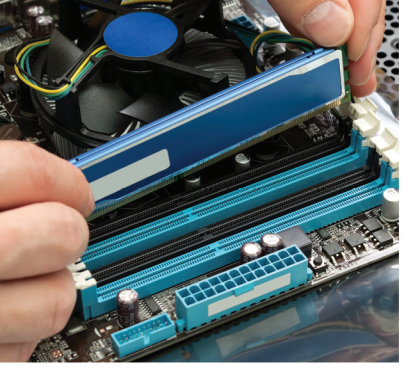

IDENTIFYING OPPORTUNITY OCCUPATIONS IN PENNSYLVANIA, NEW JERSEY, AND DELAWARE

A Special Report by the Community Development Studies & Education Department

FEDERAL RESERVE BANK OF PHILADELPHIA

IDENTIFYING OPPORTUNITY OCCUPATIONS IN PENNSYLVANIA, NEW JERSEY, AND DELAWARE

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September 2015

The author would like to thank Peter Cappelli, Paul Harrington, Phil Lewis, Hal Martin, Leonard Nakamura, Dan Restuccia, Elif Sen, Bledi Taska, and Audrey Watson for their invaluable insights and feedback on a draft of this report. The views expressed in this report are those of the author and do not necessarily reflect the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

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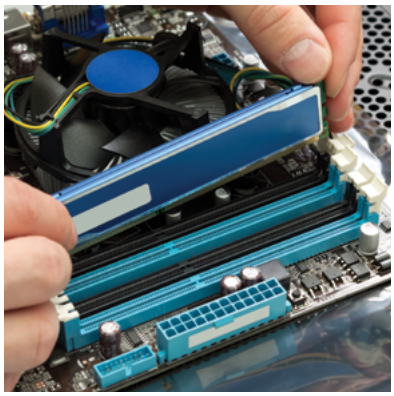


ABSTRACT

Building on research published by the Federal Reserve Banks of Philadelphia, Cleveland, and Atlanta in Wardrip et al. (2015), this report explores the degree to which the economies of 11 metropolitan statistical areas (MSAs) in Pennsylvania, New Jersey, and Delaware include *opportunity occupations*, or occupations characterized by above-average pay for workers without a bachelor's degree. Between 28 percent and 29 percent of total employment in these MSAs meets the definition of an opportunity occupation whether an occupation is classified by the typical education needed for entry or by the results of a survey of incumbent workers and occupational experts. Employer preferences for educational attainment as expressed in online job ads lower the share to roughly 22 percent.

Depending on how the educational requirement of an occupation is measured, opportunity occupation shares in these 11 MSAs range from almost 34 percent to roughly 19 percent. Local variability is driven not only by the types of jobs available but also by employer preferences for education. The educational attainment requested in online job ads varies widely across the MSAs and, to a lesser extent, over time.

INTRODUCTION

A study published by the Federal Reserve Banks of Philadelphia, Cleveland, and Atlanta explored employment opportunities for workers without a four-year college degree in the 100 largest MSAs nationwide (Wardrip et al. 2015). In the report, the authors defined an *opportunity occupation* as one that pays workers on average at least the national annual median wage, adjusted for differences in local consumption prices, and is generally considered accessible for those without a bachelor's degree.

The report finds that about 27.4 percent of employment falls within an opportunity occupation when either the typical level of education needed to enter the occupation or the education suggested by incumbent workers and occupational experts is considered. When the minimum education specified in online job ads is used instead, the share of opportunity occupations falls to 20.3 percent of total employment. The report also finds that employer preferences for higher levels of educational attainment expressed in online job ads vary across the study MSAs, diminishing employment opportunities for those without a bachelor's degree more in some places than in others.

As an extension of Wardrip et al. (2015), this report provides an in-depth analysis of 11 MSAs in states within the Third Federal Reserve District: Pennsylvania, New Jersey, and Delaware.[1] The largest opportunity occupations are identified across these MSAs in aggregate, and metro-level nuances are teased out. Using data extracted from more than 1 million online job ads provided by Burning Glass Technologies, the educational preferences of employers are also investigated — by occupation and by geography — for the role they play in expanding or limiting opportunity for workers without a bachelor's degree.

[1] In addition to the seven large metropolitan areas (Allentown, Harrisburg, Lancaster, Philadelphia, Pittsburgh, Scranton, and Trenton) covered in Wardrip et al. (2015), this report includes the Atlantic City, Erie, Reading, and York MSAs. Total employment in May 2014 exceeded 100,000 in each of the 11 MSAs. Eight other MSAs primarily located in Pennsylvania, New Jersey, and Delaware did not meet this threshold and are excluded because of concerns about data reliability for these smaller economies.

DATA AND METHODS

This section provides a brief overview of the data sets and methods used to define and identify opportunity occupations. For a fuller discussion of the data and methods, see Wardrip et al. (2015).

As mentioned previously, an opportunity occupation is one with an estimated annual median wage equal to or exceeding the national annual median wage, after adjusting for differences in local consumption prices, and is generally considered accessible to a worker without a bachelor's degree. Data on employment and hourly wages are from the May 2014 update of the Occupational Employment Statistics (OES) data set produced by the U.S. Department of Labor's Bureau of Labor Statistics (BLS) (see Table 1). For salaried occupations not typically associated with year-round work (e.g., teachers), the annual median wage from the OES data set is used. For all other occupations, the median hourly wage provided in the OES data set is multiplied by the occupation-specific median weekly hours worked (where available) estimated from Current Population Survey data and by 52 weeks to determine an annual median wage. Rather than using the annual estimate provided in the OES data set, the annual median wage is calculated in this fashion to capture the part-time nature of employment that characterizes many occupations that are accessible to workers with lower levels of formal education. Assuming full-time employment, as the OES data set does, would exaggerate annual earnings.

For each MSA, the national annual median wage ($35,540 in May 2014) is adjusted to account for differences in local consumption prices using Regional Price Parities produced by the Bureau of Economic Analysis.[2] This adjustment means that if the local cost of living is lower than the national average, the wage threshold for an opportunity occupation will be lower than the national annual median wage by the same factor. If the occupation's annual median wage is equal to or above this opportunity occupation threshold wage, then the occupation meets the first criterion.

Three different data sets are used to determine whether the occupation meets the second criterion; that is, whether it is accessible to workers without a bachelor's degree. Because each of the three data sets is intended to capture different information, occupation-level disagreement often occurs between them; as such, three different sets of opportunity occupations are developed. The first data set is national in scope and reflects the typical level of education needed to enter the occupation using education categories developed through the BLS's Employment

[2] Regional Price Parities, which range from 92.1 in the Pittsburgh MSA to 111.5 in the Trenton MSA, are from 2011 because it was the last series published using the MSA definitions consistent with the OES data set. More on the Regional Price Parities series used in this analysis can be found at http://bea.gov/newsreleases/regional/rpp/2013/rpp0613.htm. The MSA definitions used in this analysis were developed by the Office of Management and Budget and published in OMB Bulletin No. 10-02 on December 1, 2009 (available at https://www.whitehouse.gov/sites/default/files/omb/assets/bulletins/b10-02.pdf).

Projections program (hereafter "BLS data set").

The second data set is from the Occupational Information Network (O*NET), developed under the sponsorship of the U.S. Department of Labor's Employment and Training Administration (hereafter "O*NET data set"). The O*NET data set is based on survey responses of incumbent workers and occupational experts regarding the level of education required to work in a given profession. Data for individual occupations are updated on a rolling basis, and the data set used in this analysis was published in July 2014. If at least half of the survey respondents indicate that an occupation requires less than a bachelor's degree, it meets the education criterion to be considered an opportunity occupation.[3] As with the BLS data set, the O*NET data set is national in scope and does not reflect regional differences.

The third data set used to assess education requirements is provided by Burning Glass Technologies (BGT). BGT mines more than 40,000 online job sites and extracts a wealth of information from each job posting it collects. Extracted information used in this study includes the occupation, the MSA, and the minimum education associated with the ad. A minimum education level is specified in roughly one-half of the job ads in the data set, but even after excluding the ads where this information is missing, the data set (hereafter "BGT data set") includes nearly 1.3 million records for the 11 study MSAs between 2011 and 2014. As with the O*NET data set, an occupation is considered accessible for a worker without a bachelor's degree if at least half of the job ads with a minimum education specified indicate as much. Where there are not at least 50 job ads for a given occupation in a given MSA, ads for that occupation are aggregated across a broader swath of similarly sized metropolitan areas to develop a more reliable, but admittedly less localized, estimate.[4] The ability to illuminate primarily local preferences for educational attainment and the fact that the estimates represent the employer perspective differentiate this data set from the other two.

Several caveats regarding online jobs data need to be mentioned. The first is that the minimum education level extracted by BGT may represent the preferred education rather than the minimum permissible. For example, if a job is advertised as "bachelor's degree preferred," the implication is that a candidate without this degree would still be considered. However, if no other credential is stated explicitly, this ad would be coded in such a way that it would appear inaccessible to someone without a bachelor's degree.

