LITERACY AND THE ENTRY-LEVEL WORKFORCE:

The Role of Literacy and Policy in Labor Market Success

William C. Wood
James Madison University

June 2010

Employment Policies
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Executive Summary

The 2008–09 economic recession, our country's worst since the Great Depression, did not impact all Americans equally. While unemployment for the nation peaked at 10.1 percent, it was considerably higher for specific demographics. For instance, adults with less than a high school diploma had a 15 percent unemployment rate, and teenage unemployment rose above 27 percent.

Across the board, those who were less skilled or less experienced suffered substantially higher rates of unemployment and spent longer periods of time searching for a job than their more-educated counterparts.

This unfortunate employment gap isn't surprising. Data from the Bureau of Labor Statistics consistently show that a lack of education is a setback in the job market and strongly correlates with lower median earnings and higher unemployment rates. New research from economist William C. Wood explores the important role that literacy and policy play in the employment gap between more- and less-educated Americans.

Using data from the National Assessment of Adult Literacy (NAAL), Wood finds that low literacy is associated with a variety of unfavorable labor market outcomes. One striking fact is that those with the lowest literacy scores are 16.5 times more likely to have received public financial aid in the past year, relative to those in the highest literacy group. They are also more likely to be in the lowest measured wage group, working full-time but earning less than $300 per week.

Even controlling for education and other personal characteristics, those who have difficulty working with and filling out forms (e.g., job applications) are at a higher risk for being low-wage employees.

Less literate individuals are coming to the workforce with other disadvantages: Wood finds that nearly 64 percent have never used a computer, and only 27 percent have a high school degree or equivalent. Those with a high school diploma or higher are 2 to 4 percent more likely to be employed full-time than their less educated counterparts.

For these less-educated Americans, the workplace can function as a second classroom—a chance to gain valuable experience needed to move up in the workforce. But instead of making potential employees more attractive to employers, the most popular labor policies unintentionally make less-skilled employees more expensive to hire. Wood classifies these pay and benefit mandates as employer push policies. Governments at the city, state, and federal level frequently use such policies in the form of a mandated minimum wage.

Wood's research demonstrates that these policies can actually be a barrier to work if an individual's skill set can't justify the higher pay. If a small grocery store owner is required to pay a minimum wage of $8 or $9 per hour to hire someone to stock shelves, he or she is far less likely to take a chance on training an applicant who can't read the food labels or use a computer to log their work. Instead of providing opportunity to a less-skilled individual, mandated wages or benefits can take that opportunity away.

With roughly 27 million Americans lacking the basic ability to fill out a job application, the results of this study have important legislative implications: Well-intentioned policies that mandate more costly terms of employment—like increases in the minimum wage—may have perverse results that end up harming their intended beneficiaries.

While arguments remain about the appropriate source of funding, research suggests that policies designed to increase skills and abilities have the potential to raise wages and make applicants more attractive to employers. Other options include a broadly applied training wage that allow less literate members of the workforce to acquire job skills and catch up to their more-educated peers—preventing them from becoming "just another statistic."

—Employment Policies Institute

Introduction

The Human Capital Approach

The effects of education and ability on labor incomes were well known at the time of Adam Smith, but it was in the mid-twentieth century that the formal economic theory was developed.[1] The approach came to be called human capital by analogy with investment in financial capital.[2] Just as an investor gives up money now in the hope of a future return, a worker foregoes income now to gain education or training in the hope of a higher future income.

Research has made clear that human capital has many dimensions, including not only education but also attributes as diverse as health and ethical behavior. Any personal skill or attribute that makes someone more valuable to an organization can be considered human capital.

In the United States, most individuals get their earliest formal investment in human capital through preschools and elementary schools. Early verbal and quantitative literacy are also acquired in the home and may be reinforced in a variety of ways.[3]

As important as human capital is to earnings, it is not the sole determinant. Two individuals with equal human capital can earn widely varying amounts of income depending on their occupational choices, human characteristics such as race and gender, and other factors. Therefore, when researchers estimate influences on labor incomes, they include a variety of demographic variables in addition to measures of human capital. There are still other variables that affect labor market outcomes, such as the institutional framework and other unobservable human characteristics. These may be only imperfectly measured or not measured at all.

Research Themes

After the formalization of the human capital framework by Schultz (1961) and Becker (1964), there was an explosion of research that has made it possible to more accurately quantify the influence of personal characteristics on labor market outcomes. A number of common themes emerge from the research[4,5]:

- Education pays, with higher attainment associated with strongly higher labor income.
- Marital status matters, with married individuals receiving more income and working more.
- Family size matters, with higher labor force participation among those with many dependents.
- Race and gender have effects on earnings that are reduced but not eliminated when other personal characteristics are controlled.

This last point is especially important. As one example, racial minority workers often have lower educational attainment than non-minority workers and consequently lower labor incomes. When people of equal educational attainment are compared across races, the differences are greatly reduced. Concerning gender, women's unadjusted labor incomes are substantially smaller than

[1]Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (New York: Oxford, 1976).
[2]Theodore W. Schultz, "Investment in Human Capital," *American Economic Review* 51, no. 1 (March 1961): 1–17.
[3]Judy Harris Helm and Lilian Katz, *Young Investigators: The Project Approach in the Early Years* (New York: Teachers College Press, 2000).
[4]Francisco L. Rivera-Batiz, "Quantitative Literacy and the Likelihood of Employment Among Young Adults in the U.S." *Journal of Human Resources* 27, no. 2 (Spring 1992): 313–328.
[5]Spyors Konstantopoulos and Amelie Constant, "The Gender Gap Reloaded: Are School Characteristics Linked to Labor Market Performance?" *Social Science Research* 37, no. 2 (June 2008): 374–385.

men's. This gender gap is reduced (but not eliminated) when incomes are adjusted for education and other human capital variables.[6]

Although there is widespread agreement that investment in human capital improves job prospects and earnings for individuals, the channels of influence are subject to some dispute. The most straightforward story is that educational attainment increases productivity, making someone more desirable for employment.[7] The increased demand in the labor market leads to higher earnings. In this view, educational attainment is good for individuals and good for society.

