Measuring the Demand for Education

Prepared for the BLS Technical Advisory Committee – June 17, 2016

Introduction

Each year, significant resources are devoted annually by the Federal and state governments to provide job seekers with information on jobs in demand and the skill sets that employers are looking for. State education and labor market information systems depend on having reliable and accurate information on the educational and skill requirements of the current and future workforce and the training that is needed to meet the needs of employers and job seekers.

However, there is lack of clarity on how to measure the demand for education in the U.S. economy. For example, depending on the data set used and the methodological approach adopted there are significant differences in estimates of the proportion of jobs that will require a level of education beyond high school. Using Current Population Survey data, for example, the Georgetown University Center on Education and Training (CEW) found that by 2020 (over a projection period from 2010 to 2020), 65% of jobs would require more than a high school diploma. At the same time, using Minnesota vacancy data on the educational requirements of job openings, the Minnesota State Labor Market Information agency found that only 38 percent of vacancies require more than a high school degree.

Although the Bureau of Labor Statistics does not produce estimates of the projected number of jobs that will require more than high school, we do produce a listing of the typical level of education that is needed for entry into over 800 detailed occupations. And while we do not advocate this practice, if one were to aggregate current and projected employment in occupations that require more than a high school diploma, about 36% of current jobs and 49% of projected new jobs over the latest 2014-2024 projections would fall into this category. As this article will explain, there is a belief that BLS endorses this methodology as a way of estimating the demand for education. In particular the Georgetown CEW has asserted that BLS adopts this practice and has criticized us for doing so.

The goal of this paper is to present a proposed framework for BLS to measure the demand for educational attainment. Before presenting this framework, we review the BLS education and training categories in terms of their fitness for use. We explore the Georgetown CEW criticism of BLS and also develop an assessment of their method for estimating the skills required by employers in terms of educational attainment. We then conduct a brief examination of the Minnesota job vacancy data. To set the stage for our proposed approach for measuring the education requirements of jobs, we first examine recent trends in educational attainment and review evidence on the upskilling of educational outcomes the U.S. Our proposed method will attempt to measure the heterogeneity within occupations as proxied by wage premia as way of assigning education requirements to jobs within occupations. We use this heterogeneity as a way of estimating the demand for education.

BLS education and training categories – fitness for use and criticisms

For each of the over 800 occupations in the Standard Occupation Classification (SOC) system, the BLS has developed a typical education requirement for entry into each occupation. The goal of this system is

to provide career advice to students who are trying to determine their educational pathway for entry into an occupation. It is also designed for individuals who are switching careers. The designation of typical educational category for entry into an occupation is updated every two years during the biennial projections cycle. It is the result of extensive research undertaken by BLS occupational analysts. The final designation is a consensus decision-making process.

Table 1 provides a snapshot of the education levels that are typically required for entry for a select set of occupations. There are 8 such categories designated by BLS shown in the table, ranging from 'no formal education requirement' to 'Doctoral or Professional degree'. The table also shows that for each occupation, the designation of a particular level of education for entry coexists with an American Community Survey (ACS) based distribution of educational attainment of current employment that can cover the spectrum from less than high school to Bachelor's degree or higher (the ACS provides further detail within this latter category, we have combined these categories for simplicity here).

Table 1: For selected detailed occupations, typical education needed for entry 2014 and ACS distribution of employment by educational attainment category for employees in occupation ages 25 and older, 2012-2103.

Occupational title	SOC Code	BLS education typically required for entry into the occupation	ACS educational attainment distribution				
			Less than a high school diploma	High school diploma or equivalent	Some college, no degree	Associate's degree	Bachelor's degree or higher
Oral and maxillofacial surgeons	29-1022	Doctoral or professional degree	0.2	0.3	0.0	0.3	99.3
Pharmacists	29-1051	Doctoral or professional degree	0.1	0.1	1.4	0.9	97.5
Survey researchers	19-3022	Master's degree	0.2	0.3	4.8	3.9	90.8
Mental health counselors	21-1014	Master's degree	1.0	5.0	10.1	5.4	78.5
Industrial production managers	11-3051	Bachelor's degree	3.3	18.7	23.5	9.2	45.3
Construction managers	11-9021	Bachelor's degree	6.9	26.3	24.3	8.5	34
Computer programmers	15-1131	Bachelor's degree	0.7	4.7	13.1	9.7	71.8
Actuaries	15-2011	Bachelor's degree	0.0	0.0	1.5	0.0	98.5
Electrical and electronics engineering technicians	17-3023	Associate's degree	4.0	22.6	33.5	21.6	18.3
Radiation therapists	29-1124	Associate's degree	0.0	3.6	12.4	30.6	53.5

