A Look Behind the Numbers

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Opportunity Occupations in Ohio: Identification, Online Postings, and Employer Education Preferences

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In September 2015 the Federal Reserve Banks of Philadelphia, Cleveland, and Atlanta published an analysis of "opportunity occupations" in the nation's largest metropolitan areas, opportunity occupations being those jobs that are generally accessible to an individual without a four-year college degree and that pay a decent wage. Using national administrative and survey data for occupation-specific education requirements, we and our co-authors found that 27 percent of national employment in 2014 can be considered an opportunity occupation. However, when using a different data source—real-time online job ads—to capture the educational preferences of employers, this share declined to 20.3 percent.[1] *We also found considerable variation in the share of opportunity occupations across metro areas, as well as differences in the degree to which employer education preferences restricted employment opportunities across metros. (Read* **Identifying Opportunity Occupations in the Nation's Largest Metropolitan Economies** *here.)*

Introduction

In this report we take an in-depth look at opportunity occupations in the eight largest Ohio metro areas: Akron, Canton, Cincinnati, Cleveland, Columbus, Dayton, Toledo, and Youngstown. Our aim for this analysis is to provide an update to workforce professionals on recent trends in the labor market for job seekers without a four-year degree, while also laying the groundwork for further research on opportunity occupations. Our future research seeks to understand why the share of opportunity occupation employment varies across the top 100 metro areas. In addition, we will investigate the prevalence of employers seeking higher levels of education than is required for an opportunity occupation, or "up-credentialing." In keeping with these dual objectives, we include practical and research implications throughout our findings.

First, we identify those occupations in Ohio that are accessible for someone without a four-year college degree and that pay a better wage than the national median. Then, we examine the rates at which different occupations are posted online and analyze employer education preferences for opportunity occupations via online job ads. Finally, we offer some concluding thoughts and next steps.

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[1] Wardrip, Keith, Kyle Fee, Lisa Nelson and Stuart Andreason. *Identifying Opportunity Occupations in the Nation's Largest Metropolitan Economies.* Federal Reserve Banks of Atlanta, Cleveland, and Philadelphia, 2015.

Data and Methods

There are a few key points to make regarding the data and methods we used to identify opportunity occupations in this report; for a complete methodological discussion, see the "Data and Methods" section of *Identifying Opportunity Occupations in the Nation's Largest Metropolitan Economies*.[2]

Data on employment, wages, and location quotients come from the Bureau of Labor Statistics Occupational Employment Statistics (May 2014). We used three different datasets to determine the education level for a specific occupation. The first is from the Bureau of Labor Statistics' (BLS) Employment Projections program and reflects the typical level of education needed to enter an occupation. The second dataset is from the Employment & Training Administration's Occupational Information Network (O*NET) program. The occupation-specific education levels in this dataset are based on survey responses of incumbent workers and occupation experts and reflect the level of education a new hire would need to perform the job. We consider an occupation to be accessible to a worker without a four-year degree if at least 50 percent of the O*NET survey respondents do. The third dataset is from Burning Glass Technologies (BGT). This dataset is created from information extracted from online job ads from more than 40,000 job sites and reflects the educational preferences of employers. We assume that an occupation is available to a worker without a four-year degree if more than 50 percent of the job ads specify a high school diploma or an associate's degree as the minimum level of education. It is also important to note that both the BLS and O*NET datasets are national in scope, while the BGT dataset allows for an occupation's required education to differ across metros.

An occupation's median annual wage must exceed a local minimum threshold for it to be considered decent-paying. According to the Bureau of Labor Statistics, the national annual median wage for all workers—$35,540 in 2014, adjusted for local consumption prices—serves as that wage threshold. This threshold is arbitrary, and does not reflect a level of self-sufficiency for families of varying sizes and compositions. The adjustment for local consumption prices can and does cause some occupations to be classified as opportunity occupations in some metros but not in others.

Table 1 (all **Tables** and **Charts** appear beginning on page 12, below) illustrates how the data are used to classify opportunity occupations. Looking at the first two columns, we see that first-line supervisors of production and operating workers in both the Youngstown and Columbus MSAs meet the wage threshold for an opportunity occupation: the annual median wage for this occupation exceeds the opportunity occupation wage threshold. According to the O*NET data, 76 percent of the survey respondents indicated the job was accessible to those without a bachelor's degree. This job is therefore considered an opportunity occupation using O*NET.

Looking at employer preferences, we see that in Columbus, employer preferences for education fall below our 50 percent threshold (46%), so this position would not be considered an opportunity occupation using the BGT data. In Youngstown it would be, however, since 68 percent of the job ads requested less than a four-year degree. In columns three and four, note that

[2] Wardrip, cited above.

while secretaries and administrative assistants meet the education requirements for an opportunity occupation in both the Cleveland and Canton metros using either O*NET or BGT, the annual median wage does not exceed the wage threshold in Canton; therefore this position is not considered an opportunity occupation in that metro.

Findings

Section One Findings: Identifying Opportunity Occupations in Ohio's Largest Metros

In this section, we look at all of the occupations in eight Ohio metros available to someone without a four-year degree to determine which ones qualify as opportunity occupations. Once we have identified opportunity occupations, we document the share of employment in opportunity occupations in each Ohio metro, offer some insights into why some metro areas have higher shares of opportunity-occupation employment, and highlight the commonality and concentration of these opportunity occupations across the eight metros in the state.

Finding 1a: Most jobs requiring less than a four-year degree in Ohio's eight largest metros are low paying.

Table 2 lists the top 20 largest occupations requiring less than a four-year degree in Ohio. Many of the occupations on this list reside in the service sector and most are low-paying. Of these 20, more than half—13—do not meet our wage threshold to qualify as an opportunity occupation. Moreover, the 13 occupations that do not meet the local wage threshold account for 74 percent of the total employment in this table, which suggests that a majority of the jobs for someone without a four-year degree are in low-paying occupations. While only seven occupations listed here are considered opportunity occupations, there are others that qualify, although at lower levels of employment.

Practical Implication:
A majority of occupations available to someone without a four-year degree are low-paying; however, there are some occupations that do provide a decent paycheck. Job-seekers and workforce development professionals should be aware of which occupations provide better paychecks than others for workers without a four year degree.

Finding 1b: Administrative surveys and online job ads tend to agree on the level of education needed for an opportunity occupation, with some differences.

Table 3 lists the 30 largest opportunity occupations in Ohio's eight metro areas. Registered nurses top the list, followed by general and operations managers; bookkeeping, accounting and auditing clerks; heavy and tractor-trailer truck drivers; maintenance and repair workers, general; and secretaries and administrative assistants, except legal, medical, and executive. The third column of Table 3 lists the dataset that considers an occupation to be an opportunity occupation. While there are some discrepancies among the BLS, O*NET, and BGT datasets, most occupations are considered to be an opportunity occupation in all three datasets.

Practical Implication:
The finding that the education needed for most opportunity occupations is generally consistent across administrative surveys and online job ads indicates that employer education preferences tend to align with public sources. However, the presence of some differences highlights the need to consult multiple sources of data to fully understand the education requirements associated with an occupation.

Research Implication:
Those occupations considered to be opportunity occupations in the BLS and O*NET datasets but which are not in the BGT dataset provide a sample to investigate the practice of "up-credentialing," wherein employers seek higher levels of education than typically required for an opportunity occupation.

Finding 1c: Ohio's largest metros have a higher share of employment in opportunity occupations than the national average.

Table 4 shows the share of total employment that is considered to be an opportunity occupation according to the BLS and O*NET datasets. In general, Ohio has a higher share of employment in opportunity occupations than the national average. The Cleveland metro area has the highest share of opportunity occupation employment in the state with 36 percent, while Canton, Dayton, and Youngstown each have roughly 30 percent of employment in opportunity occupations. Given the similarities between the shares of BLS and O*NET, further findings will focus on the O*NET-designated opportunity occupations.

