The Impact of Human Capital in the American Labor Market Series

# Skills, Earnings, and Employment of Americans with Postsecondary Education Below the Bachelor's Degree

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# Preface

Efforts to increase rates of college enrollment to meet growing demands from the labor market have been underway in the United States since the middle of the 20th century. By the first decade of the 21st century, policymakers and others were doubling down on these efforts, including calls for at least 60% of U.S. adults to have a college education.[I] By 2021, it was clear those efforts were paying dividends: two-thirds (66.4%) of 25- to 29-year-old Americans attained college degrees or pursued some postsecondary education.[II] For those who believe that postsecondary education is and should be the sole response for meeting growing labor market demand, we are well on course. But are we?

A large body of research explores this question, examining differences in earnings and labor market outcomes by level of educational attainment. Most of these studies utilize a human capital model that relies on attainment as a measure for the stock of human capital an individual brings to the labor market. Attainment is used for practical reasons; data on the other measure for human capital—foundational skills—are rarely available from standard household surveys. But, as this and other reports in the ETS Human Capital in the American Labor Market Series demonstrate, attainment is not a perfect measure.[III] In fact, too often the earnings and employment advantages attributed to attainment are exaggerated in the data. The reason? Skills.

In this new report for the ETS Center for Research on Human Capital and Education, the authors use data from the Programme for the International Assessment of Adult Competencies (PIAAC) to estimate the independent effect of skills –literacy and numeracy skills – on labor market and educational attainment outcomes for individuals across three levels of postsecondary education below a bachelor's degree: associate degree awardees, certificate awardees, and college non-completers (adults with some postsecondary schooling but without a credential).[IV]

As expected, the authors found that increased levels of educational attainment bolster earnings. For example, when compared to those with a high school diploma, and statistically controlling for key variables that influence earnings, those with some college but no award are expected to earn 8% more than high school graduates, while adults with a certification are expected to realize about 12% more, and those with an associate's degree are expected to earn almost 26% more than high school grads. However, when levels of literacy are entered into the equation, the returns to these levels of education decline. While those who earn a certification or degree below the bachelor's continue to realize a monthly earnings gain compared to those with a high school degree, the difference is less robust. This is because some of the return to educational attainment is in fact a *return to skills*. In fact, the return to skills when holding other variables constant, including educational attainment, is quite strong: each standard deviation increase in literacy skills boost earnings outcomes for all three attainment groups of adults by more than 8%. However, for adults who started post-

secondary education but did not complete a degree, no earnings payoff was found once skills were entered in the equation. Stated another way, for this group, earnings gains over high school graduates are attributable to their skill proficiencies and not their post-secondary attainment. This is an important finding when considered in the context of the size of the population that falls into this category – some 25 million adults, many of whom may have incurred costs - of dollars and time - to pursue their post-secondary education, but do not realize an earnings gain that is independent of their skill levels.

In their analyses, the authors also found sizeable employment advantages (probability of being employed) by level of education. In fact, the likelihood of employment for those with some college education below the bachelor' degree relative to their counterparts with just a high school diploma was significant and increased with each successive level of attainment. Again, not a surprising finding. However, when literacy skills are entered into the analysis, the findings once again shift. Compared to adult high school graduates without any postsecondary education, the increased likelihood of being employed when skills were entered into the equation dropped from: 6.4 to 4.1 among those who completed some post-secondary education but did not earn a degree or certificate, from 9.5 to 7.9 among those earning a certificate, and from 11.5 to 8.6 among those earning an associate's degree. As with earnings, skills play an important role in the employment outcome - the stronger the skills, the higher the probability of employment across and within levels of attainment. In other words, a part of the favorable employment outcomes of adults with higher levels of attainment are attributable to skills. In fact, for those with attainment below the bachelors, a 1 standard deviation increase in literacy proficiency was related to a nearly 5 percentage point increase in the probability of employment, after statistically controlling for educational attainment.

What these findings suggest is that educational attainment may be signaling a false sense of security for many learners and their families, and policy efforts with a sole focus on attainment without considering skills may be misleading.

Public policies to further increase the already high share of high school students who enroll in college may well lead to more college enrollments, but to be effective, the study's authors contend that we must first confront the role that skills play in both the completion of postsecondary education and labor market outcomes.[V] The authors suggest that bolstering student foundational skills at the elementary and secondary school level would improve the likelihood of students completing a course of study leading to a college award. Additionally, the authors argue that degree completion and foundational skill development should be simultaneous goals for postsecondary institutions to bolster earnings and employment outcomes of adults right after completing college as well as over their working lifetimes.

*—Paul Harrington and Irwin Kirsch*

## Notes

[I] *Lumina Foundation Strategic Plan for 2017 to 2020*, Indianapolis, IN: Lumina Foundation, https://www.luminafoundation.org/wp-content/uploads/2018/01/strategic-plan-2017-to-2020-apr17.pdf.

[II] Source: Authors' calculations based on U.S. Census Bureau, Educational Attainment in the United States: 2021, https://www.census.gov/data/tables/2021/demo/educational-attainment/cps-detailed-tables.html.

[III] See reports in the Impact of Human Capital in the American Labor Market Series here: https://www.ets.org/research/policy/human-capital-education/reports.html#accordion-25fd53d090-item-8d5a5c57e4.

[IV] For a discussion of skills and earnings outcomes among populations who have earned a bachelor's degree, please see: Fogg, *Skills and the Earnings of College Graduates*.

[V] The dissonance between public-school educational success rhetoric and the reality of public-school skill outcomes was recently highlighted by Director of the Institute for Educational Studies Mark Schneider. See Mark Schneider, "Education Runs on Lies," Institute for Education Studies, March 23, 2022, https://ies.ed.gov/director/remarks/03-23-2022.asp

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## Introduction

College for all has become an important policy objective in the United States, particularly in the past decade. Private foundations have encouraged state and local governments to develop programs and policies to sharply increase the share of their resident populations with a college degree. The Lumina Foundation has led the way in this area by establishing a national goal that 60 percent of adults aged 25 to 64 earn a postsecondary credential.[1] Most state education establishments have created similar postsecondary credential goals for adults, and a few states have already enacted or plan to enact legislation of varying types in support of the specific postsecondary credential goals in their state.[2] States have adopted a variety of approaches to support achievement of their individual goals, most often focused on financial aid and business partnerships.[3]

Much of the impetus for national and especially state goals for raising the share of adults with postsecondary credentials of various kinds is associated with a policy perspective that connects economic growth and personal well-being with educational attainment. A highly educated workforce is considered a key ingredient to the welfare of state and local resident populations and a key ingredient in the highly competitive economic development activities of states.[4]

A large and varied body of research has developed over the last 50 years that explores differences in earnings by level of educational attainment in the United States. The major emphasis of these studies has been on the earnings advantages of individuals who have completed a bachelor's degree in comparison to those with a high school diploma.[5] Studies that explore the employment and earnings advantages of those with attainment levels below the bachelor's degree have been comparatively scarce until recently. Dearth of research in this area is partly attributable to fewer data sources available to measure outcomes of persons with educational attainment below the bachelor's degree level, including those with associate's degrees and pre-baccalaureate certificate awards, as well as those with some postsecondary education but without any award. Studies of labor market outcomes of individuals with education below the bachelor's degree level have become available more recently as national survey questionnaires have been better structured to explore degrees and certificates below a bachelor's degree level.[6]

Beginning in the late 1990s and early 2000s, some states developed longitudinal data based on administrative school and work records that are sometimes made available to researchers.[7] These longitudinal data link student high school and college records with employment and earnings data at the state level.[8] Many of these studies are focused exclusively on community colleges.[9] This means that these studies are unable to provide much insight on the employment and earnings outcomes of those with attainment below the bachelor's level who were enrolled in 4-year colleges and universities or in private nonprofit or

for-profit 2-year (or below) colleges. Unions, industry groups, and nonprofit organizations also provide a substantial number of sub-baccalaureate certificate awards that serve as a basis for occupational licenses.[10]

Earlier national studies including longitudinal studies of young people found substantial earnings gains among those who earned an associate's degree, but most of these studies did not explore the returns to earning just a certificate or completing some postsecondary education without an award.[11] However, a few earlier national studies did provide insights into earnings outcomes of individuals with education below the bachelor's degree level including certificates or some college education without a credential. Analysis of the Survey of Income and Program Participation (SIPP) conducted among a cross-section of nonelderly adults in the 1980s found earnings advantages for certificate awardees as well as for those with associate's degrees. However, this study did not present findings for those with some college but no award.[12] A second study that relied on findings from the National Educational Longitudinal Survey (NELS) examined the returns to earning a community college education among young people during the 1990s. These authors found significant annual earnings gains for completion of each additional full-time year of community college education, with gains to a certificate award completion about the same as those associated with 1 year of full-time enrollment in a community college and somewhat larger gains for those with an associate's degree.[13]

A unique early study that included measures of literacy skills for adults based on the National Adult Literacy Survey (NALS, 1992) examined the returns to attainment of the adult population (including attainment below the bachelor's degree) after accounting for foundational skills.[14] The analysis in this study was designed to sort out the earnings effects of learning gains that occur with more schooling from the independent effects of a credential (including attainment below the bachelor's degree level). This study suggested that in most instances the gains to additional schooling were the product of higher literacy skills.[15]

In this paper we use the findings from the Programme for the International Assessment of Adults Competencies (PIAAC) survey of adult skills conducted in the United States in 2012, 2014, and 2017 to explore the earnings and employment gains to attendance and completion of postsecondary education below the bachelor's degree level. We explore the employment and earnings outcomes separately for three educational groups of adults: those with some postsecondary education without any certificate or degree award, those who earned a certificate below the associate's degree level, and those who earned an associate's degree. The analysis includes all individuals with postsecondary attainment below that bachelor's degree regardless of the level (less than 2-year, 2-year, or 4-year college) or sector (public or private/for-profit or nonprofit) of enrollment.

Virtually all studies of the returns to schooling utilize a Mincerian earnings function to estimate the impact of human capital investments on earnings of workers.[16] These studies rely on measures of educational attainment to serve as proxies for "worker abilities" in earnings regressions to estimate returns to schooling. However, it has long been recognized that attainment measures used in these regressions may overstate the impact of attainment since measures of ability that are independent of attainment are not included in the regression. Cross national studies suggest that educational attainment may not fully measure the stock of an individual's human capital.[17] This problem can be substantial. In an earlier analysis of PIAAC data, the authors found substantial variation in literacy skill scores among individuals with the same level of attainment - with substantial shares of U.S. adults with bachelor's and even graduate degrees with deficient literacy skills.[18] This study takes advantage of the PIAAC literacy measures to disentangle the independent effects of attainment from the effects of literacy skills on earnings and employment outcomes among adults with a college education below the bachelor's degree level.

## A Word About PIAAC

The PIAAC survey of adult skills was designed to assess the cognitive skills of the adult (aged 16–74) resident population in 39 nations implemented over three cycles between 2012 and 2017.[19] The PIAAC skills assessment is administered in respondents' homes and includes both foundational skills assessments along with a detailed background questionnaire. The literacy assessment measures a respondent's ability to understand, evaluate, use, and engage with written texts to participate in society, to achieve personal goals, and to develop individual knowledge and potential.[20] The literacy assessment includes three distinct types of tasks: (a) accessing and identifying information, (b) integrating and interpreting different parts of a text, and (c) evaluating and assessing relevance and credibility of arguments in a text.

The findings from the literacy assessment are reported on a scale that ranges from 0 to 500. Scores at the lower end of the scale indicate abilities limited to relatively easier literacy tasks whereas higher scores indicate proficiency at more difficult tasks. Findings for these scores are provided as a continuous variable in the PIAAC data file. However, the PIAAC program also categorizes scores into six different literacy levels ranging from Below Level 1 to Level 5 to provide some insight into the nature of the proficiencies required at different score levels. A literacy task Below Level 1 (a scale score between 0 and 175) would include finding a telephone number in a short, printed advertisement. At the other extreme, a literacy Level 5 score (between 376 to 500) would require respondents to find information from dense texts and evaluate an evidence-based argument. More information about each of the six literacy scale levels are provided in Appendix C.

## Earnings by Level of Education and Skills: An Overview

We found strong links between earnings and the level of education and skills among workers with education below the bachelor's degree level. The tabulation from U.S. PIAAC data provided in Appendix Chart A4 revealed a substantial earnings advantage among out-of-school employed persons between the ages of 16 and 74 with postsecondary schooling below the bachelor's degrees (+14%) relative to high school graduates. While the earnings premium for the entire group of below the bachelor's college-educated workers is large (+14%), the size of the earnings premium relative to high school graduates varies by level of education; from +15 percent among certificate awardees and nearly twice as high among associate's degree completers (+29%) to no statistically significant earnings premium (relative to high school graduates) among those with postsecondary schooling but no degree or certificate award (Appendix Chart A4).

Descriptive analysis of PIAAC data also revealed that among workers with postsecondary schooling below the bachelor's degree, those with stronger literacy skills scores had higher monthly earnings (Appendix Table A8). The earnings of workers with postsecondary education below the bachelor's degree also varied quite sharply by field of study with especially high mean monthly earnings in engineering and science fields as well as in trades and technical fields of study, but below average earnings among those who specialized in health and in education/social sciences/humanities (Appendix Chart A5).

Considerable variation in earnings was also found across demographic traits among workers with below the bachelor's degree education. The mean monthly earnings of women were only equal to 70 percent of their male counterparts. Substantial differences in mean monthly earnings were also found across race/ethnicity groups with significant earnings gaps between White and Asian/Pacific Islander workers and their Black and Hispanic counterparts. Significant earnings deficits were also found among persons with sensory and cognitive disabilities as well as among younger 16- to 24-year-old out-of-school workers (Appendix Chart A6).

## Earnings by Level of Education and Skills: A Closer Look

Descriptive analysis cannot separate the independent effects of foundational skills on the earnings of workers from other factors that are known to influence earnings including prior work experience and level of educational attainment, as well as their fields of study while in college. To disentangle the independent effect of literacy proficiencies and educational attainment and other characteristics of employed persons on their earnings, labor market researchers commonly employ earnings regression analyses. In this section, we present findings from earnings regression analysis designed to estimate the independent effect of human capital traits including literacy proficiency, educational attainment, and work experience on the earnings of workers.[21] We used the human capital earnings function

approach developed by Jacob Mincer, which is typically employed to estimate returns to human capital investment after statistically controlling for background traits and other variables known to affect earnings.[22]

These regressions are based on the human capital theory that postulates that the earnings of workers are determined by the quantity of their human capital and the rate of return to that human capital in the labor market.[23] Human capital is composed of the stock of knowledge, skills, and abilities of individuals that are valued in the production of goods and services. Like returns on investment in physical capital, the human capital stock of individuals is considered to be an investment that is expected to bear a stream of returns in the future.

One of the most important returns to human capital in the labor market is the earnings of workers. The stock of human capital determines the potential productivity of workers, and since the wages paid to workers are closely tied to their productivity, workers with a higher level of human capital are generally expected to earn higher wages. It is important to note that investments in education and skills do not always yield a positive return for the individual. As labor market requirements change or supply/demand imbalances develop, investors may lack good information about the potential returns to alternative human capital outlays and future family and life circumstance may inhibit the returns to these investments.[24] Because gains to the human capital investment mostly occur in the future, there can be considerable risk to these investments.[25]

Human capital represents the productive potential of individuals and is most often measured by formal educational attainment and work experience, since these measures are most often available to researchers from various national household surveys. Educational attainment enhances the productive potential of an individual though formal knowledge development. Individuals with higher levels of education typically possess greater levels of knowledge and skills that are rewarded in the labor market. Work experience, which is considered a source of human capital development, adds to the human capital of individuals through increased knowledge and skills acquired through formal company training and especially through informal on-the-job learning acquired by engaging in productive activities and learning from other workers.[26]

A third measure of human capital, foundational skills, is an important element that represents a distinct dimension of a worker's productive potential. The PIAAC survey was designed to produce measures of literacy and numeracy skills of adults in the United States and 38 other OECD nations. Gary Becker contends that while educational attainment is an important measure of human capital, using educational attainment to represent human capital in earnings regressions overestimates the earnings premium from educational attainment because some of the earnings premium is attributable to a greater stock of ability among more educated individuals.[27] Our second and third regression models are designed to explore this idea as they include independent measures of literacy derived from PIAAC data.

We employ the PIAAC estimates of literacy proficiencies to measure skills of workers independent of their level of educational attainment.[28] Separate regressions with numeracy proficiency measures of skill are provided in Appendix Tables D3 and D6.[29] These measures of proficiency provide important insights into the cognitive skills that are required to effectively perform work across a vast number of jobs in the U.S. labor market. Human capital theory postulates that workers with higher levels of skills are rewarded in the labor market because of their enhanced contribution to firm output. These skills are enhanced further in the labor market as employers are more likely to invest in training workers with higher skills because workers with higher skills typically have a higher aptitude for learning and are more trainable.[30] Research has consistently found higher earnings associated with higher levels of skills even after statistically controlling for educational attainment.[31] Our earlier papers that explored the connections between skills and earnings (using PIAAC data) found sizeable earnings premiums associated with literacy and numeracy proficiencies of full-time workers, part-time workers, and college graduate workers even after statistically controlling for the effect of educational attainment and work experience.[32]

The earnings regressions in this paper are an expanded version of the basic Mincer earnings function. The dependent variable in these earnings functions consists of the natural log of monthly earnings; the independent variables include the three measures of human capital (literacy skills, educational attainment, and work experience) and other explanatory variables including reported undergraduate field of study, job traits such as weekly hours of work and the region of residence of the worker, and background traits of workers (gender, race/ethnicity, foreign-born status, disability status).

We estimated three earnings regression models. The dependent variable in all three models is the natural log of monthly earnings. A detailed list with descriptions of all independent variables included in these regression models and the dependent variable, as well as formulas for these regression models, is presented in Appendix D. The three earnings regression models differ in the inclusion of literacy skills and major field of study.

> Earnings Regression Model 1: The first earnings regression model does not include any measure of foundational skills. This regression estimates the independent effect of human capital measures of educational attainment and work experience on the earnings of workers after controlling for the remaining covariates in the regression. High school graduates serve as the base group in this regression. Most human capital studies do not include direct measures of foundational skills. Thus, Model 1 represents the most frequently employed earnings function.
>
> Earnings Regression Model 2*:* The second regression model includes all the explanatory variables in the first regression model and an additional explanatory variable representing foundational skills, in this instance the PIAAC literacy skill score. Model 2 is specified to estimate the independent effect of literacy proficiencies of workers on their

earnings after statistically controlling the effect on earnings of the other two measures of human capital—educational attainment and work experience—and other controls included in the regression. High school graduates serve as the base group in this regression.

Earnings Regression Model 3: The third regression model uses all the explanatory variables in the second regression model but with the addition of measures of field of study reported by those with attainment levels below the bachelor's degree. Model 3 only includes workers who had completed postsecondary education below the bachelor's degree.[33] Regression Models 1 and 2 include workers who had completed postsecondary education below the bachelor's degree level as well as high school graduates (with high school graduates serving as the base group). The base group in this Model 3 consists of workers with some college education but without any award.

The population in Earnings Regression Models 1 and 2 includes 16- to 74-year-old workers who were not enrolled in school and who had completed some postsecondary education below the bachelor's degree level or workers who had completed high school without any postsecondary education. The dependent variable in these regression models consists of the natural log of monthly earnings, and the independent variables include the three measures of human capital (skills, educational attainment [select categories], and work experience), background traits of workers (gender, race/ethnicity, foreign-born status, disability status), and the region of residence of workers. Work experience is specified in these earnings regression models as a quadratic variable to capture the relationship between work experience and earnings postulated by Jacob Mincer; that is, earnings increase with additional work experience but at a diminishing rate.[34]

Earnings Regression Model 3 includes the same explanatory variables as the second regression—three measures of human capital, background traits of workers, and region of residence of workers—and an additional set of independent variables representing the college major field of study of workers. The population in the third regression model includes 16- to 74-year-old workers who were not enrolled in school and who had completed some postsecondary education below the bachelor's degree level. High school graduates are excluded from the third regression model since postsecondary field of study was added to the independent variables in the regression and postsecondary field of study information was only available for those who had enrolled in college and was not available for those workers who had completed only high school without any postsecondary education. Findings from Earnings Regression Models 1 and 2 are presented in Table 1. The dependent variable for both regression models is the natural log of monthly earnings. The single difference in the independent variables between the two regression models is the inclusion of a literacy skills score in the Regression Model 2. After statistically controlling for the effects of other covariates (included in the regression) that are known to influence the earnings of workers, Regression Model 1 shows substantial and significant earnings advantages for all three

postsecondary attainment levels below the bachelor's degree. For workers with some postsecondary education without an award, regression model 1 estimated an earnings premium of 8.6 percent compared to the earnings of high school graduates.Workers with a certificate award below the associate's degree level had a monthly earnings advantage of 12.8 percent relative to high school graduates, and among those who earned an associate's degree, Regression Model 1 showed an expected premium of 29.6 percent in monthly earnings relative to high school graduates. Regression Model 1 also showed substantial earnings gains associated with work experience with an expected earnings premium of 4.0 percent per additional year of work experience, with that rate of growth diminishing over time.

