The Impact of Human Capital in the American Labor Market Series

Skills and Earnings in the Part-Time Labor Market

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THE ETS CENTER FOR
RESEARCH ON HUMAN CAPITAL AND EDUCATION

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May 2020

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Research and Development
Educational Testing Service
Rosedale Road
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Suggested citation: Neeta Fogg, Paul Harrington, Ishwar Khatiwada, and Larry Hanover. *Skills and Earnings in the Part-Time Labor Market,* The Impact of Human Capital in the American Labor Market Series (Princeton, NJ: Educational Testing Service, 2020).

NOTE TO READER

This report was completed in the weeks after the COVID-19 pandemic began turning the country upside down, sending Americans across the land into social isolation, throwing millions into unemployment, and shuttering untold numbers of businesses. It will take a long time for the full implications of this crisis to be understood, including the impact to the U.S. economy. Similarly, we cannot speculate what the impact will be on the subject of this report: the part-time labor market. Suffice it to say, however, that we believe these findings on skills and wages will greatly matter regardless of when the economy recovers, or what that recovery looks like.

Preface

After the end of the Great Recession, the nation's labor-force picture was transformed dramatically, with the unemployment rate dropping from near-historic highs in 2009 to levels that are now at 50-year lows. This swing was the result of job creation that, although unspectacular, far outpaced the slow growth in the U.S. labor force.

While this long period of low unemployment obviously was good news, the dynamics behind the changes in the makeup of the workforce came with their own set of significant issues. The year 2017 marked the beginning of a general labor shortage in the United States, with labor-supply problems constraining the nation's productive capacity. According to the authors of this report, primarily from Drexel University's Center for Labor Markets and Policy, these problems were especially severe among the kinds of prevailing-wage jobs where strong skills in literacy and numeracy, as well as higher levels of educational attainment, are crucial: professional, paraprofessional, and managerial occupations, including the "helping professions" of health and education that are dominated by women (and so incredibly relevant during this time of the coronavirus crisis).

These issues are explored in this third paper in The Impact of Human Capital in the American Labor Market Series. The report, commissioned by the ETS Center for Research on Human Capital and Education, examines the association between wages and skills in the part-time labor market and is based on analysis of 2012–2014 data from the Survey of Adult Skills of the Programme for the International Assessment of Adult Competencies (PIAAC), an assessment measuring achievement in key domains, including literacy and numeracy, for countries across the world.

Following up on the series' initial report, which discovered a consistent and strong effect of literacy and numeracy skills on the wages of American full-time workers, the authors have found that, during this period of labor shortage, the overall effect of skills on the wages of part-time workers, too, were consistent and strong. They also found the skills of part-time workers to be similar on average to those of full-time workers, although wide variations existed among occupational sectors.

The researchers furthermore explored the difference in wages between full- and part-time workers across a spectrum of occupations, ranging from those at the top of the wage scale to the bottom. As expected, the authors found a large hourly wage penalty incurred on average by those who work part time as opposed to full time.

However, the story of health and education professionals stands out for its status as a unique, illustrative exception. While the similar literacy and numeracy proficiencies of this sector's part- and full-time workers are not unusual, these workers face no wage penalty, which is not the average scenario.

The higher demand for these skilled workers translates into greater opportunities for flexible work schedules than professionals outside of these "helping professions," the authors write. Health and education professionals are twice as likely to work part time compared to other professionals, with both full- and part-time workers averaging about $24 per hour. This difference in the flexibility offered by employers likely stems from the nature of the duties of health and education professionals such as nurses and teachers, which do not require the same worker to complete each task from start to finish; that is, duties can be handed over to another worker with minimal disruption. That handoff largely is made possible by the similar literacy and numeracy skill proficiencies of full- and part-time workers.

Women gravitate to these types of occupations, constituting 77 percent of all health/education professionals. They are far more likely to seek flexibility for reasons such as childcare, and under these labor-shortage conditions, employers appear willing to accommodate them while still paying prevailing wage.

The circumstances of workers in all other professions, such as lawyers and accountants, represent a stark contrast. They incur the largest hourly wage penalty, with full-time workers in these "other professions" earning 70 percent more per hour than their part-time counterparts ($32 per hour vs. $18.65). This wage penalty is associated with significantly lower literacy, and especially numeracy, proficiencies among part timers—in fact, this is the only occupational sector where part timers show weaker skills than full timers. Flexibility is not typical in these occupations; with a workforce that is much more likely to be male, there has been little pressure to accommodate workforce needs in hours or weeks of work.

The characteristics of these professional groups tie into the broader discussions in this series on the unprecedented changes experienced in the U.S. labor market. The first report in this series, *Skills and Earnings in the Full-Time Labor Market,* discussed the economy's shift from goods-producing industries to services-producing industries—the kinds of jobs we typically see in these professions. It also discussed how technological change simultaneously has led to the automation and loss of routine jobs, with the new jobs tilting the labor market in favor of those with higher levels of literacy and numeracy skills.[1] Taken together, both reports demonstrate the importance of human capital for all workers, part time and full time, trying to make a living in today's economy.

Recent U.S. Bureau of Labor Statistics projections suggested another decade of slow increases in the size of the nation's workforce, which would continue to place pressure on firms to find skilled workers, particularly among the nation's professional and managerial workforce. Through 2028, employment in these occupations was projected to rise by 8 percent (about 1.5 times the pace of growth in overall employment in the nation) and account for half of the expected total employment increase for the 2018–2028 period. Such tight labor conditions could translate into employers feeling pressure to better accommodate needs for flexibility in the future throughout the nation's professional and managerial workforce, not just in health and education.

Furthermore, the bulk of the growth in the labor force was expected to be among women across the age spectrum, as well as all individuals aged 55 and above: two groups that place a high value on flexibility in weeks of work over the course of the year as well as weekly hours of work.[2]

While new technology and organizational structures can help producers organize work in ways that it can be more readily handed off, these handoffs to part timers are most probable when literacy and numeracy skills are similar. In other words, comparable skills between full- and part-time workers are one essential requirement of greater flexibility in the workplace. When more individuals have skills, we all reap the benefits. It is important, as a society, that we pursue measures that allow more individuals to reap those rewards.

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Acknowledgments

The authors would like to express their special thanks to Anita Sands for her careful review of this report and incisive suggestions. We also would like to thank John Mazzeo. His review and comments substantially aided the authors in their efforts to improve the paper. Lastly, we are grateful to ETS, and especially Irwin Kirsch, for the continued support to our research in examining the impact of human capital in American labor markets.

Executive Summary

Low wages, low skills, and high turnover are often considered to be primary characteristics of part-time employment, with much research suggesting that the wages of part-time workers are not influenced by either their skills or level of educational attainment. Using data from the Survey of Adult Skills of the Programme for the International Assessment of Adult Competencies (PIAAC) for the United States, however, this analysis finds considerable payoffs to literacy and numeracy skills (as well as schooling) among Americans engaged in part-time employment.

Part-time workers' earnings are much lower than those of their full-time counterparts, a difference often referred to as the part-time wage penalty. This wage penalty is quite large. The mean hourly wage of part-time workers is only two-thirds that of full-time workers. Despite this wage penalty, there were no significant differences between part- and full-time workers in literacy skills and only modest differences in numeracy skills scores—the opposite of the substantial differences one would expect.

However, a closer look at the data reveals the sources of the wage penalty and uncovers large gains to skills in part-time labor markets. A comparison of mean hourly wages of part-time workers across occupations found sharp differences. The hourly wages of part-time workers were sharply higher in professional fields (which account for 30 percent of all part-time employment) and moderately higher in clerical/blue-collar occupations (16 percent) compared to the hourly wages of the part-time workers in other nonprofessional occupations (food/personal service, retail, health/education support, and elemental occupations), which account for the remaining 54 percent and are considered typical part-time jobs. Differences in the occupational distribution of employment between full- and part-time jobs largely account for the overall part-time wage penalty.

A comparison within professional occupations found there were no differences in the health and education fields in the hourly wage rates—or in literacy and numeracy skills—between full- and part-time workers. In contrast, there were large differences between the wages and skills of full- and part-time workers in professional occupations outside the health and education fields.

These findings suggest a high degree of substitutability between full- and part-time workers in the health and education professions. Workers in these fields appear to have greater flexibility in weekly hours of work since employers paid the same wages to these professionals who also had the same literacy and numeracy skills. It appears that employers in the health and education professional fields are able to organize work in a way so that scheduling flexibility does not act as an impediment to worker contributions to production. Indeed, scheduling flexibility that accommodates a largely female workforce without a wage penalty is an important characteristic of these occupations.

In sharp contrast, large hourly wage penalties were found for part-time workers in professional occupations outside the health and education fields, and these penalties were accompanied by substantially lower literacy and numeracy skills among part-time compared to full-time workers. Part-time workers accounted for 9 percent of all workers in professional occupations outside health and education, compared to less than half the share of part-time workers in health and education professional occupations (21%). Moreover, it appears that part-time work in professions outside health and education was relegated to lower-skilled workers. The skills of full- and part-time workers in these occupations suggest almost no substitutability for one another.

More than half of part-time workers were employed in nonprofessional service occupations, where skills and wages are much lower than in professional fields. Interestingly, we found little evidence of a part-time wage penalty in these occupations. There were generally no differences between the skills of part- and full-time workers in these occupations except in cases of part timers having significantly higher skills than their counterparts. These findings on wages and skills suggest a high degree of substitutability between full- and part-time workers in most of the nonprofessional service occupations.

The skill advantages of part-time workers in these occupations relative to full-time workers suggest that some fraction likely wanted full-time work but were involuntarily working part time to avoid unemployment, even though it meant working in occupations that did not fully utilize their skills. At the time of the PIAAC survey in 2012–2014, the level of involuntary part-time employment remained at high levels after declining only slightly following the trough of the Great Recession of 2008–2009.

An important part of our analysis of part-time wages was to develop statistical models designed to estimate the associations between skills and earnings of part-time workers. These models, based on the long-established human capital theory, test the idea that the earnings of workers are influenced by their personal abilities, including knowledge and skills that are developed in part through formal schooling and work experience.

Findings suggest that the impacts of human capital on the earnings of part-time workers is quite large. The first model that included the measure of literacy skills found large hourly wage gains to all three human-capital variables included in the model—literacy skills, educational attainment, and years of work experience. A second model that included the PIAAC numeracy skill scores found similar results.

Part-time workers able to find employment in professional occupations had large regression-adjusted hourly-wage advantages. Regression analysis found that the hourly wages of part-time workers were considerably higher (38 percent among health/educational professionals and 28 percent among professionals outside health and education) compared to those in retail occupations (the base group). We also found a significant earnings advantage among part-time workers in blue-collar occupations. Earnings regressions found a 17 percent higher hourly wage among part-time blue-collar workers compared to their counterparts in retail. This hourly earnings advantage of blue-collar workers cannot be explained by human-capital characteristics and is likely attributable to other factors such as union representation and wage differentials to compensate for risks and difficulties in performing these jobs.

The overall net impact of skills on the earnings of part-time workers was quite similar to that measured in full-time labor markets. An increase in the literacy score of part-time workers by one standard deviation was associated with a 7.5 percent increase in hourly earnings. Our previous study of full-time workers had found that an increase in the skill scores was associated with an increase of 8.4 percent in their monthly earnings.

Introduction

Part-time workers' hourly pay is sharply below the wages received by full-time workers in the United States and many other industrialized nations.[3] This wage gap is known as the part-time wage penalty and is widely viewed as the cost incurred by those who seek the flexibility of part-time employment or are unable to find full-time work.[4] The stereotypical view of part-time work is that it is characterized by work in low-wage, low-skill, and high-turnover service occupations.[5] Examples include work in fast-food restaurants and grocery stores staffed by both teens and older workers, as well as (mostly) adult women employed as home health aides and personal-care attendants. As a result of this stereotype, the wage penalty is often attributed to particular kinds of jobs: those concentrated in labor-market segments with flexible work hours.

Despite this stereotype, the evidence makes clear that part-time employment is found in virtually all occupations in the American labor market, not just particular segments. Indeed, a substantial share of those employed in professional and paraprofessional occupations usually work part time. These higher-level occupations have much different wage, skill, and employment stability traits than many other part-time ones. Substantial shares of part-time employment are also found in blue-collar and clerical occupations. These occupations generally pay higher hourly wages and have lower worker turnover.

This report uses new information about the literacy and numeracy skills of part-time workers to explore the connection between these skills and part-time workers' wages. The first section provides a descriptive review of part-time employment in the U.S. labor market, with emphasis on the part-time wage penalty among professional workers. It provides a unique perspective on the wage penalty as we can include not only measures of full- and part-time wages, but also full- and part-time worker literacy and numeracy skills.

Most research on part-time employment relies on measures of educational attainment as a proxy for worker skills. Defining low-skill employment (or for that matter, almost any segment of the labor market) based on educational attainment can often result in substantial mismeasurement of the skills of a given population.[6] Achieving a diploma, certificate, or degree is not necessarily an indicator of cognitive skill.