A competing view is that educational attainment may signal only an individual's productivity.[8] In this view, a college education adds little actual productivity—but does demonstrate that someone has enough of a work ethic and self-discipline to complete degree requirements. To wit, colleges act only as very expensive pre-employment agencies. This signaling view and similar theories have led to a lively and long-running debate about human capital and alternative views of labor markets.[9]

These competing views matter a great deal for education policy, but not much for individual incentives. Those with the means and ability will typically find that more education benefits them personally.

It is important to recognize that, even at its best, human capital theory cannot explain all variation in labor incomes. For example, a Ph.D.-holding scientist might for personal reasons feel constrained to locate in a rural area with few employment opportunities. The scientist's earnings at a local manufacturing facility would not reflect the high degree of human capital attained.

Data and Design

Literacy is an attribute of special public policy importance, in that literacy not only makes individuals more employable but also makes them more capable of participating in self-government and civic life in general. There are multiple dimensions of literacy, including reading, writing, and applying basic skills to problem solving. And all these forms of literacy can be measured in a variety of ways.

The National Assessment of Adult Literacy

Testing and quantifying human capital relationships call for a great deal of high-quality data. Testing within any one organization or region might yield interesting conclusions, but for national public policy purposes, a large national sample is best. For this reason, I use the National Assessment of Adult Literacy (NAAL), which is collected by the National Center for Education Statistics (NCES).

Although the primary purpose of the assessment is to measure progress in adult literacy, the NCES points out that the NAAL "also provides information on adults' literacy performance and related background characteristics to researchers, practitioners, policymakers, and the general public".[10] A data undertaking of this size requires a large amount of personnel and time, such that the comprehensive public use data from 2003 did not become available to researchers until March 2007.

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[6]Konstantopoulos, 374–385.

[7]Gary S. Becker, *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education* (New York: National Bureau of Economic Research, distributed by Columbia University Press, 1964).

[8]Michael Spence, "Job Market Signaling," *Quarterly Journal of Economics* 87, no. 3 (August 1973): 355–374.

[9]Irvin Sobel, "Human Capital and Institutional Theories of the Labor Market: Rivals or Complements?" *Journal of Economic Issues* 16, no. 1 (March 1982): 255–272.

The NAAL measures literacy among those 16 and older. It includes a nationally representative sample measured on three different scales of literacy [11]:

- "Prose literacy is the knowledge and skills needed to perform prose tasks (i.e., to search, comprehend, and use information from continuous texts, such as paragraphs from stories)"
- "Document literacy is the knowledge and skills needed to perform document tasks (i.e., to search, comprehend, and use information from non-continuous texts in various formats, such as bills or prescription labels)"
- "Quantitative literacy is the knowledge and skills required to perform quantitative tasks (i.e., to identify and perform computations, either alone or sequentially, using numbers embedded in printed materials)"

The actual test booklets are not released, but sample questions similar to those asked in 2003 have been made available. Here are three examples considered only moderately difficult (meaning 50 to 74 percent of subjects answered them correctly)[12]:

- Prose literacy (Subject is shown an almanac chart.) *Write three food sources of vitamin E, using a chart from the almanac.*
- Document literacy (Subject is shown a Yellow Pages telephone directory.) *Identify which store to call to have a microscope repaired, using the Yellow Pages.*
- Quantitative literacy (Subject is shown pricing information on peanut butter.) *Compare the cost per ounce of two brands of peanut butter, and circle the one that is more economical.*

Testing Design and Statistical Aggregation

The NAAL design provides for extensive collection of background information (age, race, income, and household circumstances) along with the administration of the literacy test. More than 19,000 adults took part in the survey, sampled to represent the entire U.S. population 16 and over. In addition, about 1,200 inmates in federal and state prisons were separately surveyed, as a population of particular interest in terms of literacy and human capital questions.

African-American and Hispanic households were sampled beyond their proportion of the population, with NAAL providing appropriate weights to researchers. This allows large enough sample sizes to provide information on public policy issues of interest to minorities, while also allowing researchers to apply weights that make the final numbers nationally representative.

Background information collection and testing combined took about 90 minutes. Participants each received an incentive payment of $30, increasing participation and ensuring a more representative sample. Accommodations were made for disabled participants and for those with limited proficiency in English.[13]

Even a 90-minute survey and testing period was not sufficient for every participant to take the entire test. Instead, different participants took different parts of the

[10]U.S. Department of Education, National Assessment of Adult Literacy (Washington, DC: National Center for Education Statistics, 2009d). Available online: http://nces.ed.gov/naal/

[11]U.S. Department of Education, "Fast Facts," National Assessment of Adult Literacy (Washington, DC: National Center for Education Statistics, 2009a). Available online: http://nces.ed.gov/fastFacts/display.asp?id=69

[12]U.S. Department of Education, 2009d.

master tests, and results were then aggregated statistically. The large sample size, coupled with the superior results that come from limiting testing fatigue, make the aggregate results reliable.[14]

However, the disadvantage of this approach is that inferences about any one individual's literacy become quite uncertain. NAAL's designers warn that individual inferences are unreliable.[15] Even state-level inferences are uncertain, except in states that took part in a separate state assessment program (Kentucky, Maryland, Massachusetts, Missouri, New York, and Oklahoma).

Single-Variable Results

Educational Attainment: Not the Same Thing as Literacy

The NAAL data show that literacy and educational attainment can vary independently. Some people with little educational attainment are classified as "proficient," while some college degree holders are not.

