



The Impact of Human Capital in the American Labor Market Series

Skills and Labor Market Outcomes of Working-Age Americans

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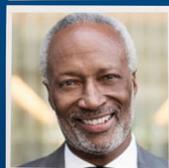
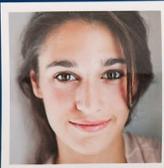


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Preface

In 2008, in their widely acclaimed book, *The Race Between Education and Technology*, Harvard researchers Claudia Goldin and Lawrence Katz described human capital as the central determinant of economic growth in the United States in the 20th century.^[i] Today, human capital, defined typically as the stock of knowledge, skills, and abilities of individuals, remains a critical driving force for growth of individuals and the nation.^[ii] In fact, research that examines the role of skills in the American labor market, including research previously published by the ETS Center for Research on Human Capital Education, reveals strong links between human capital, as measured using literacy and numeracy proficiencies of workers, and worker earnings. These linkages are evident for prime-age full-time workers, college graduates, and part-time workers and provide a clear image of the earnings return to skills.^[iii] But the benefits of strong skills do not start and end with earnings.

In this new policy report, the fourth in a series examining the impact of human capital in the American labor market from the ETS Center for Research on Human Capital Education, the authors take a unique perspective on the critical link between human capital and labor market outcomes by expanding the analysis to nonpecuniary outcomes. Using the available cognitive and background data that were collected as part of the Programme for the International Assessment of Adult Skills (PIAAC), this new report explores the links between the skills of American workers and a wide variety of labor market outcomes beyond earnings, including whether a person was employed, unemployed, or not in the labor force at the time of the PIAAC survey. Across each of these categories, in addition to skill levels, key background data were examined. For the employed population, for example, employment intensity, employer-provided training, occupation, and job satisfaction data were analyzed. For those who reported they were unemployed, the duration of unemployment and previous employment experiences was examined, whereas information on previous employment experiences was examined for those who reported that they were not in the labor force at the time of the PIAAC survey. The analysis in this paper reveals that these nonpecuniary labor market outcomes are also tightly bound to respondents' literacy and numeracy skills.

Because the connection that individuals have with the labor market varies over the life cycle, the report also explores these labor market outcomes across age cohorts including teens and young adults, prime working-age adults, and older adults. As each of these groups are at different stages in their working lives, this information is key for the development of targeted policy interventions. For example, findings here suggest that current policy efforts to address alarming levels of disconnected youth across the nation may be inadequate because they miss the central role that foundational skills play in generating positive economic, social, and civic outcomes for young people. Likewise, other findings from the analysis here suggest that unemployed prime-age workers with higher levels of literacy and numeracy skills were more likely to have had recent employment than their peers with lower skills. As stakeholders in

the business community, policy makers, and researchers all call for significant investments in reskilling and upskilling America's dislocated workers, this report cautions that these efforts must address existing skill levels to be effective.

The rich and comprehensive findings by age cohort presented in this new report make a significant contribution to our understanding of the role of skills in labor market outcomes and offer policy makers and others invaluable insights for informing policy and interventions that can meaningfully and strategically impact those outcomes.

—Irwin Kirsch and Paul Harrington

Notes

ⁱ Claudia Goldin & Lawrence F. Katz, *The race between education and technology* (Cambridge, Massachusetts: Belknap Press of Harvard University Press, 2008).

ⁱⁱ New occupational employment projections by the U.S. Bureau of Labor Statistics suggest that occupations that typically require workers to hold a postsecondary credential will grow at more than double the pace of occupations where no credentials are required for a new hire. More than one-half of projected employment growth over the 2018 to 2028 period is expected to occur in occupations that require a postsecondary degree. See Kevin S. Dubina, Teresa L. Morisi, Michael Rieley, and Andrea B. Wagoner, 'Projections Overview and Highlights, 2018–28,' *Monthly Labor Review* (October 2019), <http://www.bls.gov/opub/mlr/2019/article/projections-overview-and-highlights-2018-28.htm> and Table 7 Occupational Projections, 2020–2030, and Worker Characteristics, 2020, U.S. Bureau of Labor Statistics, modified September 8, 2021, <http://www.bls.gov/emp/tables/occupational-projections-and-characteristics.htm>

ⁱⁱⁱ 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: ETS, 2020); Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, *Skills and the Earnings of College Graduates*, The Impact of Human Capital in the American Labor Market Series (Princeton, NJ: ETS, 2019); 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: ETS, 2018).

Introduction

Human capital is the stock of knowledge, skills, and abilities of individuals that represents their productive potential in economic activity. Like physical capital, which includes assets or inputs used to support the production of goods and services (e.g., machinery, equipment, etc.), individuals invest in human capital with an expectation of a future stream of benefits. Investment in human capital makes workers more productive such that individuals with higher levels of human capital, or ability, are more attractive to employers and are rewarded with improved employment and earnings experiences.¹

In today's economies, the human capital of individuals is closely linked to the likelihood of success in the labor market. This link has strengthened over time as the U.S. economy has continued to shift from goods production to services production and as technological advances have made the production process more sophisticated across most industries—changes that increasingly demand higher levels of human capital in the workforce. Goldin and Katz labeled the 20th century as the "Human Capital Century" and considered human capital to be the central determinant of economic growth in the United States during that period.² The increase in the demand for higher levels of human capital in the workforce is expected to continue and even intensify as human capital becomes an increasingly important driving force behind growth in the 21st century.³

Most studies on the human capital of workers use educational attainment as the key indicator of human capital. This is partly because of the widespread availability of data on educational attainment in large-scale databases. Links between educational attainment and the employment and earnings outcomes of workers have been examined in numerous studies.⁴ In this paper, which is the fourth in a series examining the impact of human capital in the American labor market, we offer a somewhat unique perspective on the link between human capital and labor market experiences over the life cycle. Rather than focus on educational attainment, we use direct measures of literacy and numeracy skills based on data from the Survey of Adult Skills of the Programme for the International Assessment of Adult Competencies (PIAAC)—specifically, data collected in the United States over three rounds in 2012, 2014, and 2017.⁵ Although educational attainment is a valuable indicator, skills data are shown to be strongly related to whether young people stay in school, how far they progress, the types of courses they take, and subsequently, the kinds of jobs they obtain. Therefore, looking at the relationship between skills and a range of labor market outcomes beyond earnings allows a more nuanced investigation of the role that skills play in helping individuals attain the goal of maintaining sustainable employment over their lifetimes.

The PIAAC data are collected through household interviews and include direct measures of cognitive skills as well as an extensive background questionnaire that is designed to capture information on a wide variety of variables including demographic traits of respondents, their educational attainment, work experience and work history, labor market activities, and labor market outcomes. This paper uses the 2012-14-17 PIAAC restricted use data file to examine the links between the literacy and numeracy skills of 16- to 74-year-old Americans and a range of labor market outcomes. Using information from the PIAAC background questionnaire, we have identified different sets of labor market outcome measures that apply to the total working-age population and to individuals who were employed, unemployed, or out of the labor force at the time of the PIAAC survey, as shown in Table 1. Links between skills and labor market outcomes are examined separately for all 16- to 74-year old persons and then for all 16- to 74-year-olds who were employed, unemployed, or out of the labor force at the time of the PIAAC survey. Specifically, the labor market outcomes for the each of the four groups include (a) employment, unemployment, out of the labor force, and employment history among **all** (16- to-74-year-old) persons; (b) employment intensity, receipt of employer-provided training, and occupation among **employed** persons; (c) duration of unemployment and employment history among **unemployed** persons; and (d) employment history among individuals who were **out of the labor force** (Table 1). We also examine the difference between the skills of workers with different labor market outcomes along with the effect size, which is determined by dividing the difference between mean skills scores of two populations by the PIAAC standard deviation for each skill domain discussed in the paper (i.e., literacy and numeracy). A commonly used interpretation of effect size is to refer to effect sizes of 0.2 as small, 0.5 as medium, and 0.8 as large. However, this interpretation is simply a rule of thumb and caution should be exercised in using these thresholds to interpret the magnitude of change.^{6, 7}

Table 1: Labor Force Outcome Measures Investigated for Segments of the Working-Age Population

LABOR FORCE OUTCOME MEASURES	TOTAL WORKING-AGE POPULATION	EMPLOYED	UNEMPLOYED	OUT OF THE LABOR FORCE
Labor Force Status				
Employed	X			
Unemployed	X			
Out of the Labor Force	X			
Employment History	X		X	X
Employment Intensity		X		
Employer-provided Training		X		
Occupation		X		
Duration of Employment			X	

Because the connection that individuals have with the labor market varies over the life cycle, the link between skills and labor market outcomes differs by age group. To address these differences within each cohort, we also explore the connection between skills and labor market outcomes for age groups representing three stages of working life: teens and young adults, individuals of prime working age, and older adults. We include this exploration because it has the potential to suggest policy interventions targeted to individuals in each age group to better support their success in the labor market and the overall well-being of individuals and families. Finally, using logistic regression analysis, we estimate the independent associations between skills and each of these 10 labor market outcomes for all, employed, unemployed, and out of the labor force persons with regression controls for education and age.⁸ Whereas the descriptive analysis in this paper focuses on the link between skills and labor market outcomes, regression analysis provides insights into the link between skills and labor market outcomes after statistically controlling for the effects of educational attainment and age. For example, our previous papers, using regression analysis, have found that although educational attainment and skills are related, they are not perfectly related; each has a strong independent effect on earnings.⁹ For this paper, a total of 20 logistic regressions were estimated: 10 regression models that include the literacy skill score as a dependent variable and another 10 that include the numeracy skill score as a dependent variable. Estimates of the regression-based link between skills and each of the 10 outcome measures are presented with the discussion of each outcome measure in subsequent sections of the paper.

About the Data

The PIAAC survey of adults was organized by the Organization for Economic Cooperation and Development to develop measures of the foundational cognitive skills that could be compared across nations.¹⁰ The PIAAC data collection was conducted over three survey rounds completed in 2012, 2014, and 2017. In the United States, the three rounds of the survey include a nationally representative sample of more than 12,000 adults between the ages of 16 and 74. Data collection was conducted by personal visit where a comprehensive background questionnaire was administered and followed by a direct assessment of literacy and numeracy collected on paper and by computer. The skills assessment employs an adaptive design that begins with a set of short, easy literacy and numeracy items. Based on these core scores and some background traits, respondents are directed to easier or more difficult questions.

Because of the use of an adaptive questionnaire, PIAAC employs an item response theory scaling method that uses the regularities in response patterns to model the commonalities among items. To bolster the accuracy of these measurements, PIAAC uses plausible values

(PV), which are multiple imputations, based on prior empirical evidence. All 10 PVs are used in this paper to produce more accurate estimates of a groups' proficiencies. Both the literacy and numeracy measures are produced on a scale of 0 to 500.

The literacy domain of the PIAAC study measures the ability to understand and evaluate written text in the context of societal participation. PIAAC items include continuous texts such as sentences and paragraphs as well as document texts such as schedules, graphs, and maps. The literacy measure is estimated on a scale of 0 to 500. Figure 1 provides a general description of the literacy skills associated with a score at each of the six levels. In our study, due to sample size limitations, below level 1 and level 1 measures are combined into "level 1 and below," and level 4 and level 5 are combined into "level 4/5."

Figure 1: Literacy Domain Achievement Levels and Task Descriptions

ACHIEVEMENT LEVEL AND SCORE RANGES	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. There is seldom any competing information in the text and the requested information is identical in form to information in the question or directive. The respondent may be required to locate information in short continuous texts. However, in this case, the information can be located as if the text were non-continuous in format. 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. 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, non-continuous, or mixed texts to locate a single piece of information that is identical to or synonymous with the information given in the question or directive. Some tasks, such as those involving non-continuous texts, may require the respondent to enter personal information onto a document. 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 determining the meaning of sentences and reading paragraphs of text is expected.
level 2 226-275	At this level, the medium of texts may be digital or printed, and texts may comprise continuous, non-continuous, or mixed types. Tasks at this level require respondents to make matches between the text and information and may require paraphrasing or low-level inferences. Some competing pieces of information may be present. Some tasks require the respondent to <ul style="list-style-type: none"> • Cycle through or integrate two or more pieces of information based on criteria. • Compare and contrast or reason about information requested in the question; or navigate within digital texts to access and identify information from various parts of a document.
level 3 276-325	Texts at this level are often dense or lengthy, and include continuous, non-continuous, mixed, or multiple pages of text. Understanding text and rhetorical structures become more central to successfully completing tasks, especially navigating complex digital texts. Tasks require the respondent to identify, interpret, or evaluate one or more pieces of information, and often require varying levels of inference. Many tasks require the respondent to construct meaning across larger chunks of text or perform multi-step operations in order to identify and formulate responses. Often tasks also demand that the respondent disregard irrelevant or inappropriate 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, non-continuous, mixed, or multiple type texts. Complex inferences and application of background knowledge may be needed to perform the task successfully. Many tasks require identifying and understanding one or more specific, non-central idea(s) 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 requirement. Tasks often require respondents to be aware of subtle, rhetorical cues and to make high-level inferences or use specialized background knowledge.

The numeracy domain of PIAAC evaluates the mathematical/computational skills that are fundamental for everyday functioning both at work and at home. The numeracy measure is estimated on a scale of 0 to 500. Figure 2 provides a general description of the numeracy skills associated with a score at each of the six levels. In our study, due to sample size limitations, below level 1 and level 1 measures are combined into "level 1 and below" and level 4 and level 5 measures are combined into "level 4/5."

Figure 2: Numeracy Domain Achievement Levels and Task Descriptions

ACHIEVEMENT LEVEL AND SCORE RANGES	TASK DESCRIPTIONS
below level 1 0-175	Tasks at this level require the respondents to carry out simple processes such as counting, sorting, performing basic arithmetic operations with whole numbers or money, or recognizing common spatial representations in concrete, familiar contexts where the mathematical content is explicit with little or no text or distractors.
level 1 176-225	Tasks at this level require the respondent to carry out basic mathematical processes in common, concrete contexts where the mathematical content is explicit with little text and minimal distractors. Tasks usually require one-step or simple processes involving counting, sorting, performing basic arithmetic operations, understanding simple percentages such as 50%, and locating and identifying elements of simple or common graphical or spatial representations.
level 2 226-275	Tasks at this level require the respondent to identify and act on mathematical information and ideas embedded in a range of common contexts where the mathematical content is fairly explicit or visual with relatively few distractors. Tasks tend to require the application of two or more steps or processes involving calculation with whole numbers and common decimals, percentages and fractions; simple measurement and spatial representation; estimation; and interpretation of relatively simple data and statistics in texts, tables and graphs.
level 3 276-325	Tasks at this level require the respondent to understand mathematical information that may be less explicit, embedded in contexts that are not always familiar and represented in more complex ways. Tasks require several steps and may involve the choice of problem-solving strategies and relevant processes. Tasks tend to require the application of number sense and spatial sense; recognizing and working with mathematical relationships, patterns, and proportions expressed in verbal or numerical form; and interpretation and basic analysis of data and statistics in texts, tables and graphs.
level 4 326-375	Tasks at this level require the respondent to understand a broad range of mathematical information that may be complex, abstract or embedded in unfamiliar contexts. These tasks involve undertaking multiple steps and choosing relevant problem-solving strategies and processes. Tasks tend to require analysis and more complex reasoning about quantities and data; statistics and chance; spatial relationships; and change, proportions and formulas. Tasks at this level may also require understanding arguments or communicating well-reasoned explanations for answers or choices.
level 5 376-500	Tasks at this level require the respondent to understand complex representations and abstract and formal mathematical and statistical ideas, possibly embedded in complex texts. Respondents may have to integrate multiple types of mathematical information where considerable translation or interpretation is required; draw inferences; develop or work with mathematical arguments or models; and justify, evaluate and critically reflect upon solutions or choices.

Skills and Labor Market Outcomes and Skills for the Working-Age Population

In this first section, we focus on the relationship between skills and labor market outcomes for the working-age population, those adults between the ages of 16 and 74, looking at labor force status and employment history. Given that the connection individuals have with the labor market varies over the life cycle, these same relationships are examined for three cohorts of adults: teens and young adults ages 16 to 24, those in the prime working ages of 25 to 54, and older individuals ages 55 to 74.¹¹

Teens and young adults (16- to 24-years-old) are mostly new (or at least newer) entrants into the labor market, and many are only partially engaged in the world of work as they are more often intensively engaged in the acquisition of human capital through enrollment in secondary or postsecondary school. For a large majority of young people, schooling is the

primary life activity during their teen and young adult years, and employment experiences are often tailored to allow a focus on schooling. The human capital investments made during this period, in terms of educational attainment, skills development, and work experience, exert a strong influence on the pathways available to individuals as they enter the prime working stage of their lifetimes.

For most individuals, the prime working stage spans the period between ages 25 and 54. During this stage, the great majority of individuals are actively and intensively engaged in the labor market, and for most, earnings from work determine the living standards achieved for their families and households. Human capital investments made earlier in life have very high payoffs during the prime working-age years. The degree of labor force engagement differs between prime-age men and women, although that difference has narrowed considerably over time. Interruption in work associated with childbearing has become less frequent and shorter in length as mothers continue working in the labor market after short, temporary exits for childbearing.¹²

Older individuals, those aged 55 and above, typically reduce their labor force attachment and work intensity as they enter the preretirement and retirement stages of their working lifetime, resulting in reduced earnings in this stage of their lives. At age 55 and thereafter, workers begin to change their workforce activities, increasingly mixing work and retirement income in an effort to maintain living standards.¹³ As older workers advance in age, the balance between work and retirement activity shifts sharply toward retirement and labor force participation declines. Among those who remain employed, there is often a downshift to a less intensive work schedule, often on the same job. Among baby boomers (a cohort of the population typically defined as having been born between 1946 and 1964), employment in "encore careers," or bridge jobs, to bolster incomes has become more prevalent. These encore occupations provide more flexibility in weekly hours and weeks of work.¹⁴

Labor Force Status

The section of the PIAAC background survey that pertains to labor market activities and outcomes of respondents begins with a series of questions to ascertain the labor force status of respondents at the time of the PIAAC survey (i.e., during the week prior to the administration of the survey). Based on the responses to these questions, working-age respondents are classified into three mutually exclusive labor force status groups: employed, unemployed, and out of the labor force. The unemployed are those individuals who were not employed at the time of the PIAAC survey but were actively seeking employment. Employed and unemployed persons are considered active participants in the labor market, and together they comprise the labor force. Those who were out of the labor force were not employed and not actively seeking employment. The 2012-14-17 PIAAC survey found that, on

average, nearly 71 percent of 16- to 74-year-old persons in the United States were employed and 5 percent were unemployed (Table 2). Some 24 percent of the total working-age population was out of the labor force at the time of the PIAAC survey.

Labor market attachment of the working-age population changes over the working lifetime. The distribution of the teen and young adult population (ages 16 to 24), prime working-age population (ages 25 to 54), and the mature population (ages 55 to 74) by their labor force status, as presented in Table 2, illustrates these differences. Early in their working lives, between the ages of 16 and 24, schooling is the primary activity of most individuals, resulting in generally lower rates of labor market attachment among this age group; nearly 26 percent of the teen and young adult population was out of the labor force at the time of the PIAAC survey. In contrast, prime-age workers have high rates of labor market attachment; only 13 percent remain out of the labor force. Among the mature population, labor market exits are much more common as many in this age group choose to retire or develop health issues that impede their labor market participation. Nearly 44 percent of mature individuals were out of the labor force at the time of the PIAAC survey.

Table 2: Percentage Distribution of the 16- to 74-Year-Old Population by Their Labor Force Status at the Time of the PIAAC Survey, U.S., 2012-14-17 (Standard Errors in Parentheses)

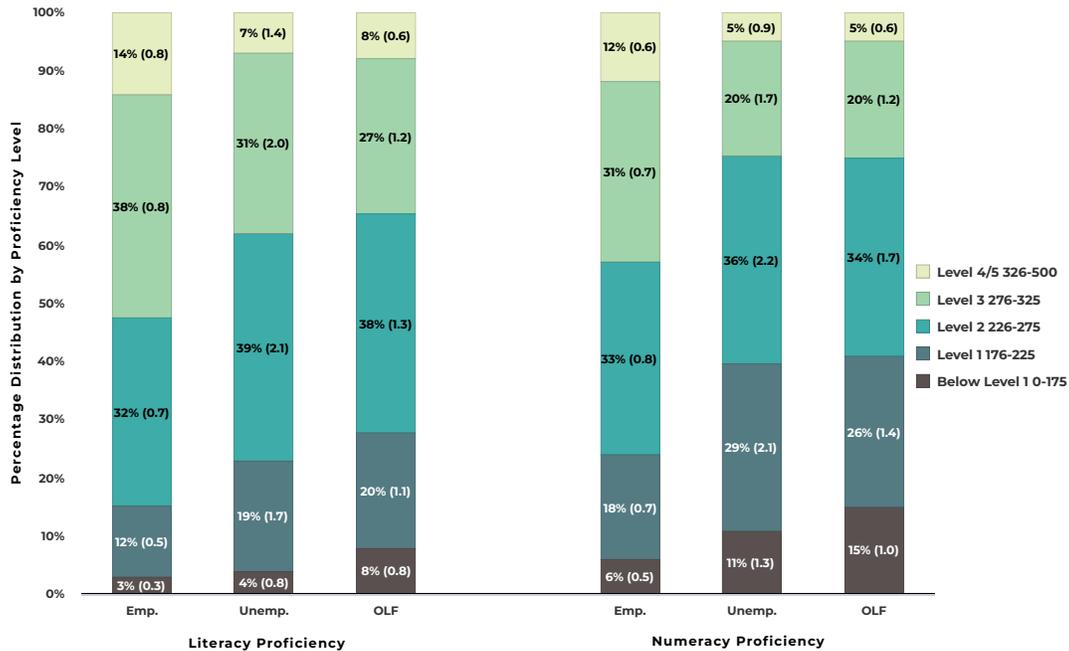
LABOR FORCE STATUS	TOTAL WORKING-AGE POPULATION	AGE GROUPS			
	16-74	16-24	25-54	55-74	
Employed	70.7% (0.5)	63.7% (1.3)	81.9% (0.5)	53.4% (0.9)	
Unemployed	5.2% (0.05)	10.3% (0.4)	4.8% (0.2)	3.0% (0.2)	
Out of the Labor Force	24.1% (0.5)	25.9% (1.3)	13.3% (0.5)	43.7% (0.9)	
Total	100.0%	100.0%	100.0%	100.0%	

Skills and Labor Force Status

To examine the connection between skills and labor force status, Figure 3 shows the distribution of 16- to 74-year-old individuals who were employed, unemployed, and out of the labor force at the time of the PIAAC survey by their literacy and numeracy proficiency levels.¹⁵ On the literacy scale, the share of individuals with scores at or below level 1 ranged from 15 percent among employed persons to 23 and 28 percent among those who were unemployed and out of the labor force, respectively, at the time of the PIAAC survey. Conversely, the share of working-age persons with literacy proficiency at or above level 3 was much higher among the employed (52 percent) than among those who were unemployed (38 percent) or out of the labor force (35 percent). It is important to note that performance at level 3 and higher is considered an important benchmark in attaining proficient levels of literacy and numeracy skills. Various indices converge to suggest that individuals with level 3 skills in literacy and numeracy have greater access to multiple social, economic, and

educational benefits.¹⁶ Data in Figure 3 show similarly higher levels of numeracy proficiency among employed persons compared to those who were unemployed or out of the labor force at the time of the PIAAC survey.