Even after statistically controlling for the effects of educational attainment and work experience, Regression Model 1 revealed a large earnings advantage for men (15.9%) relative to women. Similarly, we found that native-born workers had expected earnings that were 8.7 percent higher than their foreign-born counterparts. Regression Model 1 showed that persons with a sensory or cognitive disability had expected earnings that were 8 percent lower than those without such disabilities. Large earnings differences were also found across regions with substantial earnings gains for those employed in the West and Northeast compared to those employed in the South. Regression Model 1 showed no statistically significant differences across race/ethnicity groups in the earnings of employed persons with education below the bachelors, after accounting for differences in attainment, work experience, and other predictors of worker earnings included in the regression.

## Table 1: Estimated Percentage Change in the Monthly Earnings From a Change in Predictor Variables for 16- to 74-Year-Old Out-of-School Employed Persons with Postsecondary Educational Attainment Below the Bachelor's Degree or with Just a High School Diploma in the United States, 2012–2014–2017 (Earnings Regression Models 1 and 2)

| | REGRESSION MODEL 1 | | REGRESSION MODEL 2 | |
|---|---|---|---|---|
| VARIABLE | COEFFICIENT | PERCENT EFFECT | COEFFICIENT | PERCENT EFFECT |
| Standardized literacy score | — | — | 0.081*** | 8.4% |
| Male | 0.148*** | 15.9% | 0.146*** | 15.7% |
| Hispanic | -0.064 | -6.2% | -0.037 | -3.7% |
| Black | -0.065 | -6.3% | -0.020 | -2.0% |
| Asian, Pacific Islander, or other race | 0.030 | 3.0% | 0.052 | 5.4% |
| Native-born | 0.083*** | 8.7% | 0.042 | 4.3% |
| Some college, no award | 0.083*** | 8.6% | 0.045 | 4.6% |
| Certification | 0.120*** | 12.8% | 0.091*** | 9.6% |
| Associate's degree | 0.260*** | 29.6% | 0.217*** | 24.2% |
| With disabilities | -0.083** | -8.0% | -0.062** | -6.0% |
| Weekly hours of work | 0.038*** | 3.9% | 0.038*** | 3.9% |
| Northeast | 0.132*** | 14.1% | 0.130*** | 13.8% |
| Midwest | 0.026 | 2.7% | 0.024 | 2.5% |
| West | 0.152*** | 16.4% | 0.148*** | 15.9% |
| Work experience | 0.039*** | 4.0% | 0.039*** | 4.0% |
| Work experience-squared | -0.001*** | -0.1% | -0.001*** | -0.1% |
| Constant = 6 | | | | |
| R-squared = 0.504 | | | | |
| N = 3001 | | | | |

— Not applicable.
Statistical significance: *** sig. at .01 level, ** sig at .05 level.
NOTE: Base group: High school graduate without any postsecondary education, female, White, foreign-born, without disabilities, and residing in the South.

The addition of the literacy skills in Regression Model 2 resulted in some substantial changes in the coefficients of several independent variables. Regression Model 2 showed that literacy skills have substantial effects on the earnings of workers after accounting for their level of educational attainment and work experience. The literacy coefficient indicates that an increase of one standard deviation in the literacy proficiencies of workers with attainment levels below the bachelor's degree is expected to increase monthly earnings by 8.4 percent. This suggests that, even after accounting for human capital investments that develop knowledge, skills, and abilities in school and through work experience, literacy skills have a strong positive direct effect on the earnings of workers.

The addition of the literacy skills measure in Regression Model 2 resulted in a sharp decline in the size of the estimated coefficient of some college, no award. Findings from Regression Model 2 indicate that after controlling for literacy skills and other variables included in the regression, the monthly earnings of workers with some postsecondary education without an award are expected to be statistically no different from the monthly earnings of workers with just a high school diploma. This means that the earnings advantage of those with some college, but no award found in Regression Model 1 and in the descriptive analysis is likely the product of stronger literacy skills among those who enrolled in college but exited school prior to earning an award relative to their counterparts who completed high school but never enrolled in a postsecondary educational institution.

The addition of the literacy skill measure in Regression Model 2 also resulted in reductions in the size of the expected earnings premiums among those with a non-degree certificate award below the associate's level as well as those with an associate's degree. The coefficient for a certificate only award declined in Regression Model 2 but remained statistically significant, with expected earnings premium (relative to high school graduates) of 9.6 percent. The size of the coefficient for associate degrees also declined, but the expected earnings advantage was a still quite large, 24.2 percent, and statistically significant.

Regression Model 1 revealed that native-born workers had an expected earnings advantage of 8.7 percent compared to foreign-born workers, holding other variables constant. The addition of the literacy skill measure in Regression Model 2 reduced the size of the coefficient of native-born workers such that their expected earnings were no longer statistically different than that of their foreign-born counterparts. It appears that after controlling for literacy skills, the earnings advantage of native-born workers over their foreign-born counterparts disappears. This means that native-born and foreign-born workers with attainment levels below the bachelor's degree and who possess similar literacy skills can expect to earn about the same each month.

The findings on male/female earnings differences in Regression Model 2 are nearly identical to those in Regression Model 1. Adding the literacy variable in Regression Model 2 resulted in almost no change in the size of the male coefficient and reduced the expected male earnings premium by just 0.2 percentage points from 15.9 percent in Regression Model 1 to 15.7 percent in Regression Model 2. This finding suggests that forces aside from human capital likely underlie the large wage deficit among employed women.[35] The addition of literacy skills reduces the size of the race/ethnicity coefficients, but similar to Regression Model 1, the coefficients of race/ethnicity groups are not statistically significant, indicating that after controlling for human capital and background traits, work intensity, and region of residents, the monthly earnings of workers in different race/ethnicity groups are not expected to be different.

Regression Model 3 differs in two important respects from Regression Model 2. First, it includes college field of study or concentration area among those who had some level of postsecondary education below the bachelor's degree (Table 2). Second, high school graduates were excluded from the population because postsecondary field of study information was not available for those workers who had completed only high school without any postsecondary education. One of the results of this change was that the earnings premiums estimated in Regression Model 3 for attainment was measured relative to a different base group; instead of high school graduates that represented the base group in Regression Models 1 and 2, the base group in Regression Model 3 comprises workers who had completed some postsecondary education without an award.

## Table 2: Estimated Percentage Change in the Monthly Earnings From a Change in Predictor Variables for 16- to 74-Year-Old Out-of-School Employed Persons with Postsecondary Educational Attainment Below the Bachelor's Degree in the United States, 2012–2014–2017 (Earnings Regression Model 3)

| VARIABLE | COEFFICIENT | PERCENT EFFECT |
|---|---|---|
| Standardized literacy score | 0.094*** | 9.9% |
| Male | 0.146*** | 15.7% |
| Hispanic | -0.056 | -5.5% |
| Black | -0.016 | -1.6% |
| Asian, Pacific Islander, or other race | 0.069 | 7.2% |
| Native-born | 0.014 | 1.4% |
| Certification | 0.000 | 0.0% |
| Associate's degree | 0.141*** | 15.1% |
| With disabilities | -0.098*** | -9.4% |
| Health majors | 0.160*** | 17.4% |
| Business majors | 0.110*** | 11.6% |
| Engineering and science majors | 0.171*** | 18.7% |
| Blue-collar majors | 0.104 | 10.9% |
| All other majors | 0.005 | 0.5% |
| Weekly hours of work | 0.037*** | 3.7% |
| Northeast | 0.088 | 9.2% |
| Midwest | 0.009 | 0.9% |
| West | 0.103*** | 10.9% |
| Work experience | 0.047*** | 4.8% |
| Work experience-squared | -0.001*** | -0.1% |
| Constant = 5.630 | | |
| R-squared = 0.514 | | |
| N = 1665 | | |

Statistical significance: *** sig. at .01 level, ** sig at .05 level.
NOTE: Base group: Some college without an award, education/humanities/social science major, female, White, foreign-born, without disabilities, and residing in the South.

Several key human capital findings emerge from Regression Model 3. First, the size of the literacy coefficient in Regression Model 3 remains substantial. A 1 standard deviation increase in literacy scores is associated with an expected 9.9 percent gain in earnings for workers with postsecondary education below the bachelor's degree level. The coefficient for a certificate award in this regression indicates that the earnings of workers with a certificate award are not expected to be statistically different from the earnings of their counterparts with some college but no award. Among workers with an associate's degree, Regression Model 3 showed an expected earnings advantage of 15.1 percent. Findings from Regression Model 3 (Table 2) reveal the importance of the field of study in influencing the earnings outcomes of those with postsecondary education below the bachelor's degree level. Relative to the base group that

consists of workers with education, humanities, or social sciences majors, workers in three out of the five major field of study groups included in Regression Model 3 (health, business, and engineering/science majors) saw large and statistically significant earnings advantages. We interpret these findings to mean that part of the earnings advantage of education below the bachelor's degree level is closely tied to the field of specialization.

Students who specialize in fields with clear ties to occupations had large earnings advantages. Monthly earnings for those who specialized in fields related to engineering/scientific and information technology had an expected monthly earnings advantage of 18.7 percent relative to the education, humanities, and social science majors (base group). Workers with a health specialty had a similarly large expected earnings advantage of 17.4 percent, and those who studied business had an expected earnings premium of 11.6 percent (Table 2).

## Employment Advantages of College Below the Bachelor's

Human capital theory and research related to labor market gains from a college education are primarily focused on estimating the returns to investments measured in earnings. However, gains to human capital investment can occur through gains in other labor market outcomes, including the likelihood of employment.[36] Some advocates for certificate programs and for postsecondary enrollment, absent an award, argue that enrolling in a postsecondary institution can substantially increase an individual's likelihood of employment especially among those who wish to transition to employment from being unemployed or out of the labor force.[37]

Studies of the gains in the likelihood of employment seem to be produced much less frequently than studies focused on traditional human capital earnings functions. However, as state longitudinal databases, like those discussed in a previous section, have been created, studies of the impact of gains in the likelihood of employment associated with higher levels of educational attainment have become more widely available.

Among the most prominent of these studies is a Kentucky longitudinal study that tracked a cohort of high school graduates to explore the labor market impact of community college enrollment. The study found considerable gains in employment rates among those who earned an award from one of the state's community colleges. Using a fixed effects regression model applied to a longitudinal database created from unemployment insurance (UI) tax reports along with community college system administrative data, the authors found substantial gains in the likelihood of employment for those who earned an award from a community college. The study reported that an associate's degree award yielded an increase in employment of between 12 percent and 15 percent for men and 20 percent for women.[38] At the certificate level, the Kentucky study showed that earning a certificate award from one

of the state's community colleges was associated with a gain in the likelihood of employment of 9 percent for women but no employment gains for men, compared to those with some college but no award.[39]

A study in Washington state, again using UI wage records and community college administrative records, showed substantial gains in the likelihood of employment for persons with a long-term certificate or associate's degree. The authors found that among those who earned an associate's degree, the likelihood of employment among women increased by about 11 percentage points 7 years after initial enrollment when compared to matriculants with some college but no award; the gain for men was 8 percentage points. The Washington study found that short-term certificates did not result in an increase in the probability of employment, although employment gains did occur for long-term certificate programs.[40]

A study of the labor market impacts of certificate awards in Virginia and North Carolina similarly used community college administrative records combined with UI tax reports to create a longitudinal database. These data were fit with a fixed-effects model to measure employment and earning outcomes for those with a certificate award. The authors compared certificate awardees with community college enrollees who exited school without an award. They found large gains in the likelihood of employment from a long-term certificate award in North Carolina (12 percentage points) but a much smaller gain in Virginia (2 percentage points). Short-term certificates also increased the probability of employment 6 percent in North Carolina and 3.3 percent in Virginia.[41]

Public schools in the state of Texas were the subject of a longitudinal study to explore the impact of exiting college with no award relative to high school students with no college attendance.[42] This study used school administrative records combined with Texas UI tax records of the Texas public high school graduating senior class to track enrollment in Texas public and private 2- and 4-year institutions of higher learning for 15 years after high school completion. This study used a method that relies on an inverse probability weighting method to account for differences (known to influence labor market outcomes) between high school graduates with no postsecondary schooling (who in effect serve as a "matched" comparison group) and the treatment group of those with some college but no award.

The Texas high school senior study showed very large gains in the probability of employment with a 20 percentage point advantage in employment 15 years after high school graduation for 2-year college students and a 19 percentage point advantage for 4-year college students who exited school with no award relative to their high school graduate counterparts who never earned any college credit.

The National Longitudinal Survey of Youth, a longitudinal survey of a cross section of high school aged students (those aged 13 to 17) when the first round was implemented in 1997 with regular follow-up contact through 2011, was used by Clayton-Scott and Wen to explore the employment and earnings experiences of those who had enrolled in the postsecondary

system including measures of employment gain associated with attainment levels below the bachelor's degree.[43] The authors found the likelihood of employment increased by 9 percentage points for those who earned an associate's degree, but the authors found no employment gains for those who earned just a certificate. Among those with some college without an award at the 2-year level, the study also showed no employment gains. However, the authors found that persons who exited 4-year colleges without an award were about 6 percentage points more likely to be employed.

Using the findings from the Educational Longitudinal Study, Rosenbaum, Ahearn, Becker, and Rosenbaum used logistic regressions to estimate the odds of employment for on-time high school graduates by level of attainment below the bachelor's degree level. The analysis showed that the odds of employment were significantly higher for those who earned a certificate or associate's degree award. However, the study revealed no employment advantage for those with some college but no award compared to their high school graduate counterparts.[44]

## Evidence from PIAAC

In this section, we present descriptive findings from our analysis of PIAAC data to examine the employment advantages of individuals with an education below the bachelor's degree level. Specifically, we examine connections between employment of these individuals and their key demographic traits, educational attainment, and literacy proficiency. Employment is measured with the employment to population (E/P) ratio, which is sometimes referred to as the employment rate. The E/P ratio is a measure of the share of working-age persons who are employed at a point in time. It is widely used as a top-line measure of labor market success among different population groups and increasingly is used in the place of the unemployment rate to assess the labor market well-being of different population groups over the business cycle.[45]

The E/P ratio presented in this study was derived from PIAAC data and was measured as the proportion of the 16- to 74-year-old population (not enrolled in school) that was employed (including payroll wage and salary employment, self-employment, or unpaid work in a family business) at some point during the week prior to the administration of the PIAAC questionnaire.

Descriptive findings from the PIAAC data (presented in Appendix B) revealed a positive connection between the level of educational attainment and the likelihood of employment. The E/P ratio of adult high school graduates with no postsecondary schooling was 64 percent. This is sharply below the E/P ratio of 81 percent among those with a bachelor's degree and 75 percent among those with postsecondary attainment below the bachelor's degree. Among the pre-baccalaureate group, there were very small differences in the E/P ratio between those with some college, no award, a certificate only, and an associate's degree award (Appendix Chart B1).

The descriptive data also suggested sharply higher E/P ratios among those with stronger skills (Appendix Table B1). The size of the E/P ratio deficit for lower skilled adults was also substantial at every level of educational attainment (Appendix Table B1). Literacy skills at or above Level 3 are often adopted as literacy proficiency threshold in the data because of the association between skills at these levels and favorable economic and social outcomes.[46] Among adults with some college, but no award, the E/P ratio was 66.9 percent for those with literacy skill score below Level 3 and 80.3 percent for their counterparts with literacy skill score at Level 3 or higher (Appendix Table B1). Higher skilled (Level 3 or higher) postsecondary educated adults with no award were 1.2 times more likely to be employed than their lower skilled counterparts (below Level 3). Lower skilled certificate and associate's degree award recipients were also significantly less likely to be employed than those with higher skills but the same level of attainment (Appendix Table B1). The descriptive findings certainly support this view with much higher employment rates among those with literacy skills at Level 3 and higher, within each attainment level below the bachelor's degree level, compared to their counterparts with literacy skills below Level 3.

## Regression Analysis of the Likelihood of Employment

Findings from descriptive analyses of PIAAC data on the connections between skills, education, and the likelihood of employment (E/P ratio) presented above shed light on the sizeable employment advantages of higher levels of skills and educational attainment. In this section, we delve deeper into these relationships by using regression analysis to estimate the independent relationship between the likelihood of employment and the skills, educational attainment, and demographic traits. Using logistic regression analysis, we estimated three regression models to provide estimates of the association between each of the independent variables and the likelihood of employment. Logistic regression is an appropriate estimation technique where the dependent variable (employment) is discrete (employed or not employed).[47] The explanatory variables include two measures of human capital—literacy skills and educational attainment, along with background and demographic traits including gender, age, race/ethnicity, nativity status, sensory/learning disability status, and region of residence in the United States.[48]

The dependent variable in all three regression models is the employment status of 16- to 74-year-old out-of-school adults. A detailed list with descriptions of all independent variables included in these regression models and the dependent variable plus formulas for these regression models are presented in Appendix E. The three regression models differ in the inclusion of literacy skills and major field of study.

> Employment (E/P) Regression Model 1: The first model does not include any measure of foundational skills. This model estimates the independent association between educational attainment and the likelihood of employment after statistically controlling for the remaining covariates. The population in Regression Model 1 (and Regression

Model 2) includes 16- to 74-year-old out-of-school adults who had completed just a high school education without any postsecondary education and those who had completed some postsecondary education below the bachelor's degree level. High school graduates serve as the base group in Regression Model 1.

Employment (E/P) Regression Model 2: The second model includes all the explanatory variables in the first regression and an additional explanatory variable representing a second measure of human capital foundational skills, represented by the PIAAC literacy skill score. This model is specified to estimate the independent effect of literacy skills on the probability of employment after statistically controlling for the influence of educational attainment and other regression controls. High school graduates serve as the base group in this regression.

Employment (E/P) Regression Model 3: The third model uses all the explanatory variables in the second regression but with the addition of measures of field of study reported by those with postsecondary educational attainment below the bachelor's degree level. The population in this model differs from Regression Models 1 and 2 and includes 16- to 74-year-old out-of-school adults with some postsecondary education below the bachelor's degree level. High school graduates without any postsecondary education are excluded from Regression Model 3. The base group in this regression consists of those with some postsecondary education but without any award. Regression Model 3 is designed to explore the effects of human capital and more specifically field of study on the likelihood of employment of adults with a college education below the bachelor's degree level.

The findings from Regression Model 1 revealed that, holding other factors constant, men were much more likely to be employed than women; men were expected to be 12.7 percentage points more likely to be employed relative to women among adults with postsecondary education below the bachelor's degree or just a high school diploma (Table 3). This finding was unsurprising given the higher levels of labor force attachment among men relative to women in the United States, even after accounting for the human capital and other factors known to influence participation in the labor market.[49]

Regression Model 1 found no significant differences in employment rates across race/ethnicity groups after accounting for other background traits and educational credentials. However, age was closely related to the likelihood of employment. Younger workers and older workers were both significantly less likely to be employed than their prime-age (25- to 54-year-old) counterparts. However, Regression Model 1 showed no statistically significant differences in the likelihood of employment of 35- to 44-year-olds and 45- to 54-year-olds relative to individuals between the ages of 25 and 34 (in the base group). Teens and young adults, on the other hand, were substantially less likely to be employed after accounting for educational attainment and other traits; their likelihood of employment was expected to be 5.3

percentage points lower than 25- to 34-year-olds in the base group. These findings suggest that after accounting for their human capital traits, out-of-school teens and young adults are less likely to work than prime-age workers. Given their out-of-school status, this means that young people in the country are much more likely to be disconnected from either education or work than their prime-age counterparts, a disturbing finding in the context of the long-term outlook for the U.S. economy. This is reflective of longer terms declines in the E/P ratio of young people in the United States.[50]

The likelihood of employment among older workers with educational attainment levels below the bachelor's degree level was also sharply below that of prime-age persons. Adults in the pre-retirement years of 55 to 64 had a likelihood of employment that was 15.3 percentage points lower than their 25- to 34-year-old (base group) counterparts. The likelihood of employment among the retirement-aged population (65- to 74-year-olds) was 41.7 percentage points below that of the base group (25- to 34-year-olds). The probability of employment was also significantly lower among persons with sensory and cognitive disabilities. These individuals had a probability of employment that was 11.2 percentage points below that of their counterparts with no such limitations.

Regression Model 1 revealed significant higher likelihood of employment for all three levels of educational attainment below the bachelor's degree level compared to adults who had just completed high school without any postsecondary education. After accounting for control variables in the regression, the likelihood of employment for a nonenrolled person with some college but no award was expected to be 6.4 percentage points higher than that of out-of-school high school graduates with no postsecondary enrollment. The regression showed that compared to out-of-school high school graduates (without any college education), the likelihood of employment is expected to be 9.5 percentage points higher among those with a certificate award below the associate's degree and 11.5 percentage points higher among those with an associate's degree award. Thus, Regression Model 1 found substantial employment advantages in the likelihood of employment for those with some college education below the bachelor' degree relative to their counterparts with just a high school diploma, and the size of the employment advantage is expected to be larger with each successively higher level of attainment below the bachelor's degree level.

Regression Model 2 is identical to Regression Model 1 except it includes literacy skill scores as an explanatory variable, expanding the human capital measure from solely educational attainment to include a direct measure of literacy skills derived from the PIAAC survey. While educational attainment has served as a primary measure of ability, it is not a perfect measure; when employed solely as a measure of human capital in regressions, it exaggerates the size of the earnings or employment advantage attributed to educational attainment. Findings from Regression Model 2 confirmed that this is the case with respect to the role of sub-baccalaureate educational attainment in influencing the probability of employment.