Table 1 shows the loose correspondence between literacy and educational attainment. Note that among those students in high school, 4.4 percent were already "proficient." Among those out of high school but without a diploma, 1.2 percent were "proficient" despite their lack of formal education. Among college graduates, only 35.4 percent were "proficient," and 2.1 percent were "below basic" in measured literacy.

Table 1 is based on prose literacy, but similar results are obtained using document and quantitative literacy as well. Prose, document, and quantitative literacy are highly (but not perfectly) correlated across individuals. That is, people with high prose literacy tend to have high document and quantitative literacy scores.

TABLE 1: Educational Attainment and Literacy Level

	Literacy Level			
Educational Attainment	**Below Basic**	**Basic**	**Intermediate**	**Proficient**
Still in High School	14.1%	36.8%	44.7%	4.4%
Less than High School or Some High School	50.4%	32.6%	15.8%	1.2%
GED or High School Equivalency	10.3%	44.6%	42.7%	2.5%
High School Graduate	12.8%	39.4%	44.0%	3.8%
Vocational School, Some College, or A.A. Degree	5.5%	25.2%	56.0%	13.4%
College or Above	2.1%	11.8%	50.7%	35.4%
Sample Size = 19,243				

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), tabulated by the author using AM statistical software.

[13]U.S. Department of Education, "Frequently Asked Questions: Results," National Assessment of Adult Literacy (Washington, DC: National Center for Education Statistics, 2009c). Available online: http://nces.ed.gov/naal/faq_results.asp

[14]R. J. Mislevy, "Randomization-Based Inference about Latent Variables from Complex Samples," *Psychometrika* 56, no. 2 (June 1991): 177-196.

[15]U.S. Department of Education, "Frequently Asked Questions: Assessment Design," National Assessment of Adult Literacy (Washington, DC: National Center for Education Statistics, 2009b). Available online: http://nces.ed.gov/naal/faq_assess.asp

However measured, higher literacy is associated with better labor market incomes, as explored below.

At-Risk Ratios for Low Wages

The data set permitted close examination of the low-wage population, specifically: How does the risk of being a low-wage earner vary across the literacy groups? For this risk calculation, "low-wage earners" are defined as employed full-time but earning less than $300 per week.[16]

First, the percentage of low-wage earners is calculated for each literacy group. Then those percentages are divided to yield risk ratios relative to the most proficient group. They represent the increased probability of being a low-wage earner based on membership in the various literacy groups. For example, in the table below, having "below basic" document literacy was associated with a risk 2.9 times greater than that of those who scored "proficient" in document literacy.

The results show that those with "below basic" literacy are at much higher risk of being in the lowest wage group. Those with "below basic" quantitative literacy face a risk of low wages 6.44 times that of the "proficient" in quantitative literacy.

At-Risk Ratios for Public Assistance

Beyond poor labor market outcomes, a lack of literacy is associated with greater dependency on public assistance. Respondents were asked whether they or anyone in their household had in the last 12 months received Temporary Assistance for Needy Families (TANF), public assistance,

TABLE 2.1: At-Risk Ratios for Low Wages, by Document Literacy Group

Literacy Group	Percent Earning Less Than $300/week	Risk Ratio (Relative to Those Proficient in Prose Literacy)
Below Basic	17.1	2.90
Basic	10.7	1.81
Intermediate	7.1	1.20
Proficient	5.9	1.00
Sample Size = 7,352		

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), tabulated by the author using AM statistical software.

TABLE 2.2: At-Risk Ratios for Low Wages, by Prose Literacy Group

Literacy Group	Percent Earning Less Than $300/week	Risk Ratio (Relative to Those Proficient in Prose Literacy)
Below Basic	17.4	4.70
Basic	11.1	3.00
Intermediate	6.9	1.86
Proficient	3.7	1.00
Sample Size = 7,352		

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), tabulated by the author using AM statistical software.

[16]U.S. Department of Education, 2003 National Assessment of Adult Literacy Public-Use Data File User's Guide (Washington, DC: National Center for Education Statistics, 2007), J-48. Available online: http://nces.ed.gov/naal/faq_assess.asp

TABLE 2.3: At-Risk Ratios for Low Wages, by Quantitative Literacy Group		
Literacy Group	**Percent Earning Less Than $300/week**	**Risk Ratio (Relative to Those Proficient in Prose Literacy)**
Below Basic	16.1	6.44
Basic	10.4	4.16
Intermediate	6.4	2.56
Proficient	2.5	1.00
Sample Size = 7,352		

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), tabulated by the author using AM statistical software.

TABLE 3: At-Risk Ratios for TANF or Public Assistance, by Prose Literacy Group		
Literacy Group	**Percent Receiving TANF or Public Assistance**	**Risk Ratio (Relative to Those Proficient in Prose Literacy)**
Below Basic	3.3	16.50
Basic	3.0	15.00
Intermediate	1.4	7.00
Proficient	0.2	1.00
Sample Size = 17,997		

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), tabulated by the author using AM statistical software.

or public welfare payments from the state or local welfare office. "Yes" responses were much more likely for those with lower literacy skills. Those with the lowest level of literacy were 16.5 times more likely to have received public assistance than those rated proficient in prose literacy.

A similar pattern applied to those with participation in the food stamps program. Those with the lowest levels of literacy were 11.14 times more likely to have received food stamps in the past year than those rated proficient in prose literacy. It is estimated that nearly half of all U.S. children live in households that will receive food stamps at some point.[17] NAAL data make it clear that those facing food insecurity risk are more concentrated in households of low literacy.

Characteristics of Those "Below Basic" in Literacy

Although the results presented so far appear to show strong effects of literacy on a variety of outcomes, it is important to note that poor literacy is associated with low human capital overall. That is, someone "below basic" in the various forms of literacy is likely to have other characteristics that also stand in the way of high-wage income. Table 5 (on page 11) exhibits some of these characteristics—some directly affecting earnings such as lower health, and others indicating lower civic engagement (being registered to vote) or reduced home resources (having fewer than 25 books at home).

