
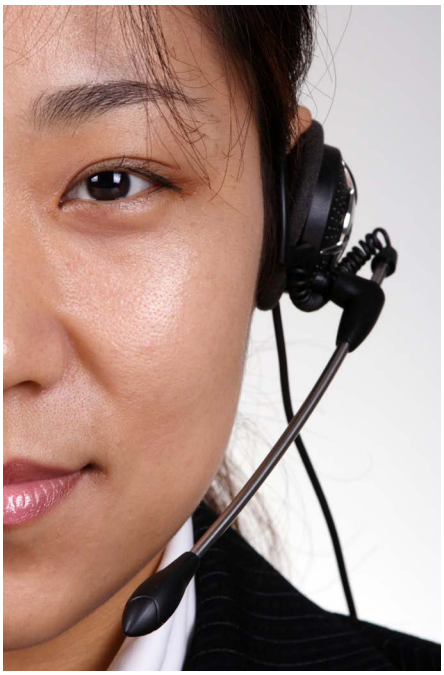



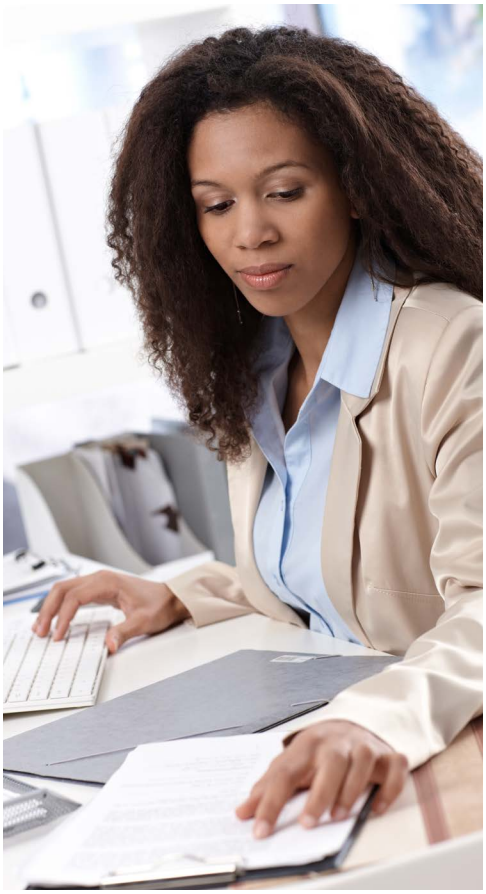

OPPORTUNITY OCCUPATIONS

Revisited

Exploring Employment for Sub-Baccalaureate Workers Across Metro Areas and Over Time

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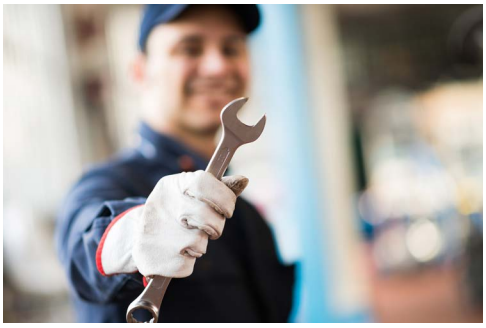


We would like to thank Oliver Cooke, Papia Debroy and staff at Opportunity@Work, Kyle DeMaria, Mels de Zeeuw, Sydney Diavua, Eileen Divringi, Emily Garr Pacetti, Brad Hershbein, Hal Martin, Ashley Putnam, Davin Reed, Mark Schweitzer, Bob Sheets, Meg Shope Koppel, Theresa Singleton, Bledi Taska, Anna Tranfaglia, and Jason Tyszko for their insightful comments. The views expressed here are those of the authors and do not necessarily represent the views of the Federal Reserve Banks of Cleveland or Philadelphia or the Federal Reserve System.

Opportunity Occupations Revisited

Exploring Employment for Sub-Baccalaureate Workers Across Metro Areas and Over Time

April 2019

TABLE OF CONTENTS

Introduction 2

Background 3

Data and Methods 5

Findings 6

Discussion 19

References 21

Appendix 1 24

Appendix 2 30

Appendix 3 33

Appendix 4 36

Appendix 5 39

INTRODUCTION

Economic polarization in the U.S. economy, sometimes described as the hollowing out of the middle class, is likely to be at the core of many of the economic and social challenges our country will encounter over the next several decades. Technological advancement, including automation, is thought to be an important driver of labor market polarization, but increased levels of global trade and lower rates of unionization are also thought to be factors (Autor, Levy, and Murnane 2003; Autor, Katz, and Kearney 2006; Acemoglu and Autor 2011; Lichtenstein 2013; Foote and Ryan 2015). Moreover, while the current economic expansion might be historic in length, job growth has favored the college educated (Carnevale, Jayasundera, and Gulish 2016), and the presence of middle-wage jobs has diminished in urban areas as low-wage work has grown (Autor 2019).

As a result of the confluence of these market forces, a plethora of research initiatives have been pursued to better understand and address these labor market dynamics. Launched with a report in 2015 (Wardrip et al. 2015), our opportunity occupations concept is one of these efforts. We define an opportunity occupation as one that is characterized by a high degree of opportunity employment — jobs accessible to workers without a bachelor's degree and typically paying above the national annual median wage (adjusted for differences in regional price levels). In this report, we advance our research on opportunity occupations and add to the broader literature by incorporating new data, making methodological improvements, and investigating the following research questions:

1. Which occupations offer the most opportunity employment for sub-baccalaureate workers?
2. Do employers' educational expectations exhibit variability across regional economies or over time?
3. What share of total employment can be classified as opportunity employment?
4. How do a metro area's occupational mix, employers' educational expectations, and price levels affect the share of opportunity employment?

The remainder of this report is organized as follows: The next section provides a discussion that places our opportunity occupation concept within a broad spectrum of similar initiatives. A brief treatment of the data and methods used in this analysis precedes the presentation of our findings, and a discussion section addresses the policy implications raised by our results.

Key Findings

- Opportunity employment — defined as employment accessible to workers without a bachelor's degree and typically paying above the national annual median wage ($37,690), adjusted for regional differences in consumer prices — accounts for 21.6 percent of total employment in the 121 metro areas analyzed in this report.
- Some of the largest opportunity occupations, including a number in health care and the skilled trades, could experience above-average growth through 2026 and are not considered to be at significant risk of automation, while the reverse is true for some occupations in office and administrative support.
- For some of the largest opportunity occupations, the share of jobs available to sub-baccalaureate workers rose by more than 5 percentage points in recent years, suggesting that educational requirements and the overall level of opportunity can be influenced by the business cycle.
- Among the metro areas analyzed, the opportunity employment share ranges from a high of 34.0 percent in Toledo, OH to a low of 14.6 percent in Washington, D.C.
- A metro area's occupational mix, the educational expectations of its employers, and its cost of living can substantially affect its opportunity employment share, with a combined effect of more than 10 percentage points in some cases.

BACKGROUND

As mentioned in the introduction, a number of recent research efforts have sought to better understand the labor market implications of economic polarization, and in particular, the prospects for the 68 percent of U.S. residents who do not have a four-year college degree.[1] Using illustrative rather than comprehensive citations, the following brief overview of related work allows us to place this analysis into its broader context.

A substantial portion of the research investigating middle-skills jobs — often defined as those that require some education and training beyond a high school diploma but less than a four-year degree — relies on national survey data to explore the distribution of decent-paying work by the wages and educational attainment of today's workers. Frequently, efforts are directed at understanding changes in the scale and occupational composition of middle-skills work over time (Holzer 2015; Carnevale et al. 2017), as well as the level of training that a worker without a college degree might need to access it (Carnevale et al. 2018). Research in this vein frequently produces findings relevant to the U.S. economy as a whole, although some reports do provide estimates for states (Carnevale, Strohl, and Ridley 2017) and metro areas (Shearer and Shah 2018).

Whereas our opportunity occupations concept focuses on wages earned by the typical worker, a related body of recent research extends the analysis of sub-baccalaureate employment beyond wages, using a broader notion of job quality and elucidating steps that can be taken to improve conditions for lower-wage workers. Although definitions vary, work of this nature generally measures job quality by the presence or absence of a variety of characteristics, including, but not necessarily limited to, benefits (e.g., retirement, paid leave), flexible schedules, wealth-building opportunities, and the job's likelihood of placing a worker on a career pathway (Fabiani 2018).[2] Regarding the last issue, a substantial amount of recent attention has been paid to identifying occupations that promote upward mobility for their workers (Lamback, Gerwin, and Restuccia 2018; Shearer and Shah 2018).

A parallel body of research assesses the extent to which automation could impact job availability for workers lacking a four-year degree. While automation is expected to affect nearly all occupations to some extent, research in this space finds that the risk of automation tends to be higher for those organized around more routine tasks and requiring less education. Jobs in production, transportation, and administrative support are believed to be among those most susceptible to technological advances and mechanization (Muro, Maxim, and Whiton 2019; Ding, Leigh, and Harker 2018; Manyika et al. 2017).

Definitions

Opportunity employment: employment accessible to workers without a bachelor's degree and typically paying above the national annual median wage, adjusted for regional differences in consumer price levels

Opportunity occupation: an occupation characterized by work that frequently meets the definition of opportunity employment

Wage threshold: the wage level in a metro area that an occupation's annual median wage must meet or exceed for its jobs to be classified as opportunity employment; the wage threshold is the national annual median wage ($37,690) adjusted for differences in regional price levels

Sub-baccalaureate: used to describe a worker or resident without a bachelor's degree, or a job that does not require a bachelor's degree

[1] For residents age 25 and over (2017 American Community Survey, Table DP02).

[2] See Ton (2014) and volume two of Andreason et al. (2018) for in-depth discussions of quality jobs.

While we acknowledge the importance of considering both job quality and automation in assessments of the labor market, the primary objective of this report is to gain a better understanding of the regional factors that influence current employment opportunities for sub-baccalaureate workers — an objective that can be accomplished more easily than before by leveraging new sources of data. In recent years, real-time labor market information (RTLMI) — in the form of online job advertisements, for example — has been incorporated into analyses aimed at understanding employers' demands for worker skills and education.[3] Frequently, the purpose is to illustrate the discrepancy between the higher level of education that employers seek today and the lower level of education held by current workers in the same position nationally (see the discussion of the "degree gap" by Fuller and Raman (2017) and the "credentials gap" in Burning Glass Technologies (2014)). Other research applications of job postings data explore the changing nature of skill requirements (Sigelman et al. 2019), the depth of the skills gap for specific occupations and skills (Restuccia, Taska, and Bittle 2018; Rothwell 2014), and the means to understand and maximize the value of certain credentials (Schneider and Sigelman 2018a; Schneider and Sigelman 2018b; Markow et al. 2017). However, analyses of RTLMI that allow for comparisons across metro areas are rare.[4]

To our knowledge, our portfolio of research on opportunity occupations is unique because it paints a picture of local economic opportunity for sub-baccalaureate workers using online job advertisements to understand local employer preferences for education. With this report, we expand the power of the opportunity occupations framework by exploring the ways in which a region's occupational mix and its cost of living interact with employers' educational preferences to produce dramatically different levels of economic opportunity across the metropolitan landscape.

[3] See Appendix 1 for a discussion of the caveats associated with job postings data.

[4] In an early analysis of online job ads primarily focused on explaining local unemployment rates, Rothwell (2012) estimates an "education gap" for metro areas that includes a measure of employers' educational preferences and the education of the existing labor force. In a more recent study of science, technology, engineering, and math (STEM) jobs using online job ads, Rothwell (2014) produces some estimates for metro areas, such as the length of time required to fill job openings and the average value of skills posted in job openings.

DATA AND METHODS

Estimates in this report rely heavily on four data sets. We use the Occupational Employment Statistics data set (2017) produced by the Bureau of Labor Statistics (BLS) for occupation-specific employment and wage data. Online job ads data from Burning Glass Technologies (2015–2017) inform our understanding of the education employers seek when filling open positions; more specifically, we use the minimum level of education listed in each online job ad, where available, to calculate the share of jobs accessible to sub-baccalaureate workers in a given metro area for a given occupation.[5] Because not all occupations guarantee the typical worker a 40-hour work week, we use American Community Survey data (2012–2016) to estimate the median weekly hours worked for each occupation and factor these estimates into our calculation of annual median wages.

As mentioned above, in order to be considered opportunity employment, an occupation's annual median wage must meet or exceed the national annual median wage ($37,690), adjusted for differences in regional price levels. To make this adjustment, we use Regional Price Parities data (2016) from the Bureau of Economic Analysis (BEA) in calculating the local wage threshold that separates lower-wage employment from higher-wage work in each metro area. We use the national annual median wage as a base not because we feel it represents some level of sufficiency or guarantees each worker a middle-class lifestyle but because it reflects the wage-earning experiences of the typical American worker. Some studies similar in intent to ours calculate wage thresholds that incorporate assumptions about household size and composition (e.g., Bhandari and Brown 2018) or adjust the wage threshold based on the age of the worker (Carnevale et al. 2017), but we do not want our results to be driven by these types of assumptions or by a normative determination of income sufficiency. We prefer to simply adjust the national annual median wage to account for regional price levels but acknowledge that, as a result, the local wage thresholds used in this analysis are not necessarily demarcations between jobs that pay enough and jobs that pay too little for households of all types and sizes.

In the metro areas analyzed, we classify the employment associated with each occupation into one of three groups based on the occupation's wages relative to the local wage threshold and the share of online job ads requesting less than a bachelor's degree. To elaborate, we calculate a local annual median wage for an occupation by multiplying its hourly median wage by the median weekly hours worked and by 52 weeks (assuming year-round employment). If this value falls below the national annual median wage ($37,690), adjusted for regional price levels (from a low of $33,100 in Springfield, MO to a high of $47,900 in San Jose, CA), we classify all of the occupation's employment as lower-wage work. For occupations that meet or exceed this threshold, we split employment into one of two categories — opportunity employment and higher-wage employment requiring a bachelor's degree — using the share of jobs accessible to sub-baccalaureate workers.[6] For example, if 40 percent of the jobs ads are accessible to sub-baccalaureate workers, then 40 percent of local employment for that occupation is classified as opportunity employment, while the remaining 60 percent is designated as higher-wage employment requiring a bachelor's degree.

With employment for every occupation in each metro area classified in this way, we are able to summarize the level of opportunity embedded in each occupation and in each metro area. Overall, our findings pertain to 121 of the nation's largest metro areas, accounting for 103.5 million jobs, or 73 percent of U.S. employment in 2017.

See Appendix 1 for a more complete discussion of the data, methods, and metro area selection criteria employed in this analysis.

[5] For this analysis, we describe this level of education interchangeably as "expected," "required," and "preferred," acknowledging that, both for the individual job ad and in aggregate, it is unclear whether the minimum level of education is intended by the employer to be set in stone or negotiable. For the purposes of comparing patterns across metro areas or over time, this issue of interpretation is irrelevant.

[6] We calculate the sub-baccalaureate share using local job ads if there are at least 100 local ads with a minimum education level provided. If there are fewer than 100 such ads for an occupation in a given metro area, we instead use the occupation's sub-baccalaureate share calculated from a group of metro areas with similar levels of educational expectations; for a very few occupations with a particularly small sample size, we use the sub-baccalaureate share calculated across all metro areas. Local job ads are used to describe the educational expectations of employers for at least half of employment in every metro area analyzed. See Appendix 1 for more information.

FINDINGS

Which occupations offer the most opportunity employment for sub-baccalaureate workers?

Table 1 lists the 25 largest opportunity occupations present in the 121 metro areas analyzed. These 25 account for 47.7 percent of all opportunity employment in these regions, and registered nurses top the list with nearly 1.4 million such jobs.[7] Among these largest opportunity occupations, nine are wholly accessible to sub-baccalaureate workers (i.e., the share of sub-baccalaureate job ads equals 100 percent). For some of these (e.g., electricians), all employment is classified as opportunity employment because in every metro area for which data are available, the annual median wage exceeds the local wage threshold; for other occupations that clearly do not require a bachelor's degree but that are not as well compensated (e.g., maintenance and repair workers), a percentage of the employment is considered lower wage because in some metro areas, the annual median wage falls below the local wage threshold. For 16 occupations (29.0 percent of opportunity employment) listed in Table 1, there is no consensus among employers regarding the education level of preferred job candidates. As a result, for occupations such as general and operations managers, some portion of employment is also classified as higher-wage employment for which a bachelor's degree is required.