Regression Model 2 found that literacy skills had a positive impact on the likelihood of employment among those with pre-baccalaureate levels of education (some college no award, certificate award, associate's degree award, or just a high school diploma without any postsecondary education). Overall, a 1 standard deviation increase in literacy proficiency was related to a 4.8 percentage point increase in the probability of employment among out-of-school adults with education below the bachelor's degree level. The regression also revealed strong employment advantages associated with education. Compared to high school graduates without any postsecondary education, the likelihood of employment was estimated to be 4.1 percentage points higher for those with no award, 7.9 percentage points higher for those earning a certificate, 8.6 percentage points higher for those earning an associate's degree.

### Table 3: Estimated Percentage Point Effect in the Employment to Population Ratio from a Change in Predictor Variables for 16- to 74-Year-Old Out-of-School Population with Postsecondary Educational Attainment Below the Bachelor's Degree or with Just a High School Diploma in the United States, 2012-2014-2017 (Employment Regression Models 1 and 2)

| | PERCENTAGE POINT EFFECT | |
|---|---|---|
| VARIABLE | REGRESSION MODEL 1 | REGRESSION MODEL 2 |
| Standardized literacy skill score | — | 4.8*** |
| Male | 12.7*** | 12.5*** |
| Hispanic | -1.9 | 0.5 |
| Black | -3.5 | -0.6 |
| Asian or Pacific Islander | -6.2 | -3.6 |
| Other races | -5.8 | -5.1 |
| Age 16 to 24 years | -5.3** | -5.2** |
| Age 35 to 44 years | -2.3 | -1.7 |
| Age 45 to 54 years | -2.5 | -1.7 |
| Age 55 to 64 years | -15.3*** | -14.1*** |
| Age 65 to 74 years | -41.7*** | -39.7*** |
| Some college, no award | 6.4*** | 4.1** |
| Certification | 9.5*** | 7.9*** |
| Associate's degree | 11.5*** | 8.6*** |
| Native-born | -4.2 | -6.1** |
| With disabilities | -11.2*** | -9.9*** |
| Northeast region | 0.9 | 0.7 |
| Midwest region | 4.4*** | 4.2*** |
| West region | 2.6 | 1.9 |
| N = 5605 | | |

— Not applicable.
Statistical significance: *** sig. at .01 level, ** sig at .05 level.
NOTE: Base group: High school graduate without any postsecondary education, female, White, foreign-born, without disabilities, age 25 to 34, and residing in the South.

Additionally, when literacy was included in the model, we found that the size of the coefficients of postsecondary attainment declined. For example, the effect of postsecondary schooling with no award on the probability of employment declined from +6.4 percentage points estimated in Regression Model 1 to +4.1 percentage points in Regression Model 2, a decline of more than one third. Including literacy in Regression Model 2 also resulted in a decline among those earning a certificate. The percentage point employment advantage associated with earning a certificate award (relative to a high school graduate) declined from +9.5 in Regression Model 1 to +7.9 in Regression Model 2, a 17 percent reduction in the expected employment advantage. Including literacy skills in Regression Model 2 also resulted in a reduction in the size of the expected employment rate advantage for persons who earned

an associate degree award. Here the employment rate advantage fell from 11.5 percentage points in Regression Model 1 to 8.6 percentage points in Regression Model 2, representing a relative decline of 25 percent.

An important effect of including the literacy skills variable in Regression Model 2 was observed on the change in the size and significance of the native-born variable. Regression Model 1 showed no significant difference in the likelihood of employment between native-born and foreign-born out-of-school persons with attainment levels below the bachelor's degree level. However, when the regression controls included literacy skills in addition to the educational attainment measures (in Regression Model 2), we found that native-born persons with attainment levels below the bachelor's degree were 6.1 percentage points less likely to be employed than their foreign-born counterparts.[51]

Regression Model 3 differs from Regression Models 1 and 2 as it explores the impact of field of study on the probability of employment among out-of-school adults with postsecondary attainment levels below the bachelor's degree. Studies of the returns to bachelor's degrees and higher have shown substantial links between earnings and other labor market outcomes and undergraduate and graduate fields of study. Regression Model 3 explores the relationship between field of study and the likelihood of employment among adults with education below the bachelor's degree level in the context of literacy skills of the adult population.[52] Because this regression model includes postsecondary fields of study, high school graduates without any postsecondary education are excluded from the population in the regression. The base group in this model comprises persons with some college, but no award. Thus, the results from Regression Model 3 are not directly comparable with the findings from Regression Models 1 and 2, which include high school graduates with no college in the population.

## Table 4: Estimated Percentage Point Effect in the Employment to Population Ratio from a Change in Predictor Variables for 16- to 74-Year-Old Out-of-School Population with Postsecondary Educational Attainment Below the Bachelor's Degree Level in the United States, 2012-2014-2017 (Employment Regression Model 3)

| VARIABLE | PERCENTAGE POINT EFFECT REGRESSION MODEL 3 |
|---|---|
| Standardized literacy skill score | 5.6*** |
| Male | 11.2*** |
| Hispanic | 5.3** |
| Black | 4.4 |
| Asian or Pacific Islander | 2.8 |
| Other races | 0.7 |
| Age 16 to 24 years | -0.4 |
| Age 35 to 44 years | -4.2 |
| Age 45 to 54 years | -7.0** |
| Age 55 to 64 years | -16.8*** |
| Age 65 to 74 years | -33.4*** |
| Certification | 4.4* |
| Associate's degree | 4.4** |
| Health Major | 2.8 |
| Business major | 7.8** |
| Engineering or science major | -2.4 |
| Blue-collar major | 0.6 |
| All other majors | 1.9 |
| Native-born | -5.5 |
| With disabilities | -7.0** |
| Northeast | 0.3 |
| Midwest | 4.0** |
| West | -1.0 |
| N = 2818 | |

Statistical significance: *** sig. at .01 level, ** sig at .05 level.
NOTE: Base group: Some college without an award, education/humanities/social science major, female, White, foreign-born, without disabilities, age 25 to 34, and residing in the South.

The findings in Table 4 show significant increases in the likelihood of employment associated with stronger literacy scores. The regression revealed that holding other factors constant, a 1 standard deviation increase in literacy proficiency scores among those with postsecondary attainment below the bachelor's was associated with a 5.6 percentage point increase in the likelihood of employment. Individuals earning an associate's degree were expected to have an employment rate that was 4.4 percentage points higher than the E/P ratio of those with some college but no award. The coefficient associated with receiving a certification, although also at

4.4 percent, was not statistically significant. This means that earning a certificate award is not expected to significantly increase the likelihood of employment compared to those with some college, but no award.

Findings from Regression Model 3 on the field of study variables suggested that compared to the base group (education/humanities/social science majors), only those who studied one of the many business-related fields in their college education below the bachelor's degree level could expect a higher probability of employment. Those with a business major were expected to be 7.8 percentage points more likely to be employed compared to those with fields related to education, social sciences, and humanities included in the regression base group. After accounting for both literacy skills and attainment levels, Regression Model 3 showed no employment advantages compared to the base group (education/humanities/social science majors) for health, engineering and science, trades and technical fields (blue-collar) and other specialized major fields of study.

Findings from these three employment rate regression models suggested the important effects that both literacy and educational attainment play in influencing the likelihood of employment. Higher literacy scores significantly increased the likelihood of employment among adults with postsecondary educational attainment below the bachelor's degree level. Regression Model 1 (that does not include a literacy skills variable) showed that individuals with any postsecondary education level (certificate awards or associate's degrees and even those with just some college education but no award) had considerably higher probabilities of employment compared to out-of-school adults with just a high school diploma and no postsecondary education. Regression Model 2 showed that estimates of the employment advantage among adults with some college, but no degree (relative to high school graduates) declined by about one third once we accounted for literacy skills but was still substantial. The relative declines in the regression-based estimates of employment advantages in Regression Model 2 (that includes literacy skills) relative to Regression Model 1 (that does not include literacy skills) for those with a certificate award and associate's degree awards were also sizeable: -17 percent and -25 percent, respectively.

## Implications of the Findings

The role of literacy skills in directly increasing the employment and earnings outcomes of adults with attainment levels below the bachelor's degree is clear. Regression findings reveal an 8-percentage point earnings gain for 1 standard deviation increase in literacy proficiency among 16- to 74-year-old adults with below the bachelor's degree education including those who had just graduated high school without any college education. Among pre-baccalaureate college-educated adults (excluding high school graduates without any college education), the earnings gain for 1 standard deviation increase in literacy proficiency was even higher, nearly 10 percent.

The effect of literacy skills on the likelihood of being employed is also substantial. Our logistic regression analyses revealed that a 1 standard deviation increase in literacy scores was associated with a 4.8 percentage point increase in the probability of employment among 16- to 74-year-old adults with pre-baccalaureate education including high school graduates. This means that holding other factors constant, the labor market rewards those with stronger literacy skills by employing them at higher rates and paying them substantially higher wages. Employing the model for the same group of adults after excluding high school graduates revealed that an increase in the literacy skill score by 1 standard deviation is expected to increase the likelihood of employment by 5.6 percentage points.

It's important to note that the estimates in these regressions are limited to just the direct effect of literacy skills on earnings and employment. However, there are a number of indirect effects associated with literacy skills in the labor market. These indirect effects are primarily associated with an enhanced academic ability that facilitates academic achievement and thus a higher level of educational attainment, which also has strong returns in the job market.[53]

Findings from analyses of earnings and employment of adults with attainment below the bachelor's degree level revealed substantial gains in the labor market for adults who are able to enroll in college and complete a course of study that leads to an associate's degree or a certificate award below the associate's degree level.

Descriptive data showed very large earnings and employment advantages for those who earn an associate's degree compared to high school graduates with no college education. The monthly earnings advantage for adults with an associate's degree averaged 29 percent higher compared to high school graduates without any college education. The earnings regressions showed that even after accounting for demographic and other factors known to influence earnings of workers, including literacy skills, the earnings advantage among employed adults with an associate's degree was about 24 percentage points greater than their high school graduate counterparts.

Adults with an associate degree had a mean E/P ratio that was 13 percentage points higher than that of high school graduates without any college education. Our analyses showed that associate's degree awardees continue to have a sizeable employment advantage (9 percentage points) relative to high school graduates even after accounting for skills and other factors included in the regression that are known to influence the likelihood of employment.

The PIAAC descriptive data showed earnings and employment advantages among adults with a certificate below the associate's degree level when compared to high school graduates without any college education. Employed adults with a certificate award had mean earnings that averaged 15 percent more than their high school graduate counterparts. Our earnings regression analyses showed an earnings premium of 8 percent among workers with a certificate award relative to high school graduates after accounting for skills and work experience and other background traits.

The E/P ratio for those with a certificate was 10 percentage points higher than that of their high school graduate counterparts. The logistic regression model, after accounting for literacy skills and other characteristics that influence employment, revealed that the likelihood of employment among those adults who earned a certificate award was 8 percentage points greater compared to high school graduates. The size of this gain suggests a strong positive employment effect associated with a certificate award.

The E/P ratio of those with some college but no award was 73 percent at the time of the PIAAC survey, much greater than the 64 percent E/P ratio among high school graduates. Results from the analysis showed that after accounting for literacy skills and other background traits, those with some college but no award had a 4.1-percentage point employment advantage over high school graduates.

The findings on the earnings advantages of adults with some college without an award paint a much more mixed picture. We found a substantial earnings premium for some college no award (8.6 percent) compared to high school graduates when literacy skills were not included in the model. However, when the literacy variable was added to the model, the coefficient for some college was no longer statistically significant. This suggests that any observed earnings advantage among this group of employed adults is the result of their stronger literacy skills, not their post-secondary attainment status. Persons with some college but no award had mean literacy scores that were much higher (26 points equal to 0.52 standard deviation units) compared to their high school graduate counterparts; this is likely the source of their earnings advantage (see Appendix Table A2).

We did find that adults with some college but no award are more likely to work than their high school graduate counterparts. The analyses (including literacy skill score) revealed that postsecondary enrollment with no degree or certificate was associated with a substantial 4.1 percentage point higher probability of employment compared to high school graduates. These findings present a mixed picture for those who exit college with no award. Their likelihood of securing employment is enhanced by their prior college experience, but their earnings are not improved by college attendance.

Dating back to the mid-1990s, American high schools have sent about two thirds of their graduating seniors to a postsecondary institution right after high school completion.[54] The majority of those who do not enroll immediately after graduation eventually enroll in college by their late 20s. Data from the 2002 Educational Longitudinal Study showed that about 85 percent of the 2002 spring sophomore cohort had enrolled in college at some point over the 10-year period between 2002 and 2012.[55]

Reflecting this behavior, educational attainment expectations of high school students and their parents are ambitious. About 70 percent of high school seniors expect to earn a bachelor's degree or higher while about 20 percent expect to enroll in college without the intention of earning a bachelor's degree. Parents have even higher expectations for their

children: 9 out of 10 parents of high school students expect their child to earn a bachelor's degree or higher.[56] Yet 10 years after high school completion, just over one half of all students will achieve any postsecondary award. One in three earn a bachelor's degree or higher while another one third will have enrolled in college but not attained a degree.[57] For many in this latter group of individuals, the payoffs to college investments are likely disappointing. Almost universally, those who exit college without a degree, and especially their parents, had expectations of degree attainment. The cost of the difference between student and parent goals for educational attainment and their actual achievement can be partially measured by the earnings and employment differences found between aspiration and attainment.

The United States sends an exceptionally large share of high school students into the postsecondary educational system, nearing a state of universal college enrollment. For those who enroll in college and are able to complete a degree or certificate program, the gains in earnings and employment are, on average, considerable. Moreover, the size of these gains increases with each level of attainment. Yet a large share of these college students fails to complete a course of study that leads to a degree or certificate at any level.

The PIAAC survey estimated that about 56.8 million nonenrolled adults had educational attainment levels below the bachelor's degree. About 16.2 million, or 29 percent of these individuals, had attained a certificate award below the associate's degree, while 15.5 million or some 27 percent had earned an associate's degree. However, 25 million, or 44 percent, of nonenrolled adults experienced some kind of postsecondary education, ranging from enrollment in private proprietary schools to enrollment in the most elite 4-year colleges and universities, but left school prior to earning any type of certification or degree. For these adults, the PIAAC data indicated that their postsecondary enrollment yielded, on average, only very limited benefits to them.

A policy to further increase the already high share of high school students who enroll in college may well lead to more college enrollments, but to be effective we must first confront the reality that skills play an important role in the completion of postsecondary education and labor market outcomes.[58] Our findings from the PIAAC survey revealed very large literacy skills gaps between those high school graduates who never enrolled and their college bound counterparts.[59] The likelihood of earning a postsecondary degree or certificate award is substantially influenced by the academic abilities of students in high school as measured by both their grade point average and performance on standardized foundational skills tests.[60]

The current free college/college-for-all policy is largely focused on bolstering college enrollment rates through financial strategies, which are based on the view that college costs have spiraled beyond the means of many lower income families. Yet there is little evidence of rising net college costs and some evidence that the net costs at 2-year colleges have declined

in recent years.[61] Others have argued that admission standards, especially those related to standardized tests have served to exclude some population groups from college enrollment. Yet the evidence for this is also not strong.

One half of the postsecondary institutions in the United States are classified as open admission schools, meaning these schools accept students without requiring admission tests, high school GPA, high school class rank, or letters of recommendation.[62] For example, most 2-year institutions are open admission, and over the last 10 years, the share of 4-year colleges that have become open admission has increased to 25 percent. Among the remaining half of colleges that require some evidence of academic skill, more than 40 percent admit 75 percent or more of all applicants, an admittance rate that would place these schools in the nonselective category.

The evidence of rising college expenses or selective admissions serving as barriers to enrollment is not strong. Net college costs have remained low as student aid levels from various sources have increased, and a very large share of postsecondary institutions have no or low admissions requirements. Thus, free college and the abolition of standardized testing may make less of a contribution to expanded college enrollment and completion in the nation than expected by advocates. It is no accident that the literacy skills of adults in the United States vary sharply by level of educational attainment. The mean literacy skill score of those with postsecondary schooling below the bachelor's degree level is 26 points, or half a standard deviation unit, higher than the average of adults with a high school diploma without any college education; the average 4-year college graduate has more than 1 standard deviation advantage in literacy skills. Educational attainment is itself a product of foundational skills.

Our analyses of the PIAAC data revealed that earning a degree or certificate below the bachelor's degree level can lead to substantial gains in the labor market in the form of an increased probability of employment and higher earnings. However, the gains to the single largest group of adults with below the bachelors' degree level of education—those with some college but no award—are much diminished compared to those who earn an award.

A strategy to bolster the labor market outcomes of young people and adults cannot solely or even primarily rely on expanded financial support or reducing admissions requirements. At its heart, a postsecondary strategy that raises the likelihood of life success must be an effort to both bolster college completion while raising foundational skills of students.

Degree completion and foundational skill development should be simultaneous goals for postsecondary institutions. Stronger literacy and numeracy skills are closely associated with substantial employment and earnings returns to those who attain an undergraduate 2-year degree or certificate. Even better, helping newly minted award recipients gain access to employment in positions that more intensively utilize their foundational skills will further improve their earnings experiences.[63] But with widespread open admissions and more

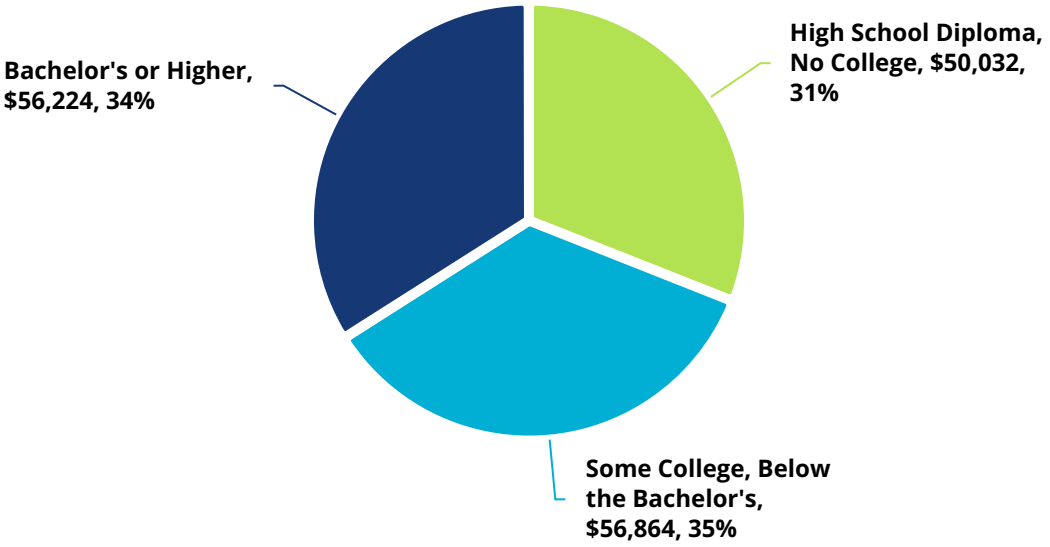
institutions of higher education rejecting standardized tests as an important admission criterion, a college award, even at the bachelor's and graduate levels, is no guarantee of strong foundational skills among degree recipients.[64]

Efforts to increase college completions should be heavily focused on developing foundational skills. Bolstering student foundational skills at the elementary and secondary school level is an obvious policy choice that would improve the likelihood of students completing a course of study leading to a college award. Yet in recent years, testing programs that support foundational skills development have been eliminated or rendered meaningless in many states. Yet, the elimination of potentially actionable data from foundational skills tests seems to be the educational equivalent of 'kicking the can down the road." Columnist Jason Rily recently noted that ending the use of standardized tests "won't close the learning gap that the test exposes. It will merely delay the exposure until some future date."[65] The great body of PIAAC research suggests that this "future date" occurs some time shortly after the shift in individuals' primary life activity from schooling to work when skills are required in the labor market.

Post-secondary educational institutions should also focus on better developing the foundational skills of their students. The increasing prevalence of open admissions or low admission standards in the American postsecondary system suggests an assumption by these institutions that the incoming students have strong foundational skills. However, this is not true since most 2-year and many 4-year institutions test the literacy and numeracy skills of incoming students to determine if they should be placed in noncredit remedial courses to bolster their literacy and numeracy skills.[66] Unfortunately the results of the current, widespread post-secondary remedial system are mixed, at best.[67] Further research and evaluation are needed to examine the validity of remedial testing and the effectiveness of remedial courses of study on increasing (remediating) the skills of students.