Computer user support specialists	15-1151	Some college, no degree	0.7	11.1	28.0	17.2	43.0
Teacher assistants	25-9041	Some college, no degree	2.6	29.3	29.0	14.7	24.4
Medical transcriptionists	31-9094	Postsecondary nondegree award	1.3	19.9	39.4	21.5	18.0
Phlebotomists	31-9097	Postsecondary nondegree award	2.9	26.2	45.0	16.1	9.8
Firefighters	33-2011	Postsecondary nondegree award	1.0	16.1	43.5	20.1	19.3
Hairdressers, hairstylists, and cosmetologists	39-5012	Postsecondary nondegree award	6.7	45.5	31.5	10.1	6.1
Property, real estate, and community association managers	11-9141	High school diploma or equivalent	4.7	19.2	28.1	8.6	39.4
Floral designers	27-1023	High school diploma or equivalent	2.3	9.8	17.6	12.7	57.5
Parking enforcement workers	33-3041	High school diploma or equivalent	3.4	25.3	30.1	10.3	31.0
Animal control workers	33-9011	High school diploma or equivalent	5.7	37.7	27.5	13.0	16.0
Home health aides	31-1011	No formal educational credential	12.4	34.6	31.9	9.8	11.3
Crossing guards	33-9091	No formal educational credential	19.3	42.2	23.9	6.2	8.4
Cooks, fast food	35-2011	No formal educational credential	30.9	40.3	18.2	5.2	5.4
Bartenders	35-3011	No formal educational credential	7.5	27.8	35.6	10.0	19.2

Consider the occupation 'radiation therapists', which is listed as having an Associate's degree as the typical education required for entry. As one would expect, not all employees in the occupation have an Associate's degree. In fact, nearly 54% of employees ages 25 and older in this occupation had a bachelor's degree or higher in 2012-2013. Using expert judgment to assign an education level that is typically required for entry into an occupation designation does not provide a measure of the current market demand by employers for skills or the distribution of educational attainment in that occupation. The current demand for education will be reflected in the hiring choices by firms in terms of the educational attainment category for both new and experienced employees.

As another example, consider the occupation computer support specialists. This occupation is listed as typically requiring 'some college, no degree' for entry. Despite this designation, 17.2 percent of employees aged 25 and older in this occupation had an 'Associates degrees' and 43 percent had a bachelor's degree or higher. The mixture of educational attainment categories among employees in the occupation suggests that the demand for education may be very heterogeneous within the occupation.

In the 2014-2024 projections, this occupation is projected to have a net employment increase of 89,000 from 767,000 to 856,000. Certainly, no one, including the BLS, should claim that the entire projected net employment change of 89,000 should be counted as part of the anticipated demand for workers with 'some college, no degree'.

A more subtle juxtaposition, however, is to note that employment is projected to increase by 89,000 in this occupation in which 'some college, no degree' is the typical educational requirement for entry. If one were to aggregate the net employment changes for all occupations in which 'some college, no degree' is the typical requirement for entry, it is easy to see how this aggregate number could be interpreted as BLS's projection of the demand for workers with 'some college, no degree' over the projection period. While BLS does not do this, it is this interpretation that has been the basis for criticisms of the BLS projections methodology, including those made by the Georgetown University Center on Education and the Workforce, to which we now turn our attention.

Georgetown University Center on Education and the Workforce

The Georgetown University Center for Education and the Workforce (CEW) has levied two criticisms at the BLS educational categories for entry into occupations. The first is the claim that BLS uses these categories as a basis for measuring the demand for workers by educational attainment. The second is that BLS assumes that the educational requirements of occupations remains constant over their projections period and that BLS uses this assumption to forecast the demand for workers by educational attainment.