Table 1. Largest Opportunity Occupations (2017)

			Distribution of Total Occupational Employment		
Occupation Title	Opportunity Employment	Share of Sub-Baccalaureate Job Ads	Opportunity Employment	Higher Wages, Bachelor's Degree Required	Lower Wages
Registered Nurses	1,374,014	65.9%	65.9%	34.1%	0.0%
Heavy and Tractor-Trailer Truck Drivers	1,032,790	100.0%	93.1%	0.0%	6.9%
Bookkeeping, Accounting, and Auditing Clerks	581,455	58.8%	52.8%	37.4%	9.8%
Maintenance and Repair Workers	491,285	100.0%	54.0%	0.0%	46.0%
Carpenters	457,460	100.0%	91.7%	0.0%	8.3%
Electricians	453,790	100.0%	100.0%	0.0%	0.0%
Licensed Practical and Licensed Vocational Nurses	446,360	100.0%	100.0%	0.0%	0.0%
Supervisors of Office and Administrative Support Workers	433,025	38.9%	39.5%	60.5%	0.0%
General and Operations Managers	432,315	24.6%	26.0%	74.0%	0.0%
Sales Representatives, Wholesale and Manufacturing	426,495	39.5%	40.3%	59.5%	0.3%
Police and Sheriff's Patrol Officers	405,652	89.0%	87.9%	12.1%	0.0%
Sales Representatives, Services, All Other	370,776	44.9%	45.0%	53.8%	1.2%
Supervisors of Retail Sales Workers	368,040	64.9%	45.1%	21.3%	33.7%
Automotive Service Technicians and Mechanics	338,550	100.0%	76.9%	0.0%	23.1%
Plumbers, Pipefitters, and Steamfitters	313,670	100.0%	99.7%	0.0%	0.3%
Secretaries and Administrative Assistants	284,418	73.6%	17.7%	5.1%	77.2%
Construction Laborers	270,250	100.0%	40.2%	0.0%	59.8%
Computer User Support Specialists	262,827	53.1%	52.6%	47.1%	0.3%
Supervisors of Construction Trades and Extraction Workers	254,647	65.9%	65.3%	34.7%	0.0%
Executive Secretaries and Executive Administrative Assistants	227,786	46.0%	47.3%	52.7%	0.0%
Securities, Commodities, and Financial Services Sales Agents	225,101	70.8%	66.9%	32.1%	1.0%
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	221,640	100.0%	100.0%	0.0%	0.0%
Supervisors of Mechanics, Installers, and Repairers	204,586	65.4%	65.5%	34.5%	0.0%
Supervisors of Transportation and Material Moving Workers	204,286	71.8%	72.0%	28.0%	0.0%
Supervisors of Production and Operating Workers	202,699	53.5%	53.5%	46.5%	0.0%

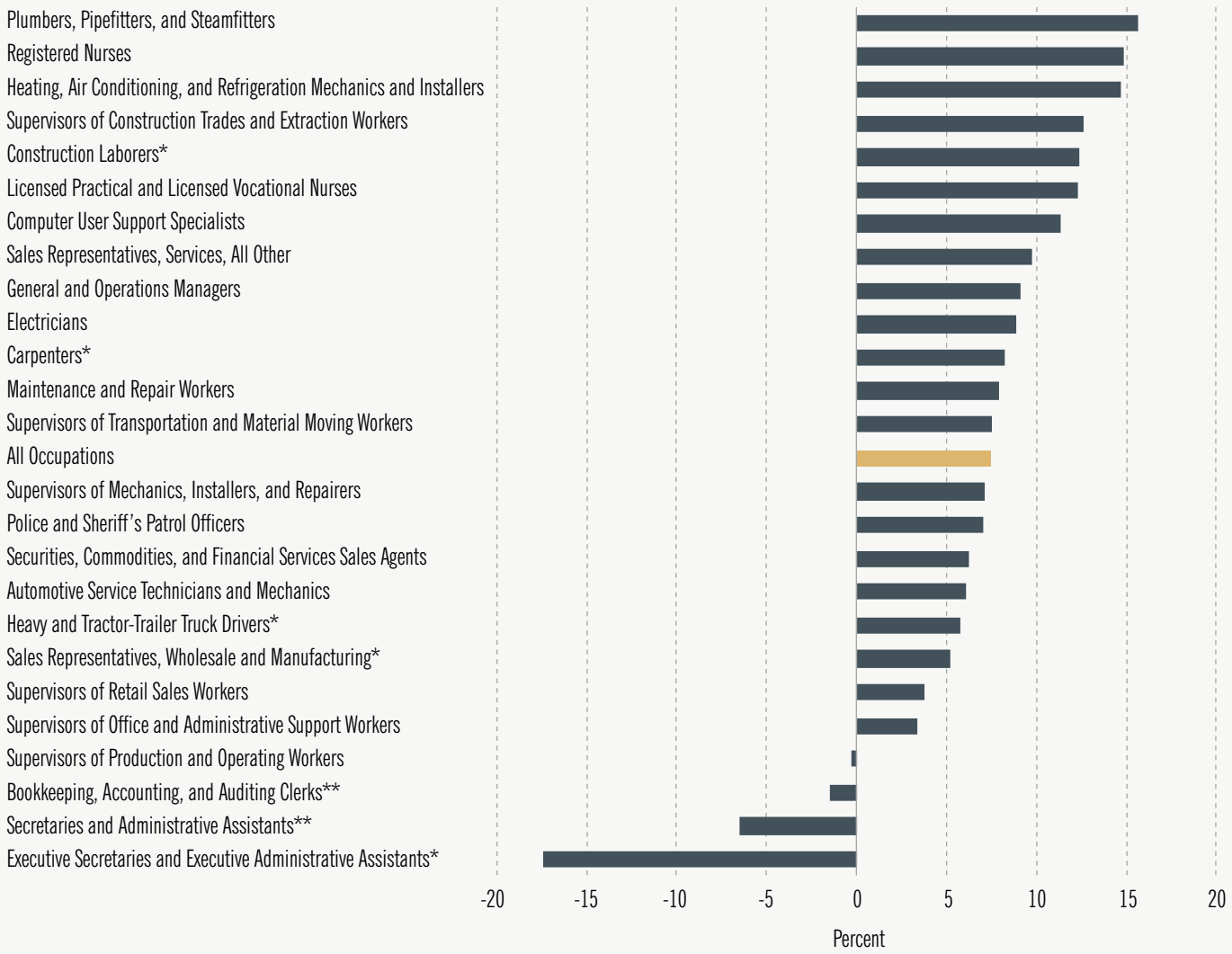
Sources: Authors' calculations using data from BLS Occupational Employment Statistics (May 2017), Burning Glass Technologies (2015–2017), BEA Regional Price Parities (2016), and American Community Survey Five-Year Public Use Microdata Sample (2012–2016)

[7] Our initial report (Wardrip et al. 2015) also identified registered nurses as the largest opportunity occupation, which was contrary to the conventional wisdom that a four-year degree was increasingly becoming a requirement for employment in the field. Fee (2017) points out that the demand (in the form of the number of online job ads) for registered nurses increased four times faster than that of all other occupations from 2014 to 2016. Moreover, "of the increased number of online job postings for RNs, most do not require candidates to have a bachelor's degree" (pg. 4), which caused employers' educational preferences — previously trending toward higher levels of education — to reverse course. Digging deeper into the online job ads data to examine educational preferences of the "best hospitals in Ohio," Fee (2017) finds that the type of employer often dictates the level of education they prefer, with these elite hospitals requiring RNs to have a four-year degree for reasons related to certification rather than skills.

Importantly, according to employment projections produced by the BLS, more than half of the 25 largest opportunity occupations, as well as 52 percent of total opportunity employment across all occupations, are expected to grow at a faster rate than overall employment (Figure 1). The future looks particularly favorable for several occupations in health care and the skilled trades but less so for some occupations in office and administrative support. Moreover, based on probabilities provided in Frey and Osborne (2017) and categories from Ding, Leigh, and Harker (2018), only a handful of the 25 largest opportunity occupations are considered to be at risk of automation (identified with asterisks in Figure 1), with most expected to decline or grow only modestly in the coming years. Professions with strong anticipated growth and a lower risk of automation could represent fertile ground for economic and workforce development practitioners to collaborate.

See Appendix 2 for information on the 100 largest opportunity occupations in the metro areas analyzed.

Figure 1. Projected Percent Change in National Employment for the Largest Opportunity Occupations (2016–2026)



Note: Using probabilities provided in Frey and Osborne (2017), Ding, Leigh, and Harker (2018) consider occupations denoted with one asterisk (*) "at risk" of automation, with a likelihood of 70–94 percent, and occupations denoted with two asterisks (**) at "high risk" of automation, with a likelihood of 95 percent or greater. The automation probability for sales representatives, services, all other was not available, and both the automation probability and the projected growth for supervisors of transportation and material moving workers represent the average of two constituent occupations.

Source: BLS Employment Projections (2016–2026)

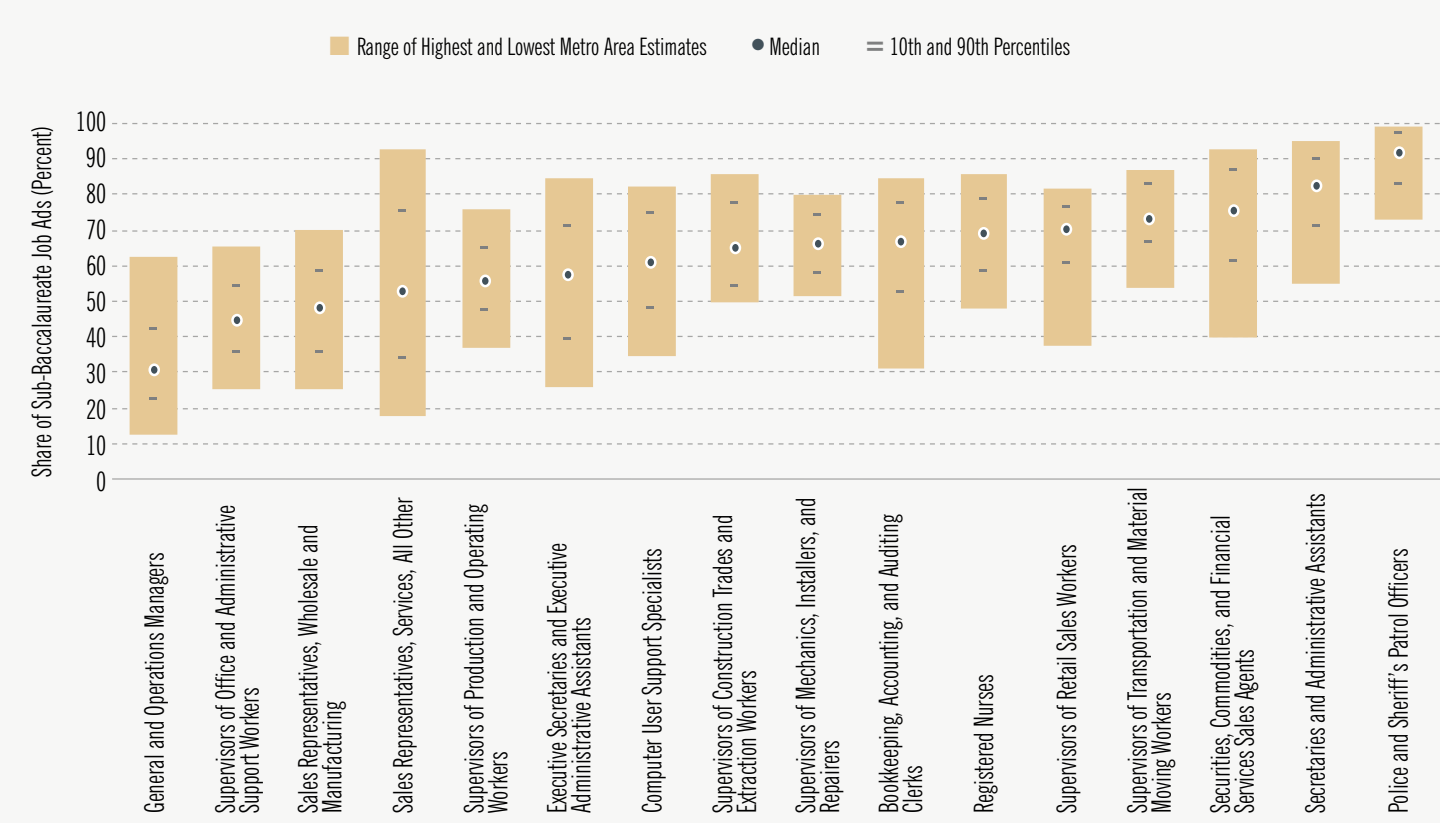
Do employers' educational expectations exhibit variability across regional economies or over time?

For a given occupation, there are at least two reasons why the education required by employers trying to fill openings in one metro area might be higher or lower than the education required by employers elsewhere. On the one hand, local educational requirements must partly reflect the true skill level necessary to do the work in that region. Prior research has shown that not all jobs in a given occupation necessarily require the same skills (Deming and Kahn 2018, Rothwell 2014, Marinescu and Wolthoff 2016, Burning Glass Technologies 2014), and a clustering of higher-level, more sophisticated work in a regional economy would naturally lead to greater overall demand for more educated candidates.[8]

In some metro areas where an occupation is less accessible to sub-baccalaureate workers than is typical, employers may also be "upcredentialing"[9] in the hiring process by asking for credentials that surpass the level of skills truly demanded by the work in question (Fuller and Raman 2017; Burning Glass Technologies 2014); feedback from employers suggests that a bachelor's degree is sometimes used as a proxy for both soft and hard skills or as a predictor of career growth and advancement (Burrowes et al. 2014; Fuller and Raman 2017). While we cannot tease out the individual contributions of these partial explanations, the sub-baccalaureate share of job ads for an occupation in a given regional economy nevertheless influences the level of opportunity that job seekers with lower levels of formal education face.

Employers' educational expectations for some occupations vary greatly across metro areas. Looking at the 16 occupations from Table 1 for which the share of sub-baccalaureate job ads is below 100 percent, the findings for executive secretaries clearly illustrate this variability (Figure 2). We find that in the typical metro area, 57 percent of the job ads for executive secretaries are accessible to sub-baccalaureate workers, but among

Figure 2. Metro Area Variation in Share of Sub-Baccalaureate Job Ads (2015–2017)



Source: Authors' calculations using data from Burning Glass Technologies (2015–2017)

[8] In their online appendix, Hershbein and Kahn (2018b) present evidence of a positive relationship between the average level of educational attainment of a metro area's workers and the level of education requested in its online job ads. In the same spirit, Wardrip, Andreason, and de Zeeuw (2017) find that job ads for four large opportunity occupations are more likely to request a bachelor's degree in metro areas with greater numbers of recent college graduates.

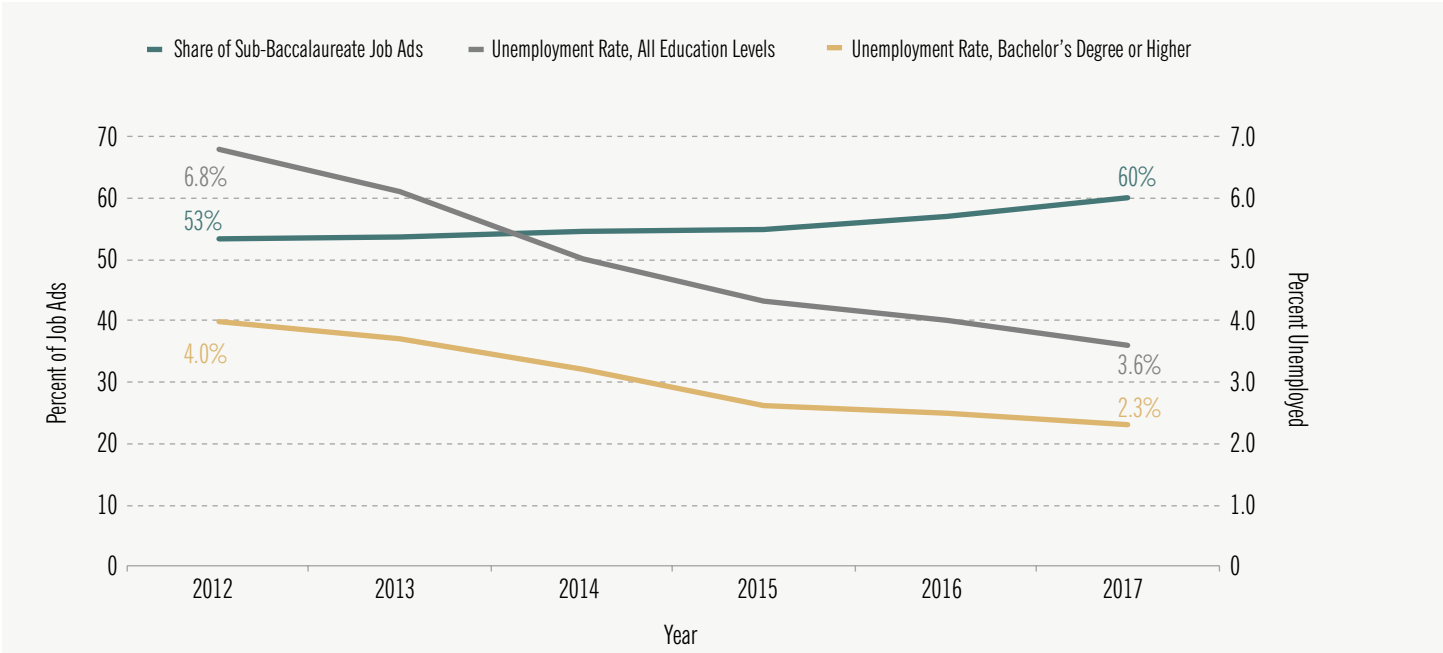
[9] Also referred to in the literature as "upskilling" and "degree inflation."

the metro areas analyzed, the share ranges from a low of 26 percent to a high of 84 percent.[10] For blue-collar occupations on the list, we find less variability across the metro areas analyzed. Among these occupations, which include police and sheriff's patrol officers and supervisors of mechanics, installers, and repairers, we find the difference between the lowest and the highest sub-baccalaureate shares to be less than 30 percentage points.

Having established that employers' educational expectations for some occupations vary across metro areas, it is also worth exploring whether they changed during the recent economic recovery. From a survey of 600 business and human resource leaders, we know that for middle-skills jobs such as these that employ both college-educated and sub-baccalaureate workers, a bachelor's degree is increasingly in demand for a number of reasons: a dissatisfaction with the quality of talent exhibited by those without a degree, an evolution of the jobs themselves to require additional skills, and a greater supply of college-educated workers during the recession (Fuller and Raman 2017). Possibly in response to a reversal of the last explanation, Figure 3 illustrates that employers in the aggregate did change their educational preferences for these 16 occupations between 2012 and 2017. Over this time period, as the national unemployment rate for those with at least a bachelor's degree fell by almost half, the annual proportion of job ads available to sub-baccalaureate workers rose from 53 percent to 60 percent. Consistent with prior research (Modestino, Shoag, and Ballance 2016), the suggestion is that as labor availability declined and fewer workers competed for each opening, some employers may have lowered their educational requirements in order to more successfully fill positions.[11]

Controlling for the metro area in which the job ads were posted, we find that the largest opportunity

Figure 3. Annual Changes in National Unemployment Rate and Share of Sub-Baccalaureate Job Ads for 16 Large Opportunity Occupations (2012–2017)



Note: Includes the 16 occupations listed in Table 1 for which the share of sub-baccalaureate job ads is below 100 percent. The annual percentages are calculated using job ads posted in the 121 metro areas analyzed. The unemployment rates are for those 25 and over, not seasonally adjusted.

Sources: Authors' calculations using data from Burning Glass Technologies (2012–2017); Current Population Survey (2012–2017)

[10] Employers' educational expectations for registered nurses also vary markedly, but in only one of the metro areas analyzed do the majority of job ads request a bachelor's degree or higher.

[11] While employers as a whole were less likely to ask for a bachelor's degree for these occupations at the end of the study period than at the beginning, individual employers can respond to a tightening labor market in a variety of ways. Terry and de Zeeuw (2018) find evidence that some small businesses loosened job requirements or increased training, but others increased pay, restructured employee responsibilities, and invested in technology to reduce the demand for labor. Research by Hershbein and Kahn (2018a) supports the notion that some employers made technological investments rather than lowering requirements during the recent economic recovery, thereby restructuring "production toward greater use of technology and higher-skilled workers" (p. 1739).

occupations did not become uniformly more accessible to sub-baccalaureate workers in the second half of this six-year period (Figure 4). Comparing the characteristics of job ads placed between 2015 and 2017 with those placed in the prior three years, we find that the share of sub-baccalaureate job ads increased by more than 5 percentage points for three supervisory positions; in fact, the six supervisory positions among these 16, along with registered nurses, exhibited the largest increases in the percentage of job ads that did not require a bachelor's degree.[12] At the other end of the spectrum, educational requirements rose for a number of occupations, with bookkeeping, accounting, and auditing clerks chief among them.

It is noteworthy that the occupations in this group identified as most likely to automate in the coming years exhibited either only a modest loosening of educational requirements or, counterintuitively in an improving economy, a tightening of requirements.