Further, research has shown that the jobs posted online are not representative of the broader universe of job openings in a given economy. Carnevale, Jayasundera, and Repnikov (2014) estimate that between 60 percent and 70 percent of all job openings are posted online. Jobs requiring at least a bachelor's degree are far more likely to be advertised on the Internet than are those seeking candidates with lower levels of formal education, a discrepancy that the authors attribute to varying levels of Internet access among candidates for different types of work.[5] Because this research is unconcerned with

[3] Although not used here, the O*NET program also classifies occupations into "job zones" based on their required level of education, work experience, and on-the-job training. See Wardrip et al. (2015) for a discussion of this alternative classification system and how it would affect the opportunity occupation estimates derived from O*NET data.

[4] For the seven large MSAs also covered in Wardrip et al. (2015), ads from the largest 100 metropolitan areas are aggregated where there are fewer than 50 local ads. The four smallest MSAs featured in this report (Atlantic City, Erie, Reading, and York) all rank between 101 and 200 in total employment, and ads from this second-largest group are aggregated where there are fewer than 50 local job ads for an occupation in one of these four MSAs. The BGT data set is large enough that, even in Erie, the MSA with the lowest total employment among the 11 study MSAs, local ads are used to classify about 50 percent of employment, while the aggregated job ads are used for the remaining 50 percent. Across the 11 MSAs, the median share of employment classified using local job ads is 65 percent.

[5] See Rothwell (2014) for an evaluation of over- or underrepresentation of major occupation groups in online job ads.

job counts by occupation, focusing instead on the characteristics of the posted ads, this limitation should not affect the findings presented here.[6]

In addition, the algorithms used to extract data from the millions of job ads posted online are not failsafe. Carnevale, Jayasundera, and Repnikov (2014) estimate that the level of education is accurately extracted about 85 percent of the time, while information pertaining to the geographic location (80-plus percent) and detailed occupation (73 percent) of the ad is slightly less reliable.

Table 1. Data Sets Used in This Study

Data	Source
Employment and Wages	
Employment and median wages by occupation and MSA (May 2014)	Occupational Employment Statistics (OES) program, U.S. Department of Labor, Bureau of Labor Statistics
National annual median wage (May 2014)	Occupational Employment Statistics (OES) program, U.S. Department of Labor, Bureau of Labor Statistics
Local consumption price adjustments (2011)	Regional Price Parities, U.S. Department of Commerce, Bureau of Economic Analysis
Median weekly hours worked (2013–2014)	Current Population Survey, U.S. Census Bureau and U.S. Department of Labor, Bureau of Labor Statistics
Education	
Typical level of education needed to enter the occupation (2012–2022)	Employment Projections program, U.S. Department of Labor, Bureau of Labor Statistics
Survey of incumbent workers and occupational experts (July 2014)	Occupational Information Network (O*NET), U.S. Department of Labor, Employment and Training Administration
Online job ads (2011–2014)	Burning Glass Technologies

The remainder of this report is split into 10 brief sections, each focusing on a discrete finding that springs from this research. The final sections summarize these findings and explore the implications for access to economic opportunity for workers who lack higher levels of formal education.

[6] For a given occupation, if positions requiring a higher level of educational attainment are more likely to be posted online than those that do not, the analysis of BGT data presented here would indicate a higher level of educational preferences than if all jobs were posted online. However, analyses by the vendor have uncovered no evidence to suggest that this is the case.

FINDINGS

THE SAME OCCUPATION CAN BE ASSOCIATED WITH DIFFERENT LEVELS OF LOCAL OPPORTUNITY

Table 2 illustrates how the data sets used in this report are combined to define opportunity occupations; shading in the last four rows indicate whether the example meets the definition of an opportunity occupation (dark gray) or not (light gray) with respect to each criterion.[7] As Table 2 shows, the annual median wage for first-line supervisors of retail sales workers exceeds the opportunity occupation threshold wage in Philadelphia and Trenton, and both the BLS and O*NET data sets suggest that a worker without a bachelor's degree can readily access employment in this field. Where the opportunities for this occupation in these two MSAs diverge is in the education requested in online job ads: 59 percent of ads in Philadelphia sought a candidate without a bachelor's degree compared with only 44 percent in Trenton.

[7] For simplicity, MSA names are shortened in this report (e.g., the Philadelphia-Camden-Wilmington MSA is referred to as the Philadelphia MSA).

Table 2. Classification of Occupations

Occupation	First-Line Supervisors of Retail Sales Workers		Automotive Service Technicians and Mechanics	
MSA	Philadelphia	Trenton	Atlantic City	Harrisburg
National annual median wage (OES)	$35,540	$35,540	$35,540	$35,540
Consumption price adjustment (RPP)	108.2	111.5	109.3	96.8
Opportunity occupation threshold wage	$38,454	$39,627	$38,845	$34,403
Hourly median wage (OES)	$21.05	$21.67	$24.72	$15.59
Median hours worked per week (CPS)	40	40	40	40
Annual median wage	$43,784	$45,074	$51,418	$32,427
Entry-level education category (BLS)	High-school diploma or equivalent	High-school diploma or equivalent	High-school diploma or equivalent	High-school diploma or equivalent
Less than a bachelor's degree (O*NET)	93%	93%	100%	100%
Less than a bachelor's degree (BGT)	59%	44%	100%	100%

Note: Sources are shown parenthetically; where no source is provided, the estimate is based on the author's calculations described in the Data and Methods section.

According to all three education data sets, a worker today generally only needs a high school diploma to be employed as an automotive service technician and mechanic, and in nine of the 11 MSAs covered in this report, the profession pays an annual median wage above the opportunity occupation threshold wage. In the Harrisburg MSA, however, the annual median wage is about $2,000 below this threshold, which disqualifies it from consideration as an opportunity occupation.

Although the BLS and O*NET data sets agree on the two occupations presented in Table 2, they differ on others that employ a substantial number of workers in the study's 11 MSAs. The five largest such occupations are described in Table 3, and the cells in gray indicate accessibility for a worker without a bachelor's degree. For general and operations managers and computer systems analysts positions, which are considered accessible to workers without a four-year college degree in the O*NET data set, the BLS data set suggests that workers new to the profession typically need a bachelor's degree, and the majority of ads in all of the study MSAs seek candidates with at least a bachelor's degree. For business operations specialists, an occupation for which entering workers typically do not need a college education, the O*NET data set and BGT data in all of the study MSAs suggest that a bachelor's degree is required.

Occupation-level disagreement on educational requirements among these three data sets in part reflects the fact that they try to capture different things: the typical education level that most workers need to enter the occupation, requirements for today's workers, and employer preferences. Disagreement may also reflect imperfections in the data sets related to small sample sizes, data processing, and the vintage of the data; for example, O*NET information on general and operations managers was collected in 2008. Because there is no right answer, no effort is made to create consistency across the

Table 3. Differences in Classification Arising from Education-Related Data Sets

Occupation	Employment	BLS Education Category	O*NET Percent Below Bachelor's Degree	BGT Percent Below Bachelor's Degree (Minimum and Maximum in 11 MSAs)	
General and Operations Managers	67,250	Bachelor's degree	62%	11%	49%
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	63,940	High-school diploma or equivalent	23%	30%	68%
Sales Representatives, Services, All Other	34,610	High-school diploma or equivalent	26%	31%	79%
Business Operations Specialists, All Other	29,190	High-school diploma or equivalent	45%	11%	32%
Computer Systems Analysts	25,880	Bachelor's degree	57%	4%	29%

Sources: Author's calculations use data from BLS Occupational Employment Statistics (May 2014), BLS Employment Projections (2012–2022), Employment and Training Administration's Occupational Information Network (O*NET) (July 2014), and Burning Glass Technologies (2011–2014).

educational classifications indicated by the three data sets. Rather, the results of each are reported to take a more nuanced look at the opportunity that exists in these economies for workers without higher levels of formal education.

MOST JOBS FOR WORKERS WITHOUT A BACHELOR'S DEGREE ARE LOW PAYING

Those who enter the labor force without a four-year college degree may encounter uncertain and low-wage employment prospects. Relative to those with a college education, the unemployment rate for these workers is typically higher than average, and the wages are generally lower.[8] Table 4 lists the 10 largest occupations in the study MSAs for which workers who are new to the profession typically do not need a bachelor's degree according to the BLS data set.

These 10 occupations account for slightly less than 1.3 million jobs in the 11 MSAs covered in this report, or roughly 22 percent of all employment. Driven to some extent by the part-time nature of some of the occupations, the annual median wages across these geographies are generally low, with 75 of the 109 MSA-occupation combinations falling short of $30,000 and only 12 classified as opportunity occupations for entering workers: registered nurses in every MSA and secretaries and administrative assistants in Trenton.[9]

THE LEVEL OF OPPORTUNITY HINGES UPON WHICH MEASURE OF EDUCATION IS USED

As described previously, this report uses three different data sets to understand the education required to work in each occupation. Table 5 indicates that about 28.7 percent of all employment, or 1.6 million of the 2.7 million jobs paying above the median wage in the study MSAs, meets the definition of an opportunity occupation using the education categories from the BLS data set. The O*NET data set, which captures survey responses of incumbent

[8] Unemployment rates and earnings by educational attainment can be found at http://www.bls.gov/cps/.

[9] The employment estimate is suppressed for one occupation in York, which is why there are not 110 observations for these 10 occupations across the study's 11 MSAs.