Finding 1d: The share of opportunity occupations varies across Ohio metro areas.

Chart 1 shows the distribution of employment by wages and O*NET education. Again, Cleveland is at the high end with 36 percent of employment in opportunity occupations, while Canton, Dayton, and Youngstown round out the bottom. Interestingly, in all eight Ohio metros, opportunity occupations account for more of the high-wage employment than occupations that require a four-year college degree. Also of note is that Canton, Toledo and Youngstown have lower shares of high-wage, bachelor's-degree-required employment than the other metro areas.

Practical Implication:
Ohio's having a larger share of employment in opportunity occupations than the national average suggests there may be more opportunities for an adult without a four-year degree to obtain a decent-paying job in this state than elsewhere.

Finding 1e: Most of the top opportunity occupations are found in all eight Ohio metro areas, although a few occupations do not exceed local wage thresholds.

Table 5 lists the number of Ohio metro areas wherein an occupation is considered an opportunity occupation. Most opportunity occupations are found in all eight metro areas, with some exceptions. With the O*NET data, the education needed for an occupation is fixed across metro areas; thus, for an occupation *not* to be considered an opportunity occupation it must fail to meet

the local wage threshold. Interestingly, in some metro areas, several occupations fail to meet or surpass this threshold by only a few hundred dollars while in other metros these occupations are well short of the local wage threshold. For example, jobs in the secretaries and administrative assistants' category are not considered opportunity occupations in Canton, Cincinnati, and Youngstown because they fail to meet the local wage threshold by $2,031, $563, and $3,610, respectively. It should be noted that there are 133 instances (5 percent of all possible MSA-occupation combinations) where the annual wage for the occupation is $1,000 higher or lower than the local wage threshold.

Finding 1f: The interaction between a metro area's cost of living and its wage distribution helps to explain that MSA's share of opportunity occupations.

Table 6 lists the regional price parity (RPP) index value, local wage threshold, and median annual wage for each Ohio MSA. A higher RPP value indicates a higher cost of living in a metro area. Operationally, metros with lower costs of living have lower local wage thresholds to meet for an occupation to be considered an opportunity occupation. Conversely, metros with higher costs of living have higher local wage thresholds that must be met for an occupation to be identified as an opportunity occupation. For example, Akron, Cleveland, and Youngstown all have similarly low RPP values that equate to the lowest local wage thresholds of roughly $31,500. However, the distribution of wages in these three metros results in different shares of opportunity occupations because metros with higher annual median wages naturally have a greater share of employment above the local wage threshold. Given this, it should be no surprise that Cleveland, with the lowest RPP value and the highest annual median wage among the eight metros, has the highest share of opportunity occupations. Conversely, when the local wage threshold is lower than annual median wage, the opposite happens: opportunity occupation shares tend to be lower, as in Canton and Youngstown.

Practical Implication:
While some occupations fail to meet local wage thresholds to qualify as opportunity occupations in some metros, it does not mean that they are not good-paying jobs. Rather, an area's cost of living and an employee's total hours worked are what determine a good-paying job in this framework.

Research Implication:
A metro's opportunity occupation share of employment is a function of an area's cost of living and its wage distribution, the latter being reflective of the area's industrial structure, which in turn influences the economic environment and cost of living in an area. The above analysis suggests that there are certain metros where lower costs of living overlap with higher-than-average wage distribution profiles due to industry structure, and produce higher shares of employment in opportunity occupations. Additional research on metro level variation in the share of employment in opportunity occupations could explore the industrial structure and cost of living in a metro area.

Finding 1g: Opportunity occupations are more concentrated in Ohio's eight metro areas compared to the nation.

Chart 2 depicts the share of opportunity occupation employment that is found in higher concentrations (location quotient > 1.25) locally than at the national level. A location quotient is a way of quantifying how concentrated a particular occupation is in a region when compared to the nation – values of greater than one indicate more concentration or specialization when compared to the nation. For example, in the Cleveland MSA, the location quotient for registered nurses is 1.44 which indicates that this occupation is 1.4 times more concentrated in Cleveland than in the nation (see **Appendix 1**). In Canton, Toledo, and Youngstown, more than 40 percent of opportunity occupation employment is in occupations that are more concentrated in the local area than nationally. On the other hand, in Cincinnati and Columbus less than 30 percent of opportunity occupation employment is found in higher concentrations than nationally. Most Ohio metros have more opportunity occupation employment in locally concentrated occupations than the national average.

Finding 1h: Each of Ohio's eight metros has a unique set of highly concentrated opportunity occupations.

Table 7 lists the 10 most concentrated opportunity occupations in each Ohio metro. While there are too many occupations to highlight, it is clear from the list that highly concentrated opportunity occupations vary from MSA to MSA. It is also apparent that the most concentrated opportunity occupations in Ohio's metro areas tend to be production-based, with the exception of Columbus, where it appears the most concentrated opportunity occupations align with business services. These highly concentrated, or "high location quotient," occupations tend to be at much lower levels of employment when compared to most common opportunity occupations noted above, yet they indicate what occupations are clustered in each of the eight metros.

Practical Implication:
High location quotient occupations are considered to be "tradable"; in other words, the goods and services associated with an occupation are for consumption outside the local area. These occupations serve the important purpose of bringing money from outside the region into the local economy. Moreover, many of these highly concentrated opportunity occupations are skilled trades that are integral to production processes.

Research Implication:
Differences in the share of opportunity occupation employment that is concentrated in a metro and the concentration of different opportunity occupations across metros point to the need for further analysis on the industrial structure of a metro area as it relates to a metro's share of opportunity occupation employment.

Section Two Findings: Differences in Online Job Postings

In this section, we take those occupations identified as opportunity occupations and see how likely it is for job ads to be posted online for a particular occupation. This type of information can

be useful not just to the jobseeker looking to gain employment in an opportunity occupation, but can also aid a researcher contemplating research design.

Finding 2a: Opportunity occupations are posted online at lower rates than those occupations that require a four-year degree.

Table 8 shows the median and average posting rate for opportunity occupations; higher-wage, bachelor's-degree-required occupations; and low-wage occupations in eight Ohio metros. Both the average and median posting rate for higher-wage, bachelor's-required occupations are higher than those for opportunity occupations, meaning that these occupations are posted online more frequently. In fact, bachelor's-degree-required occupations are posted at almost double the rate of opportunity occupations. This is consistent with other research that finds "the main source of bias in job ads data is due to differences in internet access among job applicants, which varies by education level."[3] Additionally, opportunity occupations tend to be posted at rates similar to those occupations paying lower wages.

Finding 2b: Opportunity occupations are posted online at varying rates.

However, there is considerable variability in the posting rates of opportunity occupations. **Chart 3** displays the online posting rates for the most prevalent opportunity occupations. The disparity in posting rates is quite apparent from the graph. Heavy and tractor-trailer truck drivers have the highest online posting rates at 62 online postings per every 100 jobs that currently exist, whereas police and firefighters have the lowest online posting rates among opportunity occupations. The nature of a specific occupation is likely informative as to how many job ads are posted on online. For example, high worker turnover along with strong demand for workers that are in short supply is likely the reason for the high online posting rates of heavy and tractor-trailer truck drivers. On the other hand, regularly scheduled training programs with a surplus of workers looking to enter the firefighter profession, along with a strict geographic footprint, tend to limit the need for posting those job ads online.

Practical Implication:
Even if job seekers without a four-year degree are able to overcome one barrier to employment by accessing the internet, another barrier remains in that opportunity occupations are posted online at lower rates than jobs with higher levels of educations. In general, the limited online posting rates of opportunity occupations highlight the need for job seekers to consult additional sources of job listings when looking for employment in an opportunity occupation. Similarly, online posting rates for opportunity occupations and lower-wage occupations also present an additional challenge of sorting through the multitude of postings to find those opportunity occupations.