[17]Mark R. Rank and Thomas A. Hirschl, "Estimating the Risk of Food Stamp Use and Impoverishment During Childhood," *Archives of Pediatric and Adolescent Medicine* 163, no. 11 (November 2009): 994–999.

TABLE 4: At-Risk Ratios for Food Stamps, by Prose Literacy Group		
Literacy Group	**Percent Receiving Food Stamps**	**Risk Ratio (Relative to Those Proficient in Prose Literacy)**
Below Basic	15.6	11.14
Basic	10.4	7.43
Intermediate	4.9	3.50
Proficient	1.4	1.00
Sample Size = 18,012		

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), tabulated by the author using AM statistical software.

TABLE 5: Comparative Characteristics of Those with "Below Basic" Literacy		
Characteristics	**Below Basic**	**Greater Literacy Than Below Basic**
Completed at least high school or GED	27.6	77.7
Reported being in very good or excellent health	39.5	65.1
Never used a computer	63.9	17.1
Registered to vote	46.4	74.6
Has more than 25 books in home	62.9	92.3
Sample Size = 18,040		

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), tabulated by the author using AM statistical software.

The NAAL data set shows that those with "below basic" literacy are:

- less likely to have completed high school
- less likely to be in very good or excellent health
- far more likely to have never used a computer
- less likely to have registered to vote
- less likely to have 25 or more books at home

Multi-Variable Results

The statistics presented so far are univariate—that is, based on the variation in literacy alone. They clearly show that lack of literacy is associated with poor labor market outcomes and dependency on public programs. However, the statistics also show that a variety of other social indicators are low for those lacking literacy. A univariate approach cannot separate out the relative influence of literacy as opposed to the other low social indicators. For that, a multivariate approach is required. Specifically, this report now turns to an examination of literacy and individual measures to determine the effects on employability and other outcomes.

To examine all these other factors, it is necessary to have literacy measures specific to each individual. This is not possible using NAAL native test data, in that subjects were not all exposed to the same total literacy test. Each subject instead took a few common screening questions, followed by a portion of the test. Although no one individual took the whole test, the partial tests could be aggregated across groups. The previously reported univariate statistics took advantage of Marginal Maximum

[18]U.S. Department of Education, 2007.

TABLE 6: Test Results and Self-Reported Counterpart Questions		
Test Result	**Self-Reported Counterpart Question**	**Statistics on Association with Mini-Score**
Prose Literacy	How much help do you get from family members or friends with reading or explaining newspaper articles or other written information? (Responses: "a lot," "some," "a little," "none")	$x^2 = 3100$, $p = 0.000$
Document Literacy	How much help do you get from family members or friends with filling out forms? (Responses: "a lot," "some," "a little," "none")	$x^2 = 2100$, $p = 0.000$
Quantitative Literacy	How much help do you get from family members or friends with using basic arithmetic, that is, adding, subtracting, multiplying, or dividing, such as filling out order forms or balancing a checkbook? (Responses: "a lot," "some," "a little," "none")	$x^2 = 2200$, $p = 0.0000$
Sample Size = 19,241		

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), mini-score tabulations by author.

Likelihood to accomplish the aggregation, weaving individual partial tests into overall conclusions for the NAAL sample.[18]

There are two ways around this data difficulty. The first is to compute a mini-score for each subject from the small core of screening questions that were given to the entire sample. This is a total of only nine questions, and they do not have the range and depth of the overall NAAL test—but they are available for all participating subjects and have strong, statistically significant correlations with overall test scores. A second way around the same data difficulty is to rely on individual self-reported literacy levels, which—unlike full test scores—are also available for all participating subjects. These self-reported literacy levels are also very closely tied to test scores statistically. Three examples are listed in Table 6.

Using these variables, this report proceeds through four analyses:

1. Measured effects on employment status (employed or unemployed)
2. Measured effects on the probability of receiving wages of $300 or less while employed full-time
3. Measured effects on dollar wages
4. Measured effects on the probability of receiving public assistance

Determinants of Employment Status

The employment status equation shows how the probability of being employed full-time, rather than unemployed, varies with individual characteristics. Employment vs. unemployment presents some statistical challenges because, rather than being continuously variable like many labor statistics, it is a 0 or 1 variable: employed or unemployed. Statistically, a logit model is used because it deals well with these challenges. The results are shown in Table 7 (on page 14).

As expected, educational attainment is strongly related to the probability of being employed full-time, with the positive effects relative to those without a diploma continuing through high school, college work, and college degree status. White and Hispanic workers are also more likely to be employed. African-American workers are slightly less likely to be employed, but the difference

is not statistically significant. Age and marriage variables show positive effects. Being in very good or excellent health provides a strong 3.4 percent boost in probability of being employed.

Most of the self-reported literacy variables, controlling for educational attainment, are statistically insignificant. That is, literacy taken on its own promotes employment probabilities—but the explanatory power comes from characteristics associated with literacy such as greater educational attainment and married status rather than literacy itself. There are some statistically significant effects for those who need "a little help" in reading and math relative to no help at all. They are 2.3 percent less likely to be employed, other things equal. The other levels of self-reported literacy show no statistically significant effects.

In a separate equation, using the self-reported literacy variables with the mini-score computed from screening questions, the literacy mini-score was statistically insignificant.

Additional insights can be gained by including part-time workers in the analysis, as shown in Table 8 (on page 15). Now the key variable distinguishes those who have either full- or part-time employment, as opposed to being unemployed. Although most of the variables have similar effects, the effect of gender changes. Full-time employment was positively associated with male subjects. However, when both full- and part-time employment is allowed for, the effect becomes slightly negative and statistically insignificant. In other words, men and women are equally likely to be employed in some capacity, but women are somewhat more likely to be employed part-time. Mathematical literacy also appears to have more effect on full-time employment than on being employed at all.