# Appendix A: Earnings and Skills of Persons with Education Below the Bachelor's Degree

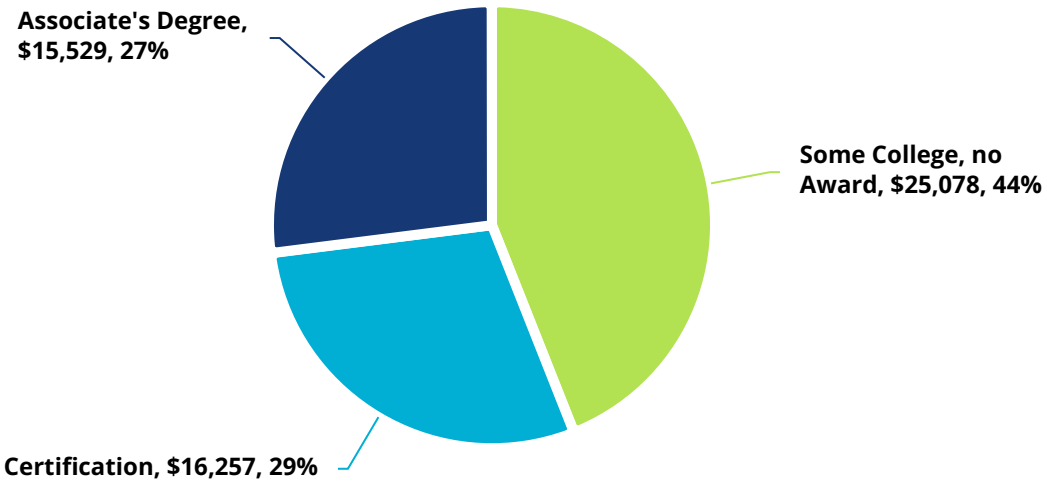
## Chart A1: Percentage Distribution of Nonenrolled Persons with a High School Diploma or Higher Level of Education (16- to 74-Years-Old) by Educational Attainment, United States, 2012-2014-2017




NOTE: Universe: 16- to 74-year-old nonenrolled persons with a high school diploma or higher level of education. Numbers in 1000s.

SOURCE: PIACC 2012-2014-2017 public use micro data files, see: https://nces.ed.gov/surveys/piaac/datafiles.asp. Tabulations by the authors.

## Chart A2: Percentage Distribution of Nonenrolled Persons (16- to 74-Years-Old) with Postsecondary Education Below the Bachelor's Degree by Educational Attainment, United States, 2012-2014-2017




NOTE: Universe: 16- to 74-year-old nonenrolled persons with some postsecondary education below the bachelor's degree. Numbers in 1000s.

SOURCE: PIACC 2012-2014-2017 public use micro data files. Tabulations by the authors.

## Table A1: Percentage Distribution of Nonenrolled Persons (16- to 74-Years-Old) by Educational Attainment in Selected Demographic Groups, United States, 2012-2014-2017

| DEMOGRAPHIC GROUPS | NUMBER OF PERSONS (IN 1000S) | HIGH SCHOOL DIPLOMA, NO COLLEGE | BELOW THE BACHELOR'S DEGREE | BACHELOR'S DEGREE OF HIGHER |
|---|---|---|---|---|
| All (16-74) | 163,120 | 31% (0.2%) | 35% (0.3%) | 34% (0.2%) |
| Gender | | | | |
| Male | 79,144 | 33% (0.5%) | 33% (0.5%) | 34% (0.3%) |
| Female | 83,975 | 29% (0.3%) | 36% (0.3%) | 35% (0.3%) |
| Race-ethnicity | | | | |
| White, non-Hispanic | 114,519 | 28% (0.3%) | 35% (0.3%) | 37% (0.3%) |
| Black, non-Hispanic | 18,595 | 40% (0.9%) | 39% (0.9%) | 21% (0.8%) |
| Hispanic | 18,069 | 41% (1.2%) | 39% (1.1%) | 20% (0.7%) |
| Asian/Pacific Islander/other, non-Hispanic | 11,937 | 25% (2.3%) | 25% (2.3%) | 50% (2.7%) |
| Age | | | | |
| 16-24 | 12,374 | 35% (1.4%) | 48% (1.7%) | 17% (1.3%) |
| 25-54 | 95,680 | 29% (0.4%) | 34% (0.5%) | 37% (0.4%) |
| 55+ | 55,065 | 33% (0.3%) | 33% (0.3%) | 33% (0.3%) |
| Nativity status | | | | |
| Native-born | 142,326 | 31% (0.3%) | 36% (0.4%) | 34% (0.3%) |
| Foreign-born | 20,721 | 30% (1.5%) | 30% (1.8%) | 40% (1.9%) |
| Disability status | | | | |
| Without disability | 124,123 | 28% (0.4%) | 34% (0.4%) | 37% (0.4%) |
| With disability | 38,909 | 38% (1.0%) | 37% (0.7%) | 26% (1.0%) |

NOTE: Universe: Below bachelor's degree, including high school graduates. Standard errors in parentheses.
SOURCE: PIAAC 2012-2014-2017 public use micro data files. Tabulations by the authors.

## Table A2: Mean Literacy Proficiency Skill Scores of Nonenrolled Persons (16- to 74-Years-Old) by Educational Attainment in Selected Demographic Groups, United States, 2012-2014-2017

| DEMOGRAPHIC CHARATERISTICS | (COL. 1) HIGH SCHOOL DIPLOMA, NO COLLEGE | (COL. 2) SOME COLLEGE, BELOW BACHELOR'S | (COL. 3) BACHELOR'S DEGREE OR HIGHER | (COL. 4) DIFFERENCE COL.2 - COL.1 | (COL. 5) DIFFERENCE COL.3 - COL.2 |
|---|---|---|---|---|---|
| All | 246 (1) | 272 (1) | 300 (1) | 26 (0.52 SD) | 28 (0.56 SD) |
| Gender | | | | | |
| Male | 247 (2) | 274 (2) | 303 (2) | 27 (0.54 SD) | 29 (0.57 SD) |
| Female | 245 (2) | 270 (1) | 298 (2) | 26 (0.51 SD) | 28 (0.55 SD) |
| Race-ethnicity | | | | | |
| White, non-Hispanic | 255 (1) | 280 (1) | 307 (1) | 25 (0.49 SD) | 27 (0.52 SD) |
| Black, non-Hispanic | 225 (3) | 249 (3) | 278 (3) | 25 (0.49 SD) | 28 (0.56 SD) |
| Hispanics | 230 (4) | 255 (3) | 277 (5) | 25 (0.50 SD) | 22 (0.44 SD) |
| Asian/Pacific Islander/other, non-Hispanic | 233 (6) | 259 (4) | 286 (3) | 26 (0.51 SD) | 27 (0.54 SD) |
| Age | | | | | |
| 16-24 | 256 (3) | 275 (4) | 309 (4) | 19 (0.38 SD) | 34 (0.67 SD) |
| 25-54 | 247 (2) | 275 (2) | 306 (2) | 27 (0.54 SD) | 31 (0.61 SD) |
| 55+ | 241 (2) | 266 (2) | 290 (2) | 25 (0.50 SD) | 24 (0.47 SD) |
| Nativity status | | | | | |
| Native-born | 250 (1) | 275 (1) | 304 (1) | 26 (0.51 SD) | 29 (0.57 SD) |
| Foreign-born | 219 (4) | 245 (3) | 279 (3) | 26 (0.52 SD) | 34 (0.67 SD) |
| Disability status | | | | | |
| Without disability | 249 (1) | 275 (1) | 303 (1) | 26 (0.51 SD) | 28 (0.56 SD) |
| With disability | 237 (2) | 263 (2) | 288 (3) | 26 (0.52 SD) | 25 (0.50 SD) |

NOTE: Col. = column. Standard errors in parentheses in Col. 1, 2, and 3. Standard deviation (of the PIAAC literacy score) equivalent of the differences in mean literacy scores in parentheses in Col. 4 and 5. Universe: Below bachelor's, including high school graduates.
SOURCE: PIAAC 2012-2014-2017 public use micro data files. Tabulations by the authors.

## Table A3: Percentage Distribution of Nonenrolled Persons (16- to 74-Years-Old) by Educational Attainment by Level of Literacy Proficiency, United States, 2012-2014-2017

| LITERACY PROFICIENCY LEVEL | LITERACY SKILLS SCORE RANGE | HIGH SCHOOL DIPLOMA, NO COLLEGE | SOME COLLEGE, BELOW BACHELOR'S DEGREE | BACHELORS'S DEGREE OR HIGHER |
|---|---|---|---|---|
| Level 1 or below | 0 to 225 | 31% (1.4%) | 14% (0.9%) | 5% (0.5%) |
| Level 2 | 226 to 275 | 44% (1.5%) | 38% (1.4%) | 21% (1.1%) |
| Level 3 | 276 to 325 | 22% (1.1%) | 39% (1.5%) | 47% (1.3%) |
| Level 4/5 | 326+ | 3% (0.5%) | 9% (0.8%) | 28% (1.7%) |
| Total | | 100% | 100% | 100% |

NOTE: Universe: Below bachelor's degree, including high school graduates. Standard errors in parentheses
SOURCE: PIAAC 2012-2014-2017 public use micro data files. Tabulations by the authors.

## Table A4: Mean Literacy Proficiency Skill Scores of the Nonenrolled Population (16- to 74-Years-Old) by Educational Attainment, United States, 2012-2014-2017

| DEMOGRAPHIC CHARATERISTICS | SOME COLLEGE, NO AWARD | CERTIFICATE AWARD | ASSOCIATE'S AWARD |
|---|---|---|---|
| All | 273 (3) | 265 (2) | 278 (2) |
| Gender | | | |
| Male | 276 (2) | 270 (2) | 276 (3) |
| Female | 271 (2) | 260 (2) | 280 (2) |
| Race-ethnicity | | | |
| White, non-Hispanic | 282 (2) | 272 (2) | 285 (2) |
| Black, non-Hispanic | 251 (4) | 244 (5) | 252 (4) |
| Hispanics | 255 (4) | 247 (5) | S |
| Asian/Pacific Islander/other, non-Hispanic | S | S | S |
| Age | | | |
| 16-24 | 277 (4) | S | S |
| 25-54 | 276 (2) | 268 (3) | 281 (2) |
| 55+ | 267 (3) | 260 (3) | 271 (3) |
| Nativity status | | | |
| Native-born | 277 (2) | 267 (2) | 282 (2) |
| Foreign-born | 241 (5) | S | S |
| Disability status | | | |
| Without disability | 277 (2) | 267 (2) | 280 (2) |
| With disability | 262 (3) | 258 (3) | 272 (4) |

NOTE: S = suppressed, insufficient sample. Universe: Below bachelor's degree, excluding high school graduates. Standard errors in parentheses.
SOURCE: PIAAC 2012-2014-2017 public use micro data files. Tabulations by the authors.

## Table A5: Distribution of Nonenrolled Persons (16- to 74-Years-Old) by Literacy Proficiency Skill Level by Educational Attainment, United States, 2012-2014-2017

| LITERACY SKILL LEVEL | SOME COLLEGE, NO AWARD | CERTIFICATE AWARD | ASSOCIATE'S DEGREE |
|---|---|---|---|
| Level 1 or below | 14% (1.4%) | 16% (1.5%) | 10% (1.6%) |
| Level 2 | 37% (2.0%) | 45% (2.5%) | 34% (2.6%) |
| Level 3 | 39% (2.3%) | 34% (2.5%) | 45% (2.5%) |
| Level 4/5 | 10% (1.4%) | 5% (1.0%) | 10% (1.5%) |

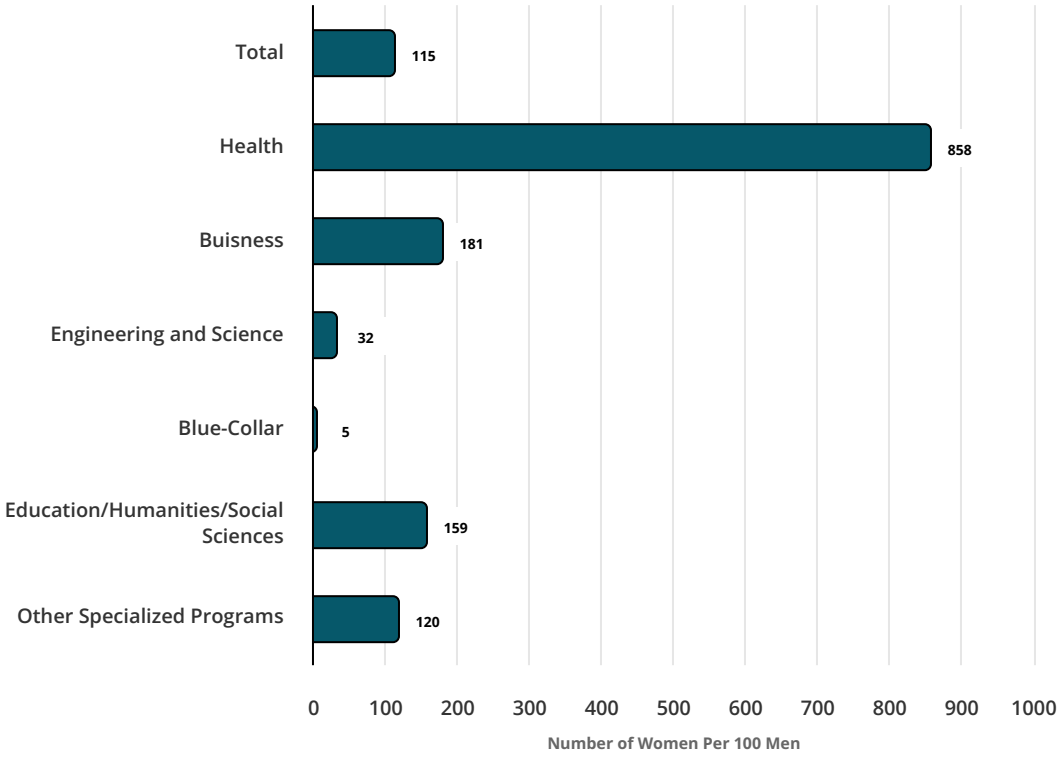
NOTE: Universe: Below bachelor's degree, including high school graduates. Standard errors in parentheses.
SOURCE: PIAAC 2012-2014-2017 public use micro data files. Tabulations by the authors.

## Table A6: Percentage Distribution of Nonenrolled Persons (16- to 74-Years-Old) in Each Educational Category by Field of Study, United States, 2012-2014-2017

| FIELD OF STUDY | SOME COLLEGE, NO AWARD | CERTIFICAE AWARD | ASSOCIATE'S DEGREE | TOTAL (WITH SOME COLLEGE BELOW THE BACHELOR'S DEGREE) |
|---|---|---|---|---|
| Health | 11% (0.8%) | 27% (1.7%) | 21% (1.6%) | 19% (0.5%) |
| Business | 20% (1.4%) | 13% (1.4%) | 23% (1.6%) | 19% (0.8%) |
| Engineering and science | 15% (1.2%) | 17% (1.4%) | 17% (1.3%) | 16% (0.8%) |
| Blue-collar | 7% (0.8%) | 21% (1.7%) | S | 11% (0.7%) |
| Education/humanities/social sciences | 24% (1.6%) | S | 17% (1.5%) | 17% (1.0%) |
| Other specialized programs | 19% (1.4%) | 16% (1.6%) | 14% (1.4%) | 17% (0.9%) |
| All other/not elsewhere classified | S | S | S | S |
| Total | 100% | 100% | 100% | 100% |

NOTE: Universe: Below bachelor's degree, excluding high school graduates. Standard errors in parentheses. S = suppressed, insufficient sample.
SOURCE: PIAAC 2012-2014-2017 public use micro data files. Tabulations by the authors.

## Chart A3 Number of Nonenrolled Women with Postsecondary Education Below the Bachelor's Degree per 100 Men by Field of Study, United States, 2012-2014-2017




NOTE: Universe: 16- to 74-year-old persons, below bachelor's degree, excluding high school graduates.

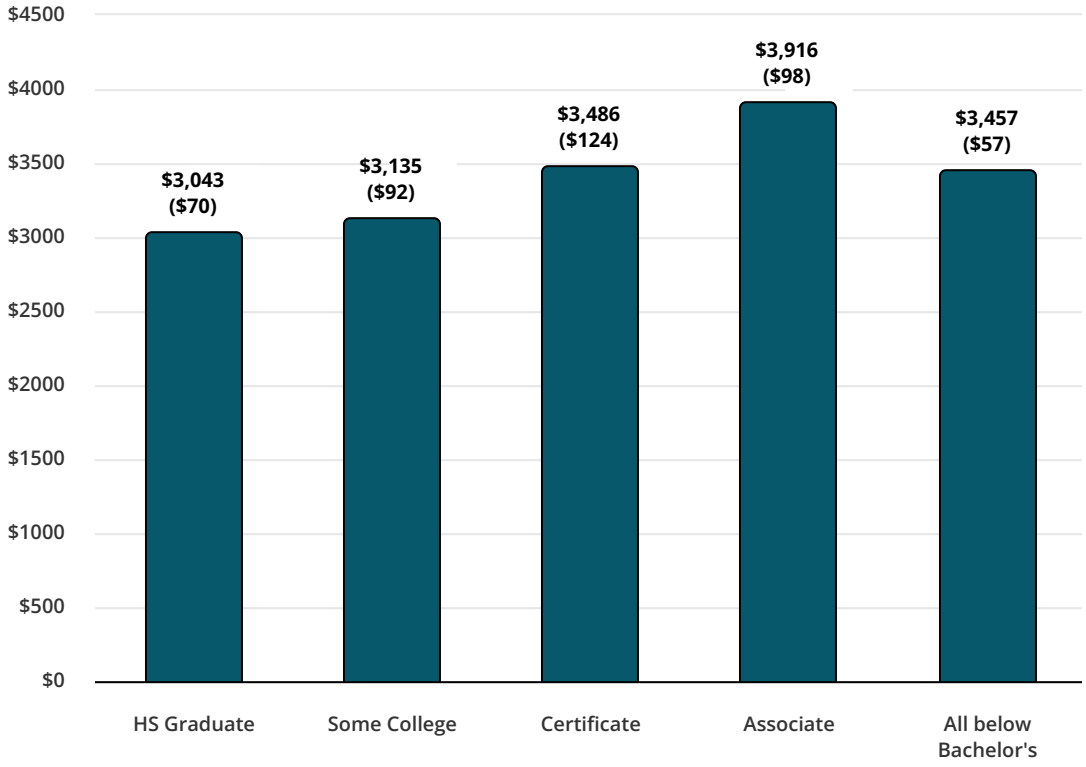
SOURCE: PIACC 2012-2014-2017 public use micro data files. Tabulations by the authors.

## Table A7: Percentage Distribution of Nonenrolled Persons (16- to 74-Years-Old) in Race/Ethnicity Groups by Field of Study, United States, 2012-2014-2017

| FIELD OF STUDY | SOME COLLEGE, NO AWARD | CERTIFICAE AWARD | ASSOCIATE'S DEGREE | TOTAL (WITH SOME COLLEGE BELOW THE BACHELOR'S DEGREE) |
|---|---|---|---|---|
| Health | 17% (0.8%) | 25% (2.4%) | 18% (2.0%) | 19% (0.7%) |
| Business | 20% (0.9%) | 20% (2.6%) | 15% (1.7%) | 19% (0.8%) |
| Engineering and science | 17% (0.8%) | 16% (2.5%) | 16% (0.8%) | 16% (0.8%) |
| Blue-collar | 11% (0.9%) | 6% (1.9%) | 13% (1.7%) | 11% (0.7%) |
| Education/humanities/social sciences | 17% (1.1%) | 17% (1.7%) | 18% (2.3%) | 17% (1.0%) |
| Other specialized programs | 17% (1.0%) | 17% (1.9%) | 17% (2.2%) | 17% (0.9%) |
| Total | 100% | 100% | 100% | 100% |

NOTE: Universe: Below bachelor's degree, excluding high school graduates. Standard errors in parentheses. S = suppressed, insufficient sample.
SOURCE: PIAAC 2012-2014-2017 public use micro data files. Tabulations by the authors.

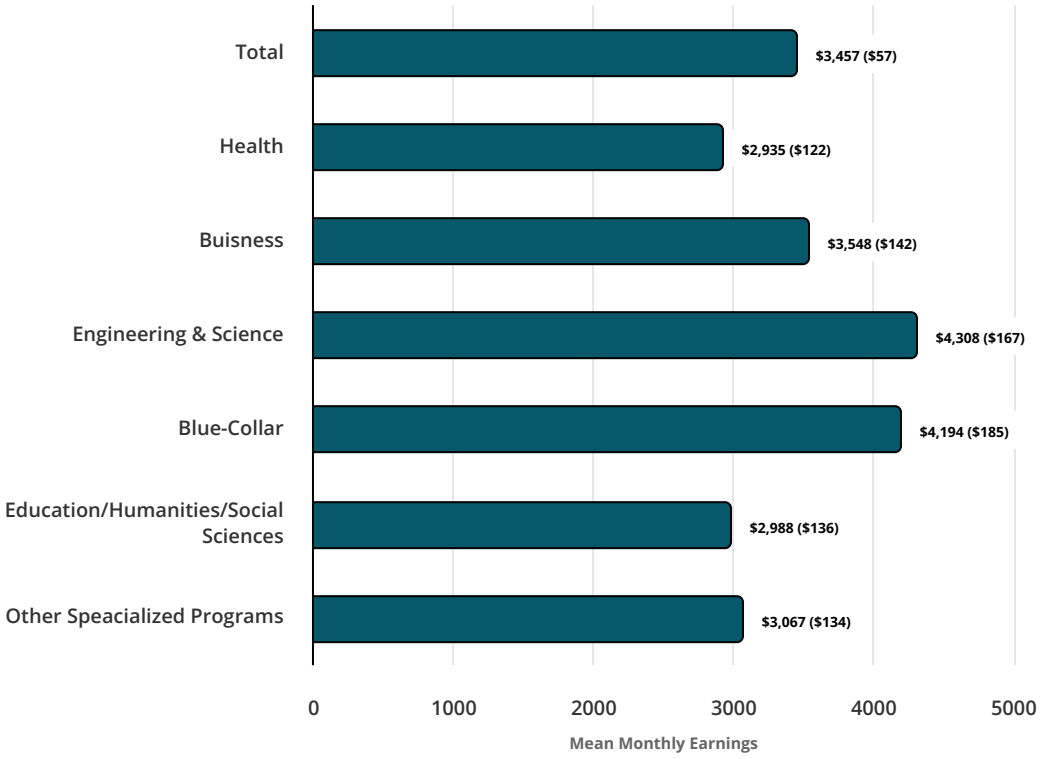
## Chart A4: Mean Monthly Earnings of Nonenrolled Employed Persons (16- to 74-Years-Old) by Educational Attainment, United States, 2012-2014-2017




NOTE: Universe: Below bachelor's degree, including high school graduates. HS = high school. Standard errors in parentheses.