[3] Carnevale, Anthony P., Tamara Jayasundera, and Dmitri Repnikov. *Understanding Online Job Ads Data: A Technical Report.* Washington, D.C.: Center on Education and the Workforce, Georgetown University, 2014.

Research Implication:
Researchers should be aware that jobs are posted at different rates when relying on information embedded in job ads to perform analysis. Moreover, not all job ads provide complete information. In addition, while not presented here, occupation-specific posting rates vary by metro area; the industry and firm composition, for example, along with other factors likely influence the posting rate of an occupation in a given metro area. These potential biases should make a researcher working with online job ads exercise caution when designing research and interpreting results.

Section Three Findings: Employer Education Preferences

In this section, we explore whether the practice of up-credentialing—a process whereby employers may require a bachelor's degree for jobs which historically have not needed one—may be evident. Initially, we identified what share of metro employment is no longer accessible to someone without a four-year degree. Next, we aggregated job postings data across the years (2011 through 2014) and eight metro areas to produce an estimate of employer education preferences to see how many opportunity occupations are subject to up-credentialing. Finally, we look to see if employer education preferences have changed from 2011 to 2014 as labor markets have recovered from the Great Recession.

Finding 3a: Employer education preferences are less restrictive in Ohio's eight metros than in the nation.

What we found in our analysis is that using employer education preferences extracted from online job ads to signal the education required for an occupation tends to lower the share of employment that is deemed an opportunity occupation in a metro area. **Chart 4** shows the share of opportunity occupation employment according to O*NET and BGT data along with the difference between those employment shares. Employer education preferences expressed in job ads lowers the share of opportunity occupations across all eight Ohio MSAs. Stated differently, employer preferences for higher education levels than is considered necessary by administrative surveys results in certain jobs not being considered opportunity occupations in each of eight Ohio metros we examined. However, online employer preferences tend to be less restrictive in Ohio's eight metros when compared to the nation's 100 largest metros, as suggested by the national average. Columbus, which sees opportunity occupation employment fall 7 percentage points due to employer preferences for higher levels of education, is the most restrictive metro in Ohio. Conversely, employer preferences are least restrictive in Canton, Toledo, and Youngstown.

Finding 3b: Employer education preferences suggest that not all opportunity occupations are available to someone without a four-year degree.

Table 9 shows the percent of job ads requesting less than a bachelor's degree for the most prevalent opportunity occupations in Ohio. While most occupations in this table exceed 50 percent, those occupations with less than 50 percent would not be considered an opportunity occupation based upon employer education preferences expressed in job ads. Occupations not accessible to those without a bachelor's degree include: general and operations managers;

first-line supervisors of office and administrative support; computer systems analysts; first-line supervisors of production and operating workers; sales representatives, wholesale and manufacturing, technical and scientific products; and human resource specialists.

Finding 3c: Employer education preferences for the same opportunity occupation vary across Ohio's eight metros.

Comparing the MSAs with the highest and the lowest share of job ads requesting less than a four-year degree reveals that employer education preferences for the same opportunity occupation vary across Ohio metropolitan areas (last column, **Table 9**). The smaller the difference between the MSAs with the lowest and highest shares of job ads indicates there is more agreement in employer education preferences across the metros and the bigger the difference, the less agreement across the MSAs. Those opportunity occupations with the most disagreement in employer education preferences across the eight metros include registered nurses; general and operations managers; licensed practical and licensed vocational nurses; first-line supervisors of production and operating workers; and computer user support specialists.

Finding 3d: The practice of up-credentialing is more likely to happen in certain opportunity occupations.

Table 10 lists the most common opportunity occupations in Ohio metros that are out of reach to someone without a four year degree according to BGT. Across all 281 opportunity occupations, only 59 occupations are subject to up-credentialing in online job ads. Some of the larger opportunity occupations subject to the practice of up-credentialing include general and operations managers; first-line supervisors of office and administrative support workers; computer systems analysts; executive secretaries and executive administrative assistants; and first-line supervisors of production and operating workers. (Appendix 2 has the 10 largest opportunity occupations subject to up-credentialing broken out by metro area.)

Finding 3e: If an opportunity occupation is subject to up-credentialing in one metro area, it is likely to be the case in other metro areas.

The last three columns of Table 10 indicate that if an opportunity occupation was subject to up-credentialing in one metro area, it was likely to be happening in other metro areas. On the other hand, some opportunity occupations are only subject to up-credentialing in one or two metro areas.

Practical Implication:
The practice of up-credentialing is not found in online job ads for a majority of opportunity occupations in our study metros. Evidence of up-credentialing is limited to 59 out of 281 opportunity occupations, or roughly 20 percent. However, the variation in employer education preferences across these metros may cause some up-credentialing to take place in select occupations in a few metros while not occurring in other metro areas. Yet, it is more likely for an opportunity occupation to experience up-credentialing in all metro areas if it's happening in one metro.

Research Implication:
Those opportunity occupations that do experience up-credentialing should be further investigated to look for patterns among the occupations. If employer education preferences in all metros indicate up-credentialing is taking place, does this signal an overall change in the day-to-day activities of an occupation or does it indicate the need for industry certifications or other credentials?

Finding 3f: Employer education preferences have eased over time for some opportunity occupations, but not for all.

Table 11 reports the difference in the share of job ads requesting less than a four-year degree between 2011 and 2014 for each of the most common opportunity occupations. A negative number indicates that employer preferences for higher levels of education have increased from 2011 to 2014 while a positive number indicates employer preferences for higher levels of education have declined. For most of the opportunity occupations, employer education preferences have become more accessible to those without a bachelor's degree while employer education preferences for registered nurses, police and sheriff's patrol officers and first-line supervisors of production and operating workers have become less accessible to those without a bachelor's degree from 2011 to 2014.

Finding 3g: Employer education preferences for registered nurses have increased in all Ohio metro areas.

Given that registered nurses comprise the largest opportunity occupation, it is useful to understand what is happening with employer education preferences over time. **Table 12** lists the percent of job ads requesting less than a four-year degree for registered nurses in 2011 and 2014 for eight Ohio metros. Across all of the metro areas, employer preferences for bachelor-degreed registered nurses have increased from 2011 to 2014. The largest change in employer preferences is found in Dayton, with the share of job ads requesting a four-year degree increasing from 28.8% to 45.7%. Also of note is that Cleveland's share of nursing job ads requesting less than a four-year degree in 2011 was already close to the 50 percent cut-off for the definition of an opportunity occupation. By 2014, employer education preferences in Cleveland suggest a registered nurse is no longer an opportunity occupation, given just 44 percent of the job postings are accessible to those without a four-year degree.

Practical Implication:
Easing employer education preferences may reflect improving labor markets; however, increasing employer educational demands for registered nurses is a complex issue. Registered nurses are currently the largest source of employment for someone without a four-year degree to earn a decent paycheck; however, the shift toward higher levels of education is consistent with the National Academy of Medicine's recommendation to increase the percentage of bachelor-degreed nurses. While this analysis cannot explain the reasons behind the significant changes in employer preferences for education among registered nurses, these trends are suggestive of the education demands for those seeking to enter the nursing field.

Conclusion

Our analysis shows that in Ohio's eight metros there are larger shares of opportunity occupations when compared to the nation. This holds true whether we use the education data from the survey of incumbent workers and occupation experts (O*NET) or the employer preferences from online job ads. But like the nation, the overall shares of opportunity occupations tend to be lower when using online job ads.