Figure 3: Percentage of 16- to 74-Year-Old Individuals at Each Level of the PIAAC Literacy and Numeracy Scales by Their Labor Force Status at the Time of the PIAAC Survey, U.S., 2012-14-17 (Standard Errors in Parentheses)



Emp. = employed; Unemp. = unemployed; OLF = out of the labor force.

A comparison of mean skills scores presented in Table 3 reveals that the average score of employed persons on the PIAAC literacy¹⁷ scale was 15 points (0.30 SD) higher than those who were unemployed (275 versus 261) and 22 points (0.44 SD) higher than their counterparts who were out of the labor force (275 versus 254). Gaps between the mean numeracy score of employed persons and their unemployed and out-of-the-labor-force counterparts (also in favor of employed persons) were somewhat larger: 23 points (0.46 SD) between employed and unemployed and 27 points (0.54 SD) between employed and out of the labor force (Table 3).

Table 3: Mean Scores on the PIAAC Literacy and Numeracy Scales of 16- to 74-Year-Old Individuals by Their Labor Force Status at the Time of the PIAAC Surveys, U.S., 2012-14-17 (Standard Errors in Parentheses)

SCORE	MEAN SCORES			DIFFERENCES IN MEAN SCORES	
	EMPLOYED	UNEMPLOYED	OUT OF THE LABOR FORCE	EMPLOYED MINUS UNEMPLOYED	EMPLOYED MINUS OUT OF THE LABOR FORCE
Mean Literacy Score	275 (0.9)	261 (1.8)	254 (1.4)	14.7 (2.1)***	21.8 (1.6)***
Mean Numeracy Score	263 (1.0)	240 (2.2)	236 (1.7)	23.2 (2.4)***	26.9 (1.8)***

Statistical significance of differences in mean scores: *** significant at .01 level.

NOTE: Differences in scores may not add due to rounding of mean scores.

An examination of mean literacy and numeracy scores by labor force status for teens and young adults, prime-age workers, and older workers shows differences across these age groups that are not evident when looking at the working-age population as a whole (Table 4). Comparing employed individuals versus those who were out of the labor force, the findings reveal that the pattern of differences in mean literacy and numeracy skill scores by labor force status is much different for teens and young adults than that observed for those aged 25 and above. There were no differences in the mean literacy scores of 16- to 24-year-olds who were employed and their counterparts who were out of the labor force. This finding stands in sharp contrast to both prime-age and older workers among whom employed persons had substantially greater mean skill scores than their counterparts who were out of the labor force. On the numeracy scale, we found a small but significant 7-point (0.12 *SD*) difference between the mean numeracy scores of employed 16- to 24-year-olds and those who were out of the labor force.

Similarity between the mean literacy scores and smaller gaps between the mean numeracy scores of young people who were employed and out of the labor force is partially the result of substantial shares of young people who were engaged in schooling as their primary day-to-day activity.¹⁸ This finding stands in marked contrast to prime-age and older workers among whom school enrollment rates are quite low. Thus, for young people we see a somewhat unique relationship between mean skill scores and labor force attachment, with the largely similar mean skill scores between the employed and those out of the labor force.

However, we do find that skills among employed and unemployed teens and young adults differ. Those who are unemployed had mean skill scores that were 18 points (0.32 *SD*) below their employed counterparts on the numeracy scale and 8 points (0.14 *SD*) below them on the literacy scale (Table 4). This finding suggests that for young people who participate in the labor force, their likelihood of employment is associated with higher numeracy skills and, to a lesser extent, higher literacy skills.

Table 4: Mean Scores (Standard Errors) on the PIAAC Literacy and Numeracy Scales of Individuals by Age Group and Labor Force Status at the Time of the PIAAC Surveys, U.S., 2012-14-17 (Standard Errors in Parentheses)

SCALE AND AGE GROUP	MEAN SCORES			DIFFERENCES IN MEAN SCORES	
	EMPLOYED	UNEMPLOYED	OUT OF THE LABOR FORCE	EMPLOYED MINUS UNEMPLOYED	EMPLOYED MINUS OUT OF THE LABOR FORCE
Literacy					
Age 16-24	274 (1.8)	265 (3.2)	273 (2.1)	8.2 (3.9)**	0.5 (2.9)
Age 25-54	278 (1.0)	258 (2.5)	254 (2.6)	19.8 (2.8)***	24.5 (2.7)***
Age 55-74	269 (1.7)	258 (5.7)	247 (1.9)	10.5 (5.8)	22.0 (2.0)***
Numeracy					
Age 16-24	259 (2.0)	241 (3.4)	252 (2.7)	17.8 (4.1)***	7.2 (3.2)**
Age 25-54	265 (1.1)	238 (2.7)	233 (3.0)	27.0 (3.1)***	32.1 (2.9)***
Age 55-74	260 (1.8)	243 (6.2)	233 (2.2)	17.2 (6.5)***	27.2 (2.9)***

Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.

NOTE: Differences in scores may not add due to rounding of mean scores.

Among prime-age individuals, there were large differences in mean literacy and numeracy skill scores between those who are employed and their unemployed and out-of-the-labor-force counterparts, suggesting that stronger literacy and numeracy skill scores may help improve the likelihood of employment among prime-age individuals. For employed prime-age workers, mean literacy and numeracy scores were 20 points (0.40 *SD*) and 27 points (0.48 *SD*), respectively, higher than those of their counterparts classified as unemployed. Between employed prime-age workers and those who were out of the labor force the size of literacy and numeracy skill differences was even greater: 24 points (0.48 *SD*) and 32 points (0.57 *SD*), respectively (Table 4). Higher skills scores for prime-age workers are associated with employment, whereas lower scores appear to be related to unemployment and disconnection from the job market.

Among those ages 55 to 74, we found no statistically significant difference between the mean literacy scores of employed and unemployed individuals; however, the mean numeracy score of employed mature individuals was substantially higher than their unemployed counterparts (Table 4). Similar to our findings for prime-age workers, the mean scores of employed mature individuals sharply exceeded the mean scores of their counterparts who were out of the labor force by 22 (0.44 *SD*) and 27 (0.48 *SD*) points in literature and numeracy, respectively.

These findings reveal that labor force status outcomes of prime-age workers and older workers are associated with literacy and numeracy skill proficiency. For both groups of adults, we found substantially higher mean skill scores among those who were employed compared to those who were out of the labor force. The data also reveal that among prime-age workers there were large differences in skill scores between the employed and unemployed. Taken together, these findings suggest that, among adults, stronger literacy and numeracy scores are associated with a much stronger likelihood of labor market engagement and of

employment, whereas those with lower skill scores are more likely to be unemployed or disconnected from the labor market. This association also highlights the important role that the development of skills and labor market experiences plays for teens and young adults in setting up a positive lifelong trajectory, improving their chances for success in the labor market as they move into prime working age.

Regression analysis of the association between literacy skills and labor force status (with regression controls for age and education) confirms these findings. An increase in the literacy skill score by 1 standard deviation is expected to increase the likelihood of employment by 3.5 percentage points (significant at .01 level), decrease the likelihood of unemployment by 0.6 percentage points (significant at .05 level), and decrease the likelihood of being out of the labor force by 2.9 percentage points (significant at .01 level). Regression analysis for numeracy skills found stronger links: an increase in the numeracy skill score by 1 standard deviation is expected to increase the likelihood of employment by 5.5 percentage points (significant at .01 level), decrease the likelihood of unemployment by 1.1 percentage points (significant at .01 level), and decrease the likelihood of being out of the labor force by 4.4 percentage points (significant at .01 level). See Appendix E; Tables E1 to E6.

Educational Attainment and Labor Force Status

Although the focus of this paper is on skills as they are measured in PIAAC, educational attainment, as noted previously, is often used as a measure of human capital. An examination of mean skill scores by labor force status by level of educational attainment found higher literacy skills of employed individuals compared to their out-of-the-labor-force counterparts in three out of four educational groups. The gap between the literacy skills of employed and out-of-the-labor-force adults was quite substantial among those with a high school or higher level of education: a 12-point (0.24 *SD*) literacy score advantage for employed high school graduates and those with a sub-baccalaureate level of college education and, an even greater 16-point (0.32 *SD*) literacy score advantage among employed individuals with a bachelor's or higher college degree relative to four-year college graduates who were out of the labor force (Table 5).

Table 5: Mean Scores on the PIAAC Literacy Scale of 16- to 74-Year-Old Individuals by Their Labor Force Status at the Time of the PIAAC Survey by Educational Attainment and School Enrollment Status, U.S., 2012-14-17 (Standard Errors in Parentheses)

EDUCATIONAL ATTAINMENT AND SCHOOL ENROLLMENT STATUS	MEAN SCORES			DIFFERENCES IN MEAN SCORES	
	EMPLOYED	UNEMPLOYED	OUT OF THE LABOR FORCE	EMPLOYED MINUS UNEMPLOYED	EMPLOYED MINUS OUT OF THE LABOR FORCE
ALL	275 (0.9)	261 (1.8)	254 (1.4)	14.7 (2.1)***	21.8 (1.6)***
Educational Attainment					
Less Than High School	227 (2.3)	243 (3.8)	228 (2.7)	-15.5 (4.4)***	-0.8 (4.1)
High School Graduate	254 (1.5)	247 (2.9)	242 (2.0)	6.9 (3.2)**	12.0 (2.4)***
Some College, Certificate, or Associate's	277 (1.1)	270 (3.5)	265 (1.8)	6.5 (3.7)	11.6 (2.0)***
Bachelor's or Higher	304 (1.4)	294 (5.1)	287 (2.5)	9.5 (5.1)	16.3 (2.4)***
School Enrollment Status					
Enrolled	282 (1.8)	269 (3.7)	277 (2.5)	12.2 (4.2)***	4.7 (2.9)
Not Enrolled	274 (0.9)	257 (2.3)	248 (1.5)	17.0 (2.6)***	25.8 (1.7)***

Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.

NOTE: Differences in scores may not add due to rounding of mean scores.

Comparisons of the literacy scores of employed and unemployed individuals by educational attainment reveal no statistical differences among those who attended or completed college. Among high school graduates, those who were employed had a modestly higher literacy skill score (6.9 points or 0.14 *SD*) relative to their unemployed counterparts (Table 5).

Our study did uncover one anomaly in this educational attainment data. Among individuals with less than a high school education, the mean literacy score of employed persons was about the same as their out-of-the-labor-force counterparts but was substantially *lower* than that of those who were unemployed. This result is likely the composition of the employed and the unemployed in this educational group. Employment research on youth has found that many young people, including high school students, compete with adults who have low skills for entry-level jobs and often find themselves at the bottom of the job-seeking queue.¹⁹ This means that many employed individuals with less than a high school level of education might consist of adults who demonstrate low literacy and numeracy skills while many of those in the unemployment queue might be high school students and even young college students with higher skills who are at a disadvantage in their access to entry-level jobs because of (a) employer preference for adult workers in what are traditionally "kid occupations" and (b) the greater availability of adult workers with low skills to staff these positions.²⁰

Among the individuals who were enrolled in school at the time of the PIAAC survey, the mean literacy score of those who were employed (282) was over 12 points (0.24 *SD*) higher compared to unemployed students (269) but not statistically different from that of out-of-the-

labor-force students (277). In sharp contrast, among nonenrolled adults, the mean literacy score of those who were employed was 17 (0.34 *SD*) and 26 (0.52 *SD*) points higher than those who were unemployed and those who were out of the labor force, respectively (Table 5).

These differences between the enrolled and non-enrolled population in skills gaps, particularly between employed and out-of-the-labor-force individuals, are potentially the result of the choice of many students to remain out of the labor force while completing their studies, thus raising the literacy scores of the out-of-the-labor-force population among school enrolled individuals.²¹ For several decades, the employment rate of enrolled teens and young adults has continued to drift downward. The employment rates of youth (ages 16 to 24) enrolled in high school or college have declined sharply from the early 1990s to 2018. For example, among 16- to 24-year-old students, the employment rate declined from 31 percent in 1993 to 20 percent in 2018. Among those enrolled in college, the employment rate declined from 53 percent to 45 percent over the same period.²²

Employment History

Individuals with more human capital (including educational attainment, literacy, and numeracy proficiency and work experience) are more likely than those with lower levels of human capital to participate in the labor market and to find employment when they do so. Moreover, those with more human capital have greater employment stability.²³ Therefore, at any given point in time, those with higher skills will be more likely to be employed than those with lower skills. Furthermore, because employment is a path-dependent activity, those who were employed in the past are more likely to be employed currently and those who are employed currently are more likely to be employed in the future. Therefore, we expect that individuals with higher skills are likely to have a strong history of employment (a consistent path of employment) when compared with those with lower skills, who are likely to have a weaker employment history characterized by intermittent employment or no employment in the past.

The PIAAC survey gathered information regarding the employment history of all working-age respondents regardless of their labor force status at the time of the survey administration. Based on their reported employment history, each respondent in the PIAAC data file is classified into the following four mutually exclusive groups:

- currently employed
- employed during the past 12 months
- employed before the past 12 months
- never employed

Work experience is common to virtually all working-age Americans. Among the 16- to 74-year-old population, nearly 71 percent reported being employed at the time of the PIAAC survey, 7 percent were not currently employed but had worked at some point during the preceding 12 months, and 18 percent reported that they had worked at some point before the preceding 12 months. Only 4 percent of the 16- to-74-year-old population reported that they had never been employed (Table 6).

A comparison of the mean literacy score of individuals who were employed at the time of the PIAAC survey with those of individuals in the remaining three employment history categories is presented at the bottom of Table 6. Findings reveal no difference between the literacy skills of those who were currently employed and those employed in the past 12 months. However, is a sizeable gap (in favor of currently employed persons) between the literacy skills of currently employed individuals and those whose last employment ended more than 12 months ago (275 versus 251, or 24 points [0.48 *SD*]) and an even larger gap between the currently employed and those who were never employed (275 versus 238, or 37 points [0.74 *SD*]; Table 6).

Table 6: Mean Scores on the PIAAC Literacy and Numeracy Scales of 16- to 74-Year-Old Individuals by the Timing of Their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Currently Employed	275 (0.9)	263 (1.0)	70.7% (0.5)
Employed in the Past 12 Months	273 (1.9)	255 (2.3)	7.3% (0.2)
Employed Longer Than 12 Months Ago	251 (1.5)	236 (1.6)	18.1% (0.4)
Never Employed	238 (3.4)	208 (3.3)	3.8% (0.3)
Differences in Mean Scores, Currently Employed MINUS:			
Employed in the Past 12 Months	2.8 (1.8)	8.6 (2.3)***	—
Employed Longer Than 12 Months Ago	24.2 (1.9)***	27.2 (1.8)***	—
Never Employed	37.4 (3.3)***	55.5 (3.4)***	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Gaps between the mean numeracy scores of currently employed persons and previously employed persons were even larger: 9 points (0.16 *SD*) between currently employed and employed in the past 12 months and 27 points (0.48 *SD*) between currently employed and employed longer than 12 months ago. Compared to individuals who had never held a job, the mean numeracy score of those who were employed at the time of the PIAAC survey was nearly 56 points higher (263 versus 208), representing a numeracy score gap of one standard deviation (Table 6). The sizeable skills deficits of Americans who had last worked more than 12 months prior to the PIAAC or had never worked compared to those who were currently employed suggests a strong positive connection between the likelihood of current employment and literacy and numeracy proficiencies.

When analyzed by age groups, no significant differences were found in mean literacy or numeracy scores by the timing of most recent work experience among teens and young adults.²⁴ However, among adults aged 25 years and older, there were substantial differences between mean literacy and numeracy skill scores by the timing of their most recent employment experience (Table 7).

Prime-age workers who were employed at the time of the PIAAC survey had significantly higher mean literacy and numeracy skill scores relative to their counterparts who had last worked in the prior year and especially relative to those who have been out of work for a year or longer at the time of the survey. These findings suggest that higher levels of literacy and numeracy skills are positively connected to the likelihood of employment among prime-age workers.

Persons in the preretirement and retirement age cohort (55 and older) are much less likely to have worked recently compared to their prime-age counterparts; nonetheless, many remain engaged in employment. Forty percent of older workers aged 55 to 74 had last worked more than a year prior to the PIAAC survey or had never worked compared to 13 percent among prime-age workers. Beginning in the mid-1980s, the employment rate of 65- to 74-year-old persons increased, reversing a decline dating back to the late 1940s.²⁵ The rise in older worker employment rate is thought to be closely connected to rising levels in educational attainment among them. The educational attainment gap between older and prime-age workers was largely eliminated by 2006 as baby boomers entered retirement years.²⁶

Among older individuals, those who were currently employed at the time of the PIAAC survey had mean literacy scores that were 23 points (0.46 *SD*) and numeracy scores that were 27 points (0.48 *SD*) higher than their counterparts who were jobless for a year or more, revealing that longer term disconnections from employment among older individuals were associated with lower skill scores (Table 7). The skills score advantage of currently employed older workers is consistent with other research that finds rising employment of older workers is associated with increases in their stock of human capital.²⁷

Table 7: Mean Scores on the PIAAC Literacy and Numeracy Scales of Persons between the Ages of 25 and 54 and the Ages of 55 and 74 by the Timing of Their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Age 25-54			
Currently Employed	278 (1.0)	265 (1.1)	81.9% (0.5)
Employed in the Past 12 Months	268 (2.9)	247 (3.4)	5.5% (0.3)
Employed Longer Than 12 Months Ago	256 (2.5)	238 (2.7)	10.8% (0.5)
Never Employed	210 (6.2)	176 (7.0)	1.8% (0.2)
Differences in Mean Scores, Currently Employed MINUS:			
Employed in the Past 12 Months	10.2 (3.0)***	18.4 (3.5)***	—
Employed Longer Than 12 Months Ago	22.2 (2.7)***	26.9 (2.8)***	—
Never Employed	67.7 (6.2)***	89.3 (7.0)***	—
Age 55-74			
Currently Employed	269 (1.7)	260 (1.8)	53.4% (0.9)
Employed in the Past 12 Months	270 (3.8)	255 (4.6)	6.1% (0.4)
Employed Longer Than 12 Months Ago	246 (1.9)	233 (2.0)	38.8% (1.0)
Never Employed	‡	‡	1.7% (0.3)
Differences in Mean Scores, Currently Employed MINUS:			
Employed in the Past 12 Months	-1.3 (3.6)	5.3 (4.5)	—
Employed Longer Than 12 Months Ago	22.5 (2.7)***	27.1 (2.9)***	—
Never Employed	‡	‡	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

‡ Mean literacy and numeracy scores for 55- to 74-year-old old in "never employed" category were suppressed because sample cases did not meet the minimum threshold of 62.

NOTE: Differences in scores may not add due to rounding of mean scores.

Mean literacy and numeracy scores for 55- to 74-year-old old in "never employed" category were suppressed because sample cases did not meet the minimum threshold of 62.

These findings suggest that among prime-age individuals a distinguishing characteristic of those who were employed at the time of the PIAAC survey is that they had significantly higher literacy and numeracy skills than their jobless counterparts, particularly those with longer gaps since their last employment experience. Among older individuals, the literacy and numeracy skills of those who were employed at the time of the PIAAC survey were not statistically different from those who were not currently employed but had worked within a year prior to the PIAAC survey. But older individuals who reported having been jobless for more than a year or had never been employed demonstrated considerably lower literacy and numeracy skills than their employed counterparts.

Regression analysis of the links between skills and employment history (with regression controls for age and education) found (a) that the likelihood of a strong employment history (currently employed or employed in the past 12 months) is positively associated with skills; (b) that the likelihood of recent employment (current or in the past 12 months) is expected to

increase by 4.4 percentage points (significant at .01 level) with a 1 standard deviation increase in the literacy skill score; and (c) 5.8 percentage points (significant at .01 level) with a 1 standard deviation increase in the numeracy skill score (Appendix E; Tables E7 and E8).

We used a second measure of employment history to study the link between skills and lifetime work experience. For this second indicator, our gauge of lifetime work experience is measured as a ratio of actual years of work experience and potential maximum years of work experience. We have used this ratio to make the measure of work experience comparable across different age groups because actual years of work experience are, of course, closely related to age. Potential years of work experience represent the maximum number of years that the individual might have worked from age 16 onward and so is computed simply as age at the time of the PIAAC survey minus 16. In the United States, the working-age population is defined as those aged 16 and over. Persons under the age of 16 generally do not work and are excluded from almost all federal, state, and local measures of labor force activity.

Findings from a comparison of the mean literacy and numeracy scores of the 17- to 74-year-old population by the ratio of their actual and potential work experience is presented in Table 8.²⁸ Findings in Table 8 are presented for four quartiles of the ratio of actual to potential work experience, arranged from the lowest (a ratio of 0 to .24) to the highest intensity (a ratio of .75 to 1) of actual to potential years of employment. Over 80 percent of the 17- to 74-year-old population was employed during half or more of their working lifetime; 60 percent had worked for 75 percent or more of their working lifetime and 9.7 percent were employed for a quarter or less of their working lifetime.

Table 8: Mean Scores on the PIAAC Literacy and Numeracy Scales of 17- to 74-Year-Old Individuals by the Ratio of Their Actual to Potential Years of Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

RATIO OF ACTUAL TO POTENTIAL YEARS OF EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Lowest Quartile (0 to Less Than .24)	243 (2.6)	221 (3.0)	9.7% (0.4)
Second Quartile (.25 to Less Than .49)	263 (2.4)	247 (2.8)	10.0% (0.3)
Third Quartile (.50 to Less Than .74)	268 (1.5)	254 (1.8)	20.4% (0.5)
Highest Quartile (.75 TO 1)	276 (0.8)	264 (0.9)	60.0% (0.7)
Differences in Mean Scores, Highest Quartile MINUS:			
Lowest Quartile	32.7 (2.8)***	42.7 (2.8)***	—
Second Quartile	13.1 (2.4)***	16.9 (2.8)***	—
Third Quartile	8.0 (1.6)***	9.7 (1.7)***	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Skills differences between workers with different levels of work experience mirror the work history analysis discussed above; that is, individuals with a strong work history (measured by the proportion of their working lifetime years during which they were employed for at least

six months) had much higher literacy and numeracy skills than those with a weaker work experience history. The mean literacy skill score of those with the strongest work experience history (75% or more of their working lifetime) exceeded by 33 points (0.66 *SD*), 13 points (0.26 *SD*), and 8 points (0.16 *SD*) the mean literacy score of workers in the lowest, second, and third quartile, respectively, of the actual to potential work experience ratio (Table 8). The gaps were larger for numeracy scores.

The findings suggest that skills play an important role in creating a more stable and consistent pattern of lifetime employment and in extending the ability of older individuals to remain employed past the traditional retirement age. The gains to higher skills that result in more intensive lifetime employment may accrue not simply in the labor market, but also improve the retirement prospects of individuals in two ways: first, by raising the likelihood of increased savings and wealth accumulation over time with more continuous employment (higher ratio of actual to potential work experience) and, second, by increasing the likelihood of delaying retirement, resulting in increases in wealth accumulation while reducing years of reliance on retirement savings as a source of income.

