
Concentrator	92.6	73.4	8.3	10.9	7.4	94.8	79.4	11.2	4.2	5.2
Second quartile - total	95.5	74.8	9.9	10.7	4.5	94.6	81.4	9.8	3.4	5.4
Nonparticipant	95.6	78.5	8.5	8.6	4.4	93.1	70.0 !	16.5 !	6.5	6.9
Sampler	94.8	71.2	14.0	9.6	5.2	93.4	77.0 !	13.2 !	3.2	6.6
Explorer	95.9	77.7	8.2	10.0	4.1	96.5	89.3	5.1	2.1	3.5
Concentrator	96.2	75.6	5.0	15.5	3.8	96.0	88.9	4.1	3.0	4.0
Third quartile - total	96.8	77.8	10.9	8.1	3.2	95.4	84.3	9.2	2.0	4.6
Nonparticipant	95.7	77.4	11.6	6.8	4.3	96.5	78.2	16.8	1.5	3.5
Sampler	97.1	77.3	10.1	9.7	2.9	95.0	85.1	7.8	2.2	5.0
Explorer	96.8	77.3	11.9	7.5	3.2	94.4	86.8	6.5	1.2	5.6
Concentrator	97.2	79.9	10.8	6.5	2.8	96.3	86.0	7.3	3.0	3.7
Highest quartile - total	96.6	81.3	8.6	6.7	3.4	97.4	84.1	10.9	2.4	2.6
Nonparticipant	96.2	80.1	8.0	8.1	3.8	97.4	80.4 !	13.9 !	3.1	2.6
Sampler	97.0	82.4	8.2	6.4	3.0	98.2	87.1	9.1	2.0	1.8
Explorer	95.9	82.0	8.0	6.0	4.1	95.8	84.0	10.3	1.4	4.2
Concentrator	96.8	79.4	11.8	5.5	3.2	96.6	85.4 !	8.4 !	2.7	3.4

See notes at end of table.

Table 22. Percentage distribution of employment status of the high school class of 2004 in 2012 versus the high school class of 1992 in 2000, for those not currently enrolled in postsecondary education, by socioeconomic status (SES) and high school career and technical education (CTE) participation level—Continued

SES quartile and high school occupational CTE participation level	Class of 2004 in 2012					Class of 1992 in 2000				
		In labor force			Not in labor force		In labor force			Not in labor force
	Total	Working full time	Working part time	Unemployed		Total	Working full time	Working part time	Unemployed	
Lowest-highest quartile difference	-4.6	-12.7	3.1	5.1	4.6	-2.5	-6.6	2.5	1.6	2.5
Nonparticipant	-5.2	-13.9	3.8	4.9	5.2	-1.5	0.4 !	-3.0 !	1.2	1.5
Sampler	-4.3	-14.2	2.5	7.4	4.3	-4.5	-16.3 !	8.7 !	3.1	4.5
Explorer	-4.9	-15.6	8.3	2.4	4.9	0.9	0.1 !	0.4	0.3	-0.9
Concentrator	-4.2	-6.1	-3.5	5.4	4.2	-1.8	-5.9 !	2.7 !	1.5	1.8

! Interpret data with caution. Standard error is 5 percentage points or greater.
NOTE: Detail may not sum to totals because of rounding.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88/2000), Third and Fourth Follow-Up; and Education Longitudinal Study of 2002 (ELS:2002/12), Second and Third Follow-Up.

All of these results are consistent with the economic shocks visited on students and workers of all backgrounds during the later period. During both time periods, however, there were few to no statistically significant differences in employment status by CTE participation level. In other words, as in 2012, the class of 1992 in 2000 had very consistent employment outcomes regardless of involvement in CTE.

Earnings and Other Work Experiences

As with employment status, there were no differences in median annual income or median hourly wage by CTE participation level within the class of 1992 in 2000 or within the class of 2004 in 2012 (table 23). There were changes across cohorts in income and wages, however (2000 wages adjusted to 2012 dollars[6]). All CTE groups—nonparticipants and participants—saw a decline in their median annual income, and CTE samplers also saw their median hourly wage decline. Figure 12 also illustrates cross-cohort differences by concentrator field of study. However, only the drop in median income for high school students concentrating in manufacturing (from $41,230 to $25,000) was statistically significant.

[6] Respondents typically reported their income rounded to the hundreds or thousands (e.g., $30,000) in both studies, making calculated median values typically rounded as well. The inflation adjustment (2000 income times 1.33) changes the reported income for NELS:88 respondents to unrounded numbers.