Overall, for most occupations if it is considered an opportunity occupation in O*NET, it is also considered an opportunity occupation according to the online job ads. So, the process of up-credentialing is not prevalent for most of the opportunity occupations in Ohio's metros, which may bode well for job seekers without a four-year degree. But those job seekers may have to look harder to find them. In each of our eight metros, there are occupations—such as general and operations managers and computer systems analysts—that according to O*NET data are mostly available to those without a bachelor's degree, but for which online job postings indicate are mostly *unavailable* to those without a four-year degree. Also, accessibility varies across metros for the same occupation. A jobseeker with less than a four-year degree looking for work as a first-line supervisor of production and operating workers may have more success in one Ohio metro than in another.

We do not know why the educational preferences of employers in online job ads vary from O*NET requirements to the degree that they do for certain occupations. It could be the mix of employers posting jobs online. It could be that administrative surveys are not reflective of the actual skill sets necessary to fulfill employers' demands. Or, employers may be requiring higher levels of education as a proxy for certain skills they are seeking. This will be a focus of future research. Furthermore, additional Federal Reserve research will examine what factors can help explain the differences we observe in the opportunity occupation shares across the nation's largest metros.

Table 1: Classification of Opportunity Occupations

Occupation	First-line Supervisors of Production and Operating Workers		Secretaries and Administrative Assistants, Except Legal, Medical and Executive	
MSA	Youngstown	Columbus	Cleveland	Canton
National annual median wage (OES)	$35,540	$35,540	$35,540	$35,540
Consumption price adjustment (RPP)	88.7	93.8	88.6	89.7
Opportunity occupation threshold wage	$31,524	$33,336	$31,488	$31,879
Hourly median wage (OES)	$24.79	$27.04	$16.35	$14.35
Median hours worked per week (OES)	40	40	40	40
Annual median wage	$51,563	$56,243	$34,008	$29,848
Entry-level education category (BLS)	Post-secondary non-degree award	Post-secondary non-degree award	High school diploma or equivalent	High school diploma or equivalent
Less than a bachelor's degree (O*NET)	76%	76%	97%	97%
Less than a bachelor's degree (BGT)	68%	46%	82%	84%
Source: Bureau of Labor Statistics, Bureau of Economic Analysis, Current Population Survey, O*NET, Burning Glass Technologies, and authors' calculations				

Table 2: Top 20 Most Common Occupations in Ohio* for Workers without a Four-Year Degree

Occupation	Major Occupation Group	Total Employment	Annual median wage	
			MSA minimum	MSA maximum
Combined Food Preparation and Serving Workers, Including Fast Food	Food Preparation and Serving Related	132,600	$15,907	$16,107
Retail Salespersons	Sales and Related	131,320	$19,198	$20,862
Registered Nurses **	Healthcare Practitioners and Technical	110,140	$55,557	$65,270
Cashiers	Sales and Related	97,900	$13,946	$14,446
Laborers and Freight, Stock, and Material Movers, Hand	Transportation and Material Moving	88,390	$22,506	$24,877
Office Clerks, General	Office and Administrative Support	79,080	$25,480	$30,181
Waiters and Waitresses	Food Preparation and Serving Related	78,970	$13,619	$13,978
Customer Service Representatives	Office and Administrative Support	74,750	$28,288	$33,530
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	Building and Grounds Cleaning and Maintenance	71,010	$21,154	$22,714
Stock Clerks and Order Fillers	Office and Administrative Support	68,660	$20,030	$24,003
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive **	Office and Administrative Support	58,600	$27,914	$34,195
Nursing Assistants	Healthcare Support	55,240	$21,986	$25,189
Home Health Aides	Healthcare Support	53,260	$18,512	$21,632
Bookkeeping, Accounting, and Auditing Clerks **	Office and Administrative Support	52,710	$31,325	$39,166
Heavy and Tractor-Trailer Truck Drivers **	Transportation and Material Moving	50,860	$35,838	$44,845
Maintenance and Repair Workers, General **	Installation, Maintenance, and Repair	40,990	$32,573	$39,811
Team Assemblers	Production	38,550	$25,043	$33,259
First-Line Supervisors of Office and Administrative Support Workers **	Office and Administrative Support	37,980	$43,181	$50,731
Cooks, Restaurant	Food Preparation and Serving Related	36,390	$18,682	$21,068
First-Line Supervisors of Retail Sales Workers **	Sales and Related	34,470	$33,259	$36,795
*** Aggregate of 8 largest MSAs in Ohio**				
**** Generally considered to be an opportunity occupation in Ohio**				
Source: Bureau of Labor Statistics, 2014				

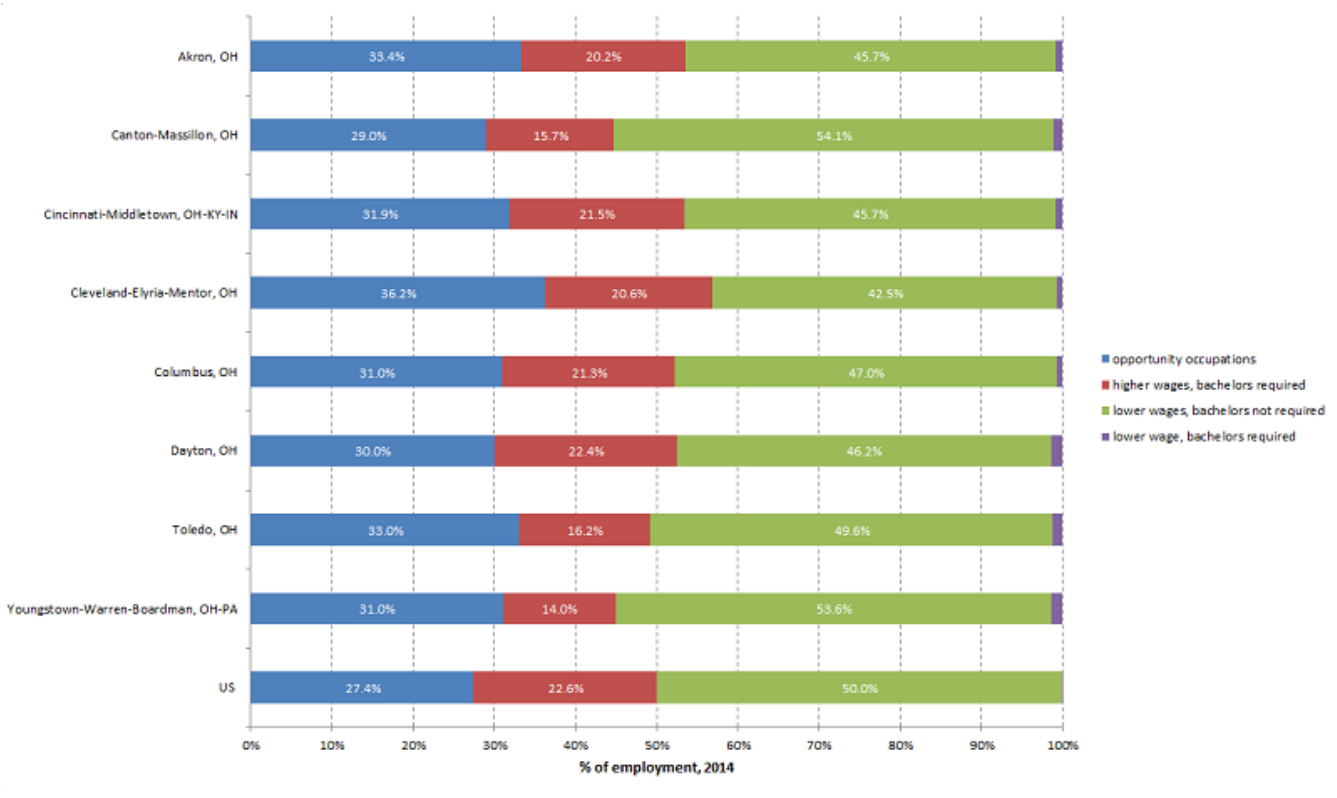
Table 3: The Most Common Opportunity Occupations in Ohio *