Table 4. Most Prevalent Occupations for Which a Bachelor's Degree Is Not Typically Required of Entering Workers (May 2014)

Occupation	Employment	Annual Median Wage	
		MSA Minimum	MSA Maximum
Retail Salespersons	199,020	$20,197	$22,922
Cashiers	150,050	$13,666	$15,132
Registered Nurses	135,210	$55,328	$74,506
Combined Food Preparation and Serving Workers, Including Fast Food	128,300	$15,616	$16,871
Office Clerks, General	125,380	$26,166	$35,630
Customer Service Representatives	110,920	$28,704	$36,317
Laborers and Freight, Stock, and Material Movers, Hand	110,110	$24,981	$29,910
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	107,390	$28,101	$46,030
Waiters and Waitresses	100,460	$13,494	$15,834
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	88,450	$19,157	$27,123

Sources: Author's calculations use data from BLS Occupational Employment Statistics (May 2014), BLS Employment Projections (2012–2022), and the Current Population Survey (2013–2014).

workers and occupational experts, produces similar results (28.3 percent). However, reflecting the educational preferences of employers as expressed in online job ads, the BGT data set lowers the opportunity occupation share to 22.3 percent, or only 1.2 million of the 2.7 million higher paying jobs.[10]

BROADLY SPEAKING, OPPORTUNITY CAN BE FOUND IN BOTH WHITE- AND BLUE-COLLAR EMPLOYMENT

Table 6 provides employment estimates for the 22 major occupation groups within the study MSAs, as well as the number and percentage of each major group's total employment classified as an opportunity occupation by the three data sets. Highlighted in gray are the five most opportunity-rich groups according to each data set; percentages in green exceed the data set's overall opportunity occupation share. Four of the major occupation groups rank among the top five for all three data sets: office and administrative support; healthcare practitioners and technical; installation, maintenance, and repair; and construction and extraction.

The greatest difference among the data sets lies in the characterization of jobs in sales and related occupations. Reflecting the education typically required to enter an occupation, the BLS data set identifies a substantial level of opportunity in this group; however, the O*NET and BGT data sets suggest that educational requirements are higher for work in some sales occupations, which elevates production work to fifth place in terms of employment in opportunity occupations for these two data sets.

Other major groups, such as protective service and legal, are characterized by higher-than-average shares of opportunity-rich employment but do not employ significant numbers of workers in the study's 11 MSAs.

[10] MSA-level observations of employment are excluded if wage or employment information is suppressed, or if information is not available in any one of the three data sets used to measure education. After exclusions, this analysis includes 5.5 million of the 5.8 million jobs across the study's 11 MSAs, or 95 percent of total employment.

Table 5. Opportunity Occupation Estimates (millions, May 2014)

	BLS	O*NET	BGT
Total employment	5.5	5.5	5.5
Paying below annual median wage	2.8	2.8	2.8
Paying at or above annual median wage	2.7	2.7	2.7
Requiring at least a bachelor's degree	1.1	1.2	1.5
Opportunity occupation	1.6	1.6	1.2
Percent opportunity occupation	28.7%	28.3%	22.3%

Sources: Author's calculations use data from BLS Occupational Employment Statistics (May 2014), BLS Employment Projections (2012–2022), Employment and Training Administration's Occupational Information Network (O*NET) (July 2014), Burning Glass Technologies (2011–2014), BEA Regional Price Parities (2011), and the Current Population Survey (2013–2014).

IN THE STUDY MSAs, NINE OPPORTUNITY OCCUPATIONS CONSISTENTLY RANK AMONG THE TOP 15

Table 7 lists the 15 largest opportunity occupations in the study MSAs specific to each of the three data sets, as well as the percentage of the occupation's total employment classified as an opportunity occupation across the MSAs. The nine occupations appearing in all three lists are highlighted in green.

As described previously, an occupation must both pay above the national annual median wage, adjusted for differences in local consumption prices, and be generally considered accessible to someone without a bachelor's degree to be classified as an opportunity occupation. Because the BLS and O*NET data sets are national in scope, an occupation either is or is not considered accessible to someone without a bachelor's degree in each, and percentages below 100 are attributable to pay below the opportunity occupation

Table 6. Opportunity Occupations by Major Occupation Group (May 2014)

Major Occupation Group	Total Employment	BLS		O*NET		BGT	
		Employment	Percent	Employment	Percent	Employment	Percent
Office and Administrative Support	944,510	268,080	28.4%	268,080	28.4%	181,100	19.2%
Sales and Related	591,510	182,560	30.9%	107,860	18.2%	86,890	14.7%
Food Preparation and Serving Related	483,050	7,850	1.6%	7,850	1.6%	7,850	1.6%
Transportation and Material Moving	379,790	98,040	25.8%	98,230	25.9%	97,460	25.7%
Healthcare Practitioners and Technical	367,360	222,750	60.6%	213,950	58.2%	197,850	53.9%
Education, Training, and Library	328,840	5,510	1.7%	4,390	1.3%	8,120	2.5%
Production	308,480	156,950	50.9%	156,950	50.9%	139,000	45.1%
Business and Financial Operations	285,680	63,170	22.1%	44,790	15.7%	13,340	4.7%
Management	232,490	26,970	11.6%	90,260	38.8%	8,040	3.5%
Installation, Maintenance, and Repair	210,840	193,740	91.9%	193,740	91.9%	193,020	91.5%
Healthcare Support	197,340	8,030	4.1%	8,030	4.1%	8,030	4.1%
Construction and Extraction	186,010	169,240	91.0%	169,240	91.0%	168,340	90.5%
Personal Care and Service	174,000	11,300	6.5%	11,250	6.5%	10,580	6.1%
Building and Grounds Cleaning and Maintenance	173,300	10,400	6.0%	10,400	6.0%	8,700	5.0%
Computer and Mathematical	160,990	35,360	22.0%	59,600	37.0%	5,480	3.4%
Protective Service	121,610	57,700	47.4%	54,250	44.6%	51,360	42.2%
Community and Social Service	103,130	7,390	7.2%	0	0.0%	1,520	1.5%
Architecture and Engineering	90,830	24,080	26.5%	22,980	25.3%	24,390	26.9%
Arts, Design, Entertainment, Sports, and Media	55,810	3,060	5.5%	5,990	10.7%	2,270	4.1%
Legal	48,240	15,210	31.5%	15,210	31.5%	4,270	8.9%
Life, Physical, and Social Science	42,680	8,960	21.0%	7,870	18.4%	5,810	13.6%
Farming, Fishing, and Forestry	3,810	300	7.9%	470	12.3%	0	0.0%
Total	5,490,300	1,576,650	28.7%	1,551,390	28.3%	1,223,420	22.3%

Note: The table is sorted in descending order of total employment in the study MSAs.

Sources: Author's calculations use data from BLS Occupational Employment Statistics (May 2014), BLS Employment Projections (2012–2022), Employment and Training Administration's Occupational Information Network (O*NET) (July 2014), Burning Glass Technologies (2011–2014), BEA Regional Price Parities (2011), and the Current Population Survey (2013–2014).

Table 7. Most Prevalent Opportunity Occupations (May 2014)

Rank	Occupation	Percent Qualifying as Opportunity Occupation	Opportunity Occupation Employment
BLS			
1	Registered Nurses	100%	135,210
2	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	100%	63,940
3	Bookkeeping, Accounting, and Auditing Clerks	92%	61,510
4	Heavy and Tractor-Trailer Truck Drivers	98%	61,190
5	First-Line Supervisors of Office and Administrative Support Workers	100%	58,160
6	Maintenance and Repair Workers, General	97%	55,700
7	First-Line Supervisors of Retail Sales Workers	100%	43,360
8	Sales Representatives, Services, All Other	100%	34,610
9	Licensed Practical and Licensed Vocational Nurses	100%	33,020
10	Carpenters	100%	32,180
11	Police and Sheriff's Patrol Officers	100%	31,320
12	Automotive Service Technicians and Mechanics	92%	29,520
13	Business Operations Specialists, All Other	100%	29,190
14	Computer User Support Specialists	100%	25,340
15	Executive Secretaries and Executive Administrative Assistants	100%	24,260
O*NET			
1	Registered Nurses	100%	135,210
2	General and Operations Managers	100%	67,250
3	Bookkeeping, Accounting, and Auditing Clerks	92%	61,510
4	Heavy and Tractor-Trailer Truck Drivers	98%	61,190
5	First-Line Supervisors of Office and Administrative Support Workers	100%	58,160
6	Maintenance and Repair Workers, General	97%	55,700
7	First-Line Supervisors of Retail Sales Workers	100%	43,360
8	Licensed Practical and Licensed Vocational Nurses	100%	33,020
9	Carpenters	100%	32,180
10	Police and Sheriff's Patrol Officers	100%	31,320
11	Automotive Service Technicians and Mechanics	92%	29,520
12	Computer Systems Analysts	100%	25,880
13	Computer User Support Specialists	100%	25,340
14	Executive Secretaries and Executive Administrative Assistants	100%	24,260
15	First-Line Supervisors of Production and Operating Workers	100%	23,890
BGT			
1	Registered Nurses	100%	135,210
2	Bookkeeping, Accounting, and Auditing Clerks	92%	61,510
3	Heavy and Tractor-Trailer Truck Drivers	98%	61,190
4	Maintenance and Repair Workers, General	97%	55,700
5	First-Line Supervisors of Retail Sales Workers	97%	42,130
6	Licensed Practical and Licensed Vocational Nurses	100%	33,020
7	Carpenters	100%	32,180
8	Police and Sheriff's Patrol Officers	100%	31,320
9	Automotive Service Technicians and Mechanics	92%	29,520
10	Construction Laborers	72%	22,190
11	Electricians	100%	22,170
12	Insurance Sales Agents	100%	17,020
13	Inspectors, Testers, Sorters, Samplers, and Weighers	96%	16,440
14	First-Line Supervisors of Construction Trades and Extraction Workers	95%	16,130
15	First-Line Supervisors of Mechanics, Installers, and Repairers	96%	15,890

Note: Occupations appearing in all three lists are highlighted in green.