Table 23. Selected work experiences and earnings of non-college-enrolled respondents of the high school class of 2004 in 2012 versus the class of 1992 in 2000, by high school career and technical education (CTE) participation level and CTE concentration field of study

	Class of 2004 in 2012				Class of 1992 in 2000			
High school CTE participation	Percent received employer training	Average hours worked per week	Median hourly wage	Median annual income	Percent received employer training	Average hours worked per week	Median hourly wage	Median annual income
Total	46.3%	40.7	$14.80	$27,000	61.4%	43.0	$17.05	$35,245
Occupational CTE participation level								
Nonparticipant	45.6	41.1	15.00	26,019	64.3	41.0	17.66	34,580
Sampler	45.6	40.2	14.75	26,500	61.7	42.6	17.90	35,910
Explorer	48.2	40.7	15.00	28,000	62.2	43.8	17.90	37,240
Concentrator	46.4	41.7	14.42	29,000	57.0	45.9	14.83	34,580
CTE concentration								
Agriculture and natural resources	45.2 !	46.4	15.65	35,000	59.4 !	47.3	14.71	34,580
Business	49.7	40.8	14.00	28,000	63.0 !	47.7	13.30	34,580
Communications and design	50.0 !	39.7	14.00	30,000	61.9 !	42.1	13.30	25,270
Computer and information science	32.1 !	39.1	16.50	30,000	66.6 !	43.4	23.03	42,560
Construction and architecture	27.6 !	42.4	13.50	25,000	50.0 !	44.4	17.96	37,240
Consumer and culinary services	47.4 !	36.7	11.36	20,000	56.9 !	41.3	13.63	29,260
Engineering technologies	55.3 !	45.0	19.00	35,000	55.8 !	43.2	20.46	43,890
Health sciences	55.7 !	40.5	13.85	25,000	54.4 !	41.2	13.35	30,590
Manufacturing	46.7 !	42.0	16.25	25,000	49.8 !	43.8	19.67	41,230
Marketing	49.1 !	43.8	17.31	30,000	43.2 !	38.6	17.35	29,260
Public services	47.8 !	45.1	14.35	34,000	84.7 !	47.2	20.02	43,225
Repair and transportation	53.4 !	42.4	15.00	35,000	38.3 !	45.7	16.74	39,900

! Interpret data with caution. Standard error is 5 percentage points or greater.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88/2000), Third and Fourth Follow-Up; and Education Longitudinal Study of 2002 (ELS:2002/12), Second and Third Follow-Up.

There were also no within-cohort differences across CTE participation levels in the average hours worked per week or the percent having received employer training for either cohort (table 23). There were changes across cohorts, but not for CTE concentrators. The percentage reporting having received employer training declined for all but CTE concentrators (e.g., from 62 to 48 percent for CTE explorers [the change for CTE concentrators was not statistically significant]), and the average hours worked per week declined two to three hours for CTE samplers and CTE explorers.

Additional detail about median annual income in both cohorts is provided in table 24, which shows results by gender, race/ethnicity, and SES. Male CTE concentrators had higher median income than female CTE concentrators in both cohorts, and there was no statistically significant change in male CTE concentrators' earnings across cohorts. The only cross-cohort difference for CTE concentrators was for blacks, who earned substantially less in 2012 than in 2000 ($20,000 vs. $37,240). There was only one cross-cohort difference for CTE concentrators by SES as well (in 2012, CTE concentrators from the second SES quartile earned $30,000, compared to $37,240 in 2000).

Table 24. Median annual income of non-college-enrolled individuals from the high school class of 2004 in 2012 versus the class of 1992 in 2000, by high school occupational career and technical education (CTE) participation level, gender, race/ethnicity, and socioeconomic status (SES) quartile