However, the ability to measure the size and occupational composition of low-wage/low-skill part-time employment, or to understand the impact of skills on the wages of part-time worker, has been limited by the lack of a direct measure of literacy and numeracy proficiencies of employed persons. As economist Paul Osterman observed, "(W)e will have to be flexible and somewhat imprecise about drawing boundaries around the low-wage/low-skill labor market. While perhaps unfortunate, this ambiguity accurately reflects the multidimensional nature of jobs ... and the incomplete character of available data."[7]

Fortunately, direct measures of the cognitive skills of workers are now available through the large-scale sample survey of skills conducted as part of the Survey of Adults Skills of the Programme for the International Assessment of Adult Competencies (PIAAC). PIAAC is designed to measure adult literacy and numeracy skills and was first administered in the United States during 2012 and 2014.[8] The PIAAC survey instrument is composed of a background questionnaire as well as cognitive assessments of literacy and numeracy proficiencies of respondents. PIAAC defines literacy as "understanding, evaluating, using and engaging with written text" and numeracy as "the ability to access, use, interpret and communicate mathematical information and ideas."[9]

We use the restricted-use data files from PIAAC to examine wages, skills, and job tenure of part-time workers and the nature of the wage penalty. An important advantage of the PIAAC questionnaire is that it includes data on the occupation of employed workers. Although limited due to sample size, this data provide the opportunity to examine the connection between part-time worker skills and hourly wages in broadly defined occupational segments of the American labor market. The PIAAC cognitive assessment's measures of literacy and numeracy proficiencies were derived from skill tests administered to about 8,700 adults aged 16 to 65. We employ these and related labor-market and background-trait variables derived from the PIAAC sample to better understand the connection between skills and wages among part-time workers in different segments of the labor market.

The Wage Penalty

First, we explore the wage penalty experienced by part-time workers. The PIAAC survey found a large mean hourly wage penalty overall, with full-time workers earning an average of $23.01 per hour, and part-time workers earning one-third less at $15.48. Several explanations exist for this penalty. One widely held view is that employers organize production to take advantage of a plentiful supply of low-cost, highly substitutable workers. Employing large shares of part-time workers provides scheduling flexibility to firms that is unavailable when relying primarily on a full-time workforce. The skill requirements of this work are not high, so labor-supply skill limitations pose less of a constraint toward expanding employment and output. Since skill requirements are low, labor supply is more plentiful and firm training costs are low. The result is higher worker turnover, reduced wage rates and fringe-benefit costs, and fewer worker protections.[10]

A substantial share of employment in retail trade, leisure and hospitality, and services to businesses sectors, as well as parts of the health and social-service sector (most notably home-care employment), includes low-wage, low-skill, high-turnover positions. The wage gap is thus the result of a system that organizes work into part-time positions that require relatively less cognitive skills, involving simple tasks and duties and low training costs. Thus, employers can tap into a potentially large labor supply, helping keep hourly wages down.[11]

A second perspective is that the decision to work part time is largely the choice of workers. Individuals determine their part-time status based on the trade-off between benefits of working and benefits of nonwork activities, including life circumstances when making the decision (e.g., young students, moms with a working spouse, persons in retirement years). This view suggests that individual workers are perfectly substitutable and can replace one another in any job making similar contributions to firm output. Firms are indifferent to the number of hours that individual workers want to work and therefore are willing to accommodate the desire for flexibility while still paying prevailing wage.[12]

Somewhere in the middle of these two perspectives is the idea that while workers may have some choice in hours of work (and other forms of workplace flexibility), the nature of production may limit firms' ability to be indifferent to the supply of worker hours. The ability to substitute one worker for another is considered to be limited by various factors, including the technological processes available in production, size and form of business organization, nature of the goods and services provided, scale of the market, and others.

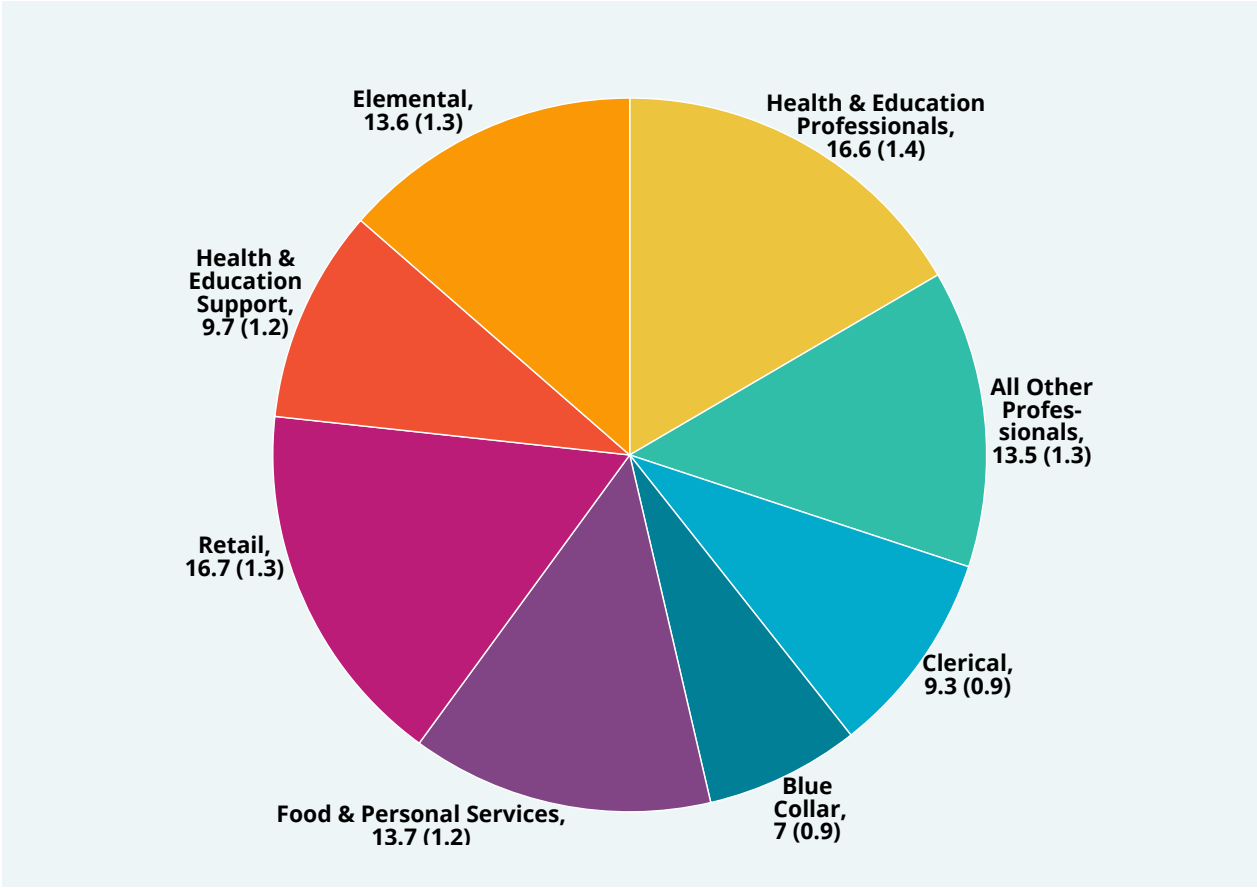
In some labor-market segments, the costs of organizing work to provide flexible scheduling options can be high. In these cases, wages are reduced to offset the costs. In other words, part-time workers must compensate the firm through lower wages. However, in other instances, the costs of a flexible schedule to the employer are low or even negative, so firms

are willing to offer part-time hours with little or no wage penalty. It is important to note that forces of technology, ownership, and standardization in production may all contribute to the size of the wage penalty.[13]

Despite these different perspectives, part-time employment is often treated as an undifferentiated mass. However, as Chris Tilly argues, "(T)he story of part-time employment is one (where) ... sharp distinctions among the various categories of workers and jobs" are found.[14]

We have organized the PIAAC findings to distinguish part-time employment by major occupational groupings. The PIAAC occupational taxonomy is designed to organize employment data based on skill level requirements for occupations. The data in Figure 1 examines the distribution of part-time employment by major occupational grouping in the American economy using the International Standard Classification of Occupations 2008 (ISCO-08). The ISCO-08 taxonomy is structured to reflect the skill levels needed to perform the task and duties at the major occupational group level.[15]

Figure 1: Percentage Distribution of Part-Time Workers by Major Occupational Group, 2012–2014 (Standard Errors in Parentheses)



Source: 2012/2014 PIAAC Surveys, Restricted Use File, tabulations by authors.

At the professional level, we distinguish between two broad groups of workers: (a) education and health professionals, and (b) all other professional occupations. About one in six part-time workers were employed in health or education professions, while the remaining professional fields accounted for 13.5 percent of overall part-time national employment. Workers in these occupational groups are categorized at the high end of the ISCO occupational skills distribution.

Clerical and blue-collar workers are generally classified in the middle of the ISCO skills classification. In the United States, they are sometimes referred to as middle-skills occupations. They require training beyond high school but below the college level.[16] Clerical occupations employed about 9.3 percent of all part-time workers, while blue-collar occupations employed about 7 percent. Similarly, food and personal service occupations, retail service occupations, and health/education support occupations are also classified around the middle of the ISCO skills classification. Together, these three occupational groups accounted for about 40 percent of the nation's part-time workforce.

Elemental occupations are at the bottom of the ISCO skills classification and include positions like freight handlers, building cleaners, landscape workers, and kitchen assistants. Skill requirements in these occupations are quite low. Elemental occupations employed 13.6 percent of part-time workers.

Incidence of Part-Time Employment, Female Employment Shares, and Mean Hourly Wage

The findings provided in Table 1 examine the incidence of part-time employment, the female share of employment, and the mean hourly wages of the persons employed within each of the major occupational employment groupings. The data reveal important patterns with respect to the incidence (part-time share of employment) in each occupation, female shares of employment within each group, and the mean hourly wage rate for each occupation.

Within the professional fields, we found substantial differences in the hourly pay rate, female share, and incidence of part-time employment between the health/education professions and "all other professional" workers. The mean hourly wage rate of $30.74 per hour for "all other professionals" was about 28 percent higher than the $24.04 hourly wage of workers in the health/education fields. Employment in the health/education professions was overwhelmingly concentrated among women. Females accounted for 77 percent of total employment in these professional fields. In contrast, just 38 percent of those in other professions were women, revealing a high degree of occupational sex segregation in those fields. We also found that the incidence of part-time employment in the health/education professions of 20.9 percent was more than double the part-time share found in the "other professional" category.

In the clerical and blue-collar occupational groups, we found a different relationship between hourly wage rates, female share of employment, and incidence of part-time work in relation to the professional fields. As with the health/education professions, we found a high degree of occupational sex segregation. Women accounted for just 16 percent of blue-collar employment, but 70 percent of clerical jobs. Despite this high degree of occupational sex segregation, we found no statistically significant difference in the mean hourly wage rate between clerical and blue-collar workers. However, hourly pay for clerical/blue-collar employment was sharply below that observed for both professional occupational groups.

The pattern of part-time employment shares in these two mid-level occupational groups seems similar to that in the professional fields. About 20 percent of employment in the heavily female-dominated clerical occupations worked part time, while just 10 percent of male dominated blue-collar employment was part time.

The hallmark of the "other nonprofessional" occupations—food/personal service, retail, health/education/support, and elemental—is high utilization of part-time workers. The incidence of part-time employment ranged from 37.7 to 44.5 percent in these occupations, compared to 9 to 21 percent for the professional fields, and 10 to 20 percent for clerical/blue-collar occupations. The female share of employment in these occupations varied considerably. Women accounted for just 31 percent of employment in elemental occupations—much lower than the 86 percent in health/education support occupations. All of the "other nonprofessional" occupations had hourly rates of pay that were significantly below that of both clerical and blue-collar workers.

Table 1: Mean Hourly Wage of Workers, Percent Female, and Percent Employed Part Time by Major Occupational Group, 2012–2014 (Standard Error in Parentheses)

MAJOR OCCUPATIONAL GROUP	MEAN HOURLY WAGE (ALL WORKERS)	PERCENT FEMALE	PERCENT EMPLOYED PART TIME
PROFESSIONAL			
HEALTH/EDUCATION PROFESSIONALS	$24.04 ($0.73)	77.1 (2.2)	20.9 (1.8)
ALL OTHER PROFESSIONALS	$30.74 ($0.79)	38.2 (1.6)	9.2 (0.9)
CLERICAL/BLUE COLLAR			
CLERICAL	$16.79 ($0.48)	70.0 (2.6)	19.8 (2.0)
BLUE COLLAR	$17.40 ($0.45)	16.0 (1.8)	10.2 (1.4)
OTHER NONPROFESSIONAL			
FOOD/PERSONAL SERVICE	$14.19 ($0.53)	49.7 (3.7)	44.5 (3.2)
RETAIL	$13.45 ($0.88)	63.0 (2.9)	42.8 (3.8)
HEALTH/EDUCATION SUPPORT	$12.36 ($0.59)	85.7 (2.7)	37.7 (3.8)
ELEMENTAL	$11.85 ($0.49)	31.4 (3.3)	40.1 (3.7)
ALL OCCUPATIONAL GROUPS	$21.41 ($0.41)	49.6 (0.7)	21.3 (0.8)

Source: 2012/2014 PIAAC Surveys, Restricted Use File, tabulations by authors.

In Table 2, we turn our attention to the difference in the mean hourly pay between full- and part-time workers in each of the major occupational groups. Overall, we found that the hourly pay of all full-time workers of $23.01 was almost 50 percent greater than the $15.48 hourly wage for part-time positions.

Looking at the two professional occupational groups, however, we found a dramatic difference. There was no statistically significant difference between the mean hourly pay of full-time workers ($24.15) and part-time workers ($23.64) in the health/education professions.[17] In sharp contrast, among "all other professionals," full-time workers earned an average of $31.97 per hour compared to $18.65 among their part-time counterparts, yielding a part-time wage penalty of $13.32—a rate only a little over half of their full-time counterparts'.