Although a number of characteristics show strong statistical effects, both of the employment status equations leave a great deal of variation unexplained. That is, there are many people with poor expected prospects for employment who nonetheless find jobs; there are many people with good expected prospects who report being unemployed.

Implications for Low-Wage Outcomes

Given that they are employed, are those with low literacy likely to receive lower wages, even after accounting for other influences? A logit approach was used to measure the probabilities. Note that in this equation, negative probabilities are good, in that they indicate a lower probability of working full-time yet falling into the lowest wage group.

In this equation, educational attainment and age have the expected negative effects on low-wage risk. In this equation, there are no statistically significant racial effects. Males are substantially less likely to be in the lowest wage grouping than females. Computer usage and overall health are also strongly associated with avoiding the lowest wage grouping.

Document literacy, as measured by filling out forms, shows strong effects. Those who need help filling out forms are much more likely to fall into the low-wage group, even controlling for a large number of background variables. In a separate equation, the mini-score was not statistically significant.

Table 9 (on page 16) shows the influences and their relative statistical importance.

Multiple Regression Results

Implications for Dollar Wages

The results above analyze the probabilities of being un-

TABLE 7: Full-Time Employment Status and Personal Characteristics		
Characteristic	**Effect on Employment Probability, Percentage**	***p*-value**
High school graduate	+2.1%	0.014*
Some college coursework	+3.4%	0**
College degree holder	+4.1%	0**
White	+3.3%	0.036*
African-American	-0.8%	0.605
Hispanic	+4.2%	0**
Male	+1.3%	0.064
Married	+4.1%	0**
Dependent children in household	-0.7%	0.338
Age 19-24 (relative to age 18 and below)	+5.8%	0**
Age 25-39 (relative to age 18 and below)	+11.4%	0**
Age 40-49 (relative to age 18 and below)	+10.5%	0**
Age 50-64 (relative to age 18 and below)	+9.1%	0**
Age 64-up (relative to age 18 and below)	+6.5%	0**
Northeast (relative to West)	+1.2%	0.237
South (relative to West)	+1.2%	0.254
Midwest (relative to West)	+2.4%	0.013*
Needs a lot of help with reading (relative to not at all)	-1.8%	0.439
Needs some help with reading (relative to not at all)	-1.4%	0.299
Needs a little help with reading (relative to not at all)	+1.0%	0.313
Needs help with forms a lot (relative to no help)	+0.3%	0.827
Needs help with forms some (relative to no help)	+0.7%	0.544
Needs a little help with forms (relative to no help)	-2.3%	0.019*
Needs a lot of help with math (relative to no help)	-1.8%	0.335
Needs some help with math (relative to no help)	-0.8%	0.573
Needs a little help with math (relative to no help)	-2.9%	0.032*
In very good or excellent health	+3.4%	0**
Has used a computer	+0.2%	0.85
Sample Size = 9,501 Wald x^2 = 367.96 p = 0.0000 Pseudo-R^2 = 0.1151 Percentage of correct predictions = 90.22%		

*indicates statistically significant ($p < 0.05$)

**indicates highly statistically significant ($p < 0.01$)

Note: In a separate logit replacing all self-reported literacy variables with the mini-score, the mini-score was statistically insignificant ($p = 0.31$).

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), logit analysis by author.

TABLE 8: Full- or Part-Time Employment Status and Personal Characteristics		
Characteristic	**Effect on Employment Probability, Percentage**	***p*-value**
High school graduate	+1.3%	0.069
Some college coursework	+2.9%	0**
College degree holder	+3.0%	0.001**
White	+2.9%	0.025*
African-American	-1.2%	0.357
Hispanic	+2.9%	0.005**
Male	-0.2%	0.765
Married	+3.2%	0**
Dependent children in household	-0.6%	0.327
Age 19-24 (relative to age 18 and below)	+2.4%	0.011*
Age 25-39 (relative to age 18 and below)	+4.9%	0**
Age 40-49 (relative to age 18 and below)	+5.1%	0**
Age 50-64 (relative to age 18 and below)	+4.5%	0**
Age 64-up (relative to age 18 and below)	+5.4%	0**
Northeast (relative to West)	+1.1%	0.174
South (relative to West)	+1.0%	0.216
Midwest (relative to West)	+2.0%	0.011*
Needs a lot of help with reading (relative to not at all)	-2.0%	0.326
Needs some help with reading (relative to not at all)	-0.5%	0.65
Needs a little help with reading (relative to not at all)	+0.8%	0.301
Needs help with forms a lot (relative to no help)	+1.0%	0.403
Needs help with forms some (relative to no help)	+0.6%	0.512
Needs a little help with forms (relative to no help)	-2.0%	0.014*
Needs a lot of help with math (relative to no help)	-1.4%	0.35
Needs some help with math (relative to no help)	-0.3%	0.819
Needs a little help with math (relative to no help)	-1.7%	0.101
In very good or excellent health	+3.0%	0**
Has used a computer	-0.1%	0.842
Sample Size = 11,627 Wald x^2 = 275.28 p = 0.0000 Pseudo-R^2 = 0.0763 Percentage of correct predictions = 91.74%		

*indicates statistically significant ($p < 0.05$)

**indicates highly statistically significant ($p < 0.01$)

Note: In a separate logit replacing all self-reported literacy variables with the mini-score, the mini-score was statistically insignificant ($p = 0.43$).

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), logit analysis by author.