SOURCE: PIACC 2012-2014-2017 public use micro data files. Tabulations by the authors.

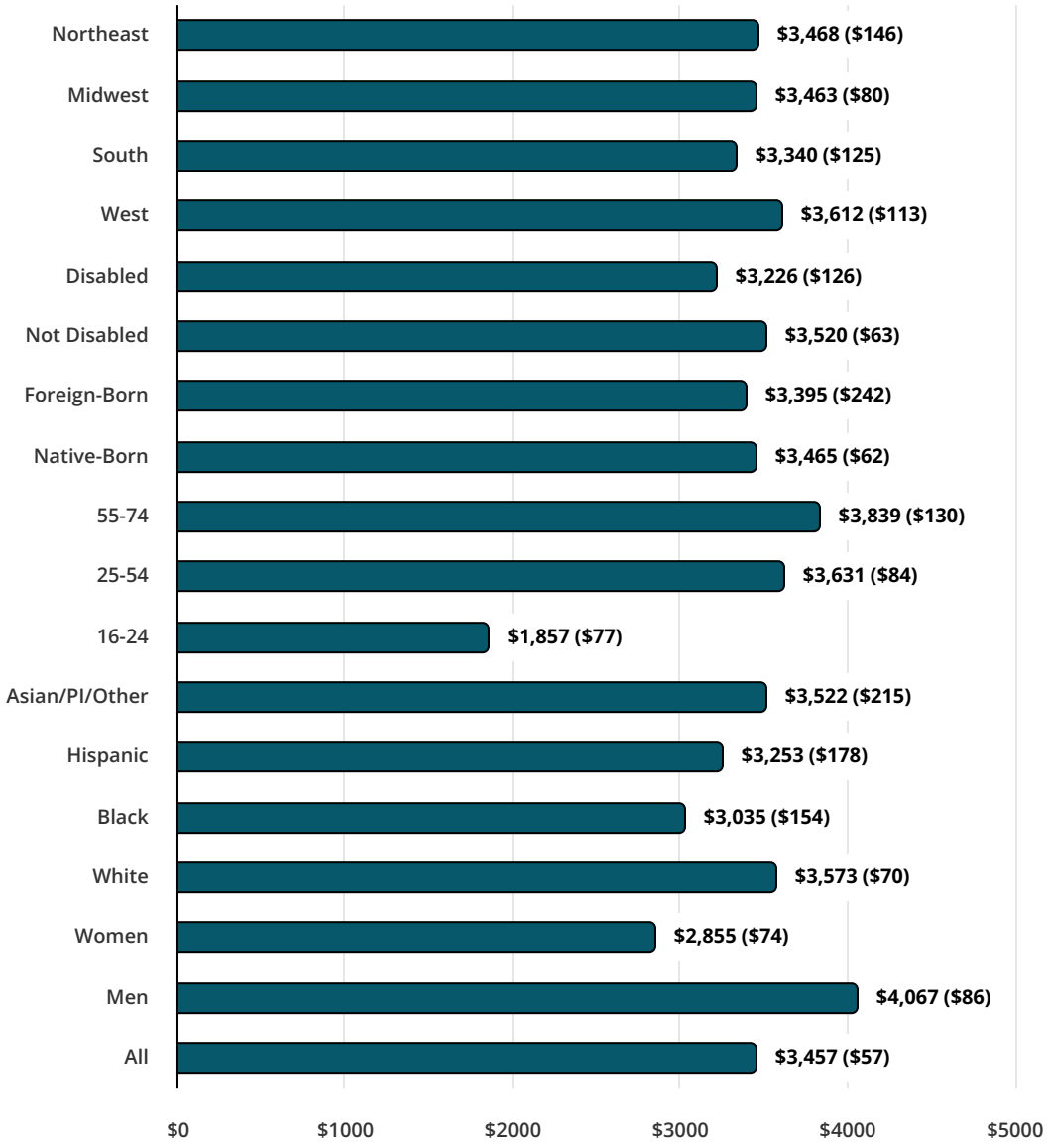
## Chart A5: Mean Monthly Earnings of Nonenrolled Employed Persons (16- to 74-Years-Old) by Major Field of Study, United States, 2012-2014-2017




NOTE: Universe: Below bachelor's degree, excluding high school graduates. Standard errors in parentheses.

SOURCE: PIACC 2012-2014-2017 public use micro data files. Tabulations by the authors.

## Chart A6: Mean Monthly Earnings of Nonenrolled Employed Persons (16- to 74-Years-Old) by Selected Demographic Characteristics, United States, 2012-2014-2017




NOTE: Universe: Below bachelor's degree, excluding high school graduates. Standard errors in parentheses.

SOURCE: PIACC 2012-2014-2017 public use micro data files. Tabulations by the authors.

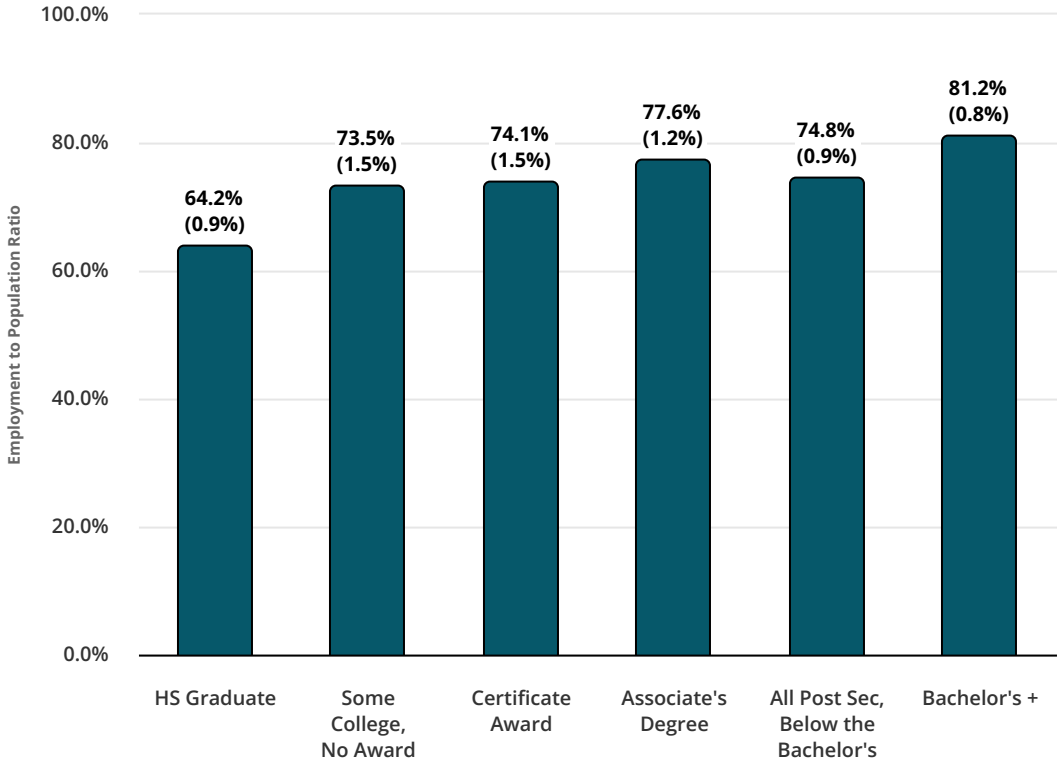
## Table A8: Mean Monthly Earnings of Nonenrolled Employed Persons (16- to 74-Years-Old) by Educational Attainment and Literacy Proficiency Level, United States, 2012-2014-2017

| EDUCATIONAL ATTAINMENT | AT LEVEL 2 OR BELOW | 3/4/5 COMBINED | DIFFERENCE | RELATIVE DIFFERENCE |
|---|---|---|---|---|
| Some college, no award | $2,838 ($118) | $3,391 ($143) | $553 ($193)*** | 20% |
| Certificate award | $3,177 ($184) | $3,882 ($198) | $704 ($291)*** | 22% |
| Associate's degree | $3,722 ($193) | $4,061 ($142) | $339 ($271) | 9% |
| Total | $3,174 ( $91) | $3,719 ( $87) | $545 ($140)*** | 17% |

Statistical significance: *** sig. at .01 level, ** sig at .05 level.
NOTE: Universe: Below bachelor's degree, excluding high school graduate. Standard errors in parentheses.
SOURCE: PIAAC 2012-2014-2017 public use micro data files. Tabulations by the authors.

# Appendix B: The Employment to Population Ratio of Persons with Education Below the Bachelor's Degree Level

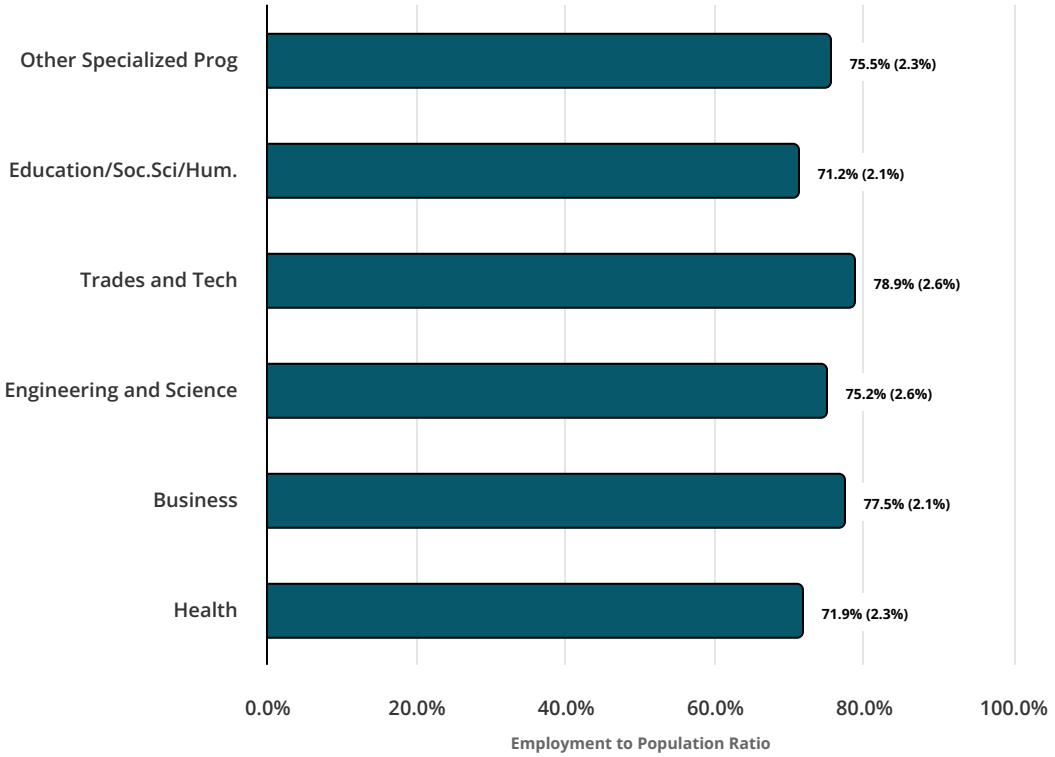
## Chart B1: Employment to Population Ratio of Nonenrolled Persons (16- to 74-Years-Old) by Educational Attainment, United States, 2012-2014-2017




NOTE: Universe: Nonenrolled, 16–74, with high school diploma or higher. HS = high school; Sec. = secondary. Standard errors in parentheses.

SOURCE: PIACC 2012-2014-2017 public use micro data files. Tabulations by the authors.

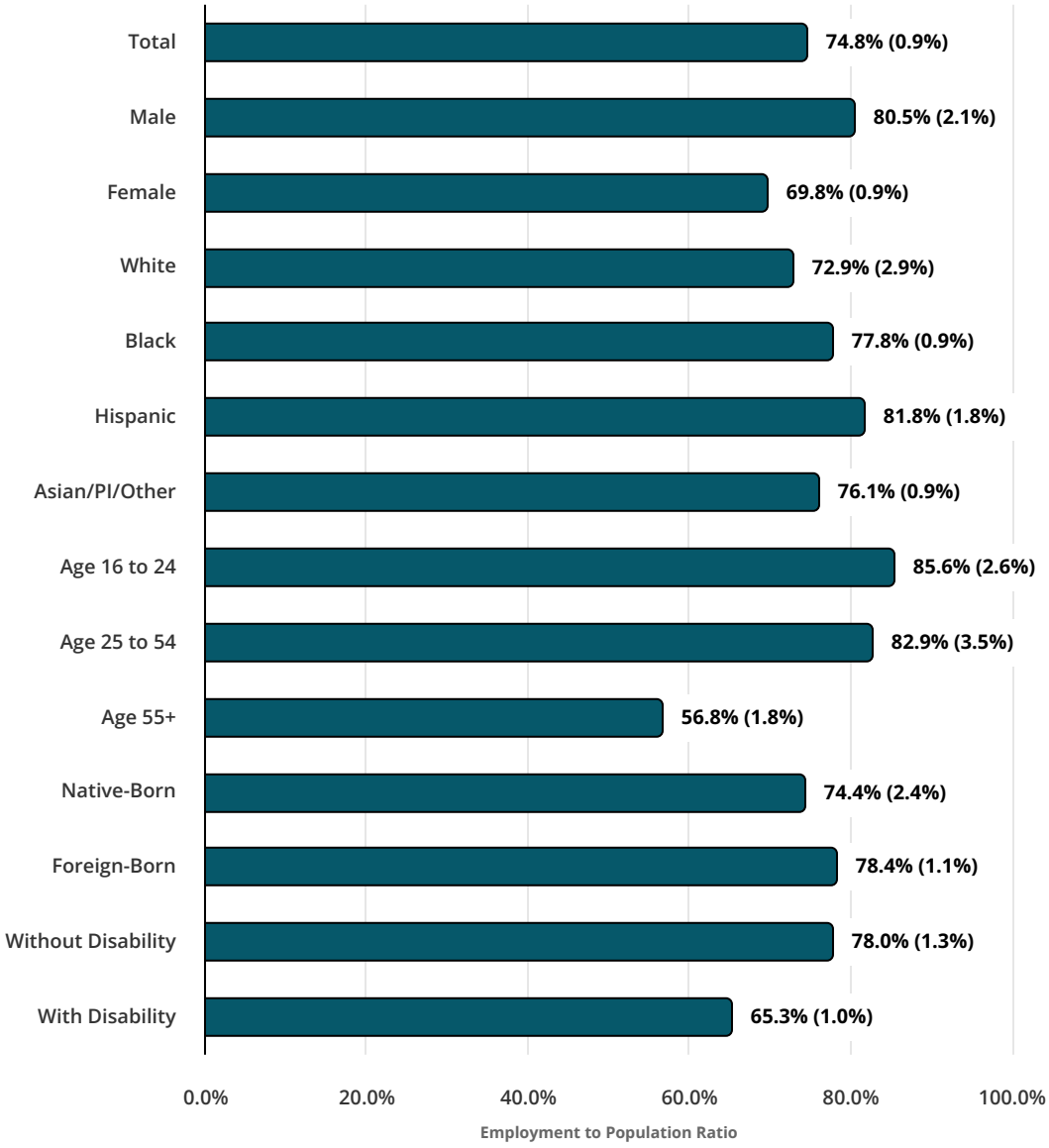
## Chart B2: Employment to Population Ratio of Nonenrolled Persons (16- to 74-Years-Old) by Field of Study, United States, 2012-2014-2017




NOTE: Universe: Below bachelor's degree, excluding high school graduates. Prog = Program; Soc.Sci = Social Science; Hum. = Humanities. Standard errors in parentheses.

SOURCE: PIACC 2012-2014-2017 public use micro data files. Tabulations by the authors.

## Chart B3: Employment to Population Ratio of Nonenrolled Persons (16- to 74-Years-Old) by Selected Demographic Traits, United States, 2012-2014-2017




NOTE: Universe: Below bachelor's, excluding high school graduates. PI = Pacific Islander. Standard errors in parentheses.

SOURCE: PIACC 2012-2014-2017 public use micro data files. Tabulations by the authors.

## Table B1 Employment to Population Ratio of Nonenrolled Persons (16- to 74-Years-Old) by Educational Attainment and Literacy Proficiency Level, United States, 2012-2014-2017

| EDUCATIONAL ATTAINMENT | (COL.1) LEVEL 2 OR BELOW | (COL.2) LEVEL 3/4/5 COMBINED | (COL.3) DIFFERENCE (COL.2 - COL.1) (PERCENTAGE POINTS) |
|---|---|---|---|
| Some college, no award | 66.9% (2.1%) | 80.3% (2.2%) | 13.4% (3.1%)*** |
| Certificate award | 70.5% (2.4%) | 79.8% (2.7%) | 9.4% (4.1%)** |
| Associate's degree | 74.0% (2.3%) | 80.6% (2.1%) | 6.6% (3.7%) |
| Total | 69.7% (1.3%) | 80.3% (1.4%) | 10.5% (2.1%)*** |

Statistical significance: *** sig. at .01 level, ** sig at .05 level.
NOTE: Universe: Below bachelor's, excluding high school graduates. Standard errors in parentheses.
SOURCE: PIAAC 2012-2014-2017 public use micro data files. Tabulations by the authors.

# Appendix C: Score Boundaries and Task Descriptions for Each of the Six PIAAC Proficiency Levels on the Literacy Scale

## Table C1: Score Boundaries and Task Descriptions for Each of the Six PIAAC Proficiency Levels on the Literacy Scale

| LITERACY PROFICIENCY LEVELS AND SCORE BOUNDARIES | LITERACY TASK DESCRIPTIONS |
|---|---|
| Below Level 1 (0 - 175) | The tasks at this level require the respondent to read brief texts on familiar topics to locate a single piece of specific information. Only basic vocabulary knowledge is required, and the reader is not required to understand the structure of sentences or paragraphs or make use of other text features. There is seldom any competing information in the text and the requested information is identical in form to information in the question or directive. While the texts can be continuous, the information can be located as if the text were noncontinuous. Tasks below Level 1 do not make use of any features specific to digital texts. |
| Level 1 (176 - 225) | Most of the tasks at this level require the respondent to read relatively short digital or print continuous, noncontinuous or mixed texts to locate a single piece of information which is identical to or synonymous with the information given in the question or directive. Some tasks may require the respondent to enter personal information into a document, in the case of some noncontinuous texts. Little, if any, competing information is present. Some tasks may require simple cycling through more than one piece of information. Knowledge and skill in recognizing basic vocabulary, evaluating the meaning of sentences, and reading of paragraph text is expected. |
| Level 2 (226 - 275) | At this level, the complexity of text increases. The medium of texts may be digital or printed, and texts may comprise continuous, noncontinuous or mixed types. Tasks in this level require respondents to make matches between the text and information, and may require paraphrase or low-level inferences. Some competing pieces of information may be present. Some tasks require the respondent to<br>• cycle through or integrate two or more pieces of information based on criteria,<br>• compare and contrast or reason about information requested in the question, or<br>• navigate within digital texts to access and identify information from various parts of a document. |

SOURCE: "PIAAC Proficiency Scales," by Claudia Tamassia and Mary Louise Lennon, 2013, Technical Report of the Survey of Adult Skills (PIAAC), Organisation for Economic Co-operation and Development, pp. 6, 7, 8 (http://www.oecd.org/skills/piaac/_technical%20report_17oct13.pdf). Copyright 2013 by OECD.