Table 2: Mean Hourly Wages of Workers by Occupational Group and Full-Time/ Part-Time Status, 2012–2014 (Standard Errors in Parentheses)

MAJOR OCCUPATIONAL GROUP	FULL TIME	PART TIME	DIFFERENCE
PROFESSIONAL			
HEALTH/EDUCATION PROFESSIONALS	$24.15 ($0.76)	$23.64 ($1.70)	$0.51 ($1.79)
ALL OTHER PROFESSIONALS	$31.97 ($0.84)	$18.65 ($1.63)	$13.32 ($1.84)***
CLERICAL/BLUE COLLAR			
CLERICAL	$17.43 ($0.49)	$14.20 ($1.20)	$3.23 ($1.29)**
BLUE COLLAR	$17.66 ($0.48)	$15.12 ($1.44)	$2.54 ($1.55)
OTHER NONPROFESSIONAL			
FOOD/PERSONAL SERVICE	$14.66 ($0.75)	$13.59 ($0.82)	$1.07 ($1.16)
RETAIL	$13.86 ($0.47)	$12.91 ($1.93)	$0.94 ($1.92)
HEALTH/ EDUCATION SUPPORT	$12.24 ($0.68)	$12.57 ($0.91)	-$0.33 ($1.04)
ELEMENTAL	$12.72 ($0.61)	$10.55 ($0.76)	$2.17 ($0.93)**
ALL OCCUPATIONAL GROUPS	$23.01 ($0.48)	$15.48 ($0.56)	$7.53 ($0.65)***

Source: 2012/2014 PIAAC Surveys, Restricted Use File, tabulations by authors.
Statistical significance: *** sig. at .01 level, **sig at .05 level.

There are three substantial differences in the characteristics of employment between the health and education professionals and "all other professionals": share of women, incidence of part-time employment, and gaps between the hourly wages of full- and part-time workers. These findings suggest that work arrangements in women-dominated professions such as health and education tend to function so that flexibility of work schedules is not penalized. In contrast, while there may be flexibility available in professional occupations outside those fields, it exacts a sizable wage penalty. The mean hourly wage of part timers for "all other professionals" was 42 percent lower than that of full timers.

In her examination of earnings penalties for different kinds of work flexibility—time out of labor force—Claudia Goldin found similar differences. She found that penalties for time out of the labor force were sizable for professional occupations such as business and law; they were much lower for occupations such as pharmacy.[18]

Scheduling flexibility is most often thought to be influenced by organizational policies and values.[19] However, the ability to effectively implement these policies and values may be limited by the nature of the work itself. Forrest Briscoe found that in professional labor markets, at least where professional services are provided to clients (for example, activities like investment advising, accounting, commodity sales, legal services, and medical diagnostic and treatment services), the level of flexibility appears associated with the ability to "hand off" a client to another professional with little or no disruption in the quality of service, at least from the client's perspective.[20]

The clerical/blue collar group (the middle-skills occupations) also displayed a divergent pattern regarding the part-time wage penalty. No statistically significant difference was found between the hourly pay of full- and part-time workers in blue-collar occupations. However, we found that part-time clerical workers earned an average of $3.23 per hour, or 20 percent, less than full-time counterparts. However, the pattern was markedly different than that observed among the professional occupations. Clerical workers, who were 70 percent female,

resembled health/education professionals with their higher share of part timers (1 in 5), while blue-collar workers more resembled the "all other professionals" group in that they were only 16 percent female and had just 1 in 10 working part time.

In other ways, however, the wage penalties vary from the pattern observed with the two professional occupational groups. Clerical positions, dominated by female workers, a substantial wage penalty exists for working part time, with full timers earning 23 percent more per hour than part timers; yet for blue-collar payroll workers, there is no statistically significant wage penalty for part-time work.

The "other nonprofessional" occupational groups had high incidences of part-time employment, between 38 and 45 percent worked part time. Women's share of employment varied considerably, from 86 percent in health/education support services to 31 percent among elemental workers. Elemental workers' hourly wages were the lowest among all occupational groups, averaging just $10.55.

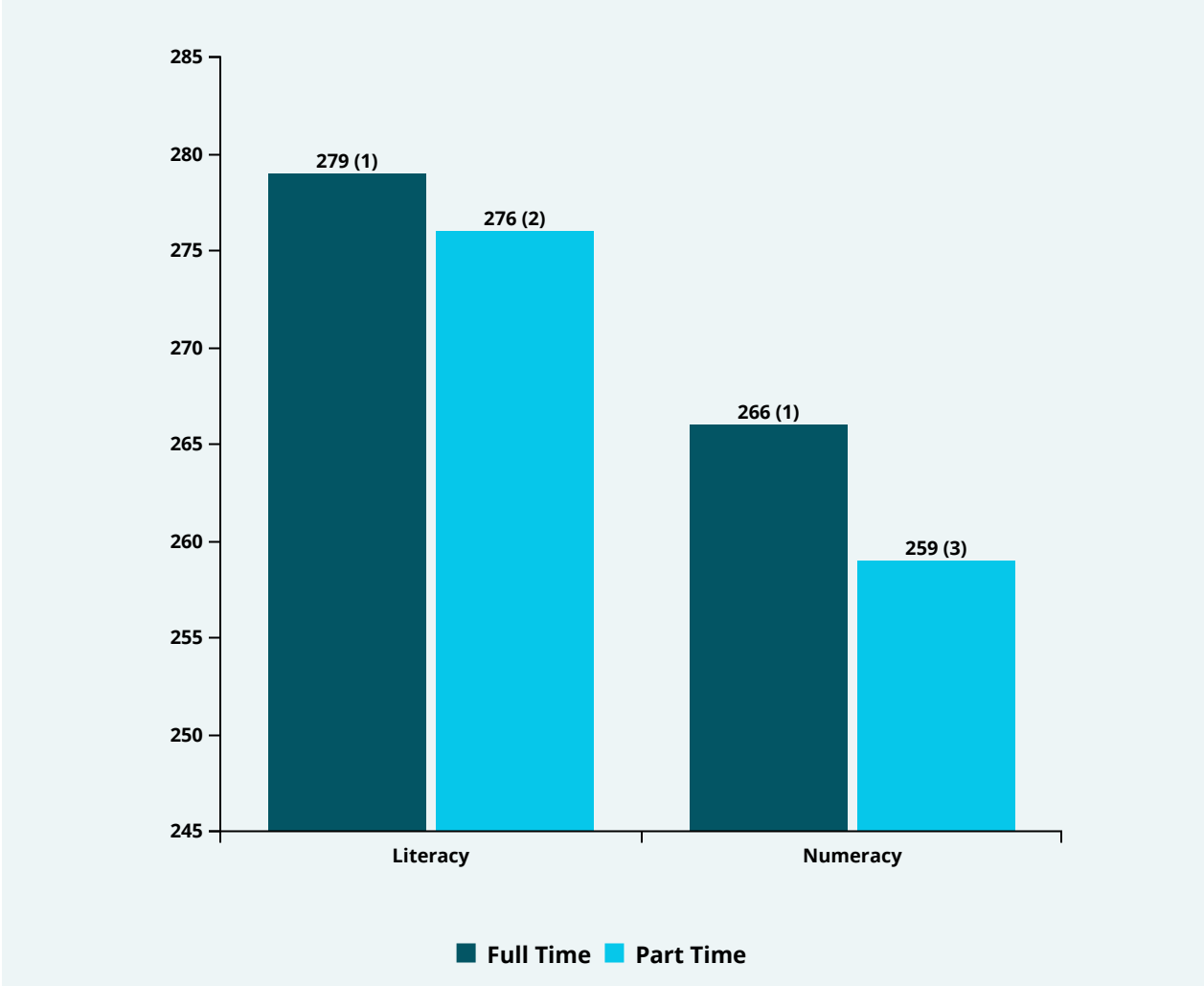
No wage penalty was found between full- and part-time workers in the female-dominated fields of food/personal service, retail, and health/education support services. With the male-intensive and lower-wage elemental occupational group, we found a significant hourly wage penalty for part-time workers ($10.55 among part timers and $12.72 among full timers).

Literacy and Numeracy Skills

Given the findings on the large hourly wage differences between full- and part-time workers, it would seem reasonable to expect large differences in their overall literacy and numeracy proficiency scores. If part-time employment is largely characterized by low-skill employment, then one would expect substantial differences in the literacy and numeracy skill scores between full- and part-time workers. However, findings often varied from expectations.

An examination of the mean literacy and numeracy scores of all full- and part-time workers (in all occupational groups) found an average literacy skill score of 279 (on a scale of 0 to 500) for full-time workers and 276 for part-time workers, a difference that was not statistically significant. On the numeracy scale, the mean score of full-time workers (266) was 7 points higher than that of part-time workers (259), a difference that was statistically significant at the .05 level (see Figure 2).

Figure 2: Mean Literacy and Numeracy Scores of Workers by Full-Time/Part-Time Status, 2012–2014 (Standard Errors in Parentheses)



Source: 2012/2014 PIAAC Surveys, Restricted Use File, tabulations by authors.

However, when examining literacy proficiency scores by occupation, there were substantial differences among full-time workers, and to a lesser extent with part-time workers (Table 3). Among full-time workers, the mean score among "all other professionals" was 299, more than a full standard deviation higher than the score of 234 of elemental workers. The scores of full-time workers in "all other professional" occupations and health/education professional occupations (295) were not statistically different. Scores in the remaining occupations ranged from 281 among clerical workers to between 234 and 267 among workers in blue-collar and "other nonprofessional" occupations.

The size of the differences in literacy scores across occupational groups was considerably smaller for part-time workers. The mean literacy scores ranged from a high of 293 among health/education professionals to a low of 259 among elemental workers, a difference of about three-quarters of a standard deviation. Surprisingly, the score of part-timers in "all

other professional" occupations was the same as clerical workers (285). The score of part-time workers in each of the remaining occupational groups ranged from 274 (food/personal-service occupations) to 261 (health/education support and blue-collar occupations).

The mean numeracy scores of full-time workers also varied considerably by occupational group. Full-time workers employed in "all other professional" occupations had a mean numeracy score of 289, while those working in elemental occupations were at just 223, about a one-standard-deviation difference.

We found smaller differences in the mean numeracy scores of part-time workers by occupation. The 40-point gap between the score of workers in health/education professional occupations, who were the highest (277), and health/education support occupations, who were the lowest (237)—is about two-thirds of a standard deviation.

Somewhat surprisingly, comparisons of mean literacy and numeracy skill scores of full- and part-time workers in each occupational group found that skills scores of full-time workers exceeded those of part-time workers in only one occupational group: "all other professionals." The mean literacy score of workers in this occupation was 299 among full-time workers and 285 among part-time workers, a statistically significant difference of 14 points. The numeracy skill advantage for full- over part-time workers in this occupation was somewhat greater than for literacy—19 points higher (289 to 270; Table 3).

What we observed as far as full- vs. part-time skill score differences for persons in health/education professional fields, in both literacy and numeracy, stands in marked contrast. There were no statistically significant differences.

In fact, among all the groups, the health/education professionals group stands out with respect to the nature of the skills scores of full- and part-time workers. Taken together with the fact that there is no wage penalty associated with part-time employment in these occupations, it suggests a high degree of interchangeability of full- and part-time workers in the delivery of services.

That is in contrast to the picture that emerges in the analysis of the skills and earnings of workers employed in the "all other professionals" grouping, which employs the highest skilled workers in the American labor market but with full-time workers having higher skill scores than part timers as well as hourly wage advantages. Indeed, full-time pay is 70 percent higher. These results suggest that unlike with health/education professionals, there is much less opportunity in the other professional fields to organize work in a way to make full- and part-time workers more substitutable. Part-time workers in these occupations have lower literacy and numeracy skills and earn much less per hour than full timers—compounding the process of handing off clients to gain schedule flexibility.

These findings, in combination with our earlier findings on full-time/part-time wage parity in the health/education professions, suggest that scheduling flexibility is likely available in those professions because of the ability to "hand off" clients and work responsibilities. The handoff between part timers and full timers is facilitated by the similar literacy and numeracy skills proficiencies. In contrast, among "all other professionals," we find significant—and in the case of numeracy, quite large—skill differences, as well as large hourly pay gaps between full- and part-time workers. These differences suggest a diminished ability for substitution.

Table 3: Mean Literacy and Numeracy Scores of Full- and Part-Time Workers by Occupational Group, 2012–2014 (Standard Errors in Parentheses)

MAJOR OCCUPATIONAL GROUP	FULL TIME	PART TIME	DIFFERENCE
LITERACY			
PROFESSIONAL			
HEALTH/EDUCATION PROFESSIONALS	295 (2)	293 (4)	2 (4.5)
ALL OTHER PROFESSIONALS	299 (2)	285 (6)	14 (5.9)**
CLERICAL/BLUE COLLAR			
CLERICAL	281 (3)	285 (6)	-4 (6.5)
BLUE COLLAR	254 (3)	261 (9)	-7 (8.7)
OTHER NONPROFESSIONAL			
FOOD/PERSONAL SERVICE	247 (6)	274 (5)	-28 (7.8)***
RETAIL	267 (5)	275 (4)	-8 (5.6)
HEALTH/EDUCATION SUPPORT	246 (6)	261 (9)	-15 (8.2)
ELEMENTAL	234 (6)	259 (5)	-26 (7.8)***
ALL OCCUPATIONAL GROUPS	279 (1)	276 (2)	3 (2.4)
NUMERACY			
PROFESSIONAL			
HEALTH/EDUCATION PROFESSIONALS	277 (3)	277 (5)	0 (5.8)
ALL OTHER PROFESSIONALS	289 (2)	270 (7)	19 (6.9)***
CLERICAL/BLUE COLLAR			
CLERICAL	261 (3)	268 (6)	-7 (7.5)
BLUE COLLAR	246 (3)	251 (9)	-5 (9.0)
OTHER NONPROFESSIONAL			
FOOD/PERSONAL SERVICE	235 (6)	259 (5)	-23 (7.9)***
RETAIL	253 (5)	256 (5)	-3 (7.0)
HEALTH/EDUCATION SUPPORT	224 (7)	237 (8)	-14 (9.0)
ELEMENTAL	223 (6)	246 (5)	-23 (7.8)***
ALL OCCUPATIONAL GROUPS	266 (1)	259 (3)	7 (2.8)**

Source: 2012/2014 PIAAC Surveys, Restricted Use File, tabulations by authors.
Statistical significance: *** sig. at .01 level, **sig at .05 level.

