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The Relative Returns to Credit- and Non-Credit-Bearing Credentials

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Abstract

Prior research indicates that future workers will not possess enough training to contribute to a robust U.S. labor market, especially in "middle-skill" roles that require some postsecondary education but not a 4-year degree. At the same time, the last 30 years have borne witness to an increased likelihood that middle-skill individuals pursue nontraditional, non-credit-bearing, skill-based training (such as for computer operations), with little accompanying evidence on the utility of these less portable options. To address this research void, we analyzed 20 years of the National Longitudinal Survey of Youth 1997, using an individual fixed-effects regression strategy to estimate the returns to non-credit-bearing credential and licensure pathways compared with credit-bearing credential and associate degree programs. This strategy provided estimates on the returns to training that are unrelated to individual-level, time-invariant factors, such as differences in ability and motivation which remain constant over time. Our findings show that credit-bearing credentials yield an approximately equal likelihood of employment as non-credit-bearing credentials, but significantly improved earnings of about 17%, which typically equates to about $5,500 per year.

Introduction

In a labor market defined by rapid technological progress, changing demographics, and fierce global competition, jobs will increasingly require postsecondary education or training. Yet studies suggest that future workers will not possess the training to fill these jobs (Carnevale, Smith, & Strohl, 2013). Furthermore, training gaps are greatest among middle-skill jobs that require some postsecondary education but not a 4-year degree (National Skills Coalition, 2017).

At the same time, the marketplace for middle-skill training is undergoing significant changes. For example, the number of individuals completing less-than-2-year certificate programs at for-profit colleges increased by more than 500% between 1990 and 2011, whereas the comparable statistic at public institutions was less than 200%.[1] This rapidly changing landscape and the growing demand for middle-skill employees has left policymakers and students with limited information on the best way to prepare workers (Deming, Goldin, & Katz, 2012, 2013; Mettler, 2014).

[1] These tabulations are based on our calculations using the Integrated Postsecondary Education Data System downloaded from https://nces.ed.gov/ipeds/. Specifically, in the 1989–90 school year, 89,863 and 21,775 individuals completed less-than-2-year certificates at public and for-profit institutions, respectively. In 2010–11, the comparable statistics were 175,053 and 115,532, respectively. It also is worth noting for this particular example that for-profit college enrollment thereafter declined, fairly markedly, to about 43,212 completions by 2017–18.

In this report, we present evidence on the relative labor market returns to more transferable middle-skill postsecondary training, including credit-bearing certificate and associate degree programs (hereafter, credit-bearing programs) compared with terminal but targeted, non-credit-bearing certificate and licensure programs (hereafter, non-credit-bearing programs). In some cases, the credit- and non-credit-bearing programs are in similar fields (e.g., nurse's aide, computer operations programs). However, non-credit-bearing programs do not build toward an associate or bachelor's degree in the same ways that credit-bearing programs do. The appeal of many non-credit-bearing programs therefore is that they are shorter and more targeted, even sometimes less expensive and provided directly through an employer. Alternatively, the appeal of credit-bearing programs derives from their more portable, flexible nature: Students can earn credits that will follow them from one program to the next, from one employer to the next, across time.

To present evidence on the relative returns that credit-bearing and non-credit-bearing programs yield, we used the National Longitudinal Survey of Youth 1997 (NLSY97), and followed individuals from the time they were 18 years old (which occurred anywhere between 1996 and 2000) through the year in which they were 30 (which occurred anywhere between 2008 and 2014). We used NLSY97 records on respondents' education and ongoing labor market outcomes.

Our identification strategy leveraged individual fixed-effects regression models to examine within-person changes in the likelihood of employment and earnings associated with credit- and non-credit-bearing program completion. The innovation of the individual fixed-effects strategy is that it controls for any differences between individuals that are fixed across time (e.g., ability) and estimates the labor market returns associated with program completion that accrue to an individual, relative only to prior labor market participation. To control for differences in an individual's likelihood to select into a program pathway based on qualities that may change during one's life course (e.g., labor market conditions, marital status, child rearing), we also exploited time-varying controls on the county of residence and family makeup. Our models also include a control for workforce participation that is coincident with school enrollment to absorb variation associated with systematic differences in the propensity to work during credit- and non-credit-bearing training.

Our findings show that credit-bearing programs did not yield a significant increase in the likelihood of employment relative to non-credit-bearing programs. On the other hand, findings did indicate that credit-bearing programs increased yearly earnings by about 17% relative to the $33,000 average earnings of respondents who completed non-credit-bearing programs and who were employed, representing a change of about $5,500.

We tested the consistency of these findings across subgroups that prior literature indicates are vulnerable to exploitative training programs (e.g., from private for-profit training institutions). These groups include individuals from low-wealth families, wherein wealth is in the lowest tercile of the wealth distribution when the respondent was age 18; non-White individuals; and individuals whose parents had not attained a 4-year degree by the first interview wave in 1996.[2] Among these subgroups, the earnings boost to credit-bearing program completion is not statistically significant for low-wealth and non-White respondents.

We also present preliminary evidence that the positive returns to credit-bearing programs are associated with the improved flexibility of the credential.

In the sections that follow, we discuss the background literature, describe the individual fixed-effects methodology, describe our data, present findings, and conclude with policy implications.

Background

Technological advances are changing the nature of work in the United States. Research indicates that these advances have, in turn, increased the demand for workers with skills beyond a high school education, especially middle-skill training, requiring some postsecondary education but not a 4-year degree (Marr, 2019; National Skills Coalition, 2017). Despite this evidence showing that not everyone in the economy needs to or should attain a 4-year degree, particularly given the high and rising costs of education (Fuller & Raman, 2017), the research on the returns of higher education disproportionately focuses on 4-year degrees. In addition, the research on the returns to attaining less postsecondary education, while long-standing, generally focuses on a somewhat narrow conceptualization of middle-skill training associated with associate degrees from higher education institutions. In addition, this prior work presents wide variation in the results: studies found increases in annual earnings for attaining associate degrees ranging between 15% and 27% (Abel & Deitz, 2014; Kane & Rouse, 1995). Considering

[2] For an example of research showing these subgroups are vulnerable, see Le, Yang, & Simko (2017).

research on training that occurs outside higher education institutions, the studies become even less numerous and the estimates more varied.

To better inform decisions about and investments in the pursuit of middle skills, this study investigated one potentially important distinction among middle-skill training programs: credit-bearing programs in which participation generates credits that can be used toward a 4-year degree compared with terminal, non-credit-bearing programs. The credit-bearing category includes certificate and associate degree programs. These contrast with non-credit-bearing programs that also can lead to certificates, industry-recognized certifications, or licenses but do not award credits for participation or completion.

We anticipated at the outset that credit-bearing programs lead to better labor market outcomes for two reasons. First, credit-bearing programs have a requisite association with an accredited institution and, perhaps as a result, generally span more years.[3] Second, credit-bearing programs provide students with the opportunity to transfer and stack their credentials because of the linking role of credits across institutions and time. Therefore, credit-bearing programs, unlike non-credit-bearing programs, provide a gateway for attaining higher degrees.

In the subsections that follow, we discuss in greater detail the sizable and growing need for middle-skill training plus prior estimates on the return to education for middle-skill work.

Why Focus on Middle Skills?

For policymakers, a focus on middle-skill jobs is important for two reasons. First, middle-skill jobs provide an increasingly important pathway to the middle class. As the number of well-paying jobs available for those with a high school diploma or less shrinks, the number of jobs for those with more education increases (Carnevale, Strohl, Ridley, & Gulish, 2018). Second, the largest gap between the labor market demand and the labor force exists among the middle skilled: Estimates from 2015 showed that only 16% of jobs are low-skill jobs, requiring no postsecondary training, and only about one third of jobs (31%) are high-skill jobs, requiring a 4-year degree. Thus, more than half of the jobs (53%) are middle-skill jobs. At the same time, only 43% of the workforce was middle skilled (National Skills Coalition, 2017). In addition, a survey of human resource executives in 2014 found that more than two thirds of respondents felt that "their inability to attract and retain middle-skills talent frequently affected their performance" (Burrows, Young, Restuccia, Fuller, & Raman, 2014, p. 6).

Although the exact definition of middle-skill jobs is still a subject of debate (Handel, 2017), these jobs typically require a credential acquired through a certificate program or an associate

[3] Non-credit-bearing programs also may be associated with accredited institutions. However, the association with accredited institutions is not a requirement.

degree. These jobs are in a broad variety of fields, from manufacturing to health care to business, and the long-term outlook for these jobs can vary significantly. A 2018 study of middle-skill job-seeker résumés examined variance in earnings and career trajectories and found that these jobs fall into three general categories:

Lifetime—a middle-skill job that is a career in itself, allowing for advancement within the same role and long-term job stability (most common in the health-care field [e.g., nurses and dental hygienists] and advanced manufacturing)

Springboard—a job that easily leads into a career path (such as human resource assistants, computer support specialists, and bookkeepers)

Static—a job that is lower wage and does not lend itself to career growth (more common in the manufacturing field but also includes some health-care jobs, such as physician's assistant and pharmacy tech; Lamback, Gerwin, & Restuccia, 2018).