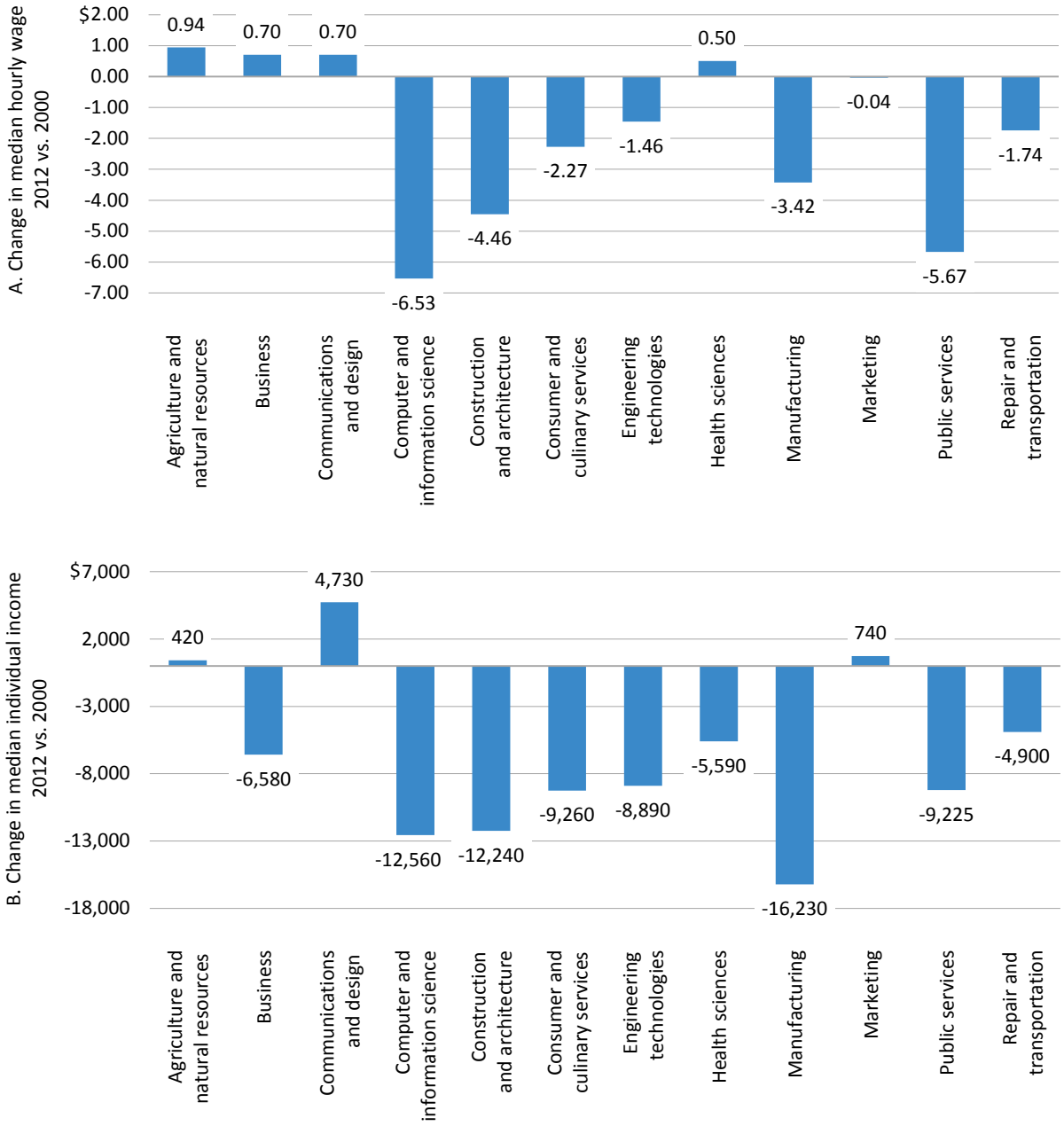
	Class of 2004 in 2012				Class of 1992 in 2000			
Characteristic	Non-participant	Sampler	Explorer	Concentrator	Non-participant	Sampler	Explorer	Concentrator
Total	$26,019	$26,500	$28,000	$29,000	$34,580	$35,910	$37,240	$34,580
Sex								
Female	23,688	24,000	21,000	24,000	33,250	31,920	33,250	26,600
Male	26,000	28,000	31,000	30,000	37,240	42,560	39,900	37,240
Race/ethnicity								
Asian, non-Hispanic	30,000	30,000	30,000	28,000	39,900	39,900	39,900	46,550
Black, non-Hispanic	18,000	20,000	20,000	20,000	39,900	33,250	25,270	37,240
Hispanic	20,000	23,000	25,000	28,800	19,950	31,920	34,580	31,920
White, non-Hispanic	27,500	27,000	30,000	30,000	33,250	37,240	39,900	33,250
Other, non-Hispanic	24,000	22,000	18,000	20,000	33,250	23,940	35,910	19,950 !
Socioeconomic status (SES) quartile								
Lowest quartile	17,000	22,000	21,000	24,000	30,590	26,600	30,590	30,590
Second quartile	24,000	25,000	28,000	30,000	29,755	35,910	35,910	37,240
Third quartile	27,000	27,000	30,000	30,000	34,580	33,250	39,900	34,580
Highest quartile	30,000	30,000	30,000	31,000	35,910	41,230	39,900	39,900

! Interpret data with caution. Standard error is one-third as large or larger than the estimate.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88/2000), Third and Fourth Follow-Up; and Education Longitudinal Study of 2002 (ELS:2002/12), Second and Third Follow-Up.