Findings for clerical and blue-collar occupations were much different from the professional fields. There were no statistically significant differences between the skill scores of full- and part-time workers (Table 3) even though full-time workers had statistically significant higher hourly rates of pay than part-time counterparts (see Table 2). These findings suggest that the full-time earnings advantage of workers in these occupations are not directly connected to workers' literacy and numeracy skills. Work tasks and responsibilities, as well as specific occupational training, may be the deciding factor in these markets.

All four other nonprofessional occupations, which have a high incidence of part-time employment (food/personal service, retail workers, health/support workers, and elemental workers), were characterized by equal or higher mean literacy and numeracy skill scores among part-time workers.

We found large and statistically significant *deficits,* however, in the literacy and numeracy skills of full-time workers relative to part-time counterparts in the food/personal-service and elemental categories. Full-time food/personal-service workers had a mean literacy score of 247, while part-time workers had a score of 274. The mean numeracy scores of full-time workers in this group were similarly lower. Elemental workers had a mean literacy score of 234, or 25 points lower than the mean literacy score of 259 among part timers. We found similarly large differences in the numeracy skills of these workers.

Part-time workers in food/personal service as well as among elemental workers had much higher literacy and numeracy skill scores than full timers. However, there was no hourly pay advantage to full-time work in food/personal-service occupations, and the hourly pay of elemental full-time workers was about one-fifth higher than that of part timers. The much higher literacy and numeracy skills of part-time workers in both occupational groups compared to full-time workers suggest the existence of a potential skill underutilization problem. At the time of the PIAAC survey, the U.S. job market had high levels of involuntary part-time employment—part-time workers who wanted a full-time job but were unable to find one because of poor job market conditions or slack work (their employer could not offer enough hours for a full-time schedule).

Job Tenure

Job tenure refers to the length of time that workers are employed by their current employer. It is often viewed as a measure of employment stability, and sometimes of job security. Higher pay is often thought to be a corollary of increased job tenure since tenure and wages are considered related to employer investment costs in worker skills development.[21]

The PIAAC questionnaire examined the job tenure of employed persons by asking when they began work for their current employer. Findings showed that full-time workers had spent an average of 8.2 years on their current job compared to 4.1 years for part timers (Table 4). Among full-time workers, job tenure varied by occupation. Mean years of job tenure among full-time workers in the four occupational groups with a low incidence of part-time employment (health/education professional, "all other professionals," and clerical/blue collar) was between 8.6 and 8.9 years, while the average job tenure for those in other nonprofessional occupations (retail, food/personal service, health/education support, and elemental) was much shorter—between 5.8 and 6.5 years.

Table 4: Comparison of Mean Job Tenure of Full- and Part-Time Workers by Major Occupational Group, 2012–2014 (Standard Errors in Parentheses)

MAJOR OCCUPATIONAL GROUP	FULL TIME	PART TIME	DIFFERENCE
PROFESSIONAL			
HEALTH/EDUCATION PROFESSIONALS	8.6 (0.5)	6.1 (0.7)	2.5 (0.9)***
ALL OTHER PROFESSIONALS	8.9 (0.4)	6.1 (1.0)	2.8 (1.1)***
CLERICAL/BLUE COLLAR			
CLERICAL	8.8 (0.6)	4.4 (0.6)	4.4 (0.8)***
BLUE COLLAR	8.6 (0.5)	5.3 (1.3)	3.4 (1.3)***
OTHER NONPROFESSIONAL			
FOOD/PERSONAL SERVICE	6.1 (0.6)	3.1 (0.5)	3.0 (0.9)***
RETAIL	6.0 (0.6)	2.3 (0.3)	3.7 (0.6)***
HEALTH/EDUCATION SUPPORT	6.5 (0.7)	4.4 (0.8)	2.1 (1.0)**
ELEMENTAL	5.8 (0.8)	2.2 (0.3)	3.6 (0.8)***
ALL OCCUPATIONAL GROUPS	8.2 (0.2)	4.1 (0.3)	4.1 (0.4)***

Source: 2012/2014 PIAAC Surveys, Restricted Use File, tabulations by authors.
Statistical significance: *** sig. at .01 level, **sig at .05 level.

The mean years of job tenure among part-time workers varied considerably by occupation. Tenure for part-time workers in retail (2.3 years) and elemental occupations (2.2) was brief. In contrast, part-time workers in both professional groups—health/education and all other professionals—had an average tenure of 6.1 years with the same employer, nearly 3 times higher. Part-time health/education support workers had a surprisingly long tenure—4.4 years.[22]

A comparison of the mean years of job tenure between full- and part-time workers within each major occupational group reveals large and significant tenure differences. The tenure of part-time workers among health/education professionals was 2.5 years less than the 8.6 years of full timers. Similarly, the tenure of part-time workers in the "all other professionals" was 2.8 fewer years than the 8.9 years of full timers.

Differences in the mean years of job tenure between full- and part-time workers in clerical and blue-collar occupations were much greater than for the two professional occupations. Full-time clerical workers had double the mean years of tenure (8.8 years vs. 4.4). Blue-collar workers in full-time jobs worked for their current employer for an average of 8.6 years, while the tenure for part time blue-collar workers was 5.3.

The findings on job tenure reveal that the lowest level of mean job tenure was among part-time workers in the "other nonprofessional" category, with the 4.4 years among health/education support workers as an exception.

Some Implications of the Descriptive Findings

A key finding from the set of descriptive analyses reviewed up to now, consistent with the earlier work of Tilly, is that part-time employment is not composed of an undifferentiated mass of low-wage, low-skill, high-turnover jobs. Instead, we find large differences in wages, literacy and numeracy skills, and job tenure among part-time workers. A comparison of mean

hourly wages of part-time workers found sharp differences across occupations. Large hourly wage advantages were found in professional part-time fields, which account for 30 percent of all part-time employment, as well as in clerical/blue-collar occupations, which account for 16 percent. Part timers in these occupations had significantly higher hourly pay than those in other nonprofessional fields, which account for 54 percent of part-time employment. Job tenure among part timers was much greater among professional workers and clerical/blue-collar workers than among the nonprofessional occupations.

Perhaps the most important finding related to the health/education professional occupations. Part-time employment in these fields stands in marked contrast to the stereotype of low-wage, low-skill, and unstable traits of part-time work. Part-time workers in health/education earned the same wage per hour as their full-time counterparts, and their literacy and numeracy skills were the same as their full-time counterparts. The mean job tenure of part timers in these occupations was lower than that of full timers but still lengthy.

Jobs in the female-intensive health/education professional fields are well-paying, employ highly skilled workers, and have considerable employment stability. Employment options in these fields appear much more flexible with respect to work arrangements for scheduling. Workers in these high-end occupations (where three-quarters of all payroll employees are women) have the ability to move from a full- to part-time schedule with no wage penalty and equally easily move from part- to full-time status since the literacy and numeracy skills of full- and part-time workers are the same.

The other group of professional occupations ("all other professionals") employs a much smaller share of female workers and does not offer the same flexibility. Part-time employment in this group comes with a large hourly wage penalty. The mean hourly wage of part-time workers is 40 percent lower than that of full-time workers. In line with their earnings advantages, full-time workers in this group have significantly higher mean literacy and numeracy skill scores than part timers. Many full timers who would like to move to a part-time schedule may face a substantial hourly wage penalty. Similarly, many part-time workers in this group seeking to shift to full-time positions are likely to face literacy and numeracy skill obstacles given the higher average skills of full-time workers in these occupations.

In the "full employment" labor market of today, these findings suggest that employers may be more willing to reorganize work tasks, duties, and responsibilities in professional labor markets given worsening labor-supply constraints in the United States. Slow labor-force growth combined with modest GDP growth have caused the ratio of unemployed workers to vacant jobs to fall below 1.0 for the past few years—indicating a general labor shortage at prevailing wages.[23]

In the next decade (through 2028), the nation's labor force is expected to increase by just 5 percent total. This extraordinarily slow growth means employers will face severe labor supply constraints on their ability to produce output and create jobs.[24] Older workers and prime-age women will account for most of the net increase, suggesting the need for greater scheduling flexibility in the organization of work. While many firms will continue to offer a flexible work policy, the nature of the tasks, duties, and responsibilities of the work itself may constrain the ability of workers to take advantage of these options. Making workers closer substitutes for one another—and whether consumers will be willing to accept such substitutes—will play a critical role in the elimination of the part-time wage penalty in these professions.

Such efforts by employers will be important to many young mothers, who have a strong desire to remain attached to the labor force, albeit on a part-time basis. A similar desire for a limited and flexible labor-force attachment exists among the rapidly rising number of aging members of the workforce interested in mixing work and retirement who are likely to seek flexibility with respect to weekly hours of work and weeks of work over the course of the year. Organizing work in professional fields to minimize the wage penalty will likely become more important as women and older workers' share of employment continues to rise. As Goldin aptly stated, "Flexibility at work has become a prized benefit, but the flexibility is of less value as it comes at a high price in terms of earnings."[25]

At the other end of the occupational distribution, we found four occupational groups (food/personal service, retail, health/education support, and elemental) characterized by much more intensive employment of part-time workers. Three of four of these occupational groups (with retail as the exception) had sharply lower mean literacy and numeracy scores compared to other occupational groups that are characterized by a low incidence of part-time employees. No literacy or numeracy skill advantages were found for full-time workers relative to part-time workers in these four occupations. Instead, in two of these occupational groups, we found higher literacy and numeracy skill scores among part-time workers than full timers (food/personal service, elemental), suggesting the skills of part-time workers are higher than the skills required to perform the tasks and functions in these occupations. Such skill underutilization is considered voluntary among workers who choose a lower-skill part-time job for convenience or some other reason even though they could perform higher-skill jobs. It is considered involuntary among workers who accept such positions because they cannot find full-time work. Whether voluntary or involuntary, this skill underutilization reflects a loss in potential worker productivity.

In the following section, we present the findings of a formal model of the determinants of the hourly pay of part-time workers. The findings from this model are consistent with the discussion above and highlight the role of occupational employment, skills, and work experience in determining the wages of part-time workers.

Regression Analysis of Part-Time Hourly Earnings

This section of the paper focuses on an examination of the factors that influence the hourly wages of part-time workers, with a specific focus on human capital. The examination is based on the human-capital theory that postulates that earnings are determined by the quantity of human capital of workers and the rate of return to alternative human capital investments.[26] Human capital is the stock of knowledge, skills, and abilities of individuals that represent their productive potential. It is typically measured by formal educational attainment, basic skill proficiencies, and work experience of individuals. Investment in human capital makes workers more productive. And, as with the expectation of future benefits that underlies investment in physical capital, individuals invest in human capital with an expectation of a future stream of benefits. A primary measure of such benefits in the labor market are the wages paid to workers that are closely related to their productivity on the job. In the human capital framework, market wage rates largely represent the returns to one's stock of human capital.

According to the theory, formal education should affect earnings positively because it is a productivity-enhancing activity. Education and earnings are positively related because workers with more schooling possess greater skills and knowledge valued in the production of good and services. The productivity-enhancing effect of schooling leads to higher earnings among better-educated workers.

Work experience is also considered an essential source of human capital development.[27] It represents additional human capital that is acquired through both formal and informal on the job training acquired from employment. Wages are expected to rise with work experience because workers acquire additional skills with work experience and move on to higher paying positions as they continue developing their productive proficiencies on the job.

Another important measure of human capital is the skills of workers. In this report, skills of workers are measured by their literacy and numeracy proficiency scores reported in the PIAAC data files. Gary Becker contended that the earnings premium to schooling tends to be biased upward, attributing this upward bias to ability. He contended that a college education accounts for only part of the earnings premium of college-educated workers over high school graduate. Some of the earnings gains associated with a college diploma are attributable to a greater stock of ability among college-bound high school graduates who earn a degree relative to counterparts who opt not to enroll. However, he argued, if these individuals had opted not to enroll in college, they would still earn about 12 percent more than their non-college-bound counterparts because of their greater ability at the time of exiting high school.[28] A similar upward bias in the rate of return to schooling was estimated by Griliches and Mason.[29]

Although the literacy and numeracy proficiencies of workers measured in PIAAC data might not exactly measure the "ability" of workers, they do provide an important measure of cognitive skills required to perform effectively across the wide array of jobs in the labor market. Skills are rewarded in the labor market because higher skill improves worker performance. Furthermore, people with higher skills are more trainable because higher skills are associated with a higher aptitude for learning.

Labor-market outcomes, of which earnings is one measure, are associated with educational attainment as well as cognitive skills. Past research has demonstrated that even among workers with the same level of educational attainment, those with higher cognitive skills have greater labor-market payoffs than those with lower cognitive skills.[30] Cognitive skills are important determinants of labor market outcomes of U.S. workers.[31] In the early 1990s, the Education Department's National Center for Education Statistics (NCES) and its Division of Adult Education and Literacy conducted a national household survey of adult literacy—the National Adult Literacy Survey. Findings from this survey revealed that the literacy proficiencies of the workers were positively and strongly associated with their weekly and annual earnings.[32] In 2003, the NCES launched the nationally representative National Assessment of Adult Literacy survey, which assessed proficiencies of American adults aged 16 and older. Findings were similar; in comparison to adults with higher levels of literacy, adults with low level of literacy were likely to have poor labor-market outcomes such as lower wages and higher rates of reliance on public assistance.[33]

Findings from the analysis of PIAAC survey data on the impact of literacy and numeracy skills on employment and earnings showed that in each country that participated in the PIAAC survey, workers with higher literacy and numeracy skills outearned those with low skills.[34] Another PIAAC-based study on the returns to skills worldwide found that among full-time workers between the ages of 35 and 54, on average, a one-standard-deviation increase in numeracy skills increased hourly wages by 18 percent.[35] The study found wide variations across countries in the returns to skills, with the highest returns to numeracy skills in the United States. The return was 28 percent among prime-age full-time workers in the United States.