Skills and Labor Market Outcomes for the Employed Population

Although employment itself is a positive labor market outcome, workers who are employed have widely different employment experiences. We have identified and will discuss the relationship between skills and the following three employment-related outcomes that can be measured with PIAAC data: employment intensity as measured by full-time versus part-time work, receipt of employer-provided training, and occupation.²⁹

Employment Intensity: Full-Time and Part-Time Work

Based on the weekly hours of work reported by respondents who were employed at the time of the PIAAC survey, we have classified all employed persons into two groups: full-time workers (those who worked 35 hours or more per week) and part-time workers (those who worked less than 35 hours per week). An earlier study of skills and the earnings of part-time workers revealed a sizeable overall hourly wage gap between full-time and part-time workers (\$23.01 per hour among full-time workers versus \$15.48 per hour among part-time workers). This overall part-time wage penalty, as it is known, is partially attributable to large shares of part-time workers concentrated in occupations that pay low wages, have low skill requirements, and are characterized by a high worker turnover and readily substitutable workers, and low training costs.³⁰ In the same study, we also found substantial earnings premiums for part-time workers with higher literacy and numeracy skills. Part-time workers with the strongest literacy and numeracy skills were concentrated in health and education professions and related occupations including the fields of nursing and teaching.

In this paper, we present full-time and part-time work status as a labor market outcome of employed workers and examine connections between the skills of workers who were employed in full-time positions relative to those of their part-time counterparts at the time of the PIAAC survey. Findings in Table 9 reveal that 73 percent of persons who were employed during the week of the PIAAC survey were working in full-time positions and the remaining 27 percent were working in part-time positions. Differences between the mean literacy and numeracy scores of full-time and part-time workers were modest and in favor of full-time workers: 4 points (0.08 *SD*) on the literacy scale and 6 points (0.11 *SD*) on the numeracy scale (Table 9). Although many workers who work in part-time positions choose to do so (voluntary part-time employed), part-time employment is more common in entry-level positions that typically employ younger workers with limited work experience and adults with lower levels of skills. In contrast, full-time positions are typically found in jobs that more often employ workers with higher levels of human capital (including skills, educational attainment, and work experience).

Table 9: Mean Scores on the PIAAC Literacy and Numeracy Scales of 16- to 74-Year-Old Employed Persons by Their Full-Time/Part-Time Employment Status, U.S., 2012-14-17 (Standard Errors in Parentheses)

FULL-TIME OR PART-TIME EMPLOYMENT STATUS	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Full-Time	277 (1.0)	265 (1.1)	73.3% (0.6)
Part-Time	272 (1.7)	259 (1.9)	26.7% (0.6)
Differences in Mean Scores, Full-Time MINUS:			
Part-Time	4.1 (1.8)**	6.4 (2.0)***	—

Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Among teens and young adults, as well as among older workers, there were no statistically significant differences in either literacy or numeracy skill scores between full-time and part-time employed (Table 10). However, among prime-age workers, the skill scores of those employed part-time were lower than those employed in full-time positions. The mean skill score of prime-age part-time workers was 7 points (0.14 *SD*) lower on the literacy scale and 11 points (0.20 *SD*) lower on the numeracy scale than prime-age full-time workers (Table 10). This difference is partly attributable to large observed differences in both literacy and numeracy skills between full-time and part-time workers in professional and related occupations where the literacy and, especially, the numeracy skills of full-time workers are much higher than those of part-time workers.³¹

These findings suggest that skills exert little influence on the likelihood of part-time employment among teens and young adults as well as older workers. A very large share of part-time employment is voluntary in nature with individuals seeking to mix work with other life activities including schooling and family responsibilities or, increasingly more common

among older individuals, to mix work and retirement.³² Differences in literacy and numeracy scores between full-time and part-time prime-age workers suggest that among prime-age workers skills do play some role in sorting workers into full-time and part-time employment.

It should be noted that part-time workers with higher literacy and numeracy skills earn significantly more than those with lower skills. Earlier research on skills and earnings of part-time workers found that skills of part-time workers had a substantial positive relationship with earnings³³—a relationship that was similar in magnitude to that found among full-time workers.³⁴

Table 10: Mean Scores on the PIAAC Literacy and Numeracy Scales of Employed Persons between the Ages of 16 and 24, 25 and 54, and 55 and 74 by Their Full-Time/Part-Time Employment Status, U.S., 2012-14-17 (Standard Errors in Parentheses)

FULL-TIME OR PART-TIME EMPLOYMENT STATUS	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Age 16-24			
Full-Time	273 (2.8)	258 (2.9)	45.6% (2.0)
Part-Time	274 (2.3)	260 (2.7)	54.4% (2.0)
Differences in Mean Scores, Full-Time MINUS:			
Part-Time	-1.4 (3.6)	-2.1 (3.9)	—
Age 25-54			
Full-Time	280 (1.0)	268 (1.1)	81.0% (0.6)
Part-Time	273 (2.4)	257 (2.9)	19.0% (0.6)
Differences in Mean Scores, Full-Time MINUS:			
Part-Time	7.0 (2.5)***	10.8 (3.0)***	—
Age 55-74			
Full-Time	268 (2.0)	260 (2.1)	70.1% (1.3)
Part-Time	270 (2.8)	260 (3.0)	29.9% (1.3)
Differences in Mean Scores, Full-Time MINUS:			
Part-Time	-1.8 (3.4)	0.7 (3.5)	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Controlling for age and educational attainment, regression analysis of the link between skills and the likelihood of full-time employment found no statistically significant connection between skills and the likelihood of full-time employment among employed persons. The coefficient of the skills variable in the regression with literacy skills and in the regression with numeracy skills did not meet the threshold of statistical significance (Appendix E; Tables E9 and E10). Findings from the descriptive analysis presented in Table 10 vary by age group; they show a positive link between skills and full-time employment among prime-age workers but not among younger or older workers. These findings warrant examination of the other factors that may influence full-time employment among workers; such an examination is beyond the scope of this paper.

Employer-Provided Training

The PIAAC questionnaire asks respondents a series of questions that are focused on their education and training experiences. One of the questions pertains to employer-provided training; specifically, workers were asked if they had attended any organized on-the-job training or training by supervisors or coworkers during the 12 months preceding the PIAAC survey.³⁵ Employer training is often a very important way for individuals to develop their skills, and employees frequently engage in training activities through employer-sponsored classroom instruction, supervisor and peer training, on-line learning technologies instruction, and on-the job training. During 2019, firms are estimated to have spent an average of \$1,286 per worker on employer-financed training with the average employee participating in 42.1 hours of training per year.³⁶

Despite its value, employers are often reluctant to engage in worker training for a variety of reasons. Among small firms, the high fixed costs of training along with the threat of larger firms pirating their staff after they achieve key proficiencies through training may inhibit their willingness to invest in worker training. Employee turnover also reduces employer willingness to train as high separation rates truncate the time needed for an employer to achieve the desired return on a training investment.³⁷ Peter Cappelli of the University of Pennsylvania has argued that employers have become reluctant to engage in extensive training as, until very recently, there was an abundance of labor supply for most occupations and, with the rapid growth in college enrollment, training costs were shifted out of businesses and onto households in the form of college tuition and fees. Cappelli notes that the inadequate employer training system results in "the phenomenon of people queuing up for unpaid internships."³⁸

Workers with higher skills are more likely to receive training from their employers.³⁹ Training provided to higher skilled workers is expected to yield higher productivity gains. Jobs that require high levels of cognitive skills are also likely to have lower turnover, reducing the risk that employers might lose their training investment to other firms. Higher incidence of training among those with higher skills is also attributable to a greater likelihood that these workers will pursue activities to further enhance their skills and human capital; activities that include training opportunities from their employer.⁴⁰

This relationship between skills and training is supported by the findings presented in Table 11 that show higher skills among workers who received training from their employer than those who did not receive such training. The mean literacy score of workers with employer-provided training was 16 points (0.32 *SD*) greater than that of their counterparts who did not receive training from their employers (284 versus 268). Mean score on the numeracy scale was also 16 points (0.29 *SD*) higher among workers with employer-provided training than among those without (272 versus 256).

Table 11: Mean Scores on the PIAAC Literacy and Numeracy Scales of 16- to 74-Year-Old Employed Persons by Self-Reported Receipt of Employer-Provided Training, U.S., 2012-14-17 (Standard Errors in Parentheses)

RECEIPT OF EMPLOYER-PROVIDED TRAINING	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Received Training	284 (1.0)	272 (1.2)	49.2% (0.8)
Did not Receive Training	268 (1.3)	256 (1.6)	50.8% (0.8)
Differences in Mean Scores, Received Training MINUS:			
Did not Receive Training	16.1 (1.6)***	15.7 (1.9)***	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Among teens and young adults, a majority (52%) received some training from employers during the prior year (Table 12). This percentage is not surprising as training is broadly defined by the PIAAC questionnaire and includes new staff orientation, which is more likely the kind of training that young labor market entrants receive.⁴¹ There was no statistical difference in mean literacy scores and numeracy scores between young workers who received some employer training and those who had not received employer training in the past year.

Table 12: Mean Scores on the PIAAC Literacy and Numeracy Scales of Employed Persons between the Ages of 16 and 24, 25 and 54, and 55 and 74 by Self-Reported Receipt of Employer-Provided Training, U.S., 2012-14-17 (Standard Errors in Parentheses)

RECEIPT OF EMPLOYER-PROVIDED TRAINING	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Age 16-24			
Received Training	278 (2.6)	264 (3.0)	51.9% (2.1)
Did not Receive Training	273 (2.4)	258 (2.8)	48.1% (2.1)
Differences in Mean Scores, Received Training MINUS:			
Did not Receive Training	4.9 (3.4)	5.9 (4.1)	—
Age 25-54			
Received Training	287 (1.1)	275 (1.3)	50.8% (0.8)
Did not Receive Training	269 (1.5)	256 (1.8)	49.2% (0.8)
Differences in Mean Scores, Received Training MINUS:			
Did not Receive Training	18.2 (1.9)***	18.8 (2.3)***	—
Age 55-74			
Received Training	277 (2.1)	267 (2.3)	43.1% (1.1)
Did not Receive Training	262 (2.2)	255 (2.5)	56.9% (1.1)
Differences in Mean Scores, Received Training MINUS:			
Did not Receive Training	15.1 (2.9)***	11.8 (3.2)***	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Among prime-age workers, more than one-half received employer-provided training, and the mean literacy and numeracy proficiency scores of these workers were positively associated with such training. Workers who received some type of training had mean literacy and numeracy scores that were 18 (0.36 *SD*) and 19 points (0.34 *SD*) higher, respectively, than those who did not participate in employer-provided training (Table 12).

Older workers are less likely to report that they received employer-provided training than teens and young adult or prime-age workers. However, older workers with higher skill scores were more likely to receive training than their counterparts with lower skill scores. The mean literacy skill score among workers in this age group who reported that they received training at work was 277 whereas those who did not receive such training had an average score of 262, representing a difference of 15 points (0.30 *SD*; Table 12). Similarly, older workers with employer-provided training had a 12-point (0.21 *SD*) advantage over those without such training on the PIAAC numeracy proficiency scale (267 versus 255).

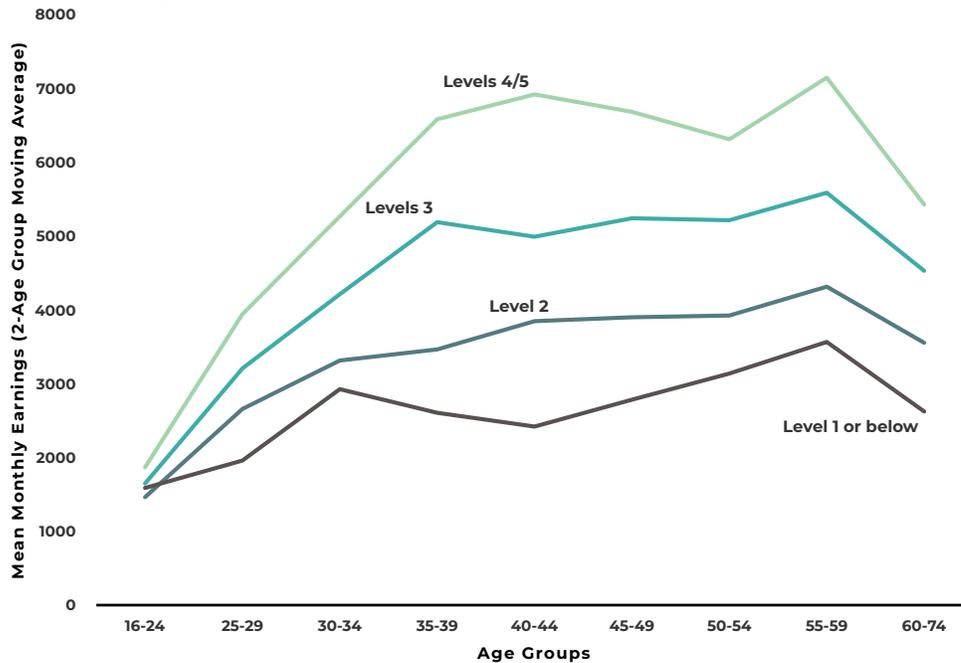
Workers with higher proficiencies (literacy and numeracy) were more likely to receive employer-sponsored training than those with lower skills. Regression analysis of the links between skills and the likelihood of employer-provided training found that even after regression controls for age and educational attainment, workers with higher skills are more likely to receive employer-provided training. The likelihood of receiving employer-sponsored training is expected to increase by 3.9 percentage points (significant at .01 level) for a 1 standard deviation increase in the literacy skill score and 2.5 percentage points (significant at .05 level) for an increase in the numeracy skill score by 1 standard deviation (Appendix E; Tables E11 and E12).

These findings suggest that the likelihood of participating in company training is related to the literacy and numeracy proficiencies of prime-age and older workers. Firms may be more likely to invest training resources in workers with stronger skills but make fewer such investments in workers with lower skills. This may help explain the more steeply sloped age earnings profiles of higher skill workers in relation to their lower skill counterparts observed in Figure 4. The figure illustrates that the pace of increase in monthly earnings with age (and years of work experience) is considerably higher for those with higher literacy skills than those with lower skills.

Flavio Cunha and James Heckman have argued that there is a dynamic complementarity in skills development. That is, skills developed at an early age raise the productivity of skills developed in subsequent ages.⁴² Employers are therefore likely to yield a higher return to training among workers with already higher skills than to those with lower skills. The productivity gains associated with investment in training is higher among workers who

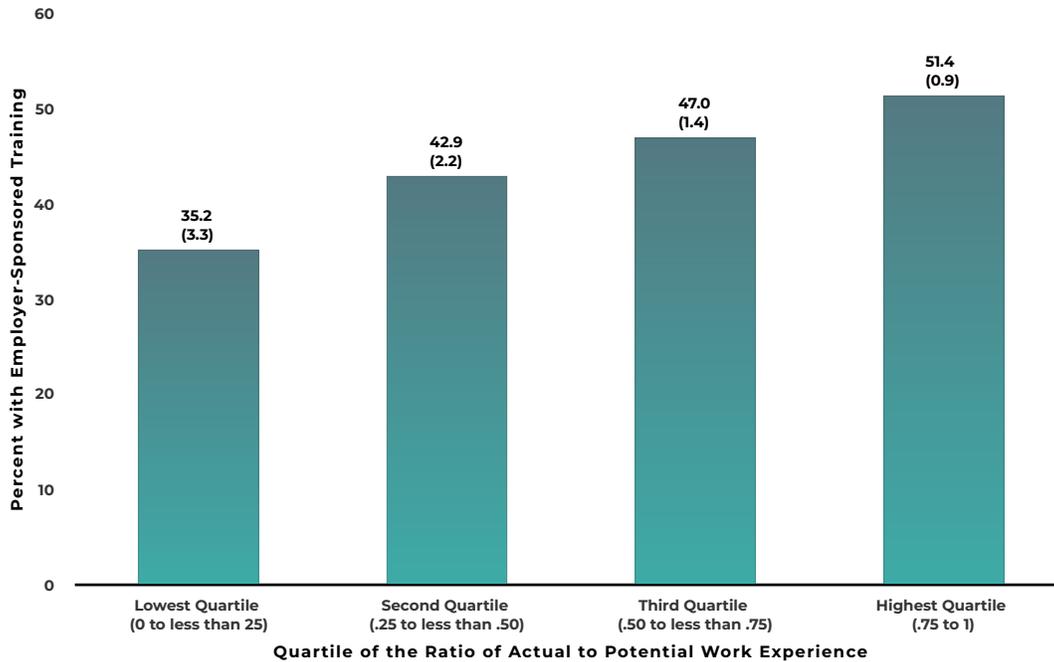
already have higher level of skills. Our analysis of PIAAC data has revealed that prime-age and older workers with higher skill levels are more likely to receive training, indicating that employers invest more heavily in workers with stronger skills.

Figure 4: Age-Earnings Profile of Employed Persons between the Ages of 16 and 74 by PIAAC Literacy Level, U.S., 2012-14-17



Increased training is expected to result in increased worker productivity and rising earnings over time. Moreover, as firms invest in higher skilled workers, their incentives to retain these workers to capture the return to the training investment also increases, potentially resulting in increased job tenure⁴³ and a higher ratio of years of actual to potential work, that is, greater lifetime employment stability. The PIAAC survey does indeed find a positive relationship between the ratio of actual to potential years of work experience and recent participation in employer-sponsored training. Findings presented in Figure 5 reveal that, among currently employed workers who had less than one-quarter of their potential lifetime years of work, 35 percent had participated in employer-sponsored training. The incidence of employer-sponsored training increased with lifetime work experience; 51 percent of workers in the top quartile of actual to potential work experience reported receiving employer-sponsored training.

Figure 5: Share of Employed Persons Aged 16 to 74 Who Reported Employer-Sponsored Training in the Year Prior to the PIAAC Survey by the Ratio of Actual to Potential Years of Work Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)



Occupation

The PIAAC data file provides occupational information for respondents who were employed at the time of the survey. PIAAC survey respondents were asked to name the occupational titles of their job, and these titles were assigned the 2008 International Standard Classification of Occupations (ISCO) codes developed by the International Labor Organization.⁴⁴ Due to sample limitations, we have combined the ISCO detailed occupational classification into five major occupational groups: professional and managerial, technical and associate professional, clerical and blue-collar, sales and service, and elementary occupation. This classification was completed by using the U.S. Department of Labor's Occupational Information Network (O*NET) to group each detailed ISCO into one of the five categories based on educational attainment and work experience (two components of human capital) requirements specified in the O*NET data.⁴⁵ The professional and managerial occupational group comprises a set of work tasks and duties that are more cognitively complex and that require workers with higher levels of human capital to effectively perform the functions required to work in these jobs. Technical and associate professional jobs also require higher levels of human capital from workers but not as high as professional and managerial jobs. Clerical and blue-collar occupations, as well as sales and service jobs, require mid- to lower

levels of human capital. The least human capital-intensive occupations are lumped in the elementary occupation group, consisting of mostly manual and physical laborer and service occupations such as dishwashers and janitors.

About 32 percent of workers who were employed at the time of the PIAAC survey were working in professional and managerial occupations. Technical and associate professional occupations, clerical and blue-collar occupations, and sales and service occupations each employed 19 to 21 percent of 16- to 74-year-old workers, and the remaining 9 percent were employed in elementary occupations.

The literacy and numeracy proficiencies of workers were highest among professional and managerial workers and lowest among workers in elementary occupations. The mean score of those in professional and managerial occupations was 298 on the PIAAC literacy scale and 290 on the numeracy scale. Gaps between the mean literacy scores of workers employed in professional and managerial occupations and their counterparts in the remaining four occupations are presented in the second half of Table 13. On average, workers employed in elementary occupations scored 55 points lower than their counterparts in professional and managerial occupations (298 versus 243), representing a difference of more than 1 standard deviation of the literacy proficiency score. The mean literacy scores of workers in sales and service occupations and clerical and blue-collar occupations were 36 to 37 points (0.72–0.74 *SD*), respectively, lower than professional and managerial workers. Technical and associate professional workers were 17 points (0.34 *SD*) behind professional and managerial workers on the mean literacy score.

Numeracy score gaps between occupational groups were larger than gaps in the literacy score. The mean numeracy score of elementary occupation workers was 61 points (1.09 *SD*) behind that of professional and managerial workers. The mean numeracy score of professional and managerial workers exceeded the mean score of workers in the remaining occupations by 46 points (0.82 *SD*) compared to sales and service workers, 39 points (0.70 *SD*) compared to clerical and blue-collar workers, and about 24 points (0.43 *SD*) compared to technical and associate professional workers (Table 13).

Table 13: Mean Scores on the PIAAC Literacy and Numeracy Scales of 16- to 74-Year-Old Employed Persons by the Occupation in Which They Were Employed, U.S., 2012-14-17 (Standard Errors in Parentheses)

MAJOR OCCUPATIONAL GROUP	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Professional & Managerial	298 (1.3)	290 (1.4)	31.9% (0.6)
Technical & Associate Professional	281 (1.5)	267 (1.7)	19.3% (0.5)
Clerical & Blue-collar	262 (1.7)	251 (1.9)	21.2% (0.5)
Sales & Service	261 (1.8)	244 (2.2)	18.6% (0.6)
Elementary Occupations	243 (2.5)	229 (2.5)	9.0% (0.3)
Differences in Mean Scores, Professional & Managerial MINUS:			
Technical & Associate Professional	17.0 (2.1)***	23.5 (2.4)***	—
Clerical & Blue-collar	35.9 (2.1)***	39.4 (2.1)***	—
Sales & Service	36.6 (2.2)***	46.0 (2.5)***	—
Elementary Occupations	54.6 (2.4)***	60.9 (2.5)***	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

An examination of skills differences by occupations among workers in different age groups found similar gaps in literacy proficiency scores across occupations for prime-age workers and older workers (Table 14). Among teen and young adult workers, there were no statistically significant differences between the mean literacy scores of workers in professional and managerial occupations when compared with technical and associate professional occupations and clerical and blue-collar occupations. There were statistically significant gaps between the literacy proficiencies of younger workers in sales and services occupations and elementary occupations and their counterparts in professional and managerial occupations (Table 14), although those gaps were smaller than those found for prime-age and older workers. Similar patterns were observed in numeracy proficiency gaps between occupations for different age groups of workers.⁴⁶

Table 14: Mean Scores on the PIAAC Literacy Scale of Employed Persons between the Ages of 16 and 24, 25 and 54, and 55 and 74 by the Occupation in Which They Were Employed, U.S., 2012-14-17 (Standard Errors in Parentheses)

MAJOR OCCUPATIONAL GROUP OF EMPLOYED PERSONS	AGE 16-24	AGE 25-54	AGE 55-74
Professional & Managerial	284 (5.0)	302 (1.5)	290 (2.6)
Technical & Associate Professional	285 (5.0)	282 (1.9)	276 (2.9)
Clerical & Blue-collar	276 (3.5)	263 (2.2)	252 (3.3)
Sales & Service	272 (2.7)	260 (2.3)	248 (3.4)
Elementary Occupations	258 (4.8)	237 (3.2)	234 (7.2)
Differences in Mean Scores, Professional & Managerial MINUS:			
Technical & Associate Professional	-1.4 (7.0)	19.9 (2.2)***	14.2 (3.7)***
Clerical & Blue-collar	7.7 (6.3)	39.3 (2.7)***	38.0 (3.7)***
Sales & Service	11.6 (6.0)**	42.1 (2.5)***	41.8 (4.5)***
Elementary Occupations	25.5 (7.1)***	64.8 (3.3)***	55.8 (7.2)***

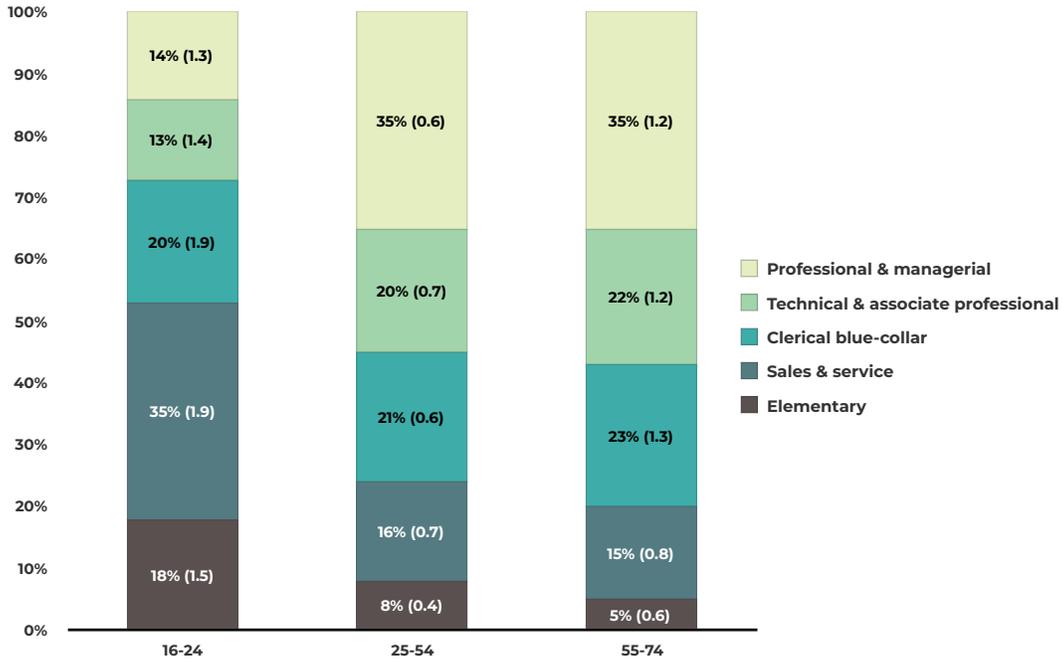
Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.