Overall, the results of comparing the two cohorts suggest much stability in the contribution of CTE to employment and earnings, at least relative to their own times. The economic opportunities for all students were worse in the latter period, as fewer reported working full time and more reported being unemployed. CTE students were not immune to these difficulties.

Figure 12. Change in median hourly wages and median individual annual income among the class of 2004 in 2012 versus the class of 1992 in 2000, by high school career and technical education field of study



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88/2000), Third and Fourth Follow-Up; and Education Longitudinal Study of 2002 (ELS:2002/12), Second and Third Follow-Up.

CONCLUSION AND IMPLICATIONS

Conclusion

This report examined the labor market outcomes of a set of former high school career and technical education (CTE) students who encountered significant economic headwinds in their postsecondary lives. The results provide three clear lessons:

- CTE participants differ substantially from nonparticipants. Those that invest most in high school CTE—concentrators, who earn at least three credits in one or more occupational fields—come from more disadvantaged backgrounds and are less academically prepared than those that invest a smaller amount in CTE. This is evident in their postsecondary education attainment: CTE concentrators, for example, earn only a high school credential more than twice as often as CTE nonparticipants (figure 5).
- Despite differences in background and postsecondary education and training, high school CTE participants are remarkably similar to nonparticipants in their employment and earnings outcomes. There are no significant differences in employment status, experiences of unemployment, or annual earnings by level of CTE participation (figures 6, 8, and 9). There were some differences favoring CTE concentrators when postsecondary education levels were taken into account (table 13).
- The similarity in labor force outcomes for CTE participants and nonparticipants is consistent with the experiences of a prior cohort of high school students who entered college and the workforce during a much more propitious time. Despite increased rates of unemployment and decreased earnings for the high school class of 2004 compared to the class of 1992, CTE participants were not affected more by the Great Recession than their contemporary peers (tables 19 and 23).

These results are both encouraging and sobering. They clearly indicate that, despite less advantaged backgrounds, CTE students from the class of 2004 fare just as well as their nonparticipating counterparts, and that this was the case for the class of 1988 as well. The results also provide a portrait of how CTE students and nonparticipants have recently faced an unfriendly economic climate that is markedly worse than that encountered by a relatively advantaged earlier cohort.

Implications for Policy and Practice

The findings reported here can inform policy discussions relating to how CTE can help students smoothly transition to postsecondary education and find meaningful and rewarding work. As noted in the U.S. Department of Education's *Investing in America's Future: A Blueprint for Transforming Career and Technical Education*, alignment between CTE programs and labor market needs can help students prepare for in-demand occupations (U.S. Department of Education 2012). For example, the report found that the median annual income of students who had concentrated in manufacturing in high school had declined substantially compared to a prior cohort. The results presented here can point to fields of study in need of innovative approaches to ensuring the long-term salience of skills learned in high school.

This report also speaks to the concern about a "lost generation" of students who completed college, or who experienced part of their early working life during a period of economic retrenchment and restructuring. Although their high school education is complete, and for most of them their postsecondary education is finished, programs and policies that can reconnect high school CTE students with in-demand skills and training could be a boon for them. While it is encouraging that CTE participants from 2004 were not more adversely affected than nonparticipants by the Great Recession, as their skills age, they may be at risk of falling behind.

At the same time, the findings provide support for the argument that CTE can have beneficial effects on the labor market outcomes of students who are most invested in it. These findings come in the context of a long-term decline in the percentage of students who invest significant proportions of their time in CTE fields. Finding ways to document and report the employment and earnings outcomes of CTE students using methods besides large-scale, periodic cohort studies can help bolster the research base that demonstrates CTE successes and investigates and corrects policy failures. Improving both the frequency and quality of such research efforts can help to overcome some of the limitations of large-scale studies, which cannot gather the detail on specific CTE programs necessary for precise policy articulation and intervention. Since the resources required to implement high-quality CTE can be more intensive and specialized than academic instruction, regular and repeated surveys and evaluations of the outcomes of CTE students may serve to sustain CTE programs and reveal their value.

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APPENDIX A. TECHNICAL APPENDIX

Overview

The Education Longitudinal Study of 2002 (ELS:2002) high school transcript study and third follow-up survey, and the National Education Longitudinal Study of 1988 (NELS:88) high school transcript study and fourth follow-up survey, gathered information about study participants' postsecondary educational experiences and labor market participation and preparation. It also gathered information about participant outcomes related to family formation, civic participation, and attitudes toward life and work. This study focuses primarily on individuals' labor market outcomes using students' demographic characteristics, high school experiences and course taking, and self-reported postsecondary education experiences drawn from survey data. Analyses also provide important context about the outcomes of career and technical education (CTE) participants by examining how CTE participants and nonparticipants compare on key student background characteristics (sex, race/ethnicity, socioeconomic status, academic course taking, and math achievement).