Employment	Occupation	Considered an Opportunity Occupation in
110,140	Registered Nurses	BLS, O*NET & BGT
55,300	General and Operations Managers	O*NET
50,940	Bookkeeping, Accounting, and Auditing Clerks	BLS, O*NET & BGT
50,860	Heavy and Tractor-Trailer Truck Drivers	BLS, O*NET & BGT
40,990	Maintenance and Repair Workers, General	BLS, O*NET & BGT
40,230	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	BLS, O*NET & BGT
37,980	First-Line Supervisors of Office and Administrative Support Workers	BLS & O*NET
34,470	First-Line Supervisors of Retail Sales Workers	BLS, O*NET & BGT
33,210	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	BLS
30,110	Licensed Practical and Licensed Vocational Nurses	BLS, O*NET & BGT
28,420	Sales Representatives, Services, All Other	BLS
25,430	Computer Systems Analysts	O*NET
24,840	Business Operations Specialists, All Other	BLS
24,250	Executive Secretaries and Executive Administrative Assistants	BLS, O*NET & BGT
21,300	Machinists	BLS, O*NET & BGT
20,590	First-Line Supervisors of Production and Operating Workers	BLS & O*NET
20,470	Construction Laborers	BLS, O*NET & BGT
19,560	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	O*NET
19,420	Inspectors, Testers, Sorters, Samplers, and Weighers	BLS, O*NET & BGT
19,020	Police and Sheriff's Patrol Officers	BLS, O*NET & BGT
17,680	Automotive Service Technicians and Mechanics	BLS, O*NET & BGT
17,150	Electricians	BLS, O*NET & BGT
16,120	Billing and Posting Clerks	BLS, O*NET & BGT
15,710	Human Resources Specialists	O*NET
15,100	Computer User Support Specialists	BLS & O*NET
14,960	Firefighters	BLS, O*NET & BGT
14,940	Carpenters	BLS, O*NET & BGT
13,360	Customer Service Representatives	BLS, O*NET & BGT
13,120	First-Line Supervisors of Mechanics, Installers, and Repairers	BLS, O*NET & BGT
12,400	Industrial Machinery Mechanics	BLS, O*NET & BGT
*** Aggregate of 8 largest MSAs in Ohio**		
Sources: Bureau of Labor Statistics, Bureau of Economic Analysis, O*NET, Burning Glass Technologies, and authors' calculations		

Table 4: Share of Employment Considered to be an Opportunity Occupation by MSA

MSA	BLS	O*NET
Akron, OH	33.6%	33.4%
Canton-Massillon, OH	29.1%	28.9%
Cincinnati-Middletown, OH-KY-IN	31.4%	31.9%
Cleveland-Elyria-Mentor, OH	36.1%	36.2%
Columbus, OH	29.5%	31.0%
Dayton, OH	30.1%	30.0%
Toledo, OH	33.1%	33.0%
Youngstown-Warren-Boardman, OH-PA	30.9%	31.1%
Nation	27.4%	27.4%
Sources: Bureau of Labor Statistics, Bureau of Economic Analysis, O*NET, and authors' calculations		

Chart 1: Employment Distribution by Education and Wages



Sources: Bureau of Labor Statistics, Bureau of Economic Analysis, O*NET, and authors' calculations

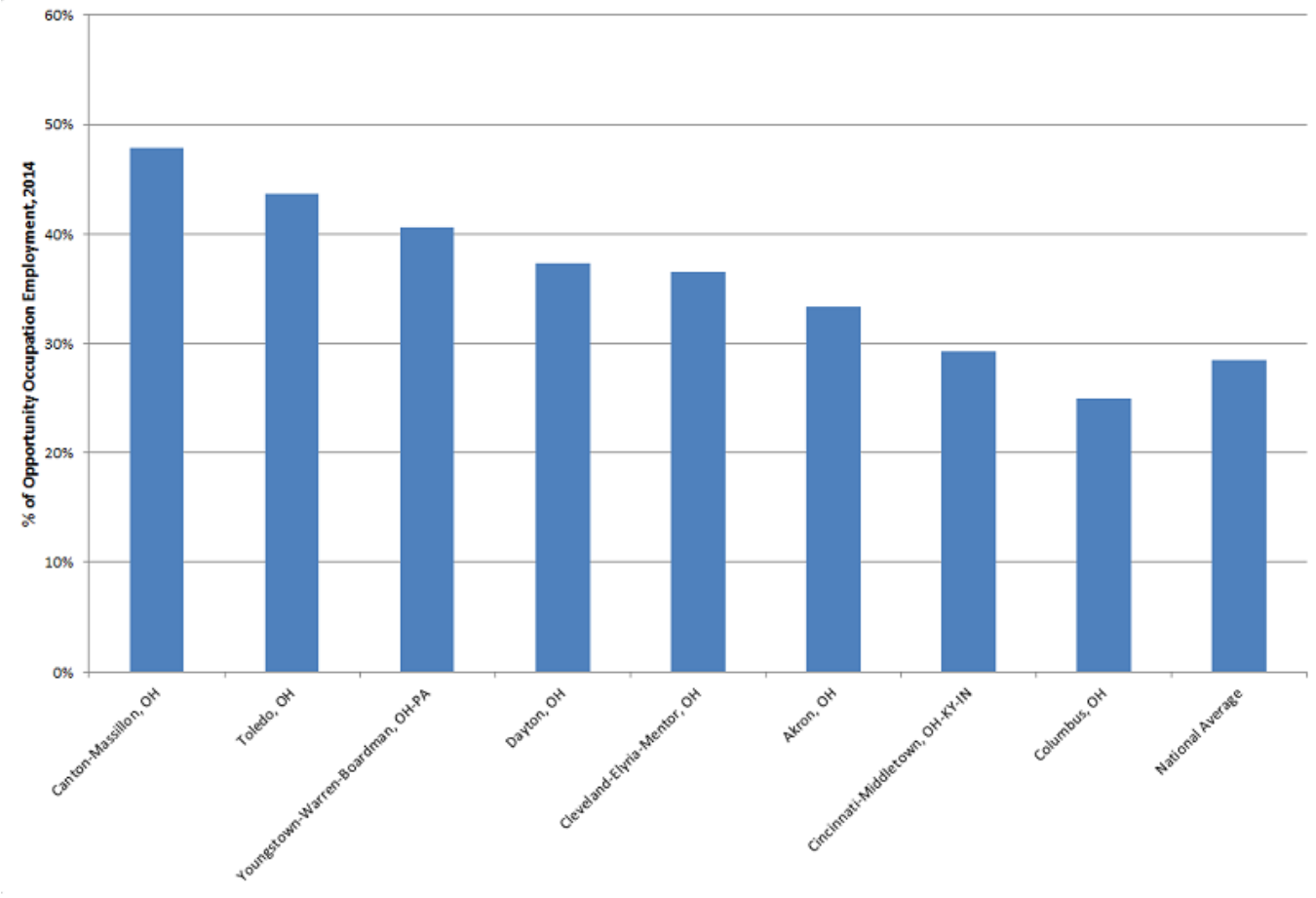
Table 5: Opportunity Occupation Classification by MSA