NOTE: Differences in scores may not add due to rounding of mean scores.

These large gaps between the skill scores of workers employed in professional and managerial occupations and workers employed in each of the remaining four occupations (for all workers and workers in each age cohort) imply that workers with higher skills are more likely to gain access to professional and managerial occupations. Multiple regression analysis (with regression controls for age and education) also confirms that workers with higher skills are more likely to gain access to jobs in the professional and managerial occupations. The likelihood of employment in a professional or managerial occupation is expected to increase by 5.4 percentage points (significant at .01 level) for an increase in the literacy skills score by 1 standard deviation and by 5.9 percentage points (significant at .01 level) for an increase in the numeracy skills score by 1 standard deviation (Appendix E; Tables E13 and E14).

Separately, we have analyzed the occupational employment patterns of the three age cohorts. As expected, teens and young adults have considerably different occupational employment patterns compared to prime-age and older workers. Younger workers are much less likely than adult workers to be employed in professional and managerial occupations and associate professional and technical occupations and more likely than adults to work in sales and service occupations and elementary occupations (Figure 6). Fifty-three percent of all teens and young adults were employed in sales and service and elementary occupations, where about 50 percent of all workers were employed in part-time positions. In contrast, 25 percent of prime-age workers and 20 percent of older workers were employed in these predominantly entry-level occupations.

Figure 6: Percentage Distribution of Employed Persons between the Ages of 16 and 24, 25 and 54, and 55 and 74, by the Occupation in Which They Were Employed, U.S., 2012-14-17 (Standard Errors in Parentheses)



Skills and Labor Market Outcomes for the Unemployed Population

In this section, we examine two labor market outcomes that are relevant to unemployed individuals. The first is the duration of the ongoing spell of unemployment of those classified as unemployed at the time of the PIAAC survey. This includes those persons who were jobless but were both actively engaged in job search activities and were willing to accept a job if one became available. The second outcome is the work history of unemployed individuals, that is, their job ended during the past 12 months (preceding the PIAAC survey), their job ended more than 12 months ago, or they had never held a job.

Duration of Unemployment

Respondents who were unemployed at the time of the PIAAC survey were asked about the total number of months that they had been unemployed. We have classified all unemployed individuals into three groups based on the number of months that they were unemployed at the time of the PIAAC survey: 0 to 1 months representing short-term unemployed, 2 to 5 months representing medium-term unemployed, and 6 months or more representing long-term unemployed. The mean duration of a spell of unemployment is strongly associated with overall labor market conditions. The average duration of unemployment will usually be

longer during economic downturns when the number of unemployed persons outnumber the number of open jobs.⁴⁷ During economic recessions, unemployment rises as employers' demand for workers falls, resulting in job losses and reductions in vacant positions and increased unemployment durations as more unemployed workers chase fewer vacant positions.

The PIAAC surveys used in this study were conducted in 2012, 2014, and 2017. During 2012 and 2014, the nation's labor markets were quite slack and still recovering from the effects of the Great Recession of 2007–09 and were characterized by very high shares of long-term unemployed workers and long unemployment durations. According to the Current Population Survey (CPS) data from the U.S. Bureau of Labor Statistics, the share of unemployed workers who were out of work for 27-plus weeks was 41 percent in 2012, 34 percent in 2014, and 24 percent in 2017—considerably higher than the prerecession low of 18 percent in 2007. The mean duration of unemployment among these unemployed workers was 39 weeks in 2012, 34 weeks in 2014, and 25 weeks in 2017—much higher compared to the mean duration of 16.8 weeks in 2007, before the onset of the Great Recession.⁴⁸

Among individuals who were unemployed at the time of the PIAAC survey, only 22 percent were unemployed for 1 month or less (short duration), 37 percent were unemployed for 2 to 5 months, and the remaining 41 percent were experiencing a much longer duration (6 months or more) of unemployment. These findings are consistent with those we highlighted from the CPS.

Thus, the PIAAC survey was largely conducted during a period when the U.S. labor market remained quite weak, with large shares of long-term unemployed job seekers comprising lower skill as well as higher skill individuals. Indeed, gaps between the mean literacy and numeracy scores of unemployed individuals by the duration of their unemployment were modest, and none of these differences met the threshold of statistical significance at the .01 or the .05 levels (Table 15). Multiple regression analysis also found that the duration of unemployment was not statistically related to their skills. We estimated two regression models (one with literacy skills and the second with numeracy skills) to examine the connection between skills and the likelihood of short-term or medium-term unemployment (less than 6 months) with regression controls for age and education. The coefficient of skills in each of the two models was not statistically significant (Appendix E; Tables E15 and E16). Examinations of the mean proficiency scores of unemployed teens and young adults, prime-age workers, and older workers by unemployment duration also reveal a lack of statistically significant differences in skill scores by unemployment duration (see Appendices B, C, and D).

Table 15: Mean Scores on the PIAAC Literacy and Numeracy Scales of 16- to 74-Year-Old Unemployed Persons by the Duration of Their Unemployment, U.S., 2012-14-17 (Standard Errors in Parentheses)

DURATION OF UNEMPLOYMENT (MONTHS)	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
0 TO 1 Month	266 (4.5)	246 (4.8)	22.3% (1.1)
2 TO 5 Months	261 (3.2)	240 (3.5)	37.0% (1.8)
6 Months or More	258 (3.0)	237 (3.0)	40.7% (1.5)
Differences in Mean Scores, 0 to 1 Month Duration MINUS:			
2 TO 5 Months	4.7 (6.0)	6.6 (6.6)	—
6 Months or More	8.1 (4.9)	9.8 (5.2)	—

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

One possible explanation of the PIAAC sample's inability to detect a significant difference in literacy and numeracy skills scores by duration of unemployment may be associated with structural shifts in the industry and occupational composition of employment that result in a much less efficient matching process in the labor market.⁴⁹ The smaller (than expected) differences in skills of unemployed workers by duration of unemployment might also be the result of a weaker labor market when the PIAAC surveys were conducted, particularly in the earlier years of 2012 and 2014.⁵⁰ Some of the longer unemployment durations observed in the PIAAC data are therefore more likely to be attributable to a weak labor market rather than the employability (and skills) of workers. As noted above, during weak economic conditions, even workers with strong skills are likely to be unemployed and remain unemployed for longer durations.

The link between skills and unemployment duration is better measured during a period when the labor market is strong because longer unemployment durations during full employment conditions are more likely to result from lower levels of employability (and skills) rather than a widespread lack of employment opportunities resulting from slack economic conditions and a lack of labor demand. During full employment conditions, the duration of unemployment is likely to be shorter for those who have higher levels of skills and are more employable than individuals who have lower levels of skills and tend to remain unemployed for longer durations.

Analyzing just the 2017 PIAAC data, when the U.S. economy was stronger than in 2012 or 2014, could provide a better measure of the link between skills and unemployment durations. Unfortunately, sample constraints prevent us from using a single year PIAAC data file to conduct a statistically reliable analysis of the connection between skills and unemployment duration.

Employment History of Unemployed Persons

About 56 percent of all 16- to 74-year-old individuals who were unemployed at the time of the PIAAC survey reported being employed at some point during the 12 months preceding the PIAAC survey, whereas 35 percent reported they had stopped working more than 12 months preceding the PIAAC survey. Nine percent of currently unemployed persons reported that they had never been employed (Table 16).

Unemployed persons with more recent employment experience had higher skills than those who had last held a job more than a year ago or those who had never held a job. The mean literacy score of unemployed persons with a job in the past 12 months was 14 points (0.28 *SD*) higher than the mean literacy score of their counterparts who were last employed more than 12 months ago (267 versus 253). The mean literacy score of unemployed individuals who were last employed in the past 12 months was the same as that of unemployed persons with no previous employment. Some of these never employed individuals might be young labor market entrants who are looking for their first job and are likely to have higher skills than those unemployed persons who are older and are opting to enter the labor market without any employment experience throughout their working lifetime. The mean numeracy score of unemployed persons with more recent employment experience was also 14 points (0.25 *SD*) higher than those who held their last job more than a year ago (247 versus 234) and 27 points (0.48 *SD*) higher compared to their counterparts who had never held a job (247 versus 220; Table 16).

Table 16: Mean Scores on the PIAAC Literacy and Numeracy Scales of 16- to 74-Year-Old Unemployed Persons by the Time of Their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Employment in the Past 12 Months	267 (2.7)	247 (2.8)	55.8% (1.8)
Employed Longer Than 12 Months Ago	253 (2.9)	234 (3.6)	35.3% (1.9)
Never Employed	253 (4.9)	220 (5.5)	8.9% (0.9)
Differences in Mean Scores, Employed in the Past 12 Months MINUS:			
Employed Longer Than 12 Months Ago	14.4 (1.0)***	13.6 (4.5)***	—
Never Employed	14.0 (5.6)**	27.1 (6.1)***	—

Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

An examination of the employment history of unemployed teens and young adults found that 50 percent reported that they had worked in the past year, and the remaining share of unemployed young people were about evenly split between reporting that their last work experience occurred over a year ago (21.7%) or that they had never worked (22.6%). The mean literacy score of unemployed youth with recent work experience was not statistically

different from the mean score of those with work experience that occurred longer than one year in the past. However, relative to the mean literacy score of their counterparts who had never worked (255), the mean literacy score of unemployed teens and young adults with recent work experience (272) was sharply higher and the difference of 17 points (0.34 *SD*) was statistically significant at the .05 level (Table 17).

The distribution of prime-age individuals who were unemployed at the time of the PIAAC survey by their most recent employment experience revealed that 58 percent had been employed during the 12 months preceding the PIAAC survey, 40 percent were last employed more than 12 months ago, and only 2 percent reported that they had never been employed.

Among unemployed prime-age individuals, longer gaps since their last employment experience are associated with lower literacy and numeracy skills scores. The mean literacy score of 262 among the unemployed prime-age individuals who had worked in the prior year was 9 points (0.18 *SD*) higher than the mean literacy score of those who were employed longer than 12 months ago and 22 points (0.44 *SD*) higher than those who had never been employed (Table 17).

Table 17: Percentage Distribution and Mean Scores on the PIAAC Literacy Scales of Unemployed Persons between the Ages of 16 and 24, 25 and 54, and 55 and 74 by the Time of Their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE OF ALL UNEMPLOYED PERSONS	AGE 16-24	AGE 25-54	AGE 55-74
Percentage Distribution			
Employed in the Past 12 Months	55.6%(2.6)	57.5%(2.6)	50.5%(4.3)
Employed Longer Than 12 Months Ago	21.7%(2.8)	40.0%(2.7)	49.5%(4.3)
Never Employed	22.6%(2.5)	2.4%(0.7)	‡
Mean Literacy Score			
Employed in the Past 12 Months	272 (4.6)	262 (2.9)	273 (9.0)
Employed Longer Than 12 Months Ago	260 (6.6)	253 (3.9)	243 (6.6)
Never Employed	255 (5.5)	240 (11.0)	‡
Differences in Mean Scores, Employed in the Past 12 Months MINUS:			
Employed Longer Than 12 Months Ago	11.4 (7.8)	9.0 (4.5)**	29.3 (10.7)***
Never Employed	16.8 (7.4)**	22.2 (11.4)**	‡

Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.

‡ Data for the "never employed" category for unemployed 55- to 74-year-old persons are not provided because the sample size did not meet the minimum threshold of 62.

NOTE: Differences in scores may not add due to rounding of mean scores.

At the time of the PIAAC 2012-14-17 surveys, 51 percent of unemployed individuals between the ages of 55 and 74 reported that their most recent employment ended in the past 12 months and the remaining 49 percent were last employed longer than 12 months ago. Among unemployed older persons who were last employed in the past 12 months prior to the PIAAC survey, the mean literacy score was 273, which was 29 points (0.58 *SD*) higher than the mean literacy score of those who were employed longer than 12 months ago.

Similar to previous sections, we have supplemented descriptive analysis with multiple regression analysis using two regressions (one with literacy skills and the second with numeracy skills) to examine the association between skills of workers who were unemployed at the time of the PIAAC survey and their likelihood of having been employed at any time in the past (Appendix E; Tables E17 and E18). The coefficient of literacy skills was not statistically significant indicating that after controlling for age and education, there was no statistical link between literacy skills and the likelihood of past employment among unemployed individuals. In contrast, numeracy skills were found to have a statistically significant positive effect on the likelihood of past recent employment. An increase in the numeracy skill score by one standard deviation is expected to increase the likelihood of past employment among unemployed individuals by 3.4 percentage points (significant at the .01 level).

Findings on the relationship between the time of previous employment and numeracy skill scores for each of the three age groups of unemployed persons (presented in Appendices B, C, and D) are very similar to the literacy skill scores findings presented in this section.

Skills and Labor Market Outcomes for the Out-of-the-Labor-Force Population

The universe of persons included in the analysis in this section of the paper comprises working-age Americans between the ages of 16 and 74 who were out of the labor force at the time of the PIAAC survey. These individuals were not employed and were not actively seeking employment at that time. The inclusion of persons on the two extreme ends of the working-age spectrum in this analysis, youth (ages 16 to 24) and older workers (ages 55 to 74), results in a higher share of individuals who are out of the labor force. The labor market participation among youth is lower because the primary life activity of most in this age group is school and not employment. Employment is also not the primary life activity among many older individuals who are in the preretirement (ages 55 to 64) or retirement (ages 65 to 74) stages of their working lives. Findings presented in Table 2 indicate a much higher share of the out-of-the-labor-force population among 16- to 24-year-old persons (26%) and 55- to 74-year-old persons (44%) than among individuals in prime working ages of 25 to 54 years old (13%).

Employment History of Out-of-the-Labor-Force Persons

Analysis of the employment history of 16- to 74-year-old persons who were out of the labor force at the time of the PIAAC survey found that 18 percent were employed at some point during the past 12 months and about 68 percent were last employed longer than 12 months preceding the PIAAC survey. The remaining 14 percent of out-of-the-labor-force individuals reported that they were never employed.

The mean skill scores of each of these three groups of the nation's out-of-the-labor-force population varied widely. The out-of-the-labor-force population with their last job at some point in the past 12 months had an average score of 276 on the PIAAC literacy scale—a mean score that was 25 points (0.50 *SD*) higher than that of out-of-the-labor-force individuals who were last employed more than 12 months ago (276 versus 251) and 40 points (0.80 *SD*) higher than their counterparts who were never employed (276 versus 236). On the PIAAC numeracy scale, out-of-the-labor-force persons with any employment during the past 12 months had a mean score that was 23 points (0.41 *SD*) higher than those with a job longer than 12 months ago (260 versus 236) and 53 points (0.95 *SD*) higher than those with no previous employment (260 versus 206; Table 18).

Table 18: Mean Scores on the PIAAC Literacy and Numeracy Scales of 16- to 74-Year-Old Persons Who Were Out of the Labor Force by the Time of Their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Employment in the Past 12 Months	276 (2.6)	260 (3.3)	18.4% (0.8)
Employed Longer Than 12 Months Ago	251 (1.6)	236 (1.7)	67.6% (1.2)
Never Employed	236 (3.8)	206 (3.8)	14.0% (1.0)
Differences in Mean Scores, Employed in the Past 12 Months MINUS:			
Employed Longer Than 12 Months Ago	25.2 (2.9)***	23.1 (3.2)***	—
Never Employed	40.3 (4.2)***	53.4 (3.9)***	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

The pattern of skill scores by the timing of last employment was different among teens and young adults who were out of the labor force (out of work and not looking for work) compared to their counterparts who were unemployed (out of work and looking for work). Mean literacy skill scores among teens and young adults who were out of the labor force were nearly identical between those who had worked in the prior year and those who not worked for more than a year but had some work experience but were 22 to 25 points (0.44–0.50 *SD*) higher, respectively, than those who said they had never worked. Just under 45 percent of 16- to 24-year-old youth who were out of the labor force at the time of the PIAAC survey reported that they never held a job (Table 19). The pattern for numeracy scores was similar (Appendix B).

Table 19: Percentage Distribution and Mean Scores on the PIAAC Literacy Scales of Out of the Labor Force Persons between the Ages of 16 and 24, 25 and 54, and 55 and 74, by the Time of Their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE	AGE 16-24	AGE 25-54	AGE 55-74
Percentage Distribution			
Employed in the Past 12 Months	37.4%(2.4)	20.4%(1.7)	10.6%(0.9)
Employed Longer Than 12 Months Ago	18.2%(1.9)	66.6%(2.2)	85.6%(1.2)
Never Employed	44.4%(2.2)	13.0%(1.6)	3.9%(0.7)
Mean Literacy Score			
Employed in the Past 12 Months	285 (3.4)	274 (5.2)	269 (4.0)
Employed Longer Than 12 Months Ago	282 (5.0)	257 (2.8)	246 (2.0)
Never Employed	260 (3.6)	208 (6.7)	‡
Differences in Mean Scores, Employed in the Past 12 Months MINUS:			
Employed Longer Than 12 Months Ago	2.5 (6.0)	17.0 (6.0)***	22.8 (4.4)***
Never Employed	24.8 (5.3)***	65.1 (7.2)***	‡

Statistical significance of differences in mean scores: *** significant at .01 level.

‡ Mean literacy and numeracy scores for 55- to 74-year-old old in "never employed" category were suppressed because sample cases did not meet the minimum threshold of 62.

NOTE: Differences in scores may not add due to rounding of mean scores.

Among prime-age persons, most of those who were not in the labor force at the time of the PIAAC survey reported some prior work experience. Twenty percent of prime-age workers who were out of the labor force had worked in the prior year with an additional 66.6 percent reporting that they too were employed in the past, but it was before the prior year (Table 19). Just 13 percent of prime-age workers who were out of the labor force at the time of the PIAAC survey reported that they had never been employed.

Prime-age persons who were out of the labor force but had recent work experience had much higher mean skills scores than those who had not worked for an extended period of time. The mean literacy score among of prime-age out-of-the-labor-force individuals who worked in the 12 months prior to the PIAAC survey was 274, which was 17 points (0.34 *SD*) higher than the mean score of those who worked before the 12-month period preceding the PIAAC survey, and 65 points (1.30 *SD*) higher than the mean literacy score of those who reported that they had never held a job (Table 19). Very similar findings were observed for these prime-age individuals on the numeracy proficiency measure (Appendix C).

Among older individuals who were out of the labor force at the time of the PIAAC survey, nearly 9 out of 10 had reported that their most recent employment was more than 12 months preceding the PIAAC survey or that they were never employed. The mean literacy and numeracy skill scores were considerably higher among the older out-of-the-labor-force individuals who had worked in the preceding 12 months than their counterparts with a longer gap since their last employment (more than 12 months). Among 55- to 74-year-old individuals who were out of the labor force at the time of the PIAAC survey but had worked in the prior year, the mean literacy score was 269: 23 points (0.46 *SD*) higher than the 246 mean

literacy score of their counterparts who had worked more than 12 months ago (Table 19). Similarly sized gaps on the mean numeracy score prevailed between these two groups of older individuals (Appendix D).

Regression analysis supports the descriptive findings. Among individuals who were not in the labor force at the time of the PIAAC survey, the likelihood of having been employed at some time in the past is expected to be 5.9 percentage points higher (significant at .01 level) for a one standard deviation increase in the literacy skill score and 7.7 percentage points higher (significant at .01 level) for a one standard deviation increase in the numeracy skill score (Appendix E; Tables E19 and E20).

Summary of Findings

This study examines the connection between skills and labor market outcomes over the entire working life as well as different stages of the working life of 16- to 74-year-old Americans. Our examination finds substantial and statistically significant differences in labor market outcomes between those with better literacy and numeracy skills relative to those with weaker skills. However, the relationship between foundational skills and measures of labor market success used in this paper differs considerably across the different stages of working life.

Teens and Young Adults

Foundational skills exert less influence on the immediate labor market outcomes of teens and young adults than among prime working-age and older individuals. Schooling is the primary life activity of most teens and young adults. The share of teens and young adults enrolled in high school or college reached a high of about 58 percent during 2010 and 2011 when the Great Recession had the worst adverse impact on teen and young adult labor markets. Since then, the share of the 16- to 24-year-old population that was enrolled in school has remained elevated, averaging 57 percent during 2017–2018.⁵¹ Almost all of those in school (92% plus) were either enrolled in full-time college programs or enrolled in high school.

A substantial majority (67%) of those aged 16 to 24 who are enrolled in high school or college mix work and school. Young people who are enrolled in school are much more likely to be employed in part-time jobs that serve a complementary function to their primary life activity of schooling. These individuals are often employed in occupations where skill requirements are minimal such as sales, service, and elementary occupations. These occupations are also characterized by part-time and part-year employment as well as lower hourly pay and higher

worker turnover. Thus, young people with stronger skills who are enrolled in school often work in lower skill occupations that more easily accommodate their primary focus of schooling.

About one in three students aged 16 to 24 did not participate in the labor market at the time of the PIAAC survey. A comparison of the literacy skill scores of students who were employed and those who were out of the labor force found no difference in mean skill scores. Thus, for young people enrolled in school, skills are not closely connected to their employment status since work plays a much more ancillary role in their lives compared to the role of work in the lives of prime-age and older individuals.