## Table C1: Score Boundaries and Task Descriptions for Each of the Six PIAAC Proficiency Levels on the Literacy Scale (Continued)

| LITERACY PROFICIENCY LEVELS AND SCORE BOUNDARIES | LITERACY TASK DESCRIPTIONS |
|---|---|
| Level 3 (276 - 325) | Texts at this level are often dense or lengthy, including continuous, noncontinuous, mixed or multiple pages. Understanding text and rhetorical structures become more central to successfully completing tasks, especially in navigation of complex digital texts. Tasks require the respondent to identify, interpret or evaluate one or more pieces of information and often require varying levels of inferencing. Many tasks require the respondent construct meaning across larger chunks of text or perform multistep operations in order to identify and formulate responses. Often tasks also demand that the respondent disregard irrelevant or inappropriate text content to answer accurately. Competing information is often present, but it is not more prominent than the correct information. |
| Level 4 (326 - 375) | Tasks at this level often require respondents to perform multiple-step operations to integrate, interpret, or synthesize information from complex or lengthy continuous, noncontinuous, mixed, or multiple type texts. Complex inferences and application of background knowledge may be needed to perform successfully. Many tasks require identifying and understanding one or more specific, noncentral ideas in the text in order to interpret or evaluate subtle evidence claim or persuasive discourse relationships. Conditional information is frequently present in tasks at this level and must be taken into consideration by the respondent. Competing information is present and sometimes seemingly as prominent as correct information. |
| Level 5 (376 - 500) | At this level, tasks may require the respondent to search for and integrate information across multiple, dense texts; construct syntheses of similar and contrasting ideas or points of view; or evaluate evidence-based arguments. Application and evaluation of logical and conceptual models of ideas may be required to accomplish tasks. Evaluating reliability of evidentiary sources and selecting key information is frequently a key requirement. Tasks often require respondents to be aware of subtle, rhetorical cues and to make high-level inferences or use specialized background knowledge. |

SOURCE: "PIAAC Proficiency Scales," by Claudia Tamassia and Mary Louise Lennon, 2013, Technical Report of the Survey of Adult Skills (PIAAC), Organisation for Economic Co-operation and Development, pp. 6, 7, 8 (http://www.oecd.org/skills/piaac/_technical%20report_17oct13.pdf). Copyright 2013 by OECD.

# Appendix D: Definitions of the Dependent and Independent Variables in the Earnings Regressions of 16- to 74-Year-Old Nonenrolled Workers, United States, PIAAC, 2012-2014-2017

## Dependent Variables

lnearns = natural log of monthly earnings,[68] including bonuses for wage and salary earners and self-employed workers

**Regression Models 1 and 2 Universe:** Workers with high school diploma, some college, no award, certification, and associate's degree.

**Regression Model 3 Universe:** Workers with some college, no award, certification, and associate's degree.

## Independent Variables

Individual Literacy and Numeracy Score

pvlitz = continuous standardized literacy proficiency score of 16 and older persons in PIAAC survey

pvnumz = continuous standardized numeracy proficiency score of 16 and older persons in PIAAC survey

Gender

*Base group is female.*

male = a dichotomous gender variable
= 1, if male
= 0, if female

Race Variable

*Base group is non-Hispanic White.*

black = a dichotomous race variable
= 1, if non-Hispanic Black
= 0, if else

hispanic = a dichotomous race variable
= 1, if Hispanic
= 0, if else

asian_pi_other = a dichotomous race variable
= 1, if Asian, Pacific Islander, and all other race
= 0, if else

Nativity Status

*Base group is foreign-born workers.*

native_born = a dichotomous nativity status variable
= 1, if born in the United States
= 0, if else

Educational Attainment Levels

*In Regression Models 1 and 2, the base group is workers with a high school diploma.*

*In Regression Model 3, the base group is workers with some college, no award.*

some_college = a dichotomous educational attainment variable
= 1, if some years of college, certification, or associate degree
= 0, if else

certification = a dichotomous educational attainment variable
= 1, if certification award
= 0, if else

associates = a dichotomous educational attainment variable
= 1, if associate's degree
= 0, if else

College Major

*Base group is education, humanities, and social science majors.*

health_major = a dichotomous college major variable
= 1, if health college major
= 0, if else

business_major = a dichotomous college major variable
= 1, if business college major
= 0, if else

eng_science_major = a dichotomous college major variable
= 1, if engineering/sciences college major
= 0, if else

blue_collar_major = a dichotomous college major variable
= 1, if blue collar college major
= 0, if else

all_other_major = a dichotomous college major variable
= 1, if remaining "All other majors" college major
= 0, if else

Disability Status

*Base group is disabled.*

with_disabilities = a dichotomous disability status variable
= 1, if with disabilities (difficulty seeing print, hearing conversation, or diagnosed with a learning disability)
= 0, if else

Weekly Hours of Work

weekly_hours = continuous weekly hours of work in the current job

Region of Residence of Worker

*Base group is resident of South region.*

northeast = a dichotomous region of residence variable
= 1, if Northeast region resident
= 0, if else

midwest = a dichotomous region of residence variable
= 1, if Midwest region resident
= 0, if else

west = a dichotomous region of residence variable
= 1, if West region resident
= 0, if else

Years of Work Experience

experience = continuous years of actual work experience

experience_sq = continuous years of actual work experience squared

Formulas for Monthly Earnings Regression Models

Regression Model 1

$$\ln(Earnings_i) = \alpha + \beta_1 Gender_i + \beta_2 Race_i + \beta_3 Nativity_i + \beta_4 Education_i + \beta_5 Disability_i + \beta_6 Weekly\ Hours_i + \beta_7 Region_i + \beta_8 Experience_i + \beta_9 Experience\ Squared_i + \mu_i$$

Regression Model 2 (with Literacy Proficiency)

$$\ln(Earnings_i) = \alpha + \beta_1 Standardized\ Literacy\ Score_i + \beta_2 Gender_i + \beta_3 Race_i + \beta_4 Nativity_i + \beta_5 Education_i + \beta_6 Disability_i + \beta_7 Weekly\ Hours_i + \beta_8 Region_i + \beta_9 Experience_i + \beta_{10} Experience\ Squared_i + \mu_i$$

Regression Model 2 (with Numeracy Proficiency)

$$\ln(Earnings_i) = \alpha + \beta_1 Standardized\ Numeracy\ Score_i + \beta_2 Gender_i + \beta_3 Race_i + \beta_4 Nativity_i + \beta_5 Education_i + \beta_6 Disability_i + \beta_7 Weekly\ Hours_i + \beta_8 Region_i + \beta_9 Experience_i + \beta_{10} Experience\ Squared_i + \mu_i$$

Regression Model 3 (with Literacy Proficiency)

$$\ln(Earnings_i) = \alpha + \beta_1 Standardized\ Literacy\ Score_i + \beta_2 Gender_i + \beta_3 Race_i + \beta_4 Nativity_i + \beta_5 Education_i + \beta_6 Disability_i + \beta_7 Weekly\ Hours_i + \beta_8 College\ Major_i + \beta_9 Region_i + \beta_{10} Experience_i + \beta_{11} Experience\ Squared_i + \mu_i$$

Regression Model 3 (with Numeracy Proficiency)

$$\ln(Earnings_i) = \alpha + \beta_1 Standardized\ Numeracy\ Score_i + \beta_2 Gender_i + \beta_3 Race_i + \beta_4 Nativity_i + \beta_5 Education_i + \beta_6 Disability_i + \beta_7 Weekly\ Hours_i + \beta_8 College\ Major_i + \beta_9 Region_i + \beta_{10} Experience_i + \beta_{11} Experience\ Squared_i + \mu_i$$

## Table D1 (Regression Model 1): Estimated Coefficients of Monthly Earnings Regressions for Nonenrolled 16- to 74-Year-Old Workers with Below Bachelor's Degree Credentials (High School Graduates, Some College, No Award, Certification, and Associates Degree) in the United States, 2012-2014-2017 (Without Proficiency Variable)

| VARIABLE | COEFFICIENT | STANDARD ERROR | Z | P > Z | % EFFECT |
|---|---|---|---|---|---|
| male | 0.148 | 0.028 | 5.3 | 0.000 | 15.9% |
| hispanic | -0.064 | 0.042 | -1.5 | 0.127 | -6.2% |
| black | -0.065 | 0.035 | -1.9 | 0.062 | -6.3% |
| asian_pi_other | 0.030 | 0.064 | 0.5 | 0.645 | 3.0% |
| native_born | 0.083 | 0.040 | 2.1 | 0.039 | 8.7% |
| somecollege | 0.083 | 0.027 | 3.1 | 0.002 | 8.6% |
| certification | 0.120 | 0.032 | 3.8 | 0.000 | 12.8% |
| associatesdegree | 0.260 | 0.027 | 9.8 | 0.000 | 29.6% |
| disabled | -0.083 | 0.025 | -3.3 | 0.001 | -8.0% |
| weekly_hours | 0.038 | 0.002 | 23.5 | 0.000 | 3.9% |
| northeast | 0.132 | 0.040 | 3.3 | 0.001 | 14.1% |
| midwest | 0.026 | 0.033 | 0.8 | 0.424 | 2.7% |
| west | 0.152 | 0.038 | 4.0 | 0.000 | 16.4% |
| experience | 0.039 | 0.004 | 11.3 | 0.000 | 4.0% |
| experiencesq | -0.001 | 0.000 | -7.8 | 0.000 | -0.1% |
| constant | 5.582 | 0.079 | 70.6 | 0.000 | — |
| R-Squared | 0.504 | 0.018 | 27.3 | 0.000 | — |
| *N = 3,001* | | | | | |

— Not applicable.

## Table D2 (Regression Model 2): Estimated Coefficients of Monthly Earnings Regressions for Nonenrolled 16- to 74-Year-Old Workers with Below Bachelor's Degree Credentials (High School Graduates, Some College, No Award, Certification, and Associates Degree) in the United States, 2012-2014-2017 (with Literacy Proficiency Variable)

| VARIABLE | COEFFICIENT | STANDARD ERROR | Z | P > Z | % EFFECT |
|---|---|---|---|---|---|
| pv_litz | 0.081 | 0.016 | 5.1 | 0.000 | 8.4% |
| male | 0.146 | 0.027 | 5.4 | 0.000 | 15.7% |
| hispanic | -0.037 | 0.041 | -0.9 | 0.360 | -3.7% |
| black | -0.020 | 0.036 | -0.6 | 0.571 | -2.0% |
| asian_pi_other | 0.052 | 0.064 | 0.8 | 0.412 | 5.4% |
| native born | 0.042 | 0.039 | 1.1 | 0.285 | 4.3% |
| somecollege | 0.045 | 0.027 | 1.6 | 0.103 | 4.6% |
| certification | 0.091 | 0.033 | 2.8 | 0.006 | 9.6% |
| associatesdegree | 0.217 | 0.028 | 7.9 | 0.000 | 24.2% |
| disabled | -0.062 | 0.025 | -2.4 | 0.015 | -6.0% |
| weekly hours | 0.038 | 0.002 | 23.3 | 0.000 | 3.9% |
| northeast | 0.130 | 0.040 | 3.2 | 0.001 | 13.8% |
| midwest | 0.024 | 0.033 | 0.7 | 0.457 | 2.5% |
| west | 0.148 | 0.037 | 4.0 | 0.000 | 15.9% |
| experience | 0.039 | 0.003 | 11.5 | 0.000 | 4.0% |
| experiencesq | -0.001 | 0.000 | -7.8 | 0.000 | -0.1% |
| constant | 5.635 | 0.080 | 70.5 | 0.000 | — |
| R-Squared | 0.511 | 0.018 | 27.9 | 0.000 | — |
| *N = 3,001* | | | | | |

— Not applicable.

## Table D3 (Regression Model 2): Estimated Coefficients of Monthly Earnings Regressions for Nonenrolled 16- to 74-Year-Old Workers with Below Bachelor's Degree Credentials (High School Graduates, Some College, No Award, Certification, and Associates Degree) in the United States, 2012-2014-2017 (with Numeracy Proficiency Variable)

| VARIABLE | COEFFICIENT | STANDARD ERROR | Z | P > Z | % EFFECT |
|---|---|---|---|---|---|
| pv_numz | 0.088 | 0.017 | 5.2 | 0.000 | 9.2% |
| male | 0.124 | 0.027 | 4.5 | 0.000 | 13.2% |
| hispanic | -0.030 | 0.041 | -0.7 | 0.471 | -2.9% |
| black | -0.002 | 0.037 | 0.0 | 0.966 | -0.2% |
| asian_pi_other | 0.055 | 0.065 | 0.9 | 0.396 | 5.6% |
| native born | 0.059 | 0.040 | 1.5 | 0.138 | 6.1% |
| somecollege | 0.043 | 0.027 | 1.6 | 0.118 | 4.3% |
| certification | 0.089 | 0.033 | 2.7 | 0.006 | 9.3% |
| associatesdegree | 0.218 | 0.028 | 7.7 | 0.000 | 24.3% |
| disabled | -0.061 | 0.025 | -2.5 | 0.014 | -6.0% |
| weekly hours | 0.038 | 0.002 | 23.3 | 0.000 | 3.9% |
| northeast | 0.130 | 0.040 | 3.3 | 0.001 | 13.9% |
| midwest | 0.026 | 0.033 | 0.8 | 0.430 | 2.6% |
| west | 0.146 | 0.037 | 4.0 | 0.000 | 15.7% |
| experience | 0.039 | 0.003 | 11.7 | 0.000 | 4.0% |
| experiencesq | -0.001 | 0.000 | -8.0 | 0.000 | -0.1% |
| constant | 5.635 | 0.080 | 70.3 | 0.000 | — |
| R-Squared | 0.511 | 0.018 | — | — | — |
| *N = 3,001* | | | | | |

— Not applicable.

## Table D4 (Regression Model 3): Estimated Coefficients of Monthly Earnings Regressions for Nonenrolled 16- to 74-Year-Old Workers with Below Bachelor's Degree Credentials (Some College, No Award, Certification, and Associates Degree) in the United States, 2012-2014-2017 (with Literacy Proficiency Variable)

| VARIABLE | COEFFICIENT | STANDARD ERROR | Z | P > Z | % EFFECT |
|---|---|---|---|---|---|
| pv_litz | 0.094 | 0.025 | 3.8 | 0.000 | 9.9% |
| male | 0.146 | 0.040 | 3.7 | 0.000 | 15.7% |
| hispanic | -0.056 | 0.048 | -1.2 | 0.246 | -5.5% |
| black | -0.016 | 0.047 | -0.3 | 0.739 | -1.6% |
| asian_pi_other | 0.069 | 0.065 | 1.1 | 0.290 | 7.2% |
| native born | 0.014 | 0.057 | 0.3 | 0.805 | 1.4% |
| certification | 0.000 | 0.039 | 0.0 | 0.992 | 0.0% |
| associatesdegree | 0.141 | 0.023 | 6.0 | 0.000 | 15.1% |
| disabled | -0.098 | 0.033 | -3.0 | 0.003 | -9.4% |
| health_major | 0.160 | 0.043 | 3.8 | 0.000 | 17.4% |
| business major | 0.110 | 0.049 | 2.3 | 0.024 | 11.6% |
| eng eci major | 0.171 | 0.049 | 3.5 | 0.001 | 18.7% |
| bluecol_major | 0.104 | 0.063 | 1.7 | 0.100 | 10.9% |
| all other major | 0.005 | 0.045 | 0.1 | 0.913 | 0.5% |
| weekly hours | 0.037 | 0.002 | 17.3 | 0.000 | 3.7% |
| northeast | 0.088 | 0.055 | 1.6 | 0.107 | 9.2% |
| midwest | 0.009 | 0.032 | 0.3 | 0.791 | 0.9% |
| west | 0.103 | 0.040 | 2.6 | 0.010 | 10.9% |
| experience | 0.047 | 0.005 | 9.0 | 0.000 | 4.8% |
| experiencesq | -0.001 | 0.000 | -6.6 | 0.000 | -0.1% |
| constant | 5.630 | 0.097 | 58.3 | 0.000 | — |
| R-Squared | 0.514 | 0.020 | — | — | — |
| *N = 1,665* | | | | | |

— Not applicable.

## Table D5 (Regression Model 3): Estimated Coefficients of Monthly Earnings Regressions for Nonenrolled 16- to 74-Year-Old Workers with Below Bachelor's Degree Credentials (Some College, No Award, Certification, and Associate's Degree) in the United States, 2012-2014-2017 (with Numeracy Proficiency Variable)

| VARIABLE | COEFFICIENT | STANDARD ERROR | Z | P > Z | % EFFECT |
|---|---|---|---|---|---|
| pv_numz | 0.096 | 0.023 | 4.2 | 0.000 | 10.1% |
| male | 0.125 | 0.040 | 3.1 | 0.002 | 13.3% |
| hispanic | -0.051 | 0.049 | -1.0 | 0.307 | -4.9% |
| black | 0.004 | 0.050 | 0.1 | 0.935 | 0.4% |
| asian_pi_other | 0.073 | 0.067 | 1.1 | 0.272 | 7.6% |
| native born | 0.036 | 0.056 | 0.6 | 0.527 | 3.6% |
| certification | -0.001 | 0.039 | 0.0 | 0.983 | -0.1% |
| associatesdegree | 0.143 | 0.025 | 5.8 | 0.000 | 15.3% |
| disabled | -0.101 | 0.033 | -3.1 | 0.002 | -9.6% |
| health_major | 0.171 | 0.042 | 4.1 | 0.000 | 18.6% |
| business major | 0.113 | 0.049 | 2.3 | 0.021 | 11.9% |
| eng eci major | 0.170 | 0.050 | 3.4 | 0.001 | 18.6% |
| bluecol_major | 0.099 | 0.062 | 1.6 | 0.112 | 10.4% |
| all other major | 0.010 | 0.044 | 0.2 | 0.827 | 1.0% |
| weekly hours | 0.037 | 0.002 | 17.3 | 0.000 | 3.7% |
| northeast | 0.088 | 0.054 | 1.6 | 0.107 | 9.2% |
| midwest | 0.011 | 0.033 | 0.4 | 0.729 | 1.1% |
| west | 0.101 | 0.039 | 2.6 | 0.011 | 10.6% |
| experience | 0.047 | 0.005 | 9.3 | 0.000 | 4.8% |
| experiencesq | -0.001 | 0.000 | -6.9 | 0.000 | -0.1% |
| constant | 5.612 | 0.096 | 58.3 | 0.000 | — |
| R-Squared | 0.514 | 0.020 | — | — | — |
| *N = 1,665* | | | | | |

— Not applicable.

## Table D6: Descriptive of Monthly Earnings Regression (Regression Models 1 and 2) for Nonenrolled 16- to 74-Year-Old Workers with Below Bachelor's Degree Credentials (High School Diploma, Some College, No Award, Certification, and Associate's Degree) in the United States, 2012-2014-2017

| VARIABLE | MEAN | SD | MIN | MAX | *N* |
|---|---|---|---|---|---|
| lninc_monthly | 7.788 | 0.768 | 4.462 | 9.512 | 3,001 |
| pvlit | 265 | 44 | 92 | 401 | 3,001 |
| pvnum | 250 | 48 | 69 | 412 | 3,001 |
| male | 0.504 | 0.500 | 0 | 1 | 3,001 |
| hispanic | 0.130 | 0.337 | 0 | 1 | 3,001 |
| black | 0.151 | 0.358 | 0 | 1 | 3,001 |
| asian_pi_other | 0.055 | 0.227 | 0 | 1 | 3,001 |
| native born | 0.894 | 0.308 | 0 | 1 | 3,001 |
| somecollege | 0.234 | 0.423 | 0 | 1 | 3,001 |
| certification | 0.158 | 0.364 | 0 | 1 | 3,001 |
| associatesdegree | 0.161 | 0.368 | 0 | 1 | 3,001 |
| disabled | 0.228 | 0.420 | 0 | 1 | 3,001 |
| weekly_hours | 38.928 | 11.777 | 1 | 98 | 3,001 |
| northeast | 0.150 | 0.357 | 0 | 1 | 3,001 |
| midwest | 0.291 | 0.454 | 0 | 1 | 3,001 |
| west | 0.166 | 0.372 | 0 | 1 | 3,001 |
| experience | 21.364 | 13.448 | 0 | 47 | 3,001 |
| experiencesq | 637.214 | 654.285 | 0 | 2209 | 3,001 |

## Table D7: Descriptive of Monthly Earnings Regression (Regression Model 3) for Nonenrolled 16- to 74-Year-Old Workers with Below Bachelor's Degree Credentials (Some College, No Award, Certification, and Associates Degree) in the United States, 2012-2014-2017

| VARIABLE | MEAN | SD | MIN | MAX | *N* |
|---|---|---|---|---|---|
| lninc_monthly | 7.898 | 0.759 | 4.423 | 9.466 | 1,665 |
| pvlit | 276 | 41 | 119 | 400 | 1,665 |
| pvnum | 261 | 45 | 98 | 412 | 1,665 |
| male | 0.467 | 0.499 | 0 | 1 | 1,665 |
| hispanic | 0.119 | 0.324 | 0 | 1 | 1,665 |
| black | 0.137 | 0.344 | 0 | 1 | 1,665 |
| asian_pi_other | 0.057 | 0.232 | 0 | 1 | 1,665 |
| native born | 0.900 | 0.300 | 0 | 1 | 1,665 |
| certification | 0.284 | 0.451 | 0 | 1 | 1,665 |
| associatesdegree | 0.292 | 0.455 | 0 | 1 | 1,665 |
| disabled | 0.219 | 0.413 | 0 | 1 | 1,665 |
| health major | 0.197 | 0.398 | 0 | 1 | 1,665 |
| business_major | 0.192 | 0.394 | 1 | 1 | 1,665 |
| eng sci major | 0.159 | 0.365 | 0 | 1 | 1,665 |
| bluecol major | 0.111 | 0.314 | 0 | 1 | 1,665 |
| all_other_major | 0.180 | 0.384 | 0 | 1 | 1,665 |
| weekly hours | 39.416 | 11.602 | 1 | 60 | 1,665 |
| northeast | 0.148 | 0.356 | 0 | 1 | 1,665 |
| midwest | 0.301 | 0.459 | 0 | 1 | 1,665 |
| west | 0.175 | 0.380 | 0 | 1 | 1,665 |
| experience | 22.612 | 12.967 | 0 | 47 | 1,665 |
| experiencesq | 679.352 | 654.670 | 0 | 2209 | 1,665 |

# Appendix E: Definitions of the Dependent and Independent Variables in the Employment Regressions of 16- to 74-Year-Old Nonenrolled Persons, United States, PIAAC, 2012-2014-2017

## Dependent Variables

employed = a dichotomous employment status at the time of the PIAAC surveys variable among nonenrolled 16- to-74-year-old individuals with high school diploma, some college, certification, and associate's degree
= 1, if employed
= 0, if else

**Regression Models 1 and 2 Universe:** Workers with high school diploma, some college, no award, certification, and associate's degree.