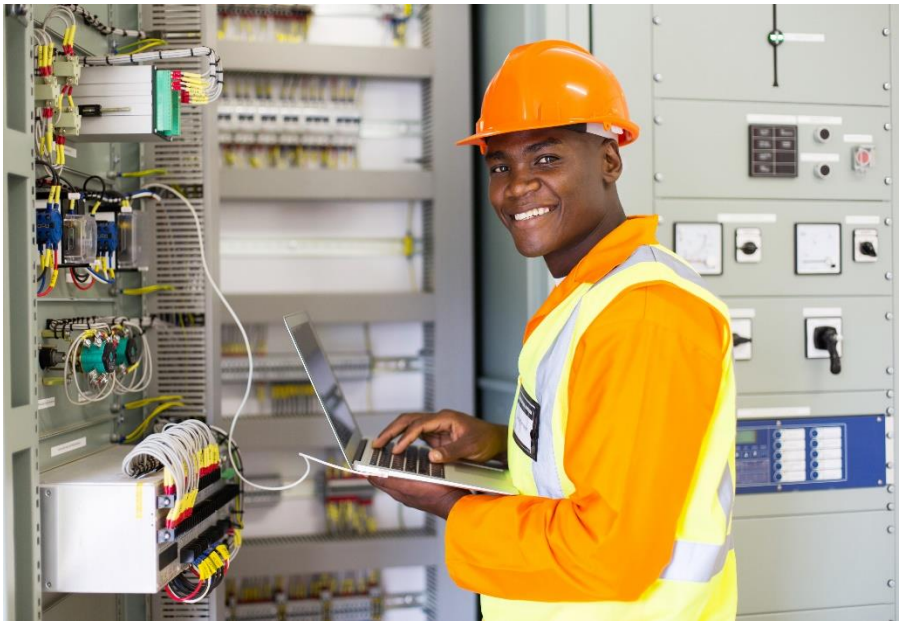
The mismatch between industry needs and the supply of middle-skill workers is rooted in the acceleration of technological change and globalization (Burrows et al., 2014; National Skills Coalition, 2017). Employer survey reports indicate that some of hardest middle-skill positions to fill are in careers with high lifetime values, such as health care, computer and mathematical operations, and technical sales and management (Burrows et al., 2014). To compensate for this unmet need, employers are "upskilling" their job postings (e.g., requiring a 4-year degree even when unnecessary for a job) to find employees with the necessary technical (e.g., computer literacy) and soft (e.g., work ethic) skills (Burrows et al., 2014).

The Labor Market Return to Middle-Skill Training

In general, the middle-skill literature, as with the broader literature on the returns to education, shows that more education is associated with higher earnings (Abel & Deitz, 2014; Belfield & Bailey, 2017; Carnevale, Rose, & Cheah, 2011). In a 2011 study, Carnevale et al. found the median lifetime earnings potential of a middle-skill employee to be $1.7 million, which is more than half a million higher than their counterparts with only a high school diploma. A separate, more recent study showed that the return on investment for associate degrees is 15% (Abel & Deitz, 2014) or $4,640–$7,160 per year compared with entering college but not completing a degree or certificate (Belfield & Bailey, 2017).

Literature that examines variation in these returns shows that students generally earn more when completing longer duration credentials and credentials in fields related to science, technology, engineering, and mathematics (Bosworth, 2010; Dadgar & Trimble, 2016; Jacobson,

LaLonde, & Sullivan, 2005; Prince & Jenkins, 2005).[4,5] Some evidence also exists that certain degree-granting institutions provide elevated returns relative to comparable credentials earned at other institutions (e.g., for-profit compared with public or nonprofit institutions; Cellini & Chaudhary, 2012; Deming, Yuchtman, Abulafi, Goldin, & Katz, 2016).



Slightly more than one fourth of certificates (27%[6]) are granted by degree-granting institutions. Recent and sharp declines in state funding for community colleges have limited public, degree-granting institution enrollment opportunities (e.g., greater restrictions on the times that classes are offered; McFarland et al., 2019; Mettler, 2014). Although the parallel increases in available non-credit-bearing postsecondary alternatives may help ease unmet market demand for middle-skill training, related research may indicate that these alternatives do not serve students well and, more worrisome still, provide substandard services to disproportionately underprivileged populations (Deming et al., 2013; Mettler, 2014). For example, research shows that for-profit colleges expressly recruit students from low-income backgrounds, charge tuition as much as five times higher than students pay at community colleges, encourage students to take out large loans, and provide equivalent or worse labor market outcomes than their public or nonprofit counterparts (Cellini & Chaudhary, 2012; Darolia, Koedel, Martorell, Wilson, & Perez-Arce, 2015; Deming et al., 2012, 2013; Kutz, 2010; Lang & Weinstein, 2013).

[4] Bosworth (2010) highlighted differences in returns by the length of the certificate program and showed that "longer term certificates have significantly higher labor market value than short-term certificates because of their greater technical and academic rigor" (p. ii). Dadgar and Weiss (2012), using administrative data from Washington state, similarly found that associate degrees and longer term certificates have a positive impact on earnings.

[5] An important part of the literature is whether there is an economic impact of participation in a higher education program without attaining a degree or certificate (Bailey, Kienzl, & Marcotte, 2004; Kane & Rouse, 1995), known as the "sheepskin" effect. We did not explore that distinction in this study. Results are varied (Belfield & Bailey, 2017).

[6] See Table 320.10 at https://nces.ed.gov/programs/digest/d17/tables/dt17_320.10.asp.

In the present study, the principal distinguishing characteristic between the programs of interest was the ability to accrue transferable and stackable credits from an accredited, degree-granting program. In the data we used, non-credit-bearing programs commonly led to certificates for nurse's aide, computer operations, cardiopulmonary resuscitation, business skills, and cosmetology, along with licenses for medical assistant, cosmetology, insurance, emergency medical technician, real estate, truck driving, and registered nurse.[7] Whereas credit-bearing programs may yield some of the same credentials, they are, by definition, associated with the accrual of academic course credits and frequently culminate with an associate degree. Herein, our central focus is on directly testing differences in the returns to terminal, non-credit-bearing programs (whether they derived from public, nonprofit, or for-profit programs) compared with more traditional, credit-bearing programs.

Methods

To estimate the relationship between career program type and the labor market trajectories of participants following completion, we used the NLSY97 and an individual fixed-effects regression analysis estimation strategy (based on Cellini & Chaudhary, 2012) to estimate the association of program completion with changes in two labor market outcomes: employment, measured using a binary variable that takes a value of 1 if employed and 0 otherwise, and quarterly earnings calculated using average hourly wage × weekly hours worked.[8] The specific regression model that we used is in Equation 1.

[7] At least two other paths to pursuing middle-skill jobs are worth mentioning but were outside the scope of this study. First, stackable-credential programs provide a hybrid between traditional non-credit-bearing certificate programs and credit-bearing academic programs by tying short-term credentials to more extended career pathways (Austin, Mellow, Rosin, & Seltzer, 2012). There are, however, at the moment, empirical challenges to distinguishing such programs, and current evidence shows that their usage is low (Belfield & Bailey, 2017). Second, apprenticeships also provide a path toward middle-skill jobs. In the past 5 years, the U.S. Department of Labor (DOL) has engaged in a significant transformation of national apprenticeship programs, expanding their reach in terms of the number of workers and beyond traditional industries and occupations (see https://www.dol.gov/featured/apprenticeship/grants for recent DOL grant programs). However, these are recent innovations and, during the time period examined in this study, apprenticeships were limited in scope (Klor de Alva & Schneider, 2018).

[8] Appendix B also presents estimates for hours and wage outcome variables separately. These outcomes were combined in the estimates presented in the main text on earnings as earnings = wages × hours.

$$y_{ict} = \alpha_1 + \alpha_2 NoHS_{ict} + \alpha_3 HS_{ict} + \alpha_4 Credit_{ict} + \alpha_5 BA_{ict} + \alpha_6 X_{ict} + \gamma_i + \delta_t + \theta_{ct} + \varepsilon_{ict} \quad (1)$$

In this model,

y_{ict} represents the outcome of interest, employment,[9] or the natural log earnings for each individual *i* in county *c* and year *t*;

$NoHS_{ict}$ takes on a value of 1 for any individual *i* and county *c* whose highest level of educational attainment in year *t* is less than a high school diploma or a General Educational Development (GED) certificate;

HS_{ict} takes on a value of 1 for any individual *i* and county *c* whose highest level of educational attainment in year *t* is a high school diploma or GED;

$Credit_{ict}$ takes on a value of 1 for any individual *i* in county *c* whose highest level of educational attainment in year *t* includes a credit-bearing postsecondary certificate or an associate degree (or any other credit-bearing credential that is designed to be completed in less than 4 years and prior to attaining a bachelor's degree); and

BA_{ict} takes on a value of 1 for any individual *i* in county *c* whose highest level of educational attainment in year *t* includes a bachelor of arts or science postsecondary degree.