While this sample of occupations is admittedly too small to conclude anything definitively, one plausible interpretation of the findings presented in Figure 4 is that a bachelor's degree was seen as less important for supervisory positions as the labor market tightened, possibly because on-the-job experience could substitute; however, a college education became more important for occupations in the process of automating, as a higher level of training has become necessary to work alongside technological advancements. These findings are consistent with prior research suggesting that occupations relying on the performance of "routine–cognitive" tasks, such as those in clerical, administrative, and sales professions, exhibited persistent upskilling in recent years, possibly because new hires needed additional skills to take advantage of the technology transforming the way the work is done (Hershbein and Kahn 2018a).

Figure 4. Change in the Share of Sub-Baccalaureate Job Ads During 2015–2017 Relative to Three Years Prior

Note: Values represent the coefficients from occupation-specific linear probability models, which include metro area fixed effects; all values are significant ($p < 0.01$). Full model results are available upon request. Using probabilities provided in Frey and Osborne (2017), Ding, Leigh, and Harker (2018) consider occupations denoted with one asterisk (*) "at risk" of automation, with a likelihood of 70–94 percent, and occupations denoted with two asterisks (**) at "high risk" of automation, with a likelihood of 95 percent or greater. The automation probability for sales representatives, services, all other was not available, and the automation probability for supervisors of transportation and material moving workers represents the average of two constituent occupations.

Source: Authors' calculations using data from Burning Glass Technologies (2012–2017)

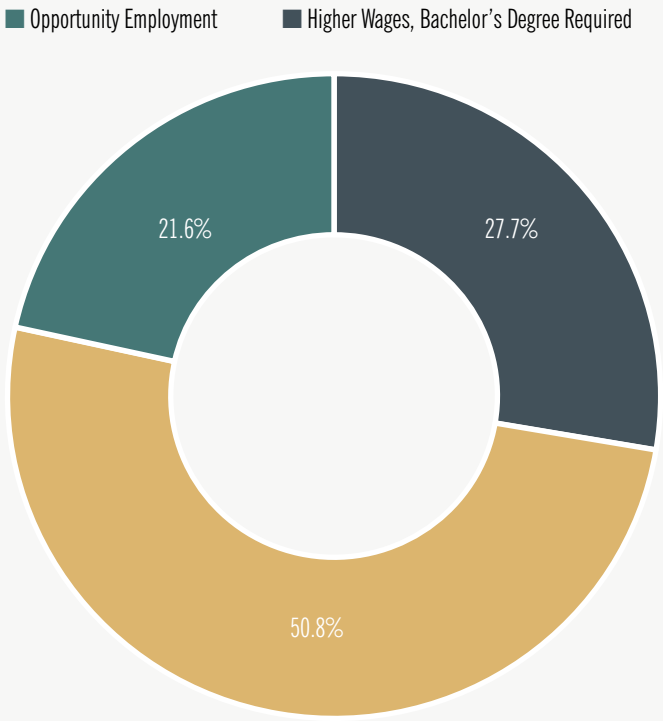
[12] Interestingly, Burning Glass Technologies (2014) finds that in 2013, supervisory positions were among the occupations exhibiting the greatest "credentials gap," or the difference between the share of job ads requesting a bachelor's degree and the share of existing workers with such a credential. It may be unsurprising, then, that educational expectations fell markedly for these occupations in recent years.

What share of total employment can be classified as opportunity employment?

Having explored opportunity employment at the occupational level, we turn now to its prevalence relative to other types of employment. Across the 121 metro areas included in this study, we find that 21.6 percent of the employment meets our definition of opportunity employment (Figure 5). Higher-wage employment requiring at least a bachelor's degree constitutes 27.7 percent of total employment, with the rest (50.8 percent) consigned to the lower-wage category.[13] It should not be surprising that in the aggregate, half of all employment is considered lower-wage, given that the national median wage is the basis for our local wage thresholds.

Figure 6 illustrates the distribution of employment by education and wages for the metro areas with the highest and lowest opportunity employment shares.[14] Consistent with our original analysis (Wardrip et al. 2015) and other recent research (Shearer and Shah 2018), we observe a dramatic difference in opportunity levels for sub-baccalaureate workers across metro areas. Toledo, OH tops the list with the highest share of opportunity employment across the 121 metro areas analyzed. A majority of the metro areas with the highest shares of opportunity employment are located in the Midwest, which is consistent with the analysis by Bauer et al. (2018) showing that after adjusting for cost-of-living differences, median annual earnings tend to be relatively high in that region.[15] Comparing the shares of higher- and lower-wage employment across these top metro areas, we see relatively small differences.

Figure 5. Distribution of Employment by Wages and Education (2017)



Sources: Authors' calculations using data from BLS Occupational Employment Statistics (May 2017), Burning Glass Technologies (2015–2017), BEA Regional Price Parities (2016), and American Community Survey Five-Year Public Use Microdata Sample (2012–2016)

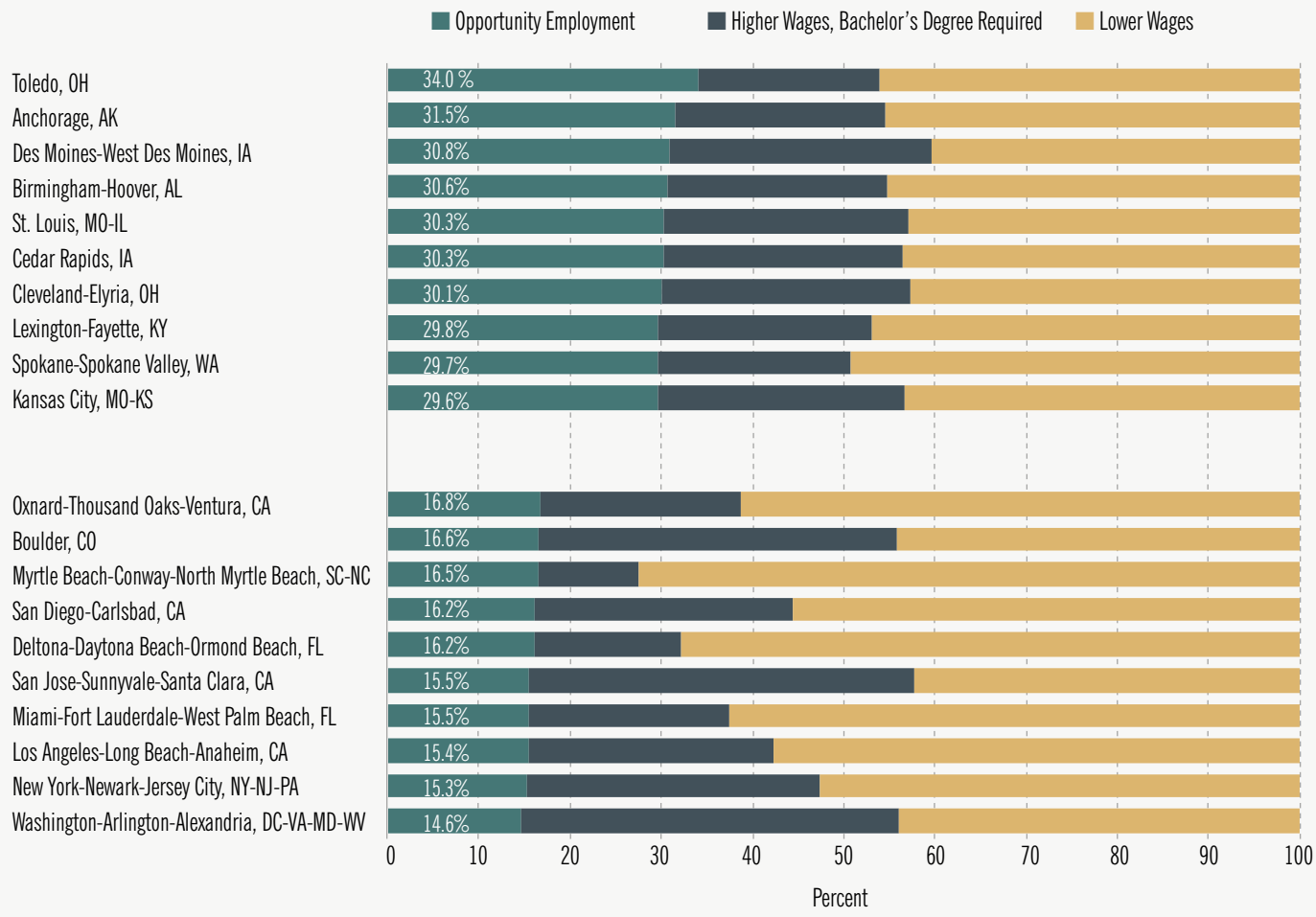
[13] In other words, 44 percent of higher-wage employment does not require a bachelor's degree (21.6 ÷ (21.6 + 27.7)). Despite using different wage thresholds, geographic coverage, years, and data sets, Carnevale et al. (2018) also find that roughly 44 percent of higher-wage employment is available to a worker without a bachelor's degree. Their analysis indicates that more than half of what they call "good jobs" for sub-baccalaureate workers require additional training or education beyond high school.

[14] As noted above, we apply the share of sub-baccalaureate job ads to occupational employment estimates to calculate the level of opportunity employment in a given metro area. In Wardrip et al. (2015), we used a binary approach instead, classifying all employment reported for an occupation as opportunity employment if at least half of its job ads were accessible to sub-baccalaureate workers. Had we used the original binary approach in this analysis, opportunity employment would have represented 21.0 percent of total employment in the metro areas analyzed, rather than the 21.6 percent we report in this analysis. At the metro area level, using the binary approach does not produce differences greater than 3.8 percentage points relative to the estimates we report using this new methodology.

[15] Using a different methodology that does not consider employers' educational expectations, Bhandari and Brown (2018) also find a preponderance of high-opportunity metro areas in the Midwest, including a few shown in Figure 6.

Looking at the metro areas with the lowest shares of opportunity employment, we find distinct differences in the distribution of higher- and lower-wage employment. Some of these metro areas, such as San Jose, CA, are characterized by higher-wage employment requiring a bachelor's degree, while other places, such as Myrtle Beach, SC, are dominated by lower-wage work. In contrast with the relatively affordable metro areas populating the top 10 in Figure 6, regional price levels for the bottom 10 metros are 12 percent higher, on average, than they are nationally, which has the effect of raising the wage threshold separating lower-wage from higher-wage employment. See the sidebar on the next page for a closer look at lower-wage employment and the insight it offers into the heterogeneity of metro areas with low opportunity employment shares.

Figure 6. Metro Areas with Highest and Lowest Opportunity Employment Shares (2017)



Sources: Authors' calculations using data from BLS Occupational Employment Statistics (May 2017), Burning Glass Technologies (2015–2017), BEA Regional Price Parities (2016), and American Community Survey Five-Year Public Use Microdata Sample (2012–2016)

Lower-Wage Employment

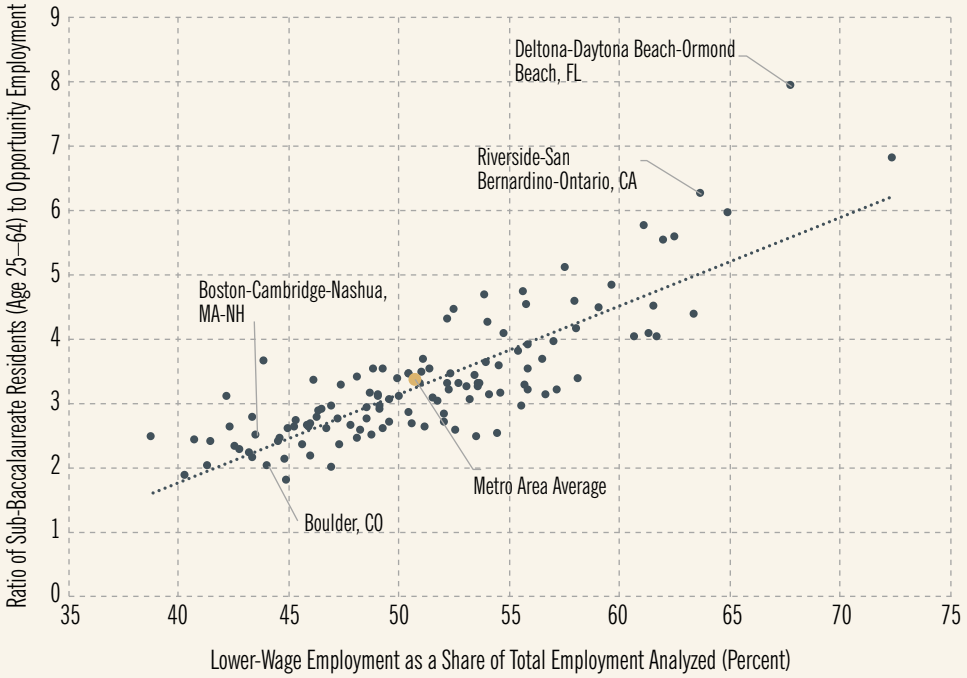
Because we use the national annual median wage as the basis for differentiating higher-wage from lower-wage employment, it is unsurprising that roughly half of overall employment in the metro areas analyzed is classified as lower-wage work. The overall level masks a great deal of variation that we observe across metro areas, however.

Among the 121 metro areas analyzed, lower-wage employment generally constitutes between 40 and 60 percent of total employment (roughly within 10 percentage points of the overall figure). This statistic falls as low as 38.8 percent in Durham-Chapel Hill, NC. At the other end of the spectrum, we find 11 metro areas for which lower-wage employment represents between 60 and 70 percent of total employment, and eight of the 11 are in Florida or California. In Myrtle Beach, SC, nearly three out of every four jobs are considered lower-wage. (See Appendix 3 for estimates for every metro area analyzed.)

Because more than two-thirds of U.S. residents age 25 and over do not have a four-year college degree and only 21.6 percent of employment in the metro areas analyzed meets our definition of opportunity employment, it is necessarily the case that sub-baccalaureate workers outnumber accessible jobs paying higher wages. In fact, we find that there are roughly 3.4 sub-baccalaureate working-age residents (25–64 years old) for each of these jobs across the metro areas analyzed. In regional economies disproportionately built around lower-wage employment, the ratio is generally much higher, as indicated in Figure 7. Considering the degree to which jobs are distributed between lower- and higher-wage work is helpful in understanding the heterogeneity of metro areas with low opportunity employment shares. For example, even though Boulder, CO and Boston have below-average opportunity employment shares, there are fewer sub-baccalaureate workers competing for each job in these relatively high-wage economies. Examples to the contrary include Riverside, CA and Deltona, FL.

The difference between an occupation's annual median wage and the local wage threshold can be quite small. Of the 50.7 million jobs classified as lower-wage employment in the metro areas analyzed, we find that roughly 6 percent are accessible to sub-baccalaureate workers and can be found in an occupation with an annual median wage within 5 percent of the local wage threshold. In a number of metro areas, more than one in 10 lower-wage jobs are just below the wage threshold. With a modest pay increase, the typical worker in these occupations would earn above the wage threshold — and lower-wage workers in the same profession would have a reasonable expectation of achieving the same level of pay over time.

Figure 7. Ratio of Sub-Baccalaureate Residents to Opportunity Employment vs. Lower-Wage Employment (2017)



Note: In the calculation of the ratio, the opportunity employment estimate is adjusted upward to account for the share of metro area employment that could not be analyzed because of data suppression. The metro area average depicted in the figure is employment-weighted.

Sources: Authors' calculations using data from BLS Occupational Employment Statistics (May 2017), Burning Glass Technologies (2015–2017), BEA Regional Price Parities (2016), American Community Survey Five-Year Public Use Microdata Sample (2012–2016), and American Community Survey One-Year Estimates, Table B23006 (2017)

Given these patterns and scanning the metro areas listed in Figure 6, one might conclude that opportunity employment is simply a function of metro area size and cost of living. Figure 8 indicates that there is a slight association (a correlation of –0.28) between a metro area's size (measured by the log of metro area total employment) and its share of opportunity employment. There is also considerable variation across similarly sized metro areas. Take Austin, TX and Cleveland, for example. Both economies include roughly 1 million jobs, but Austin's opportunity employment share of 18.5 percent is much lower than Cleveland's 30.1 percent.

Figure 9 suggests a strong negative association between regional price levels and opportunity employment shares (a correlation of –0.63). It is the case that metro areas with comparable price levels can have very different opportunity employment shares; for example, costs in both Deltona, FL and Spokane, WA are roughly 5 percent below the national average, but their opportunity employment shares are 16.2 percent and 29.7 percent, respectively. Nevertheless, across the full sample of metro area analyzed, Figure 9 suggests that there is a clear relationship between regional price levels and opportunity employment.

See Appendix 3 for detailed information on the distribution of employment for all of the metro areas analyzed.

Figure 8. Metro Area Opportunity Employment Shares vs. Total Employment (2017)

Sources: Authors' calculations using data from BLS Occupational Employment Statistics (May 2017), Burning Glass Technologies (2015–2017), BEA Regional Price Parities (2016), and American Community Survey Five-Year Public Use Microdata Sample (2012–2016)

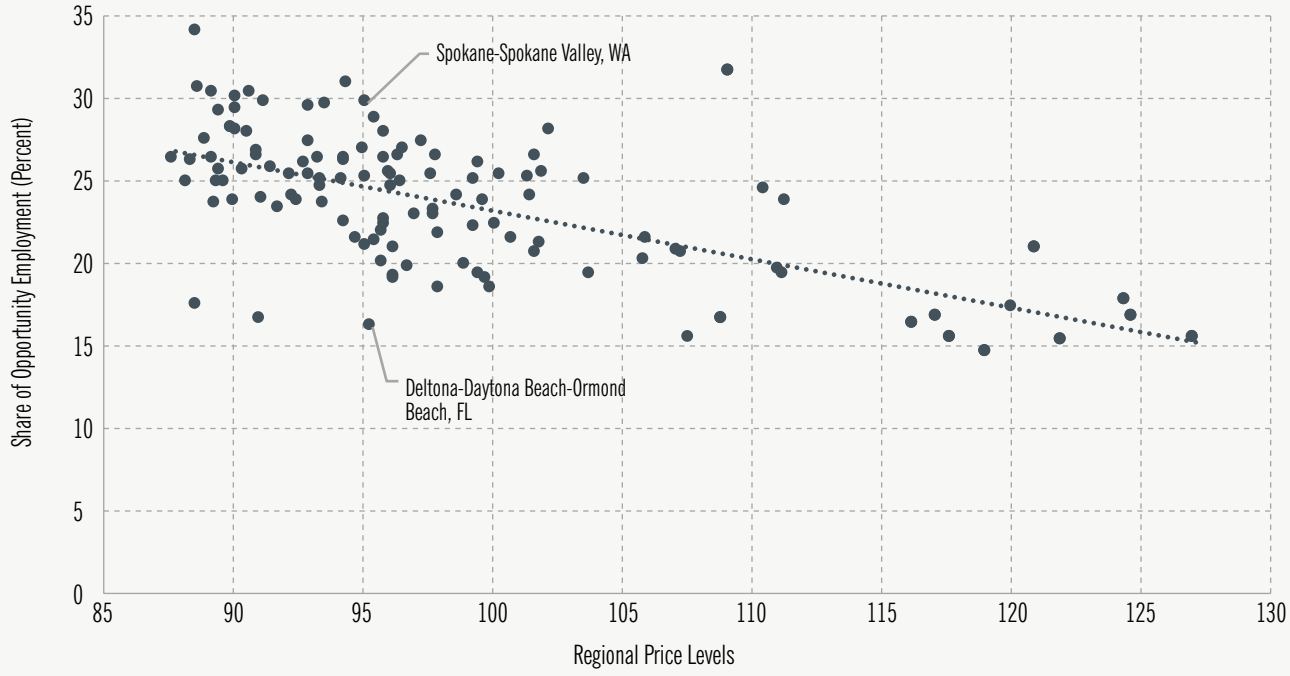
How do a metro area's occupational mix, employers' educational expectations, and price levels affect the share of opportunity employment?