Earnings regressions are typically used to estimate the return to human capital after controlling for background traits.[36] Such regression models are often referred to as human capital earnings functions, where human capital corresponds to education, work experience, and skills of workers that determine productivity. These earnings functions allow estimation of the independent association between human capital variables and wages after statistically controlling for other variables known to affect earnings of workers that are included in the regressions as explanatory variables.

The most frequent application of the human capital framework has been to estimate rates of return to investments in formal education utilizing the earnings function of Jacob Mincer.[37] According to this method, when years of schooling completed, work experience, and work experience squared are used as independent variables in a regression with the natural log of earnings as the dependent variable, the coefficient for years of schooling completed can be interpreted as the private rate of return to an additional year of schooling.[38] This study utilizes the Mincerian approach to estimate human capital earnings functions to gauge the returns to human capital in the part-time labor market.

The human capital earnings functions estimated in this paper are based on Mincer's framework, with the dependent variable in these regression models consisting of the natural log of earnings—the natural log of the monthly earnings of part-time workers between the ages of 16 and 65—and independent variables consisting of non-human-capital factors known to be associated with earnings and the following three measures of human capital:

- Skills: Literacy and numeracy skills of workers are included as explanatory variables in the form of standardized values of PIAAC literacy and numeracy proficiency scores of workers.
- Educational attainment: Educational attainment of workers in our earnings regressions is represented with a set of dummy variables representing the following educational attainment categories: less than high school level of education; high school graduate; some college without a credential, certificate, or associate degree; and bachelor's degree or higher level of education.
- Work experience: Work experience is entered in the regression as a nonlinear variable; it is specified as a quadratic variable to represent the human capital model that postulates earnings to increase with additional work experience but at a diminishing rate, reaching a maximum at a certain level of work experience.[39] Human capital theory postulates that postschooling investments in human capital decline over time. Since potential earnings are assumed to be directly proportional to the human capital stock, these earnings must also increase with experience but at a decreasing rate.

The earnings functions estimated in this paper are an expanded version of the basic Mincerian human-capital earnings function. In addition to skills, formal educational attainment, and work experience, other explanatory variables in the earnings regressions include gender, race-ethnicity, foreign-born status, disability status, school enrollment status, region of residence, and occupation in which the worker was employed at the time of the PIAAC survey. Detailed descriptions of dependent and independent variables used in the human capital earnings regression models are displayed in Appendix A.

Using regression analysis, we have identified associations between different measures of human capital and the hourly earnings of 16- to 65-year-old part-time workers after statistically controlling for other variables that are included in the regressions known to be associated with earnings of part-time workers.

We have estimated two separate human capital earnings functions: The first earnings function includes the standardized literacy score as the explanatory variable measuring skills; the second includes the standardized numeracy score for the same purpose. The universe of workers included in these earnings functions consists of part-time wage and salary workers in the United States between the ages of 16 and 65. The total sample included in the regression analysis is 941 part-time wage and salary workers.[40]

Estimated regression coefficients and their standard errors are presented in Appendix tables B-1 and B-2. The dependent variable in these regressions is the log of hourly earnings of part-time workers. The anti-log of estimated coefficients of explanatory variables minus 1 provides a measure of the expected percent change in the dependent variable (hourly earnings) associated with a one-unit change in explanatory variables. For example, the estimated coefficient for standardized literacy score was 0.072. The anti-log of 0.072 = 1.074; and 1.074 - 1 = .074, or 7.4 percent, indicating that the hourly wage of part-time workers is expected to be 7.4 percent higher for a one standard deviation increase in literacy skill score.

Effects of Literacy Skills and Other Key Factors

Findings from the first hourly earnings regression that includes the standardized literacy skills score as an explanatory variable representing skills are presented in Table 5.[41] According to these findings, an increase of one standard deviation (50 points) in the literacy score was expected to increase hourly wages of part-time workers by 7.5 percent, after statistically holding all other variables in the regression constant. The literacy coefficient is statistically significant at the .01 level.

Workers with higher levels of education are expected to have higher earnings. Analysis of the mean hourly earnings of part-time workers by level of education found higher hourly earnings with higher levels of educational attainment. While there was no statistically significant difference between the mean hourly earnings of part-time workers with or without a high school diploma (about $12 per hour), the mean hourly earnings of part-time workers with some college or a certificate/associate degree ($15 to $16 per hour) were, respectively, 31 to 36 percent higher than hourly earnings of high school graduates. Part-time workers with a bachelor's or higher degree earned $26 an hour, representing an earnings premium of 126 percent over high school graduate (see Appendix Table C-1).

However, it should be noted that within educational groups, earnings were also found to vary by literacy and numeracy skill.[42] It is true that education and skills reinforce each other. And as a result, workers with higher levels of education/skills earn much more than those with lower levels. Findings from our recent analysis of the earnings of college graduates show that the earnings links to education weaken if education fails to enhance the skills of workers.[43]

Regression findings reveal that among part-time workers, there is no statistically significant difference between the hourly earnings of workers without a high school diploma and those with one. That contrasts with our earlier study of full-time workers, which found statistically significant lower regression-adjusted earnings among full-time employed workers without a high school diploma compared to those with one.[44]

The study of the earnings of full-time workers[45] also found that, relative to high school graduates, there was no statistically significant regression-adjusted earnings advantages for workers who had some college education below the bachelor's degree level. However, in this paper, we did find hourly earnings advantages among part-time workers. Workers with some college, but no certificate or associate degree, were likely to earn 10.9 percent higher hourly earnings, holding all other explanatory variables constant (statistically significant at the .05 level). The coefficient of part-time workers with some type of certificate or an associate degree was positive but not statistically significant. Part-time workers with a college degree had large earnings advantages relative to high school graduate counterparts. Part-time workers with a bachelor's or higher degree were expected to earn 42.3 percent more per hour than a high school graduate (significant at the .01 level).

As noted above, work experience is considered part of the measure of human capital. It represents additional human capital acquired from both formal and informal on-the-job training. Wages are expected to grow with work experience because workers acquire additional skills with work experience and move on to higher-paying positions as they continue to work in the labor market. An examination of the hourly wages of part-time workers by years of work experience reveals that wages do indeed rise with years of work experience. The mean hourly wage of part-time workers rose from $12.33 per hour among workers with fewer than 10 years of work experience, to $16.96 among those with 10–19 years, $20.43 per hour for 20–29 years, and $21.95 per hours for workers with 30 or more years (Appendix Table C-1).

Findings from the earnings regression support this relationship between work experience and wages among part-time workers.[46] The earnings regression found that an additional year of paid work experience is expected to raise hourly earnings by 3.5 percent among part-time workers (Table 5). The coefficient of the work experience squared variable is negative and statistically significant, indicating that the earnings of part-time workers are expected to rise with additional work experience, but the rate of earnings growth slows down as the years of work experience increases (diminishing returns to additional work experience).

Table 5: Regression-Based Estimates of Expected Percent Change in Hourly Earnings of 16- to 65-Year-Old Part-Time Workers, 2012–2014 (Earnings Function 1: Standardized Literacy Score Included as Explanatory Variable Representing Skills)

EXPLANATORY VARIABLES	PERCENT EFFECT
SKILLS	
STANDARDIZED LITERACY SCORE	7.5***
EDUCATIONAL ATTAINMENT LEVEL (BASE GROUP: HIGH SCHOOL GRADUATE)	
LESS THAN HIGH SCHOOL	9.6
SOME COLLEGE	10.9**
CERTIFICATE/ASSOCIATE DEGREE	10.6
BACHELOR'S OR HIGHER DEGREE	42.3***
YEARS OF WORK EXPERIENCE	
EXPERIENCE	3.5***
EXPERIENCE SQUARED	-0.1***
GENDER (BASE GROUP: FEMALE)	
MALE	1.5
RACE-ETHNICITY (BASE GROUP: WHITE)	
BLACK	-8.3
HISPANIC	-4.4
ASIAN/PACIFIC ISL./OTHER RACES	-3.6
NATIVITY STATUS (BASE GROUP: FOREIGN-BORN)	
NATIVE-BORN	-2.4
DISABILITY STATUS (BASE GROUP: WITHOUT DISABILITIES)	
WITH DISABILITIES	-2.6
SCHOOL ENROLLMENT STATUS (BASE GROUP: NOT ENROLLED IN SCHOOL)	
ENROLLED IN SCHOOL	-6.2
OCCUPATION (BASE GROUP: RETAIL)	
HEALTH/EDUCATION PROFESSIONALS	37.7***
ALL OTHER PROFESSIONALS	27.9***
CLERICAL	5.3
FOOD/PERSONAL SERVICE	9.1
HEALTH/EDUCATION SUPPORT	7.6
BLUE COLLAR	17.4**
ELEMENTAL	-1.8
REGION OF RESIDENCE (BASE GROUP: SOUTH)	
NORTHEAST	10.7
MIDWEST	5.6
WEST	16.7***
R-SQUARED	0.322
N	941

Source: 2012/2014 PIAAC Surveys, Restricted Use File, tabulations by authors.
Statistical significance: *** sig. at .01 level, **sig at .05 level.

The regression coefficient for men in the regression model is not statistically significant. This means that, in sharp contrast to our earlier study of the earnings of full-time workers that found a sizable earnings advantage (about 25%) for men over women,[47] there was no regression-based difference between the hourly earnings of part-time employed men and women.

Also included as explanatory variables in our regression models are measures of the race-ethnicity of part-time workers. The earnings regressions found no statistically significant differences between the hourly earnings of White workers (the base group) and Black, Hispanic, or Asian/Pacific Islander/Other part-time workers. These findings are similar to those in the study of the earnings of full-time workers.[48] Whether a part-time worker was foreign-born[49] or native-born also did not have a statistically significant association with hourly wages. Similarly, the earnings coefficient of part-time workers with disabilities[50] was not statistically significant, indicating no regression-based difference between the hourly earnings of part-time workers with or without disabilities.

Many workers choose to work part time because they are engaged in other activities like school and family responsibilities, are partially retired, or perhaps have health-medical limitations that leave little time for full-time work.[51] At the time of the PIAAC survey, 42 percent of part-time workers were also enrolled in school. The mean hourly earnings of part-time workers who were also enrolled in school were nearly one-third lower than those who were not at the time of the PIAAC survey ($12.50 vs. $18.31; see Appendix Table C-1); this difference is statistically significant. However, the earnings regression that statistically controls for the effect of human capital, demographic, and occupational traits of workers found no statistically significant difference between the hourly earnings of enrolled and nonenrolled part-time workers.

The previous section of this report showed that the mean hourly earnings of part-time workers varied widely by occupation (Table 2). The mean hourly wages of part-time workers were highest among health/education professionals ($23.64) and all other professionals ($18.65) and lowest among health/education support workers ($12.57) and elemental workers ($10.55). The mean hourly wage of part-time workers employed in retail occupations, considered to be the typical part-time occupation, were $12.91 per hour. Compared to the $12.91 per hour earnings of part-time retail workers, the hourly earnings of part-time workers were 83 percent higher among health/educational professionals and nearly 45 percent higher among all other (nonhealth and noneducation) professional workers. Gaps between the mean hourly earnings of retail workers and workers in the remaining occupations did not meet the threshold of statistical significance.

Findings from earnings regressions showed large earnings advantages for part-time workers employed in the two professional occupations—health/education professionals and all other professionals. Those employed in the health/education professional occupations had an estimated earnings advantage of 37.7 percent compared to the base group consisting of retail employees working part time. Part-time workers employed in all other professional occupations had an hourly wage premium of 27.9 percent. The coefficients for both occupations were significant at the .01 level. These two occupational groups together accounted for 30 percent of total part-time employment in the nation. After regression controls for human capital, demographic, and other variables included in the regression, the regression coefficient of the blue-collar occupational group is positive and statistically significant. These regression findings indicate that part-time workers in blue-collar occupations hold a 17.4 percent hourly earnings advantage relative to those employed in retail fields.

Effects of Numeracy Skills and Other Key Factors

The second earnings function is estimated with the standardized numeracy score as an explanatory variable representing skills in place of the standardized literacy score. Findings in Table 6 show that an increase of one standard deviation in numeracy was expected to increase hourly earnings of part-time workers by 7.4 percent.

Findings on the regression-based associations between educational attainment and earnings in the two functions representing numeracy and literacy were similar. Compared to the hourly earnings of high school graduates, those of part-time workers were expected to be 10.8 percent higher among those with some college education and no college credentials (statistically significant at 0.05 level), and nearly 43 percent higher among those with a bachelor's or higher degree (statistically significant at 0.01 level). Regression findings show that the hourly earnings of part-time employed high school dropouts and workers with a certificate of an associate degree were not expected to be different from the hourly earnings of part-time workers with only a high school diploma; the coefficients of the two variables failed to meet the threshold of statistical significance.

Patterns of findings for the remaining variables in the function with the standardized numeracy score were similar to those in the function with the standardized literacy score. Coefficients estimated for explanatory variables representing gender, race-ethnicity, nativity, and disability status were not statistically significant, that is, no regression-based difference was expected in the earnings of part-time workers between men and women; White and Black, Hispanic, and Other race counterparts; with and without disabilities; and those who were and were not enrolled in school. Estimates of the association between work experience and hourly earnings of part-time workers in the two functions were also similar; each additional year of work experience was expected to increase earnings by 3.5 percent, and the rate of increase associated with work experience was expected to decrease with additional years of work experience, evident in the negative and statistically significant coefficient estimated for the experience squared variable in the quadratic specification of work experience.