Sources: Author's calculations use data from BLS Occupational Employment Statistics (May 2014), BLS Employment Projections (2012–2022), Employment and Training Administration's Occupational Information Network (O*NET) (July 2014), Burning Glass Technologies (2011–2014), BEA Regional Price Parities (2011), and the Current Population Survey (2013–2014).

threshold in one or more MSAs. Because BGT data reflect, where the sample size is sufficient, the level of education requested in local online job ads, percentages below 100 suggest that, in one or more MSAs, either the compensation is insufficient or employers are largely seeking college-educated candidates.

Three occupations rank in the top four for all three data sets: registered nurses; bookkeeping, accounting, and auditing clerks; and heavy and tractor-trailer truck drivers. A number of white-collar occupations, including computer user support specialists and executive secretaries and executive administrative assistants, are considered accessible to workers without a bachelor's degree according to the BLS and O*NET data sets, but higher educational preferences expressed by employers in some MSAs reduce the level of opportunity for these occupations. As a result, manual labor occupations and related supervisory employment round out the BGT list.

AS A RESULT OF LOCAL DIFFERENCES IN EMPLOYMENT AND WAGES, THE OPPORTUNITY OCCUPATION SHARE IN THE STUDY MSAs VARIES DRAMATICALLY

The preceding analysis clearly shows that some occupations afford a worker with a lower level of formal education a better chance at earning a good wage than do others. By definition, however, not every job can pay above the median wage. Using the O*NET data set, Figure 1 sheds light on how opportunity and wage levels intersect geographically in each of the 11 metropolitan areas in this study.[11]

In Figure 1, employment in occupations with an annual median wage at or above the national annual median wage, adjusted for differences in local consumption prices as described previously, is depicted in dark green (if a bachelor's degree is not required) or dark blue (if it is). Occupations paying less than the adjusted annual median wage are shown in lighter shades of the same colors. This figure tells a number of important stories:

- Based on the educational requirements reported by incumbent workers and occupational experts, the opportunity occupation share ranges from 33.6 percent in Reading to 22.3 percent in Atlantic City.[12]
- In most metropolitan areas, occupations for which the annual median wage is at or above the adjusted national annual median wage — the sum of the darker-shaded sections — constitute between 44 and 52 percent of total employment. Outliers include Trenton, where higher-paying work is much more common than in the other MSAs, and Erie and Atlantic City, where low-wage work dominates the landscape.
- Except in Trenton, more than half of higher-wage employment can be found in occupations that are generally considered accessible to a worker without a bachelor's degree.

[11] The opportunity occupation share calculated using the BLS data set is higher for each of the study's 11 MSAs when compared with the O*NET opportunity occupation share, but the median difference is less than one-third of a percentage point, and the maximum metro-level difference is 2.6 percentage points. Because these two data sets produce similar results and for the sake of simplicity, this section and the next analyze O*NET data to the exclusion of the BLS data set.

[12] As mentioned previously, an MSA-occupation observation is excluded in this analysis if either its wages or employment is suppressed, or if, for that occupation, information is not available in any one of the three data sets used to measure education. After exclusions, this analysis evaluates between 85 percent and 97 percent of total employment in each MSA. Of course, if excluded occupations differ substantially from included occupations in terms of wages or education requirements, this would affect the opportunity occupation shares reported here. For seven of the 11 MSAs (but generally by very small margins), excluded occupations are more likely to be associated with lower levels of formal education in the BLS data set than are included occupations. For the occupations for which wage and employment estimates are available but O*NET or BGT estimates are not (representing only 70,000 of the 300,000 excluded jobs), excluded occupations in five MSAs are more likely to be classified as an opportunity occupation using the BLS data set than are included occupations. If these occupations were included, the BLS opportunity occupation share would increase by no more than 0.4 percentage point for any of these MSAs.

- Employment in lower-paying occupations that do not require a four-year college degree (in light green) far exceeds higher-paying employment for workers with the same educational attainment (in dark green). In Erie and Atlantic City, the ratio of the former to the latter is at least 2.5 to 1.

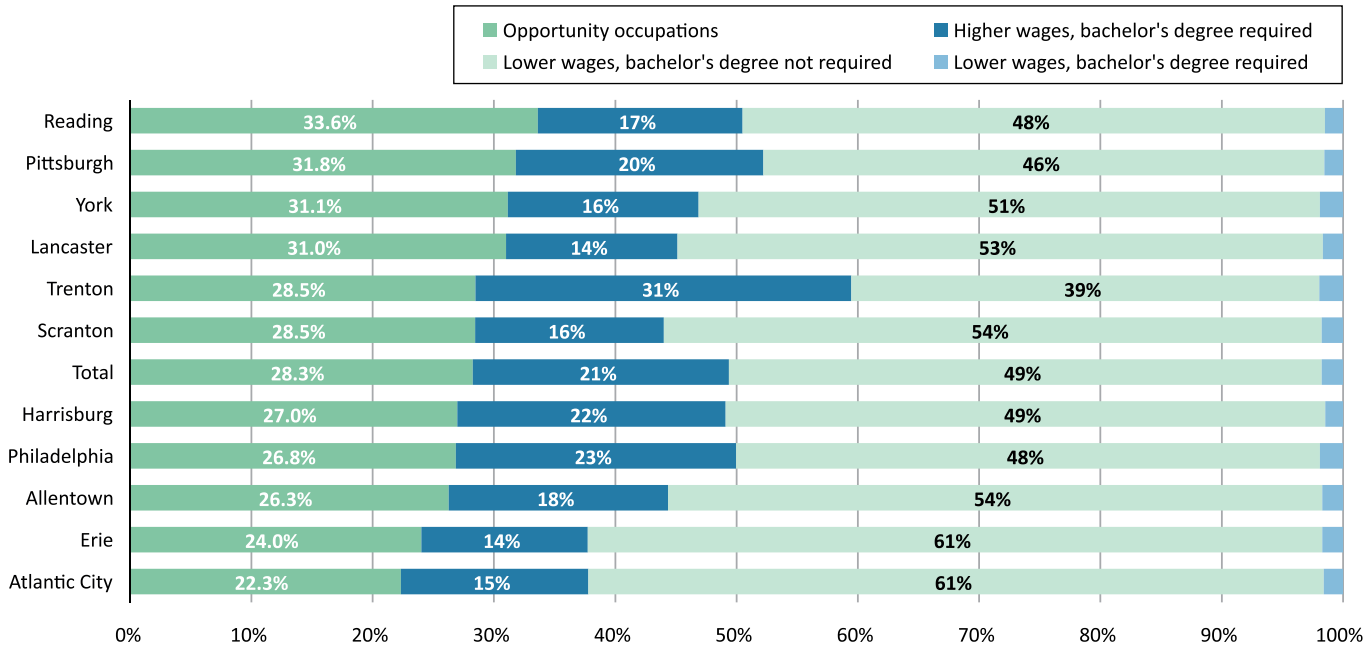
FOR ALL BUT ONE STUDY MSA, EMPLOYER PREFERENCES FOR EDUCATION REDUCE THE SHARE OF EMPLOYMENT THAT CAN BE CLASSIFIED AS AN OPPORTUNITY OCCUPATION

The preceding section uses the O*NET data set, which is national in scope, to illustrate that the local level of economic opportunity for a worker without a bachelor's degree varies widely. The BGT data set, on the other hand, allows for an analysis of local educational preferences for individual occupations because, where the number of observations is sufficient, the education requested in job ads posted in a given MSA can be used to classify it as accessible, or inaccessible, to a worker without a four-year college degree. Figure 2 compares each MSA's opportunity occupation share calculated using O*NET data (also provided in Figure 1) with the share derived from the BGT data set.

Across these 11 MSAs, the overall difference between the levels of opportunity based on the O*NET and BGT data sets is 6 percentage points (28.3 percent versus 22.3 percent). In Trenton and Philadelphia, the gap is closer to 8 percentage points, suggesting that employer preferences for education may be having an outsized effect in these areas.

Focusing specifically on the Philadelphia and Trenton MSAs, some of the largest occupations for which the O*NET data set suggests accessibility for workers without a bachelor's degree, but the BGT data set does not, are identified in Table 3 (e.g., gen-

Figure 1. Distribution of Local Employment by Wages and O*NET Education (May 2014)



Sources: Author's calculations use data from BLS Occupational Employment Statistics (May 2014), Employment and Training Administration's Occupational Information Network (O*NET) (July 2014), BEA Regional Price Parities (2011), and the Current Population Survey (2013–2014).

eral and operations managers and computer systems analysts). Because the typical education required to enter these occupations in the BLS data set is also a bachelor's degree, it is likely that O*NET survey data are underestimating the level of required education in these cases, which has the effect of exaggerating the gap between the O*NET and BGT opportunity occupation shares. At the same time, employers' preferences for education appear to be creating barriers to employment in some large occupations — for example, executive secretaries and executive administrative assistants, and computer user support specialists — that are classified as opportunity occupations in other MSAs.