Occupation	# of Ohio MSAs	MSA not found in
Registered Nurses	8	
General and Operations Managers	8	
Bookkeeping, Accounting, and Auditing Clerks	7	Canton
Heavy and Tractor-Trailer Truck Drivers	8	
Maintenance and Repair Workers, General	8	
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	5	Canton, Cincinnati, Youngstown
First-Line Supervisors of Office and Administrative Support Workers	8	
First-Line Supervisors of Retail Sales Workers	8	
Licensed Practical and Licensed Vocational Nurses	8	
Computer Systems Analysts	8	
Executive Secretaries and Executive Administrative Assistants	8	
Machinists	8	
First-Line Supervisors of Production and Operating Workers	8	
Construction Laborers	7	Canton
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	8	
Inspectors, Testers, Sorters, Samplers, and Weighers	7	Toledo
Police and Sheriff's Patrol Officers	8	
Automotive Service Technicians and Mechanics	6	Canton, Dayton
Electricians	8	
Billing and Posting Clerks	6	Akron, Canton, Youngstown
Human Resources Specialists	8	
Computer User Support Specialists	8	
Firefighters	8	
Carpenters	8	
Customer Service Representatives	1	Akron, Canton, Cinncinnati, Columbus, Dayton, Toledo, Youngstown
First-Line Supervisors of Mechanics, Installers, and Repairers	8	
Industrial Machinery Mechanics	8	
Source: Bureau of Labor Statistics, Bureau of Economic Analysis, O*NET, and authors' calculations		

Table 6: Cost of Living, Local Wage Threshold, and Annual Median Wage

MSA	Regional Price Parity	Local Wage Threshold	Annual median wage
Akron, OH	88.6	$31,488	$34,610
Canton-Massillon, OH	89.7	$31,879	$30,270
Cincinnati-Middletown, OH-KY-IN	93.0	$33,052	$35,850
Cleveland-Elyria-Mentor, OH	88.6	$31,488	$36,300
Columbus, OH	93.8	$33,337	$35,980
Dayton, OH	91.9	$32,661	$34,620
Toledo, OH	89.9	$31,950	$32,940
Youngstown-Warren-Boardman, OH-PA	88.7	$31,524	$29,870
Sources: Bureau of Labor Statistics, Bureau of Economic Analysis, and authors' calculations			

Chart 2: Share of Opportunity Occupation Employment with a Location Quotient > 1.25



Sources: Bureau of Labor Statistics, Bureau of Economic Analysis, O*NET, and authors' calculations

Table 7: Top 10 Most Concentrated Opportunity Occupations by MSA

MSA	Occupation	Location Quotient	Employment, 2014
Akron	Power Distributors and Dispatchers	7.24	190
Akron	Security and Fire Alarm Systems Installers	3.55	510
Akron	Model Makers, Metal and Plastic	3.33	50
Akron	Engineering Technicians, Except Drafters, All Other	3.14	500
Akron	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	3.14	670
Akron	Computer-Controlled Machine Tool Operators, Metal and Plastic	3.11	1090
Akron	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	3.10	530
Akron	Mixing and Blending Machine Setters, Operators, and Tenders	3.07	890
Akron	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	2.90	480
Akron	Locksmiths and Safe Repairers	2.89	120
Canton	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	9.16	240
Canton	Metal-Refining Furnace Operators and Tenders	5.76	150
Canton	Occupational Therapy Assistants	4.62	180
Canton	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	4.36	1020
Canton	Millwrights	3.84	190
Canton	Tool and Die Makers	3.53	330
Canton	Physical Therapist Assistants	3.50	330
Canton	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	3.42	410
Canton	Computer-Controlled Machine Tool Operators, Metal and Plastic	3.37	610
Canton	Bailiffs	2.58	50
Cincinnati	Correspondence Clerks	3.75	210
Cincinnati	Tax Examiners and Collectors, and Revenue Agents	3.60	1720
Cincinnati	Hoist and Winch Operators	2.97	60

Table 7: Top 10 Most Concentrated Opportunity Occupations by MSA (continued)

Cincinnati	Model Makers, Metal and Plastic	2.52	120
Cincinnati	Coil Winders, Tapers, and Finishers	2.48	280
Cincinnati	Bailiffs	2.31	280
Cincinnati	Radio, Cellular, and Tower Equipment Installers and Repairers	2.19	220
Cincinnati	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	2.07	1520
Cincinnati	Paper Goods Machine Setters, Operators, and Tenders	2.05	1410
Cincinnati	Computer-Controlled Machine Tool Operators, Metal and Plastic	2.03	2250
Cleveland	Tool and Die Makers	4.50	2560
Cleveland	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	4.40	1410
Cleveland	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	3.49	870
Cleveland	Air Traffic Controllers	3.36	580
Cleveland	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	3.29	520
Cleveland	Bailiffs	3.15	390
Cleveland	Hazardous Materials Removal Workers	3.03	960
Cleveland	Forging Machine Setters, Operators, and Tenders, Metal and Plastic	3.00	480
Cleveland	Pourers and Casters, Metal	2.99	220
Cleveland	Computer-Controlled Machine Tool Operators, Metal and Plastic	2.77	3080
Columbus	Automotive Glass Installers and Repairers	4.70	530
Columbus	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	2.90	1150
Columbus	Bailiffs	2.65	310
Columbus	Computer Systems Analysts	2.41	9110
Columbus	Engineering Technicians, Except Drafters, All Other	2.15	1040
Columbus	Insurance Claims and Policy Processing Clerks	1.84	3330
Columbus	Insurance Appraisers, Auto Damage	1.84	180
Columbus	Computer Network Architects	1.83	1830
Columbus	Computer, Automated Teller, and Office Machine Repairers	1.81	1440
Columbus	Loan Interviewers and Clerks	1.79	2730
Dayton	Model Makers, Metal and Plastic	4.46	80
Dayton	Engine and Other Machine Assemblers	4.25	450
Dayton	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	3.73	210
Dayton	Computer-Controlled Machine Tool Operators, Metal and Plastic	3.07	1240

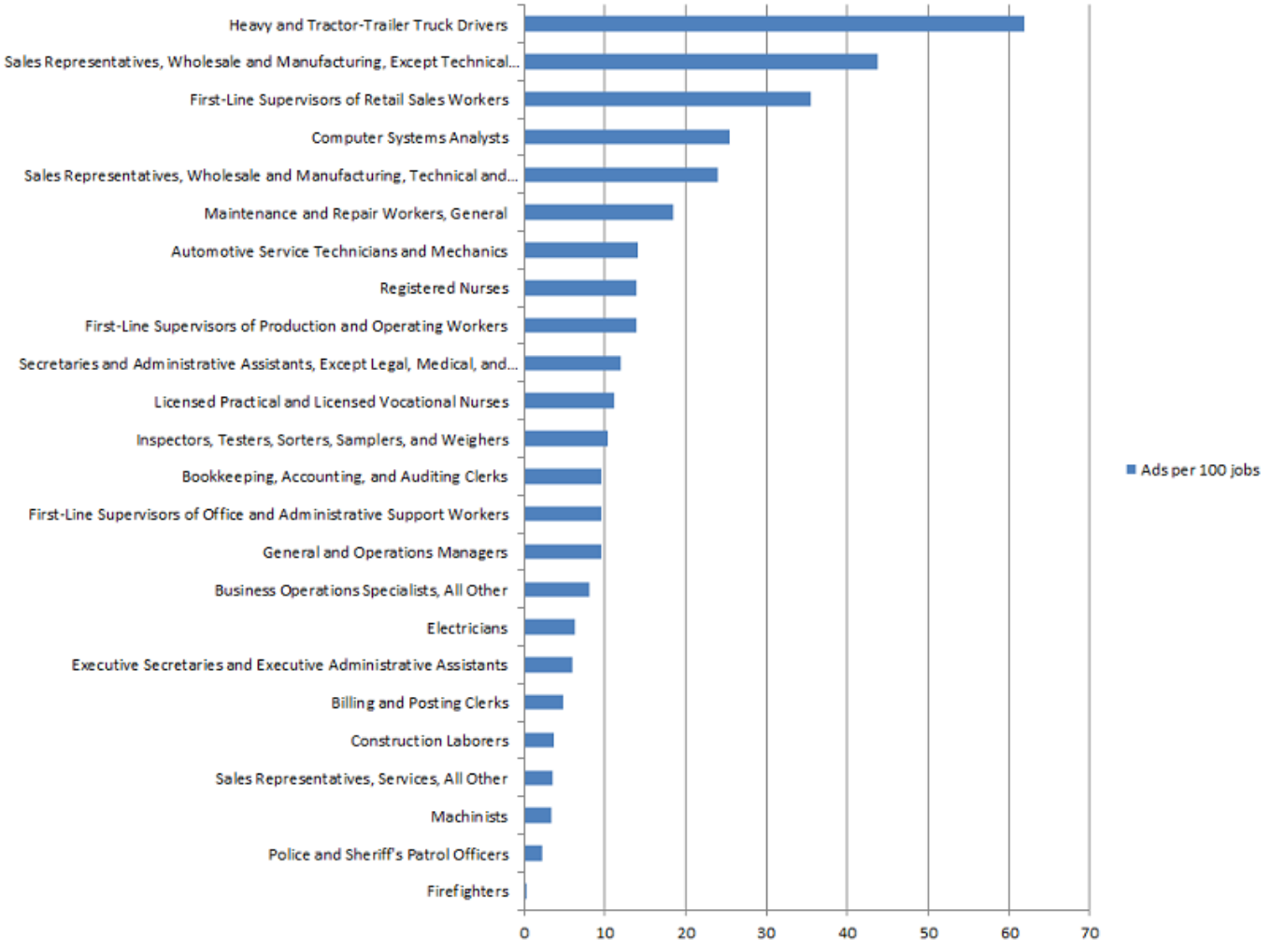
Table 7: Top 10 Most Concentrated Opportunity Occupations by MSA (continued)