Similar to other variables, the regression-based associations between occupation and hourly earnings of part-time workers from the earnings function with numeracy were similar to the function with literacy. Findings in Table 6 reveal that part-time workers employed in health/education professional occupations, all other professional occupations, and blue-collar occupations were, respectively, expected to earn 37.2 percent, 27.7 percent, and 16.7 percent more than their counterparts in retail occupations; the coefficients of the two professional occupations were statistically significant at the .01 level, and the coefficient of blue-collar occupations was significant at the .05 level.[52]

Table 6: Regression-Based Estimates of Expected Percent Change in Hourly Earnings of 16- to 65-Year-Old Part-Time Workers, 2012–2014 (Earnings Function 1: Standardized Numeracy Score Included as Explanatory Variable Representing Skills)

EXPLANATORY VARIABLES	PERCENT EFFECT
SKILLS	
STANDARDIZED NUMERACY SCORE	7.4**
EDUCATIONAL ATTAINMENT LEVEL (BASE GROUP: HIGH SCHOOL GRADUATE)	
LESS THAN HIGH SCHOOL	9.2
SOME COLLEGE	10.8**
CERTIFICATE/ASSOCIATE DEGREE	11.2
BACHELOR'S OR HIGHER DEGREE	42.8***
YEARS OF WORK EXPERIENCE	
EXPERIENCE	3.5***
EXPERIENCE SQUARED	-0.1***
GENDER (BASE GROUP: FEMALE)	
MALE	0.3
RACE-ETHNICITY (BASE GROUP: WHITE)	
BLACK	-6.5
HISPANIC	-3.6
ASIAN/PACIFIC ISL./OTHER RACES	-3.5
NATIVITY STATUS (BASE GROUP: FOREIGN-BORN)	
NATIVE-BORN	-0.8
DISABILITY STATUS (BASE GROUP: WITHOUT DISABILITIES)	
WITH DISABILITIES	-2.9
SCHOOL ENROLLMENT STATUS (BASE GROUP: NOT ENROLLED)	
ENROLLED IN SCHOOL	-6.5
OCCUPATION (BASE GROUP: RETAIL)	
HEALTH/EDUCATION PROFESSIONALS	37.2***
ALL OTHER PROFESSIONALS	27.7***
CLERICAL	5.4
FOOD/PERSONAL SERVICE	8.8
HEALTH/EDUCATION SUPPORT	7.8
BLUE COLLAR	16.7**
ELEMENTAL	-2.1
REGION OF RESIDENCE (BASE GROUP: SOUTH)	
NORTHEAST	11.0
MIDWEST	5.9
WEST	16.8***
R-SQUARED	0.323
N	941

Source: 2012/2014 PIAAC Surveys, Restricted Use File, tabulations by authors.
Statistical significance: *** sig. at .01 level, **sig at .05 level.

In summary, regression analysis of the hourly earnings of part-time workers found close associations between each of the measures of human capital and the hourly earnings of workers. Literacy and numeracy skills are closely associated with earnings in the part-time labor market. An increase in the skill score of part-time workers by one standard deviation was associated with a 7.5 percent increase in hourly earnings for literacy. Our previous study of full-time workers had found that an increase in the skill scores of full-time workers was associated with an increase of 8.4 percent.[53]

The association between work experience and earnings was strong among part-time workers. Hourly earnings of part-time workers were expected to increase by 3.5 percent for each additional year of work experience, with the rate of increase expected to slow down with additional years of experience. This finding was similar to that in our previous study of prime-age full-time workers, among whom earnings were expected to increase by about 3.2 percent for each additional year of work experience, with the rate of increase also expected to slow down with additional years of experience.[54]

Part-time workers who had earned a bachelor's or higher degree experience had sizable earnings advantages. Regression analysis found that after accounting for skills, work experience, and other background and occupational traits included in the regression, part-time workers with a bachelor's or higher level of education earned about 43 percent more than those with just a high school-level education.

At the subbaccalaureate level, the regression analysis was able to discern an hourly earnings advantage among part-time workers who had completed some college without earning a credential. Regression analysis of the hourly earnings of part-time workers found that compared to high school graduates, the earnings of part-time workers with some college education but no degree were 11 percent higher. These gains are largely realized by a combination of stronger skills and finding part-time employment in professional occupations.

Our earlier study of the earnings of prime-age full-time workers had found no regression-based earnings gains to college education below the bachelor's degree level, even for those with a certificate or associate degree.[55] It also had found that after accounting for skills, work experience, and other background and job-related traits of workers and occupational traits included in the regression, there was no statistically significant difference between the earnings of prime-age full-time workers with a subbaccalaureate level of college education and their high school graduate counterparts.[56]

Some other findings from earnings regressions of part-time workers are also surprising. Unlike our previous study of prime-age full-time workers,[57] where we found a large gender gap in earnings after regression controls, in the current study of part-time workers, we did not find any statistically significant difference between the regression-based hourly earnings of women and men. Even a simple comparison (not regression-adjusted) of the mean hourly earnings of part-time employed men and women showed no statistically significant difference between earnings. As for part-time workers with disabilities, there was, surprisingly, no difference after regression controls between their earnings compared to part-time workers without a disability. In contrast, our previous study of prime-age full-time workers had that workers with disabilities had statistically significant lower earnings than those without disabilities even after regression controls.[58]

Findings on regression-adjusted earnings differences between race-ethnicity groups and between foreign-born/native-born part-time workers mirrored the regression findings in our previous study on prime-age full-time workers.[59] Regression analysis in the current study of part-time workers found that the hourly earnings of Black, Hispanic, Asian, and all other non-

White races were not expected to be statistically different from the earnings of White part-time workers, similar to the regression findings from our study on full-time workers. Both the current study on part-time workers and the previous one on full-time workers found that after regression controls, the earnings of foreign-born workers were not statistically different from that of native-born workers.

Unsurprisingly, regression analysis found that the hourly wages of part-time workers were considerably higher (37 percent among health/educational professionals and 28 percent among nonhealth and noneducational professionals) compared to those in retail occupations (the base group). We also found a significant earnings advantage among part-time workers in blue-collar occupations. Earnings regressions found a 17 percent higher hourly wage among part-time blue-collar workers compared to those in retail. This hourly earnings advantage of blue-collar workers cannot be explained by human capital characteristics. We suspect that compensating wage differentials related to the degree of risk and difficulty associated with employment in blue-collar occupations may partly explain this advantage. Also, heavy concentrations of blue-collar workers in the construction trades may mean an hourly wage advantage related to federal legislation (Davis-Bacon prevailing wage rules) and to increased wages associated with representation by organized labor. Regression analysis found no significant differences in the hourly wages of part-time workers employed in the clerical, food/personal service, health/education support worker, and elemental occupations compared to retail.

Summary of Key Findings

Looking at occupational groups, the earnings advantage among part-time workers was especially large among those who were able to find employment in the health/education professional fields. Furthermore, these were distinguished from other professional occupations by a complete absence of either an earnings gap or skills gap between full- and part-time workers. Hourly earnings for both full- and part-time workers in this occupational group were within 51 cents of one another ($24.15 for full time vs. $23.64 for part time). Similarly, the mean literacy score of workers who were employed full and part time in these occupations were essentially the same (295 for full timers and 293 for part timers), and the mean numeracy scores were identical (277). These findings suggest that employers view full- and part-time workers in these occupations as near perfect substitutes, permitting great scheduling flexibility. This is consistent with the view of Goldin, who wrote, "When there are perfect substitutes for particular workers and zero transaction costs, there is never a premium in earnings with respect to the number or timing of hours worked."[60]

Large earnings and skill differences exist, however, between full- and part-time workers among the other group of professional occupations that exclude health/education professionals. A comparison of the mean hourly wages of workers in this occupational group found that full-time workers earned an average of $31.97 per hour, while part-time workers earned $18.65, representing a 71 percent advantage for full-time workers. Substantial literacy and numeracy skill differences were also found between full- and part-time workers among "all other professionals." Part-time workers had a mean literacy score of 285, 14 points below that of full timers. These findings suggest that full- and part-time workers in this occupational group are far from close substitutes, with sharply different hourly compensation as well as significant differences in literacy and numeracy proficiencies.

These findings also suggest that work requirements in professional occupations outside of health and education are less flexible. Full-time workers who might opt to step back to part-time work, or who may wish to mix work and retirement with a flexible schedule, are likely to

face a large wage penalty and have to perform duties on their job that may not fully utilize their skills and abilities. Work in these occupations is not organized in ways that permit the kind of "linear" flexibility in weekly hours of work available to professionals employed in health and education. This correlates with what Goldin noted as the existence of a variety of fields that are characterized by large wage penalties with respect to hours of work. Occupations in the "all other professionals" group simply require more hours, and continuous hours over the course of the workweek, than do health/education professionals jobs. As Goldin wrote:

> *In many workplaces employees meet with clients and accumulate knowledge about them. If an employee is unavailable and communicating the information to another employee is costly, the value of the individual to the firm will decline. Equivalently, employees often gain from interacting with each other in meetings or through random exchanges. If an employee is not around, that individual will be excluded from the information conveyed during these interactions and has lower value unless the information can be fully transferred in a low cost manner.*[61]

These differences deserve attention as we move into the next decade. The Bureau of Labor Statistics' (BLS) occupational employment projections forecast that all professional and managerial occupations will continue their relatively rapid pace of growth. Through 2028, employment in these occupations is projected to rise by 8 percent (about 1.5 times the pace of growth in overall employment in the nation) and account for 50 percent of the total employment increase expected in the U.S. labor market over the 2018–2028 period. Employment among health/education professionals is expected to rise by 9 percent and account for 38 percent of the total net increase in professional and managerial employment levels.[62]

BLS projections suggest that the bulk of the growth in the size of the nation's labor force will be concentrated among women of prime working age (25–54 years) and older workers (55 and over). The number of older workers is expected to rise by 6.4 million, accounting for about 60 percent of the net increase in the overall labor force. The number of prime-age women is expected to increase by about 2.7 million, accounting for 25 percent of the net increase. In other words, prime-age women and older workers are expected to account for 85 percent of the net increase in the size of the nation's labor force between 2018 and 2028.

It has been apparent for some time that older workers seek to mix work and retirement. With the decline of defined-benefit retirement programs (traditional pensions), older workers might be better off delaying full retirement.[63] Those older workers who are able to do so can continue to contribute toward retirement savings for a longer period of time, potentially deferring Social Security income to take advantage of a resulting larger monthly benefit. It also reduces the number of years of full retirement that they would need to finance.[64]

Outside of "all other professionals," we found no instance where either literacy or numeracy skill scores were higher for full-time workers than for part timers in the same occupation. However, we did find instances in which the skills of part-time workers were significantly higher than that of their full-time counterparts. Part-time workers employed in food/personal service had mean literacy scores that were 27 points higher than full timers, with a similar

advantage of part-time over full-time workers in numeracy. Part-time elemental workers also had large and statistically significant literacy (25 points) and numeracy (23 points) skill advantages compared to elemental workers employed full time.

The skill advantages of part-time workers in these occupations relative to full-time workers suggest that many of these part-time workers likely wanted full-time work but were involuntarily working part time to avoid unemployment even though it meant working in occupations that did not fully utilize their skills. At the time of the PIAAC survey during 2012–2014, the level of involuntary part-time employment remained at high levels after declining only slightly since the trough of the Great Recession of 2008–2009.

Looking at the big picture, despite variations among different groups of part-time workers, investments in human capital result in substantial gains in hourly pay. Educational attainment, literacy and numeracy skills, work experience, and access to employment in professional occupations (especially in health and education) can yield large hourly earnings advantages to part-time workers. Stronger skills are rewarded—and should be pursued and supported.

Appendix

Appendix A: Definitions of Dependent and Independent Variables in Hourly Earnings Regression Models

Below are the definitions from PIAAC 2012–2014 of the dependent and independent variables included in the hourly earnings regression models predicting the monthly earnings of 16- to 65-year-olds who work part time.

DEPENDENT VARIABLE:
lnearns = natural log of hourly earnings of wage and salary part-time workers
INDEPENDENT VARIABLES:
Individual Literacy and Numeracy Score
PVlit = continuous standardized PIAAC literacy score
PVnum = continuous standardized PIAAC numeracy score
Educational Attainment Levels
Base Group: Workers with a High School Diploma
educ_lt_hs = a dichotomous educational attainment variable
= 1, if no high school diploma
= 0, if else
educ_some_college = a dichotomous educational attainment variable
= 1, if some years of college, but without certification or associate degree
= 0, if else
educ_cert_assos = a dichotomous educational attainment variable
= 1, if some type of certification or associate degree
= 0, if else
educ_bachelors_plus = a dichotomous educational attainment variable
= 1, if Bachelor's or higher degree
= 0, if else
School Enrollment Status
Base Group: Not Enrolled in School
enrolled = a dichotomous school enrollment variable
= 1, if enrolled in school
= 0, if not enrolled in school
Years of Work Experience
experience = continuous years of actual work experience
experience_sq = continuous years of actual work experience squared
Region of Residence of Worker
Base Group: South Region
northeast = a dichotomous region of residence variable
= 1, if region of residence was Northeast region
= 0, if else
midwest = a dichotomous region of residence variable
= 1, if region of residence was Midwest region
= 0, if else
west = a dichotomous region of residence variable
= 1, if region of residence was West region
= 0, if else
Gender
Base Group: Female
male = a dichotomous gender variable
= 1, if male
= 0, if female
Race-Ethnicity
Base Group: White
black = a dichotomous race-ethnicity variable
= 1, if Black
= 0, if else
hispanic = a dichotomous race-ethnicity variable
= 1, if Hispanic
= 0, if else
asian_other_races = a dichotomous race-ethnicity variable
= 1, if Asian/Pacific Islanders/all "other" races
= 0, if else
Nativity Status
Base Group: Foreign-Born
foreign_born = a dichotomous nativity status variable
= 1, if foreign-born
= 0, if native-born
Disability Status
Base Group: Non-Disabled
disabled = a dichotomous disability status variable