**Regression Model 3 Universe:** Workers with high some college, no award, certification, and associate's degree.

## Independent Variables

Individual Literacy and Numeracy Score

pvlitz = continuous standardized literacy proficiency score of 16 and older persons in PIAAC survey

pvnumz = continuous standardized numeracy proficiency score of 16 and older persons in PIAAC survey

Gender

*Base group is female.*

male = a dichotomous gender variable
= 1, if male
= 0, if female

Race Variable

*Base group is non-Hispanic White.*

black = a dichotomous race variable
= 1, if non-Hispanic Black
= 0, if else

hispanic = a dichotomous race variable
= 1, if Hispanic
= 0, if else

asian_pi = a dichotomous race variable
= 1, if Asian and Pacific Islander
= 0, if else

other_race1 = a dichotomous race variable
= 1, if all other race
= 0, if else

Nativity Status

*Base group is foreign-born workers.*

native_born = a dichotomous nativity status variable
= 1, if born in the United States
= 0, if else

Age Variable

*Base group is 25-to 34-year-olds.*

age_16_24 = a dichotomous age variable
= 1, if 16-to-24-year-old
= 0, if else

age_35_44 = a dichotomous age variable
= 1, if 35-to-44-year-old
= 0, if else

age_45_54 = a dichotomous age variable
= 1, if 45-to-54-year-old
= 0, if else

age_55_64 = a dichotomous age variable
= 1, if 55-to-64-year-old
= 0, if else

age_65_74 = a dichotomous age variable
= 1, if 65-to-74-year-old
= 0, if else

Educational Attainment Levels

*In Regression Models 1 and 2, the base group is workers with a high school diploma.*

*In Regression Model 3, the base group is workers with some college, no award.*

some_college = a dichotomous educational attainment variable
= 1, if some years of college, certification, or associate degree
= 0, if else

certification = a dichotomous educational attainment variable
= 1, if certification award
= 0, if else

associates = a dichotomous educational attainment variable
= 1, if associate's degree
= 0, if else

College Major
*Base group is education, humanities, and social science majors.*

health_major = a dichotomous college major variable
= 1, if health college major
= 0, if else

business_major = a dichotomous college major variable
= 1, if business college major
= 0, if else

eng_science_major = a dichotomous college major variable
= 1, if engineering/sciences college major
= 0, if else

blue_collar_major = a dichotomous college major variable
= 1, if blue collar college major
= 0, if else

all_other_major = a dichotomous college major variable
= 1, if remaining "All other majors" college major
= 0, if else

Disability Status
*Base group is disabled.*

with_disabilities = a dichotomous disability status variable
= 1, if with disabilities (difficulty seeing print, hearing conversation, or diagnosed with a learning disability)
= 0, if else

Region of Residence of Worker
*Base group is resident of South region.*

northeast = a dichotomous region of residence variable
= 1, if Northeast region resident
= 0, if else

midwest = a dichotomous region of residence variable
= 1, if Midwest region resident
= 0, if else

west = a dichotomous region of residence variable
= 1, if West region resident
= 0, if else

## Formulas for Employment Regression Models

### Regression Model 1

$$Log\left(\frac{Employed}{1-Employed}\right) = \frac{e^{(\alpha+\beta_1 Gender_i+\beta_2 Race_i+\beta_3 Nativity_i+\beta_4 Education_i+\beta_5 Disability_i+\beta_6 Age\ Group_i+\beta_7 Region_i+\mu_i)}}{(1+e^{(\alpha+\beta_1 Gender_i+\beta_2 Race_i+\beta_3 Nativity_i+\beta_4 Education_i+\beta_5 Disability_i+\beta_6 Age\ Group_i+\beta_7 Region_i+\mu_i)})}$$

### Regression Model 2 (with Literacy Proficiency)

$$Log\left(\frac{Employed}{1-Employed}\right) = \frac{e^{(\alpha+\beta_1 Std.\ Literacy\ Score_i+\beta_2 Gender_i+\beta_3 Race_i+\beta_4 Nativity_i+\beta_5 Education_i+\beta_6 Disability_i+\beta_7 Age\ Group_i+\beta_8 Region_i+\mu_i)}}{(1+e^{(\alpha+\beta_1 Std.\ Literacy\ Score_i+\beta_2 Gender_i+\beta_3 Race_i+\beta_4 Nativity_i+\beta_5 Education_i+\beta_6 Disability_i+\beta_7 Age\ Group_i+\beta_8 Region_i+\mu_i)})}$$

### Regression Model 2 (with Numeracy Proficiency)

$$Log\left(\frac{Employed}{1-Employed}\right) = \frac{e^{(\alpha+\beta_1 Std.\ Numeracy\ Score_i+\beta_2 Gender_i+\beta_3 Race_i+\beta_4 Nativity_i+\beta_5 Education_i+\beta_6 Disability_i+\beta_7 Age\ Group_i+\beta_8 Region_i+\mu_i)}}{(1+e^{(\alpha+\beta_1 Std.\ Numeracy\ Score_i+\beta_2 Gender_i+\beta_3 Race_i+\beta_4 Nativity_i+\beta_5 Education_i+\beta_6 Disability_i+\beta_7 Age\ Group_i+\beta_8 Region_i+\mu_i)})}$$

### Regression Model 3 (with Literacy Proficiency)

$$Log\left(\frac{Employed}{1-Employed}\right) = \frac{e^{(\alpha+\beta_1 Std.\ Lit.\ Score_i+\beta_2 Gender_i+\beta_3 Race_i+\beta_4 Nativity_i+\beta_5 Education_i+\beta_6 Disability_i+\beta_7 Age\ Group_i+\beta_8 College\ Major_i+\beta_9 Region_i+\mu_i)}}{(1+e^{(\alpha+\beta_1 Std.\ Lit.\ Score_i+\beta_2 Gender_i+\beta_3 Race_i+\beta_4 Nativity_i+\beta_5 Education_i+\beta_6 Disability_i+\beta_7 Age\ Group_i+\beta_8 College\ Major_i+\beta_9 Region_i+\mu_i)})}$$

### Regression Model 3 (with Numeracy Proficiency)

$$Log\left(\frac{Employed}{1-Employed}\right) = \frac{e^{(\alpha+\beta_1 Std.\ Num.\ Score_i+\beta_2 Gender_i+\beta_3 Race_i+\beta_4 Nativity_i+\beta_5 Education_i+\beta_6 Disability_i+\beta_7 Age\ Group_i+\beta_8 College\ Major_i+\beta_9 Region_i+\mu_i)}}{(1+e^{(\alpha+\beta_1 Std.\ Num.\ Score_i+\beta_2 Gender_i+\beta_3 Race_i+\beta_4 Nativity_i+\beta_5 Education_i+\beta_6 Disability_i+\beta_7 Age\ Group_i+\beta_8 College\ Major_i+\beta_9 Region_i+\mu_i)})}$$

## Table E1 (Regression Model 1): Logistic Regression Coefficients of Current Employment Status of Nonenrolled 16- to 74-Year-Old Individuals with Below Bachelor's Credential (High School Diploma, Some College, Certification, and Associate's Degree), United States, 2012-2014-2017 (without Proficiency Variable)

| VARIABLE | COEFFICIENT | STANDARD ERROR | Z | P > Z | PERCENT POINT EFFECT (MARGINS) |
|---|---|---|---|---|---|
| male | 0.740 | 0.072 | 10.3 | 0.000 | 12.7% |
| hispanic | -0.110 | 0.161 | -0.7 | 0.495 | -1.9% |
| black | -0.204 | 0.105 | -1.9 | 0.053 | -3.5% |
| asian_pi | -0.361 | 0.248 | -1.5 | 0.146 | -6.2% |
| other race1 | -0.337 | 0.199 | -1.7 | 0.090 | -5.8% |
| age 16 24 | -0.307 | 0.151 | -2.0 | 0.042 | -5.3% |
| age_35_44 | -0.135 | 0.111 | -1.2 | 0.224 | -2.3% |
| age 45 54 | -0.146 | 0.121 | -1.2 | 0.229 | -2.5% |
| age 55 64 | -0.894 | 0.100 | -9.0 | 0.000 | -15.3% |
| age_65_74 | -2.431 | 0.116 | -20.9 | 0.000 | -41.7% |
| somecollege | 0.371 | 0.091 | 4.1 | 0.000 | 6.4% |
| certification | 0.552 | 0.098 | 5.7 | 0.000 | 9.5% |
| associatesdegree | 0.671 | 0.100 | 6.7 | 0.000 | 11.5% |
| native born | -0.245 | 0.172 | -1.4 | 0.154 | -4.2% |
| disabled | -0.653 | 0.076 | -8.6 | 0.000 | -11.2% |
| northeast | 0.054 | 0.135 | 0.4 | 0.693 | 0.9% |
| midwest | 0.255 | 0.087 | 2.9 | 0.003 | 4.4% |
| west | 0.150 | 0.094 | 1.6 | 0.109 | 2.6% |
| constant | 1.286 | 0.214 | 6.0 | 0.000 | — |
| *N = 5,605* | | | | | |

— Not applicable.

## Table E2 (Regression Model 2): Logistic Regression Coefficients of Current Employment Status of Nonenrolled 16- to 74-Year-Old Individuals (High School Diploma, Some College, Certification, and Associate's Degree), United States, 2012-2014-2017 (with Literacy Proficiency Variable)

| VARIABLE | COEFFICIENT | STANDARD ERROR | Z | P > Z | PERCENT POINT EFFECT (MARGINS) |
|---|---|---|---|---|---|
| pv_litz | 0.285 | 0.055 | 5.2 | 0.000 | 4.8% |
| male | 0.735 | 0.072 | 10.2 | 0.000 | 12.5% |
| hispanic | 0.031 | 0.163 | 0.2 | 0.849 | 0.5% |
| black | -0.035 | 0.111 | -0.3 | 0.755 | -0.6% |
| asian_pi | -0.212 | 0.247 | -0.9 | 0.392 | -3.6% |
| other race1 | -0.301 | 0.197 | -1.5 | 0.126 | -5.1% |
| age_16_24 | -0.309 | 0.155 | -2.0 | 0.046 | -5.2% |
| age 35 44 | -0.099 | 0.114 | -0.9 | 0.386 | -1.7% |
| age 45 54 | -0.103 | 0.121 | -0.9 | 0.397 | -1.7% |
| age_55_64 | -0.831 | 0.102 | -8.1 | 0.000 | -14.1% |
| age 65 plus | -2.338 | 0.119 | -19.7 | 0.000 | -39.7% |
| somecollege | 0.240 | 0.098 | 2.4 | 0.015 | 4.1% |
| certification | 0.466 | 0.099 | 4.7 | 0.000 | 7.9% |
| associatesdegree | 0.508 | 0.101 | 5.0 | 0.000 | 8.6% |
| native born | -0.362 | 0.174 | -2.1 | 0.038 | -6.1% |
| disabled | -0.584 | 0.075 | -7.8 | 0.000 | -9.9% |
| northeast | 0.041 | 0.134 | 0.3 | 0.761 | 0.7% |
| midwest | 0.250 | 0.086 | 2.9 | 0.004 | 4.2% |
| west | 0.111 | 0.093 | 1.2 | 0.233 | 1.9% |
| constant | 1.000 | 0.208 | 6.9 | 0.000 | — |
| *N = 5,605* | | | | | |

— Not applicable.

## Table E3 (Regression Model 2): Logistic Regression Coefficients of Current Employment Status of Nonenrolled 16- to 74-Year-Old Individuals (High School Diploma, Some College, Certification, and Associate's Degree), United States, 2012-2014-2017 (with Numeracy Proficiency Variable)

| VARIABLE | COEFFICIENT | STANDARD ERROR | Z | P > Z | PERCENT POINT EFFECT (MARGINS) |
|---|---|---|---|---|---|
| pv_numz | 0.354 | 0.067 | 5.3 | 0.000 | 6.0% |
| male | 0.651 | 0.076 | 8.6 | 0.000 | 11.0% |
| hispanic | 0.071 | 0.165 | 0.4 | 0.666 | 1.2% |
| black | 0.065 | 0.118 | 0.6 | 0.582 | 1.1% |
| asian_pi | -0.184 | 0.246 | -0.8 | 0.453 | -3.1% |
| other race1 | -0.264 | 0.198 | -1.3 | 0.183 | -4.5% |
| age_16_24 | -0.301 | 0.155 | -1.9 | 0.053 | -5.1% |
| age 35 44 | -0.099 | 0.114 | -0.9 | 0.381 | -1.7% |
| age 45 54 | -0.102 | 0.122 | -0.8 | 0.405 | -1.7% |
| age_55_64 | -0.853 | 0.100 | -8.5 | 0.000 | -14.4% |
| age 65 plus | -2.360 | 0.116 | -20.4 | 0.000 | -39.9% |
| somecollege | 0.215 | 0.099 | 2.2 | 0.029 | 3.6% |
| certification | 0.450 | 0.102 | 4.4 | 0.000 | 7.6% |
| associatesdegree | 0.489 | 0.107 | 4.6 | 0.000 | 8.3% |
| native born | -0.321 | 0.172 | -1.9 | 0.062 | -5.4% |
| disabled | -0.570 | 0.074 | -7.7 | 0.000 | -9.7% |
| northeast | 0.037 | 0.136 | 0.3 | 0.786 | 0.6% |
| midwest | 0.251 | 0.085 | 3.0 | 0.003 | 4.2% |
| west | 0.105 | 0.094 | 1.1 | 0.267 | 1.8% |
| constant | 1.450 | 0.210 | 6.9 | 0.000 | — |
| *N = 5,605* | | | | | |

— Not applicable.

## Table E4 (Regression Model 3): Logistic Regression Coefficients of Current Employment Status of Nonenrolled 16- to 74-Year-Old Individuals (Some College, Certification, and Associate's Degree), United States, 2012-2014-2017 (with Literacy Proficiency Variable)

| VARIABLE | COEFFICIENT | STANDARD ERROR | Z | P > Z | PERCENT POINT EFFECT (MARGINS) |
|---|---|---|---|---|---|
| pv_litz | 0.320 | 0.080 | 4.0 | 0.000 | 5.6% |
| male | 0.758 | 0.128 | 5.9 | 0.000 | 11.2% |
| hispanic | 0.348 | 0.174 | 2.0 | 0.046 | 5.3% |
| black | 0.298 | 0.172 | 1.7 | 0.083 | 4.4% |
| asian_pi | 0.196 | 0.378 | 0.5 | 0.605 | 2.8% |
| other race1 | 0.048 | 0.253 | 0.2 | 0.850 | 0.7% |
| age_16_24 | 0.000 | 0.236 | 0.0 | 0.998 | -0.4% |
| age 35 44 | -0.260 | 0.174 | -1.5 | 0.135 | -4.2% |
| age 45 54 | -0.400 | 0.175 | -2.3 | 0.022 | -7.0% |
| age_55_64 | -0.931 | 0.143 | -6.5 | 0.000 | -16.8% |
| age 65 plus | -2.421 | 0.160 | -15.1 | 0.000 | -33.4% |
| certification | 0.279 | 0.146 | 1.9 | 0.057 | 4.4% |
| associatesdegree | 0.298 | 0.130 | 2.3 | 0.022 | 4.4% |
| health major | 0.138 | 0.163 | 0.9 | 0.396 | 2.8% |
| business major | 0.577 | 0.194 | 3.0 | 0.003 | 7.8% |
| eng_sci_major | -0.175 | 0.190 | -0.9 | 0.355 | -2.4% |
| bluecol major | 0.023 | 0.244 | 0.1 | 0.924 | 0.6% |
| all other major | 0.177 | 0.193 | 0.9 | 0.360 | 1.9% |
| native_born | -0.338 | 0.243 | -1.4 | 0.165 | -5.5% |
| disabled | -0.502 | 0.101 | -5.0 | 0.000 | -7.0% |
| northeast | -0.009 | 0.159 | -0.1 | 0.957 | 0.3% |
| midwest | 0.295 | 0.133 | 2.2 | 0.026 | 4.0% |
| west | -0.066 | 0.133 | -0.5 | 0.621 | -1.0% |
| constant | 1.481 | 0.343 | 4.3 | 0.000 | — |
| *N = 2,818* | | | | | |

— Not applicable.

## Table E5 (Regression Model 3): Logistic Regression Coefficients of Current Employment Status of Nonenrolled 16- to 74-Year-Old Individuals (Some College, Certification, and Associate's Degree), United States, 2012-2014-2017 (with Numeracy Proficiency Variable)

| VARIABLE | COEFFICIENT | STANDARD ERROR | Z | P > Z | PERCENT POINT EFFECT (MARGINS) |
|---|---|---|---|---|---|
| pv_numz | 0.397 | 0.092 | 4.3 | 0.000 | 6.1% |
| male | 0.670 | 0.132 | 5.1 | 0.000 | 10.4% |
| hispanic | 0.384 | 0.173 | 2.2 | 0.026 | 5.9% |
| black | 0.414 | 0.184 | 2.3 | 0.024 | 6.4% |
| asian_pi | 0.262 | 0.385 | 0.7 | 0.495 | 4.1% |
| other race1 | 0.100 | 0.261 | 0.4 | 0.702 | 1.5% |
| age_16_24 | 0.016 | 0.241 | 0.1 | 0.946 | 0.3% |
| age 35 44 | -0.245 | 0.174 | -1.4 | 0.159 | -3.8% |
| age 45 54 | -0.387 | 0.179 | -2.2 | 0.031 | -6.0% |
| age_55_64 | -0.943 | 0.143 | -6.6 | 0.000 | -14.6% |
| age 65 plus | -2.442 | 0.155 | -15.8 | 0.000 | -37.8% |
| certification | 0.287 | 0.149 | 1.9 | 0.054 | 4.4% |
| associatesdegree | 0.299 | 0.132 | 2.3 | 0.024 | 4.6% |
| health major | 0.168 | 0.168 | 1.0 | 0.316 | 2.6% |
| business major | 0.572 | 0.195 | 2.9 | 0.003 | 8.8% |
| eng_sci_major | -0.195 | 0.191 | -1.0 | 0.308 | -3.0% |
| bluecol major | -0.004 | 0.242 | 0.0 | 0.986 | -0.1% |
| all other major | 0.180 | 0.191 | 1.0 | 0.345 | 2.8% |
| native_born | -0.298 | 0.237 | -1.3 | 0.209 | -4.6% |
| disabled | -0.492 | 0.101 | -4.9 | 0.000 | -7.6% |
| northeast | -0.001 | 0.161 | 0.0 | 0.993 | 0.0% |
| midwest | 0.291 | 0.133 | 2.2 | 0.029 | 4.5% |
| west | -0.074 | 0.136 | -0.5 | 0.587 | -1.1% |
| constant | 1.473 | 0.340 | 4.3 | 0.000 | — |
| *N = 2,818* | | | | | |

— Not applicable.