The impact of skills on labor force outcomes of nonenrolled young people is somewhat more similar to the relationship found among prime-age and older individuals. We found that mean literacy scores of employed teens and young adults who were not enrolled in school were somewhat higher than their counterparts who were out of the labor force. A large share of nonenrolled young people was still employed in the traditional teen and young adult labor market segment characterized by low skill requirements and low wages, although we did find employment of nonenrolled youth in associate professional and professional/managerial occupations where skills, wages, and hours of work are much different than those in the traditional teen and young adult labor market segments. The employment of out-of-school youth with higher levels of educational attainment and skill proficiency is concentrated in these professional and associate professional labor market segments.

Although overall labor force status outcomes of teens and young adults are not strongly connected to skills, we did find substantial and significant literacy and numeracy score advantages for those young people with work experience compared to those who never worked. More than one in five persons aged 16 to 24 reported they had never worked, and the literacy and, especially, numeracy skills of this group of young people were sharply below those who were currently employed (about 55% of the 16- to 24-year-old population). A substantial body of research suggests that those young people who have never worked have diminished life outcomes relative to those who have work experience. These findings suggest the need to explore the impact that lower skills may exert on the likelihood that a young person has no work experience.

Prime-Age Adults

The findings for prime-age persons whose primary life activity is most often related to the world of work reveal a close connection between labor force status and skills.⁵² Our analysis of PIAAC data for 25- to 54-year-old persons found very large positive and significant literacy and numeracy score differences between employed persons and those classified as unemployed as well as those who were out of the labor force at the time of the PIAAC

survey.⁵³ A pattern of large skill advantages for the employed relative to the unemployed and those not in the labor force were found across most of the demographic population groups included in our analysis except among Black, non-Hispanic prime-age persons. For most demographic groups of prime-age persons, we found large literacy and numeracy skill deficits among the unemployed. However, in the case of Black non-Hispanic persons, the skill score difference between employed and unemployed was quite small. This outlier finding is puzzling and merits further inquiry.

Our examination of the relationship between skills and labor force status of the prime-age population through the lens of educational attainment found large literacy and numeracy skills advantages for employed high school graduates and those with some college relative to their counterparts not in the labor force and somewhat smaller skill score differences between the employed and unemployed. Within both attainment groups, those with stronger skills were more likely to be employed.

Among college graduates, the difference in skill scores between the employed and the unemployed was quite large and significant. Unemployed college graduates were found to have much lower skills than their employed counterparts. This finding suggests that among prime-age persons with a bachelor's or higher degree, the risks of unemployment may be elevated for those with lower foundational skills. Interestingly, we find little difference between the skills of college graduates who were out of the labor force and those who were employed. Only a small fraction of college graduates did not participate in the labor market at the time of the PIAAC survey, and sample size limitations preclude much additional analysis of this population that might shed some light on this unexpected result.

A strong connection exists between most recent work experience and literacy and numeracy skills. Prime-age workers who had worked recently had much higher literacy and numeracy skills than those who had not worked in the prior year. Related to this result we found that prime-age workers who were employed during at least half of the potential years of their working lives had substantially higher literacy and numeracy skills scores compared to those with employment during less than half of their potential working years. These findings suggest that those with low skills are much less engaged in employment over their working lives than those with higher literacy and numeracy proficiencies.

Occupational access was closely connected to literacy and numeracy skills for prime-age workers. More than one in three prime-age workers were employed in professional and managerial occupations that are characterized by several desirable job characteristics related to employment stability, upward mobility, earnings and benefits. We found very large literacy and numeracy skill score deficits among those who worked in occupations outside of the professional and managerial fields. Access to the best set of jobs in the American economy is closely associated with literacy and numeracy proficiency for prime-age workers.

Overall, we found that 4.8 percent of the prime-age population was unemployed, that is, out of work but actively engaged in a job search and available to go to work right away. The risk of unemployment was closely connected to both literacy and numeracy skills with the average skills of employed persons sharply above those who were unemployed. Just under one-half (45%) of prime-age unemployed persons were out of work for a very extended time period. Those who were long-term unemployed (more than 6 months) had mean literacy and numeracy scores that were substantially below the score achieved among those who were out of work for a shorter duration. This finding suggests the possibility of a more successful job search for unemployed prime-age persons with better skills.

Older Adults

Older workers are playing an increasingly important role in supplying labor in the American job market as the pace of overall labor force growth has slowed. Projected slow labor force growth among prime-age workers and no labor force growth among teens and young adults is expected to be combined with rapid growth in the size of the older workers' labor force. Indeed, older workers are expected to account for nearly two-thirds of the net increase in the size of the nation's labor force in the next decade.

Older workers who are employed have sharply higher literacy and numeracy skills compared to those who are out of the labor force. The size of these differences persisted across all demographic groups and by level of educational attainment. Better-educated older workers with higher skills were much more likely to be employed than older workers with fewer years of schooling and lower skills. Lower skills and lower attainment are both associated with a much lower employment rate for older persons. Closely connected to this we find that those older individuals who had not worked in the prior year had sharply lower literacy and numeracy skills than those employed at the time of the PIAAC survey.

Older workers are more likely to work part-time than prime-age workers, but we found no differences in literacy and numeracy skills between full-time and part-time employment for these two groups. Employer-based training, even for older workers, is positively associated with both literacy and numeracy skills; that is, literacy and numeracy skills among those who recently participated in employer-provided training were substantially higher than these skills among those who did not participate in such training. Similar to prime-age workers, we found large concentrations of older workers employed in professional and managerial occupations (35%) as well as in technical and associated professional fields (21%). The literacy and numeracy scores of those employed in the professional and managerial fields are sharply higher than those employed in other occupations, especially in clerical and blue-collar, sales and service, and elementary occupations.

The incidence of unemployment among older persons was quite low with just 3 percent reporting that they were out of work, engaged in a job search, and available to work. About one-half of older persons who were unemployed reported that they had not worked in the prior year, although not all these individuals considered themselves as active job seekers for that length of time. These unemployed older persons who had not worked in the prior year had much lower literacy and numeracy skill scores than those with recent work experience. Similarly, we found that even among older persons who were out of the labor force, those with recent work experience and had much higher skills than those who had not worked for at least a year. For older Americans, low skills are closely associated with extended disconnection from work.

Implications

A fundamental feature of the education reform movement in the United States is that it was motivated by the idea that strong literacy and numeracy proficiencies are essential to achieving success in the labor market. Employers, organized labor, and elected officials all supported education reforms initially at the state level beginning in the 1980s and later on at the federal level with the enactment of the federal No Child Left Behind Act, more recently the Every Student Succeeds Act. This support was based on the recognition that foundational skills—reading, writing, and mathematics—were sine qua non for success in the American labor market and more broadly in society.

The seminal 1983 report, *A Nation at Risk*, raised the alarm about an educational system that delivered mediocre results and served as the springboard for national concern about an elementary and secondary education system that struggled to develop the foundational skills required to succeed as adults.⁵⁴ *A Nation at Risk* explored a variety of national and international skill assessments that found deteriorating foundational skills among American youth, widespread "functional illiteracy" among adults, large ability/achievement gaps among school-age children, widespread complaints by business and military leaders about foundational skill deficient applicants, and students who were less capable in a world that demanded greater skills to effectively compete in "commerce, industry, science and technological innovation."

The lasting impact of *A Nation at Risk* is thought to be creating the conditions for skills testing and accountability for student foundational skills development.⁵⁵ However, in recent years, testing and accountability have played an increasingly diminished role in public education. In the last decade, many states have opted to focus much more on measures of seat time, ignoring skills development when judging student and school performance. A substantial number of states implemented high stakes testing (tests that are used to make decisions about both student and school) policies. The Every Student Succeeds Act placed the burden of bolstering student skills on state government, but the result of this policy shift has been a

retreat from the focus on foundational skills development as a substantial number of states have abandoned high stakes literacy and numeracy testing of public elementary and secondary students and, in some instances, any foundational skills testing at all. Over the past decade, the number of states with requirements of some type for skills testing for graduation fell from 27 to 11 by 2019. Even among states like Massachusetts where tests are still required, "alternative pathways" to a diploma have been put in place for those unable to pass the skills test. In still other states, the test requirement has been repeatedly pushed back to years into the future.⁵⁶

At the post-secondary level, foundational skills testing has experienced a sharp fall-off. Among bachelor's degree granting institutions, two-thirds have opted to become either ACT®/SAT® test-optional or test-blind for students seeking admission during the 2021–2022 applications period.⁵⁷ The reduced requirement for ACT®/SAT® testing to be considered for admission is largely the result of the pandemic crisis, yet there are some reasons to believe that colleges that do not require a test score for admission for the incoming class of the Fall of 2022 may maintain this policy in the future.⁵⁸

The diminishing role of skills and skill measurement in the American educational system is concerning. Economists Eric Hanushek, Jens Ruhose, and Ludger Woessmann observed the following:

“

*...[M]ost research on the economic impact of schooling has focused on the number of years students remain in the educational system. This metric is not an adequate measure of student achievement and thus not a reliable indicator of economic impacts: it hardly matters how long one sits at a school desk if one learns little while occupying the seat...*⁵⁹

”

Earlier research using PIAAC data to examine the impact of skills on the earnings of American workers revealed that literacy and numeracy proficiencies exert a powerful impact on the earnings of Americans. Importantly these studies suggested that the great equalizing force in American labor markets in the United States is literacy and numeracy skills. The process of creating a more equitable distribution of earnings for adults means creating a more equitable distribution of literacy and numeracy for young people.

This paper explores the connection between skills and the labor market outside the more traditional focus on earnings, yet its findings also reveal a connection between skills and more basic labor market outcomes including employment, unemployment, or even the likelihood of participating in the job market. Our findings support the view that unemployment is not simply a macroeconomic problem solved by job creation. Substantial skills gaps suggest that skills mismatches play a critical role in creating unemployment and

are consistent with findings of an outward shift in the Beveridge curve observed in the post Great Recession period, which means that barriers between unemployed workers and vacant jobs have become stronger in recent years.⁶⁰

An outward shift of the Beveridge curve suggests rising structural unemployment; that is, the mismatch between unemployed workers and available jobs has worsened. Our findings suggest a key element underlying this trend is literacy and numeracy skill gaps. Workforce programs that focus on reducing unemployment need to better respond to the foundational skills gap as structural unemployment worsens.

Consistent with the idea of substantial structural unemployment problems in the United States during the past decade, our analysis of the PIAAC data reveal substantially lower skills among individuals who have been out of work for a long time. Unemployed individuals in the prime-age and older age groups who were out of work for a year or more had literacy and numeracy skills scores that were considerably lower than their counterparts with more recent employment. Long-term unemployed individuals are sometimes thought of as "dislocated workers" who, because of structural changes in the job content of the economy, lost their jobs with little prospect of a return to work in the same industry or occupation. Substantial amounts of federal resources have been devoted to reemployment efforts for dislocated workers, but our findings suggest that part of the reemployment problem may be lower skills, suggesting that remedial literacy and numeracy elements should be included in these reemployment efforts.

A fundamental problem confronting the nation in the coming years is exceptionally slow growth in the labor force, which means a slow growth in the nation's productive potential. Projected slow labor force growth in the United States in the coming years means the pace of economic growth, and employment and income growth (and living standards), will also slow down.⁶¹

Policies to bolster labor force participation of adults are becoming increasingly important as labor supply constraints reduce the ability of American firms to grow and prosper. In addition to slow economic growth, the impact of slow labor force growth can also be rising inflation rates from the rise in worker costs as labor becomes relatively scarce. Bolstering the skills of U.S. residents who out of work (both the unemployed and not in the labor force) can make these individuals more employable. Tying adult basic education programs in workforce development efforts with strong job placement capabilities could help increase labor force participation in a full employment economy.

A second strategy that is often used by countries around the world (including the United States) is to expand immigration. Linking immigration policy to skills may be an important alternative to expanding the size of the U.S. labor force in the future. The American higher education system has become the primary source of high-skill, foreign-born labor supply in

the nation. Easing the transition from "foreign student" to "permanent resident American worker" would likely serve as an important method of increasing the size of the U.S. labor force, particularly at the higher end of the literacy and numeracy distribution where skill shortages are likely the most severe.⁶²

Employment stability is a fundamental work value of Americans. An unstable work history is closely associated with lower incomes and poverty, and adults with long-term disconnection from work are much more likely to suffer from income inadequacy.⁶³ Our analysis of the PIAAC data found a very strong connection between the duration of joblessness and mean literacy and numeracy scores. A very important policy implication of our findings centers on the measure of disconnected youth. Our analysis provides strong support to the claim of Sands and Goodman⁶⁴ that measures used to define the disconnected youth population are inadequate and result in a fundamental misunderstanding of the solutions to the developmental problems confronting teens and young adults. Policy measures targeted toward disconnected youth frequently miss the central role that foundational skills play in generating positive economic, social, and civic outcomes for young people. The concept and measure of disconnected youth need to be recast to account for the role that foundational skills play in promoting more positive outcomes for young people.⁶⁵

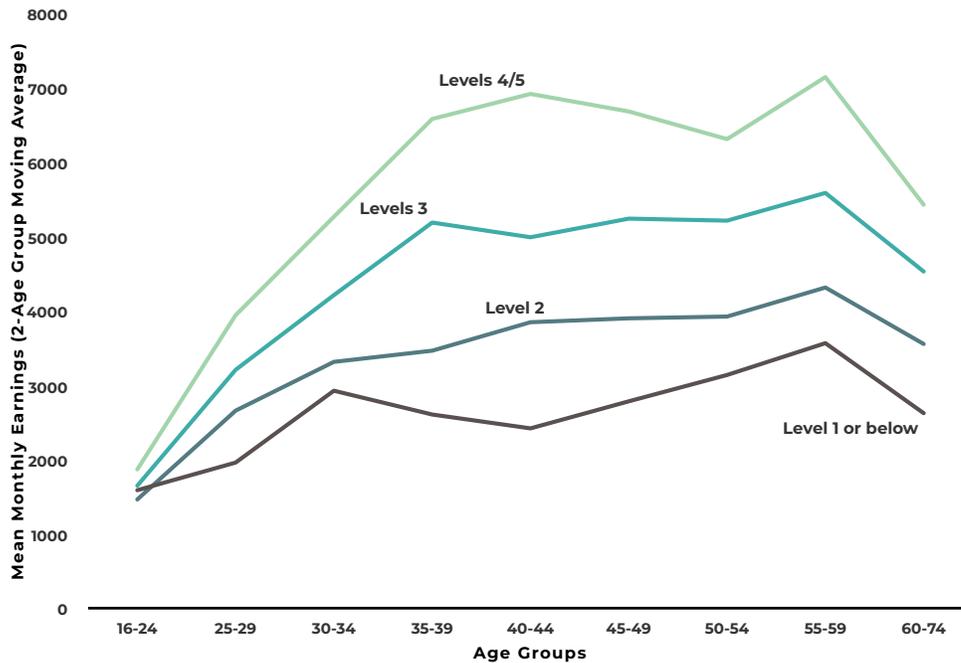
Further, the skill scores of prime-age and older individuals who had not worked for a year or more were sharply below those with work experience in the prior year. This finding suggests that an important ingredient to attaining employment stability (and perhaps reducing the risk of poverty) is to increase foundational skills of those with long-term labor market disconnection.⁶⁶ In addition, welfare-to-work programs that now emphasize a work-first strategy should be modified to include a skills development component to bolster the likelihood of participants to find more stable employment.

In recent years more attention has been focused on wealth gaps across demographic groups in the United States.⁶⁷ Personal wealth is simply a measure of the value of assets owned by an individual and represents accumulated savings (or alternatively, deferred spending of income). The ability to accrue wealth is associated with stable employment and earnings over an extended period because "[t]hose with lower incomes have flatter (lifetime) income patterns, which make savings and paying down debt more difficult."⁶⁸ More intensive employment over the working lifetime, *ceteris paribus*, raises the potential to save and accumulate wealth.

Our analysis of the PIAAC data files found that individuals who were able to work with the greatest intensity over their years of potential employment had skills that were much higher than their counterparts who worked with less intensity. The age/earnings/literacy profile provided in Figure 7 makes it quite clear that employed persons with higher skill levels have substantially greater lifetime earnings and thus a greater potential to accumulate wealth than

their lower skilled counterparts. Efforts to narrow wealth gaps in the United States over time must have literacy and numeracy skills development at the core, beginning with public school and continuing with elements of post-secondary education and workforce development programs.

Figure 7: Age-Earnings Profile of Employed Persons between the Ages of 16 and 74 by PIAAC Literacy Level, U.S., 2012-14-17



Employers in the United States engage in extensive formal and informal on-the-job training activities of their workers. An estimated \$82 billion was spent on worker training by private sector employers during 2020.⁶⁹ The PIAAC study found that those who participated in firm-supported training had substantial higher literacy and numeracy skills than those who did not participate in training, suggesting employers are able to identify and invest in higher-skilled workers. Payoffs to on-the-job training are substantial, as lower skilled workers may experience slower wage growth as their access to employer-provided training is diminished.⁷⁰ Government-sponsored incumbent worker training programs should focus more heavily on providing foundational or "general" literacy and numeracy skills (that are transferable across most industries and occupations) to help prepare these workers for participation in employer-sponsored training that is often more focused on occupational and firm-specific skills.

Most studies of the relationship between human capital and the labor market have focused on the earnings impacts of the investment in individual abilities. Our earlier papers examined the impact of skills on earnings in a variety of employment situations and found that in each case literacy and numeracy exerted a strong influence of the earnings of workers—even in

part-time labor markets. The analysis in this paper suggests that many other labor market outcomes, aside from earnings, are influenced by literacy and numeracy skills. As public elementary and secondary educational systems drift away from a focus on skills development and accountability for that development, and as workforce development programs adopt a work-first strategy, it is important to understand the labor market consequences of failing to develop skills of children and young people as well as adults left behind. The evidence from PIAAC overwhelmingly suggests that the American labor market places a high value on skills in a multitude of ways and gaps in labor market outcomes across groups in society are associated with literacy and numeracy gaps. Literacy and numeracy proficiencies are essential for success in the American labor market, and as a nation, we ignore their essential value at great peril.

Appendix A: Measures of Labor Market Outcomes

This appendix presents a description of labor market outcome concepts and definitions employed in our examination of the connections between literacy and numeracy proficiencies and the labor market outcomes of the working-age population in the United States. Using information from the PIAAC background questionnaire, we have identified a number of labor market outcome measures that pertain to the total working-age population. In addition, we have identified separate sets of labor market outcomes that pertain to those who were employed, unemployed, or out of the labor force at the time of the PIAAC survey. Descriptions of these labor market outcome measures for each of these populations are presented below.

Labor Market Outcomes of the Total Working-Age Population

Labor Force Status

Questions on the PIAAC background survey that pertain to labor market activities and outcomes of respondents begin with a series of questions to ascertain the labor force status of respondents at the time of the PIAAC survey (during the week prior to the administration of the survey). Based on the responses to these questions, working-age respondents are classified into three mutually exclusive labor force status groups: employed, unemployed, and those who are out of the labor force; that is, they are neither employed nor unemployed.

- Employed individuals are those who performed paid work (either as a payroll worker or in self-employment) or engaged in unpaid work for a family business at the time of the PIAAC survey. Individuals who were not employed at the time of the PIAAC survey were classified as either unemployed or out of the labor force.
- Unemployed individuals are those who were not employed at the time of the PIAAC survey but were actively seeking employment by engaging in one or more job search activities and were willing to take a job if one became available at the time of the PIAAC survey. Employed and unemployed individuals are considered members of the active labor force; that is, they are willing and able to supply their labor services in the labor market.
- Individuals who are out of the labor force are those who were not employed and not actively seeking employment at the time of the PIAAC survey.

Employment History

The PIAAC survey also gathers information regarding the employment history of all working-age respondents regardless of their labor force status at the time of the survey administration. Based on the reported employment history, each respondent in the PIAAC data file is classified into the following four mutually exclusive groups:

- currently employed
- employed during the past 12 months
- employed before the past 12 months
- never employed

This measure of employment history provides insights into the degree of recent connection to employment among PIAAC respondents. Employment is a path-dependent activity, and individuals who have a strong history of employment are more likely to be employed at any given point in time than their counterparts with long gaps in employment or those who have never been employed.⁷¹ Individuals who have had stronger recent connections to employment are much less likely to be in poverty and deep poverty and less likely to participate in means-tested public benefit transfer programs than their counterparts with a weak recent connection to employment.⁷² Those who have a strong history of employment are advantaged in a wide variety of ways including improved accumulation of wealth and reduced risks of poverty and its attendant negative social consequences.⁷³

A second measure of employment history is captured with a question on the PIAAC survey about years of work experience. Respondents were asked to provide the total number of years in which they were employed for six months or more in a full-time or a part-time position. Because our analysis includes individuals in a wide age range (between 16 and 74), the actual number of years of work experience is not comparable since differences in age between individuals could account for all or part of the difference in their years of work experience. In order to make the measure of work experience comparable across individuals of different ages, we have used the years of actual work experience provided in the PIAAC data file along with potential years of work experience (age minus 16)⁷⁴ to compute a ratio of actual to potential years of work experience that has a range of 0 to 1. This measure creates an age-adjusted measure of work experience. For example, 10 years of work experience would yield an actual to potential work experience ratio of 0.25 for a 56-year-old (10/40 years), 0.33 for a 46-year-old (10/30 years), and 0.5 for a 36-year-old (10/20 years). Without age adjustment, all three individuals would appear have the same level of work experience even though they have each amassed this work experience over different spans of time.

Labor Market Outcomes of Employed Persons

Not all employed individuals have the same degree of success, just as not all unemployed persons face the same degree of difficulty in finding a job. Therefore, we have examined links between the skills of workers and their employment-related outcomes. Our previous papers in this series have already revealed sharp variations in the earnings of employed workers and

the strong links between skills and earnings of workers. In this paper, we examine the four work-related labor market outcomes and their relationship with skills of workers: intensity of employment, employer-provided training, and occupation.

Intensity of Employment

We measure employment intensity by the number of hours that workers are employed during a typical week. Based on their weekly hours of employment, we have classified workers into two groups: those who work 35-plus hours per week and their counterparts who worked less than 35 hours per week. The threshold of 35 hours per week defines full-time employment; workers employed for 35-plus hours per week are considered to be employed in full-time positions and those who work less than 35 hours per week are considered to work in part-time positions. Although many workers who work in part-time positions choose to do so (voluntary part-time employed), part-time employment is more common in entry-level positions that typically employ younger workers with limited work experience and adults with lower levels of skills. In contrast, full-time positions are typically found in jobs that require higher levels of human capital—skills and education as well as work experience.

Our paper on the earnings of part-time workers revealed a sizeable hourly wage gap between full-time and part-time workers (\$23.01 per hour among full-time workers versus \$15.48 per hour among part-time workers) that we attribute to many part-time workers concentrated in occupations characterized by low hourly wage rates, low literacy and numeracy skills scores, and high turnover rates: positions where workers are readily substitutable and training costs are low.⁷⁵ In that same paper, we also found that while certain segments of the part-time labor market do employ high-skilled workers (with commensurately high hourly wages), the overall mean literacy and numeracy scores of part-time workers overall were considerably lower than those of full-time workers. In this paper, we present full-time and part-time work status as a labor market outcome of employed workers and examine connections between the skills of workers and their full-time/part-time employment status at the time of the PIAAC survey.