TABLE 9: Low-Wage Status and Personal Characteristics		
Characteristic	**Effect on Probability of Low Wages (<$300/week), Percentage**	***p*-value**
High school graduate	-1.4%	0.03*
Some college coursework	-2.3%	0.001**
College degree holder	-4.0%	0**
White	-0.2%	0.891
African-American	-0.2%	0.853
Hispanic	+0.7%	0.563
Male	-5.5%	0**
Married	-0.9%	0.082
Dependent children in household	-0.4%	0.467
Age 19-24 (relative to age 18 and below)	-3.0%	0.001**
Age 25-39 (relative to age 18 and below)	-7.6%	0**
Age 40-49 (relative to age 18 and below)	-7.0%	0**
Age 50-64 (relative to age 18 and below)	-7.1%	0**
Age 64-up (relative to age 18 and below)	-3.5%	0.001**
Northeast (relative to West)	-1.4%	0.076
South (relative to West)	+0.3%	0.690
Midwest (relative to West)	+0.7%	0.337
Needs a lot of help with reading (relative to not at all)	+0.9%	0.504
Needs some help with reading (relative to not at all)	+0.3%	0.786
Needs a little help with reading (relative to not at all)	-0.3%	0.671
Needs help with forms a lot (relative to no help)	+2.9%	0.036*
Needs help with forms some (relative to no help)	+2.1%	0.024*
Needs a little help with forms (relative to no help)	+1.8%	0.018*
Needs a lot of help with math (relative to no help)	-0.7%	0.489
Needs some help with math (relative to no help)	+0.4%	0.723
Needs a little help with math (relative to no help)	-0.9%	0.271
In very good or excellent health	-2.4%	0**
Has used a computer	-3.5%	0**
Sample Size = 8,544 Wald x^2 = 418.86 p = 0.0000 Pseudo-R^2 = 0.1652 Percentage of correct predictions = 91.56%		

*indicates statistically significant ($p < 0.05$)

**indicates highly statistically significant ($p < 0.01$)

Note: In a separate logit replacing all self-reported literacy variables with the mini-score, the mini-score was statistically insignificant ($p = 0.71$).

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), logit analysis by author.

TABLE 10: NAAL Wage Categories and Fitted Point Estimates	
NAAL Weekly Wage Category	**Fitted Point Estimate**
Less than $300	$267.40
$300-$499	$395.71
$500-$649	$571.76
$650-$1149	$861.31
$1150-$1949	$1414.62
$1950 or higher	$2232.05
Sample Size = 7,680	

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), approximation via polynomial fitting by author.

employed, and of being employed at low wages. With additional statistical assumptions, it is possible to derive approximate dollar effects on individuals' wages. The NAAL Public Use Data file groups individuals into weekly wage categories: less than $300, $300-$499, $500-$649, $650-$1149, $1150-$1949, and $1950 or higher. It also provides the percentages in each category. With a statistical approximation, it is possible to derive point estimates for each interval that very closely approximate the overall wage distribution.

The interpretation of the "less than $300" category's point estimate, for example, is that $267.40 is the most representative wage among those making $0 to $300. (A simple midpoint, $150, would underestimate wages in this group.) A similar interpretation applies in the other categories. Table 10 shows the point estimates.

Using the point estimates and the remainder of the NAAL database, Table 11 (on page 18) shows the approximate dollar effects of the studied characteristics. The largest weekly premiums are for being college degree holders (+$322 weekly) and being in the 50-64 age group, the peak earning years (+$186 weekly, relative to workers 18 or below). There are also statistically significant differences for male (+$167 weekly) and white (+$82 weekly) workers.

Literacy effects are mixed and inconsistent, with the strongest effects again associated with needing help filling out forms. The premium for computer use is highly statistically significant, as expected.

As with the employment equation, this equation shows strong effects for measured characteristics of workers, but leaves a great deal of variation unexplained. Thus, it is possible for someone with low measured human capital to make very high wages because of unmeasured effort or entrepreneurial ability and for someone with high measured human capital to receive low wages.

Implications for Receiving Public Assistance

Although lack of literacy is strongly associated with receiving public assistance in the univariate statistics, the association does not remain strong in a fuller model. Those with college coursework or degrees, as well as married individuals, are substantially less likely to be receiving public assistance. White individuals and males are also less likely to receive public assistance. Those with dependent children in the household are more likely, as are young adults. Those in very good or excellent health are also less likely to receive public assistance (see Table 12 on page 20).

TABLE 11: Characteristics and Weekly Wages, in Dollars		
Characteristic	**Measured Dollar Effect on Wages Per Week**	***p*-value**
High school graduate	+$19	0.372
Some college coursework	+$95	0**
College degree holder	+$322	0**
White	+$82	0.027*
African-American	+$22	0.581
Hispanic	+$1	0.972
Male	+$167	0**
Married	+$53	0.001**
Dependent children in household	+$33	0.051
Age 19-24 (relative to age 18 and below)	+$18	0.7
Age 25-39 (relative to age 18 and below)	+$141	0.002**
Age 40-49 (relative to age 18 and below)	+$157	0.001**
Age 50-64 (relative to age 18 and below)	+$186	0**
Age 64-up (relative to age 18 and below)	+$60	0.484
Northeast (relative to West)	-$46	0.087
South (relative to West)	-$78	0.002**
Midwest (relative to West)	-$65	0.007**
Needs a lot of help with reading (relative to not at all)	+$21	0.655
Needs some help with reading (relative to not at all)	+$36	0.272
Needs a little help with reading (relative to not at all)	+$58	0.017*
Needs help with forms a lot (relative to no help)	-$63	0.093
Needs help with forms some (relative to no help)	-$75	0.004**
Needs a little help with forms (relative to no help)	-$74	0.001**
Needs a lot of help with math (relative to no help)	-$48	0.227
Needs some help with math (relative to no help)	-$15	0.696
Needs a little help with math (relative to no help)	-$93	0.001**
In very good or excellent health	+$42	0.011*
Has used a computer	+$128	0**
Sample Size = 8,544 F = 23.28 p = 0.0000 R^2 = 0.1419		

*indicates statistically significant ($p < 0.05$)

**indicates highly statistically significant ($p < 0.01$)

Note: In a separate multiple regression replacing all self-reported literacy variables with the mini-score, the coefficient on the mini-score was +$16 and highly statistically insignificant ($p = 0.01$).