As we have shown, decent-paying job opportunities for sub-baccalaureate workers constitute widely varying percentages of total employment across metro areas. As Figures 8 and 9 suggest, the local opportunity employment share is highly correlated with regional prices but only weakly related to metro area size.

In addition to regional price levels, the findings presented above indicate that the occupational mix of jobs present in a regional economy and the level of education employers expect in competitive job candidates can influence local opportunity levels. A greater concentration of decent-paying jobs widely available to workers without a bachelor's degree — think carpenters or electricians — can certainly increase opportunity. Likewise, for occupations for which a bachelor's degree is sometimes but not always required — such as registered nurses — the educational preferences of local employers hiring to fill these positions can expand (or limit) the number of viable job opportunities for sub-baccalaureate workers.

To understand how these three factors — occupational mix, employers' educational expectations, and regional price levels — affect local opportunity individually and in combination, we recalculate opportunity employment levels for every occupation in each metro area under what we refer to as a "national counterfactual" scenario. In this scenario, we ignore actual occupational job counts and use instead the level of employment that would have been expected in each metro area based on how occupations are distributed nationally. Likewise, rather than using local employers' educational expectations, we use the educational expectations of employers for a given occupation across all metro areas.[16] Finally, rather than adjusting the national annual median wage for regional price levels to develop a local wage threshold,

Figure 9. Metro Area Opportunity Employment Shares vs. Regional Price Levels (2017)



Sources: Authors' calculations using data from BLS Occupational Employment Statistics (May 2017), Burning Glass Technologies (2015–2017), BEA Regional Price Parities (2016), and American Community Survey Five-Year Public Use Microdata Sample (2012–2016)

[16] Although we use the sub-baccalaureate share of job ads aggregated across all metro areas, excluding nonmetro areas, we refer to these as "national" counterfactual estimates for the sake of simplicity. As mentioned in footnote 6, for some occupations in every metro area — and for nearly half of employment in some smaller metro areas — we use the share of sub-baccalaureate job ads for a group of similar metro areas because there is an insufficient number of job ads to understand truly local educational preferences. Where this is the case, the national counterfactual estimates capture the difference between national educational preferences and those estimated for the metro area group, not the metro area itself.

we simply use the unadjusted value ($37,690) to determine whether an occupation's annual median wage is sufficient for it to be classified as opportunity employment. We describe these counterfactual estimates as the "expected" level for a metro area based on national conditions. Calculating these counterfactual estimates and comparing them to actual opportunity employment levels allows for an understanding of how these factors work in concert to affect local opportunity.

In addition to reflecting some measure of employer "upcredentialing," it is worth restating that the metro-to-metro variation in the share of openings for sub-baccalaureate workers for a given occupation likely also captures the uneven distribution of more and less sophisticated jobs (within an occupation) across economies. It follows, then, that the difference between the local and national shares of sub-baccalaureate job ads actually absorbs some of the effect of occupational mix that standard occupational classification systems are too broad to capture. Thus, this exercise likely overstates the effect of employers' educational expectations and understates the effect of occupational mix.

Table 2 uses data for bill and account collectors in Birmingham, AL and New York City to illustrate the logic behind the national counterfactual scenario. In Birmingham, bill and account collectors earn an annual median wage ($34,700) just above the wage threshold adjusted for regional price levels ($33,470). Nearly all jobs (97 percent) are accessible to sub-baccalaureate workers, resulting in opportunity employment of 1,371 jobs. In New York City, on the other hand, while the annual median wage ($44,380) is higher than in Birmingham, it is slightly below the local wage threshold ($45,980), so this occupation does not contribute to the metro area's stock of opportunity employment.

Table 2. Illustration of the National Counterfactual Scenario (2017)

Bill and Account Collectors	Birmingham-Hoover, AL	New York-Newark-Jersey City, NY-NJ-PA
Actual estimates		
Total employment	1,410	11,960
Annual median wage	$34,700	$44,380
Wage threshold (national annual median wage adjusted for regional price levels)	$33,470	$45,980
Local sub-baccalaureate share	97%	62%
Opportunity employment	1,371	0
National counterfactual scenario		
Expected employment based on national distribution	959	17,851
Annual median wage	$34,700	$44,380
Wage threshold (unadjusted national annual median wage)	$37,690	$37,690
Sub-baccalaureate share across all metro areas	79%	79%
Opportunity employment	0	14,053
Difference in opportunity employment (actual vs. national counterfactual)	1,371	-14,053
Attributable to occupational mix	205	-2,152
Attributable to employers' educational expectations	117	-1,350
Attributable to regional price levels	1,049	-10,551

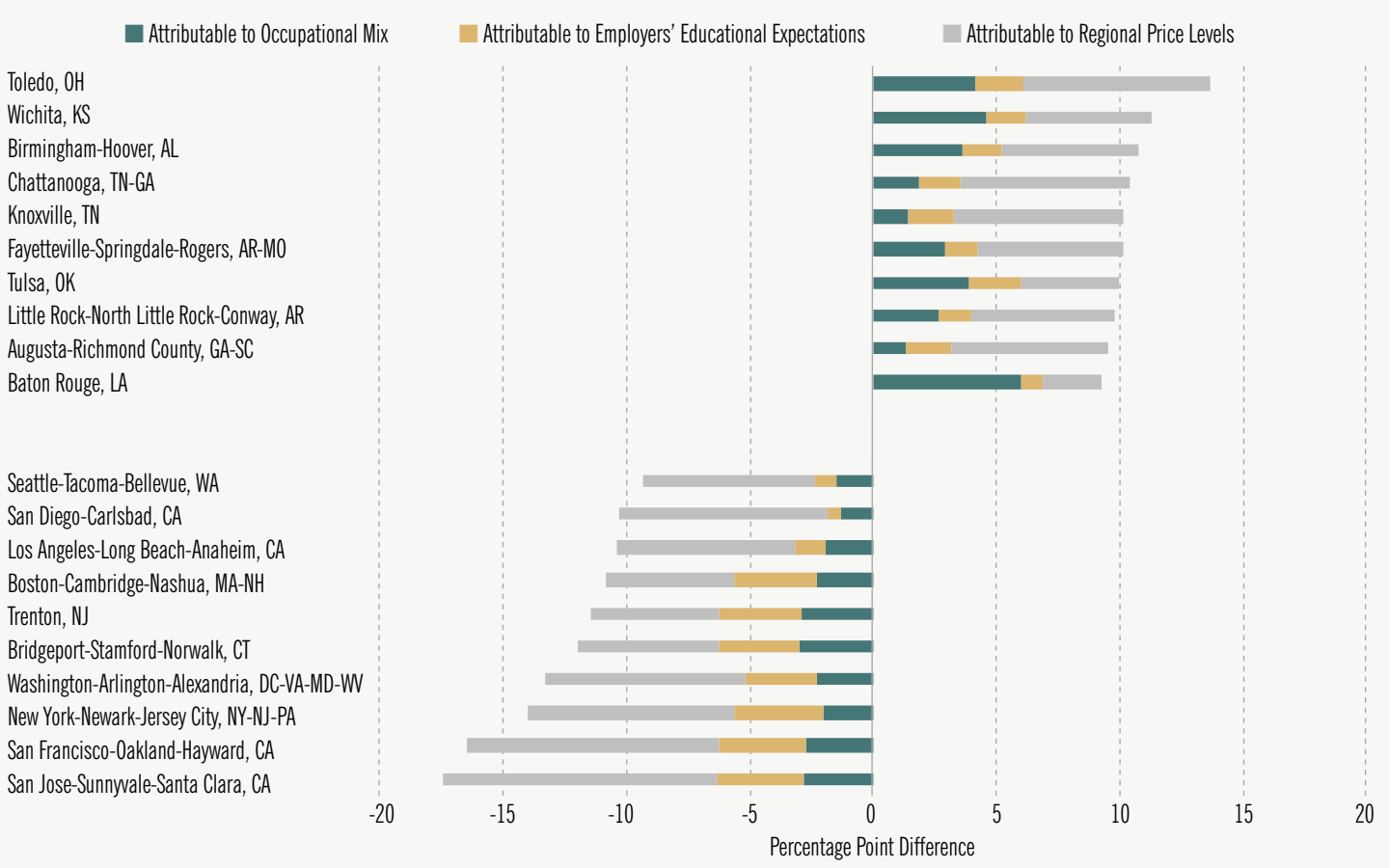
Sources: Authors' calculations using data from BLS Occupational Employment Statistics (May 2017), Burning Glass Technologies (2015–2017), BEA Regional Price Parities (2016), and American Community Survey Five-Year Public Use Microdata Sample (2012–2016)

In the national counterfactual scenario, it becomes clear that bill and account collectors are overrepresented in Birmingham (1,410 vs. 959 jobs) and underrepresented in New York City (11,960 vs. 17,851 jobs). Further, as might be expected, the occupation is more accessible to sub-baccalaureate workers in Birmingham (97 percent) and less accessible in New York City (62 percent) when compared with all metro areas (79 percent). Using the unadjusted national annual median wage ($37,690) as the threshold between lower-wage work and opportunity employment, compensation in Birmingham ($34,700) falls short, but in New York City, the annual median wage ($44,380) exceeds the threshold, leading to opportunity employment in the latter but not the former.

As compared with the national counterfactual estimates, then, this occupation offers sub-baccalaureate workers a surplus of opportunity employment in Birmingham (1,371) but a deficit in New York City (–14,053). The surplus in Birmingham is the product of three factors: The regional occupational mix includes a higher proportion of this occupation, a larger share of employers are willing to hire sub-baccalaureate workers, and the relatively low cost of living in this region allows this occupation to exceed the regionally adjusted national annual median wage. The reverse of each of these conditions is true in high-cost New York City.

As Figure 10 illustrates, a comparison of actual opportunity employment shares with those produced under the national counterfactual scenario suggests that a metro area's occupational mix, the educational expectations of its employers, and its price levels can substantially affect its opportunity employment share, with a combined effect of more than 10 percentage points in some cases. For the majority of metro areas displayed in Figure 10 and for the vast majority of those analyzed, regional price levels have a greater impact on the local opportunity employment share than do either the types of jobs available in the regional economy or the educational attainment requested by employers. In other words,

Figure 10. Difference Between Actual and National Counterfactual Opportunity Employment Shares (2017)



Note: The national counterfactual methodology does not produce reliable employment estimates for 12 of the 121 metro areas included in the full analysis, so they are excluded from this exercise.

Sources: Authors' calculations using data from BLS Occupational Employment Statistics (May 2017), Burning Glass Technologies (2015–2017), BEA Regional Price Parities (2016), and American Community Survey Five-Year Public Use Microdata Sample (2012–2016)

Table 3. Metro Areas for Which the Actual Opportunity Employment Share Differs Notably from the National Counterfactual Scenario Estimate (2017)

Metro Area	Effect of Occupational Mix	Effect of Employers' Educational Expectations	Effect of Regional Price Levels
Akron, OH			positive
Anchorage, AK	positive	positive	negative
Augusta-Richmond County, GA-SC			positive
Baltimore-Columbia-Towson, MD			negative
Baton Rouge, LA	positive		
Birmingham-Hoover, AL	positive		positive
Boston-Cambridge-Nashua, MA-NH		negative	negative
Boulder, CO	negative		negative
Bridgeport-Stamford-Norwalk, CT	negative	negative	negative
Cedar Rapids, IA	positive		
Chattanooga, TN-GA			positive
Cleveland-Elyria, OH			positive
Davenport-Moline-Rock Island, IA-IL	positive		
Dayton, OH			positive
Denver-Aurora-Lakewood, CO			negative
Fayetteville-Springdale-Rogers, AR-MO	positive		positive
Greensboro-High Point, NC			positive
Greenville-Anderson-Mauldin, SC			positive
Houston-The Woodlands-Sugar Land, TX	positive		
Huntsville, AL			positive
Knoxville, TN			positive
Lancaster, PA	positive		
Lansing-East Lansing, MI		positive	
Lexington-Fayette, KY	positive		
Little Rock-North Little Rock-Conway, AR	positive		positive
Los Angeles-Long Beach-Anaheim, CA			negative
Memphis, TN-MS-AR			positive
New York-Newark-Jersey City, NY-NJ-PA		negative	negative
Ogden-Clearfield, UT	positive	positive	
Oxnard-Thousand Oaks-Ventura, CA			negative
Salem, OR		positive	
San Diego-Carlsbad, CA			negative
San Francisco-Oakland-Hayward, CA	negative	negative	negative
San Jose-Sunnyvale-Santa Clara, CA	negative	negative	negative
Santa Rosa, CA			negative
Seattle-Tacoma-Bellevue, WA			negative
Sioux Falls, SD	positive		
St. Louis, MO-IL			positive
Toledo, OH	positive		positive
Trenton, NJ	negative	negative	negative
Tulsa, OK	positive		
Urban Honolulu, HI			negative
Washington-Arlington-Alexandria, DC-VA-MD-WV		negative	negative
Wichita, KS	positive		positive

Note: For occupational mix and employers' educational expectations, "positive" and "negative" indicate that more than 2.5 percentage points of the difference between the actual and national counterfactual opportunity employment shares can be attributed to the factor in question. In light of the greater impact of regional price levels, we use a 5 percentage point threshold for that factor. The national counterfactual methodology does not produce reliable employment estimates for 12 of the 121 metro areas included in the full analysis, so they are excluded from this exercise.

Sources: Authors' calculations using data from BLS Occupational Employment Statistics (May 2017), Burning Glass Technologies (2015–2017), BEA Regional Price Parities (2016), and American Community Survey Five-Year Public Use Microdata Sample (2012–2016)

the opportunity employment share in a high-cost metro area such as San Jose, CA is often lower than in a low-cost metro area such as Toledo, OH, in large part because the local wage threshold is $47,900 in the former and $33,400 in the latter. As a result, occupations paying an annual median wage between $33,400 and the national annual median wage ($37,690) in Toledo are considered opportunity occupations, but those paying between the national annual median wage and $47,900 in San Jose are not. The net effect is that regional price levels reduce San Jose's opportunity employment share by 11.1 percentage points relative to its national counterfactual estimate but increase Toledo's by 7.6 percentage points.

Regional prices tell only part of the story, however. In fact, for 40 of the metro areas analyzed, occupational mix and employers' educational expectations combine to exert more influence on the opportunity employment share than do regional prices. For the majority of the metro areas shown in Figure 10, the combined effects of occupational mix and employers' educational expectations either increase or decrease the opportunity employment share by at least 5 percentage points relative to the national counterfactual estimate.

Table 3 lists the metro areas for which at least one of these three factors substantially affects regional opportunity employment. In order to be included in Table 3, a metro area's opportunity employment share, relative to its national counterfactual estimate, has to be more than 2.5 percentage points higher or lower because of its occupational mix or its employers' educational expectations or more than 5 percentage points higher or lower because of its regional price levels. For roughly one-third of these metro areas, local opportunity employment is materially impacted by more than one of these factors. In the majority of cases, these factors move in the same direction, either positively or negatively affecting the level of local opportunity employment. For example, all three factors have a negative effect on San Francisco's opportunity employment share. However, cases such as Anchorage, AK illustrate that these factors can at least partially counteract one another by influencing opportunity employment in opposing ways.

See Appendix 4 to learn more about how the actual opportunity employment share compares with estimates developed under the national counterfactual scenario for the 109 metro areas eligible for this exercise.

DISCUSSION

The likelihood of finding decent-paying employment in any labor market hinges not only on one's personal skills and abilities but also on the type of work available, the education and credentials that local employers seek, and the relationship between wage levels and prices. Consistent with our original research on opportunity occupations (Wardrip et al. 2015), this report finds that opportunity-rich employment for sub-baccalaureate workers takes many forms, both within and across regional economies. Where opportunity employment is in short supply, however, there are several ways to close this gap that are worth exploring.

One of the most striking findings in this report is the lack of consensus among employers about the importance of a bachelor's degree for some of the largest opportunity occupations. This is evident in the wide metro-to-metro variation in the share of job postings open to sub-baccalaureate workers and is particularly true for white-collar opportunity occupations in office and administrative support and sales. Some of this variation can surely be explained by the higher demand for certain skills observed in higher-wage labor markets (Deming and Kahn 2018), the heterogeneity in required skills captured by more nuanced job titles but masked by standard occupational classification (Marinescu and Wolthoff 2016), and evidence that for some occupations, job ads seeking college-educated candidates ask for advanced skills relative to sub-baccalaureate job ads (Burning Glass Technologies 2014).[17] Our analysis does not control for these possibilities, but if they do not fully explain the variation in employers' educational preferences across metro areas, the demand for a college degree may represent an unnecessary barrier for sub-baccalaureate workers in some places relative to others.

The frequency with which employers seek college-educated candidates has also changed in recent years. Occupations evolve continuously, and evidence suggests that some increasingly require a higher level or different set of skills than they have historically as a result of structural shifts in the economy (Hershbein and Kahn 2018a). Nevertheless, this report is not the first to identify the loosening of educational requirements in a strengthening economy (Modestino, Shoag, and Ballance 2016).[18] Consistent with prior research (Modestino, Shoag, and Ballance 2019; Modestino, Shoag, and Ballance 2016; Fuller and Raman 2017), the suggestion is that employers' preferences for college-educated candidates may be at least partly related to the depth of the labor pool and not solely due to the education required by the work itself.

Rather than being set in stone, the "dynamic nature of employer skill requirements" (Modestino, Shoag, and Ballance 2016, p. 346) implied by this body of research hints at a greater potential to match workers lacking a four-year college degree to decent-paying employment — a potential that need not depend on a sharp decline in the unemployment rate to be realized. Employers can promote this matching process in a number of ways. For example, when developing a job description or posting a job advertisement, careful consideration and clear, standardized communication of the skills and competencies necessary for success in a given occupation could lead to hiring efficiencies for the employer, a better "signaling" of private sector skill requirements to workers and training providers, and a subsequent narrowing of the perceived skills gap (Tyszko, Sheets, and Reamer 2017; Tyszko 2018). A focus on hiring for specific hard and soft skills and a commitment to objectively assessing the skills of applicants with a variety of experiences and educational backgrounds could simultaneously reduce employer costs[19] and expand opportunities for some prospective workers in the process.[20]

By itself, however, greater employer openness to skills-based hiring practices would not expand employment opportunities for workers lacking in-demand skills. Some occupations will always require a level of training and preparation that can be achieved only through extensive postsecondary study, and, particularly in regional economies where these occupations are concentrated, efforts to make baccalaureate and graduate-level education affordable and accessible for lower-income students are important. For other occupations, however, a stronger societal commitment

[17] Each of these explanations could also reflect variations in industry composition across metro areas. In other words, executive secretaries working in a labor market with a high concentration of firms in finance and insurance might need a different skill set than if the market largely consisted of employers in accommodation and food services.