This technical appendix provides additional detail about the sizes of the analysis samples used in this report, measures used in figures and tables, and statistical procedures used to identify statistically significant differences.

Analysis Samples

ELS:2002 enables projections to the nationally representative population of 10th-graders in 2002 or 12th-graders in 2004. NELS:88 enables projections to the nationally representative sample of eighth-, 10th-, or 12th-graders in 1988, 1990, or 1992, respectively. Because the focus of this report is on the occupational outcomes of high school CTE participants, and because CTE participation status is simplest to define at the end of high school, this report focuses on 12th-graders who graduated by the end of summer 2004 (and summer 1992 for NELS:88). Thus the report does not address issues related to the role of CTE in encouraging high school persistence and completion. In addition, to align with public policy interests, the analysis only includes students who attended public schools. The weighted response rate was 90.7 percent for the ELS:2002 high school transcript study and 83.8 percent for the ELS:2002 third follow-up questionnaire. The coverage rate for the NELS:88 high school transcript collection (weighted

response rates were not reported) was 92.0 percent, and the weighted response rate for the fourth follow-up questionnaire was 82.7 percent. The weights used in the analysis (described in the Measures section below) adjust for nonresponse in each study.

Analysis sample members were in 12th grade in 2004 (or 1992 for NELS:88 sample members), graduated from high school (with a regular diploma or alternative credential) by the end of August 2004 (or 1992), responded to both the end-of-high school survey and the eight-year follow-up survey, had complete high school transcript records, and met minimum credit requirements of at least 16 credits overall and a nonzero amount of English credits.

Table A-1 provides information about the analysis sample sizes for the two studies. A total of 6,988 cases in ELS:2002 met all of these criteria, while a total of 7,046 cases in NELS:88 did so. The actual number of cases analyzed in any given table or figure, or portion of a table or figure, varies due to patterns of missing or nonapplicable data for different variables (in other words, cases were not excluded if data were missing on individual variables). The Measures section, below, identifies the specific variables used to identify the sample for analysis.

Table A-1. Number of sample members in ELS:2002 and NELS:88 meeting given analysis sample criteria

Respondent criteria	ELS:2002	NELS:88
Has positive weight on the longitudinal transcript weight;	11,386	10,310
And in the 12th-grade cohort;	10,380	9,086
And completed high school prior to August of senior year;	9,894	8,771
And attended only public school;	7,346	7,577
And has complete (four years of) transcript data;	7,006	7,125
And has at least 16 total credits and nonzero English credits	6,988	7,046

Measures

This section explains the measures used, how they were collected, and how they are used in the analysis. Variable names from the ELS:2002 or NELS:88 database are presented in all capital letters, with ELS:2002 variable names appearing first and NELS:88 variable names appearing second, unless otherwise noted. For more information about these variables and the studies more generally, see Ingels et al. (2014) for ELS:2002 (available at nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2014364) and Curtin et al. (2002) for NELS:88 (available at nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2002323).

Analysis Sample Criteria

All analyses involve respondents who had a positive longitudinal cohort weight (F3F1TSCWT, F4TRSCWT). A cohort flag indicates whether the student was in the grade 12 cohort (G12COHRT, G12COHRT). High school completion date was used to determine if students had graduated prior to August of their 12th-grade year (F3HSCPDR, F4HSGRDT). Public/private school attendance pattern identified students who attended public schools (F1CTLPLN, G12CTRL2). A composite transcript flag was available to identify students who had four full years of transcript data (F1RTRFLG, F2RTR09-12). Finally, analysis sample members had to have a nonzero amount of English credits (F1RENG_C, F2RHEN_C) and at least 16 total earned credits (F1RHTUN). (The NELS:88 database contains no composite variable for total credits earned; a sum of individual subject credits was used instead.)

Student Background, High School Education, and Postsecondary Education

Student background variables

A group of student background variables is used to help understand variation in CTE experiences and postsecondary outcomes across different types of students. This group of variables includes gender, socioeconomic status (SES), race/ethnicity, academic concentration, and score on the ELS:2002 12th-grade math assessment.