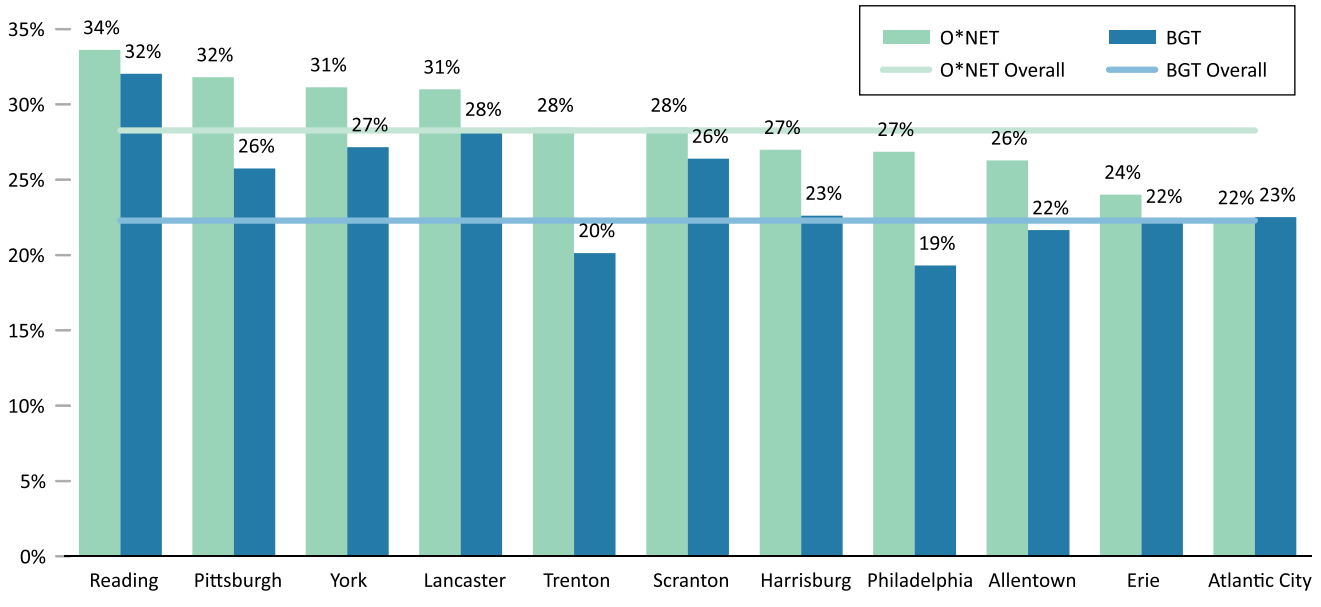
In Reading and Erie, the gap between the O*NET and BGT opportunity occupation shares is less than 2 percentage points. Atlantic City stands alone as the only MSA in which online job ads suggest a marginally higher level of opportunity than do the survey responses reflected in the O*NET data set (22.5 percent versus 22.3 percent). The underlying occupational differences between the two data sets are numerous in Atlantic City, but the two largest occupations considered accessible to a worker without a bachelor's degree in the BGT data set but not in the O*NET data set are in sales.

The data table in the Appendix includes information on the 10 largest opportunity occupations identified using either the O*NET or BGT data set in each of the study MSAs, including an estimate of total employment, the location quotient comparing the representation of the occupation in the MSA relative to the U.S., and the share of job ads requesting less than a bachelor's degree.

THE OCCUPATIONAL COMPOSITION OF THE LOCAL ECONOMY HELPS EXPLAIN RELATIVE OPPORTUNITY LEVELS FOR THOSE WITHOUT A FOUR-YEAR COLLEGE DEGREE

Opportunity occupation shares reported previously are partially determined by the mix of

Figure 2. Share of Local Employment Classified as an Opportunity Occupation (May 2014)



Sources: Author's calculations use data from BLS Occupational Employment Statistics (May 2014), Employment and Training Administration's Occupational Information Network (O*NET) (July 2014), Burning Glass Technologies (2011–2014), BEA Regional Price Parities (2011), and the Current Population Survey (2013–2014).

Figure 3. Distribution of Employment by Major Occupation Group and MSA (May 2014)

Source: Author's calculations use data from BLS Occupational Employment Statistics (May 2014).

industries and associated occupations that form a local economy.[13] Figure 3 hints at the local-level variability in occupational mix for three MSAs that represent the continuum of opportunity occupation shares as calculated with the O*NET data set: Reading with the highest share (33.6 percent), Trenton approximating the midpoint (28.5 percent), and Atlantic City with the lowest share (22.3 percent). Depicted in green are a few of the major occupation groups shown in Table 6 to capture a significant level of employment in opportunity occupations. Major occupation groups depicted in shades of gray are also important in these regional economies but do not offer much in the way of high-wage opportunities for a worker without a bachelor's degree.

With the knowledge that Reading's economy affords workers without a bachelor's degree greater access to opportunity than does Atlantic City's, it is unsurprising that major occupation groups associated with opportunity make up a greater share of total employment. The degree to which each major group is represented, however, is interesting. Roughly 11 percent of employment in Reading is in the area of production, which, as shown in Table 6, includes jobs that frequently meet the opportunity occupation criteria. Trenton stands out for its economy's overrepresentation of work in both office and administrative support and in business and financial operations. As a tourism and gaming destination, Atlantic City has an economy that is heavily reliant on food preparation and serving related occupations (18 percent) that do not compensate workers sufficiently to be considered opportunity occupations.

EMPLOYER PREFERENCES FOR EDUCATION ALSO PARTLY EXPLAIN WHY SOME METROPOLITAN AREAS PROVIDE GREATER OPPORTUNITY FOR WORKERS WITHOUT A BACHELOR'S DEGREE THAN DO OTHERS

In addition to an economy's occupational composition, the educational preferences of employers

[13] This report focuses on occupations rather than industries, but given their interrelatedness, an economy's industry composition certainly has implications for the opportunities it offers its workers. An investigation of the relationship between industry and opportunity is fertile ground for future research.

also affect local opportunity. Table 8 shows the share of job ads that request less than a bachelor's degree for some of the largest opportunity occupations identified in the BLS and O*NET data sets. Values more than 10 percentage points above (below) the MSA median are shown in gray (green).

Several important observations can be drawn from Table 8.

- Representing a mix of white- and blue-collar work, the five occupations listed at the top of the table are typically accessible to a worker without a bachelor's degree in every study MSA for which estimates are available. This is also true for insurance sales agents and registered nurses.
- Job ads requesting less than a bachelor's degree are in the minority in all of the study MSAs for three occupations: general and operations managers, business operations specialists, and computer systems analysts. As shown in Table 7, the BLS and O*NET data sets disagree on whether these occupations are generally accessible to a worker without a bachelor's degree, and online job ads over this period suggest that they are not.
- For nine of the 19 occupations shown, however, it is a mixed bag. For example, a computer user support specialist without a bachelor's degree might meet employer expectations for the majority of ads in Erie but might be unqualified for many of the open positions in Philadelphia.[14]
- Lastly, patterns related to the level of education requested in online job ads emerge within metropolitan areas and can be most directly observed by looking at the gray and green highlighted values in Table 8. For eight of the 15 occupations for which estimates could be calculated, the share of ads requesting less than a bachelor's degree is at least 10 percentage points above the median in the Atlantic City MSA; job ads in the Erie and Scranton MSAs also suggest generally lower educational expectations. The Trenton, Philadelphia, and York MSAs lie at the other end of the spectrum, showing evidence of much higher employer preferences for education.[15]

FOR SOME OPPORTUNITY OCCUPATIONS, THE EDUCATION REQUESTED IN ONLINE JOB ADS SHOWED SIGNS OF CHANGE IN RECENT YEARS

Table 9 provides the percentage of job ads requesting less than a bachelor's degree for occupations identified in Table 7 and calculates the difference between the 2011 and 2014 percentages. The table is sorted in descending order of the difference, so occupations that became more accessible to those without a bachelor's degree during this four-year period appear at the top.

In 2014, a significantly greater share of ads sought candidates without a four-year college degree than was true in 2011 for seven of these 23 occupations. In several cases, the change was statistically significant but not meaningful for the purposes of this study; for example, the share of ads for computer systems analysts requesting less than a bachelor's degree rose from 5 percent to 9 percent, suggesting that even after the increase, the job remains out of reach for most

[14] Preliminary analysis of job ads for computer user support specialists for a separate study suggests that the industry of the employer can play a role in the local-level variation reported in Table 8. In other words, local-level variation may be affected less by differences in educational preferences for similar employers and more by differences in educational preferences across industries, which are not evenly represented from one MSA to another.

[15] The finding that educational preferences in online job ads tend to be correlated within metropolitan areas is consistent with preliminary findings discussed but not fully developed in Wardrip et al. (2015). Further research is warranted into the factors that produce these patterns, such as differences in industry presence and the educational attainment of the resident population.