The omitted category is a non-credit-bearing certificate or licensure program.

The primary innovation of this report relied on the individual fixed effects (y_i), which were used to identify changes in employment and earnings that accrued to NLSY97 respondents after completing credit-bearing programs compared with non-credit-bearing programs while holding constant persistent differences between individuals, such as ability or motivation. Therefore, if we are concerned that students select into non-credit-bearing programs instead of credit-bearing programs because they are less able or motivated, if that ability or motivation factor is consistent in an individual's life, then these effects will effectively control for that.

The additional controls integrated in the model are for situations in which program selection may change across time. Specifically, to account for variation in program availability and context that changes across time, we integrated year fixed effects (δ_t) and county by year trends (θ_{ct}). To account for individuals' different likelihoods to choose training programs, whether they were single or married, as well as whether they have children, we controlled for a host of individual by year factors, such as marital status, the number of children, and age by race and age by gender fixed effects (x_{ict}).

[9] Because employment is a 0/1 dummy variable, the employment estimates are all linear probability models.

One of the most critical identification challenges associated with using an individual fixed effects strategy, such as Equation 1, is associated with any systematic, unobserved, and time-varying differences in the employment or earnings trajectories between individuals who pursue credit- and non-credit-bearing course taking. For example, individuals with an ongoing strong connection to the labor market may prefer coursework that will be more targeted and less time consuming, as typical of non-credit-bearing pathways. These individuals may also exhibit smaller changes in earnings from before to after credential attainment because of their preexisting workforce connections. In contrast, individuals who experience a disruption in their labor market connection (e.g., through reduced hours or lower wages) may be more likely to pursue credit-bearing options. They may then exhibit a larger increase in earnings from before to after credential attainment because of the drop in earnings just prior to attainment.

To address these concerns, we integrate two controls into x_{ict} for a respondents' participation in work in any period during which the individual may have been concurrently enrolled in school. These controls include one parameter for concurrent enrollment in a non-credit-bearing program and a second for enrollment in a credit-bearing program.[10] These controls are designed to absorb variation associated with systematic differences in the propensity to work during credit- and non-credit-bearing training, related to the concept of Ashenfelter's Dip (1978) associated with systematic differences in pre-training work behavior. We also estimate Equation 1 separately for hours and wages to examine the extent to which any differential return to earnings is driven by hourly wage.

The error term, ε_{ict}, represented the variation that remained unexplained after accounting for the parameters in the model. We estimated these models using ordinary least squares regression and Huber-White clustering of standard errors at the state of residence at age 18 to account for systematic variation in outcomes or participation experience by program (Huber, 1967; White, 1980).

The primary coefficient of interest in this model was α_4, which indicates the average differences in the employment and earnings outcomes between individuals whose highest educational attainment was a credit-bearing credential or an associate degree compared with a non-credit-bearing certificate or license.

We also present exploratory analyses that examined the extent to which attaining a credit-bearing credential or associate degree as one's highest educational attainment by age 30,

[10] If the respondent reports concurrent credit- and non-credit-bearing enrollment, we code those as credit-bearing enrollment because evidence suggests that a credit-bearing program is the more long-term and potentially more time-consuming commitment.

versus a non-credit-bearing credential or license, affected one's likelihood to ever attain a bachelor's degree. The model we used for this strategy is in Equation 2.

$$y_{ic} = \beta_1 + \beta_2 Credit_{ic} + \beta_3 X_{ic} + \varepsilon_{ic} \quad (2)$$

In this model, the principal coefficient of interest was β_2, which indicates the extent to which credit-bearing programs were associated with a greater propensity to attain a bachelor's degree by age 30. The control variables (X_{ic}) included gender and race/ethnicity, as well as marital status and the number of children at first attainment (or age 18 if no high school graduation or higher attainment recorded). We also included fixed effects for age and county of residence at first attainment (or age 18 if no high school graduation or higher attainment recorded).

Data

The data that we used for our analysis was the NLSY97, which provided longitudinal, participant-level information on about 9,000 nationally representative respondents starting in 1997 (when respondents were ages 12–18) and continuing through 2016 (when respondents were ages 31–37). Across this period, there were 17 interview rounds, and all data were self-reported. We restricted the sample to 6,093 respondents, which was balanced to span ages 18–30 for each individual. We further restricted the sample to only those who did not earn a bachelor's degree within 6 years of high school graduation or GED attainment.

The NLSY97 contains two related strands of questioning associated with schooling and training question stems that we used to create the educational attainment variables central to the analysis. In Figure 1, we share the logic used to construct our educational attainment variables, including attainment of a credit-bearing credential or associate degree and a non-credit-bearing credential or license. This language was adapted from the question stems that start the respective schooling and training sections in the NLSY97. The Bureau of Labor Statistics changed the schooling and training questions stems slightly across the 17 rounds, but each time, they followed a consistent logic. Appendix A provides additional detail on the manner in which we used questions on participant labor market participation to construct our employment and earnings dependent variables.

Figure 1. The Flow of Schooling and Training Questions in the NLSY97 Used to Identify Educational Attainment Type and Date of Completion

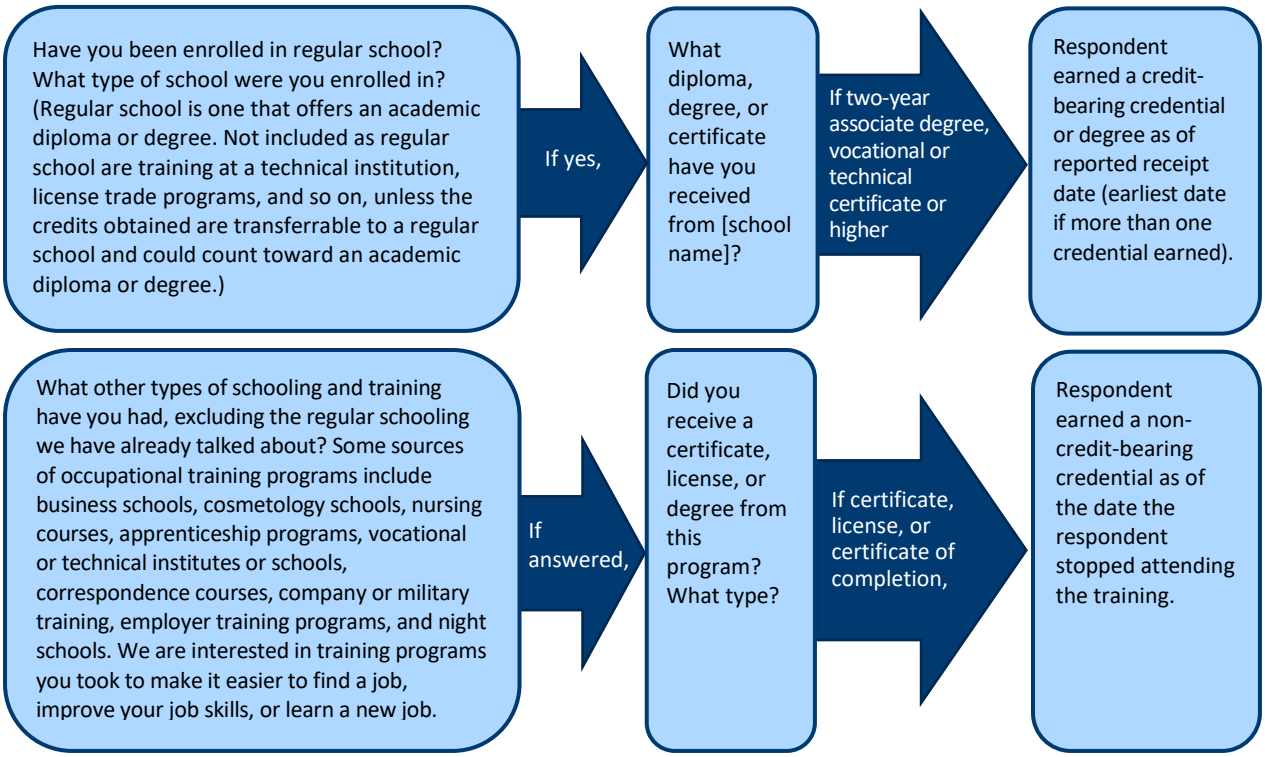


Table 1 presents descriptive details on the gender, race/ethnicity, marital status, the number of children, parental education, parental wealth, employment, and earnings of the NLSY97 respondents in our analysis sample. These statistics show that the sample was approximately half female and more than 60% non-White, and few respondents (19%) at age 18 had a parent with 4 or more years of college. The family makeup of respondents at the time of highest educational attainment indicated that about 16% were married, and about 31% had a child. About half of the respondents (47%) had no postsecondary training by age 30. Also, at age 30, about 82% of the respondents were employed, and the average earnings (adjusted to 2016 dollars) were $37,888. As a point of comparison, these earnings were about 319% of the federal poverty line for a single-family household in 2016. Taken together, these characteristics indicate that the sample was disproportionately representative of underprivileged respondents in the overall NLSY97 because of our restriction of the sample to include only those individuals who did not graduate with a bachelor's degree within 6 years of high school graduation.