Gender is simply defined as male or female (F2SEX, F4SEX). SES is a scaled index constructed by the National Center for Education Statistics (NCES) based on parents' education, parents' occupation, and family income (F1SES2R, F2SES1). To understand variations by SES and simplify reporting, a version that divides the scale into quarters (F1SES2QR, F2SES1Q) is used.

Respondents are divided into one of five racial or ethnic categories: Asian (non-Hispanic), black (non-Hispanic), Hispanic, white (non-Hispanic), or other (American Indian, Alaska Native, Native Hawaiian, Pacific Islander, and those reporting more than one race) (F1RACE_R, F4RACEM). Hispanic ethnicity may be of any race; all race categories are non-Hispanic. NELS:88 explicitly allowed for "other" responses, and ELS:2002 allowed for respondents to choose more than one race; both of these categories are reported as "other" in the tables. Because of small percentages that result in unstable estimates, results for American Indian/Alaska Native and Native Hawaiian/Pacific Islander are also included in "other."

Disability status (only reported for ELS:2002 respondents) is identified by the conjunction of two measures: whether the student had an individualized education plan (IEP) in 10th grade, as identified by the school (BYIEPFLG), and whether the student had been provided special test or

questionnaire accommodations as part of either the 10th-grade assessment or survey (BYACCTYP) or the first follow-up assessment or survey (F1ACCTYP). A student that meets either of these requirements would be classified as having a learning or other disability.

Academic concentration (only reported for ELS:2002 respondents) describes the extent to which graduates completed a college-oriented academic curriculum in high school, as defined by NCES (F1RACAD). A graduate is deemed to be an academic concentrator if he or she earned at least four credits in English; four credits in math at the level of algebra I or higher; three credits in science with at least one higher than biology (i.e., chemistry or physics); three credits in social studies, with at least one of those credits in U.S. or world history; and two credits in a single non-English (foreign) language.

Students who participated in the ELS:2002 first follow-up took a mathematics assessment specially designed for the study. For purposes of demonstrating how the high school academic achievement of CTE participants may differ from nonparticipants, a percentile distribution (0–100) of the standardized math score (F1TXMSTD) will be constructed, weighted by the panel transcript weight described earlier.

Grade point average (GPA) in academic courses (only reported for ELS:2002 respondents) represents the grades earned in courses in English, social studies, mathematics, science, fine arts, and foreign language (F1RAGP).

High school degree

As noted above, only respondents who were regular diploma recipients or alternative credential (GED or certificate of attendance) recipients by the end of August 2004 are included in the analysis (F3HSSTAT and F3HSCPDR from ELS:2002, F4HSGRDT from NELS:88).

CTE participation and field of study

Respondents will be classified in one of four categories based on their earned credit in specific labor market preparation (SLMP) courses (to be identified as "occupational CTE credits" in the report) (F1CCSSC and F1SCRED from ELS:2002, F2RCSSC and F2RSCRED from NELS:88):[7]

1. Nonparticipants (less than one occupational CTE credit)
2. Samplers (one to two occupational CTE credits in one or more fields)

[7] Note that this excludes courses in family and consumer sciences (such as home economics) and general labor market preparation (such as keyboarding).

3. Explorers (three or more occupational CTE credits, but no three credits in any single CTE field)
4. Concentrators (three or more occupational CTE credits in at least one CTE field)

CTE participants are those in the last three categories.

Concentrators may be further classified by their high school CTE field of study. Each course on respondents' high school transcripts can be classified in one of the 12 fields of study listed below. These fields of study are based on the 2008 update to the CTE portion of the Secondary School Taxonomy (SST) (Bradby 2007). The taxonomy of occupational courses used here has been updated to maintain consistency with studies of postsecondary careers, with some less-common courses combined into a single field (particularly public services courses, which include education, legal, and public safety courses) and other fields split into separate fields (such as separating engineering technologies from construction and architecture). Therefore, the taxonomy used in this report is

1. agriculture and natural resources;
2. business;
3. communications and design;
4. computer and information science;
5. construction and architecture;
6. consumer and culinary services;
7. engineering technologies;
8. health sciences;
9. manufacturing;
10. marketing;
11. public services; and
12. repair and transportation.

For more information on the definition of CTE participant status and fields of study, see Dalton et al. (2013).

Education Outcomes

Postsecondary education attainment

Respondents' education attainment (only reported for ELS:2002 respondents) is grouped into seven categories: no high school credential, high school credential only, some postsecondary attendance but no postsecondary credential, undergraduate certificate or diploma, associate degree or certificate, bachelor's degree, or advanced degree or certificate (F3ATTAINMENT).