Let's examine each of these in turn. For simplicity, in table 2 we have taken the 8 BLS education categories from table 1 and divided them into two groups, educational categories that require high school or less for entry and categories that require education beyond high school for entry. We use combined ACS data from 2012-2013 to estimate the level of employment in each of the detailed occupations. According to CEW, by assigning all of the employment that falls into occupations in which the entry requirement is 'high school or equivalent' or 'no formal educational credential' is required, BLS is estimating that 63.6 percent of employees in 2012-2013 were in these jobs. Obviously, this is an unwarranted conclusion. Not all current employees are new entrants and the demand for educational attainment will vary with tenure and experience. Indeed, the ACS 2012-2013 distribution of educational attainment in table 2 shows that only 36.7% of employees in these occupations have an educational attainment level of high school or less.

Table 2. Distribution of employment in 2014 and projected employment change from 2014-2024 using BLS education categories for entry and ACS distribution of educational attainment

BLS and CPS educational categories	2014 Employment		2014-2024 projected employment change	
	Level (thousands)	Percent	Level (thousands)	Percent
BLS education categories typically required for entry	95,725	63.6%	4,966	50.7%
Occupations with high school or less*	54,814	36.4%	4,823	49.3%
Occupations with more than high school**				
ACS educational attainment				
Employment of those with high school or less***	55,283	36.7%	2,943	30.1%
Employment of those with more than high school****	95,236	63.3%	6,845	69.9%

* Occupations in which the education typically required for entry is:
- no formal credential required
- high school or equivalent

For these occupations, all of the employment in 2014 and the employment change 2014-2024 is assigned to the category of high school or less

** Occupations in which the education typically required for entry is:
- Post secondary nondegree award
- Some college, no degree
- Associates degree
- Bachelor's degree
- Master's degree
- Doctoral or professional degree

For these occupations, all of the employment in 2014 and all of the employment change 2014-2024 is assigned to the category of more than high school

***For each occupation, the 2012-2013 percentage of employees with an education attainment of less than high school or high school or equivalent are used in the calculation of ACS totals

****For each occupation, the 2012-2013 percentages of employees with an education attainment or some college, no degree; associate's degree; bachelor's degree; master's degree; or doctoral or professional degree are used in the calculation of ACS totals for 2014 and for the 2014-2024 projected employment change

The CEW criticism is perhaps best captured in their June 2013 report, "Recovery: Job Growth and Education Requirements Through 2020"[1], where it is noted that:

> "The BLS estimate of education needs in the U.S. economy falls far beneath actual expectations and certainly fare beneath those of many developing countries. What's also surprising is that these number do not conform at all to three other prominent government datasets: the U.S. Census, the American Community Survey (ACS), and the Current Population Survey (CPS). Table 1 (for 2010) demonstrates that, by BLS calculations, a mere 31 percent of all jobs could be classified as postsecondary, yet both the ACS and the CPS consistently report figures twice as high. Despite overwhelming evidence of increasing education requirements for jobs, the BLS estimates of education required for various occupations has remained stagnant."

The report goes on to say,

> "BLS's government mandate prevents it from publishing commentary on the meaning of its numbers, but the implication here is clear: if only 31 percent of Americans need postsecondary education as the minimum education level required for their jobs, and 60 percent have postsecondary education, then 30 percent of our workforce is overqualified."

The second criticism is that BLS assumes that educational requirements of jobs remains constant over the projection period and uses this assumption to forecast the demand for educational attainment categories. In their June 2010 report, "Help Wanted: Projections of Jobs and Education Requirements through 2018,"[2] it is noted that:

> "The Bureau of Labor Statistics (BLS) and the Georgetown University Center on Education and the Workforce (Center) use fundamentally different methodologies to forecast education data that can be boiled down to two issues:
>
> 1. The Center uses historical data to inform its projections while BLS holds education demand constant. This means that BLS assumes if 10% of jobs in an occupation in 2008 require postsecondary education, then 10% of jobs in the same occupation in 2018 will require postsecondary education...
> 2. The Center uses all valid data on education requirements to builds its projections, while the BLS assigns a single educational or training requirement to each of the 755 occupations in its projections. Rather than reply on trends in educational demand, BLS uses a mix of available data and subjective judgments by BLS analysts and informal industry contracts.
>
> This is important because BLS' educational and training requirements undercount postsecondary degrees by 22 million in 2008. This implies that 22 million workers are overeducated. The overwhelming consensus in the literature contradicts this."