Table 8. MSA-Level Share of Job Ads with a Minimum Education Less Than a Bachelor's Degree for the Most Prevalent Opportunity Occupations (2011–2014)

Occupation	MSA Median	Allentown	Atlantic City	Erie	Harrisburg	Lancaster	Philadelphia	Pittsburgh	Reading	Scranton	Trenton	York
Automotive Service Technicians and Mechanics	100%	100%	100%		100%	100%	100%	100%	100%	100%		100%
Maintenance and Repair Workers, General	95%	95%	95%	94%	95%	95%	90%	91%	96%	96%	93%	96%
Licensed Practical and Licensed Vocational Nurses	94%				94%	99%	94%	86%	95%	100%		
Heavy and Tractor-Trailer Truck Drivers	89%	92%	87%	80%	82%	94%	89%	95%	89%	92%	71%	88%
Bookkeeping, Accounting, and Auditing Clerks	76%	77%	94%	76%	78%	75%	66%	67%	77%	80%	60%	65%
Inspectors, Testers, Sorters, Samplers, and Weighers	74%	74%		92%	69%	54%	61%	74%	77%	83%	33%	84%
Insurance Sales Agents	70%	58%		70%	64%	69%	58%	70%	78%	75%		71%
First-Line Supervisors of Retail Sales Workers	64%	66%	69%	73%	59%	67%	59%	64%	64%	69%	44%	64%
Registered Nurses	64%	72%	64%	59%	64%	70%	63%	59%	66%	84%	55%	62%
First-Line Supervisors of Mechanics, Installers, and Repairers	61%	55%	78%	52%	65%	65%	57%	54%	61%	62%	48%	63%
Executive Secretaries and Executive Administrative Assistants	55%	61%			55%	61%	45%	49%	67%	75%	45%	31%
Computer User Support Specialists	54%	54%	57%	75%	60%	61%	41%	48%	55%	53%	32%	43%
First-Line Supervisors of Production and Operating Workers	51%	49%	64%	60%	49%	48%	45%	58%	60%	63%	24%	51%
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	50%	50%	68%	56%	48%	54%	41%	43%	53%	60%	30%	44%
First-Line Supervisors of Office and Administrative Support Workers	43%	45%	66%	46%	45%	47%	38%	43%	30%	42%	34%	40%
Sales Representatives, Services, All Other	35%	31%	79%		32%	65%	36%	48%			34%	34%
General and Operations Managers	29%	26%	49%	34%	29%	27%	19%	24%	37%	35%	11%	29%
Business Operations Specialists, All Other	16%	16%	32%		12%	23%	11%	14%		22%	12%	26%
Computer Systems Analysts	9%	15%	6%	29%	10%	9%	6%	7%	14%	16%	4%	6%

Notes: Occupations are listed in descending order of the MSA median, and values that are more than 10 percentage points above (below) the MSA median are shown in gray (green). Where estimates are missing, fewer than 50 online job ads from 2011 to 2014 specified a minimum education. Aggregates from similarly sized metropolitan areas are used in the analysis but not reported here. Carpenters, police and sheriff's patrol officers, construction laborers, first-line supervisors of construction trades and extraction workers, and electricians are excluded because local estimates could be calculated for fewer than half of the study MSAs. All but one calculated estimate from these excluded occupations exceeded 50 percent.

Source: Author's calculations use data from Burning Glass Technologies (2011–2014).

Table 9. Annual Share of Online Job Ads Requesting Less Than a Bachelor's Degree for the Most Prevalent Opportunity Occupations

Occupation	2011	2012	2013	2014	Difference (2011–2014)
First-Line Supervisors of Construction Trades and Extraction Workers	61%	52%	63%	66%	4.7%
Licensed Practical and Licensed Vocational Nurses	92%	93%	95%	96%	4.6%**
Computer Systems Analysts	5%	6%	6%	9%	4.0%**
Computer User Support Specialists	42%	45%	48%	45%	3.2%**
First-Line Supervisors of Office and Administrative Support Workers	38%	39%	42%	41%	3.2%**
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	43%	43%	44%	45%	2.5%**
Maintenance and Repair Workers, General	92%	92%	90%	93%	1.3%*
Business Operations Specialists, All Other	13%	12%	12%	14%	1.2%
Executive Secretaries and Executive Administrative Assistants	49%	45%	45%	50%	1.0%
Automotive Service Technicians and Mechanics	99%	100%	100%	100%	0.9%**
Electricians	99%	100%	100%	100%	0.7%
Police and Sheriff's Patrol Officers	82%	78%	86%	82%	0.4%
Inspectors, Testers, Sorters, Samplers, and Weighers	71%	63%	65%	70%	-0.8%
General and Operations Managers	22%	23%	21%	21%	-1.1%
Bookkeeping, Accounting, and Auditing Clerks	70%	69%	69%	67%	-2.6%*
Construction Laborers	98%	98%	100%	95%	-2.8%
First-Line Supervisors of Retail Sales Workers	66%	61%	57%	62%	-3.8%**
First-Line Supervisors of Mechanics, Installers, and Repairers	60%	59%	55%	56%	-4.0%*
Heavy and Tractor-Trailer Truck Drivers	93%	90%	87%	89%	-4.1%**
Sales Representatives, Services, All Other	44%	40%	39%	39%	-5.3%*
First-Line Supervisors of Production and Operating Workers	53%	49%	51%	47%	-5.6%**
Insurance Sales Agents	69%	63%	58%	62%	-7.2%**
Registered Nurses	72%	65%	64%	59%	-13.0%**

** Difference is statistically significant at the 95 percent confidence level.

* Difference is statistically significant at the 90 percent confidence level.

Note: Values for carpenters are not presented because there were fewer than 100 job ads specifying a minimum education posted in the study MSAs in 2014.

Source: Author's calculations use data from Burning Glass Technologies (2011–2014).

workers lacking a four-year degree.

Over the same period, eight occupations became significantly less accessible to the same workers. This group includes three first-line supervisory occupations and registered nurses. For the latter, the share of job ads requesting less than a bachelor's degree declined by 13 percentage points between 2011 and 2014.[16, 17]

Rather than representing a sea change in the educational preferences of employers, the differences observed in Table 9 could reflect other phenomena. First, the change could be driven by a shift in the geographic location of the job openings. For example, if the number of ads in an MSA with lower educational attainment standards doubled and the number of ads in another MSA with higher standards fell precipitously, the percentage shown in Table 9 would rise even if individual employers did not change their candidate search criteria between 2011 and 2014. Similarly, if a type of employer with higher educational attainment standards accounted for a disproportionately higher number of ads in either 2011 or 2014, the difference could again reflect the composition of the job ads rather than a shift in preference.[18] Lastly, changes in the comprehensiveness of the BGT data set — whether the product of better coverage by the data provider or of a growing likelihood that job openings will be advertised online — could also affect these results.

Table 10. Annual Share of Online Job Ads for First-Line Supervisors of Retail Sales Workers Requesting Less Than a Bachelor's Degree by MSA

MSA	2011	2012	2013	2014	Difference (2011–2014)
Atlantic City	67%	68%	72%	70%	2.2%
Harrisburg	59%	57%	57%	60%	0.9%
York	64%	67%	61%	64%	-0.3%
Philadelphia	62%	57%	56%	61%	-0.5%
Allentown	70%	65%	59%	68%	-2.2%
Lancaster	71%	66%	66%	66%	-5.2%
Trenton	52%	42%	34%	45%	-7.3%
Reading	71%	68%	56%	63%	-7.8%*
Erie	82%	80%	55%	73%	-8.8%*
Scranton	76%	69%	65%	67%	-9.0%**
Pittsburgh	73%	63%	58%	62%	-10.6%**

** Difference is statistically significant at the 95 percent confidence level.

* Difference is statistically significant at the 90 percent confidence level.

Source: Author's calculations use data from Burning Glass Technologies (2011–2014).

Controlling for the first concern — that of any geographic influence on aggregate changes in educational preferences — Table 10 shows the share of online job ads requesting less than a bachelor's degree for first-line supervisors of retail sales workers in each study MSA. As shown in Table 9, the overall share of such ads fell slightly but significantly during this period. In no individual MSA did this occupation become significantly more accessible to a worker without a bachelor's degree, while in four, it became less so. Although they do not factor into the calculations of statistical significance, estimates for 2012 and 2013 are included to indicate the degree to which these estimates exhibit year-to-year variation.

[16] Consistent with a shift toward higher education, the Institute of Medicine of the National Academies (2010), now the National Academy of Medicine, recommends that the percentage of nurses with a bachelor's degree should increase from 50 percent to 80 percent by 2020.

[17] Burning Glass Technologies suggested that ads for registered nurses should be assumed accessible to a worker with an associate's degree in the 17 percent of cases in which the minimum education was not specified in the posting. The minimum education for registered nurses was not imputed, however, because missing values were not imputed for other occupations. Doing so for registered nurses would have resulted in a smaller but still a statistically significant decline of 9 percentage points in the share of ads requesting less than a bachelor's degree between 2011 and 2014 (from 76 percent to 67 percent).