Table 1. NLSY97 Sample Characteristics

	N	Weighted mean percentage
Gender: Female	2,917	49%
Gender: Male	3,176	51%
Race/ethnicity: American Indian, Eskimo, or Aleut	31	1%
Race/ethnicity: Asian or Pacific Islander	64	2%
Race/ethnicity: Black or African American	1,864	15%
Race/ethnicity: Hispanic	1,463	13%
Race/ethnicity: White	2,593	67%
Race/ethnicity: Other	78	2%
Family characteristics: Marital status at time of highest educational attainment	793	16%
Family characteristics: At least one child at time of highest educational attainment	2,129	31%
Family characteristics: At least one parent with at least 4 years of college	912	19%
Highest educational attainment: No high school diploma/GED	555	8%
Highest educational attainment: High school diploma/GED	2,423	39%
Highest educational attainment: Non-credit-bearing certificate or license	1,992	33%
Highest educational attainment: Credit-bearing certificate or associate degree	676	12%
Highest educational attainment: Bachelor's or higher degree	447	8%
Outcomes: Employment at age 30	4,884	82%
Outcomes: Earnings at age 30	5,761	$37,888

Note. The total sample included 6,093 individuals, which was restricted from the larger sample of 8,984 NLSY97 respondents to include individuals who did not attain a bachelor's degree within 6 years of their high school graduation. Earnings represent 2016 dollars. See Appendix A for detail on the weighting procedure.

Descriptive Changes in the Outcomes of Interest: Employment and Earnings

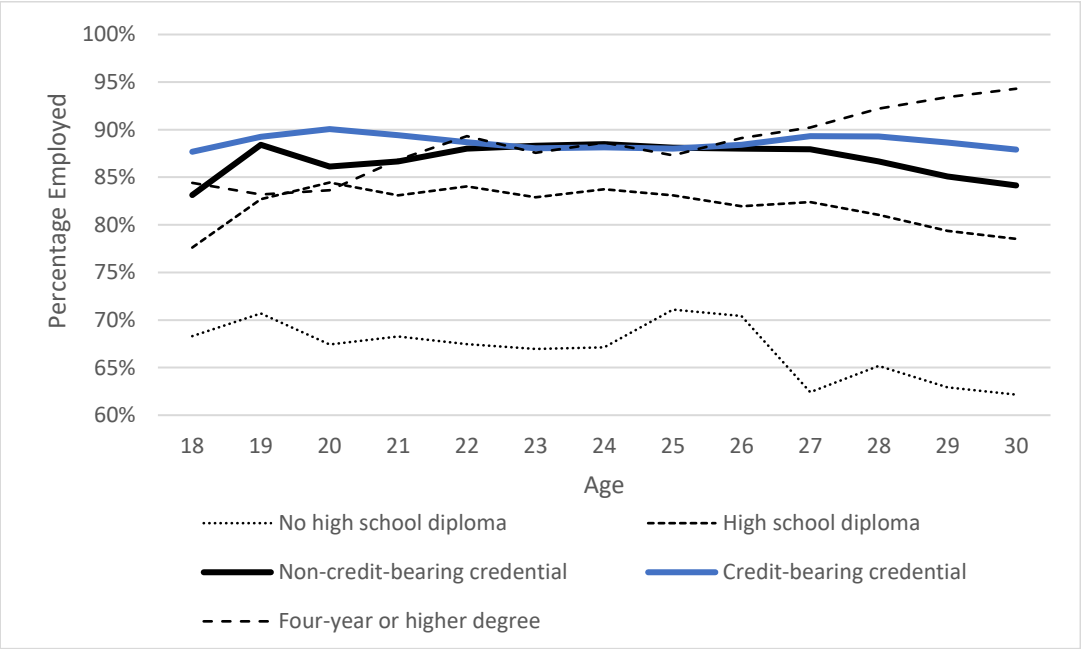
Our analysis examined two outcomes related to educational attainment: employment and earnings. In this section, we look descriptively at the trajectories of these outcomes in two ways. First, we plot the outcomes for people at different ages grouped by the highest level of education they ever attained by age 30. Second, we focus on the years just before and after attainment. These depictions suggest that credit-bearing programs are more likely to enhance an individual's labor market outcomes (particularly earnings) relative to non-credit-bearing programs.

Employment

The likelihood of employment at some point in a year was approximately equal among respondents who completed credit-bearing and non-credit-bearing programs until their late

20s. At age 24, the likelihood of employment was 88% for respondents whose highest educational attainment was a credit-bearing credential as well as for respondents whose highest educational attainment was a non-credit-bearing credential. At age 30, the likelihood of employment diverged just slightly between these groups to 88% and 84%, respectively (see Figure 2).

Figure 2. Percentage Employed by Age and Highest Educational Attainment



Note. The total sample included 6,093 NLSY97 respondents who did not attain a bachelor's degree within 6 years of high school graduation or obtaining a GED. We applied custom weights and based profiles on respondents' highest educational attainment. See Appendix A for detail on the weighting procedure.

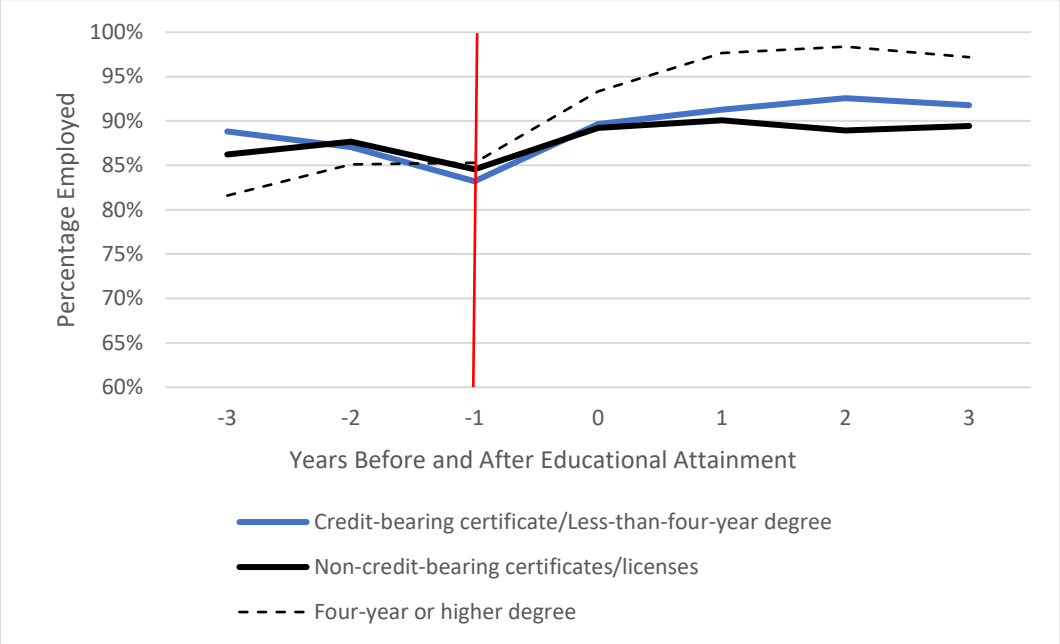
Other changes that occur during an individual's life-span may explain these descriptive findings related to differences in the types of people who choose each path. Consider child rearing as an example of such a change: Individuals are more likely to enroll in programs that they perceive to be more challenging when they do not have children (or have fewer children); also, the presence of children may reduce an individual's likelihood of employment unrelated to their educational attainment, especially among mothers (Gough & Noonan, 2013; Moore & Waite, 1977; Sibulkin & Butler, 2005). Therefore, these descriptive changes may be an artifact of omitted variables that are simultaneously changing throughout a person's life-span and codetermined with educational attainment but are not a by-product of attainment.

To focus on the change in outcomes that we observed from the attainment of credentials, we next present graphs that depict the years just prior to and following program completion (see Figure 3). These depictions show the differences in employment likelihood that respondents

experienced in the 3 years prior to credit-bearing and non-credit-bearing educational attainment and the 4 years following attainment. In this figure, Year 0 represents the year of completion.[11] The red vertical line presented in Year -1 depicts the final full year before program completion and after which we would anticipate the divergence in employment likelihood.

The findings from this second descriptive investigation reinforced our interpretation of the evidence presented in Figure 3. Although the employment likelihood was quite similar between credit-bearing and non-credit-bearing program pathways prior to completion, in the years immediately following completion, respondents who attained a credit-bearing certificate or a 2-year degree were more likely to be employed.

Figure 3. Percentage Employed by Years Before and After Educational Attainment



Note. The total sample included 1,727 NLSY97 respondents who did not attain a bachelor's degree within 6 years of high school graduation or obtained a GED and were between the ages of 18 and 30 three years before and after their highest educational attainment. We applied custom weights and based profiles on respondents' highest educational attainment. See Appendix A for detail on the weighting procedure.