Dayton	Mechanical Engineering Technicians	2.44	320
Dayton	Occupational Therapy Assistants	2.39	210
Dayton	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	2.28	610
Dayton	Vocational Education Teachers, Postsecondary	2.26	750
Dayton	Tool and Die Makers	2.08	430
Dayton	Machinists	2.06	2220
Toledo	Engine and Other Machine Assemblers	8.85	760
Toledo	Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers	6.88	310
Toledo	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	5.07	1120
Toledo	Petroleum Pump System Operators, Refinery Operators, and Gaugers	5.03	470
Toledo	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	4.71	750
Toledo	Tool and Die Makers	3.85	660
Toledo	Mechanical Door Repairers	3.41	130
Toledo	Millwrights	3.10	270
Toledo	Machinists	2.95	2600
Toledo	Occupational Therapy Assistants	2.61	190
Youngstown	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	6.13	330
Youngstown	Tool and Die Makers	4.80	590
Youngstown	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	4.53	130
Youngstown	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	4.46	150
Youngstown	Occupational Therapy Assistants	4.09	210
Youngstown	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	3.81	1170
Youngstown	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	3.70	250
Youngstown	Crane and Tower Operators	3.49	250
Youngstown	Millwrights	3.35	210
Youngstown	Metal-Refining Furnace Operators and Tenders	3.15	110
Sources: Bureau of Labor Statistics, O*NET			

Table 8: Job Posting Density by Occupation Classification in Ohio*

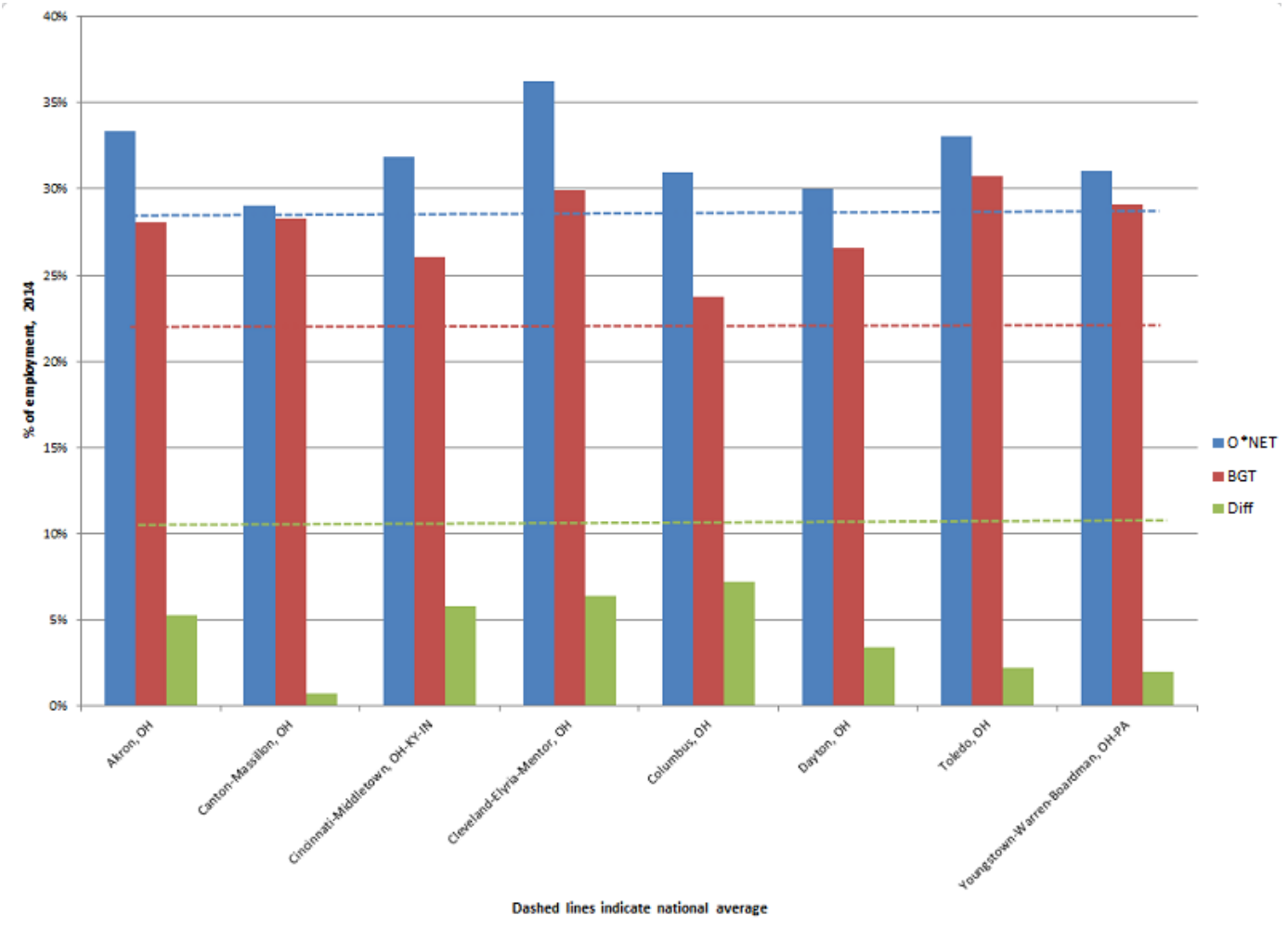
	Ads per 100 jobs	
	Average	Median
Opportunity occupations	12.5	7.5
Higher wages, bachelors required	25.4	15.1
Lower wages	11.0	5.9
* Aggregate of 8 largest MSAs in Ohio		
Sources: Bureau of Labor Statistics, Bureau of Economic Analysis, O*NET, Burning Glass Technologies, and authors' calculations		

Chart 3: Job Posting Density for Most Common Opportunity Occupations in Ohio's Eight Largest Metros



Sources: Bureau of Labor Statistics, Bureau of Economic Analysis, O*NET, Burning Glass Technologies, and authors' calculations