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

Occupation of Workers

Base Group: Workers in Retail Trade

occ_mgmt_health_educ = a dichotomous occupation variable
= 1, if managerial and associate/health/education managerial and professional occupation
= 0, if else

occ_otherprof_assos = a dichotomous occupation variable
= 1, if all other professional and managers/all other associate professional occupation
= 0, if else

occ_clerical = a dichotomous occupation variable
= 1, if clerical occupation
= 0, if else

occ_cooks_perserv = a dichotomous occupation variable
= 1, if cooks/waiters/bartenders/other personal support occupation
= 0, if else

occ_healtheduc_support = a dichotomous occupation variable
= 1, if health/education support occupation
= 0, if else

occ_blue_collar = a dichotomous occupation variable
= 1, if blue collar occupation
= 0, if else

occ_elemental = a dichotomous occupation variable
= 1, if elemental occupation
= 0, if else

Appendix B: Estimated Coefficients of Earnings Regressions

Table B-1: Estimated Coefficients of Hourly Earnings Regressions for 16- to 65-Year-Old Part-Time Workers, 2012–2014 (Earnings Function 1: With Literacy Skills)

VARIABLE NAME	COEFFICIENT	STANDARD ERROR	*Z*	*P>Z*
PVLIT_	0.072	0.028	2.6	0.009
MALE	0.015	0.044	0.3	0.738
BLACK	-0.087	0.069	-1.3	0.204
HISPANIC	-0.045	0.052	-0.9	0.388
ASIAN_OTHER_RACES	-0.037	0.086	-0.4	0.667
EXPERIENCE	0.035	0.005	6.8	0.000
EXPERIENCESQ	-0.001	0.000	-4.8	0.000
EDUC_LT_HS	0.091	0.061	1.5	0.133
EDUC_SOME_COLLEGE	0.103	0.054	1.9	0.055
EDUC_CERT_ASSOC	0.101	0.056	1.8	0.074
EDUC_BACHELORS_PLUS	0.353	0.065	5.4	0.000
ENROLLED	-0.064	0.044	-1.4	0.150
OCC_MGMT_HEALTH_EDUC	0.320	0.092	3.5	0.001
OCC_OTHERPROF_ASSOS	0.246	0.087	2.8	0.004
OCC_CLERICAL	0.052	0.087	0.6	0.553
OCC_COOKS_PERSERV	0.087	0.079	1.1	0.272
OCC_HEALTHEDUC_SUPPORT	0.073	0.070	1.1	0.294
OCC_BLUE_COLLAR	0.160	0.074	2.2	0.030
OCC_ELEMENTAL	-0.018	0.057	-0.3	0.750
NATIVE_BORN	-0.025	0.062	-0.4	0.692
DISABLED	-0.026	0.072	-0.4	0.720
NORTHEAST	0.101	0.064	1.6	0.113
MIDWEST	0.054	0.055	1.0	0.326
WEST	0.154	0.061	2.6	0.011
_CONS	2.019	0.088	23.0	0.000
E_R2	0.322	0.033	9.7	0.000
E_N	941	†	†	†

† = not applicable.

Table B-2: Estimated Coefficients of Hourly Earnings Regressions for 16- to 65-Year-Old Part-Time Workers, 2012–2014 (Earnings Function 2: With Numeracy Skills)

VARIABLES	COEFFICIENT	STANDARD ERROR	*Z*	*P>Z*
PVNUM_	0.072	0.032	2.220	0.026
MALE	0.003	0.044	0.070	0.944
BLACK	-0.067	0.076	-0.880	0.378
HISPANIC	-0.036	0.050	-0.730	0.468
ASIAN_OTHER_RACES	-0.035	0.086	-0.410	0.682
EXPERIENCE	0.035	0.005	6.740	0.000
EXPERIENCESQ	-0.001	0.000	-4.770	0.000
EDUC_LT_HS	0.088	0.060	1.470	0.143
EDUC_SOME_COLLEGE	0.103	0.054	1.920	0.055
EDUC_CERT_ASSOC	0.106	0.056	1.900	0.057
EDUC_BACHELORS_PLUS	0.357	0.066	5.410	0.000
ENROLLED	-0.067	0.044	-1.540	0.122
OCC_MGMT_HEALTH_EDUC	0.317	0.093	3.410	0.001
OCC_OTHERPROF_ASSOS	0.244	0.087	2.810	0.005
OCC_CLERICAL	0.052	0.089	0.590	0.556
OCC_COOKS_PERSERV	0.084	0.079	1.060	0.290
OCC_HEALTHEDUC_SUPPORT	0.075	0.069	1.090	0.277
OCC_BLUE_COLLAR	0.154	0.073	2.110	0.035
OCC_ELEMENTAL	-0.022	0.058	-0.380	0.706
NATIVE_BORN	-0.008	0.060	-0.130	0.894
DISABLED	-0.030	0.072	-0.410	0.682
NORTHEAST	0.105	0.064	1.630	0.103
MIDWEST	0.058	0.055	1.050	0.294
WEST	0.155	0.059	2.620	0.009
_CONS	2.012	0.087	23.020	0.000
E_R2	0.323	0.034	9.620	0.000
E_N	941	†	†	†

† = not applicable.

Appendix C: Mean Hourly Earnings Included in Earnings Regression Analysis

Table C-1: Mean Hourly Earnings of 16- to 65-Year-Old Part-Time Workers Included in the Earnings Regression Analysis, 2012–2014

GROUP	MEAN	STANDARD ERROR	PERCENT DIFFERENCE	PERCENTAGE DISTRIBUTION OF PART-TIME WORKERS
ALL	$15.88	$0.57	†	100
EDUCATIONAL ATTAINMENT (BASE GROUP: HIGH SCHOOL GRADUATE)				
NO HIGH SCHOOL DIPLOMA	$12.24	$1.34	6	16.3
HIGH SCHOOL DIPLOMA	$11.53	$0.49	†	28.1
SOME COLLEGE	$15.13	$1.48	31**	19.4
CERTIFICATE OR ASSOCIATE DEGREE	$15.71	$1.13	36***	16.7
BACHELOR'S OR HIGHER DEGREE	$26.11	$1.98	126***	19.5
YEARS OF WORK EXPERIENCE (BASE GROUP: LESS THAN 10 YEARS)				
LESS THAN 10 YEARS	$12.33	$0.75	†	52.0
10–19 YEARS	$16.96	$1.16	38***	17.9
20–29 YEARS	$20.43	$1.71	66***	11.6
30+ YEARS	$21.95	$1.96	78***	18.5
GENDER (BASE GROUP: FEMALE)				
MALE	$14.74	$1.03	-11	37.9
FEMALE	$16.57	$0.79	†	62.1
RACE-ETHNICITY (BASE GROUP: HISPANIC)				
WHITE, NON-HISPANIC	$17.04	$0.75	†	64.1
BLACK, NON-HISPANIC	$13.43	$1.37	-21**	11.3
HISPANIC	$12.40	$1.24	-27***	14.3
ALL OTHER*	$16.16	$2.85	-5	10.4
NATIVITY STATUS (BASE GROUP: NATIVE BORN)				
FOREIGN-BORN	$15.97	$1.53	-0.6	11.4
NATIVE-BORN	$15.87	$0.65	†	88.6
DISABILITY STATUS (BASE GROUP: WITHOUT DISABILITIES)				
WITH DISABILITIES	$17.50	$2.34	13	20.4
WITHOUT DISABILITIES	$15.46	$0.54	†	79.6
SCHOOL ENROLLMENT STATUS (BASE GROUP: NOT ENROLLED)				
ENROLLED	$12.50	$0.71	-32***	41.9
NOT ENROLLED	$18.31	$0.78	†	58.1
OCCUPATIONAL GROUP (BASE GROUP: RETAIL)				
HEALTH/EDUCATION PROFESSIONAL	$23.61	$1.69	84***	16.2
ALL OTHER PROFESSIONALS	$21.69	$2.48	69***	13.8
CLERICAL	$14.09	$1.18	10	9.2
FOOD/PERSONAL SERVICE	$13.34	$0.81	4	13.8
RETAIL	$12.84	$1.87	†	16.5
HEALTH/EDUCATION SUPPORT	$12.44	$0.91	-3	9.7
BLUE COLLAR	$14.92	$1.44	16	6.9
LABORER	$11.27	$1.15	-12	13.9
REGION OF RESIDENCE (BASE GROUP: SOUTH)				
NORTHEAST	$17.20	$1.44	20*	17.9
MIDWEST	$15.81	$1.51	11	24.6
SOUTH	$14.28	$0.63	†	31.9
WEST	$17.01	$1.44	19*	25.6

† = not applicable.
Statistical significance: *** sig. at .01 level, **sig. at .05 level.
*Note: Asian/Pacific Islanders are included in "other" race category. The mean hourly earnings of Asian/Pacific Islanders were $19.04 compared to just $12.96 among workers in the "Other Race" group that includes American Indian/Alaska native and other races. However, there were only 46 sample cases of Asian/Pacific Islanders in our sample for hourly earnings regression analysis for part-time workers; the sample-size of workers in the "Other Race" group was only 39. Since the sample-size requirement of 62 was not achieved among Asian/Pacific Islanders or the "Other Race" group alone, we combined these two race-ethnicity groups into the "All Other" category.

Appendix D: About the Data

Analyses appearing in this report are based on the PIAAC 2012–2014 Restricted Use File (RUF) data provided by Educational Testing Service. We have restricted our findings to 16- to 65-year-old wage and salary workers with positive hourly earnings. Respondents to PIAAC surveys were asked about their gross (pretax) earnings at work. Questions regarding earnings were designed to capture hourly, daily, weekly, biweekly, monthly, and annual earnings to minimize nonresponses. In cases where respondents were unwilling to provide exact gross pay, questions were also asked to capture earnings in any other categories. Data on gross monthly and hourly earnings were derived from responses to the earnings questions. Derived data on continuous values of gross monthly and hourly earnings data are available only in the RUF.

Our analysis of hourly earnings in the report is based on RUF. The hourly earnings data were available for only 3,796 wage and salary workers between the ages of 16 and 65. After trimming earnings at the top and the bottom percentiles and excluding workers with foreign qualification, workers with missing occupations, and missing work experience, we had a sample of 3,666 workers 16- to 65-year-olds for our analysis of full- and part-time workers.

The PIAAC data collection process limits the time and related burdens required of respondents by only administering a fraction of the proficiency tests to individual adult participants in the survey. PIAAC survey respondents were not administered every skill proficiency question. Instead, 10 plausible values (PVs) for literacy and numeracy test scores are provided in the PIAAC data file. PVs are a statistical means to replicate a probable score distribution that summarizes how well each respondent answered a small subset of the assessment items and how well other respondents from a similar background performed on the rest of the assessment item pool. These plausible values are estimated using item response theory models. According to the PIAAC technical documentation, in addition to the estimation of survey errors from the complex sampling design of PIAAC, one should also estimate the measurement errors presented in the proficiency assessments whenever the 10 plausible scores are used in the analysis. The measurement error accounts for variations in these 10 plausible values. All the PIAAC proficiency measures in this report—for both descriptive and regression-based estimates and associated measurement errors—are estimated using 10 plausible values.[65] All the analysis and results presented in this paper that involved the use of numeracy and literacy outcomes are based on using all 10 plausible values. Standard errors of the estimates were calculated using the standard formula for calculating standard errors using multiple imputations in combination with corresponding jackknife replication methods. Standard errors for all analyses of literacy and numeracy proficiencies include measurement errors.

Classification of PIAAC Occupations in Eight Categories

The respondents in PIAAC surveys in all participating countries were asked to name current or past occupational titles in their job. These occupations were then assigned the International Standard Classification of Occupations 2008 (ISCO-08) codes developed by the International Labor Organization (ILO).[66] In this report, we have grouped these occupations into the following eight categories:

1. Health and Education Professionals
2. All Other Professionals (excluding Health and Education Professionals)[67]
3. Clerical

4. Blue Collar
5. Food and Personal Service
6. Retail
7. Health and Education Support
8. Elemental

Crosswalk Between ISCO-08 and SOC 2010 Occupations

Respondents in PIAAC surveys in all participating countries were asked to name current or past occupational titles in their job. These occupations were then assigned ISCO-08 codes.[68] In August 2012, the BLS, on behalf of the Standard Occupational Classification Policy Committee, published a crosswalk between 438 ISCO-08 occupations and the 2010 Standard Occupational Classification (SOC).[69] For these 438 ISCO-08 occupations, the BLS assigned 1,125 SOC codes. Of the 438 ISCO-08 occupations, only 155, or 35 percent (155/438), identified as one-to-one SOC matched occupations, while the remaining 283 occupations were assigned to two or more SOC categories. Our analysis of the BLS crosswalk shows that even at the two-digit SOC level, 78 occupations were assigned multiple two-digit SOC occupation codes.

For the majority of ISCO occupations, the BLS finds no one-to-one match of 2010 SOC occupations. These occupations cut across multiple SOC occupations. For example, for ISCO-08 occupation "insurance representative (3321)," BLS assigned three SOC occupations: insurance underwriter (SOC 13-2053), first-line supervisors of nonretail sales workers (SOC 41-1012), and insurance sales agents (SOC 41-3021). Under the SOC system, ISCO classified "insurance underwriter" under the two-digit broad SOC category "business and financial operations occupations," while first-line supervisors of nonretail sales and insurance sales agent fell under "sales and related occupations." Given these issues, a direct link between occupation in PIAAC and SOC cannot be established.

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Endnotes

1 Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, *Skills and Earnings in the Full-Time Labor Market,* The Impact of Human Capital in the American Labor Market Series (Princeton, NJ: Educational Testing Service, 2018).

2 Kevin Dubina, Teri Morisi, Michael Riely, and Andrea Wagoner, *Monthly Labor Review: Projections Overview and Highlights, 2018–28* (Washington: U.S. Bureau of Labor Statistics, October 2019), https://www.bls.gov/opub/mlr/2019/article/projections-overview-and-highlights-2018-28.htm.