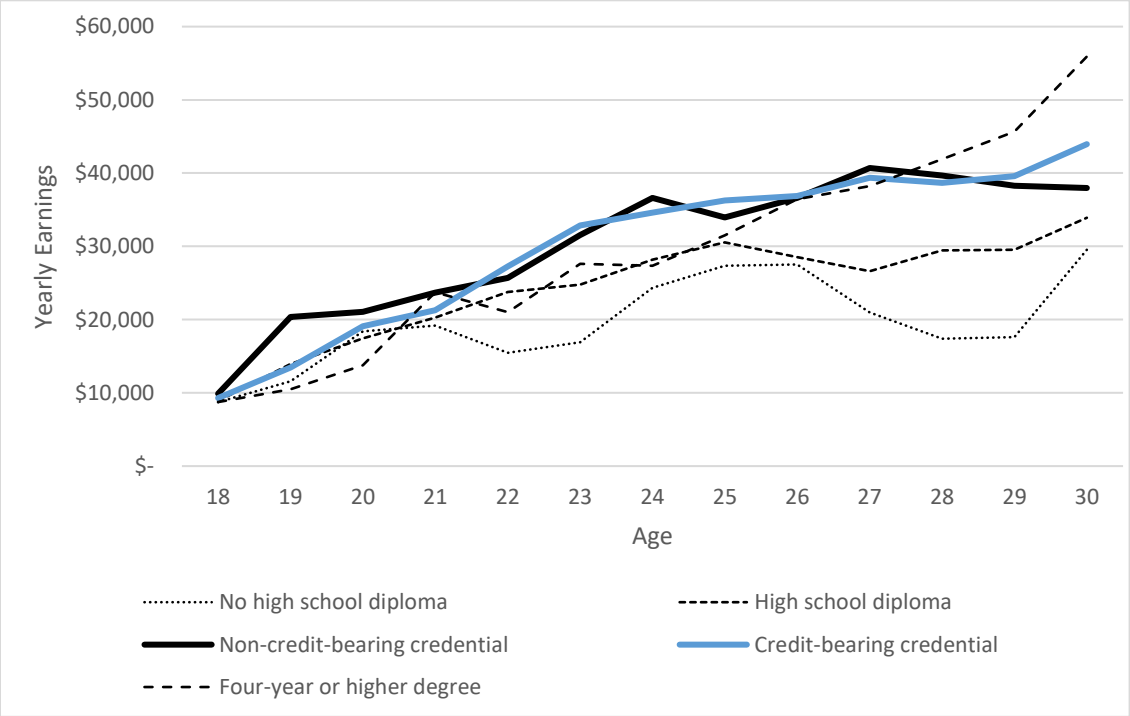
Earnings

The descriptive earnings detail was consistent with and even larger in magnitude than the descriptive employment detail. Specifically, Figure 4 shows that earnings were approximately equivalent for respondents who would ultimately complete credit-bearing and non-credit-

[11] Completion may have occurred at any point in the calendar year—as early as January or as late as December. Program participation may have occurred through all of Year -1 (e.g., through continuous enrollment in a 2-year program) or not at all (e.g., if participation in a short-term certificate program was wholly contained in Year 0).

bearing programs throughout their mid-20s but diverged by age 30. For example, at age 24, respondents whose highest attainment was from a credit-bearing certificate or 2-year degree program earned an average of $34,619 per year, whereas respondents whose highest attainment was from a non-credit-bearing certificate or licensure program earned an average of $36,608 per year, a surplus of about $2,000 per year that accrued to respondents who ultimately completed a non-credit-bearing program.[12] However, by age 30, the groups earned an average of $43,949 and $34,619, respectively—indicating that respondents who completed credit-bearing programs attained about $10,000 more per year by age 30 (see Figure 4).

Figure 4. Earnings by Age and Highest Educational Attainment

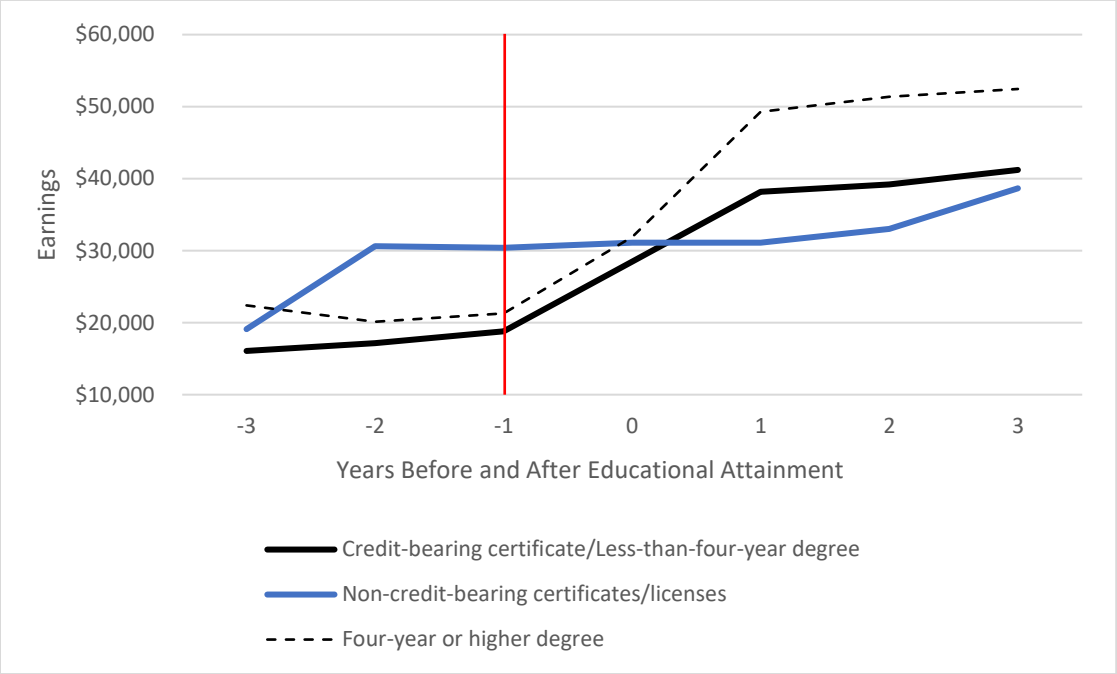


Note. The total sample included 6,093 NLSY97 respondents who did not attain a bachelor's degree within 6 years of high school graduation or obtained a GED. We applied custom weights and based profiles on respondents' highest educational attainment. See Appendix A for detail on the weighting procedure.

When we looked at earnings in the years before and after educational attainment, we saw data consistent with the nature of employment: relatively flat earnings prior to attainment and a rise in earnings after attainment (see Figure 5). The trend among respondents who attained non-credit-bearing credentials showed an overall gain from Year -3 to Year +3, but it was flatter than the curves for the other two categories.

[12] Related to the way the figure was constructed, respondents may or may not have earned the noted credential (certificate or degree) by age 24. Respondents were grouped by the highest level of education ever attained, which may have been attained at a later age.

Figure 5. Earnings by Year Before and After Educational Attainment



Note. The total sample included 1,727 NLSY97 respondents who did not attain a bachelor's degree within 6 years of high school graduation or obtained a GED and were between the ages of 18 and 30 three years before and after their highest educational attainment. We applied custom weights and based profiles on respondents' highest educational attainment. See Appendix A for detail on the weighting procedure.

Impact Findings

To examine the differential labor market returns to credit-bearing and non-credit-bearing attainment, we used an individual fixed-effects strategy to identify changes in employment and earnings that accrued to NLSY97 respondents upon completion. Our estimates showed that credit-bearing programs did not yield a significant increase in the likelihood of employment relative to non-credit-bearing programs (Table 2, findings column 1). Our estimates did, however, show that credit-bearing programs increased yearly earnings by about 17% relative to the $33,000 average earnings of respondents who completed non-credit-bearing programs and who were employed, representing a change of about $5,500 (Table 2, findings column 2).[13]

[13] Beyond the focus on the relative return associated with credit- and non-credit-bearing attainment, these results also showed significant improvements in the employment and earnings that respondents receive after completing a bachelor's degree or higher degree-based program.