Employer-Provided Training

The PIAAC questionnaire asks respondents a series of questions that are focused on their education and training experiences. One of the questions pertains to employer-provided training; specifically, workers were asked if they had attended any organized on-the-job training or training by supervisors or coworkers during the 12 months preceding the PIAAC survey.⁷⁶ Answers to this question are in the form of "Yes" or "No" with a "Yes" response representing workers who have received employer-provided training in the preceding 12 months and a "No" response representing their counterparts who did not receive such training. Workers with higher levels of human capital are more likely to pursue and receive

training;⁷⁷ a phenomenon that is aptly described by James Heckman as "[s]kills begets skills and capabilities foster future capabilities."⁷⁸ Individuals with higher levels of education are more likely to invest in additional education and training and see a greater need for ongoing training.⁷⁹ Furthermore, the productivity associated with job training is higher among workers who already have high levels of human capital. Human capital is found to be an important predictor of additional education and training and lifelong learning; a phenomenon that some have labeled a *Matthew effect*: individuals who have already acquired high levels of human capital are more likely to engage in learning and training activities that will further enhance their human capital.⁸⁰

Occupation

Occupation is an important measure of job quality. Occupation embodies the distinct characteristics of work performed by incumbents in a field and is closely linked to the human capital of workers including their skills, education, knowledge, and abilities. PIAAC survey respondents were asked to name the occupational titles of their job, and these titles were assigned the ISCO codes developed by the International Labor Organization.⁸¹ Using the highest level of aggregation in the ISCO-08 code hierarchy of five occupational groups, we have examined differences in the literacy and numeracy skills of U.S. workers classified into five groups based on the occupation in which they were employed at the time of the PIAAC survey.

Access to employment in high level occupations is expected to be closely connected to human capital of workers, particularly their skills. Our paper on skills and earnings of college graduates found that even among workers who have a bachelor's or higher college degree, access to college level occupations was closely related to skills. College level occupations are occupations that utilize skills, knowledge, and abilities that are typically developed with a college education. College graduates with lower skills were more likely to work in non-college-level occupations than their peers with higher skills. Only two-thirds of college graduate workers with literacy skills at or below level 2 were employed in college level occupations compared to 76 percent among those with level 3 skills and 83 percent among those with level 4 or 5 skills.⁸²

Labor Market Outcomes of Unemployed Persons

Unemployed persons represent working-age individuals who were not employed at the time of the PIAAC survey but were engaged in an active job search and were willing to take a job if one became available at that time. The PIAAC data files allow us to examine the connection between the literacy and numeracy skills of those classified as unemployed and the following two labor market outcomes: the duration of their spell of unemployment at the time of the PIAAC survey and their employment history; that is, the length of time since their last job.

Unemployment Duration

Respondents who were unemployed at the time of the PIAAC survey were asked about the total number of months that they had been unemployed (duration of unemployment). In our examination of the link between skills and unemployment durations, we have classified all unemployed individuals into three groups based on the number of months that they were unemployed at the time of the PIAAC survey: 0 to 1 month representing short-term unemployed, 2 to 5 months representing medium-term unemployed, and 6 months or more representing long-term unemployed.

Employment History of Unemployed Persons

The PIAAC survey gathers information regarding the employment history of all working-age respondents. Unemployed individuals are asked if they were employed during the past 12 months (preceding the PIAAC survey), employed more than 12 months ago, or never employed. Using this measure allows insights into the prior labor market attachment of individuals who were unemployed at the time of the PIAAC survey.

As noted earlier, employment is a path-dependent activity, and individuals who have a strong history of employment are more likely to be employed at any given point in time than their counterparts with long gaps in employment or those who have never been employed. Therefore, unemployed individuals with a weak employment history are much more likely to face problems in finding a job than their counterparts with a strong history of employment. The link between skills and employment history of unemployed individuals is assessed by examining differences between the skills of the following three groups of unemployed individuals: those who were employed during the past 12 months (preceding the PIAAC survey), those who were employed more than 12 months ago, and those who were never employed.

Labor Market Outcomes of Persons Out of the Labor Force

Individuals who were out of the labor force at the time of the PIAAC survey were neither employed nor unemployed. These individuals were not participating in the labor market at the time of the PIAAC survey. Our examination of the labor market outcomes for this group includes just one outcome: their employment history.

Employment History of Persons Out of the Labor Force

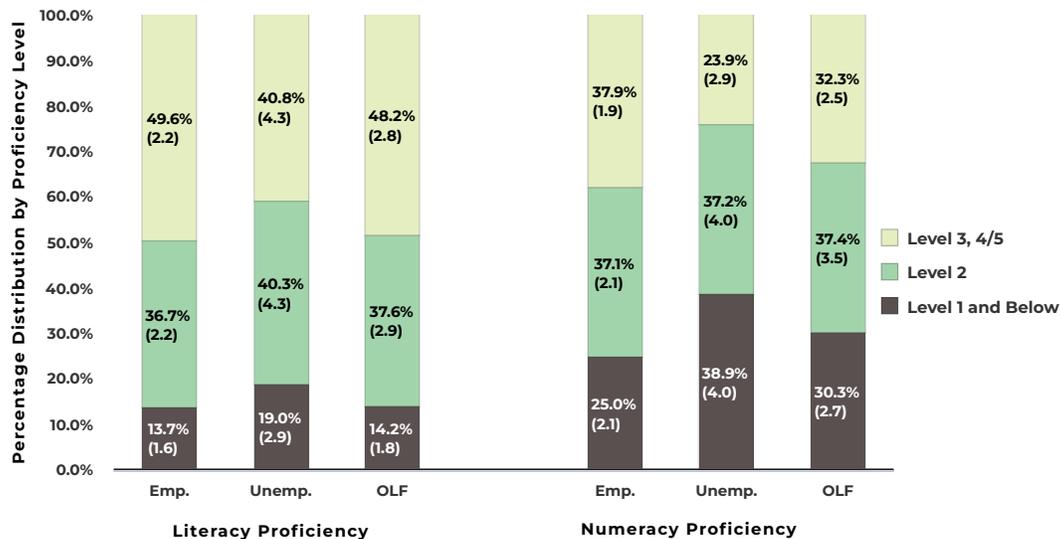
As is true for unemployed individuals, persons who were out of the labor force at the time of the PIAAC survey were classified into three groups: those who were employed during the past 12 months (preceding the PIAAC survey), those who were employed more than 12 months

preceding the PIAAC survey, and those who were never employed. These groups allowed us to study the connection between skills and the employment history of individuals who were out of the labor force at the time of the PIAAC survey.

Appendix B: Skills and Labor Market Outcomes of the 16- to 24-Year-Old Population

Total 16- to 24-Year-Old Population

Figure B1: Percentage of 16- to 24-Year-Old Individuals at Each Level of the PIAAC Literacy and Numeracy Scales, by their Labor Force Status at the Time of the PIAAC Survey (Employed, Unemployed, or Out of the Labor Force), U.S., 2012-14-17 (Standard Errors in Parentheses)



Emp. = employed; Unemp. = unemployed; OLF = out of the labor force.

Table B1: Percentage Distribution of the 16- to 24-Year-Old Population in the U.S. at Each Level of the PIAAC Literacy and Numeracy Scales, 2012-14-17 (Standard Errors in Parentheses)

LEVEL OF PROFICIENCY	LITERACY	NUMERACY
Level 1 or Below	14.4% (1.1%)	27.8% (1.6%)
Level 2	37.3% (1.7%)	37.2% (1.9%)
Level 3	37.6% (1.6%)	26.9% (1.5%)
Level 4/5	10.8% (1.0%)	8.1% (0.8%)

Table B2: Mean Scores on the PIAAC Literacy Scale of 16- to 24-Year-Old Individuals by their Labor Force Status at the Time of the PIAAC Survey, by Demographic Characteristics U.S., 2012-14-17 (Standard Errors in Parentheses)

DEMOGRAPHIC CHARACTERISTICS	MEAN SCORES			DIFFERENCES IN MEAN SCORES	
	EMPLOYED	UNEMPLOYED	OUT OF THE LABOR FORCE	EMPLOYED MINUS UNEMPLOYED	EMPLOYED MINUS OUT OF THE LABOR FORCE
All	274 (1.8)	265 (3.2)	274 (2.1)	8.2 (3.9)**	0.5 (2.9)
Gender					
Male	270 (2.6)	264 (4.9)	276 (3.4)	5.6 (5.5)	-5.7 (4.4)
Female	277 (2.1)	267 (4.2)	270 (2.7)	10.8 (4.8)**	7.1 (3.3)**
Race-Ethnicity					
White, non-Hispanic	283 (2.1)	277 (3.9)	289 (3.5)	6.4 (4.4)	-5.4 (4.0)
Black, non-Hispanic	252 (4.7)	248 (6.6)	245 (5.0)	4.1 (8.3)	6.6 (7.3)
Hispanic	255 (4.2)	263 (7.8)	257 (3.6)	-7.9 (8.2)	-1.6 (5.8)
Nativity Status					
Native-Born	276 (1.8)	266 (3.3)	275 (2.4)	9.4 (3.8)***	0.5 (3.1)
Foreign-Born	250 (6.3)	250 (12.0)	256 (7.7)	0.6 (12.7)	-5.7 (10.4)
Disability Status					
With Disabilities	261 (2.7)	259 (6.5)	253 (6.5)	2.6 (6.8)	7.9 (7.2)
Without Disabilities	276 (2.0)	268 (4.0)	278 (2.4)	8.1 (4.5)	-1.4 (3.2)

Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.
NOTE: Differences in scores may not add due to rounding of mean scores.

Table B3: Mean Scores on the PIAAC Literacy Scale of 16- to 24-Year-Old Individuals by their Labor Force Status at the Time of the PIAAC Survey, by Educational Attainment and School Enrollment Status, U.S., 2012-14-17 (Standard Errors in Parentheses)

EDUCATIONAL ATTAINMENT AND SCHOOL ENROLLMENT STATUS	MEAN SCORES			DIFFERENCES IN MEAN SCORES	
	EMPLOYED	UNEMPLOYED	OUT OF THE LABOR FORCE	EMPLOYED MINUS UNEMPLOYED	EMPLOYED MINUS OUT OF THE LABOR FORCE
All	274 (1.8)	265 (3.2)	274 (2.1)	8.2 (3.9)**	0.5 (2.9)
Educational Attainment					
Less Than High School	254 (3.4)	255 (5.0)	261 (3.2)	-1.5 (6.0)	-7.5 (5.4)
HS Diploma	271 (2.3)	262 (3.7)	279 (3.7)	8.6 (4.3)**	-8.4 (4.3)**
Some College, Certificate, Associate's	277 (3.1)	‡	‡	‡	‡
Bachelor's or Higher Degree	304 (3.4)	‡	‡	‡	‡
School Enrollment Status					
Enrolled	277 (2.4)	269 (4.2)	276 (2.4)	7.5 (5.2)	0.6 (3.6)
Not Enrolled	270 (2.3)	260 (4.6)	263 (4.2)	10.5 (5.3)**	6.6 (4.7)

Statistical significance of differences in mean scores: ** significant at .05 level.
‡ Findings for these groups are not published due to insufficient sample size.
NOTE: Differences in scores may not add due to rounding of mean scores.

Table B4: Mean Scores on the PIAAC Literacy and Numeracy Scales of 16- to 24-Year-Old Individuals, by the Timing of their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Currently Employed	274 (1.8)	259 (2.0)	63.7%
Employed in Past 12 Months	280 (2.9)	263 (3.2)	15.4%
Employed Longer Than 12 Months Ago	275 (4.4)	255 (4.8)	7.0%
Never Employed	259 (3.3)	229 (3.1)	13.9%
Differences in Mean Scores, Currently employed MINUS:			
Employed in Past 12 Months	-6.2 (3.4)	-4.4 (3.4)	—
Employed Longer Than 12 Months Ago	-1.4 (4.8)	3.6 (5.1)	—
Never Employed	14.7 (4.1)***	29.9 (4.1)***	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Employed 16- to 24-Year-Old Population

Table B5: Mean Scores on the PIAAC Literacy and Numeracy Scales of 16- to 24-Year-Old Employed Persons by the Occupation in Which They Were Employed, U.S., 2012-14-17 (Standard Errors in Parentheses)

MAJOR OCCUPATIONAL GROUP	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Professional & Managerial	284 (5.0)	273 (5.6)	13.7%
Technical & Associate Professional	285 (5.0)	272 (5.2)	12.8%
Clerical & Blue-collar	276 (3.5)	263 (4.1)	20.0%
Sales & Service	272 (2.7)	254 (3.1)	35.0%
Elementary Occupations	258 (4.8)	245 (4.5)	18.4%
Differences in Mean Scores, Professional & Managerial MINUS:			
Technical & Associate Professional	-1.4 (7.0)	1.1 (7.4)	—
Clerical & Blue-collar	7.7 (6.3)	10.2 (7.6)	—
Sales & Service	11.6 (6.0)**	19.3 (6.8)***	—
Elementary Occupations	25.5 (7.1)***	28.8 (6.9)***	—

Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Unemployed 16- to 24-Year-Old Population

Table B6: Mean Scores on the PIAAC Literacy and Numeracy Scales of 16- to 24-Year-Old Unemployed Persons by the Time of Their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Employed in the Past 12 Months	272 (4.6)	252 (4.3)	55.6%
Employed Longer Than 12 Months ago	260 (6.6)	236 (7.8)	21.7%
Never Employed	255 (5.5)	220 (6.3)	22.6%
Differences in Mean Scores, Employed in the past 12 months MINUS:			
Employed Longer Than 12 Months ago	11.4 (7.8)	15.3 (8.6)	—
Never Employed	16.8 (7.4)**	31.2 (7.4)***	—

Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Out of the Labor Force 16- to 24-Year-Old Population

Table B7: Mean Scores on the PIAAC Literacy and Numeracy Scales of 16- to 24-Year-Old Persons Who Were Out of the Labor Force by the Time of Their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Employment in the Past 12 Months	285 (3.4)	270 (4.4)	37.4%
Employed Longer Than 12 Months Ago	282 (5.0)	264 (5.8)	18.2%
Never Employed	260 (3.6)	231 (3.5)	44.4%
Differences in Mean Scores, Employed in the Past 12 Months MINUS:			
Employed Longer Than 12 Months Ago	2.5 (6.0)	6.0 (7.4)	—
Never Employed	24.8 (5.3)***	39.6 (5.4)***	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Disconnected Youth and Skills

An important policy implication of our findings centers on the population of disconnected youth. The ages of 16 to 24 can be characterized as a period of transition from childhood, when individuals are mostly dependent on the choices made by others, to adulthood, when individuals become increasingly responsible for their own choices and when these choices are closely associated with their current and future well-being. Working-age teens and young adults are very often engaged in human capital investment activities that have the potential to exert a strong influence on the alternative life pathways available to them.

The interrelationship between employment and enrollment of the 16- to 24-year-old population has become a prominent interest in the education and employment policy realm, with a particular focus on those young people who are not engaged in either work or school—the disconnected youth population.⁸³ The late teen and young adult years are times when most individuals are intensively investing in their development of human capital abilities that are valued in the labor market. Human capital theory posits that the two primary ways that individuals develop their abilities are through formal schooling and through work experience, and a large body of evidence exists that connects employment and earnings gains to human capital investment as measured by schooling and work experience. Yet disconnected youth are not engaged in these human capital development activities, creating a gulf in ability development between disconnected youth and youth engaged in school or work or both. Disconnected youth have much lower levels of educational attainment and are especially likely to not earn a high school diploma. About one-half of disconnected youth have either never worked or not worked anytime within the previous five years. In contrast, more than 75 percent of connected youth have worked within the prior 12 months.⁸⁴

The October supplement to the Current Population Survey (CPS) examined the post high school activities of new high school graduates in the fall term following their high school graduation. It also included a broader study of the labor force and school enrollment status of the entire 16- to 24-year-old population in the nation. Using the standard policy measure of youth disconnection, the CPS October supplement found that during the 2012 to 2017 period, the mean number of young people who were neither employed nor enrolled in school was 5.135 million, yielding a disconnection or "opportunity youth" share of 13.4 percent.⁸⁵

Our analysis of the PIAAC data from the 2012-14-17 U.S. survey finds a lower incidence of youth disconnection than the CPS during this period. While the CPS estimates indicated that 13.4 percent of teens and young adults were neither in school or working, the PIAAC survey found that 10.5 percent of these youth were disconnected from both school and employment. The lower PIAAC disconnection rate is the result of a much higher employment rate of the 16- to 24-year-old population found in the PIAAC study relative to the CPS.⁸⁶

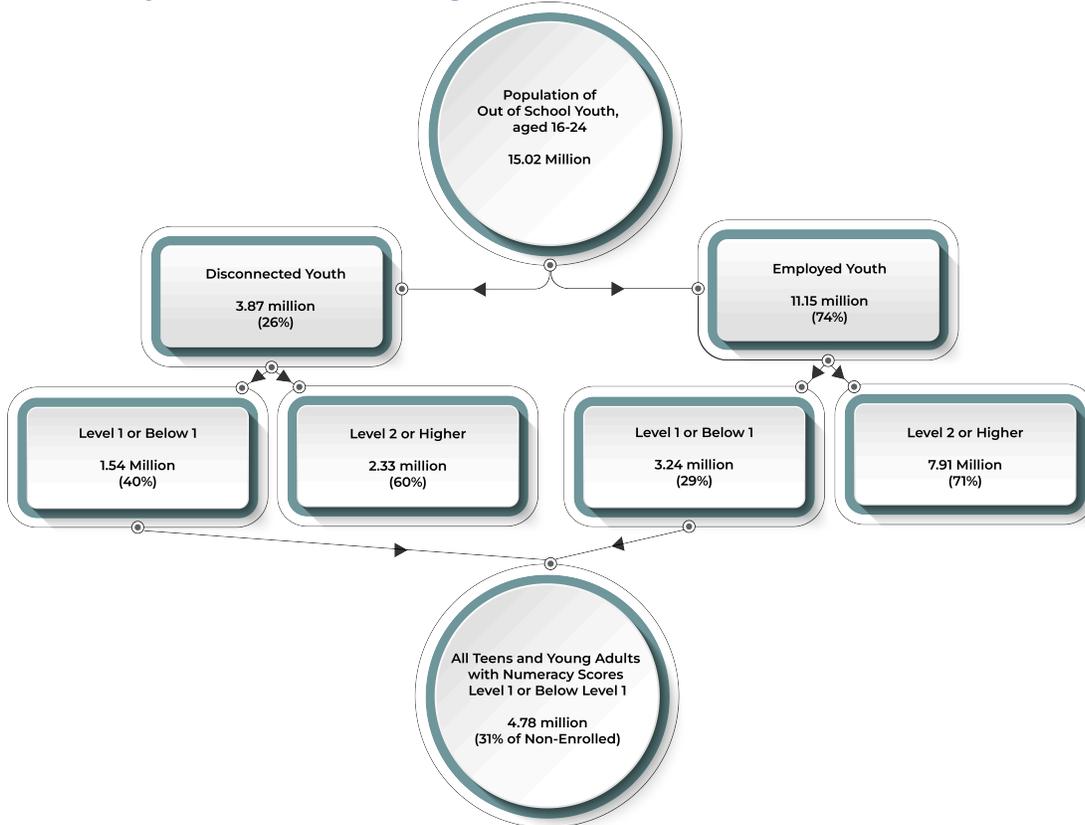
In Figure B2, we examine the interrelationship between skills and youth disconnection by connecting PIAAC numeracy skill levels for out-of-school youth aged 16 to 24 with their labor force status at the time of the PIAAC survey. A total of just over 15 million teens and young adults were not enrolled in school on average during the 2012-14-17 period.

The PIAAC survey found a disconnected youth population (those out of school who were either unemployed or out of the labor force) of 3.87 million individuals, equal to about one-quarter of the total out-of-school youth population. The remaining three-quarters of out-of-school youth were employed at the time of the 2012-14-17 PIAAC survey.

An examination of the skill scores of disconnected teens and young adults reveals that about 1.5 million, or 40 percent, of disconnected youth scored at only level 1 or below level 1 on the PIAAC numeracy scale. Ironically, we find that the majority of out of school youth with very low numeracy skills are not classified as disconnected youth. Indeed, we find that 3.24 million out-of-school teens and young adults were employed (not disconnected) but had very low numeracy skills (Figure B2).

Skill scores at level 1 or below level 1 suggest potentially poor employment and earnings prospects for these youngsters as they age into the prime-age labor force with access largely limited to elementary occupations and with a higher incidence of part-time employment. A major weakness of the policy measure of disconnected youth is that it fails to consider the foundational skill proficiencies of teens and young adults when identifying youth who are at the greatest risk of poor life outcomes. The policy measure of disconnection was developed at a time when little information was available about the foundational skills of working-age teens and young adults. Analysts thus relied on the then available measures of human capital from the CPS and the American Community Survey of educational attainment and school enrollment and current employment status. Yet, an examination of the skills of out-of-school teens and young adults using the PIAAC data finds that a large majority of those with the lowest skills are employed and therefore not classified as disconnected youth. Moreover, our analysis reveals that the majority of young people who are classified as disconnected have numeracy skills at level 2 and higher.

Figure B2: The Labor Force Status and the Level of Proficiency on the PIAAC Numeracy Scale of Persons Aged 16 to 24 in the U.S., 2012-14-17



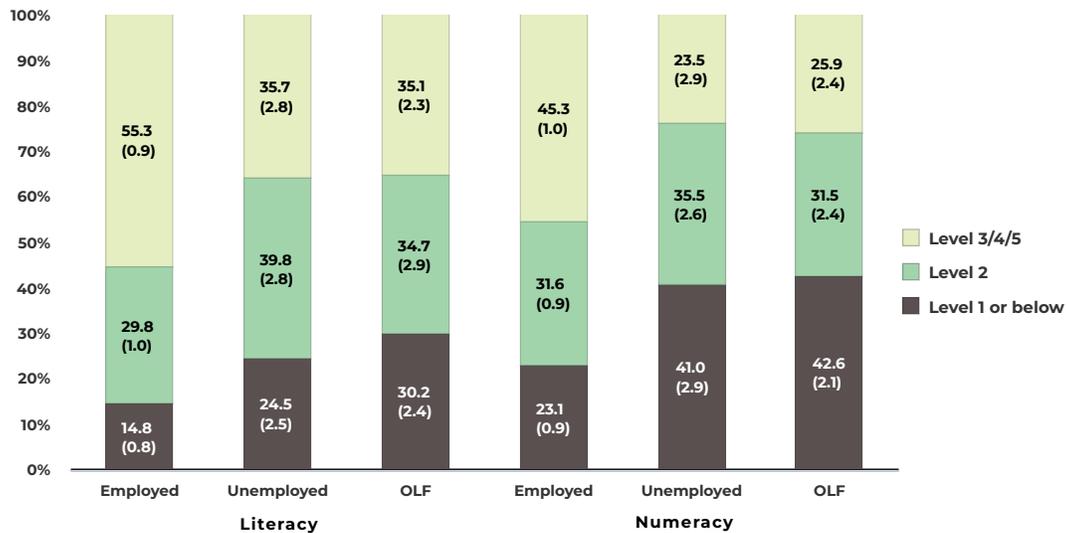
Anita Sands and Madeline Goodman of ETS have argued that the connection (or disconnection) that millennials have to education and work fails to acknowledge a deeper and more important impediment to long-term success. They find that literacy and numeracy skills of millennials are associated with better employment and earnings experiences. They also find gains to skills for millennials outside the labor market context including in social capital and in community and civic life.⁸⁷

Our analysis provides strong support to Sands and Goodman's claim that measures used to define the disconnected youth population are inadequate and result in a fundamental misunderstanding of the solutions to the developmental problems confronting teens and young adults. Our analysis finds that the policy measure of disconnected youth misses the central role that foundational skills play in generating positive economic, social, and civic outcomes for young people. The concept and measure of disconnected youth needs to be recast to account for the role that foundational skills play in promoting more positive outcomes for young people. Given the significant differences in labor market outcomes shown for prime-age and older individuals with higher skills, it is clear that the paths young people take—either out of necessity or by choice—play a critical role in setting up their future possibilities.