Postsecondary certifications or licenses

Respondents reported (only in ELS:2002) whether they had earned a "professional certification, professional license, or a state or industry license (A professional certification or license verifies that one is qualified to perform a specific job. It includes things like licensed realtor, certified medical assistant, certified construction manager, or Cisco Certified Network Associate)" (F3A27). They were also asked whether the certification or license was required for their current or most recent job (F3A32).

In addition to questions about whether certifications and licenses were earned, respondents were asked (only in ELS:2002) if their postsecondary degree or certificate was required for their current or most recent job (F3B30A-D). They were also asked (in both ELS:2002 and NELS:88) whether they had participated in a training program offered by their employer in the last 12 months (F3B35, F4CTRNQ). These variables will be examined alongside the certification and licensure variables to provide a more comprehensive picture of occupational preparation.

Occupational Outcomes

Measures of occupational outcomes apply to varying groups of respondents. In some cases, all respondents were asked the question (e.g., about postsecondary certifications or licenses and employment status). In most other cases, respondents who had ever had any employment were asked the questions. These respondents were asked about their current (at the time of the interview) job if they had one or, if not, their most recent job. Only respondents who were currently employed are included in the analysis of items such as hours, earnings, and occupation. Occupational outcomes are only examined for those who were not enrolled in a postsecondary education institution at the time of the 2012 or 2000 survey.

Postsecondary employment

Employment status (F3EMPSTAT for ELS:2002; F4AEMPL, F4BLHPW, and F4AWNTJ for NELS:88) is categorized as working full time, working part time, unemployed, or out of the labor force.

Experiences with unemployment (for ELS:2002 respondents only) are examined through the following measures: whether the respondent was ever unemployed since January 2009 (F3C07), the total number of months unemployed since January 2009 (F3C08), the number of times the respondent was unemployed since January 2009 (F3C09), the longest length of time in months spent unemployed since January 2009 (F3C10), and whether the respondent was eligible for or received unemployment compensation (F3C11).

Postsecondary hours worked

In addition to employment status, the report examines the number of hours worked in respondents' current or most recent jobs (F3B21, F4BLHPW).

Postsecondary earnings

Earnings are examined in two ways. First, for respondents' current or most recent job, earnings are reported as a standardized hourly wage rate (F3HOURWAGE for ELS:2002, F4BRATE and F4BRATP for NELS:88) based on information respondents provided about their pay periods and pay amounts. This calculated wage rate was bottom coded at $2.13 per hour and top coded at $100 per hour to prevent disclosure of respondent identities. Second, earnings are reported as total 2011 or 1999 income from employment (F3ERN2011, F4HI99). This variable was also top coded, at $600,000.

Postsecondary occupation

Postsecondary occupation is the current or most recent job reported by the respondent (F3ONET2CURR, F3ONET6CURR) (ELS:2002 respondents only). It is coded to the 2010 Standard Occupational Classification (SOC) (https://www.onetcenter.org/taxonomy.html) taxonomy using codes and information from the Occupational Information Network (O*NET). Respondents coded their job titles and duties to O*NET codes using tools provided with the ELS:2002 web survey, or with the assistance of interviewers. Both two-digit and six-digit codes are provided in the data file, but two-digit codes will typically be used in the analysis and sometimes collapsed into broader categories in order to ensure sufficient cases for breakdowns by education attainment and high school CTE participation and field.

Postsecondary education helped prepare for work and career

Two aspects of the relation between a respondents' postsecondary education and employment can be examined (ELS:2002 respondents only). First, respondents reported the importance of their postsecondary education in preparing them for "work and career" (F3A15A). Responses were very important, somewhat important, and not at all important. Second, respondents reported whether their current or most recent job was closely related to their postsecondary

major or field of study (F3B31). Responses were closely related, somewhat related, and not related.

Changes in occupational expectations

For respondents who reported an occupation they expected to hold at age 30 in both 2004 and 2012 (i.e., ELS:2002 respondents only), NCES calculated a measure of change or stability in occupational expectations (F3OCC30F1VF3). The variable reports whether the prestige score of expected occupation at age 30 is higher, lower, or unchanged between 2004 and 2012.

Other Outcomes

Debt load and student loans

The debt load, or debt-to-income ratio, is calculated as the ratio of total nonmortgage debt (F3D33) to 2011 employment income (F3ERN2011). To provide context for this variable, total nonmortgage debt is reported separately. In addition, the report examines debt tied to education—specifically, the total amount borrowed by respondents for their postsecondary education (F3STLOANAMT).