The report also notes:

> "Changes in requirements in existing occupational categories – a phenomenon known as 'upskilling' – accounts for about two-thirds of the growth in educational demand. The BLS projections of

[1] https://cew.georgetown.edu/wp-content/uploads/2014/11/Recovery2020.FR_.Web_.pdf
[2] https://cew.georgetown.edu/wp-content/uploads/2014/12/fullreport.pdf

industry and occupation do not take (this) point into consideration and, as a result, miss as much as two-thirds of the upskilling in the economy."

In fact, BLS does not use the educational requirements for entry into an occupation as a basis for forecasting how many jobs will require different levels of educational attainment. Our designation of the typical educational requirements for entry into occupations is for the current base period of the projections only. As previously mentioned, these requirements are reviewed and updated every two years.

So why then is there a misunderstanding? There are a number of reasons. First, in the past, BLS has explicitly published analyses and tables that have contributed to the confusion. For example, the December 10, 2009 Monthly Labor Review article "Occupational Employment Projections to 2018"[3] contains the following passage:

"In 2008, about 3 in 10 jobs were in occupations that were classified in a category involving some sort of postsecondary award or degree. It is projected that occupations in such categories will account for almost half of all new jobs created from 2008 to 2018." To the reader it is likely a distinction without a difference as to whether BLS is talking about the projected demand for more than high school jobs or the projected net change in employment in occupations that generally require a postsecondary degree or award for entry. Second, there are a number of non-BLS analyses that have done exactly this using BLS data, helping to perpetuate the impression. And finally, given that there is substantial interest in trying to determine the demand for education and BLS has not yet developed a methodology for doing so – the education training categories required for entry is likely interpreted by many as a second best alternative in addressing this gap.

The CEW method for estimating educational requirements of jobs

The CEW's method for estimating the educational requirements of jobs both in the current period and over any given projections period is based on the starting assumption that for any occupation, the percentage of employees with any given educational attainment level represents the demand by employers for workers with that educational attainment level. As well, CEW uses linear extrapolation to 'project' changing educational requirements of occupations (essentially regressing the shares of occupations requiring different levels of educational attainment against time), so that depending on the occupation the share of jobs in the out year of a projection period that requires more than high school may in fact be higher than in the current cross section.

Consider, for example, the occupation fast food cooks in table 1. According to table 1, 5.4% of fast food cooks in 2012-2013 held a bachelor's degree or higher. The Georgetown method would include this 5.4% as part of the number of jobs that will require a bachelor's degree or higher over the relevant projection period. While it is possible that there is a heterogeneity in the demand for fast food cooks that is consistent with firms' demanding a skill set that is consistent with having a Bachelor's degree for a relatively small number of workers, we will argue that there are better proxies, in particular the existence of wage premia by educational attainment within the occupation, that provide a preferred basis for estimating differential demands for hiring workers with varying skill sets.

[3] http://www.bls.gov/opub/mlr/2009/11/art5full.pdf

What is the impact of the Georgetown method on estimates of the demand for workers with more than a high school degree? Start by taking the 2012-2013 ACS distribution of detailed occupational employment by educational attainment and assume that the percentage in each occupation with more than high school represents the demand for that educational attainment level by firms. Now taking the BLS projections for employment by occupation and applying these ACS educational attainment shares in each occupation, an estimated 72% of jobs will require more than high school (Note that this is the result of applying the current cross section and does not use linear projections of the change in educational requirements over the projection period).

There are a number of reasons to question this approach. The chief among these forms the basis for our suggested approach. If there is a difference in demand within an occupation for those with more education as compared to those with less, we should observe wage differentials across the educational attainment groups. Merely applying the percentages in each education category is not sufficient.

Finally, how does this estimate compare to what we would get if we (improperly) applied the BLS education categories for entry to the projected net changes in net employment? Table 2 conducts this exercise. Over the 2014-2024 projection period, 49.3% of the net employment change occurs in occupations that typically require high school or less education for entry.