[18] Recent descriptive analyses of online job ads suggest that between 2012 and 2017, employers also became less likely to ask for prior work experience (Burning Glass Technologies 2018a) and somewhat less likely to require a background check (Burning Glass Technologies 2018b). Contrary to these analyses, however, Hershbein and Kahn (2018a) argue that skill requirements remained high through 2015 and present complementary findings suggesting that firms' demand for greater skills is structural rather than cyclical.

[19] Fuller and Raman (2017) find that for some middle-skills occupations, job postings that require a bachelor's degree take longer to fill on average and are associated with higher wages when compared with ads that have no such requirement.

[20] For an expanded discussion of technological advancements in labor market matching, see Lennon and Steinberg (2018).

to shorter-term, lower-cost postsecondary skills development could not only help close the perceived skills gap but also lower employer inhibitions to removing the degree requirement from their job postings in the first place.[21] In light of the number of supervisory positions among the ranks of the largest opportunity occupations, the role of employer-provided incumbent worker training to prepare employees for better-paying managerial positions should not be overlooked. Employers can also play an active role in developing workers' skills by exploring apprenticeships, a well-known example of the "earn-and-learn" model, and a recent analysis suggests that there is substantial opportunity to expand this model to new occupations (Fuller and Sigelman 2017). Whether skills are developed and credentials are attained through an apprenticeship, a sector-based career pathways approach, a coding boot camp, or any other means, the sometimes challenging task of engaging employers in both the development of the training curriculum and the hiring of successful participants is critical to success (Opportunity America, American Enterprise Institute for Public Policy Research, and Brookings Institution 2018; Jones 2018).[22]

In addition to improving the skills of today's workers and expanding access to available jobs, local leaders can also focus regional economic development efforts on industries providing above-average levels of decent-paying employment for workers without a bachelor's degree. While this paper analyzes occupations, economic development strategies more commonly target industries. Metro areas with low opportunity employment shares — and particularly lower-wage economies where sub-baccalaureate workers greatly outnumber opportunity-rich jobs — could benefit from the growth of industries where such jobs are disproportionately represented. When these "opportunity industries" are tradable (i.e., oriented to external markets), they can also promote broader economic growth (Shearer and Shah 2018).[23]

This report also illustrates that regional prices have large effects on the level of opportunity employment in an area. The national counterfactual exercise shows that the level of opportunity employment is frequently lower in high-cost metros and higher in low-cost metros owing, at least in part, to regional price levels. For occupations just below the wage threshold, a modest wage increase could expand the local stock of opportunity employment.[24] Moreover, given that housing costs are a large component of regional prices and household budgets, efforts to maintain or expand the level of opportunity employment could look to affordable housing policies for solutions.[25] In both low- and high-cost metros, policies that create and preserve affordable housing could lead to better alignment between costs and wages. While the correct combination of affordable housing interventions is dependent on local conditions and is beyond the scope of this report, the opportunity occupation framework provides some common ground for housing and workforce development professionals to work more closely.

As the number of recent publications on this topic suggests, a single study cannot answer all of the important questions, and the best studies lead to even more lines of inquiry. We believe that future research should seek to understand the effect that a metro area's level of opportunity has on outcomes for its workers as well as on the region's level of economic growth and inequality. It is also worth exploring whether sub-baccalaureate workers respond to regional opportunity levels by migrating from places with low levels to places where accessible work is more abundant. Finally, we are curious whether competition for workers, as measured by the local concentration of firms hiring for a given occupation, affects the educational expectations included in job postings. Given the increasing interest in economic mobility and the ever-expanding frontier of data with which to investigate the issue, we look forward to the field's further exploration of the causes and consequences of local economic opportunity.

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[21] In an evaluation of a career pathways program for young adults, Fein and Hamadyk (2018) note that, after participating in the program, several employers reconsidered their requirements for entry-level positions, providing anecdotal evidence that "effective sectoral programs can lead employers to substitute a trusted workforce intermediary's 'brand' for academic credentials in hiring decisions" (p. 91).

[22] For more on employer engagement models, see Van Kleunen (2018).

[23] For more on various approaches to urban economic development and their effectiveness, see Bartik (2016).

[24] That is, assuming a modest wage increase would not materially affect employer hiring behavior.

[25] Housing costs are assigned more weight than any other expenditure in the development of the Regional Price Parities used to adjust for regional price levels. More information can be found at https://www.bea.gov/sites/default/files/methodologies/RPP2016_methodology.pdf.

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APPENDIX 1

Detailed Data and Methods

Local estimates of employment and wages

Occupation-level estimates of employment and wages for metro areas are from the May 2017 Occupational Employment Statistics (OES) data set published by the U.S. Department of Labor's Bureau of Labor Statistics (BLS).[26] OES estimates capture full- and part-time employment in nonfarm establishments and exclude military-specific occupations, self-employed workers, unincorporated firms, household workers, and unpaid family workers. We used six-digit occupation codes to identify 766 occupations in our sample. Wages reflect gross pay and include tips but exclude overtime pay, tuition reimbursements, and other types of premium pay. For occupations classified in the OES file as being paid an annual salary but not working 40 hours per week, 52 weeks per year (e.g., teachers), we used the annual median wage provided in the OES data set. For the majority of occupations, however, we calculated an annual median wage assuming 52 weeks but using the typical hours worked per week as estimated from American Community Survey (ACS) data (see below).

Employers' educational preferences

We used data acquired from Burning Glass Technologies (BGT) to understand the level of education sought by employers filling open positions during the study period. BGT collects online job advertisements from more than 40,000 websites daily and populates a database with dozens of data points extracted from each job ad that can be used in labor market research.[27] The information of primary interest for this research includes the occupation associated with the job ad, the metro area of the employer, and the minimum level of education listed in the ad. Regarding the last piece of information, and as stated in the report, it is not clear whether the lowest level of education mentioned by the employer is required or simply preferred.

Before describing our use of the job postings data in this analysis, a few caveats related to this form of real-time labor market information should be mentioned.

It is well known that not all job openings are posted online; using data from the prior year, Carnevale, Jayasundera, and Repnikov (2014) estimated that 60–70 percent of all job openings were posted online, a share that is believed to have risen to approximately 85 percent (Burning Glass Technologies). Further, whether a job opening is posted online is thought to be a function of how likely an employer or job seeker is to use the internet when hiring or looking for a job. This leads to an underrepresentation of less skilled occupations and jobs in the skilled trades, which typically employ sub-baccalaureate workers, and an overrepresentation of high-skilled jobs for college-educated workers (Carnevale, Jayasundera and Repnikov 2014; Rothwell 2014; EMSI 2015; Hershbein and Kahn 2018b; Rothwell 2012). This pattern is problematic for our study only if, within an occupation, higher-skilled openings are more likely to be posted online than are those requiring less education; analyses by BGT had not uncovered this type of bias preceding our initial use of this data set (Wardrip et al. 2015), but were this to be the case, our analysis would underestimate opportunity for sub-baccalaureate workers.

Because this study focuses on the characteristics of the job ads posted rather than on their number, a more pressing concern is the accuracy of the data extracted from the ads that are posted. Carnevale, Jayasundera and Repnikov (2014) found that accuracy varied depending on what was being extracted. The geographic location, occupation title, major occupation group, education, and skills were considered accurate greater than 80 percent of the time, while accuracy levels were lower for industry and more detailed occupation codes. It is possible that accuracy is greater today because the algorithms used to extract information from job ads are continually being refined (Hershbein and Kahn 2018b). We believe that one of the strengths of online job ads data is their ability to illuminate the differential demand for education and skills across metro areas, a strength we argue outweighs their inherent weaknesses.

[26] For more on OES data, see https://www.bls.gov/oes/.

[27] For more on Burning Glass Technologies data, see https://www.burning-glass.com/.

In total, the BGT database included 75.7 million job ads posted by employers between 2015 and 2017, the years on which our research is primarily focused. After excluding job ads with no level of education provided (true for roughly half of the sample), ads for internships, and ads missing information on geographic location, our data set included approximately 29.1 million job ads in the metro areas analyzed. Using the same exclusions, additional job ads were analyzed for the prior three-year period (2012–2014) for our investigation of temporal changes in employers' educational expectations.

For an occupation with an annual median wage that exceeded the minimum threshold in a given metro area, the share of sub-baccalaureate job ads for that occupation in the BGT data set was multiplied by the total employment estimate in the OES data set to arrive at an estimate of opportunity employment. We used local job ads for occupations with at least 100 ads posted in the metro area between 2015 and 2017 with a minimum level of education provided, a circumstance that was true for 83 percent of total employment analyzed in the 121 metro areas.

If there were fewer than 100 job ads with education specified for an occupation in a given metro area, we instead used the sub-baccalaureate share from a group of metro areas with similar levels of educational expectations. In order to develop these groups, for every occupation for which we had at least 100 job ads locally between 2012 and 2017,[28] we calculated the ratio of the local share of sub-baccalaureate job ads to the national share. For this set of occupations, we calculated the median ratio for each metro area, with lower median values indicating a lower share of jobs accessible to sub-baccalaureate workers than is true nationally.[29] We used these median values to create three metro area groups: least accessible for sub-baccalaureate workers (median ratio <0.95); average accessibility (median ratio 0.95–1.05); and most accessible for sub-baccalaureate workers (median ration >1.05).[30] If an occupation had fewer than 100 local job ads with education specified in a given metro area, we applied the share of sub-baccalaureate job ads from the appropriate group of metro areas. This was true for 14 percent of total employment analyzed in the 121 metro areas. In the few cases in which there was an insufficient number of job ads in a given metro area group (<1 percent of employment analyzed), the share of sub-baccalaureate job ads across all three groups was used. We had to exclude a very few occupations from the study entirely because there were not 100 job ads with education specified across all metro areas during the study period. See Appendix 5 for more information on the classification of metro areas into three groups based on the relationship between employers' preferences for education at the local and national levels.

For the 63 occupations for which the BLS believes that a doctoral or professional degree is typically required to enter the field, we overrode BGT data and set the share of sub-baccalaureate job ads to 0. We used classifications from the BLS's Employment Projections program (2016–2026) to make this determination; these occupations accounted for the remaining 2 percent of employment analyzed.[31]

An important point of departure from earlier work on opportunity occupations is the fractional, rather than binary, use of the sub-baccalaureate share calculated from BGT data. In prior work (Wardrip et al. 2015), we considered all of a higher-wage occupation's employment to be opportunity employment if the occupation's sub-baccalaureate share was at least 50 percent; if the share fell below 50 percent, we classified it entirely as higher-wage work requiring a bachelor's degree. We believe that the shift to a fractional approach paints a better picture of local opportunity, and as noted in the body of the report, the two approaches produce similar results overall.

[28] We used six years of data in order to expand the number of occupations with at least 100 local job ads.

[29] In calculating the median, we excluded occupations for which the national sub-baccalaureate share rounded to 0 percent or 100 percent because by definition, the local share would be identical to the national and the ratio would be 1. Leaving these occupations in the calculation would have skewed the medians toward 1 for each metro area and muted the geographic variation that we were trying to capture. We also excluded military-specific occupations because they are omitted from OES employment data.

[30] Rather than limiting this process to the 121 metro areas analyzed, we included all 387 metro areas in these groups and in the calculation of the groups' sub-baccalaureate shares. We did so in order to maintain flexibility in the selection of metro areas for this report.

[31] For more on Employment Projections data, see https://www.bls.gov/emp/.

Selection of metro areas for analysis

The 121 metro areas analyzed in this study accounted for 103.5 million jobs in the May 2017 OES data set, or roughly 73 percent of employment nationwide. These metro areas were included in this analysis because they met two criteria imposed to ensure reliability of the estimates. First, local job ads (a minimum of 100 ads per occupation) were sufficient to describe the educational expectations of employers for at least half of employment in the metro area. Loosening this criterion would have meant that the educational preferences calculated from the group of similar metro areas (or from all metro areas in a few cases) would have held greater sway in the resulting estimates than would have truly local job ads.

The second criterion was that less than 15 percent of a metro area's employment could be suppressed as a result of missing employment, wage, or job ads data. A higher level of suppression would have called into question whether the results we report using available data are truly representative of the economy as a whole or whether the occupations for which data are suppressed might have qualitatively changed our findings. Among the metro areas meeting the first condition, only Ann Arbor, MI was disqualified by this second condition.

Both the OES data and the online job ads provided by BGT used the 2013 metro area definitions developed by the Office of Management and Budget. Of the 121 metro areas analyzed, 113 are metropolitan statistical areas (MSAs) defined by counties, while eight in the Northeast are New England city and town areas (NECTAs).[32]

Regional variation in consumer price levels

In order to qualify as an opportunity occupation, the annual median wage for an occupation had to meet or exceed a certain wage threshold. Acknowledging that prices vary regionally, we based our wage threshold on the national annual median wage reported in the May 2017 OES file — $37,690 — and adjusted it to reflect consumer price levels in each metro area. To make this adjustment, we used Regional Price Parities (RPPs) produced by the U.S. Department of Commerce's Bureau of Economic Analysis for 2016 (the midpoint of our primary study period). In this series, an RPP value of 100 represents the national average; higher (lower) values reflect higher (lower) prices. Values for the metro areas analyzed ranged from a high of 127.1 in San Jose to a low of 87.8 in Springfield, MO. RPPs are produced for county-based MSAs; for each NECTA in New England, we applied the value of the MSA that had the greatest degree of geographic overlap.[33]

Median weekly hours worked

Rather than assuming all occupations are typified by full-time work and potentially overestimating (or even underestimating) annual wages as a result, we estimated median weekly hours worked using the ACS Five-Year Public Use Microdata Sample covering years 2012 through 2016.[34] There is not a perfect one-to-one match between the occupational codes used in the OES data set and the codes used in the ACS; rather, in the 121 metro areas analyzed, the finer-grained OES data included 766 occupations that corresponded to only 469 broader occupations in the ACS. In spite of this higher level of aggregation and acknowledging the fact that the ACS captures "usual hours worked per week" at all jobs rather than for the primary job only, incorporating the typical experiences of workers is an improvement over assuming a 40-hour work week for occupations that are generally characterized by part-time (or overtime) pay.

In the metro areas analyzed, roughly 73 percent of employment was associated with a median work week of 40 hours, and 4 percent exceeded 40 hours. Annual wages for the remaining 23 percent of employment were calculated assuming fewer than 40 hours of work per week. Chief among these occupations, listed in descending order of employment, are: retail salespersons (35 hours); combined food preparation and serving workers, including fast food (30); cashiers (29); waiters and waitresses (30); stock clerks and order fillers (38); and personal care aides (35).

[32] For more on these metro area definitions, see https://obamawhitehouse.archives.gov/sites/default/files/omb/bulletins/2013/b13-01.pdf.

[33] For more on RPPs, see https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area.

[34] For more on the American Community Survey, see https://www.census.gov/programs-surveys/acs/.

National counterfactual scenario

In an effort to understand the degree to which a metro area's occupational mix, employers' educational expectations, and price levels influenced its level of opportunity employment, we developed alternative estimates under what we call a "national counterfactual" scenario. This exercise not only allows us to compare a metro area's actual opportunity employment share with what it would be if its occupational mix, its employers' educational preferences, and its cost of living mirrored national conditions, but it also allows us to isolate the individual effects of each factor.

At the metro level, we approximated the national occupational mix by dividing actual occupational employment estimates by the location quotient available in the OES file. Doing so scales the occupation's employment to the size of the metro area's economy in a way that mirrors the occupation's national representation. In order to remove the effect of regional price levels, we did not adjust the national annual median wage using the local RPP; rather, we used the unadjusted value ($37,690) as the wage threshold for every metro area. Last, for occupations with an annual median wage above $37,690, we multiplied the alternative employment estimate by the share of sub-baccalaureate job ads across all metro areas (rather than using the local sub-baccalaureate share).[35] For a given occupation, the product of this employment estimate and sub-baccalaureate share, using an unadjusted wage threshold, represented the level of opportunity employment in our national counterfactual scenario. Aggregating these occupation-level values, we calculated a national counterfactual opportunity employment share for each metro area. The estimate of interest in this exercise is the percentage point difference between the actual and national counterfactual opportunity employment shares.

We isolated the effect of each factor on this percentage point difference by employing a methodology referred to by Shorrocks (2013) as the Shapley decomposition because it is calculated in the same way as the Shapley value used in the study of cooperative game theory. Prior research has used this decomposition approach to explore the extent to which differences in state and national poverty levels can be attributed to differences in mean income or differences in the distribution of income at these two geographic levels (Kolenikov and Shorrocks 2003; Dhongde 2004). Rather than using this methodology to disentangle the factors that influence the distribution of income or inequality[36] and emboldened by the claim that "the procedure can be employed in all areas of applied economics whenever one wishes to assess the relative importance of the explanatory variables," (Shorrocks 2013, p. 101) we adopted this approach to better understand how differences between local and national occupational mixes, educational expectations, and regional price levels affect the share of opportunity employment in a metro area.

Our estimates were derived using the following formulas, where "emp" represents an occupation's total employment, "edu" is shorthand for the share of sub-baccalaureate job ads, "$" stands for the wage threshold used, "local" represents the actual, local values for a metro area, and "N" stands for national counterfactual estimates (see page 28 for National Counterfactual Decomposition Formulas). The bracketed term for the wage threshold used in each calculation (either "local $" or "N $") is not used in the equation but rather signifies the threshold used to determine whether an occupation's annual median wage is high enough to be considered opportunity employment.

[35] Although we use the sub-baccalaureate share of job ads aggregated across all metro areas, excluding nonmetro areas, we refer to these as "national" counterfactual estimates for the sake of simplicity.

[36] See Chantreuil and Trannoy (2011) for a discussion of the use of the Shapley decomposition in the study of income inequality.