Comparisons between High School Classes of 2004 and 1992

For comparison of changes over time, ELS:2002's predecessor study, the National Education Longitudinal Study of 1988 (NELS:88), served as a source.[8] NELS:88 began with eighth-graders in 1988 but also surveyed sophomores in 1990 and followed the same survey timing (1992, 1994, and 2000). As in ELS:2002, the senior-year follow-up of NELS:88 augmented its sample to ensure a nationally representative sample of seniors for 1992. The analytical sample for NELS:88 is set to be the same as in ELS:2002: public high school 12th-graders from 1992 who were high school graduates (regular diploma recipients or alternative completers), had complete secondary transcripts in the database, and met minimum credit criteria of at least 16 credits and a nonzero amount of English credits.

Substantial survey content was carried across the two longitudinal studies, ensuring data comparability. However, it should be noted that differences across the surveys remain. Principally, data collection for the ELS:2002 third follow-up began in the summer (of 2012), while data collection for the NELS:88 eight-year follow-up began in the spring (of 2000).

[8] Additional secondary longitudinal studies in the same series were available for analysis. However, these could not be used for trend reporting. The High School & Beyond Study of 1980 Sophomores (HS&B:So) began with high school sophomores and did not resurvey students at the same intervals as NELS:88 and ELS:2002 (HS&B:So surveyed respondents 10 years after their typical high school graduation, instead of eight). NCES also conducted a survey of seniors as part of HS&B in 1980, but the senior cohort was only resurveyed six years after their senior year.

Race/ethnicity definitions have changed over time, as has the calculation of SES across the two studies (ELS:2002 did not include household possessions as part of the scale). Further, NELS:88 did not attempt to include as many students with disabilities or impairments in their survey.

In addition, because it was developed after NELS:88 data were collected, codes for specific occupations in NELS:88 do not use the O*NET classification scheme; instead, they use a study-specific code frame. Variables using this study-specific coding scheme were also used in the initial rounds (base year and first follow-up) of ELS:2002 and can be cross-walked to O*NET for later ELS:2002 rounds. However, given the effort involved in constructing the matched occupation variable and potential questions about the matching (16 NELS:88 codes match to 23 general [two-digit] O*NET codes, without any additional specificity), NELS:88–ELS:2002 comparisons in this report do not include occupation.

Statistical Procedures

All results from ELS:2002 are weighted by the first follow-up to third follow-up transcript weight (F3F1TSCWT) and project to the 12th-grade population of 2004 (G12COHRT=1 or 2). Balanced repeated replication (BRR) weights (F3F1T001 through F3F1T200) are used to adjust standard errors for the complex survey design of ELS:2002. Similarly, all results from NELS:88 are weighted by the fourth follow-up transcript weight (F4TRSCWT); however, given that BRR weights were not created for NELS:88, Taylor series linearization using the primary sampling unit (PSU) and sampling strata (STRATUM) were used to calculate standard errors.

Some key analytical variables were imputed by NCES. These include eight-year follow-up employment status, occupation, total earnings, and highest level of education attained; in no case did the percent of cases imputed exceed 10 percent. More information about imputation, as well as about weights, can be found in Ingels et al. (2014) for ELS:2002 and Curtin et al. (2002) for NELS:88.

This analysis compares means and proportions using a student's *t* test. Differences between estimates were tested against the probability of a Type I error[9] or significance level. The statistical significance of each comparison was determined by calculating the *t* value for the difference between each pair of means or 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:

[9] A Type I error occurs when one concludes that a difference observed in a sample reflects a true difference in the population from which the sample was drawn, when no such difference is present.

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

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 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. However, because multiple comparisons are made in this report simultaneously, which increases the likelihood of type I errors, a lower alpha of 0.001 was chosen, representing a confidence level of 99.9 percent. This alpha level was chosen based on a Bonferroni correction for multiple comparisons, where the typical alpha (0.05) is divided by the number of comparisons made, *n*. In this case, *n* was set at 30, which is representative of the number of comparisons in the average figure in this report. Choosing a single *n* simplifies interpretation and promotes consistency in significance testing. When analysts test hypotheses that show alpha values at the 0.001 level or smaller, they reject the null hypothesis that there is no difference between the two quantities. Failing to reject a null hypothesis (i.e., detect a difference), however, does not imply the values are the same or equivalent.

Values in the tables that do not meet minimum sample size criteria are suppressed in the tables and designated with a special symbol (‡). Values whose estimates are unstable are flagged with

exclamation marks. For percentages, estimates are defined as unstable if the standard error is 5 or more (meaning that the true value lies in a range of about +/- 20 percentage points, based on an alpha level of 0.05); for means, estimates are defined as unstable if the standard error of the mean is one-third or more as large as the estimate.

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