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), multiple regression analysis by author.

With a large set of control variables accounted for, literacy has no separate statistically significant effect. This doesn't mean that less literate individuals don't receive public assistance; the univariate statistics demonstrated just the opposite. But it indicates that there are other factors at work determining whether one receives public assistance. Literacy is just one of many influencing characteristics.

It is important to note that self-reporting of public assistance may be inaccurate because of a stigma associated with receiving welfare. (However, a similar stigma might apply to reporting a lack of literacy skills, and yet those variables seem to be accurately reported.)

Discussion

The Importance of Unmeasured Variation

The findings reported above are characterized by considerable unmeasured variation, meaning that people may do very differently in labor markets than their human capital suggests. Although the averages favor high human capital, certain highly qualified individuals may be unemployed while others with low human capital take home high labor incomes.

Unmeasured variation reflects the properties of the models used in this report. To some extent, it is a product of the limited data set produced by the NAAL. Even an extensive data set based on lengthy interviews cannot capture individual enterprise or all personal choices. Only in a single bureaucratic organization would we expect pay scales to mechanically reflect measured human capital.

In the mixed economy of the twenty-first century United States, there are some areas where pay scales are rigidly set, but there are also large areas where pay is limited only by an individual's drive and creativity. The freedom to relocate and seek employment consistent with unmeasured personal goals is highly valued, even as it does make measurement of labor market outcomes more difficult.

Consider a concrete example: A painter who worked hard and skillfully could achieve steady employment and high earnings even with "below basic" literacy; the outcome could then be attributed to unmeasured human capital (skill in painting) and a totally unmeasured variable, individual work ethic. Alternatively, a highly skilled attorney could make the decision to resign from a lucrative practice and do volunteer work. Again, the relationship between measured human capital and compensation would be weakened.

Employer Push vs. Employee Pull

The results of this report provide additional background for public policy discussions on improving earnings and equality. The employer push approach in public policy is aimed at making employment the gateway to a whole suite of benefits: a higher wage (minimum wage or a considerably higher "living" wage), together with a retirement plan, medical insurance, and generous family leave. Employer push requires employers to pay more per effective labor input.

In a market economy, employer push policies are necessarily conditional: If you hire a worker, you must provide a certain suite of benefits. Because not all applicants have skills that justify the higher wages or benefits, it often means that fewer (or, alternatively, more-skilled) applicants are hired for these positions. The resulting reduction in hiring denies some entry-level workers access to organized labor markets at all. They are then shunted into informal part-time work, the underground economy, or unemployment.

TABLE 12: Public Assistance and Personal Characteristics		
Characteristic	**Effect on Probability of Receiving Public Assistance, Percentage**	***p*-value**
High school graduate	-0.4%	0.001**
Some college coursework	-0.7%	0**
College degree holder	-1.1%	0**
White	-0.6%	0.011*
African-American	0.3%	0.232
Hispanic	-0.3%	0.153
Male	-0.4%	0.001**
Married	-0.7%	0**
Dependent children in household	1.4%	0**
Age 19-24 (relative to age 18 and below)	0.9%	0.003**
Age 25-39 (relative to age 18 and below)	0.5%	0.028*
Age 40-49 (relative to age 18 and below)	0.4%	0.112
Age 50-64 (relative to age 18 and below)	0.2%	0.315
Age 64-up (relative to age 18 and below)	0.0%	0.98
Northeast (relative to West)	0.0%	0.888
South (relative to West)	0.1%	0.667
Midwest (relative to West)	-0.3%	0.028*
Needs a lot of help with reading (relative to not at all)	-0.1%	0.755
Needs some help with reading (relative to not at all)	0.0%	0.96
Needs a little help with reading (relative to not at all)	0.1%	0.684
Needs help with forms a lot (relative to no help)	-0.1%	0.632
Needs help with forms some (relative to no help)	-0.1%	0.717
Needs a little help with forms (relative to no help)	-0.1%	0.362
Needs a lot of help with math (relative to no help)	0.1%	0.529
Needs some help with math (relative to no help)	0.2%	0.300
Needs a little help with math (relative to no help)	0.1%	0.627
In very good or excellent health	-0.7%	0**
Has used a computer	0.0%	0.74
Sample Size = 19,258 Wald x^2 = 499.48 p = 0.0000 Pseudo-R^2 = 0.1802 Percentage of correct predictions = 97.17%		

*indicates statistically significant ($p < 0.05$)

**indicates highly statistically significant ($p < 0.01$)

Note: In a separate logit replacing all self-reported literacy variables with the mini-score, the mini-score was statistically insignificant ($p = 0.59$).

Source: National Assessment of Adult Literacy Public Use Data File (U.S. Department of Education, 2009d), logit analysis by author.

Consider the general category of workers with low human capital. Even within that group, employer push provides the most help to those relatively well-off and such policies can do actual harm to the less-well-off. Low skilled applicants are unable to compete when the act of hiring them would compel the employer to provide the entire package of benefits. For example, low-wage individuals are significantly more likely to have problems with document, prose, and quantitative literacy, as shown in Tables 2.1 through 2.3 on pages 9–10. Those who have trouble filling out forms are at significantly higher risk of falling into the low-wage group, even after controlling for educational attainment and other characteristics (see Table 9 on page 16). Employer push policies call for increasing the pay and benefits of these prospective workers, making it less likely they will be hired in the first place.