## Table E6: Descriptive of Employment Regression (Regression Models 1 and 2) for Nonenrolled 16- to 74-Year-Old Workers with Below Bachelor's Degree Credentials (High School Diploma, Some College, No Award, Certification, and Associate's Degree) in the United States, 2012-2014-2017

| VARIABLE | MEAN | SD | MIN | MAX | *N* |
|---|---|---|---|---|---|
| employed | 0.617 | 0.486 | 0 | 1 | 5,606 |
| pvlit | 260 | 45 | 78 | 407 | 5,606 |
| pvnum | 244 | 49 | 50 | 414 | 5,606 |
| male | 0.460 | 0.498 | 0 | 1 | 5,606 |
| hispanic | 0.121 | 0.327 | 0 | 1 | 5,606 |
| black | 0.176 | 0.381 | 0 | 1 | 5,606 |
| asian_pi | 0.023 | 0.149 | 0 | 1 | 5,606 |
| other race1 | 0.036 | 0.185 | 0 | 1 | 5,606 |
| age 16 24 | 0.130 | 0.336 | 0 | 1 | 5,606 |
| age_35_44 | 0.160 | 0.367 | 0 | 1 | 5,606 |
| age 45 54 | 0.177 | 0.381 | 0 | 1 | 5,606 |
| age 55 64 | 0.179 | 0.383 | 0 | 1 | 5,606 |
| age_65 plus | 0.123 | 0.328 | 1 | 1 | 5,606 |
| somecollege | 0.221 | 0.415 | 0 | 1 | 5,606 |
| certification | 0.146 | 0.354 | 0 | 1 | 5,606 |
| associatesdegree | 0.137 | 0.344 | 0 | 1 | 5,606 |
| native born | 0.900 | 0.300 | 1 | 1 | 5,606 |
| disabled | 0.277 | 0.447 | 0 | 1 | 5,606 |
| northeast | 0.162 | 0.368 | 0 | 1 | 5,606 |
| midwest | 0.265 | 0.442 | 0 | 1 | 5,606 |
| west | 0.163 | 0.370 | 0 | 1 | 5,606 |

## Table E7: Descriptive of Employment Regression (Regression Model 3) for Nonenrolled 16- to 74-Year-Old Workers with Below Bachelor's Degree Credentials (Some College, No Award, Certification, and Associate's Degree) in the United States, 2012-2014-2017

| VARIABLE | MEAN | SD | MIN | MAX | *N* |
|---|---|---|---|---|---|
| employed | 0.680 | 0.467 | 0 | 1 | 2,818 |
| pvlit | 272 | 41 | 107 | 407 | 2,818 |
| pvnum | 257 | 46 | 83 | 414 | 2,818 |
| male | 0.437 | 0.496 | 0 | 1 | 2,818 |
| hispanic | 0.110 | 0.313 | 0 | 1 | 2,818 |
| black | 0.148 | 0.355 | 0 | 1 | 2,818 |
| asian_pi | 0.021 | 0.142 | 0 | 1 | 2,818 |
| other race1 | 0.034 | 0.181 | 0 | 1 | 2,818 |
| age 16 24 | 0.073 | 0.260 | 0 | 1 | 2,818 |
| age_35_44 | 0.175 | 0.380 | 0 | 1 | 2,818 |
| age 45 54 | 0.186 | 0.389 | 0 | 1 | 2,818 |
| age 55 64 | 0.197 | 0.398 | 0 | 1 | 2,818 |
| age_65_plus | 0.126 | 0.331 | 1 | 1 | 2,818 |
| certification | 0.291 | 0.454 | 0 | 1 | 2,818 |
| associatesdegree | 0.271 | 0.445 | 0 | 1 | 2,818 |
| health_major | 0.203 | 0.403 | 0 | 1 | 2,818 |
| disabled | 0.191 | 0.393 | 1 | 1 | 2,818 |
| health major | 0.154 | 0.361 | 0 | 1 | 2,818 |
| business_major | 0.104 | 0.306 | 0 | 1 | 2,818 |
| eng sci major | 0.181 | 0.385 | 0 | 1 | 2,818 |
| bluecol major | 0.905 | 0.293 | 0 | 1 | 2,818 |
| all_other_major | 0.257 | 0.437 | 0 | 1 | 2,818 |
| northeast | 0.161 | 0.367 | 0 | 1 | 2,818 |
| midwest | 0.276 | 0.447 | 0 | 1 | 2,818 |
| west | 0.181 | 0.385 | 0 | 1 | 2,818 |

## About the Authors

**Neeta Fogg** is an economist at Rhode Island College. She has led net impact studies of workforce development programs and school-to-work and school-to-college program initiatives. She has conducted longitudinal research of Philadelphia high school graduates and been deeply engaged in the analysis of the labor market impact of literacy and numeracy skills in the United States.

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**Anita M. Sands** is a lead policy researcher and author in the ETS Center for Research on Human Capital & Education. Her published work covers education equity, economic opportunity, racial and economic segregation, concentrated poverty, research methodology, and program evaluations. Sands has coauthored numerous policy reports for the Center including most recently *Opportunity Across the States* (2021) and *Buttressing the Middle: A Case for Reskilling and Upskilling America's Middle-Skill Workers in the 21st Century* (2021). Prior to joining ETS, Sands taught in the Department of Sociology at Rider University and owned a consulting firm where she directed projects to address racial and economic segregation, poverty, and land-use policy inequities. Sands earned her MA and is ABD from the Department of Sociology PhD program at Temple University.

# Endnotes

1 "We're Tracking America's Progress Toward the 60% Attainment Goal," Lumina Foundation, [accessed April 1, 2022.] https://www.luminafoundation.org/stronger-nation/report/#/progress.

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16 Jacob Mincer, *Schooling, Experience and Earnings, Human Behavior and Social Institutions*, NBER Working Paper 14633 (New York, NY: National Bureau of Economic Research, 1974), https://www.nber.org/papers/w14633.

17 Eric Hanushek and Ludger Woessmann, "Do Better Schools Lead to More Growth? Cognitive Skills, Economic Outcomes and Causation," *Journal of Economic Growth* 17 (2012): 267–321.

18 Neeta Fogg, Paul Harrington, Ishwar Khatiwada, Irwin Kirsch, Anita Sands, and Larry Hanover, *If You Can't Be With the Data You Love: And the Risks of Loving the Data You're With* (Princeton, NJ: ETS, 2019), https://www.ets.org/research/report/love-the-data; Madeline J. Goodman, Anita M. Sands, and Richard J. Coley, *America's Skill Challenge: Millennials and the Future* (Princeton, NJ: ETS, 2015), https://www.ets.org/s/research/30079/asc-millennials-and-the-future.pdf.

19 The PIAAC data collection yielded 12,300 usable responses over all three rounds of the survey in the United States.

20 Mary Louise Lennon and Claudia Tamassia, "The Development of the PIAAC Cognitive Instruments," in *Technical Report of the Survey of Adult Skills* (Paris, France: Organization for Economic Cooperation and Development, 2013), 2:1–28.

21 Earnings regressions presented in this section were also estimated with the same explanatory variables except with numeracy proficiencies instead of literacy proficiencies. Findings from these (numeracy) earnings regressions are presented in Appendix Tables D3 and D5.

22 For a review of human capital earnings functions, see Mincer, *Schooling, Experience, and Earning*; Solomon W. Polachek and W. Stanley Siebert, *The Economics of Earnings* (Cambridge, MA: University Press, 1993); Jacob Mincer, "Investment in Human Capital and Personal Income Distribution," *Journal of Political Economy* 66, no. 4 (1958): 281–302.

23 Gary S. Becker, *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education,* 3rd ed. (Chicago, IL: University of Chicago Press, 1993).

24 A common manifestation of low or no returns to human capital investment occurs among college graduates who are malemployed. See Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, *Skills and Earnings of College Graduates,* The Impact of Human Capital in the American Labor Market Series (Princeton, NJ: ETS, 2019), https://www.ets.org/s/research/pdf/skills-and-the-earnings-of-college-graduates.pdf.

25 Our earlier analysis of PIAAC data on returns to skills in the college labor market found that about one in four employed individuals with a bachelor's degree had earnings that on average were not significantly different from high school graduates. These mal employed individuals worked in occupations that did not typically require the knowledge, skills, and abilities associated with a bachelor's degree. See Fogg et al., *Skills and the Earnings of College Graduates*.

26 Mincer, *Schooling, Experience, and Earnings*.

27 Becker, *Human Capital*.

28 The relationship of education and skills is explored in Fogg et al., *If You Can't Be With the Data You Love*.

29 Findings from regressions with numeracy proficiency measures of skill are very similar to those of regressions that use literacy proficiency measures of skill.

30 Neeta Fogg, Paul Harrington, Ishwar Khatiwada, Irwin Kirsch, and Anita Sands, *Human Capital and Labor Market Outcomes of Working-Age Americans*, The Impact of Human Capital in the American Labor Market Series (Princeton, NJ: ETS, forthcoming).

31 Richard J. Murnane, John B. Willett, and Frank Levy, "The Growing Importance of Cognitive Skills in Wage Determination," *Review of Economics and Statistics* 77, no. 2 (1995): 251–266, https://doi.org/10.2307/2109863; McKinley L. Blackburn and David Neumark, "Omitted-Ability Bias and the Increase in Return to Schooling," *Journal of Labor Economics* 11, no. 3 (1993): 521–554, https://www.jstor.org/stable/2535084; Castex Gonzalo and Evgenia Kogan Dechter, "The Changing Roles of Education and Ability in Wage Determination," *Journal of Labor Economics* 32, no. 4 (2014): 685–710, https://doi.org/10.1086/676018; Eric Hanushek, Guido Schwerdt, Simon Wiederhold, and Ludger Woessmann, "Returns to Skills around the World: Evidence from PIAAC," *European Economic Review* 73, C (2015): 103–130.

32 Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, *Skills and Earnings in the Full-Time Labor Market,* The Impact of Human Capital in the American Labor Market Series (Princeton, NJ: Educational Testing Service, 2018); Neeta Fogg, Paul Harrington, Ishwar Khatiwada, and Larry Hanover, *Skills and Earnings in the Part-Time Labor Market,* The Impact of Human Capital in the American Labor Market Series (Princeton, NJ: Educational Testing Service, 2020); Fogg et al., *Skills and Earnings of College Graduates*.

33 Because of the inclusion of college major field of study as an explanatory variable, this regression only includes workers with some postsecondary education below the bachelor's degree level and excludes high school graduates.

34 Mincer, *Schooling, Experience, and Earnings*.

35 We explore some sources of this deficit in the examination of the possible causes of a sizeable gap between the hourly wages of part-time workers and full-time workers in our study of the link between skills and the earnings in the part-time labor market. One of the reasons of the lower wage among part-time workers is attributable to the cost to employers of providing the flexibility that is associated with part-time work. In some labor-market segments, the costs of organizing work to provide flexible work options can be high. In this case, wages are reduced to offset the employer cost of accommodating this flexibility, meaning that part-time workers must compensate the firm in the form of a wage penalty. There are also sectors of the labor market where the costs of flexibility to the employer are quite low, so firms are willing to offer hours of work that accommodate worker desires with little or no wage penalty. It is important to note that forces of technology, ownership, and standardization in production may all contribute to the size of the part-time wage penalty. See Fogg et al., *Skills and Earnings in the Part-Time Labor Market*. We also explored the issue of gender gap in earnings in our study of the link between skills and the earnings of college graduates. In a review of literature for this study, we found that a number of studies have attributed the gender gap in earnings to career interruption of women (in the form of labor force withdrawal or reduction of hours or both) as they bear and raise children. These career interruptions result in depreciation of the skills of women and reduction in their accumulation of human capital through paid work experience. See Fogg et al., *Skills and the Earnings of College Graduates*.

36 Fogg et al., Skills and Labor Market Outcomes of Working-Age Americans.

37 Much of the interest in noncredentialed postsecondary attainment is associated with the emergence of them idea that a shortage of workers in 'middle skills' occupations had emerged in the United States. See *Bridge the Gap: Rebuilding America's Middle Skills* (Washington, DC: Accenture; Boston, MA: Burning Glass; Boston, MA: Harvard Business School, n.d.), https://www.hbs.edu/competitiveness/Documents/bridge-the-gap.pdf; *Understanding Quality: The Role of States in Supporting Quality Non-Degree Credentials*, Workcred Report (Washington, DC: National Governor's Association, 2020), https://www.workcred.org/Documents/Understanding-Quality-Workcred-NGA-Report-2020.pdf); Anthony Carnevale, Tamara Jayasundera, and Andrew R. Hanson, *Five Ways That Pay: Along the Way to the B.A.* (Washington, DC: Georgetown Public Policy Institute, 2012), https://cew.georgetown.edu/wp-content/uploads/2014/11/CTE.FiveWays.FullReport.pdf. Peter Riley Bahr finds gains to credits earned among those who do not earn a postsecondary credential in selected fields of study. See Peter Riley Bahr, *The Labor Market Returns to a Community College Education for Non-Completing Adults,* CAPSEE Working Paper (New York, NY: Center for Analysis of Postsecondary Education and Employment, 2016), https://vtechworks.lib.vt.edu/bitstream/handle/10919/90830/HigEducLaborMarketReturnsMinority.pdf?sequence=1&isAllowed=y.

38 Diplomas are long-term educational programs below the bachelor's degree level and are distinguished from shorter duration programs where a certificate is awarded.

39 Christopher Jepsen, Kenneth Troske, and Paul Coomes, "The Labor Market Returns to Community College Degrees, Diplomas and Certificates," *Journal of Labor Economics* 32, no. 1 (2014), 95–121, https://www.jstor.org/stable/10.1086/671809.

40 Mina Dadgar and Madeline Joy Trimble, "Labor Market Returns to Sub-Baccalaureate Credentials: How Much Does a Community College Degree or Certificate Pay?" *Education Evaluation and Policy Analysis* 7, no. 4 (2015), 399–418, https://www.jstor.org/stable/43773519.

41 Di Xu and Madeline Joy Trimble, *Evidence on the Labor Market Returns to Non-Degree Community College Awards in Two States* (New York, NY: Teacher's College, Columbia University, Community College Research Center, 2014).

42 Matt S. Giani, Paul Attewell, and David Walling, "The Value of an Incomplete Degree: Heterogeneity in the Labor Market Benefits of College Non-Completion," *The Journal of Higher Education* 91, no. 4 (2019): 514–539, https://www.tandfonline.com/doi/abs/10.1080/00221546.2019.1653122.

43 Judith Clayton-Scott and Qiao Wen, *Estimating Returns to College Attainment: Comparing Survey and State Administrative Data Based Estimates,* CAPSEE Working Paper (Washington, DC, Center for the Analysis of Postsecondary Education and Employment, 2017), https://ccrc.tc.columbia.edu/media/k2/attachments/estimating-returns-to-college-attainment.pdf.

44 James Rosenbaum, Caitlin Ahern, Kelly Becker, and Janet Rosenbaum, *The New Forgotten Half and Research Directions to Support Them* (New York, NY: WT Grant Foundation, 2015), https://wtgrantfoundation.org/wp-content/uploads/2015/09/The-New-Forgotten-Half-and-Research-Directions-to-Support-Them.pdf

45 Julius Shishkin, "Employment and Unemployment: The Doughnut or the Hole?" *Monthly Labor Review* (Washington, DC: U.S. Bureau of Labor Statistics, 1976), https://www.bls.gov/opub/mlr/1976/article/pdf/employment_and_unemployment_the_doughnut.pdf; Roland Winkler and Christian Bredemeier, "The Employment Dynamics of Different Population Groups over the Business Cycle," *Applied Economics* 49, no. 26 (2017): 2545–2562; Economics Research Department, *Assessing Differences in Labor Market Outcomes Across Race, Age, and Educational Attainment* (Minneapolis, MN: Federal Reserve Bank of Minneapolis, Opportunities & Inclusive Growth Institute, 2017), https://www.minneapolisfed.org/institute/working-papers/17-09.pdf; Ulla Christensen, Lone Schmidt, Margit Kriegbaum, Charlotte Ørsted Hougaard, and Bjørn E. Holstein, "Coping with Unemployment: Does Educational Attainment Make Any Difference?" *Scandinavian Journal of Public Health* 24, no. 4 (2006): 363–370, https://pubmed.ncbi.nlm.nih.gov/16861186/.

46 Anita Sands and Madeline Goodman, *Too Big to Fail: Millennials on the Margins* (Princeton, NJ, ETS, 2018), https://www.ets.org/research/report/opportunity-too-bigto-fail/millennial.

47 Scott Menard, *Applied Logistic Regression Analysis*, 2nd ed. (Thousand Oaks, CA: Sage Publications, 2002).

48 Employment regressions presented in this section were also estimated with the same explanatory variables except with numeracy proficiencies instead of literacy proficiencies. Findings from these (numeracy) employment regressions are presented in Appendix Tables E3, and E5.

49 A discussion of the gender gap in labor force attachment is provided in our forthcoming paper: Neeta Fogg, Paul Harrington, Ishwar Khatiwada, Irwin Kirsch, and Anita Sands, *Human Capital and the Labor Force Participation Behavior of American Men and Women* (Princeton, NJ: ETS, forthcoming).

50 Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, *The 2021 Summer Jobs Outlook for American Teens* (Philadelphia, PA: Drexel University, Center for Labor Markets and Policy, 2021), https://drexel.edu/~/media/Files/clmp/2021%20Teen%20Summer%20Job%20Outlook%20Report%20May%202021.ashx?la=en.

51 Our regression of labor force participation for men found that foreign-born men were more likely to participate in the labor force; however, no significant differences were found among women. Op. Cit. Fogg, Harrington and Khatiwada. *Human Capital and the Labor Force Participation of Men and Women (forthcoming).*

52 Jepsen et al., "The Labor Market Returns." In their study of returns to community college awards in Kentucky, the authors find a positive employment effect for women, primarily in health-related fields of study.

53 Neeta Fogg and Paul Harrington, *From Diplomas to Degrees: A Longitudinal Study of the College Enrollment and Graduation Outcomes of High School Graduates from the School District of Philadelphia,* prepared for Project U-Turn and The Philadelphia Youth Network, December 2015, https://drexel.edu/~/media/Files/clmp/diplomas_to_degrees_full_report_2015.pdf.

54 "Table 302.10. Recent high school completers and their enrollment in college, by sex and level of institution: 1960 through 2019," *Digest of Education Statistics* (website), National Center for Education Statistics, 2020, https://nces.ed.gov/programs/digest/d20/tables/dt20_302.10.asp.

55 Erich Lauff, Steven Ingels, and Elise Christopher, *Educational Longitudinal Study of 2002 (ELS 2002) A First Look at 2002 High School Sophomores 10 Year Later,* NCES 2014-363 (Washington, DC: U.S. Department of Education, 2014), https://nces.ed.gov/pubs2014/2014363.pdf.

56 Xianglei Chen, Joanna Wu, and Shayna Tasoff, *Postsecondary Expectations and Plans for the High School Senior Class of 2003–04*, NCES 2010-170rev (Washington, DC: U.S. Department of Education, 2010), https://nces.ed.gov/pubs2010/2010170rev.pdf.

57 Lauff et al., *Educational Longitudinal Study of 2002*.

58 The dissonance between public-school educational success rhetoric and the reality of public-school skill outcomes was recently highlighted by Director of the Institute for Educational Studies Mark Schneider. See Mark Schneider, "Education Runs on Lies," Institute for Education Studies, March 23, 2022,

https://ies.ed.gov/director/remarks/03-23-2022.asp.

59 These gaps are quite large across all age groups, although the size of the gap rises somewhat with the age of the respondent at the time of the PIAAC survey.

60 Fogg and Harrington, *From Diplomas to Degrees.* Most recently, the Massachusetts Institute for Technology reinstated its SAT/ACT admission requirement. The dean of admissions, in explaining the decision to test for cognitive skills, noted, "Our research has shown that, in most cases, we cannot reliably predict students will do well at MIT unless we consider standardized test results alongside grades, coursework, and other factors. These findings are statistically robust and stable over time and hold when you control for socioeconomic factors and look across demographic groups." See Kathy Wren, "Q&A: Stuart Schmill on MIT's Decision to Reinstate the SAT/ACT Requirement," *MIT News,* March 28, 2022, https://news.mit.edu/2022/stuart-schmill-sat-act-requirement-0328.

61 Between 2009–10 and 2018–19, real net prices at 4-year colleges for first-time, full-time, matriculating students have remained unchanged while net prices at 2-year institutions fell by about 15 percent as financial aid packages have become more generous. See "Table 331.30. Average amount of grant and scholarship aid and average net price for first-time, full-time degree/certificate-seeking students awarded Title IV aid, by control and level of institution and income level: Selected years, 2009-10 through 2018-19," *Digest of Education Statistics* (website), National Center for Education Statistics, 2020, https://nces.ed.gov/programs/digest/d20/tables/dt20_331.30.asp.

62 *Admissions*, Publication No. 2019037 (Washington, DC: Institution of Education Sciences, National Center for Education Statistics, 2019), https://nces.ed.gov/pubs2019/2019037.pdf.

63 Neeta Fogg, Paul Harrington, Ishwar Khatiwada, Irwin Kirsch, and Anita Sands, *Skill and Skill Use at Work, and Earnings of American Workers* (Princeton, NJ: ETS, forthcoming).

64 Fogg et al., *If You Can't Be With the Data You Love.*

65 Jason Riley, "The Pursuit of 'Social Justice' Is Getting People Killed," *Wall Street Journal*, July 12, 2022, https://www.wsj.com/articles/the-pursuit-of-social-justice-killed-testing-stop-frisk-gun-policy-biden-administration-11657658420?reflink=desktopwebshare_permalink.

66 A study published by the U.S. Department of Education reported that 68 percent of beginning students at public 2-year colleges and 40 percent of beginning students at 4-year public colleges enrolled in at least one remedial course. The study reported that at the 2-year-level remedial students enrolled in three remedial courses. See Xiangiei Chen and Sean Simone, *Remedial Coursetaking at U.S. Public 2- and 4- Year Institutions: Scope, Experiences and Outcomes*, NCES 2016-405 (Washington, DC: U.S. Department of Education, 2016), https://nces.ed.gov/pubs2016/2016405.pdf.

67 Many of those who enrolled in remedial courses failed to complete them: just 49 percent of beginning 2-year students completed their remedial courses while only 59 percent of their 4-year counterparts completed their remedial courses. However, among those who do complete their math remedial course of study, the evidence suggests an improved chance of earning any math college credit. However, English remedial courses did not appear to create much improvement in the chance of earning any English college credit. See Chen and Simone, *Remedial Coursetaking.*

68 Respondents in PIAAC surveys are also asked about their gross (pretax) earnings at work. The earnings data questions are designed to capture hourly, daily, weekly, biweekly, monthly, and annual earnings to minimize nonresponse. In cases where respondents were unwilling to provide exact gross pay, questions were also asked to capture earnings in category. Derived data on gross monthly and hourly earnings are made available to researchers in the PIAAC data file. However, derived continuous gross monthly and hourly earnings data are available only in Restricted Use File (RUF). The monthly earnings analysis appearing in this report include bonuses for wage and salary workers and self-employed. Our analysis of monthly earnings in the report is based on Restricted Use File provided by ETS.

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