Appendix C: Skills and Labor Market Outcomes of the 25- to 54-Year-Old Population

Total 25- to 54-Year-Old Population

Figure C1: Percentage of 25- to 54-Year-Old Individuals at Each Level of the PIAAC Literacy and Numeracy Scales by Their Labor Force Status at the Time of the PIAAC Survey (Employed, Unemployed, or Out of the Labor Force), U.S., 2012-14-17 (Standard Errors in Parentheses)



OLF = out of the labor force.

Table C1: Mean Scores on the PIAAC Literacy Scale of 25- to 54-Year-Old Individuals by Their Labor Force Status at the Time of the PIAAC Survey by Demographic Characteristics, U.S., 2012-14-17 (Standard Errors in Parentheses)

DEMOGRAPHIC CHARACTERISTICS	MEAN SCORES			DIFFERENCES IN MEAN SCORES	
	EMPLOYED	UNEMPLOYED	OUT OF THE LABOR FORCE	EMPLOYED MINUS UNEMPLOYED	EMPLOYED MINUS OUT OF THE LABOR FORCE
All	278 (1.0)	258 (2.5)	254 (2.6)	19.8 (2.8)***	24.5 (2.7)***
Gender					
Male	278 (1.3)	261 (4.0)	246 (4.2)	17.0 (4.3)***	32.1 (4.5)***
Female	279 (1.2)	257 (2.9)	257 (3.3)	22.1 (3.3)***	22.0 (3.6)***
Race-Ethnicity					
White, non-Hispanic	291 (1.0)	271 (2.9)	270 (2.8)	20.6 (3.2)***	21.1 (3.0)***
Black, non-Hispanic	253 (2.6)	248 (4.8)	220 (4.6)	4.6 (5.4)	32.9 (5.0)***
Hispanic	244 (3.0)	233 (6.6)	216 (7.0)	11.8 (7.8)	28.3 (7.1)***
Nativity Status					
Native-born	284 (0.9)	262 (2.7)	258 (2.4)	22.0 (2.9)***	25.8 (2.6)***
Foreign-born	249 (2.4)	235 (6.9)	233 (7.4)	14.7 (7.3)**	16.6 (7.4)**
Disability Status					
With Disabilities	260 (2.3)	244 (4.0)	231 (3.4)	16.0 (4.7)***	29.5 (3.9)***
Without Disabilities	283 (1.2)	263 (3.0)	267 (3.0)	19.2 (3.2)***	15.9 (3.1)***

Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.

NOTE: The "all other races" group consists of Blacks, Hispanics, Asian, and all other race-ethnic groups. We have combined these race-ethnic groups in 55- to 74-year-old group analysis because minimum sample requirement threshold of 62 was not met in each of the race-ethnic group. Differences in scores may not add due to rounding of mean scores.

Table C2: Mean Scores on the PIAAC Literacy Scale of 25- to 54-Year-Old Individuals by Their Labor Force Status at the Time of the PIAAC Survey by Educational Attainment and School Enrollment Status, U.S., 2012-14-17 (Standard Errors in Parentheses)

EDUCATIONAL ATTAINMENT AND SCHOOL ENROLLMENT STATUS	MEAN SCORES			DIFFERENCES IN MEAN SCORES	
	EMPLOYED	UNEMPLOYED	OUT OF THE LABOR FORCE	EMPLOYED MINUS UNEMPLOYED	EMPLOYED MINUS OUT OF THE LABOR FORCE
All	278 (1.0)	258 (2.5)	254 (2.6)	19.8 (2.8)***	24.5 (2.7)***
Educational Attainment					
Less Than High School	216 (3.3)	221 (5.9)	212 (4.5)	-5.2 (6.6)	3.6 (5.3)
High School Graduate	252 (1.8)	243 (4.0)	235 (3.6)	8.6 (4.5)	16.9 (3.8)***
Some College, Certificate, or Associate's	278 (1.5)	270 (3.7)	265 (3.3)	8.7 (4.1)**	13.0 (3.7)***
Bachelor's or Higher	306 (1.5)	290 (5.8)	302 (4.5)	15.8 (6.0)***	4.4 (4.4)
School Enrollment Status					
Enrolled	288 (2.6)	274 (7.7)	280 (6.0)	13.7 (7.8)	7.8 (6.0)
Not Enrolled	277 (1.0)	256 (2.8)	250 (2.8)	21.2 (3.1)***	27.2 (2.9)***

Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.

NOTE: Differences in scores may not add due to rounding of mean scores.

Table C3: Mean Scores on the PIAAC Literacy and Numeracy Scales of 25- to 54-Year-Old Individuals by the Ratio of Their Actual to Potential Years of Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

RATIO OF ACTUAL TO POTENTIAL YEARS OF EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Lowest Quartile (0 to less than .25)	234 (3.8)	210 (4.4)	7.3%
Second Quartile (.25 to less than .50)	267 (3.1)	251 (3.3)	10.3%
Third Quartile (.50 to less than .75)	276 (2.0)	263 (2.1)	20.9%
Highest Quartile (.75 to 1)	279 (0.9)	266 (1.0)	61.4%
Differences in Mean Scores, Highest Quartile MINUS:			
Lowest Quartile	45.7 (3.9)***	56.1 (4.5)***	—
Second Quartile	12.5 (3.1)***	15.8 (3.3)***	—
Third Quartile	3.0 (2.2)	3.6 (2.2)	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Employed 25- to 54-Year-Old Population

Table C4: Mean Scores on the PIAAC Literacy and Numeracy Scales of 25- to 54-Year-Old Employed Persons by the Occupation in Which They Were Employed, U.S., 2012-14-17 (Standard Errors in Parentheses)

MAJOR OCCUPATION	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Professional & Managerial	302 (1.5)	294 (1.6)	35.2%
Technical & Associate Professional	282 (1.9)	266 (2.3)	20.1%
Clerical & Blue-collar	263 (2.2)	251 (2.2)	20.8%
Sales & Service	260 (2.3)	242 (2.7)	16.0%
Elementary Occupations	237 (3.2)	222 (2.9)	8.0%
Differences in Mean Scores, Professional & Managerial MINUS:			
Technical & Associate Professional	19.9 (2.2)***	27.5 (3.1)***	—
Clerical & Blue-collar	39.3 (2.7)***	43.0 (2.7)***	—
Sales & Service	42.1 (2.5)***	52.1 (2.8)	—
Elementary Occupations	64.8 (3.3)***	71.5 (3.0)***	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Unemployed 25- to 54-Year-Old Population

Table C5: Mean Scores on the PIAAC Literacy and Numeracy Scales of 25- to 54-Year-Old Unemployed Persons by the Duration of Their Unemployment, U.S., 2012-14-17 (Standard Errors in Parentheses)

DURATION OF UNEMPLOYMENT (MONTHS)	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
0 to 1 Month	264 (6.2)	246 (6.6)	19.5%
2 to 5 Months	262 (4.0)	240 (4.4)	34.8%
6 Months or More	253 (3.2)	234 (3.6)	45.7%
Differences in Mean Scores, 0 to 1 Month MINUS:			
2 to 5 Months	2.6 (7.0)	5.4 (7.7)	—
6 Months or More	11.1 (7.1)	11.5 (7.7)	—

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Table C6: Mean Scores on the PIAAC Literacy and Numeracy Scales of 25- to 54-Year-Old Unemployed Persons by the Time of Their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Employment in the Past 12 Months	262 (2.9)	247 (2.8)	57.5%
Employed Longer Than 12 Months Ago	253 (3.9)	234 (3.6)	40.3%
Never Employed	240 (11.0)	220 (5.5)	2.4%
Differences in Mean Scores, Employed in the Past 12 Months MINUS:			
Employed Longer Than 12 Months Ago	9.0 (4.5)**	7.0 (5.7)	—
Never Employed	22.2 (11.4)**	25.7 (12.2)**	—

Statistical significance of differences in mean scores: ** significant at .05 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Out of the Labor Force 25- to 54-Year-Old Population

Table C7: Mean Scores on the PIAAC Literacy and Numeracy Scales of 25- to 54-Year-Old Persons Who Were Out of the Labor Force by the Time of Their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Employment in the Past 12 Months	274 (5.2)	252 (5.9)	20.4%
Employed Longer Than 12 Months Ago	257 (2.8)	239 (2.9)	66.6%
Never Employed	208 (6.7)	173 (7.6)	13.0%
Differences in Mean Scores, Employed in the Past 12 Months MINUS:			
Employed Longer Than 12 Months Ago	17.0 (6.0)***	13.0 (6.2)**	—
Never Employed	65.1 (7.2)***	78.9 (8.1)***	—

Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.

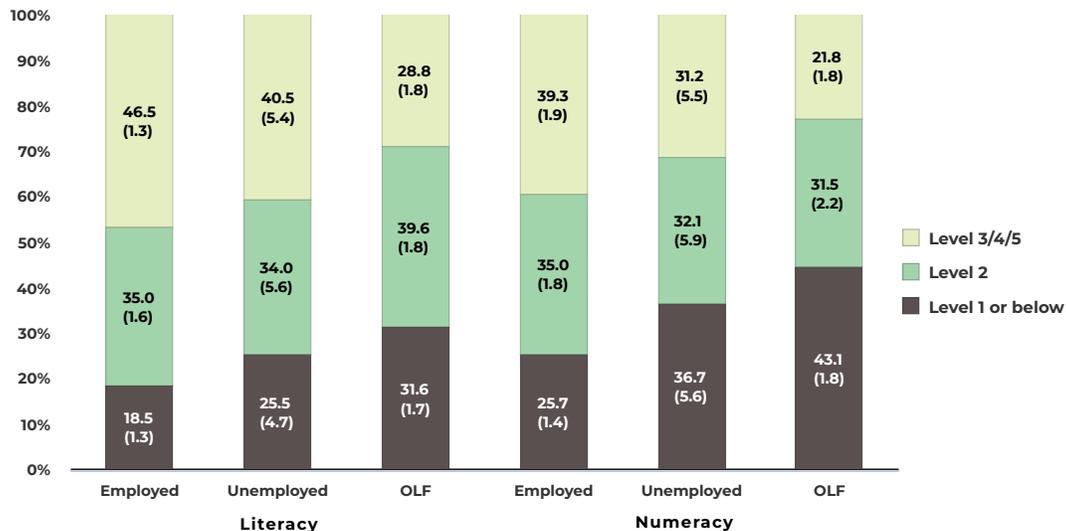
— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Appendix D: Skills and Labor Market Outcomes of the 55- to 74-Year-Old Population

Total 55- to 74-Year-Old Population

Figure D1: Percentage of 55- to 74-Year-Old Individuals at Each Level of the PIAAC Literacy and Numeracy Scales by Their Labor Force Status at the Time of the PIAAC Survey (Employed, Unemployed, or Out of the Labor Force), U.S., 2012-14-17 (Standard Errors in Parentheses)



OLF = out of the labor force.

Table D1: Mean Scores on the PIAAC Literacy Scale of 55- to 74-Year-Old Individuals by Their Labor Force Status at the Time of the PIAAC Survey by Demographic Characteristics, U.S., 2012-14-17 (Standard Errors in Parentheses)

DEMOGRAPHIC CHARACTERISTICS	MEAN SCORES			DIFFERENCES IN MEAN SCORES	
	EMPLOYED	UNEMPLOYED	OUT OF THE LABOR FORCE	EMPLOYED MINUS UNEMPLOYED	EMPLOYED MINUS OUT OF THE LABOR FORCE
All	269 (1.7)	258 (5.1)	247 (19.0)	10.5 (5.8)	22.0 (2.0)***
Gender					
Male	270 (2.4)	253 (9.4)	248 (3.0)	16.4 (9.9)	21.7 (3.9)***
Female	268 (1.9)	262 (6.9)	246 (2.0)	6.1 (7.2)	21.9 (2.7)***
Race-Ethnicity					
White, non-Hispanic	279 (1.7)	279 (6.4)	257 (2.0)	0.0 (6.5)	21.7 (2.6)***
All other races	235 (4.2)	224 (8.6)	215 (4.0)	10.8 (8.9)	20.7 (6.0)***
Nativity Status					
Native-born	274 (1.6)	270 (5.4)	250 (2.0)	4.3 (5.3)	24.0 (2.6)***
Foreign-born	228 (5.8)	221 (13.6)	215 (6.0)	7.1 (15.4)	13.4 (8.2)
Disability Status					
With Disabilities	262 (3.4)	250 (9.9)	236 (2.8)	11.8 (10.8)	25.4 (4.5)***
Without Disabilities	271 (1.9)	261 (6.6)	253 (2.2)	9.9 (6.9)	17.9 (6.4)***

Statistical significance of differences in mean scores: *** significant at .01 level.

NOTE: The "all other races" group consists of Blacks, Hispanics, Asian, and all other race-ethnic groups. We have combined these race-ethnic groups in 55- to 74-year-old group analysis because minimum sample requirement threshold of 62 was not met in each of the race-ethnic group. Differences in scores may not add due to rounding of mean scores.

Table D2: Mean Scores on the PIAAC Literacy Scale of 55- to 74-Year-Old Individuals by Their Labor Force Status at the Time of the PIAAC Survey by Educational Attainment, U.S., 2012-14-17 (Standard Errors in Parentheses)

EDUCATIONAL ATTAINMENT	MEAN SCORES			DIFFERENCES IN MEAN SCORES	
	EMPLOYED	UNEMPLOYED	OUT OF THE LABOR FORCE	EMPLOYED MINUS UNEMPLOYED	EMPLOYED MINUS OUT OF THE LABOR FORCE
All	269 (1.7)	258 (5.1)	247 (19.0)	10.5 (5.8)	22.0 (2.0)***
Educational Attainment					
Less Than High School	206 (6.2)	‡	196 (4.0)	‡	9.8 (7.7)
High School Graduate	247 (2.9)	‡	236 (2.7)	‡	10.3 (4.2)**
Some College, Certificate, or Associate's	271 (2.5)	‡	259 (2.5)	‡	12.6 (3.0)***
Bachelor's or Higher	295 (2.6)	‡	279 (3.3)	‡	16.3 (3.9)***

Statistical significance of differences in mean scores: *** significant at .01 level, ** significant at .05 level.

‡ Findings for these groups are not published due to insufficient sample size.

NOTE: Differences in scores may not add due to rounding of mean scores.

Table D3: Mean Scores on the PIAAC Literacy and Numeracy Scales of 55- to 74-Year-Old Individuals by the Ratio of Their Actual to Potential Years of Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

RATIO OF ACTUAL TO POTENTIAL YEARS OF EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Lowest Quartile (0 to less than .25)	214 (4.6)	194 (4.6)	6.4%
Second Quartile (.25 to less than .50)	241 (4.2)	225 (4.6)	7.6%
Third Quartile (.50 to less than .75)	250 (2.1)	237 (2.4)	21.0%
Highest Quartile (.75 to 1)	268 (1.4)	259 (1.5)	65.0%
Differences in Mean Scores, Highest Quartile MINUS:			
Lowest Quartile	54.3 (4.7)***	64.4 (4.7)***	—
Second Quartile	27.4 (4.4)***	33.4 (4.8)***	—
Third Quartile	18.5 (2.6)***	22.0 (2.7)***	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Employed 55- to 74-Year-Old Population

Table D4: Mean Scores on the PIAAC Literacy and Numeracy Scales of 55- to 74-Year-Old Employed Persons by the Occupation in Which They Were Employed, U.S., 2012-14-17 (Standard Errors in Parentheses)

MAJOR OCCUPATION	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Professional & Managerial	290 (2.6)	284 (2.9)	35.1%
Technical & Associate Professional	276 (2.9)	265 (3.3)	21.5%
Clerical & Blue-collar	252 (3.3)	243 (3.6)	23.3%
Sales & Service	248 (3.4)	235 (4.0)	14.9%
Elementary Occupations	234 (7.2)	222 (7.8)	5.3%
Differences in Mean Scores, Professional & Managerial MINUS:			
Technical & Associate Professional	14.2 (3.7)***	19.0 (4.5)***	—
Clerical & Blue-collar	38.0 (3.7)***	40.9 (4.2)***	—
Sales & Service	41.8 (4.5)***	48.8 (5.2)***	—
Elementary Occupations	55.8 (7.2)***	61.6 (8.1)***	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Differences in scores may not add due to rounding of mean scores.

Unemployed 55- to 74-Year-Old Population

Table D5: Mean Scores on the PIAAC Literacy and Numeracy Scales of 55- to 74-Year-Old Unemployed Persons by the Duration of Their Unemployment, U.S., 2012-14-17 (Standard Errors in Parentheses)

DURATION OF UNEMPLOYMENT (MONTHS)	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
0 to 5 Months	251 (9.4)	236 (9.7)	45.3%
6 Months or More	264 (6.0)	248 (6.2)	54.7%
Differences in Mean Scores, 0 to 5 Months MINUS:			
6 Months or More	-13.4 (10.4)	-11.8 (10.0)	—

— Not applicable.

NOTE: To meet the sample requirement of 62, 0-5 months and 6 or more month category were created for unemployed 55- to 74-year-old. Differences in scores may not add due to rounding of mean scores.

Table D6: Mean Scores on the PIAAC Literacy and Numeracy Scales of 55- to 74-Year-Old Unemployed Persons by the Time of Their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Employment in the Past 12 Months	273 (9.0)	257 (9.4)	50.9%
Employed Longer Than 12 Months Ago	243 (6.6)	229 (7.3)	49.1%
Never Employed	‡	‡	‡
Differences in Mean Scores, Employed in the Past 12 Months MINUS:			
Employed Longer Than 12 Months Ago	29.3 (10.7)***	28.2 (11.1)***	—
Never Employed	‡	‡	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

‡ Findings for these groups are not published due to insufficient sample size.

NOTE: There was only one sample of unemployed in "never employed" category for 55- to 74-year-old group. For this reason, "never employed" category was not combined with "employed longer than 12 months ago" category. Differences in scores may not add due to rounding of mean scores.

Out of the Labor Force 55- to 74-Year-Old Population

Table D7: Mean Scores on the PIAAC Literacy and Numeracy Scales of 55- to 74-Year-Old Persons Who Were Out of the Labor Force by the Time of Their Most Recent Employment Experience, U.S., 2012-14-17 (Standard Errors in Parentheses)

MOST RECENT EMPLOYMENT EXPERIENCE	MEAN LITERACY SCORE	MEAN NUMERACY SCORE	PERCENTAGE DISTRIBUTION
Employment in the Past 12 Months	269 (4.0)	254 (5.3)	11.0%
Employed Longer Than 12 Months Ago or Never Employed	244 (2.0)	230 (2.2)	89.0%
Differences in Mean Scores, Employed in the Past 12 Months MINUS:			
Employed Longer Than 12 Months Ago or Never Employed	25.1 (4.4)***	23.7 (5.1)***	—

Statistical significance of differences in mean scores: *** significant at .01 level.

— Not applicable.

NOTE: Out of the labor force group in "No work experience" category had 51 sample cases. This category is combined with "employed longer than 12 months ago" category. Differences in scores may not add due to rounding of mean scores.

Appendix E: Definitions of the Dependent and Independent Variables in the Logistic Regressions, 16- to 74-Year-Olds, PIAAC, 2012-2014-2017

Dependent Variables

MODEL 1:

employed = a dichotomous employment status at the time of the PIAAC surveys variable **among all 16- to-74-year-old individuals**

= 1, if employed

= 0, if else

MODEL 2:

unemployed = a dichotomous unemployment status at the time of the PIAAC surveys variable **among all 16- to-74-year-old individuals**

= 1, if unemployed

= 0, if else

MODEL 3:

olf = a dichotomous out of labor force status at the time of the PIAAC surveys variable **among all 16- to-74-year-old individuals**

= 1, if out of the labor force

= 0, if else

MODEL 4:

olf = a dichotomous employed within the past 12-month variable **among all 16- to-74-year-old individuals**

= 1, if currently employed or employed within the past 12 months

= 0, if else

MODEL 5:

ft_employed = a dichotomous full-time employment status at the time of the PIAAC surveys variable **among employed individuals**

= 1, if employed full-time (worked at least 35 hours per week)

= 0, if employed part-time

MODEL 6:

oijt = a dichotomous on-the-job training variable **among employed individuals**

= 1, if received employer provided on-the-job training

= 0, if else

MODEL 7:

prof_manag_occ = a dichotomous professional/managerial occupation variable **among employed individuals**

= 1, if employed in professional or managerial occupations

= 0, if else

MODEL 8:

unempdur_0_5months = a dichotomous unemployment duration variable **among unemployed individuals**

= 1, if unemployed for 0-5 months

= 0, if unemployed for 6 months or more

MODEL 9:

empl_somept_unemp = a dichotomous employment history status variable **among unemployed individuals**

= 1, if worked at some point in the past

= 0, if else

MODEL 10:

empl_somept_olf = a dichotomous employment history status variable **among out of labor force individuals**

= 1, if worked at some point in the past

= 0, if else

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

AGE VARIABLE:

Base group is 16-to-24-year old.

age25_54 = a dichotomous age variable

= 1, if 25-to-54-year-old

= 0, if else

age55_74 = a dichotomous age variable

= 1, if 55-to-74-year-old

= 0, if else

EDUCATIONAL ATTAINMENT LEVELS:

Base group is workers with a high school diploma.

no_hsdiploma = a dichotomous educational attainment variable

= 1, if less than high school diploma

= 0, if else

some_college = a dichotomous educational attainment variable

= 1, if some years of college, certification, or associate degree

= 0, if else

bachelors_pl = a dichotomous educational attainment variable

= 1, if Bachelor's or higher degree

= 0, if else

Dependent Variable (Tables E1 and E2)

employed = a dichotomous employment status at the time of the PIAAC surveys variable **among all 16- to-74-year-old individuals**

= 1, if employed

= 0, if else

Table E1: Logistic Regression Coefficients of Current Employment Status of 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Literacy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_litz	0.193	0.036	5.3	0.000	0.035
age25_54	0.715	0.067	10.8	0.000	0.130
age55_74	-0.636	0.072	-8.9	0.000	-0.115
no_hsdiploma	-0.507	0.068	-7.5	0.000	-0.092
some_college	0.384	0.054	7.1	0.000	0.070
bachelors_pl	0.651	0.087	7.5	0.000	0.118
constant	0.556	0.073	7.7	0.000	—
N = 11,918					

— Not applicable.

Table E2: Logistic Regression Coefficients of Current Employment Status of 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Numeracy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_numz	0.305	0.038	8.0	0.000	0.055
age25_54	0.748	0.066	11.3	0.000	0.135
age55_74	-0.614	0.071	-8.7	0.000	-0.111
no_hsdiploma	-0.454	0.069	-6.6	0.000	-0.082
some_college	0.345	0.054	6.4	0.000	0.062
bachelors_pl	0.528	0.090	5.9	0.000	0.095
constant	0.580	0.073	7.9	0.000	—
N = 11,918					

— Not applicable.