Minnesota Job Vacancy Survey

Another perspective on the educational requirements that employers require by occupations is to use state job vacancy data. In 2015 the Minnesota State Labor Market Information agency conducted such a study using Minnesota Job Vacancy Survey data. This survey is conducted twice a year with a quarter reference period and reports information on vacancies, including industry, occupation, and education requirements.[4] Aggregated data from this survey show that only 38% of job openings require some postsecondary education. In an April 27, 2015 article by Adam Belz in the (Minnesota) Star Tribune[5], this 38% figure was contrasted with the 2010 report from the Georgetown CEW that estimated that 70 percent of the jobs in the state will require postsecondary education by the end of the 2008-2018 projection period. The article also cited that a separate analysis by the Star Tribune using the BLS educational training categories for entry, found that "only 35 percent of jobs in Minnesota require more than a high school diploma and only 33 percent of jobs nationally".

One of the factors limiting the comparability of these studies is that the job vacancy data represent the current flows of openings that, if filled, will contribute to the longer run stocks of jobs. The estimate that 38 percent of job vacancies require some postsecondary education is weighted by openings, which are not evenly distributed by occupation size. An initial step to make this more comparable to the stock of all positions is to weight the data by relative occupation size instead. This basically assumes that the educational requirements associated with job openings by occupation is representative of the educational requirements of current employment in those same occupations. We performed this experiment using second quarter 2014 data from the Job Vacancy Survey and the result is that the percentage of jobs requiring more than a high school education rose to 45%.

[4] Detailed methodology is available from http://mn.gov/deed/data/data-tools/job-vacancy/method-jvs.jsp.
[5] http://www.startribune.com/how-forecast-of-minn-high-skills-jobs-was-twisted-out-of-shape/301376811/

This finding, that the number of jobs requiring postsecondary education is higher than the number of vacancies that do, reflects the fact that job turnover is higher in lower skilled occupations. We confirmed this using the Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) data on job-to-job flows.[6] This data source shows that, in the second quarter of 2014), 63.4% of workers had some postsecondary education, but only 57.6% of job hires were of workers with postsecondary education. While there may be slight differences between job vacancies and job hires, this finding of higher turnover among lower skilled workers closely matches the finding of higher turnover in lower skilled occupations. However, the result showing 45% of jobs requiring more than a high school education is still far lower than the estimate of 70% from the Georgetown CEW.

Trends in Educational Attainment

Part of the CEW methodology is based on an extrapolation of trends in educational attainment, so we examine some of the trends in attainment over the past 15 years. Attainment data show workers with postsecondary education in nearly every occupation, even those that are not traditionally considered skilled. The share of high school graduates attending college has increased dramatically over the past few decades, which has resulted in an increasing share of the labor force with postsecondary education. Some of this increase has been absorbed by faster growth in occupations that typically require postsecondary education, while some has resulted in increasing shares of workers with postsecondary education in occupations that don't typically need it. Historical data from CPS can provide data on the scale of these shifts. CPS has comparable data on educational attainment and occupations back to the year 2000. To analyze distributions across types of occupations, we define college level occupations as those in which at least 60% of workers had a bachelor's degree or higher in the year 2000, and we define high school level occupations as those in which at least 60% of workers had no formal education beyond high school. All other occupations are defined as mixture occupations. This relatively simple breakdown allows us to isolate occupations that are predominantly filled by college graduates from those in which workers of all different levels of education are found.

Looking at the types of occupations in which workers with at least a bachelor's degree were employed between 2000 and 2015 shows that slightly less than half worked in college level occupations, and that the share working in these occupations declined slightly between 2000 and 2015.

Table 3: Distribution of workers with a Bachelor's degree or higher by occupation level

Occupation level	Share of Bachelor's degree or higher workers			
	2000	2006	2010	2015
College occupations	48.6%	47.0%	46.8%	44.7%
Mixture occupations	46.5%	47.1%	47.6%	49.5%
High School occupations	4.9%	5.8%	5.6%	5.7%

[6] http://lehd.ces.census.gov/data/j2j_beta.html

Looking in more detail at just the mixture occupations, the share of employment in these occupations made up by workers with a bachelor's or higher degree grew from 27.6% in 2000 to 36.5% in 2015, with a corresponding decline in workers with a high school education or less.