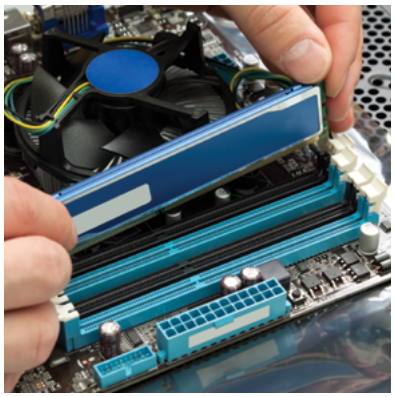
[18] Refer to the prior footnote about computer user support specialists.

CONCLUSIONS

This research highlights two specific determinants of economic opportunity: the type of work available in a local economy and the role that formal education plays in granting workers access to decent paying jobs. In the 11 MSAs covered in this report, opportunity occupations constitute between 22 percent and 34 percent of total employment when based on an assessment of required education by workers and occupational experts. In 10 of the 11 MSAs, the share drops, by up to 8 percentage points, when the educational preferences of employers are considered instead.

It is true that certain broad occupational categories — such as healthcare practitioners; production; installation, maintenance, and repair; and construction and extraction — are more likely to offer work at an above-average wage for those without a college degree than are others. Economies that include higher levels of employment in these fields will offer more and better opportunities for workers with lower levels of formal education.

Similarly, economies in which employers' expectations for education are closely aligned with other assessments of the education required to do the job will be more opportunity-rich for those without a college degree than will economies in which more highly educated candidates are routinely sought for the same work. Related research suggests that larger MSAs with higher levels of educational attainment and income and lower levels of poverty and wage inequality are more likely to see requests for higher education in online job advertisements (Wardrip et al. 2015), but more research is needed to understand this phenomenon fully.



LOOKING AHEAD

The opportunity inherent in a given metropolitan economy for any worker is predicated on at least three factors: the worker's education and skill level, the availability of employment that matches the worker's education and skills, and the process by which an employer evaluates candidates' qualifications and fills open positions. Public, private, and nonprofit actors have opportunities to address each of these factors in ways that would improve access to gainful employment for workers who lack a four-year college degree.

Regarding education and skills, the growing cost of a higher education and the accompanying rise in student loan debt have been widely reported.[19] Low- and moderate-income entrants to the labor force who cannot afford a four-year degree, do not wish to be burdened by debt, or simply aspire to a career for which a college degree should not be required can build the skills and knowledge important for success in the job market through a variety of public and private channels. In addition to public funding for workforce development, the availability of low-cost, small-dollar loans that consumers could use to build in-demand skills and attain certificates could have a significant impact on workforce readiness for individuals and, if done at scale, for the broader labor market.

This analysis does not assess whether the supply of higher wage jobs accessible to workers without a bachelor's degree in a given economy is sufficient to meet the demands placed on it by its workforce. Evidence presented in this study, however, indicates that, with few exceptions, the largest occupations accessible for a worker without a four-year degree offer below-average wages. Innovative efforts to deploy capital in ways that create good jobs are worth following. Small and mid-sized businesses committed to creating jobs that pay living wages, to providing health benefits, and to emphasizing employee advancement, for example, or companies that hire workers trained by partnering workforce development agencies, are prioritized in these alternative funding models.

With regard to the evaluation of candidate qualifications, some research finds evidence of "upcredentialing," which simply means that some employers are now requiring a college degree for occupations that have not historically demanded one (Burning Glass Technologies 2014, Burrowes et al. 2014). Some employers believe that a college education can serve as a proxy for other characteristics and believe that a more educated staff will pay dividends for the company in the long run (Burrowes et al. 2014; Ferguson, Hitt, and Tambe 2013; CareerBuilder 2014). However, there has also been recent energy in the opposite direction. A handful of communities are pursuing skills-based hiring practices that prioritize third-party assessments of worker skills over formal education. Employers

[19] See Hylands (2014) for information on rising student loan debt in the Third Federal Reserve District.

in these communities must be both open to using assessment scores to gauge applicant qualifications and have a good grasp of the skills necessary for a new hire to be successful in an open position. By quantifying sought-after skills acquired in nonacademic settings and providing low-cost opportunities to upgrade those skills, this process could open the door to prospective employees who would otherwise be screened out of the search process for not having a college degree.

Because skills-based hiring is not commonplace, however, understanding the factors that determine minimum education requirements for open positions and the drivers of variation — across employers, across metropolitan economies, and over time — is critical to identifying potential barriers to employment for workers who lack higher levels of formal education. Several questions on this topic remain unanswered: Is spatial variation simply indicative of underlying variation in the industry makeup of local economies, or is it a response to differences in local levels of human capital? Are temporal changes related to the growing complexity of work or to the amount of slack in the labor market? Some research has been done on this issue, but more is needed.[20]

If a four-year college degree is not truly needed to fill an open position successfully — if, instead, a college education is simply used as a proxy for worker skills or attributes in the absence of better information during the employer-employee matchmaking process — then setting the educational attainment bar higher than the job requires may present an artificial barrier to a worker without a college education and could make the job more difficult to fill despite the availability of qualified workers.[21] Additional analysis of the growing treasure trove of real-time labor market information complemented by dialogue with employers and occupational experts could shed light on this subject and could benefit both workers and employers alike.

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[20] See, for example, Modestino, Shoag, and Ballance (2015) and Hershbein and Kahn (2015).

[21] Rothwell (2014) analyzes the length of time that job ads are posted online and finds evidence to suggest that those requesting lower levels of education generally fill more quickly than those requesting a bachelor's degree.

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APPENDIX

Ten Largest Opportunity Occupations in Each Study MSA

Rank	SOC Code	Occupation Title	Employment	Location Quotient	Estimated Annual Median Wage	Percent Less Than a Bachelor's Degree (O*NET)	Percent Less Than a Bachelor's Degree (BGT)
Allentown–Bethlehem–Easton MSA							
1	29-1141	Registered Nurses	8,350	1.2	$64,667	77%	72%
2	53-3032	Heavy and Tractor-Trailer Truck Drivers	5,350	1.3	$42,869	95%	92%
3	11-1021	General and Operations Managers	3,690	0.7	$108,529	62%	26%
4	43-3031	Bookkeeping, Accounting, and Auditing Clerks	3,680	0.9	$36,296	82%	77%
5	49-9071	Maintenance and Repair Workers, General	3,520	1.1	$37,773	100%	95%
6	43-1011	First-Line Supervisors of Office and Administrative Support Workers	3,150	0.9	$52,770	60%	45%
7	41-1011	First-Line Supervisors of Retail Sales Workers	2,540	0.8	$42,016	93%	66%
8	29-2061	Licensed Practical and Licensed Vocational Nurses	2,270	1.3	$45,386	99%	
9	49-3023	Automotive Service Technicians and Mechanics	2,110	1.3	$38,210	100%	100%
10	51-1011	First-Line Supervisors of Production and Operating Workers	1,620	1.1	$60,632	76%	49%
Atlantic City–Hammonton MSA							
1	29-1141	Registered Nurses	2,860	1.1	$74,506	77%	64%
2	39-1011	Gaming Supervisors	1,570	66.9	$57,658	92%	78%
2	49-9071	Maintenance and Repair Workers, General	1,570	1.3	$40,435	100%	95%
4	35-1012	First-Line Supervisors of Food Preparation and Serving Workers	1,210	1.4	$40,914	89%	81%
4	41-1011	First-Line Supervisors of Retail Sales Workers	1,210	1.0	$43,347	93%	69%
6	43-1011	First-Line Supervisors of Office and Administrative Support Workers	1,110	0.8	$47,195	60%	66%
7	11-1021	General and Operations Managers	980	0.5	$110,635	62%	49%
8	33-3051	Police and Sheriff's Patrol Officers	940	1.5	$85,072	89%	
9	27-4011	Audio and Video Equipment Technicians	770	13.1	$57,242	82%	
10	41-3099	Sales Representatives, Services, All Other	620	0.8	$51,854	26%	79%
10	47-2061	Construction Laborers	620	0.8	$43,347	99%	
Erie MSA							
1	29-1141	Registered Nurses	3,100	1.2	$55,328	77%	59%
2	41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	1,610	1.2	$47,133	23%	56%
3	11-1021	General and Operations Managers	1,360	0.7	$89,879	62%	34%
4	51-1011	First-Line Supervisors of Production and Operating Workers	1,270	2.3	$48,838	76%	60%
5	41-1011	First-Line Supervisors of Retail Sales Workers	1,140	1.0	$36,192	93%	73%
6	53-3032	Heavy and Tractor-Trailer Truck Drivers	1,060	0.7	$34,382	95%	80%
7	43-1011	First-Line Supervisors of Office and Administrative Support Workers	990	0.8	$42,203	60%	46%
8	51-4041	Machinists	930	2.6	$39,645	95%	
9	29-2061	Licensed Practical and Licensed Vocational Nurses	920	1.4	$38,979	99%	
10	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	820	1.8	$33,530	97%	92%