Dependent Variable (Tables E3 and E4):

unemployed = a dichotomous unemployment status at the time of the PIAAC surveys
variable **among all 16- to-74-year-old individuals**

= 1, if unemployed

= 0, if else

Table E3: Logistic Regression Coefficients of Current Unemployment Status of 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Literacy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_litz	0.193	0.036	5.3	0.000	0.035
age25_54	0.715	0.067	10.8	0.000	0.130
age55_74	-0.636	0.072	-8.9	0.000	-0.115
no_hsdiploma	-0.507	0.068	-7.5	0.000	-0.092
some_college	0.384	0.054	7.1	0.000	0.070
bachelors_pl	0.651	0.087	7.5	0.000	0.118
constant	0.556	0.073	7.7	0.000	—

N = 11,918

— Not applicable.

Table E4: Logistic Regression Coefficients of Current Unemployment Status of 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Numeracy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_numz	0.305	0.038	8.0	0.000	0.055
age25_54	0.748	0.066	11.3	0.000	0.135
age55_74	-0.614	0.071	-8.7	0.000	-0.111
no_hsdiploma	-0.454	0.069	-6.6	0.000	-0.082
some_college	0.345	0.054	6.4	0.000	0.062
bachelors_pl	0.528	0.090	5.9	0.000	0.095
constant	0.580	0.073	7.9	0.000	—

N = 11,918

— Not applicable.

Dependent Variable (Tables E5 and E6):

olf = a dichotomous out of labor force status at the time of the PIAAC surveys variable among all 16- to-74-year-old individuals

= 1, if out of the labor force

= 0, if else

Table E5: Logistic Regression Coefficients of Current Out of the Labor Force Status of 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Literacy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_litz	-0.118	0.054	-2.2	0.027	-0.006
age25_54	-0.678	0.075	-9.1	0.000	-0.033
age55_74	-1.248	0.114	-11.0	0.000	-0.060
no_hsdiploma	0.091	0.110	0.8	0.410	0.004
some_college	-0.211	0.131	-1.6	0.106	-0.010
bachelors_pl	-0.596	0.119	-5.0	0.000	-0.029
constant	-2.087	0.071	-29.6	0.000	—
N = 11,918					

— Not applicable.

Table E6: Logistic Regression Coefficients of Current Out of the Labor Force Status of 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Numeracy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_numz	-0.229	0.053	-4.3	0.000	-0.011
age25_54	-0.712	0.073	-9.8	0.000	-0.034
age55_74	-1.287	0.111	-11.6	0.000	-0.062
no_hsdiploma	0.038	0.108	0.4	0.726	0.002
some_college	-0.170	0.131	-1.3	0.194	-0.008
bachelors_pl	-0.470	0.119	-3.9	0.000	-0.023
constant	-2.112	0.072	-29.4	0.000	—
N = 11,918					

— Not applicable.

Dependent Variable (Tables E7 and E8):

olf = a dichotomous employed within the past 12-month variable **among all 16- to-74-year-old individuals**

= 1, if currently employed or employed within the past 12 months

= 0, if else

Table E7: Logistic Regression Coefficients of Employment within the Past 12 Month Status of 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Literacy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_litz	-0.184	0.037	-4.9	0.000	-0.029
age25_54	-0.591	0.073	-8.1	0.000	-0.094
age55_74	1.013	0.073	13.8	0.000	0.160
no_hsdiploma	0.523	0.068	7.7	0.000	0.083
some_college	-0.384	0.060	-6.5	0.000	-0.061
bachelors_pl	-0.603	0.095	-6.4	0.000	-0.095
constant	-1.072	0.078	-13.8	0.000	—

N = 11,918

— Not applicable.

Table E8: Logistic Regression Coefficients of Employment within the Past 12 Month Status of 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Numeracy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_numz	-0.277	0.040	-6.9	0.000	-0.044
age25_54	-0.617	0.073	-8.4	0.000	-0.097
age55_74	0.999	0.073	13.7	0.000	0.157
no_hsdiploma	0.478	0.069	6.9	0.000	0.075
some_college	-0.351	0.060	-5.8	0.000	-0.055
bachelors_pl	-0.499	0.099	-5.1	0.000	-0.079
constant	-1.097	0.079	-13.9	0.000	—

N = 11,918

— Not applicable.

Dependent Variable (Tables E9 and E10)

ft_employed = a dichotomous full-time employment status at the time of the PIAAC surveys variable **among employed individuals**

= 1, if employed full-time (worked at least 35 hours per week)

= 0, if employed part-time

Table E9: Logistic Regression Coefficients of Full-Time Employment Status of Currently Employed 16- to 74-Year-Old Workers, U.S., 2012-14-17, with Standardized Literacy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_litz	0.295	0.040	7.4	0.000	0.044
age25_54	0.352	0.082	4.3	0.000	0.052
age55_74	-1.175	0.080	-14.8	0.000	-0.173
no_hsdiploma	-0.585	0.075	-7.9	0.000	-0.086
some_college	0.343	0.069	5.0	0.000	0.051
bachelors_pl	0.600	0.094	6.4	0.000	0.088
constant	1.421	0.079	17.9	0.000	—
N = 11,914					

— Not applicable.

Table E10: Logistic Regression Coefficients of Full-Time Employment Status of Currently Employed 16- to 74-Year-Old Workers, U.S., 2012-14-17, with Standardized Numeracy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_numz	0.394	0.037	10.6	0.000	0.058
age25_54	0.372	0.083	4.5	0.000	0.054
age55_74	-1.180	0.080	-14.7	0.000	-0.172
no_hsdiploma	-0.540	0.075	-7.2	0.000	-0.079
some_college	0.311	0.069	4.5	0.000	0.045
bachelors_pl	0.489	0.095	5.1	0.000	0.071
constant	1.462	0.080	18.2	0.000	—
N = 11,914					

— Not applicable.

Dependent Variable (Tables E11 and E12)

ojt = a dichotomous on-the-job training variable **among employed individuals**

= 1, if received employer provided on-the-job training

= 0, if else

Table E11: Logistic Regression Coefficients of On-the-Job-Training Status of Currently Employed 16- to 74-Year-Old Workers, U.S., 2012-14-17, with Standardized Literacy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_litz	-0.083	0.048	-1.7	0.083	-0.015
age25_54	1.467	0.088	16.7	0.000	0.261
age55_74	0.864	0.107	8.1	0.000	0.154
no_hsdiploma	-0.581	0.116	-5.0	0.000	-0.103
some_college	0.138	0.095	1.5	0.147	0.025
bachelors_pl	0.464	0.099	4.7	0.000	0.082
constant	-0.164	0.098	-1.7	0.095	—
N = 7,448					

— Not applicable.

Table E12: Logistic Regression Coefficients of On-the-Job-Training Status of Currently Employed 16- to 74-Year-Old Workers, U.S., 2012-14-17, with Standardized Numeracy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_numz	-0.036	0.046	-0.8	0.438	-0.006
age25_54	1.476	0.088	16.8	0.000	0.263
age55_74	0.885	0.106	8.4	0.000	0.157
no_hsdiploma	-0.551	0.116	-4.8	0.000	-0.098
some_college	0.117	0.095	1.2	0.217	0.021
bachelors_pl	0.418	0.099	4.2	0.000	0.074
constant	-0.161	0.098	-1.6	0.101	—
N = 7,448					

— Not applicable.

Dependent Variable (Tables E13 and E14)

prof_manag_occ = a dichotomous professional/managerial occupation variable **among employed individuals**

- = 1, if employed in professional or managerial occupations
- = 0, if else

Table E13: Logistic Regression Coefficients of Managerial/Professional Occupation Status of Currently Employed 16- to 74-Year-Old Workers, U.S., 2012-14-17, with Standardized Literacy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_litz	0.163	0.041	3.9	0.000	0.039
age25_54	-0.160	0.092	-1.7	0.082	-0.038
age55_74	-0.433	0.099	-4.4	0.000	-0.102
no_hsdiploma	-0.398	0.109	-3.7	0.000	-0.094
some_college	0.560	0.064	8.8	0.000	0.132
bachelors_pl	0.745	0.078	9.6	0.000	0.176
constant	-0.277	0.088	-3.2	0.002	—
N = 7,280					

— Not applicable.

Table E14: Logistic Regression Coefficients of Managerial/Professional Occupation Status of Currently Employed 16- to 74-Year-Old Workers, U.S., 2012-14-17, with Standardized Numeracy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_numz	0.107	0.045	2.4	0.017	0.025
age25_54	-0.167	0.092	-1.8	0.069	-0.040
age55_74	-0.458	0.097	-4.7	0.000	-0.109
no_hsdiploma	-0.443	0.109	-4.1	0.000	-0.105
some_college	0.588	0.065	9.0	0.000	0.140
bachelors_pl	0.795	0.083	9.6	0.000	0.189
constant	-0.285	0.088	-3.3	0.001	—
N = 7,280					

— Not applicable.

Dependent Variable (Tables E15 and E16)

unempdur_0_5months = a dichotomous unemployment duration variable **among unemployed individuals**

= 1, if unemployed for 0-5 months

= 0, if unemployed for 6 months or more

Table E15: Logistic Regression Coefficients of Unemployed for 0 to 5 Months of Currently Unemployed 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Literacy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_litz	0.360	0.052	7.0	0.000	0.054
age25_54	0.645	0.125	5.2	0.000	0.097
age55_74	0.763	0.123	6.2	0.000	0.115
no_hsdiploma	-0.450	0.203	-2.2	0.027	-0.068
some_college	0.667	0.106	6.3	0.000	0.101
bachelors_pl	2.509	0.114	21.9	0.000	0.379
constant	-2.683	0.147	-18.2	0.000	—
N = 7,476					

— Not applicable.

Table E16: Logistic Regression Coefficients of Unemployed for 0 to 5 Months of Currently Unemployed 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Numeracy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_numz	0.393	0.051	7.6	0.000	0.059
age25_54	0.653	0.123	5.3	0.000	0.098
age55_74	0.743	0.121	6.1	0.000	0.112
no_hsdiploma	-0.446	0.202	-2.2	0.027	-0.067
some_college	0.672	0.105	6.4	0.000	0.101
bachelors_pl	2.471	0.116	21.4	0.000	0.372
constant	-2.687	0.146	-18.4	0.000	—
N = 7,476					

— Not applicable.

Dependent Variable (Tables E17 and E18)

empl_somept_unemp= a dichotomous employment history status variable **among unemployed individuals**

= 1, if worked at some point in the past

= 0, if never employed in the past

Table E17: Logistic Regression Coefficients of Employed at Some Point in the Past among Currently Unemployed 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Literacy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_litz	0.128	0.086	1.5	0.137	0.029
age25_54	-0.780	0.181	-4.3	0.000	-0.178
age55_74	-1.121	0.268	-4.2	0.000	-0.257
no_hsdiploma	0.213	0.216	1.0	0.324	0.049
some_college	-0.040	0.220	-0.2	0.858	-0.009
bachelors_pl	-0.041	0.224	-0.2	0.853	-0.009
constant	0.972	0.174	5.6	0.000	—
N = 1,596					

— Not applicable.

Table E18: Logistic Regression Coefficients of Employed at Some Point in the Past among Currently Unemployed 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Numeracy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_numz	0.170	0.086	2.0	0.048	0.039
age25_54	-0.780	0.180	-4.3	0.000	-0.178
age55_74	-1.128	0.266	-4.2	0.000	-0.258
no_hsdiploma	0.221	0.217	1.0	0.309	0.050
some_college	-0.054	0.221	-0.2	0.807	-0.012
bachelors_pl	-0.097	0.237	-0.4	0.683	-0.022
constant	1.010	0.171	5.9	0.000	—
N = 1,596					

— Not applicable.

Dependent Variable (Tables E19 and E20)

empl_somept_olf = a dichotomous employment history status variable **among out of labor force individuals**

= 1, if worked at some point in the past

= 0, if never employed in the past

Table E19: Logistic Regression Coefficients of Employed at Some Point in the Past among Currently Out of Labor Force 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Literacy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_litz	0.204	0.172	1.2	0.235	0.013
age25_54	2.197	0.353	6.2	0.000	0.143
age55_74	3.302	0.283	11.7	0.000	0.215
no_hsdiploma	-1.016	0.252	-4.0	0.000	-0.066
some_college	1.558	0.526	3.0	0.003	0.102
bachelors_pl	-0.191	0.443	-0.4	0.667	-0.012
constant	1.595	0.210	7.6	0.000	—
N = 1,596					

— Not applicable.

Table E20: Logistic Regression Coefficients of Employed at Some Point in the Past among Currently Out of Labor Force 16- to 74-Year-Old Individuals, U.S., 2012-14-17, with Standardized Numeracy Proficiency Score

VARIABLE	COEFFICIENT	STD. ERR.	Z	P > Z	MARGINS
pv_numz	0.532	0.163	3.3	0.001	0.034
age25_54	2.352	0.367	6.4	0.000	0.150
age55_74	3.466	0.302	11.5	0.000	0.221
no_hsdiploma	-0.976	0.250	-3.9	0.000	-0.062
some_college	1.479	0.542	2.7	0.006	0.094
bachelors_pl	-0.600	0.468	-1.3	0.200	-0.038
constant	1.768	0.223	7.9	0.000	—
N = 1,596					

— Not applicable.

About the Authors



Neeta Fogg is an economist at the Center for Labor Markets and Policy (CLMP) at Drexel University. At Drexel, 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 Gary S. Becker, *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education*, 3rd ed. (Chicago: University of Chicago Press, 1993).
 - 2 Claudia Goldin and Lawrence F. Katz, *The Race between Education and Technology* (Cambridge, MA: Harvard University Press, 2008).
 - 3 New occupational employment projections by the U.S. Bureau of Labor Statistics suggest that occupations that typically require workers to hold a postsecondary credential will grow at more than double the pace of occupations where no credentials are required for a new hire. More than one-half of projected employment growth over the 2018 to 2028 period is expected to occur in occupations that require a postsecondary degree. See Kevin S. Dubina, Teresa L. Morisi, Michael Rieley, and Andrea B. Wagoner, "Projections Overview and Highlights, 2018-28," *Monthly Labor Review* (October 2019), <https://doi.org/10.21916/mlr.2019.21>, and *Table 1.7 Occupational Projections 2020-30, and Worker Characteristics 2020*, September 8, 2021, U.S. Bureau of Labor Statistics, <http://www.bls.gov/emp/tables/occupational-projections-and-characteristics.htm>.
 - 4 For some examples of such studies, see Christopher R. Tamborini, Chang Hwan Kim, and Arthur Sakamoto, "Education and Lifetime Earnings in the United States," *Demography* 52, no. 2 (2015): 1383–1407, <https://doi.org/10.1007/s13524-015-0407-0>; Demetrio Scopelliti, "The College Payoff: A Look at Income and Wealth Premiums," *Monthly Labor Review* (March 2020), <https://www.bls.gov/opub/mlr/2020/beyond-bls/the-college-payoff-a-look-at-income-and-wealth-premiums.htm>; Kristen Broady and Brad Hershbein, "Major Decisions: What Graduates Earn over Their Lifetimes," *Up Front* (blog), Brookings, October 8, 2020, <https://www.brookings.edu/blog/up-front/2020/10/08/major-decisions-what-graduates-earn-over-their-lifetimes/>; Christian Bredemeier and Roland Winkler, "The Employment Dynamics of Different Population Groups over the Business Cycle," *Applied Economics* 49, no. 26 (2017): 2545–62; 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* 34, no. 4 (2016): 363–70; Economic Research Department, *Assessing Differences in Labor Market Outcomes across Race, Age, and Educational Attainment*, Working Paper 17-09 (Kansas City, Missouri: Federal Reserve Bank of Kansas City, 2017), <https://www.minneapolisfed.org/institute/working-papers/17-09.pdf>.
- For a discussion of the limitations of the educational attainment measure in human capital research, please see Neeta Fogg et al., *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/s/research/pdf/if-you-cant-be-with-the-data-you-love.pdf>.
- 5 For more information about the PIAAC study in the United States see <https://nces.ed.gov/surveys/piaac/>.
 - 6 Joseph A. Durlak, "How to Select, Calculate, and Interpret Effect Sizes," *Journal of Pediatric Psychology* 34, no. 9 (October 2009): 917–28, <https://doi.org/10.1093/jpepsy/jsp004>.
 - 7 Detailed definitions and a discussion of all of these labor market outcomes are provided in Appendix A.
 - 8 Definitions of variables included in these regression models along with the coefficients, marginal effects, and statistical significance of all explanatory variables in each of the 20 regression models are presented in Appendix E.
 - 9 Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, *Skills and Earnings in the Full-Time Labor Market* (Princeton, NJ: ETS, 2018), <https://www.ets.org/s/research/pdf/skills-and-earnings-in-the-full-time-labor-market.pdf>; Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, *Skills and Earnings of College Graduates* (Princeton, NJ: ETS, 2019), <https://www.ets.org/s/research/pdf/skills-and-the-earnings-of-college-graduates.pdf>; Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, *Skills and Earnings in the Part-Time Labor Market*, (Princeton, NJ: ETS, 2020), <https://www.ets.org/s/research/pdf/skills-and-earnings-in-the-part-time-labor-market.pdf>.
 - 10 For a detailed discussion of the assessment design, background questionnaire cognitive items, data collection methods, sampling and weighting, and data analysis see Irwin Kirsch and William Thorn, *Technical Report of the Survey of Adult Skills (PIAAC)* (Paris: Organization for Economic Cooperation and Development, 2013), https://www.oecd.org/skills/piaac/Technical%20Report_17OCT13.pdf.
 - 11 Detailed findings from the analysis of the connections between skills and labor market outcomes for 16- to 24-, 25- to 54-, and 55- to 74-year-old individuals are presented in Appendices B, C, and D, respectively.

- 12 Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, *Human Capital and the Labor Force Participation Behavior of American Men and Women* (Princeton, NJ: ETS, forthcoming).
- 13 This has proven somewhat daunting. See Neeta Fogg, Paul Harrington, and Nancy Snyder, *Gray Warnings: Challenges in the Direct Care Workforce* (Philadelphia, PA: Center for Labor Markets and Policy, Drexel University, 2018), 55–56, http://www.mass.gov/files/documents/2018/10/02/Workforce_report_2018_REVISED.pdf.
- 14 Neeta Fogg and Paul Harrington, *Occupational Profiles for the Mature Worker: Finding and Using Detailed Information about Occupations with the Largest Share of Mature Workers* (Indianapolis, IN: Council for Adult and Experiential Learning, 2012), https://www.cael.org/hubfs/premium_content_resources/adult_learning/pdfs/TMT_Occupational_Profiles.pdf
- 15 Five proficiency levels are defined for both literacy and numeracy ranging from a low of below level 1 to a high of level 4/5.
- 16 Andrew Sum, Irwin Kirsch, and Robert Taggart, *The Twin Challenges of Mediocrity and Inequality—Literacy in the U.S. from an International Perspective* (Princeton, NJ: ETS, 2002); Kirsch and Thorn, *Technical Report*; Anita Sands and Madeline Goodman, *Too Big To Fail: Millennials on the Margins* (Princeton, NJ: ETS, 2018), <https://www.ets.org/s/research/report/opportunity-too-big-to-fail.pdf>.
- 17 The mean literacy proficiency score of all adults surveyed during PIAAC 2012-14-17 surveys was 269 and the standard deviation was 50.5. The mean numeracy score was 256 and standard deviation was 56.5.
- 18 At the time of the PIAAC study, about 60% of all teens and young adults were in school compared to just 8% school enrollment among the population aged 25 and above. The mean literacy scores of enrolled young people were the same for the employed and those out of the labor force. Among nonenrolled young people, the mean literacy scores for those out of the labor force were modestly lower than those who were employed. See Appendix B.
- 19 David Loewenberg, "Summer School Is the New Summer Job," *Education Next* 20, no. 3 (2020): 14–20, <https://www.educationnext.org/summer-school-new-summer-job-why-fewer-teens-are-working-why-it-matters/>.
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- 24 Detailed findings for teens and young adults are presented in Appendix B.
- 25 The employment rate of the 65- to 74-year-old population began to reverse its downward trend in 1985 at a nadir of 14.5 percent. By 2019 the employment rate of these older workers had nearly doubled to 27.0 percent.
- 26 Gary Burtless, *Can Educational Attainment Explain the Rise in Labor Force Participation at Older Ages?* (Chestnut Hill, MA: Trustees of Boston College, Center for Retirement Research, 2013), https://crr.bc.edu/wp-content/uploads/2013/09/IB_13-13-508x.pdf.
- 27 Estimates of the impact of educational attainment, a proxy for human capital ability, on the job market attachment of older workers range from about one-fifth to one-half of the increase observed over time; see David M. Blau and Ryan M. Goodstein, "Can Social Security Explain Trends in Labor Force Participation of Older Men in the United States?" *Journal of Human Resources* 45, no. 2 (2010): 328–63. <http://jhr.uwpress.org/content/45/2/328.short>.

- 28 Respondents who were 16 at the time of the PIAAC survey do not have any prior work experience since they were not eligible to work in years preceding the PIAAC survey. Therefore, this analysis excludes individuals who were 16-years-old at the time of the PIAAC survey.
- 29 Earnings of workers is an important employment-related outcome but is excluded from this paper because the connections between earnings and skills as well as other measures of human capital have been examined in detail in the following three previous papers by the authors: Fogg et al., *Full-Time Labor Market*; Fogg et al., *College Graduates*; Fogg et al., *Part-Time Labor Market*.
- 30 Fogg et al., *Part-Time Labor Market*.
- 31 An exception to this was in the health and education professional fields where skills levels were about the same for both full-time and part-time workers, as were hourly rates of pay. See Fogg et al., *Part-Time Labor Market*.
- 32 Megan Dunn, "Who chooses part-time work and why?" *Monthly Labor Review* (March 2018), <https://doi.org/10.21916/mlr.2018.8>.
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- 35 The PIAAC questionnaire defines employer-provided training as follows: "1. This type of training is characterized by planned periods of training, instruction or practical experience, using normal tools of work. 2. It is usually organized by the employer to facilitate adaptation of (new) staff. 3. It may include general training about the company as well as specific job-related instructions (safety and health hazards, working practices). 4. It includes for instance organized training or instructions by management, supervisors or co-workers to help the respondent to do his/her job better or to introduce him/her to new tasks but can also take place in the presence of a tutor." See PIAAC Background Questionnaire (<http://nces.ed.gov/surveys/piaac/2017-en-household-bq.htm>).
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- 40 Britta Gauly and Clemens M. Lechner, "Self-Perfection or Self-Election? Unraveling the Relationship between Job-Related Training and Adults' Literacy Skills," *PLoS ONE* 14, no. 5 (2019): e0215971, <https://doi.org/10.1371/journal.pone.0215971>.
- 41 Training, as defined by the PIAAC questionnaire, includes new staff orientation, compliance training (such as safety and health, and company personnel policy and practices) as well as general and specific skill training designed to help workers learn new job tasks or become more proficient at the tasks they undertake.
- 42 Flavia Cunha and James Heckman, "The Technology of Skill Formation," *American Economic Review* 97, no. 2 (2007): 31–47, <https://doi.org/10.1257/aer.97.2.31>.
- 43 There is a substantial and significant positive relationship between literacy and numeracy skills and the length of tenure on the current job. Fogg et al., *Part-Time Labor Market*.
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- 45 The O*NET content model is designed to develop measures of knowledge, skills, and abilities that are the distinguishing characteristics of occupations. O*NET findings are based on a continuing data collection program from incumbent workers. See: O*NET Resource Center, Employment and Training Administration, U.S. Department of Labor, <https://www.onetcenter.org/overview.html>.
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