Hiring someone requires the employer to take a risk: that the proposed employee will productively contribute to the organization. When the proposed employee lacks literacy and other basic skills, the risk is less attractive. Compelling benefits in the employment package makes the risk still less attractive. In an increasingly technological society, "employer push" can mean requiring higher pay and benefits for employees who have never used a computer or never finished high school (see Table 5 on page 11). Even so, some of these employees are—or can become—quite productive. The question is whether they will get the opportunity.

In contrast, employee pull policies are aimed at improving employee productivity, so that employers willingly compete to hire skilled workers by offering attractive wages and benefits. Higher productivity from higher schooling translates into greater labor income, as Table 11 on page 18 makes clear. Having some college coursework increases wages $95 per week, other things equal, while a college degree's effect is estimated at $322 per week.

Since not everyone can take advantage of higher education, it is especially important to note that productivity also grows among less-schooled employees who receive on-the-job training and gain experience.

It is difficult for an employer to know how much a potential new hire can improve on the job, but high human capital provides useful indicators. Yet employer push policies can prevent workers from ever getting their opportunity to demonstrate their ability to grow and learn on the job.

Conclusion

The National Assessment of Adult Literacy provides a large, carefully controlled, nationally representative sample for examining labor market outcomes. The database compiled by NAAL is especially useful in studying those who receive low labor incomes. In the three measured forms (prose, document, and quantitative), high literacy is strongly associated with favorable labor market outcomes. Low literacy is associated with lower probabilities of employment, greater probabilities of low labor income, and sharply higher probabilities of requiring public assistance.

The averages revealed in the statistical analysis are striking. The exceptions are also significant, given the high degree of unexplained variation that allows people to receive compensation very different from what their human capital would predict.

The results of this study provide additional background for policy debate between employer push and employee pull models of the labor market. Low measured human capital among low-wage workers casts doubt on the strategy of simply requiring more generous compensation packages for potential hires.

This strategy increases the probability that willing workers with low human capital simply do not get hired.

Increasing worker productivity through promotion of formal and informal acquisition of human capital, on the other hand, has substantial promise for improving terms of employment. Employer pull has the added advantage of promoting mutual interests rather than triggering unintended consequences.

In an economy that increasingly values skills and technical ability, permanent improvements in labor market outcomes for low-paid workers depend on their ability to acquire the skills to be contributing and effective employees.

References

Becker, Gary S. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. New York: National Bureau of Economic Research; distributed by Columbia University Press, 1964.

Bennett, I.M. and others. "The Contribution of Health Literacy to Disparities in Self-Rated Health Status and Preventive Health Behaviors in Older Adults." *Annals of Family Medicine* 7 (2009): 204-211.

Clark, J. R. and Dwight R. Lee. "Government Transfers and Inequality: An Anatomy of Political Failure." *Journal of Public Finance and Management* 8, no. 2 (March 2008): 265-301.

Frank, Robert H. Falling Behind: *How Rising Inequality Harms the Middle Class*. Berkeley, CA: University of California Press, 2007.

Helm, Judy Harris and Lilian Katz. Young Investigators *The Project Approach in the Early Years*. New York: Teachers College Press, 2000.

Konstantopoulos, Spyors and Amelie Constant. "The Gender Gap Reloaded: Are School Characteristics Linked to Labor Market Performance?" *Social Science Research* 37, no. 2 (June 2008): 374-385.

Mislevy, R. J. "Randomization-Based Inference about Latent Variables from Complex Samples." *Psychometrika* 56, no. 2 (June 1991): 177-196.

Rank, Mark R. and Thomas A. Hirschl. "Estimating the Risk of Food Stamp Use and Impoverishment During Childhood." *Archives of Pediatric and Adolescent Medicine* 163, no. 11 (November 2009): 994-999.

Rivera-Batiz, Francisco L. "Quantitative Literacy and the Likelihood of Employment Among Young Adults in the U.S." *Journal of Human Resources* 27, no. 2 (Spring 1992): 313-328.

Schultz, Theodore W. "Investment in Human Capital." *American Economic Review* 51, no. 1 (March 1961): 1-17.

Smith, Adam. *An Inquiry into the Nature and Causes of the Wealth of Nations*. New York: Oxford, 1976.

Sobel, Irvin. "Human Capital and Institutional Theories of the Labor Market: Rivals or Complements?" *Journal of Economic Issues* 16, no. 1 (March 1982): 255-272.

Spence, Michael. "Job Market Signaling." *Quarterly Journal of Economics* 87, no. 3 (August 1973): 355-374.

U.S. Department of Education. *2003 National Assessment of Adult Literacy Public-Use Data File User's Guide*. Washington, DC: National Center for Education Statistics, 2007. Available online: http://nces.ed.gov/NAAL/pdf/2007464.pdf

U.S. Department of Education. "Fast Facts." *National Assessment of Adult Literacy*. Washington, DC: National Center for Education Statistics, 2009a. Available online: http://nces.ed.gov/fastFacts/display.asp?id=69

U.S. Department of Education. "Frequently Asked Questions: Assessment Design." *National Assessment of Adult Literacy*. Washington, DC: National Center for Education Statistics, 2009b. Available online: http://nces.ed.gov/naal/faq_assess.asp

U.S. Department of Education. "Frequently Asked Questions: Results." *National Assessment of Adult Literacy*. Washington, DC: National Center for Education Statistics, 2009c. Available online: http://nces.ed.gov/naal/faq_results.asp

U.S. Department of Education. *National Assessment of Adult Literacy*. Washington, DC: National Center for Education Statistics, 2009d. Available online: http://nces.ed.gov/naal/

White, Sheida. *Assessing the Nation's Health Literacy: Key Concepts and Findings of the National Assessment of Adult Literacy (NAAL)*. Chicago, IL: AMA Foundation, 2008.

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