Table 2. Regression Estimates of Employment Likelihood and Natural Log Earnings by Educational Attainment

	(1) Employed	(2) Natural log yearly earnings
No high school diploma or GED	-0.082***	-0.313***
	(0.014)	(0.046)
High school diploma or GED attainment	-0.026***	-0.135***
	(0.008)	(0.027)
Non-credit-bearing certificates/licenses	(reference category)	
Credit-bearing certificate/associate degree	**0.017**	**0.153*** **
	(0.012)	**(0.044)**
4-year or higher degree	0.083***	0.411***
	(0.017)	(0.064)
Marital status	-0.012**	0.028
	(0.006)	(0.018)
Number of children	-0.037***	-0.104***
	(0.005)	(0.009)
Enrolled in School	-0.037***	-0.259***
	(0.006)	(0.013)
Enrolled in Training	0.011**	-0.035*
	(0.006)	(0.020)
Constant	0.754***	8.480***
	(0.043)	(0.319)
Observations	79,134	59,313
Number of individuals	6,093	6,015
R-squared	0.070	0.264

Note. Standard deviations are in parentheses. The total sample included 6,093 NLSY97 respondents who did not attain a bachelor's degree within 6 years of high school graduation or obtained a GED. The models included the following fixed effects: individual, year, gender*age, race*age, and year trend*county. We applied custom weights and clustered standard errors at the state of residence at age 18. See Appendix A for detail on the weighting procedure.
*$p < .10$. **$p < .05$. ***$p < .01$.

Hours and Wages

To examine the extent to which changes in earnings are associated with fundamental differences in the relationship to work that individuals in credit- and non-credit-bearing credentialing programs have, we present an analysis of our estimates separately on hours and wages. These analyses indicated that although the earnings differences were largely driven by changes in the number of hours worked, significant differences occurred in the wages that respondents who completed credit-bearing training earned relative to respondents who completed non-credit-bearing programs. Specifically, respondents who completed credit-

bearing programs worked about 100 more hours each year and earned about 9.2% more (Table 3).

Table 3. Regression Estimates of Yearly Hours Worked and Natural Log Hourly Wage by Educational Attainment

	(1) Yearly hours	(2) Natural log hourly wage
No high school diploma or GED	-312.0***	-0.056**
	(37.24)	(0.024)
High school diploma or GED attainment	-137.2***	-0.061***
	(26.49)	(0.013)
Non-credit-bearing certificates/licenses	(reference category)	
Credit-bearing certificate/associate degree	**99.93****	**0.088*****
	(46.89)	**(0.031)**
4-year or higher degree	431.6***	0.132***
	(64.42)	(0.031)
Marital status	-7.294	0.053***
	(18.47)	(0.008)
Number of children	-123.3***	-0.009
	(10.33)	(0.007)
Enrolled in School	-281.8***	-0.072***
	(15.77)	(0.009)
Enrolled in Training	-17.17	-0.019*
	(17.97)	(0.009)
Constant	774.3***	2.205***
	(226.7)	(0.117)
Observations	76,163	59,313
Number of individuals	6,079	6,015
R-squared	0.168	0.200

Note. Standard errors in parentheses. The total sample included 6,093 NLSY97 respondents who did not attain a bachelor's degree within 6 years of high school graduation or obtained a GED. The models included the following fixed effects: individual, year, gender*age, race*age, and year trend*county. We applied custom weights and clustered standard errors at the state of residence at age 18. See Appendix A for detail on the weighting procedure.
*$p < .10$. **$p < .05$. ***$p < .01$.

Subgroup Analyses

Prior research indicated that individuals from low-wealth families, non-White individuals, and individuals who were the first in their families to attend college were significantly less likely to go directly from high school into a 4-year college program compared with their more economically advantaged peers (McFarland et al., 2019). We next examined the stability of these estimates across these more vulnerable subgroups.

The findings among our subgroups of interest show that employment results were consistent across subgroups (Table 4). The results on earnings, on the other hand, indicate that respondents from low-wealth families (in the lowest tercile of the wealth distribution when the respondent was age 18) and non-White respondents did not experience significant earnings increases for completing a credit-bearing program compared with completing a non-credit-bearing program (Table 5, findings columns 2 and 3). We also found that the changes in hours and wages for low-wealth and non-White respondents associated with credit-bearing credentials were not statistically significant, as shown in Appendix B.

Table 4. Regression Estimates of Employment Likelihood Among Vulnerable Subgroups

	(1) Overall	(2) Low Wealth	(3) Non-White	(4) Parent without bachelor's degree
No high school diploma or GED	-0.082***	-0.098**	-0.073	-0.079***
	(0.014)	(0.037)	(0.045)	(0.015)
High school diploma or GED attainment	-0.026***	-0.056***	-0.019	-0.027***
	(0.008)	(0.020)	(0.024)	(0.009)
Non-credit-bearing certificates/licenses	(reference category)			
Credit-bearing certificate/associate degree	**0.017**	**0.002**	**0.003**	**0.016**
	(0.012)	**(0.042)**	**(0.031)**	**(0.015)**
4-year or higher degree	0.083***	0.151**	0.082	0.066**
	(0.017)	(0.066)	(0.063)	(0.027)
Marital status	-0.012**	-0.014	0.013	-0.012
	(0.006)	(0.021)	(0.015)	(0.008)
Number of children	-0.037***	-0.037***	-0.035***	-0.037***
	(0.005)	(0.012)	(0.010)	(0.005)
Enrolled in School	-0.037***	-0.031**	-0.032**	-0.035***
	(0.006)	(0.012)	(0.012)	(0.006)
Enrolled in Training	0.011**	0.012	0.037**	0.012*
	(0.006)	(0.018)	(0.015)	(0.006)
Constant	0.754***	1.080***	0.760***	0.751***
	(0.043)	(0.147)	(0.128)	(0.085)

Observations	79,134	20,089	45,444	60,836
Number of individuals	6,093	1,547	3,500	4,685
R-squared	0.070	0.145	0.141	0.081

Note. Standard deviations are in parentheses. The total sample included 6,093 NLSY97 respondents who did not attain a bachelor's degree within 6 years of high school graduation or obtained a GED. The models included the following fixed effects: individual, year, gender*age, race*age, and year trend*county. We applied custom weights and clustered standard errors at the state of residence at age 18. See Appendix A for detail on the weighting procedure.
*p < .10. **p < .05. ***p < .01.

Table 5. Regression Estimates of Natural Log Yearly Earnings Among Vulnerable Subgroups

	(1) Overall	(2) Low Wealth	(3) Non-White	(4) Parent without bachelor's degree
No high school diploma or GED	-0.313***	-0.232**	-0.141	-0.314***
	(0.046)	(0.109)	(0.157)	(0.048)
High school diploma or GED attainment	-0.135***	-0.122**	0.000	-0.149***
	(0.027)	(0.057)	(0.087)	(0.029)
Non-credit-bearing certificates/licenses	(reference category)			
Credit-bearing certificate/associate degree	**0.153*** (0.044)**	**0.101 (0.092)**	**0.274 (0.184)**	**0.156*** (0.044)**
4-year or higher degree	0.411***	0.355	0.338**	0.370***
	(0.064)	(0.23)	(0.151)	(0.109)
Marital status	0.028	0.087	-0.012	0.030
	(0.018)	(0.052)	(0.049)	(0.022)
Number of children	-0.104***	-0.092***	-0.05	-0.104***
	(0.009)	(0.022)	(0.041)	(0.012)
Enrolled in School	-0.259***	-0.210***	-0.254***	-0.210***
	(0.013)	(0.047)	(0.047)	(0.021)
Enrolled in Training	-0.035*	-0.066	-0.102**	-0.038*
	(0.020)	(0.052)	(0.040)	(0.021)
Constant	8.48***	7.525***	8.235***	8.551***
	(0.319)	(0.345)	(0.521)	(0.309)
Observations	59,313	14,306	33,219	45,566
Number of individuals	6,015	1,518	3,448	4,620
R-squared	0.264	0.305	0.376	0.254

Note. Standard deviations are in parentheses. The total sample included 6,093 NLSY97 respondents who did not attain a bachelor's degree within 6 years of high school graduation or obtained a GED. The models included the following fixed

effects: individual, year, gender*age, race*age, and year trend*county. We applied custom weights and clustered standard errors at the state of residence at age 18. See Appendix A for detail on the weighting procedure.
*p < .10. **p < .05. ***p < .01.

Exploratory Analyses

Students may select into different education pathways for a multitude of reasons. These could include differences in the potential outcomes associated with programs' labor market earnings. However, students also may consider any additional flexibility that credit-bearing pathways provide, such as students' ability to build on the credits they earned in the pathway toward eventual attainment of a bachelor's degree at a later point.

To investigate differences in the utility of the credit- and non-credit-bearing pathways in terms of their flexibility, we followed the main results just presented with additional, exploratory analyses. These analyses investigated differences in the flexibility of educational attainment by examining the likelihood that students who started credit and non-credit-bearing pathways eventually earned a bachelor's degree.

The short-term employment or earnings gains associated with a program are unlikely to capture the full range of benefits that individuals consider when selecting their educational pursuits. Other potential benefits that individuals likely consider include some potential signaling value associated with a degree and long-term earnings, both of which may accrue because of the flexibility that a program may provide, especially considering the rapid evolution of present-day labor markets. One hallmark of flexibility is associated with the ability to transfer or stack credentials, typical in credit-bearing programs, which provides the opportunity to build from preassociate certificates to associate degrees and then to bachelor's degrees.