Chart 4: Share of Employment Considered an Opportunity Occupation by Data Source



Sources: Bureau of Labor Statistics, Bureau of Economic Analysis, O*NET, Burning Glass Technologies, and authors' calculations

Table 9: Percent of Online Job Ads Requesting less than a Bachelor's Degree for Most-Common Opportunity Occupations

Occupation	Share of job ads *	MSA max-min range
Registered Nurses	59.0%	27.4%
General and Operations Managers	25.1%	27.7%
Bookkeeping, Accounting, and Auditing Clerks	74.7%	14.2%
Heavy and Tractor-Trailer Truck Drivers	81.3%	18.2%
Maintenance and Repair Workers, General	94.8%	4.2%
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	81.5%	9.2%
First-Line Supervisors of Office and Administrative Support Workers	43.1%	24.7%
First-Line Supervisors of Retail Sales Workers	66.4%	14.9%
Licensed Practical and Licensed Vocational Nurses	89.3%	32.2%
Computer Systems Analysts	11.1%	7.1%
Executive Secretaries and Executive Administrative Assistants	95.2%	20.3%
Machinists	94.5%	11.5%
First-Line Supervisors of Production and Operating Workers	48.8%	36.3%
Construction Laborers	94.9%	8.6%
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	18.9%	3.4%
Inspectors, Testers, Sorters, Samplers, and Weighers	69.8%	22.7%
Police and Sheriff's Patrol Officers	93.3%	18.8%
Automotive Service Technicians and Mechanics	99.6%	1.4%
Electricians	99.9%	1.2%
Billing and Posting Clerks	90.2%	14.1%
Human Resources Specialists	33.6%	10.3%
Computer User Support Specialists	52.3%	30.3%
Firefighters	95.2%	13.3%
Carpenters	100.0%	0.0%
Customer Service Representatives	83.3%	12.2%
First-Line Supervisors of Mechanics, Installers, and Repairers	58.4%	6.6%
Industrial Machinery Mechanics	100.0%	0.0%
*** Aggregated across all 8 Ohio metros in study from 2011-2014**		
Not considered an opportunity occupation in BGT		
Sources: Bureau of Labor Statistics, O*NET, Burning Glass Technologies, and authors' calculations		

Table 10: Top 30 Most Common Up-Credentialed Opportunity Occupations in Ohio *

Occupation	Employment, 2014	# of MSAs considered an Opportunity Occupation	# of MSAs up-credentialing	Share of MSAs in which up-credentialed
General and Operations Managers	55,300	8	8	100%
First-Line Supervisors of Office and Administrative Support Workers	37,980	8	4	50%
Computer Systems Analysts	25,430	8	8	100%
Executive Secretaries and Executive Administrative Assistants	24,250	8	3	38%
First-Line Supervisors of Production and Operating Workers	20,590	8	4	50%
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	19,560	8	8	100%
Human Resources Specialists	15,710	8	8	100%
Computer User Support Specialists	15,100	8	2	25%
Administrative Services Managers	9,490	8	8	100%
Industrial Production Managers	9,130	8	8	100%
Radiologic Technologists	7,410	8	1	13%
Loan Officers	7,340	7	2	29%
Paralegals and Legal Assistants	7,180	8	8	100%
First-Line Supervisors of Non-Retail Sales Workers	6,910	8	5	63%
Dental Hygienists	6,480	8	8	100%
First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	5,770	8	1	13%
Respiratory Therapists	4,930	8	1	13%
Computer Network Architects	4,460	6	6	100%
Vocational Education Teachers, Postsecondary	3,860	8	8	100%
Wholesale and Retail Buyers, Except Farm Products	3,830	8	8	100%
Web Developers	3,820	8	8	100%
Chemical Technicians	3,420	8	1	13%
Tax Examiners and Collectors, and Revenue Agents	2,840	8	6	75%
Procurement Clerks	2,640	7	6	86%
Diagnostic Medical Sonographers	2,210	8	1	13%
First-Line Supervisors of Fire Fighting and Prevention Workers	2,190	8	8	100%
Life, Physical, and Social Science Technicians, All Other	1,800	7	7	100%
Advertising Sales Agents	1,710	5	5	100%
Real Estate Sales Agents	1,500	3	1	33%
Appraisers and Assessors of Real Estate	1,390	6	6	100%
*** Aggregate of 8 largest MSAs in Ohio**				
Sources: Bureau of Labor Statistics, Bureau of Economic Analysis, O*NET, Burning Glass Technologies, and authors' calculations				

Table 11: Percent of Job Ads Requesting less than a Bachelor's Degree

Occupation	2011*	2014*	Difference	
Automotive Service Technicians and Mechanics	98.6%	100.0%	1.4%	***
Billing and Posting Clerks	91.2%	89.0%	-2.2%	
Bookkeeping, Accounting, and Auditing Clerks	71.7%	77.7%	6.0%	***
Carpenters	100.0%	100.0%	0.0%	
Computer Systems Analysts	10.6%	13.7%	3.1%	***
Computer User Support Specialists	51.1%	52.1%	1.0%	
Construction Laborers	87.2%	97.6%	10.4%	***
Customer Service Representatives	80.5%	84.4%	3.9%	***
Electricians	99.4%	100.0%	0.6%	
Executive Secretaries and Executive Administrative Assistants	54.6%	54.7%	0.1%	
Firefighters	95.3%	94.5%	-0.8%	
First-Line Supervisors of Mechanics, Installers, and Repairers	55.7%	60.4%	4.7%	**
First-Line Supervisors of Office and Administrative Support Workers	38.7%	46.4%	7.7%	***
First-Line Supervisors of Production and Operating Workers	52.0%	47.0%	-5.0%	***
First-Line Supervisors of Retail Sales Workers	67.4%	69.0%	1.6%	
General and Operations Managers	22.4%	27.2%	4.8%	***
Heavy and Tractor-Trailer Truck Drivers	79.8%	82.0%	2.2%	
Human Resources Specialists	31.1%	35.3%	4.2%	***
Industrial Machinery Mechanics	100.0%	100.0%	0.0%	
Inspectors, Testers, Sorters, Samplers, and Weighers	65.4%	70.6%	5.2%	**
Licensed Practical and Licensed Vocational Nurses	81.9%	89.4%	7.5%	
Machinists	87.1%	96.2%	9.1%	***
Maintenance and Repair Workers, General	94.2%	95.4%	1.2%	
Police and Sheriff's Patrol Officers	97.1%	90.8%	-6.3%	**
Registered Nurses	61.8%	54.3%	-7.5%	***
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	19.8%	18.2%	-1.6%	
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	80.2%	81.3%	1.1%	
*** Aggregate of 8 largest MSAs in Ohio**				
Sources: Bureau of Labor Statistics, O*NET, Burning Glass Technologies, and authors' calculations				
**** Difference is statistically significant at 95 percent confidence level**				
***** Difference is statistically significant at 99 percent confidence level**				

Table 12: Percent of Job Ads Requesting less than a Bachelor's Degree for Registered Nurses

MSA	2011	2014	Difference (2011-2014)	
Akron, OH	72.5%	63.2%	-9.4%	***
Canton-Massillon, OH	80.9%	69.1%	-11.8%	***
Cincinnati-Middletown, OH-KY-IN	69.0%	53.9%	-15.1%	***
Cleveland-Elyria-Mentor, OH	50.2%	44.1%	-6.1%	***
Columbus, OH	73.4%	62.9%	-10.5%	***
Dayton, OH	71.2%	54.3%	-17.0%	***
Toledo, OH	71.8%	63.0%	-8.8%	***
Youngstown-Warren-Boardman, OH-PA	77.8%	69.1%	-8.7%	***
Sources: Bureau of Labor Statistics, O*NET, Burning Glass Technologies, and authors' calculations				
***** Difference is statistically significant at 99 percent confidence level**