3 Elena Bardasi and Janet Gornick, "Work for Less? Women's Part-Time Wage Penalties across Countries," *Feminist Economics* 14, no. 1 (2008): 37–72, https://doi.org/10.1080/13545700701716649.

4 Working part time in order to engage in important life activities including schooling and family responsibilities is called voluntary part-time work. Working part time because full-time employment cannot be found is called involuntary part-time work; it provides job-market participants with the opportunity to continue working and avoid joblessness, especially during recessions.

5 Chris Tilly, *Half a Job: Bad and Good Part-Time Jobs in a Changing Labor Market* (Philadelphia: Temple University Press, 1996).

6 Neeta Fogg, Paul Harrington, Ishwar Khatiwada, Irwin Kirsch, Anita Sands, and Larry Hanover, *If You Can't Be with the Data You Love: and the Risks of Loving the Data You're With* (Princeton, NJ: Educational Testing Service, 2019).

7 Paul Osterman, "Employers in the Low-Wage/Low Skill Labor Market," in *Low-Wage Workers in the New Economy,* ed. Richard Kazis and Marc Miller (Washington: Urban Institute Press, 2001).

8 Measures of problem solving in a technology-rich environment were also included in the competency assessment of the PIAAC study in the United States.

9 The PIAAC data collection process limits the time and related burdens required of respondents by only administering a fraction of the proficiency tests to individual adult participants in the survey. PIAAC survey respondents were not administered every skill proficiency question. Instead, 10 plausible values (PVs) for literacy and numeracy test scores are provided in the PIAAC data file. PVs are a statistical means to replicate a probable score distribution that summarizes how well each respondent answered a small subset of the assessment items and how well other respondents from a similar background performed on the rest of the assessment item pool. These plausible values are estimated using item response theory models. According to the PIAAC technical documentation, in addition to the estimation of survey errors from the complex sampling design of PIAAC, one should also estimate the measurement errors presented in the proficiency assessments whenever the 10 plausible scores are used in the analysis. The measurement error accounts for variations in these 10 plausible values. All PIAAC proficiency measures in this report—for both descriptive and regression-based estimates and associated measurement errors—are estimated using 10 plausible values. See Kentaro Yamamoto, Lale Khorramdel, and Matthias von Davier, "Chapter 17: Scaling PIAAC Cognitive Data," *Technical Report of the Survey of Adult Skills (PIAAC)* 2nd Ed. (Paris: OECD Publishing, 2016), https://www.oecd.org/skills/piaac/_Technical%20Report_17OCT13.pdf.

10 Tilly, *Half a Job*.

11 This view is derived from dual labor market theory. See Peter B. Doeringer and Michael J. Piore, *Internal Labor Markets and Manpower Analysis* (Abingdon, England: Routledge, 1985). For a discussion of the application of dual labor market theory to part-time employment, see Chris Tilly, "Dualism in Part-Time Employment," *Industrial Relations* 31, no. 2 (1992): 330–347, https://doi.org/10.1111/j.1468-232X.1992.tb00312.x.

12 A discussion of the "standard model" can be found in Barry T. Hirsch, "Why Do Part-Time Workers Earn Less? The Role of Worker and Job Skills," *Industrial and Labor Relations Review* 58, no. 4 (2005): 525–551, http://www.jstor.org/stable/30038605.

13 Claudia Goldin and Lawrence F. Katz, "A Most Egalitarian Profession: Pharmacy and the Evolution of a Family-Friendly Occupation," *Journal of Labor Economics* 34, no. 3 (2016): 705–746, https://scholar.harvard.edu/files/lkatz/files/jole_gk_pharm_published.pdf.

14 Tilly, *Half a Job*.

15 International Labor Office, *International Standard Classification of Occupations (ISCO-08): Vol. 1: Structure, Group Definitions and Correspondence Tables*, 2012.

16 For an example of the middle skills concept, see *Bridge the Gap: Rebuilding America's Middle Skills* (Accenture, Burning Glass, and Harvard Business School, 2014), https://www.hbs.edu/competitiveness/Documents/bridge-the-gap.pdf.

17 These findings are not unique. Other studies in health fields find no wage penalties. See Goldin and Katz, "Most Egalitarian Profession"; and Barry Hirsch and Edward Schumacher, "Monopsony Power and Relative Wages in the Labor Market for Nurses," *Journal of Health Economics* 14, no. 4 (1995): 443–476, https://doi.org/10.1016/0167-6296(95)00013-8; Manuel J. Carvajal and Ioana Popovici, "Pharmacists' Wages and Salaries: The Part-Time Versus Full-Time Dichotomy," *Research in Social and Administrative Pharmacy* 12, no. 2 (2016): 341–346, https://doi.org/10.1016/j.sapharm.2015.06.003.

18 Claudia Goldin, "A Grand Gender Convergence: Its Last Chapter," *American Economic Review* 104, no. 4 (2014): 1091–1119, http://dx.doi.org/10.1257/aer.104.4.1091.

19 Robert Drago and Douglas Hyatt, "Symposium: The Effect of Work-Family Policies on Employees and Employers," *Industrial Relations* 42, no. 2 (2003): 139–144, http://www.blackwellpublishing.com/content/BPL_Images/Journal_Samples/IREL0019-8676~42~2/285.PDF.

20 Forrest Briscoe, "From Iron Cage to Iron Shield? How Bureaucracy Enables Temporal Flexibility for Professional Service Workers," *Organizational Science* 18, no. 2 (2007): 297–314, https://www.jstor.org/stable/25146100?seq=1#metadata_info_tab_contents.

21 Doeringer and Piore, *Internal Labor Markets*.

22 A substantial share of health-care support staff in the United States are employed as personal-care attendants. These workers are primarily financed as required under the federal Medicaid law to support efforts to help consumers with two or more limitations in activities of daily living at home. The employer/employee relationship, however, is between the consumer and the personal-care attendant. Often, the worker is a friend or family member. This may partially account for significantly different job tenure of part-time workers in the health/education support fields compared to other nonprofessional part-time work. See Neeta Fogg, Paul Harrington, and Nancy Snyder, *Gray Warnings: Challenges in the Direct Care Workforce,* Office of the State Auditor, Commonwealth of Massachusetts, June 2018.

23 The Beveridge definition of full employment is that rate of unemployment where the number of unemployed workers is equal to the number of available jobs. William Beveridge, *Full Employment in a Free Society* (London: George Allen and Unwin Ltd, 1946).

24 U.S. Bureau of Labor Statistics, Employment Projections: Civilian Labor Force by Age, Sex, Race, and Ethnicity, https://www.bls.gov/emp/tables/civilian-labor-force-summary.htm.

25 Goldin, "Grand Gender Convergence."

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

27 Jacob Mincer, *Schooling, Experience, and Earnings*, National Bureau of Economic Research (New York: Columbia University Press, 1974).

28 Becker, *Human Capital.*

29 Zvi Griliches and William M. Mason, "Education, Income, and Ability," *Journal of Political Economy* 80, no. 3 (1972): S74–S103.

30 Richard J. Murnane, John B. Willett, and Frank Levy, "The Growing Importance of Cognitive Skills in Wage Determination," *Review of Economics and Statistics* 77, no. 2 (1995): 251–266, https://doi.org/10.3386/w5076; McKinley L. Blackburn and David Neumark, "Omitted-Ability Bias and the Increase in Return to Schooling," *Journal of Labor Economics* 11, no. 3 (1993): 521–554.

31 Richard J. Murnane, John B. Willett, Yves Duhaldeborde, and John H. Tyler, "How Important Are the Cognitive Skills of Teenagers in Predicting Subsequent Earnings," *Journal of Policy Analysis and Management* 19, no. 4, (2000): 547–568, https://doi.org/10.1002/1520-6688(200023)19:4%3C547::AID-PAM2%3E3.0.CO;2-%23; Castex Gonzalo and Evgenia Kogan Dechter, "The Changing Roles of Education and Ability in Wage Determination," *Journal of Labor Economics* 32, no. 4 (2014): 685–710, https://doi.org/10.1086/676018.

32 Andrew Sum, *Literacy in the Labor Force: Results from the National Adult Literacy Survey (NALS)*, National Center for Education Statistics, NCES 1999-470, 1999.

33 William C. Wood, *Literacy and the Entry-Level Workforce: The Role of Literacy and Policy in Labor Market Success* (Washington: Employment Policy Institute, 2010).

34 Marguerita Lane and Gavan Conlon, *"The Impact of Literacy, Numeracy and Computer Skills on Earnings and Employment Outcomes*," OECD Education Working Papers No. 129 (Paris: OECD Publishing, 2016), https://www.oecd-ilibrary.org/education/the-impact-of-literacy-numeracy-and-computer-skills-on-earnings-and-employment-outcomes_5jm2cv4t4gzs-en.

35 Eric Hanushek, Guido Schwerdt, Simon Wiederhold, and Ludger Woessmann, "Returns to Skills around the World: Evidence from PIAAC," *European Economic Review* 73(C) (2015): 103–130.

36 For a review of the key theoretical underpinnings of human capital earnings functions, see Mincer, *Schooling, Experience, and Earnings*; Solomon W. Polachek and W. Stanley Siebert, *The Economics of Earnings* (Cambridge: University Press, 1993); Jacob Mincer, "Investment in Human Capital and Personal Income Distribution," *Journal of Political Economy* 66, no. 4 (1958): 281–302, https://www.jstor.org/stable/1827422.

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

38 The coefficient can be interpreted as a private rate of return to an additional year of schooling only if it is assumed that the only cost of college is forgone earnings.

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

40 There were 9 part-time workers with missing information on educational attainment, occupation, and years of work experience, and 18 were hourly earnings outliers, that is, hourly earnings in the top and bottom percentile of the hourly earnings distribution. All were excluded from the regression analysis.

41 Estimated regression coefficients and their standard errors are presented in Appendix Table A-3.

42 Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, *Skills and Earnings in the Full-Time Labor Market,* The Impact of Human Capital in the American Labor Market Series (Princeton, NJ: Educational Testing Service, 2018), https://www.ets.org/s/research/pdf/skills-and-earnings-in-the-full-time-labor-market.pdf.

43 For reference, see 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: Educational Testing Service, 2019), https://www.ets.org/s/research/pdf/skills-and-the-earnings-of-college-graduates.pdf.

44 Fogg, Harrington, and Khatiwada, *Full-Time Labor Market*.

45 Ibid.

46 The quadratic specification of years of work experience variable in the earnings regression is designed to capture the relationship between work experience and earnings postulated by Mincer; that is, earnings rise with additional work experience but at a decreasing rate; Mincer, *Schooling, Experience, and Earnings*.

47 Fogg, Harrington, and Khatiwada, *Full-Time Labor Market*.

48 Ibid.

49 In PIAAC surveys, foreign-born persons are defined as those born abroad regardless of their citizenship.

50 The PIAAC measure of disability is not based on activities of daily living criteria. It is limited to persons who report a sensory limitation (hearing and vision) or a learning disability.

51 Megan Dunn, "Who Chooses Part-Time Work and Why?" *Monthly Labor Review,* U.S. Bureau of Labor Statistics, March 2018.

52 Estimated regression coefficients and their standard errors are presented in Appendix Table A-3.

53 Fogg, Harrington, and Khatiwada, *Full-Time Labor Market*.

54 Ibid.

55 Ibid.

56 Ibid.

57 Ibid.

58 Ibid.

59 Ibid.

60 Goldin, "Grand Gender Convergence."

61 Ibid.

62 For reference, see Kevin Dubina, Teri Morisi, Michael Riely, and Andrea Wagoner, *Monthly Labor Review: Projections Overview and Highlights, 2018–28* (Washington: U.S. Bureau of Labor Statistics, October 2019), https://www.bls.gov/opub/mlr/2019/article/projections-overview-and-highlights-2018-28.htm.

63 Jurg Siegenthaler and Andrew Bremmer, "Flexible Work Schedules, Older Workers and Retirement," *Journal of Aging and Social Policy* 12, no. 1 (2000): 19–34. Related to this, there is bipartisan support in Congress for legislation increasing the age at which those with defined contribution retirement plans must begin withdrawals from their retirement savings to 72 from 70 and would no longer place age restrictions on workers making retirement contributions. See Melanie Waddell, "Senators Introduce Retirement Bill Similar to House SECURE Act," *ThinkAdvisor,* April 1, 2019, https://www.thinkadvisor.com/2019/04/01/senators-introduce-retirement-bill-that-mirrors-house-secure-act/?slreturn=20200027131916, and Jonathan Pond, "Ponderings for the Week of July 8–14, 2019," Ponderings blog.

64 See Geoffrey T. Sanzenbacher and Steven A. Sass, *Is Working Longer a Good Prescription for All?* Issues in Brief, ib2017–21 (Chestnut Hill, MA: Center for Retirement Research, 2017), https://ideas.repec.org/p/crr/issbrf/ib2017-21.html; and Laurence Kotlikoff, Paul Moeller, and Paul Solman, *Get What's Yours: The Secrets of Maxing Out Your Social Security* (New York: Simon and Schuster, 2016).

65 See Yamamoto et al., "Scaling PIAAC Cognitive Data."

66 For detail, see International Labor Office, *ISCO-08*.

67 "All Other Professionals and Managers/All Other Associate Professionals" includes a wide range of professionals such as executives and managers, senior government officials, managers in retail trade, wholesale trade, construction, religious managers, journalists, writers, lawyers, philosophers, historians, scientists, software developers, system analysts, database developers and managers, actors, musicians, business service and administration managers, and so on.

68 For detail, *see International Labor Office, ISCO-08*.

69 See Bureau of Labor Statistics, "Crosswalk between the International Standard Classification of Occupations (ISCO-08) and the 2010 Standard Occupational Classification (SOC)," August 2012, http://www.bls.gov/soc/ISCO_SOC_Crosswalk_process.pdf.

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