National Counterfactual Decomposition Formulas

Occupational mix=

2/6 ∗ (local emp ∗ local edu [local $] – N emp ∗ local edu [local $]) +

1/6 ∗ (local emp ∗ N edu [local $] – N emp ∗ N edu [local $])+

1/6 ∗ (local emp ∗ local edu [N $] – N emp ∗ local edu [N $])+

2/6 ∗ (local emp ∗ N edu [N $] – N emp ∗ N edu [N $])

Employers' educational expectations=

2/6 ∗ (local emp ∗ local edu [local $] – local emp ∗ N edu [local $]) +

1/6 ∗ (N emp ∗ local edu [local $] – N emp ∗ N edu [local $])+

1/6 ∗ (local emp ∗ local edu [N $] – local emp ∗ N edu [N $])+

2/6 ∗ (N emp ∗ local edu [N $] – N emp ∗ N edu [N $])

Regional price levels=

2/6 ∗ (local emp ∗ local edu [local $] – local emp ∗ local edu [N $]) +

1/6 ∗ (N emp ∗ local edu [local $] – N emp ∗ local edu [N $])+

1/6 ∗ (local emp ∗ N edu [local $] – local emp ∗ N edu [N $])+

2/6 ∗ (N emp ∗ N edu [local $] – N emp ∗ N edu [N $])

For any occupation for which the opportunity employment estimate under the national counterfactual scenario differed from its actual value, the resulting estimates for occupational mix, employers' educational expectations, and regional price levels sum precisely (with no residual) to this difference. These values were aggregated at the metro area level and used to apportion the overall percentage point difference in the actual and national counterfactual opportunity employment shares to each of the three factors.

Two important caveats to this methodology are worth noting. First, as discussed in the report, there are rational reasons that employers' educational preferences for a given occupation in a given metro area might be higher or lower than they are in aggregate; for example, higher- and lower-skilled work within an occupation is likely unevenly distributed across metro areas, which would necessarily produce varying levels of sub-baccalaureate accessibility. It follows, then, that the difference between the local and national share of sub-baccalaureate job ads actually absorbs some of the effect of occupational mix that standard occupational classification systems are too broad to capture. As such, the effect of employers' educational expectations is likely overstated, and the effect of occupational mix is likely understated.

Second, for some occupations in every metro area — and for nearly half of employment in some smaller metro areas — we used the share of sub-baccalaureate job ads for a group of similar metro areas because there was an insufficient number of job ads to understand truly local educational preferences. Where this is the case, the national counterfactual estimate captures the difference between national educational preferences and those estimated for the metro area group, not the metro area itself; for metro areas assigned to the groups most and least accessible for sub-baccalaureate workers, this approach perpetuates the notion that employers' educational expectations are significantly influencing opportunity. Given these caveats, we do not describe the national counterfactual estimates as the "natural" or "normal" level of opportunity employment; rather, we describe them as the "expected" level based on national conditions. Admittedly imperfect, this exercise is nevertheless helpful in understanding whether opportunity employment is expanded or limited by a metro area's occupational mix, employers' educational expectations, or price levels.

Twelve of the 121 metro areas included in the full analysis are excluded from this exercise because the employment estimates produced under the national counterfactual scenario do not meet our inclusion criteria for the share of total employment analyzed (≥85 percent) or the share of total employment with a sufficient number of local job ads (≥50 percent), or because the close similarity of the actual and counterfactual opportunity employment shares complicates the attribution of the minimal difference to the three factors.

Appendix 4 compares the actual opportunity employment share with the national counterfactual estimate for metro areas analyzed and apportions the difference in these shares to the metro area's occupational mix, employers' educational preferences, and price levels.

Measuring the change in employers' educational expectations over time

In order to determine whether employers' educational expectations changed as the economy strengthened in the years following the Great Recession, we compared the level of education requested during two consecutive three-year periods: our primary study period (2015 to 2017) and the three years prior (2012 to 2014). We limited the sample of job ads in the BGT data set as described above, including only those placed in the 121 metro areas analyzed and excluding ads for internships and those missing information related to education or geography. For this exercise, we focused only on the 16 of the 25 largest opportunity occupations with a sub-baccalaureate share below 100 percent, as reported in Table 1.

Using this sample of 10.1 million job ads, we created a binary education variable (0=bachelor's degree or higher required; 1=no bachelor's degree required) and used this as the dependent variable in 16 occupation-specific linear probability models. The variable of interest in the model was a binary time-period variable (0=2012 to 2014; 1=2015 to 2017). The coefficient on this variable can be interpreted as the change in the share of job ads that did not require a bachelor's degree from the first period to the second period. Each model also included metro area fixed effects. Full model results are available upon request.

APPENDIX 2

100 Largest Opportunity Occupations (2017)

These occupations represent the greatest level of opportunity employment across the 121 metro areas analyzed. For some, all employment meets the definition of opportunity employment, but for others, employers seek candidates with a bachelor's degree to fill a portion of the job openings. Further, in some metro areas, the occupation is classified as lower-wage employment because its annual median wage falls below the local wage threshold.

					SHARE OF EMPLOYMENT		
Rank	Occupation Code	Occupation Title	Opportunity Employment	Total Employment Analyzed	Opportunity Employment	Higher Wages, Bachelor's Degree Required	Lower Wages
1	29-1141	Registered Nurses	1,374,014	2,086,530	65.9%	34.1%	0.0%
2	53-3032	Heavy and Tractor-Trailer Truck Drivers	1,032,790	1,109,200	93.1%	0.0%	6.9%
3	43-3031	Bookkeeping, Accounting, and Auditing Clerks	581,455	1,100,950	52.8%	37.4%	9.8%
4	49-9071	Maintenance and Repair Workers, General	491,285	910,140	54.0%	0.0%	46.0%
5	47-2031	Carpenters	457,460	498,780	91.7%	0.0%	8.3%
6	47-2111	Electricians	453,790	453,790	100.0%	0.0%	0.0%
7	29-2061	Licensed Practical and Licensed Vocational Nurses	446,360	446,360	100.0%	0.0%	0.0%
8	43-1011	First-Line Supervisors of Office and Administrative Support Workers	433,025	1,097,410	39.5%	60.5%	0.0%
9	11-1021	General and Operations Managers	432,315	1,664,070	26.0%	74.0%	0.0%
10	41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	426,495	1,059,600	40.3%	59.5%	0.3%
11	33-3051	Police and Sheriff's Patrol Officers	405,652	461,450	87.9%	12.1%	0.0%
12	41-3099	Sales Representatives, Services, All Other	370,776	824,430	45.0%	53.8%	1.2%
13	41-1011	First-Line Supervisors of Retail Sales Workers	368,040	816,260	45.1%	21.3%	33.7%
14	49-3023	Automotive Service Technicians and Mechanics	338,550	440,280	76.9%	0.0%	23.1%
15	47-2152	Plumbers, Pipefitters, and Steamfitters	313,670	314,670	99.7%	0.0%	0.3%
16	43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	284,418	1,603,040	17.7%	5.1%	77.2%
17	47-2061	Construction Laborers	270,250	672,670	40.2%	0.0%	59.8%
18	15-1151	Computer User Support Specialists	262,827	499,570	52.6%	47.1%	0.3%
19	47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	254,647	390,050	65.3%	34.7%	0.0%
20	43-6011	Executive Secretaries and Executive Administrative Assistants	227,786	481,920	47.3%	52.7%	0.0%
21	41-3031	Securities, Commodities, and Financial Services Sales Agents	225,101	336,650	66.9%	32.1%	1.0%
22	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	221,640	221,640	100.0%	0.0%	0.0%
23	49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	204,586	312,160	65.5%	34.5%	0.0%
24	53-1048	First-Line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Handling Supervisors	204,286	283,890	72.0%	28.0%	0.0%
25	51-1011	First-Line Supervisors of Production and Operating Workers	202,699	379,020	53.5%	46.5%	0.0%
26	33-2011	Firefighters	197,449	217,920	90.6%	6.1%	3.2%
27	47-2073	Operating Engineers and Other Construction Equipment Operators	196,570	210,670	93.3%	0.0%	6.7%
28	49-9041	Industrial Machinery Mechanics	192,510	192,510	100.0%	0.0%	0.0%
29	51-4041	Machinists	190,060	245,320	77.5%	2.2%	20.3%
30	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	173,165	174,670	99.1%	0.8%	0.1%
31	49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	170,340	170,340	100.0%	0.0%	0.0%
32	51-4121	Welders, Cutters, Solderers, and Brazers	166,749	207,850	80.2%	3.1%	16.7%
33	41-3021	Insurance Sales Agents	156,387	281,860	55.5%	42.6%	1.9%

Rank	Occupation Code	Occupation Title	Opportunity Employment	Total Employment Analyzed	SHARE OF EMPLOYMENT		
					Opportunity Employment	Higher Wages, Bachelor's Degree Required	Lower Wages
34	43-5052	Postal Service Mail Carriers	155,022	232,340	66.7%	33.3%	0.0%
35	43-5061	Production, Planning, and Expediting Clerks	152,824	255,270	59.9%	39.1%	1.0%
36	13-1199	Business Operations Specialists, All Other	139,482	809,370	17.2%	82.8%	0.0%
37	29-2010	Clinical Laboratory Technologists and Technicians	138,551	230,640	60.1%	39.9%	0.0%
38	13-1071	Human Resources Specialists	132,968	442,380	30.1%	69.9%	0.0%
39	33-3012	Correctional Officers and Jailers	131,691	191,820	68.7%	18.9%	12.5%
40	51-2098	Assemblers and Fabricators, All Other, Including Team Assemblers	119,823	785,610	15.3%	0.1%	84.7%
41	29-2034	Radiologic Technologists	117,416	137,820	85.2%	14.8%	0.0%
42	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	113,515	351,130	32.3%	12.5%	55.2%
43	43-9041	Insurance Claims and Policy Processing Clerks	106,727	222,070	48.1%	20.5%	31.4%
44	13-2072	Loan Officers	103,213	230,810	44.7%	55.3%	0.0%
45	43-4131	Loan Interviewers and Clerks	101,762	174,170	58.4%	15.0%	26.5%
46	43-4051	Customer Service Representatives	98,491	2,095,760	4.7%	1.0%	94.3%
47	49-3011	Aircraft Mechanics and Service Technicians	96,930	96,930	100.0%	0.0%	0.0%
48	47-2051	Cement Masons and Concrete Finishers	92,520	125,090	74.0%	0.0%	26.0%
49	43-5053	Postal Service Mail Sorters, Processors, and Processing Machine Operators	91,960	101,210	90.9%	9.1%	0.0%
50	43-3021	Billing and Posting Clerks	89,989	358,240	25.1%	10.8%	64.0%
51	41-1012	First-Line Supervisors of Non-Retail Sales Workers	89,321	202,610	44.1%	55.9%	0.0%
52	11-9051	Food Service Managers	89,179	135,380	65.9%	34.1%	0.0%
53	43-6012	Legal Secretaries	88,235	142,440	61.9%	34.9%	3.1%
54	25-2012	Kindergarten Teachers, Except Special Education	86,233	93,760	92.0%	7.7%	0.3%
55	47-2141	Painters, Construction and Maintenance	85,340	166,890	51.1%	0.0%	48.9%
56	47-2211	Sheet Metal Workers	83,290	95,610	87.1%	0.0%	12.9%
57	49-3021	Automotive Body and Related Repairers	82,490	100,630	82.0%	0.0%	18.0%
58	13-1031	Claims Adjusters, Examiners, and Investigators	81,249	231,840	35.0%	63.0%	2.0%
59	21-1012	Educational, Guidance, School, and Vocational Counselors	80,437	190,220	42.3%	57.7%	0.0%
60	49-3042	Mobile Heavy Equipment Mechanics, Except Engines	79,880	79,940	99.9%	0.0%	0.1%
61	23-2011	Paralegals and Legal Assistants	79,090	243,380	32.5%	67.1%	0.4%
62	11-9141	Property, Real Estate, and Community Association Managers	78,146	147,760	52.9%	46.1%	1.0%
63	29-2071	Medical Records and Health Information Technicians	77,171	143,700	53.7%	21.6%	24.7%
64	15-1121	Computer Systems Analysts	76,604	506,140	15.1%	84.9%	0.0%
65	17-3023	Electrical and Electronics Engineering Technicians	74,891	92,910	80.6%	19.4%	0.0%
66	29-2021	Dental Hygienists	73,440	151,570	48.5%	51.5%	0.0%
67	29-2055	Surgical Technologists	73,005	73,200	99.7%	0.3%	0.0%
68	13-1020	Buyers and Purchasing Agents	70,418	320,970	21.9%	78.1%	0.0%
69	49-9052	Telecommunications Line Installers and Repairers	70,270	73,690	95.4%	0.0%	4.6%
70	25-2052	Special Education Teachers, Kindergarten and Elementary School	67,808	128,390	52.8%	46.5%	0.7%
71	13-1151	Training and Development Specialists	67,230	221,660	30.3%	69.7%	0.0%
72	35-1011	Chefs and Head Cooks	67,024	101,110	66.3%	28.1%	5.6%
73	43-3051	Payroll and Timekeeping Clerks	66,350	113,140	58.6%	40.4%	0.9%
74	43-5032	Dispatchers, Except Police, Fire, and Ambulance	66,205	143,350	46.2%	4.6%	49.3%
75	15-1142	Network and Computer Systems Administrators	64,084	307,020	20.9%	79.1%	0.0%

Rank	Occupation Code	Occupation Title	Opportunity Employment	Total Employment Analyzed	SHARE OF EMPLOYMENT		
					Opportunity Employment	Higher Wages, Bachelor's Degree Required	Lower Wages
76	29-1126	Respiratory Therapists	62,789	90,670	69.3%	30.7%	0.0%
77	49-9051	Electrical Power-Line Installers and Repairers	62,690	62,690	100.0%	0.0%	0.0%
78	47-4011	Construction and Building Inspectors	61,627	75,560	81.6%	18.4%	0.0%
79	47-2081	Drywall and Ceiling Tile Installers	60,170	73,890	81.4%	0.0%	18.6%
80	53-3021	Bus Drivers, Transit and Intercity	59,500	124,510	47.8%	0.0%	52.2%
81	43-6013	Medical Secretaries	58,227	420,970	13.8%	1.5%	84.7%
82	15-1152	Computer Network Support Specialists	58,186	154,780	37.6%	62.4%	0.0%
83	43-4199	Information and Record Clerks, All Other	58,048	118,260	49.1%	14.6%	36.3%
84	11-9199	Managers, All Other	57,703	303,260	19.0%	81.0%	0.0%
85	53-2031	Flight Attendants	57,422	74,770	76.8%	2.8%	20.4%
86	31-2021	Physical Therapist Assistants	57,030	57,430	99.3%	0.0%	0.7%
87	47-2181	Roofers	55,810	88,170	63.3%	0.0%	36.7%
88	51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	55,554	86,730	64.1%	3.6%	32.4%
89	25-2031	Secondary School Teachers, Except Special and Career/Technical Education	54,978	689,680	8.0%	92.0%	0.0%
90	49-9099	Installation, Maintenance, and Repair Workers, All Other	54,360	109,960	49.4%	0.6%	50.0%
91	37-1011	First-Line Supervisors of Housekeeping and Janitorial Workers	53,709	111,560	48.1%	15.4%	36.5%
92	51-5112	Printing Press Operators	53,525	125,130	42.8%	4.4%	52.8%
93	29-2099	Health Technologists and Technicians, All Other	52,930	91,100	58.1%	12.9%	29.0%
94	41-9022	Real Estate Sales Agents	52,634	115,190	45.7%	39.7%	14.6%
95	15-1132	Software Developers, Applications	51,129	734,850	7.0%	93.0%	0.0%
96	11-9021	Construction Managers	51,017	207,260	24.6%	75.4%	0.0%
97	11-2022	Sales Managers	50,415	306,930	16.4%	83.6%	0.0%
98	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	50,402	255,620	19.7%	80.3%	0.0%
99	11-3031	Financial Managers	50,210	450,490	11.1%	88.9%	0.0%
100	47-4051	Highway Maintenance Workers	49,740	63,600	78.2%	0.0%	21.8%

Sources: Authors' calculations using data from BLS Occupational Employment Statistics (May 2017), Burning Glass Technologies (2015–2017), BEA Regional Price Parities (2016), and American Community Survey Five-Year Public Use Microdata Sample (2012–2016)

APPENDIX 3

Metro Area Employment Characteristics (2017)

This appendix provides information on the distribution of employment by wages and education, as well as the number of sub-baccalaureate, working-age residents for each job classified as opportunity employment. In order to be included in the study, the metro area's share of employment analyzed (shown below) has to meet or exceed 85 percent, and the share of employment with a sufficient number of local job ads (not shown) has to meet or exceed 50 percent.