Continued

Rank	SOC Code	Occupation Title	Employment	Location Quotient	Estimated Annual Median Wage	Percent Less Than a Bachelor's Degree (O*NET)	Percent Less Than a Bachelor's Degree (BGT)
Harrisburg–Carlisle MSA							
1	29-1141	Registered Nurses	7,050	1.1	$63,586	77%	64%
2	53-3032	Heavy and Tractor-Trailer Truck Drivers	5,870	1.6	$46,051	95%	82%
3	43-1011	First-Line Supervisors of Office and Administrative Support Workers	3,940	1.2	$50,128	60%	45%
4	11-1021	General and Operations Managers	3,470	0.7	$101,158	62%	29%
5	43-3031	Bookkeeping, Accounting, and Auditing Clerks	3,140	0.9	$35,194	82%	78%
6	49-9071	Maintenance and Repair Workers, General	3,090	1.1	$36,379	100%	95%
7	41-1011	First-Line Supervisors of Retail Sales Workers	2,290	0.8	$41,558	93%	59%
8	13-1031	Claims Adjusters, Examiners, and Investigators	2,050	3.4	$57,200	40%	54%
8	43-9041	Insurance Claims and Policy Processing Clerks	2,050	3.5	$38,542	98%	70%
10	29-2061	Licensed Practical and Licensed Vocational Nurses	1,730	1.1	$44,949	99%	94%
Lancaster MSA							
1	53-3032	Heavy and Tractor-Trailer Truck Drivers	3,920	1.5	$37,565	95%	94%
2	29-1141	Registered Nurses	3,290	0.7	$65,270	77%	70%
3	41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	2,990	1.3	$51,522	23%	54%
4	43-3031	Bookkeeping, Accounting, and Auditing Clerks	2,860	1.1	$34,902	82%	75%
5	11-1021	General and Operations Managers	2,720	0.8	$99,239	62%	27%
6	49-9071	Maintenance and Repair Workers, General	2,660	1.3	$39,000	100%	95%
7	47-2031	Carpenters	2,590	2.5	$37,190	99%	
8	29-2061	Licensed Practical and Licensed Vocational Nurses	2,070	1.8	$41,309	99%	99%
9	41-1011	First-Line Supervisors of Retail Sales Workers	1,830	0.9	$43,638	93%	67%
10	43-1011	First-Line Supervisors of Office and Administrative Support Workers	1,780	0.8	$52,686	60%	47%
Philadelphia–Camden–Wilmington MSA							
1	29-1141	Registered Nurses	62,750	1.2	$74,152	77%	63%
2	43-3031	Bookkeeping, Accounting, and Auditing Clerks	32,520	1.0	$40,248	82%	66%
3	11-1021	General and Operations Managers	32,370	0.8	$139,043	62%	19%
4	43-1011	First-Line Supervisors of Office and Administrative Support Workers	28,160	1.0	$56,472	60%	38%
5	49-9071	Maintenance and Repair Workers, General	23,620	0.9	$39,458	100%	90%
6	53-3032	Heavy and Tractor-Trailer Truck Drivers	21,440	0.7	$43,909	95%	89%
7	41-1011	First-Line Supervisors of Retail Sales Workers	19,540	0.8	$43,784	93%	59%
8	33-3051	Police and Sheriff's Patrol Officers	15,300	1.2	$61,818	89%	88%
9	15-1121	Computer Systems Analysts	14,860	1.4	$89,856	57%	6%
10	29-2061	Licensed Practical and Licensed Vocational Nurses	14,580	1.1	$50,502	99%	94%

Rank	SOC Code	Occupation Title	Employment	Location Quotient	Estimated Annual Median Wage	Percent Less Than a Bachelor's Degree (O*NET)	Percent Less Than a Bachelor's Degree (BGT)
Pittsburgh MSA							
1	29-1141	Registered Nurses	30,410	1.4	$61,214	77%	59%
2	11-1021	General and Operations Managers	13,700	0.8	$110,518	62%	24%
3	43-3031	Bookkeeping, Accounting, and Auditing Clerks	13,400	1.0	$34,902	82%	67%
4	49-9071	Maintenance and Repair Workers, General	12,180	1.1	$37,794	100%	91%
5	53-3032	Heavy and Tractor-Trailer Truck Drivers	12,050	0.9	$40,893	95%	95%
6	43-1011	First-Line Supervisors of Office and Administrative Support Workers	11,170	1.0	$52,229	60%	43%
7	47-2061	Construction Laborers	8,910	1.3	$36,608	99%	97%
8	41-1011	First-Line Supervisors of Retail Sales Workers	8,820	0.9	$39,270	93%	64%
9	47-2031	Carpenters	8,650	1.7	$44,845	99%	100%
10	49-3023	Automotive Service Technicians and Mechanics	6,690	1.3	$33,467	100%	100%
Reading MSA							
1	29-1141	Registered Nurses	3,510	1.1	$59,946	77%	66%
2	53-3032	Heavy and Tractor-Trailer Truck Drivers	2,600	1.3	$42,307	95%	89%
3	51-2092	Team Assemblers	2,480	1.8	$37,024	100%	
4	49-9071	Maintenance and Repair Workers, General	2,440	1.5	$42,848	100%	96%
5	41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	1,870	1.1	$59,738	23%	53%
6	51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	1,860	15.3	$45,448	100%	
7	43-3031	Bookkeeping, Accounting, and Auditing Clerks	1,790	0.9	$35,402	82%	77%
8	11-1021	General and Operations Managers	1,760	0.7	$108,716	62%	37%
9	43-1011	First-Line Supervisors of Office and Administrative Support Workers	1,470	0.9	$52,728	60%	30%
10	41-1011	First-Line Supervisors of Retail Sales Workers	1,430	1.0	$40,726	93%	64%
Scranton–Wilkes-Barre MSA							
1	29-1141	Registered Nurses	5,690	1.1	$58,698	77%	84%
2	53-3032	Heavy and Tractor-Trailer Truck Drivers	4,590	1.5	$40,227	95%	92%
3	53-7051	Industrial Truck and Tractor Operators	3,440	3.5	$34,237	100%	99%
4	49-9071	Maintenance and Repair Workers, General	3,050	1.3	$34,278	100%	96%
5	41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	2,960	1.1	$47,674	23%	60%
6	11-1021	General and Operations Managers	2,530	0.7	$99,403	62%	35%
7	43-1011	First-Line Supervisors of Office and Administrative Support Workers	2,360	0.9	$49,566	60%	42%
8	29-2061	Licensed Practical and Licensed Vocational Nurses	2,110	1.6	$42,640	99%	100%
9	41-1011	First-Line Supervisors of Retail Sales Workers	1,860	0.8	$40,435	93%	69%
10	49-3023	Automotive Service Technicians and Mechanics	1,560	1.3	$33,717	100%	100%

Continued

Rank	SOC Code	Occupation Title	Employment	Location Quotient	Estimated Annual Median Wage	Percent Less Than a Bachelor's Degree (O*NET)	Percent Less Than a Bachelor's Degree (BGT)
Trenton–Ewing MSA							
1	29-1141	Registered Nurses	4,750	1.1	$70,866	77%	55%
2	43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	4,140	1.1	$46,030	97%	72%
3	33-3051	Police and Sheriff's Patrol Officers	3,510	3.3	$88,442	89%	
4	11-1021	General and Operations Managers	2,630	0.8	$156,335	62%	11%
5	43-1011	First-Line Supervisors of Office and Administrative Support Workers	2,620	1.1	$61,339	60%	34%
6	43-3031	Bookkeeping, Accounting, and Auditing Clerks	2,220	0.9	$44,595	82%	60%
7	49-9071	Maintenance and Repair Workers, General	1,740	0.8	$45,365	100%	93%
8	43-6011	Executive Secretaries and Executive Administrative Assistants	1,600	1.4	$57,928	96%	45%
9	41-1011	First-Line Supervisors of Retail Sales Workers	1,230	0.6	$45,074	93%	44%
10	43-9022	Word Processors and Typists	1,160	8.6	$41,683	100%	
York–Hanover MSA							
1	29-1141	Registered Nurses	3,450	1.0	$67,891	77%	62%
2	53-3032	Heavy and Tractor-Trailer Truck Drivers	3,190	1.5	$44,574	95%	88%
3	53-7051	Industrial Truck and Tractor Operators	2,080	3.1	$34,757	100%	96%
4	11-1021	General and Operations Managers	2,040	0.8	$99,333	62%	29%
5	43-3031	Bookkeeping, Accounting, and Auditing Clerks	1,900	0.9	$34,590	82%	65%
6	49-9071	Maintenance and Repair Workers, General	1,830	1.1	$38,771	100%	96%
7	41-1011	First-Line Supervisors of Retail Sales Workers	1,470	1.0	$39,957	93%	64%
8	43-1011	First-Line Supervisors of Office and Administrative Support Workers	1,410	0.8	$49,005	60%	40%
9	49-3023	Automotive Service Technicians and Mechanics	1,290	1.6	$37,149	100%	100%
10	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	1,250	2.0	$37,939	97%	84%

Notes: To be included in the table, the occupation had to be identified as an opportunity occupation using either the O*NET or BGT data set. The location quotient is provided in the OES file and represents the ratio of an occupation's share of the local economy to its share of the national economy. Values equal to or greater than 2.0, indicating double the representation locally, are highlighted in gray. BGT values are based on online job ads from the MSA only. Where estimates are missing, online job ads with a minimum education specified between 2011 and 2014 numbered fewer than 50. O*NET and BGT values under 50 percent are highlighted in green.

Sources: Author's calculations use data from BLS Occupational Employment Statistics (May 2014), Employment and Training Administration's Occupational Information Network (O*NET) (July 2014), Burning Glass Technologies (2011–2014), BEA Regional Price Parities (2011), and the Current Population Survey (2013–2014).

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