To test the extent to which this specific type of flexibility was associated with stacking from an initial credit-bearing certificate or associate degree to a bachelor's degree, we estimated the differential propensity to attain a bachelor's degree by age 30 between respondents whose first educational attainment was from a credit-bearing program compared with respondents whose first educational attainment was from a non-credit-bearing program (see Equation 2 and the results in Table 7). With these findings, we show that respondents whose initial postsecondary educational attainment was from a credit-bearing program were 11 percentage points more likely to attain a bachelor's degree by age 30 than respondents whose initial postsecondary educational attainment was from a non-credit-bearing program.[14]

[14] We also estimated results for each vulnerable subgroups. These subgroup analyses showed that (similar to the subgroup analyses relevant to the main results) vulnerable populations experience similar propensities to leverage a credit-bearing degree to attain a bachelor's degree. See Appendix C.

Table 6. Regression Estimates of First Attainment in Credit-Bearing Programs Compared With Non-Credit-Bearing Programs on the Propensity to Attain a Bachelor's Degree by Age 30

	Propensity to attain a bachelor's degree
Credit-bearing certificate/associate degree (first attainment)	0.111***
	(0.014)
Male	-0.021*
	(0.011)
White	-0.01
	(0.014)
Marital status at first attainment (or age 18)	0.002
	(0.015)
Number of children at first attainment (or age 18)	-0.021***
	(0.007)
Constant	0.02
	(0.088)
Age at first attainment (or age 18) fixed effects	Yes
County at first attainment (or age 18) fixed effects	Yes
Observations	2,859
R-squared	0.224

Note. The total sample included 6,093 NLSY97 respondents who did not attain a bachelor's degree within 6 years of high school graduation or obtained a GED. We applied custom weights and clustered standard errors at the state of residence at age 18. See Appendix A for detail on the weighting procedure.
*$p < .10$. **$p < .05$. ***$p < .01$.

Conclusion

In this report, we showed that credit-bearing programs have significant positive returns on students' earnings relative to the returns that accrue to individuals who complete non-credit-bearing postsecondary training programs. The magnitude of the earnings difference that accrues to students who complete credit-bearing programs is on the order of $5,500 per year. We found that this increase in earnings is associated in both an increase in hours as well as an increase in the hourly wage. In addition, our research presented results from exploratory analyses that provide modest evidence that credit-bearing programs are indeed more portable (i.e., used to support ultimate bachelor's degree attainment).

There are a number of policy implications for these findings, but further research is needed to help sort out the efficacy of those policies. First, the higher returns to credit-bearing credentials signal a need for increased support for these pathways and greater understanding of why individuals choose non-credit-bearing programs. If a barrier to credit-bearing pathways is financial cost,

additional means-tested education subsidies may be necessary to ensure that all students can contribute to the future labor market in accordance with their ability. Second, approaching this from a different angle, if the differential in returns is caused by the hypothesized terminal nature of non-credit-bearing programs, this could signal a need to examine potential mechanisms for better connecting careers and educational pathways for students. This type of approach is reflected in current discussions on middle skills, including the discourse on stackable credentials (Austin et al., 2012; Belfield & Bailey, 2017; Bohn & McConville, 2018), and calls to connect apprenticeship training to college credits (Klor de Alva & Schneider, 2018; McCarthy, Palmer, & Prebil, 2017).

In interpreting the results from this study, there are relevant considerations associated with the systematic influence of the field of study, types of credentials, and individual background on respondent outcomes. To examine these interaction effects, employers, states, and workforce regulation boards should consider gathering ongoing evidence on the experiences and outcomes of diverse students' in a range of training programs to enhance their understanding of the ability for a range of programs to serve them well. These data should aim to include information on the roles that credit-bearing and non-credit-bearing training programs play in facilitating or impeding students' abilities to meet their education and career goals and succeed in life. Without careful data collection, evaluation, and support services, training programs and their stakeholders may undermine the longer-term successes of the students that they aim to provide.

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Appendix A. Description of the NLSY97 Data

Overview of the Data Source

For this study, we used NLSY97 public-use and restricted-use geographic data. We obtained the public-use data through the NLS Investigator, an online tool that allows users to select and download specific variables. The restricted-use data used for this study included respondents' state and county of residence. A total of 8,984 NLSY97 respondents participated in the first interview when respondents were between ages 12 and 18. At the time of this study, the 17th interview round from 2015–16 included the most recent data available. We constructed a yearly dataset, with one record per respondent for each calendar year between ages 18 and 30.

Sample Characteristics

We constructed the following characteristics for each respondent: race/ethnicity, age, marital status, number of children, parents' education level and level of family wealth, and county of residence. In this appendix, we discuss the details associated with constructing each variable.

Race/Ethnicity

Respondents reported their race, ethnicity, and date of birth during the first interview. The NLSY97 race categories included American Indian, Eskimo, or Aleut; Asian or Pacific Islander; Black or African American; White; and some other race. We categorized respondents who reported being a Hispanic ethnicity as Hispanic, regardless of their reported race.

Age

Age was defined using respondents' year of birth.

Marital Status and Number of Children

Respondents' marital status and number of children varied across years in the dataset. We obtained marital status in a given year using a combination of respondents' reported year of their first marriage, reported year that their first marriage ended, and reported legal marital status at the time of each interview. The dates for more than one marriage were not available. If respondents reported that their first marriage ended, we categorized these respondents as married again if they reported that their marital status was married at the time of the interview after the end of their first marriage. Respondents who reported being married again after their first marriage were then categorized as not married if they reported being divorced or widowed. We used the birth year of respondents' biological and adopted children to calculate the number of children that respondents had in a given year.

Parents' Education Level and Level of Family Wealth

We created two characteristics based on respondents' parents that we collected at the first interview round. To determine parents' education level, we used the highest grade level completed by respondents' residential mother and father. We identified a mother or father with at least 4 years of college completed as having completed a bachelor's degree.

We used respondents' reported household net worth at the first interview if respondents were not independent to determine whether respondents were from a low-wealth family. We then adjusted the household net worth to 2016 dollars. We categorized respondents in households in the bottom third of net worth as from a low-wealth family.

County of Residence

We collected respondents' state and county of residence at each interview round. Therefore, respondents' state and county data were not available during a year when a respondent was not interviewed. To obtain respondents' state and county information for years when a respondent was not interviewed or data was missing between ages 18 and 30, we assumed that the respondent resided in the same state and county that was reported during the previous interview.

Educational Attainment

Our principal independent variable of interest was educational attainment. To construct these measures, we leveraged NLSY97 data on the years that respondents received each of the following: (a) a high school diploma or GED, (b) a non-credit-bearing or credit-bearing certificate or license, (c) an associate degree, or (d) a bachelor's degree or higher. When possible, we used NLSY97-created variables for the year that respondents reported receiving a high school diploma, a GED, or a degree from regular schooling. These NLSY97-created variables used information reported across all rounds for all respondents. If more than one degree of the same type was reported, the earliest valid receipt date was presented.[15]

We used the NLSY97-created variables for the year that respondents obtained a high school diploma or GED. No respondent had both a high school diploma receipt date and a GED receipt date. We used the NLSY97-created date for when a respondent left high school if a respondent was missing a diploma or GED receipt year (i.e., the respondent reported receipt of a high school diploma or GED but did not provide a date of receipt).

[15] See https://www.nlsinfo.org/content/cohorts/nlsy97/other-documentation/codebook-supplement/appendix-1-education-variable/date for more information about how NLSY97 created each date.

The year that respondents received their first non-credit-bearing certificate or license was obtained using respondents' report of attainment from a training program. The language in the NLSY97 training questionnaire asked respondents to report on training rather regular postsecondary schooling: "Other than high school, college, or university degree programs you may have told me about earlier, since [date of last interview], have you attended any schooling, courses, or training programs designed to help people find a job, improve their job skills, or learn a new job? Some sources of occupational training programs include trade schools, nursing courses, apprenticeships, vocational or technical institutes, company or military trainings, correspondence courses, employer training programs, and other continuing education."[16] We identified respondents who reported receiving a vocational certificate, a state license, a certificate of completion, or other license from a training program as non-credit-bearing certificate or license recipients. We defined the date of receipt as the date the respondent stopped attending the training or last stopped attending the training if the respondent was attending the training at the time of the interview because the date of receipt was not collected. We retained the earliest date of receipt across all interview rounds. We did not use the NLSY97-created variable for the date that respondents reported receipt of a training certificate or license because the date presented reflects the most recent certificate or license, not the earliest attainment.

Respondents reported receipt of an associate degree or a credit-bearing certificate in the schooling questionnaire. Items in the schooling questionnaire asked respondents to report on the following types of schools: 2-year colleges, community colleges, junior colleges, 4-year colleges or universities, graduate schools, law schools, and medical schools. We obtained the year that respondents received an associate degree from an NLSY97-created variable. An NLSY97-created variable was not available for the receipt date of vocational or technical certificates reported in the schooling questionnaire. Therefore, we examined respondents' reported vocational or technical certificate receipt from regular schooling across all interview rounds and retained the earliest date if more than one certificate was reported. We retained the earliest associate degree or certificate receipt year.