				SHARE OF EMPLOYMENT				
Metro Area	Metro Area Employment	Share of Employment Analyzed	Total Employment Analyzed	Higher Wages, Bachelor's Degree Required	Lower Wages	Opportunity Employment	Rank: Opportunity Employment Share (1 to 121)	Ratio of Sub-Baccalaureate Residents (Age 25–64) to Opportunity Employment
Akron, OH	328,230	95.8%	314,330	25.9%	46.0%	28.1%	16	2.6
Albany-Schenectady-Troy, NY	448,160	97.0%	434,610	30.0%	44.6%	25.4%	45	2.5
Albuquerque, NM	381,200	95.3%	363,160	21.7%	59.1%	19.2%	103	4.5
Allentown-Bethlehem-Easton, PA-NJ	358,910	95.5%	342,610	21.5%	57.1%	21.4%	85	3.9
Anchorage, AK	173,420	93.0%	161,320	23.0%	45.4%	31.5%	2	2.7
Asheville, NC	191,430	95.1%	182,010	18.1%	58.2%	23.7%	69	3.4
Atlanta-Sandy Springs-Roswell, GA	2,619,440	97.4%	2,551,890	30.2%	48.9%	20.9%	91	3.5
Augusta-Richmond County, GA-SC	218,410	90.9%	198,540	21.1%	54.0%	24.8%	59	4.3
Austin-Round Rock, TX	996,540	97.0%	966,970	30.1%	51.5%	18.5%	106	3.5
Baltimore-Columbia-Towson, MD	1,360,320	96.5%	1,312,140	30.5%	48.7%	20.7%	92	3.2
Baton Rouge, LA	392,000	94.1%	368,780	22.2%	50.5%	27.4%	22	2.9
Birmingham-Hoover, AL	504,290	96.6%	487,290	24.1%	45.3%	30.6%	4	2.6
Boise City, ID	308,170	94.4%	290,930	22.7%	55.9%	21.4%	86	3.9
Boston-Cambridge-Nashua, MA-NH	2,726,490	94.1%	2,566,850	36.8%	43.6%	19.6%	99	2.5
Boulder, CO	178,460	92.8%	165,690	39.3%	44.1%	16.6%	113	2.0
Bridgeport-Stamford-Norwalk, CT	415,670	94.2%	391,560	34.6%	48.2%	17.2%	110	3.4
Buffalo-Cheektowaga-Niagara Falls, NY	547,750	97.2%	532,420	24.3%	49.6%	26.1%	37	2.7
Cape Coral-Fort Myers, FL	258,370	94.2%	243,490	15.9%	61.6%	22.6%	77	4.5
Cedar Rapids, IA	140,640	88.7%	124,760	26.3%	43.4%	30.3%	6	2.2
Charleston-North Charleston, SC	336,560	95.3%	320,630	21.8%	53.6%	24.5%	61	3.3
Charlotte-Concord-Gastonia, NC-SC	1,186,840	98.3%	1,167,020	29.0%	46.4%	24.7%	60	2.9
Chattanooga, TN-GA	241,810	93.3%	225,570	20.0%	53.6%	26.4%	32	3.3
Chicago-Naperville-Elgin, IL-IN-WI	4,589,690	96.5%	4,430,260	28.2%	52.4%	19.3%	101	3.5
Cincinnati, OH-KY-IN	1,056,680	98.2%	1,037,330	26.3%	44.6%	29.1%	13	2.4
Cleveland-Elyria, OH	1,029,230	96.7%	995,700	27.3%	42.7%	30.1%	7	2.3
Colorado Springs, CO	274,870	94.2%	259,040	28.4%	52.3%	19.4%	100	4.3
Columbia, SC	370,160	95.5%	353,580	23.9%	52.8%	23.3%	73	3.3
Columbus, OH	1,038,240	97.8%	1,015,390	28.8%	45.9%	25.3%	47	2.7
Dallas-Fort Worth-Arlington, TX	3,485,200	98.3%	3,424,760	25.4%	52.3%	22.3%	79	3.3
Davenport-Moline-Rock Island, IA-IL	181,490	93.4%	169,580	22.3%	48.3%	29.4%	12	2.6
Dayton, OH	371,610	95.4%	354,480	25.7%	46.1%	28.2%	15	2.7
Deltona-Daytona Beach-Ormond Beach, FL	192,010	91.7%	176,110	16.0%	67.8%	16.2%	116	7.9
Denver-Aurora-Lakewood, CO	1,443,130	97.0%	1,399,640	32.0%	46.5%	21.4%	84	2.9
Des Moines-West Des Moines, IA	363,420	94.6%	343,780	28.8%	40.4%	30.8%	3	1.9

Metro Area	Metro Area Employment	Share of Employment Analyzed	Total Employment Analyzed	SHARE OF EMPLOYMENT			Rank: Opportunity Employment Share (1 to 121)	Ratio of Sub-Baccalaureate Residents (Age 25–64) to Opportunity Employment
				Higher Wages, Bachelor's Degree Required	Lower Wages	Opportunity Employment		
Detroit-Warren-Dearborn, MI	1,966,680	96.8%	1,903,220	26.7%	47.0%	26.4%	31	3.0
Durham-Chapel Hill, NC	298,540	94.7%	282,610	40.2%	38.8%	21.0%	89	2.5
El Paso, TX	301,590	93.9%	283,190	17.6%	65.0%	17.4%	109	6.0
Eugene, OR	152,110	91.8%	139,710	20.4%	56.5%	23.1%	74	3.7
Fayetteville-Springdale-Rogers, AR-MO	239,920	92.4%	221,570	23.5%	51.6%	24.9%	58	3.1
Fort Collins, CO	154,510	86.3%	133,340	26.7%	52.1%	21.2%	88	2.7
Fresno, CA	372,770	95.4%	355,780	19.0%	62.0%	19.0%	104	5.5
Grand Rapids-Wyoming, MI	551,620	96.0%	529,490	20.5%	54.5%	25.0%	54	2.5
Greensboro-High Point, NC	363,510	96.3%	350,140	21.8%	53.3%	24.9%	57	3.1
Greenville-Anderson-Mauldin, SC	401,590	95.6%	384,050	20.3%	54.1%	25.6%	41	3.1
Harrisburg-Carlisle, PA	323,720	94.8%	306,960	26.9%	48.1%	24.9%	56	2.4
Hartford-West Hartford-East Hartford, CT	581,750	95.5%	555,800	34.1%	40.8%	25.2%	51	2.4
Houston-The Woodlands-Sugar Land, TX	2,929,400	96.4%	2,822,720	26.7%	49.3%	24.0%	64	3.5
Huntsville, AL	222,080	91.3%	202,840	33.0%	43.4%	23.5%	72	2.8
Indianapolis-Carmel-Anderson, IN	1,029,390	96.0%	987,760	25.2%	48.8%	26.0%	38	2.5
Jackson, MS	262,680	94.0%	246,930	22.5%	53.7%	23.8%	68	3.3
Jacksonville, FL	668,140	96.9%	647,140	22.7%	55.4%	21.9%	82	3.8
Kalamazoo-Portage, MI	139,130	89.9%	125,140	21.5%	54.7%	23.9%	66	3.2
Kansas City, MO-KS	1,055,320	98.9%	1,043,730	27.1%	43.3%	29.6%	10	2.2
Knoxville, TN	380,260	95.7%	364,030	21.5%	52.3%	26.1%	36	3.2
Lancaster, PA	241,190	93.5%	225,400	19.0%	55.9%	25.1%	52	3.2
Lansing-East Lansing, MI	215,080	88.1%	189,420	24.9%	45.7%	29.4%	11	2.4
Las Vegas-Henderson-Paradise, NV	962,720	97.5%	938,660	15.7%	61.4%	22.9%	75	4.1
Lexington-Fayette, KY	272,410	91.2%	248,470	23.2%	47.0%	29.8%	8	2.0
Little Rock-North Little Rock-Conway, AR	347,590	96.3%	334,750	25.3%	49.2%	25.6%	42	2.9
Los Angeles-Long Beach-Anaheim, CA	6,047,050	97.6%	5,898,920	27.0%	57.6%	15.4%	119	5.1
Louisville/Jefferson County, KY-IN	646,670	95.3%	616,100	21.5%	52.1%	26.4%	30	2.8
Madison, WI	387,300	93.7%	362,810	29.7%	45.0%	25.3%	48	1.8
Memphis, TN-MS-AR	617,990	96.2%	594,710	21.5%	51.8%	26.7%	26	3.0
Miami-Fort Lauderdale-West Palm Beach, FL	2,561,390	97.2%	2,489,060	21.9%	62.6%	15.5%	118	5.6
Milwaukee-Waukesha-West Allis, WI	841,550	96.9%	815,750	26.3%	44.9%	28.8%	14	2.1
Minneapolis-St. Paul-Bloomington, MN-WI	1,932,310	98.3%	1,899,400	30.6%	41.4%	28.0%	18	2.0
Myrtle Beach-Conway-North Myrtle Beach, SC-NC	157,450	92.7%	145,930	11.1%	72.4%	16.5%	114	6.8
Nashville-Davidson–Murfreesboro–Franklin, TN	940,810	96.4%	906,490	24.4%	49.3%	26.3%	34	2.6
New Haven, CT	273,160	92.5%	252,680	27.6%	48.6%	23.8%	67	2.9
New Orleans-Metairie, LA	552,840	94.6%	522,740	21.3%	53.5%	25.2%	50	3.4
New York-Newark-Jersey City, NY-NJ-PA	9,302,710	98.4%	9,157,440	32.1%	52.5%	15.3%	120	4.5
North Port-Sarasota-Bradenton, FL	289,580	91.9%	266,230	16.8%	63.4%	19.8%	97	4.4
Ogden-Clearfield, UT	249,250	95.8%	238,720	20.0%	53.1%	26.9%	25	3.3
Oklahoma City, OK	603,780	96.9%	584,800	25.2%	49.2%	25.7%	40	3.1
Omaha-Council Bluffs, NE-IA	486,650	96.3%	468,820	26.4%	47.3%	26.3%	35	2.4
Orlando-Kissimmee-Sanford, FL	1,209,250	95.4%	1,153,170	20.8%	60.7%	18.4%	107	4.0
Oxnard-Thousand Oaks-Ventura, CA	309,860	93.7%	290,450	22.1%	61.2%	16.8%	112	5.7
Palm Bay-Melbourne-Titusville, FL	206,760	94.2%	194,800	24.9%	53.9%	21.2%	87	4.7
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	2,813,460	98.1%	2,760,290	29.4%	50.5%	20.1%	95	3.4

Metro Area	Metro Area Employment	Share of Employment Analyzed	Total Employment Analyzed	SHARE OF EMPLOYMENT			Rank: Opportunity Employment Share (1 to 121)	Ratio of Sub-Baccalaureate Residents (Age 25–64) to Opportunity Employment
				Higher Wages, Bachelor's Degree Required	Lower Wages	Opportunity Employment		
Phoenix-Mesa-Scottsdale, AZ	1,980,010	97.3%	1,926,340	25.9%	51.2%	22.9%	76	3.7
Pittsburgh, PA	1,132,950	97.8%	1,108,290	27.1%	47.9%	25.0%	55	2.7
Portland-South Portland, ME	203,740	95.2%	194,000	26.8%	52.6%	20.6%	94	2.6
Portland-Vancouver-Hillsboro, OR-WA	1,157,060	97.4%	1,126,980	28.5%	45.0%	26.5%	27	2.6
Providence-Warwick, RI-MA	567,620	95.3%	540,700	26.3%	50.0%	23.7%	70	3.4
Provo-Orem, UT	229,480	91.8%	210,630	24.4%	55.8%	19.8%	98	3.3
Raleigh, NC	606,510	97.6%	592,190	31.3%	46.3%	22.3%	80	2.8
Reading, PA	172,860	90.3%	156,120	20.6%	54.0%	25.4%	46	3.6
Reno, NV	224,130	95.1%	213,190	18.8%	57.2%	24.0%	65	3.2
Richmond, VA	643,860	94.6%	609,240	27.7%	46.8%	25.5%	43	2.6
Riverside-San Bernardino-Ontario, CA	1,435,200	96.4%	1,383,090	15.7%	63.7%	20.6%	93	6.3
Rochester, NY	510,010	96.8%	493,800	27.2%	51.0%	21.7%	83	3.3
Sacramento–Roseville–Arden-Arcade, CA	960,180	94.7%	909,300	28.4%	46.2%	25.4%	44	3.4
Salem, OR	165,560	92.3%	152,740	21.6%	50.5%	27.9%	19	3.5
Salt Lake City, UT	695,050	95.7%	665,350	26.7%	51.2%	22.1%	81	2.6
San Antonio-New Braunfels, TX	1,003,370	96.9%	972,090	22.8%	54.8%	22.4%	78	4.1
San Diego-Carlsbad, CA	1,433,340	97.6%	1,398,870	28.1%	55.7%	16.2%	115	4.7
San Francisco-Oakland-Hayward, CA	2,369,450	96.5%	2,286,010	35.8%	47.4%	16.8%	111	3.3
San Jose-Sunnyvale-Santa Clara, CA	1,089,070	95.8%	1,042,970	42.3%	42.2%	15.5%	117	3.1
Santa Rosa, CA	202,410	93.6%	189,430	21.0%	58.1%	20.9%	90	4.2
Savannah, GA	170,620	90.6%	154,620	20.5%	55.9%	23.6%	71	3.5
Scranton–Wilkes-Barre–Hazleton, PA	257,730	95.1%	245,090	18.1%	56.7%	25.2%	49	3.1
Seattle-Tacoma-Bellevue, WA	1,944,150	96.4%	1,874,660	33.2%	42.4%	24.5%	62	2.6
Sioux Falls, SD	151,480	94.1%	142,610	22.3%	53.6%	24.1%	63	2.5
Spokane-Spokane Valley, WA	232,920	94.8%	220,890	21.1%	49.2%	29.7%	9	2.9
Springfield, MA-CT	328,300	94.9%	311,670	25.4%	47.3%	27.4%	23	2.8
Springfield, MO	204,320	92.7%	189,410	18.1%	55.6%	26.3%	33	3.0
St. Louis, MO-IL	1,356,630	97.2%	1,318,850	26.9%	42.8%	30.3%	5	2.3
Stockton-Lodi, CA	242,740	92.1%	223,570	14.3%	59.7%	26.0%	39	4.8
Syracuse, NY	302,070	94.7%	286,090	24.5%	48.6%	26.9%	24	2.8
Tampa-St. Petersburg-Clearwater, FL	1,280,170	97.3%	1,245,530	23.1%	58.0%	18.9%	105	4.6
Toledo, OH	296,990	93.9%	278,810	20.0%	46.0%	34.0%	1	2.2
Trenton, NJ	229,450	89.6%	205,480	39.1%	41.5%	19.3%	102	2.4
Tucson, AZ	364,930	94.2%	343,600	24.2%	55.8%	20.0%	96	4.5
Tulsa, OK	427,880	93.8%	401,230	22.4%	49.6%	27.9%	20	3.1
Urban Honolulu, HI	460,520	93.5%	430,790	20.5%	61.8%	17.7%	108	4.0
Virginia Beach-Norfolk-Newport News, VA-NC	743,960	95.0%	706,590	23.5%	50.1%	26.4%	29	3.1
Washington-Arlington-Alexandria, DC-VA-MD-WV	3,103,530	98.0%	3,042,170	41.5%	43.9%	14.6%	121	3.7
Wichita, KS	296,330	96.1%	284,820	21.3%	50.6%	28.1%	17	2.7
Winston-Salem, NC	263,840	94.4%	249,190	21.5%	51.1%	27.4%	21	3.5
Worcester, MA-CT	281,770	96.7%	272,430	25.8%	49.1%	25.1%	53	3.1
York-Hanover, PA	180,080	93.1%	167,600	18.9%	54.6%	26.5%	28	3.6
Total	103,474,630	96.5%	99,881,410	27.7%	50.8%	21.6%	n/a	3.4

Note: In the calculation of the ratio of sub-baccalaureate residents to opportunity employment, the employment estimate is adjusted upward to account for the share of metro area employment that could not be analyzed because of data suppression.

Sources: Authors' calculations using data from BLS Occupational Employment Statistics (May 2017), Burning Glass Technologies (2015–2017), BEA Regional Price Parities (2016), American Community Survey Five-Year Public Use Microdata Sample (2012–2016), and American Community Survey One-Year Estimates, Table B23006 (2017)

Appendix 4

Actual Opportunity Employment Relative to National Counterfactual Scenario Estimates (2017)

To understand how occupational mix, employers' educational expectations, and regional price levels affect local opportunity, we recalculate opportunity employment levels for every occupation in each metro area under what we refer to as a "national counterfactual" scenario. This allows us to compare the actual opportunity employment share with what it would be if the metro area's occupational mix, employers' educational preferences, and regional price levels mirrored national conditions. The overall percentage point difference between the actual and national counterfactual opportunity employment shares is disaggregated into the portions attributable to each of these three factors.

	OPPORTUNITY EMPLOYMENT PERCENT		PERCENTAGE POINT DIFFERENCE			
Metro Area	Actual	National Counterfactual Estimate	Overall	Attributable to Occupational Mix	Attributable to Employers' Educational Expectations	Attributable to Regional Price Levels
Akron, OH	28.1	20.1	8.0	1.1	1.1	5.8
Albany-Schenectady-Troy, NY	25.4	25.3	0.1	0.1	0.0	0.0
Albuquerque, NM	19.2	16.6	2.6	-0.8	1.9	1.5
Allentown-Bethlehem-Easton, PA-NJ	21.4	21.3	0.0	0.0	0.0	0.0
Anchorage, AK	31.5	34.3	-2.8	2.9	6.2	-11.9
Atlanta-Sandy Springs-Roswell, GA	20.9	18.8	2.1	-0.2	-0.6	3.0
Augusta-Richmond County, GA-SC	24.8	15.3	9.6	1.4	1.8	6.4
Austin-Round Rock, TX	18.5	19.1	-0.6	-0.3	-0.3	0.0
Baltimore-Columbia-Towson, MD	20.7	26.2	-5.4	0.1	-0.1	-5.4
Baton Rouge, LA	27.4	18.1	9.3	6.0	0.9	2.3
Birmingham-Hoover, AL	30.6	19.9	10.7	3.6	1.6	5.5
Boise City, ID	21.4	17.5	3.9	0.3	1.4	2.2
Boston-Cambridge-Nashua, MA-NH	19.6	30.4	-10.8	-2.3	-3.3	-5.2
Boulder, CO	16.6	25.8	-9.2	-2.9	-1.2	-5.1
Bridgeport-Stamford-Norwalk, CT	17.2	29.2	-12.0	-3.0	-3.2	-5.8
Buffalo-Cheektowaga-Niagara Falls, NY	26.1	21.7	4.4	-0.4	1.2	3.6
Cedar Rapids, IA	30.3	21.3	9.0	3.5	0.8	4.7
Charleston-North Charleston, SC	24.5	19.2	5.3	1.6	1.7	2.0
Charlotte-Concord-Gastonia, NC-SC	24.7	20.8	3.9	0.7	-0.8	4.0
Chattanooga, TN-GA	26.4	15.9	10.4	1.9	1.7	6.9
Chicago-Naperville-Elgin, IL-IN-WI	19.3	23.4	-4.0	-1.5	-1.4	-1.2
Cincinnati, OH-KY-IN	29.1	22.3	6.9	1.2	1.2	4.5
Cleveland-Elyria, OH	30.1	22.5	7.6	1.4	0.4	5.8
Colorado Springs, CO	19.4	19.0	0.4	-0.1	0.2	0.3
Columbia, SC	23.3	18.2	5.1	1.2	1.1	2.8
Columbus, OH	25.3	22.1	3.2	-0.6	0.0	3.8
Dallas-Fort Worth-Arlington, TX	22.3	21.1	1.2	1.0	0.2	0.0
Davenport-Moline-Rock Island, IA-IL	29.4	20.3	9.1	2.9	2.1	4.1
Dayton, OH	28.2	20.4	7.8	0.3	1.4	6.0
Deltona-Daytona Beach-Ormond Beach, FL	16.2	12.2	3.9	-0.1	1.7	2.3
Denver-Aurora-Lakewood, CO	21.4	27.1	-5.6	0.0	-0.2	-5.4
Des Moines-West Des Moines, IA	30.8	25.0	5.8	0.6	1.0	4.2
Detroit-Warren-Dearborn, MI	26.4	22.3	4.0	0.5	0.8	2.7
Durham-Chapel Hill, NC	21.0	22.8	-1.8	-1.4	-1.4	1.0
El Paso, TX	17.4	12.1	5.4	-1.2	1.9	4.7
Eugene, OR	23.1	20.4	2.7	-0.3	1.4	1.5
Fayetteville-Springdale-Rogers, AR-MO	24.9	14.7	10.1	3.0	1.3	5.9
Grand Rapids-Wyoming, MI	25.0	19.3	5.6	-0.5	1.9	4.2
Greensboro-High Point, NC	24.9	17.8	7.1	0.7	0.6	5.8
Greenville-Anderson-Mauldin, SC	25.6	17.4	8.2	1.3	1.8	5.1
Harrisburg-Carlisle, PA	24.9	22.6	2.4	0.2	0.6	1.5
Hartford-West Hartford-East Hartford, CT	25.2	29.5	-4.3	-0.4	-1.4	-2.5
Houston-The Woodlands-Sugar Land, TX	24.0	22.6	1.4	2.5	0.0	-1.2