Table 4: Distribution of employment in mixture occupations by educational attainment

Educational attainment	Share of employment in mixture occupations			
	2000	2006	2010	2015
Bachelor's or higher	27.6%	30.5%	33.0%	36.5%
Other postsecondary	36.5%	36.0%	36.0%	34.5%
High school or less	36.0%	33.5%	30.9%	29.0%

These data show that the educational attainment of the workforce has increased faster than employment in college level occupations over the past 15 years. As a result, an increasing number of college graduates are employed in mixture occupations, those that have workers with a range of educational attainments. This is consistent with two scenarios: first, that the number of college graduates is increasing faster than demand for college graduates, meaning some college graduates are forced to take jobs that do not require a college degree, or second, that there is an increasing skill requirement in occupations, where jobs that did not require a college degree in the past now require one. Looking just at attainment data cannot determine which of these theories predominates.

Wage Premia

While most occupations have workers with a mix of educational attainments, there is also likely to be heterogeneity in educational requirements within most occupations. A retail sales worker in a discount store may need no formal education, but a worker in a more technical sales position may need postsecondary education. Examining worker wages may provide evidence on whether the workers who have postsecondary education are filling positions where it is required (in which case, they should receive a higher wage than other workers in the occupation), or not (in which case there may be no discernable wage premium).

Past studies of the wage premium for education have looked at wage premia by occupation (e.g., Neumark, Johnson, Mejia 2011)[7]. These studies use an approach of modeling wages as a function of education and other demographics. While preferable to analysis that does not control for occupation, showing a wage premium for higher education in a given occupation does not prove that all workers with a college degree need that degree. If, for example, 20 percent of positions in an occupation are higher level positions that pay more and require workers with a degree, with the remaining 80 percent of positions not requiring a degree, modeling wages within the occupation would show a premium for higher education even if 40 percent of workers had a degree (and thus half were in positions that did not require it), assuming that the workers with a degree in positions that do not require a degree have wages that are comparable to workers without a degree in the same positions.

[7] http://www.nber.org/papers/w17213.pdf

Addressing this issue requires looking at individual workers in an occupation. Our approach is based on the model used by Neumark, Johnson, and Mejia, creating a regression for each occupation to explain an individual's wage with education and other demographics as explanatory variables:

$$Ln(W_{ij}) = \alpha + \sum_{k} (\beta_k E_k) + \sum_{l} (\gamma_l D_l) + \varepsilon$$

Where W_{ij} is the wage for individual i in occupation j, E_k represents the set of educational attainment levels, and D_l represents other demographic factors that affect an individual's wage (age, age squared, sex, race, ethnicity, and marital status)

As Neumark found, the regression shows a positive return (coefficient) for higher levels of education across nearly all occupations. However, rather than examine the regression coefficients for education, which in effect reflect the average return for education, our approach uses the regression results to generate an estimate of an individual's wage, keeping all of their demographic characteristics constant, but replacing the respondent's actual education level with a high school level of education. This gives an estimate for the expected earnings for the respondent given their demographic characteristics but without postsecondary education. We then compare the estimated wage from the regression model with the actual reported wage for the respondent. If the actual reported wage is higher than the estimated wage ($W_i > \widehat{W_i}$), the worker has a higher wage than would be expected if they had a high school level of education, and therefore a wage premium exists. If the actual wage is equal to or lower than the estimated wage, there is no premium.

Wage Premium Model Results

We use this approach on all respondents with postsecondary education in the 2014 CPS data. We then sum all respondents who show a wage premium, weighting the results by their CPS weight, and grouping by level of educational attainment.

Table 5: Number of workers with an without a wage premium, by educational attainment level

Attainment	Premium	No Premium	% Premium
Doctoral/Professional	3,400,962	1,761,782	66%
Master's	9,492,073	3,504,968	73%
Bachelor's	21,403,478	11,852,055	64%
Associate's	7,883,251	7,483,459	51%
Some college no degree	12,815,618	14,622,243	47%

About 2/3rds of workers with a bachelor's or higher degree have a wage premium, while only about half of workers with an associate's degree or some postsecondary education without a degree have a wage premium over a high school education.

Wage premium analysis could use either ACS or CPS data. We prefer CPS because although ACS provides the advantage of a larger sample size, ACS provides less concrete wage data, since it only asks about wage income from the past 12 months, not necessarily from the respondent's current job. CPS

provides wage data directly tied to a person's primary occupation, and as a weekly wage it controls for workers who are not employed on a year round basis.