We also used NLSY97-created variables to identify the year that respondents received a bachelor's or higher degree. The degree types that respondents reported on the schooling questionnaire included bachelor's degree, master's degree, doctoral degree, and professional degree. We retained the earliest receipt year across all degree types.

[16] Taken from https://nlsinfo.org/content/cohorts/nlsy97/topical-guide/education/training; language changed slightly across interview rounds.

Employment and Earnings

Our principal outcomes of interest were employment and earnings. We obtained respondents' employment status and total earnings in a given year using the information collected for each job. At each interview, we collected employment and wage data for all jobs since respondents' last interview. In addition, jobs had unique identification numbers, which allowed us to tracked respondents' jobs across interview rounds.

We used the start and stop years that respondents reported working at each job to determine employment status during a given year. The year the respondent stopped working at the job is the interview date if the respondent was still employed at the job at the time of the interview. Therefore, we used the start and stop dates for a given job reported in the most recent interview round. We identified a respondent as employed in a given year if the respondent was employed with any job at any point between the start and stop years.

We used the NLSY97-created variables for reported hourly compensation and hours worked per week for each job in each interview round to calculate the yearly earnings of respondents. Respondents could report their compensation and hours worked for each job in various time frequencies, including hourly, daily, weekly, monthly, and yearly. The NLSY97-created variables transformed the compensation and hours worked reported at various frequencies to one frequency that was comparable across all jobs. The compensation and hours worked used in the NLSY97 calculation was the amount that respondents reported receiving at the time of the employment stop date (i.e., the date the respondent was no longer employed by the employer or the date of the interview if the respondent was still employed by the employer) if the job lasted for more than 13 weeks. If the job lasted 13 weeks or less, the compensation and hours worked reflect the amount that respondents reported at the start of the job. Compensation included tips, bonuses, commissions, overtime, and incentive pay.

We made additional adjustments to the NLSY97-created variables for each job. If weekly compensation or hours worked per week were missing for a given job and interview round, we used the weekly compensation or hours calculated in the previous interview round or in the subsequent round for the same job. Hours worked per week greater than 80 hours were top coded to 80 hours per week. Hourly compensation amounts greater than $1,000 for a given job were top coded to $999. Hourly compensation also was adjusted to 2016 dollars.

We converted the NLSY97-created hourly and weekly variables to obtain the total yearly earnings used in this study. First, we multiplied hourly compensation and hours worked per week to obtain earnings per week at each job. Then we calculated both earnings per month and hours worked per month for a given job by multiplying the weekly amounts by the average number of weeks in a month (4.33 weeks). We then summed respondents' monthly earnings

for all months that a respondent was employed at each job within each year. The monthly earnings used for a given month were for those months between the job start date or stop date reported in the previous interview round if the job was ongoing and the stop date reported in the given interview round. Finally, we summed respondents' yearly earnings across all jobs.

Weights

We downloaded the NLS custom weights for the specific set of respondents in our sample. The weights allowed us to correct for oversampling, clustering, and nonresponse to the interview. For more information about the NLS custom weighting program, see https://www.nlsinfo.org/weights/custom-weighting-program-documentation.

Appendix B. Findings on Wages and Hours

Table B1. Regression Estimates of Yearly Hours Worked Among Vulnerable Subgroups

	(1) Overall	(2) Low Wealth	(3) Non-White	(4) Parent without bachelor's degree
No high school diploma or GED	-312.0***	-263.3***	-293.9***	-299.8***
	(37.24)	(83.20)	(104.80)	(39.53)
High school diploma or GED attainment	-137.2***	-168.8***	-102.2*	-128.2***
	(26.49)	(58.99)	(51.77)	(25.33)
Non-credit-bearing certificates/licenses		(reference category)		
Credit-bearing certificate/associate degree	**99.93****	**-80.68**	**160.90**	**120.2****
	(46.89)	**(101.30)**	**(95.94)**	**(55.54)**
4-year or higher degree	431.6***	385.6**	212.6*	359.1***
	(64.4)	(177.0)	(110.2)	(84.2)
Marital status	-7.29	68.70	-15.15	-12.19
	(18.47)	(53.96)	(57.92)	(23.18)
Number of children	-123.3***	-89.61***	-114.3***	-116.5***
	(10.33)	(22.40)	(24.39)	(10.73)
Enrolled in School	-281.8***	-235.8***	-211.6***	-239.0***
	(15.77)	(39.54)	(31.91)	(17.39)
Enrolled in Training	-17.17	-43.84	-11.95	-11.98
	(17.97)	(46.54)	(63.38)	(16.62)
Constant	774.3***	755.1**	655.9*	773.2***
	(226.7)	(288.4)	(334.3)	(222.1)
Observations	76,163	19,438	43,938	58,613
Number of individuals	6,079	1,543	3,493	4,675
R-squared	0.168	0.236	0.261	0.163

Note. Standard errors in parentheses. The total sample included 6,093 NLSY97 respondents who did not attain a bachelor's degree within 6 years of high school graduation or obtained a GED. The models included the following fixed effects: individual, year, gender*age, race*age, and year trend*county. We applied custom weights and clustered standard errors at the state of residence at age 18. See Appendix A for detail on the weighting procedure.
*p < .10. **p < .05. ***p < .01.

Table B2. Regression Estimates of Natural Log Hourly Wage Among Vulnerable Subgroups

	(1) Overall	(2) Low Wealth	(3) Non-White	(4) Parent without bachelor's degree
No high school diploma or GED	-0.056**	-0.055	0.082	-0.082***
	(0.024)	(0.046)	(0.075)	(0.028)
High school diploma or GED attainment	-0.061***	-0.054	0.012	-0.081***
	(0.013)	(0.037)	(0.045)	(0.019)
Non-credit-bearing certificates/licenses		(reference category)		
Credit-bearing certificate/associate degree	**0.088*** **	**0.104**	**0.090**	**0.076** **
	(0.031)	**(0.062)**	**(0.117)**	**(0.029)**
4-year or higher degree	0.132***	0.192**	0.144	0.157***
	(0.031)	(0.085)	(0.088)	(0.034)
Marital status	0.053***	0.071***	0.012	0.054***
	(0.008)	(0.021)	(0.030)	(0.011)
Number of children	-0.009	-0.015	0.022	-0.018*
	(0.007)	(0.012)	(0.034)	(0.009)
Enrolled in School	-0.072***	-0.043**	-0.073*	-0.054***
	(0.009)	(0.018)	(0.040)	(0.012)
Enrolled in Training	-0.019*	-0.050**	-0.021	-0.021*
	(0.009)	(0.022)	(0.035)	(0.011)
Constant	2.205***	1.903***	2.075***	2.079***
	(0.117)	(0.126)	(0.119)	(0.172)
Observations	59,313	14,306	33,219	45,566
Number of individuals	6,015	1,518	3,448	4,620
R-squared	0.200	0.275	0.264	0.206

Note. Standard errors in parentheses. The total sample included 6,093 NLSY97 respondents who did not attain a bachelor's degree within 6 years of high school graduation or obtained a GED. The models included the following fixed effects: individual, year, gender*age, race*age, and year trend*county. We applied custom weights and clustered standard errors at the state of residence at age 18. See Appendix A for detail on the weighting procedure.
*p < .10. **p < .05. ***p < .01.

Appendix C. Exploratory Subgroup Analysis Results

Table C1. Regression Estimates of First Attainment in Credit-Bearing Programs Compared With Non-Credit-Bearing Programs on the Propensity to Attain a Bachelor's Degree by Age 30

	(1) Overall	(2) Low Wealth	(3) Non-White	(4) Parent without bachelor's degree
Credit-bearing certificate/associate degree (first attainment)	0.111*** (0.014)	0.081** (0.032)	0.114*** (0.02)	0.109*** (0.015)
Male	-0.021* (0.011)	-0.051** (0.025)	0 (0.015)	-0.024** (0.011)
White	-0.01 (0.014)	0.061 (0.042)	NA	-0.003 (0.016)
Marital status at first attainment (or age 18)	0.002 (0.015)	0.009 (0.034)	0.003 (0.021)	0.022 (0.016)
Number of children at first attainment (or age 18)	-0.021*** (0.007)	-0.026* (0.014)	-0.018** (0.008)	-0.021*** (0.007)
Constant	0.02 (0.088)	-0.018 (0.248)	-0.009 (0.258)	0.022 (0.099)
Age at first attainment (or age 18) fixed effects	Yes	Yes	Yes	Yes
County at first attainment (or age 18) fixed effects	Yes	Yes	Yes	Yes
Observations	2,859	656	1,582	2,196
R-squared	0.224	0.392	0.249	0.252

Note. Standard errors in parentheses. The total sample included 6,093 NLSY97 respondents who did not attain a bachelor's degree within 6 years of high school graduation or obtained a GED. We applied custom weights and clustered standard errors at the state of residence at age 18. See Appendix A for detail on the weighting procedure.

*$p < .10$. **$p < .05$. ***$p < .01$.

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