Metro Area	OPPORTUNITY EMPLOYMENT PERCENT		PERCENTAGE POINT DIFFERENCE			
	Actual	National Counterfactual Estimate	Overall	Attributable to Occupational Mix	Attributable to Employers' Educational Expectations	Attributable to Regional Price Levels
Huntsville, AL	23.5	18.1	5.4	-1.0	1.0	5.4
Indianapolis-Carmel-Anderson, IN	26.0	21.1	4.9	1.2	0.6	3.0
Jackson, MS	23.8	15.8	8.0	2.2	2.0	3.8
Jacksonville, FL	21.9	17.8	4.1	1.6	0.8	1.7
Kalamazoo-Portage, MI	23.9	18.2	5.7	-0.7	1.8	4.6
Kansas City, MO-KS	29.6	22.9	6.7	1.6	1.0	4.1
Knoxville, TN	26.1	16.0	10.2	1.4	1.9	6.9
Lancaster, PA	25.1	21.1	4.0	2.8	0.4	0.8
Lansing-East Lansing, MI	29.4	22.4	7.0	-0.4	2.9	4.6
Lexington-Fayette, KY	29.8	20.6	9.2	3.9	0.7	4.6
Little Rock-North Little Rock-Conway, AR	25.6	15.8	9.8	2.6	1.4	5.8
Los Angeles-Long Beach-Anaheim, CA	15.4	25.8	-10.4	-1.9	-1.2	-7.2
Louisville/Jefferson County, KY-IN	26.4	19.1	7.3	0.8	1.6	5.0
Madison, WI	25.3	24.5	0.8	-2.1	1.2	1.7
Memphis, TN-MS-AR	26.7	18.8	7.9	0.9	0.9	6.1
Miami-Fort Lauderdale-West Palm Beach, FL	15.5	18.8	-3.3	0.1	0.7	-4.1
Milwaukee-Waukesha-West Allis, WI	28.8	23.3	5.5	0.0	0.6	4.9
Minneapolis-St. Paul-Bloomington, MN-WI	28.0	29.9	-1.9	-1.7	0.4	-0.5
Nashville-Davidson–Murfreesboro–Franklin, TN	26.3	19.6	6.7	2.0	1.2	3.5
New Haven, CT	23.8	28.5	-4.7	0.1	-1.4	-3.3
New Orleans-Metairie, LA	25.2	18.9	6.4	2.5	1.3	2.6
New York-Newark-Jersey City, NY-NJ-PA	15.3	29.3	-14.0	-2.0	-3.6	-8.3
North Port-Sarasota-Bradenton, FL	19.8	17.4	2.4	0.2	2.0	0.1
Ogden-Clearfield, UT	26.9	18.1	8.8	2.9	2.6	3.3
Oklahoma City, OK	25.7	18.4	7.3	2.3	2.0	3.0
Omaha-Council Bluffs, NE-IA	26.3	21.3	5.0	1.9	0.7	2.4
Orlando-Kissimmee-Sanford, FL	18.4	17.5	1.0	-0.8	1.3	0.4
Oxnard-Thousand Oaks-Ventura, CA	16.8	25.6	-8.9	-1.3	1.6	-9.2
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	20.1	27.0	-6.8	-1.5	-1.2	-4.1
Phoenix-Mesa-Scottsdale, AZ	22.9	20.4	2.5	0.5	0.8	1.2
Pittsburgh, PA	25.0	21.4	3.6	0.8	-0.5	3.2
Portland-South Portland, ME	20.6	23.7	-3.2	0.2	0.6	-4.0
Portland-Vancouver-Hillsboro, OR-WA	26.5	27.4	-0.9	-0.5	0.7	-1.1
Provo-Orem, UT	19.8	16.8	3.0	0.3	1.4	1.3
Raleigh, NC	22.3	21.1	1.2	0.0	-0.4	1.6
Reno, NV	24.0	19.9	4.0	0.3	2.0	1.7
Richmond, VA	25.5	19.9	5.6	1.5	0.2	4.0
Riverside-San Bernardino-Ontario, CA	20.6	22.8	-2.2	-0.2	2.5	-4.5
Rochester, NY	21.7	21.4	0.4	-0.1	0.2	0.2
Sacramento–Roseville–Arden-Arcade, CA	25.4	26.0	-0.6	-1.1	1.1	-0.6
Salem, OR	27.9	22.1	5.8	0.0	2.7	3.2
Salt Lake City, UT	22.1	20.4	1.7	0.7	1.0	0.0
San Antonio-New Braunfels, TX	22.4	18.7	3.7	0.1	1.4	2.3
San Diego-Carlsbad, CA	16.2	26.5	-10.3	-1.3	-0.5	-8.4
San Francisco-Oakland-Hayward, CA	16.8	33.2	-16.4	-2.7	-3.5	-10.2
San Jose-Sunnyvale-Santa Clara, CA	15.5	32.9	-17.4	-2.8	-3.5	-11.1
Santa Rosa, CA	20.9	29.2	-8.2	-0.6	1.1	-8.8
Savannah, GA	23.6	19.1	4.5	1.8	0.8	1.9
Scranton–Wilkes-Barre–Hazleton, PA	25.2	18.7	6.6	0.6	1.7	4.2
Seattle-Tacoma-Bellevue, WA	24.5	33.8	-9.3	-1.5	-0.9	-6.9
Sioux Falls, SD	24.1	17.0	7.1	2.6	0.5	4.0
Spokane-Spokane Valley, WA	29.7	23.2	6.5	1.1	2.1	3.3
Springfield, MA-CT	27.4	26.1	1.3	-0.3	0.4	1.2
St. Louis, MO-IL	30.3	23.1	7.2	0.7	0.4	6.1
Stockton-Lodi, CA	26.0	24.3	1.7	-0.3	1.6	0.3
Syracuse, NY	26.9	23.8	3.1	0.7	0.5	1.8
Tampa-St. Petersburg-Clearwater, FL	18.9	16.7	2.3	1.1	1.2	0.0

	OPPORTUNITY EMPLOYMENT PERCENT		PERCENTAGE POINT DIFFERENCE			
Metro Area	Actual	National Counterfactual Estimate	Overall	Attributable to Occupational Mix	Attributable to Employers' Educational Expectations	Attributable to Regional Price Levels
Toledo, OH	34.0	20.3	13.7	4.1	2.0	7.6
Trenton, NJ	19.3	30.8	-11.5	-2.9	-3.4	-5.2
Tucson, AZ	20.0	17.4	2.6	-0.9	1.1	2.4
Tulsa, OK	27.9	18.0	9.9	3.9	2.1	3.9
Urban Honolulu, HI	17.7	26.5	-8.8	-0.3	2.2	-10.7
Virginia Beach-Norfolk-Newport News, VA-NC	26.4	21.4	5.1	1.9	1.7	1.5
Washington-Arlington-Alexandria, DC-VA-MD-WV	14.6	27.9	-13.3	-2.3	-2.9	-8.1
Wichita, KS	28.1	16.7	11.3	4.6	1.6	5.1
Worcester, MA-CT	25.1	26.9	-1.8	1.8	0.4	-4.0

Note: The national counterfactual methodology does not produce reliable employment estimates for 12 of the 121 metro areas included in the full analysis, so they are excluded from this exercise.

Sources: Authors' calculations using data from BLS Occupational Employment Statistics (May 2017), Burning Glass Technologies (2015–2017), BEA Regional Price Parities (2016), and American Community Survey Five-Year Public Use Microdata Sample (2012–2016)

Appendix 5

Metro Area Groups Reflecting Employers' Educational Preferences

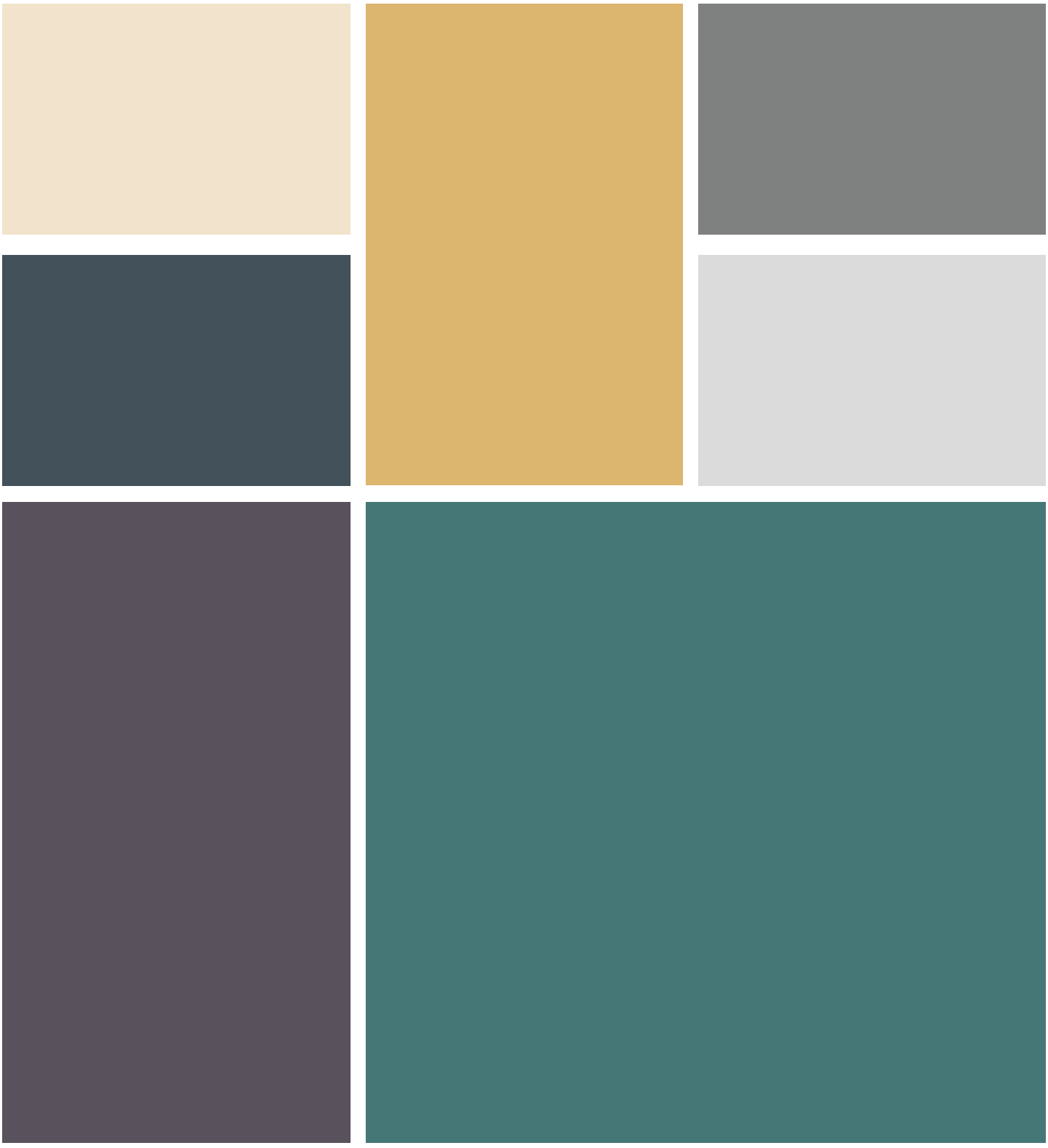
Where there are fewer than 100 job ads with education specified for an occupation in a given metro area between 2015 and 2017, we estimate opportunity employment using the share of sub-baccalaureate job ads for a group of metro areas with similar levels of educational expectations. To develop these groups, for each metro area, we calculate the ratio of the local share of sub-baccalaureate job ads to the national share for every occupation for which we have at least 100 job ads locally. This table shows the number of occupations included in this calculation and the median local-to-national ratio for each metro area. We use these median values to create three metro area groups: least accessible for sub-baccalaureate workers (median ratio <0.95), average accessibility for sub-baccalaureate workers (median ratio 0.95–1.05), and most accessible for sub-baccalaureate workers (median ratio >1.05).

Metro Area	Number of Occupations Used to Calculate Median Ratio	Median Occupation-Level Ratio of Local-to-National Share of Sub-Baccalaureate Job Ads
Least accessible for sub-baccalaureate workers (median ratio <0.95)		
Bridgeport-Stamford-Norwalk, CT	168	0.7143
San Francisco-Oakland-Hayward, CA	301	0.7778
Trenton, NJ	159	0.7843
San Jose-Sunnyvale-Santa Clara, CA	223	0.7895
Boston-Cambridge-Nashua, MA-NH	303	0.8125
New York-Newark-Jersey City, NY-NJ-PA	383	0.8158
Washington-Arlington-Alexandria, DC-VA-MD-WV	334	0.8205
Durham-Chapel Hill, NC	144	0.8974
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	298	0.9204
Chicago-Naperville-Elgin, IL-IN-WI	339	0.9231
Hartford-West Hartford-East Hartford, CT	181	0.9275
Boulder, CO	129	0.9365
New Haven, CT	139	0.9452
Average accessibility for sub-baccalaureate workers (median ratio 0.95-1.05)		
Los Angeles-Long Beach-Anaheim, CA	350	0.9509
Albany-Schenectady-Troy, NY	167	0.9674
Atlanta-Sandy Springs-Roswell, GA	284	0.9706
Seattle-Tacoma-Bellevue, WA	294	0.9724
Raleigh, NC	189	0.9762
San Diego-Carlsbad, CA	258	0.9767
Charlotte-Concord-Gastonia, NC-SC	235	0.9785
Columbus, OH	216	0.9840
Austin-Round Rock, TX	237	0.9877
Pittsburgh, PA	232	0.9879
St. Louis, MO-IL	238	0.9949
Baltimore-Columbia-Towson, MD	263	1.0000
Cleveland-Elyria, OH	232	1.0000
Denver-Aurora-Lakewood, CO	288	1.0000
Houston-The Woodlands-Sugar Land, TX	299	1.0000
Lancaster, PA	109	1.0000

Metro Area	Number of Occupations Used to Calculate Median Ratio	Median Occupation-Level Ratio of Local-to-National Share of Sub-Baccalaureate Job Ads
Minneapolis-St. Paul-Bloomington, MN-WI	279	1.0000
Providence-Warwick, RI-MA	172	1.0000
Richmond, VA	195	1.0000
Rochester, NY	169	1.0000
Worcester, MA-CT	146	1.0000
Dallas-Fort Worth-Arlington, TX	314	1.0104
Detroit-Warren-Dearborn, MI	298	1.0106
Springfield, MA-CT	133	1.0111
Indianapolis-Carmel-Anderson, IN	225	1.0114
Sacramento–Roseville–Arden-Arcade, CA	227	1.0119
Harrisburg-Carlisle, PA	144	1.0123
Miami-Fort Lauderdale-West Palm Beach, FL	270	1.0128
Lexington-Fayette, KY	133	1.0211
Portland-South Portland, ME	128	1.0212
Madison, WI	157	1.0213
Milwaukee-Waukesha-West Allis, WI	215	1.0213
Savannah, GA	114	1.0216
Memphis, TN-MS-AR	182	1.0216
Allentown-Bethlehem-Easton, PA-NJ	150	1.0221
Kansas City, MO-KS	248	1.0256
Baton Rouge, LA	142	1.0261
Fort Collins, CO	107	1.0294
Cedar Rapids, IA	105	1.0313
Huntsville, AL	119	1.0313
Akron, OH	148	1.0316
Syracuse, NY	141	1.0316
Salt Lake City, UT	207	1.0317
New Orleans-Metairie, LA	176	1.0317
Nashville-Davidson–Murfreesboro–Franklin, TN	225	1.0319
Santa Rosa, CA	97	1.0323
Omaha-Council Bluffs, NE-IA	186	1.0323
Cincinnati, OH-KY-IN	235	1.0326
Colorado Springs, CO	143	1.0345
Greensboro-High Point, NC	146	1.0354
Phoenix-Mesa-Scottsdale, AZ	290	1.0373
Reading, PA	88	1.0393
Portland-Vancouver-Hillsboro, OR-WA	264	1.0400
Des Moines-West Des Moines, IA	177	1.0460
Birmingham-Hoover, AL	172	1.0462
Columbia, SC	145	1.0476
Jacksonville, FL	185	1.0488
Little Rock-North Little Rock-Conway, AR	151	1.0500
Most accessible for sub-baccalaureate workers (median ratio >1.05)		
Dayton, OH	144	1.0501
Tampa-St. Petersburg-Clearwater, FL	247	1.0526
Toledo, OH	107	1.0526
Fayetteville-Springdale-Rogers, AR-MO	107	1.0549
Wichita, KS	132	1.0556
Virginia Beach-Norfolk-Newport News, VA-NC	214	1.0565
Buffalo-Cheektowaga-Niagara Falls, NY	167	1.0588

Metro Area	Number of Occupations Used to Calculate Median Ratio	Median Occupation-Level Ratio of Local-to-National Share of Sub-Baccalaureate Job Ads
Kalamazoo-Portage, MI	107	1.0595
Sioux Falls, SD	143	1.0595
Orlando-Kissimmee-Sanford, FL	239	1.0649
Oxnard-Thousand Oaks-Ventura, CA	143	1.0659
Tucson, AZ	173	1.0667
Charleston-North Charleston, SC	147	1.0714
Chattanooga, TN-GA	109	1.0714
Boise City, ID	146	1.0725
San Antonio-New Braunfels, TX	215	1.0753
Reno, NV	126	1.0761
Winston-Salem, NC	112	1.0765
Oklahoma City, OK	192	1.0766
Knoxville, TN	125	1.0769
Louisville/Jefferson County, KY-IN	187	1.0769
Eugene, OR	86	1.0779
Fresno, CA	120	1.0787
Davenport-Moline-Rock Island, IA-IL	106	1.0792
Provo-Orem, UT	111	1.0805
Urban Honolulu, HI	154	1.0834
Tulsa, OK	159	1.0845
Augusta-Richmond County, GA-SC	117	1.0889
Greenville-Anderson-Mauldin, SC	145	1.0952
Palm Bay-Melbourne-Titusville, FL	117	1.0952
Riverside-San Bernardino-Ontario, CA	226	1.0969
Albuquerque, NM	165	1.0976
Asheville, NC	95	1.0976
Grand Rapids-Wyoming, MI	188	1.1000
El Paso, TX	116	1.1026
Springfield, MO	105	1.1029
Lansing-East Lansing, MI	142	1.1041
Jackson, MS	113	1.1143
York-Hanover, PA	78	1.1205
Scranton–Wilkes-Barre–Hazleton, PA	105	1.1233
Cape Coral-Fort Myers, FL	98	1.1245
Las Vegas-Henderson-Paradise, NV	220	1.1284
Myrtle Beach-Conway-North Myrtle Beach, SC-NC	48	1.1287
Stockton-Lodi, CA	94	1.1307
North Port-Sarasota-Bradenton, FL	110	1.1500
Ogden-Clearfield, UT	102	1.1549
Spokane-Spokane Valley, WA	121	1.1719
Salem, OR	95	1.1967
Anchorage, AK	143	1.1972
Deltona-Daytona Beach-Ormond Beach, FL	83	1.2059

Source: Authors' calculations using data from Burning Glass Technologies (2012–2017)



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