We also performed a similar analysis using 2014 ACS data as a check on the reliability of this model. ACS and CPS data have very similar variables, but there are certain key differences that impact this analysis. CPS measures usual weekly wages, while ACS measures annual wage and salary income. To address the issue of what an annual income figure means for workers who are employed for less than the full year, we exclude these workers from the ACS sample. We suspect that workers who are employed for less than a full year may be less likely to have a wage premium (although we cannot test for this), which would account for some of the difference between our ACS and CPS results.

Using ACS data allows for examination of wage premium results at the state level. We run the regression at the national level, but then examine respondents only from the state of Minnesota, in order to compare with the job vacancy and attainment data from that state that was discussed earlier.

Table 6: Number of workers in Minnesota with an without a wage premium, by educational attainment

Attainment	Premium	No Premium	% Premium
Doctoral/Professional	66,553	27,902	70.5%
Master's	145,038	45,822	76.0%
Bachelor's	420,724	158,223	72.7%
Associate's	194,372	97,782	66.5%
Some college no degree	319,937	223,299	58.9%

Aggregating this data to generate a metric for the number of jobs that exhibit a wage premium shows that 55.2% of workers had a postsecondary education and a wage premium for that level of education. This is significantly less than share of workers in the state with postsecondary education, but higher than the share of workers who need postsecondary education according to the state job vacancy survey, and higher than the share of workers in occupations that typically require some level of postsecondary education.

Table 7: Comparison of methods for measuring share of Minnesota jobs that require postsecondary education

Measure	Share of jobs
ACS Attainment	73.2%
Wage Premium Model	55.2%
Minnesota Job Vacancy Survey	44.8%
BLS Typical Entry-Level Classification	38.9%

The wage premium model does not explicitly provide a metric for jobs that require postsecondary education. Some workers may be employed in positions that require postsecondary education but don't

pay a premium for it, or in positions that do show a wage premium but don't require postsecondary education (the latter is likely more common than the former, which is why the wage premium model shows a higher share of workers with a wage premium than the job vacancy survey shows requiring postsecondary education). What it does provide is an indication of the labor market demand for the worker's postsecondary education. If the market is paying more for a worker with education than an otherwise identical worker without education, then there is some value to the education.

The value of an education is a complex topic, and this analysis does not attempt to explore factors like the extent to which education is human capital formation versus signaling, non-labor market benefits to education, and whether the return to education fully compensates for the cost in time and money of attaining the education. By setting a very low threshold of requiring some increase in wage to be associated with postsecondary education being needed, this analysis does intend to show that taking educational attainment as a proxy for the educational requirements of the workforce results in capturing a significant number of workers who show no labor market benefit from their education.

Further examination

The results presented so far address only a wage premium compared with no postsecondary education. This approach could be modified to address wage premia between any levels of education – for example, for master's degree holders over workers with a bachelor's degree. It could also establish a threshold for the size of wage premium that would be considered significant (for example, requiring a ten percent wage premium by evaluating $W_i > \widehat{W_i} * 1.1$).

Also, this paper does not address the second of Georgetown's criticisms of BLS, that is, how to use the wage premia approach to project the demand for education over the BLS projections period. We leave this exercise to the next version of this paper.

Conclusion

This paper has examined various approaches to estimating the demand for education, including the use of BLS education and training categories for entry into occupations for that purpose. We find deficiencies in all of these approaches and instead propose an alternative method based on the existence of wage premia by educational attainment within and across occupations. This analysis produces estimates of the demand for workers with greater than a high school education for which there is a wage premium is paid. The results show that not all workers with postsecondary education have a wage premium and that therefore the percentage of such workers are lower, as one would expect, than estimates of the demand for education based solely on educational attainment, such as those provided by the Georgetown CEW method.

Questions for reviewers

1. Does the regression approach to measuring wage premia for individual respondents make sense as a way to examine the relationship between educational attainment and educational demand?
2. How does it make sense to interpret a wage premium with respect to educational requirements?

3. Is a certain size wage premium necessary to serve as a compensating differential for the time/cost of pursuing higher education?
4. How should wage premia between multiple different levels of education (e.g., bachelor's vs. associate's vs. high school) be interpreted and analyzed?