



# THE ONLINE COLLEGE LABOR MARKET

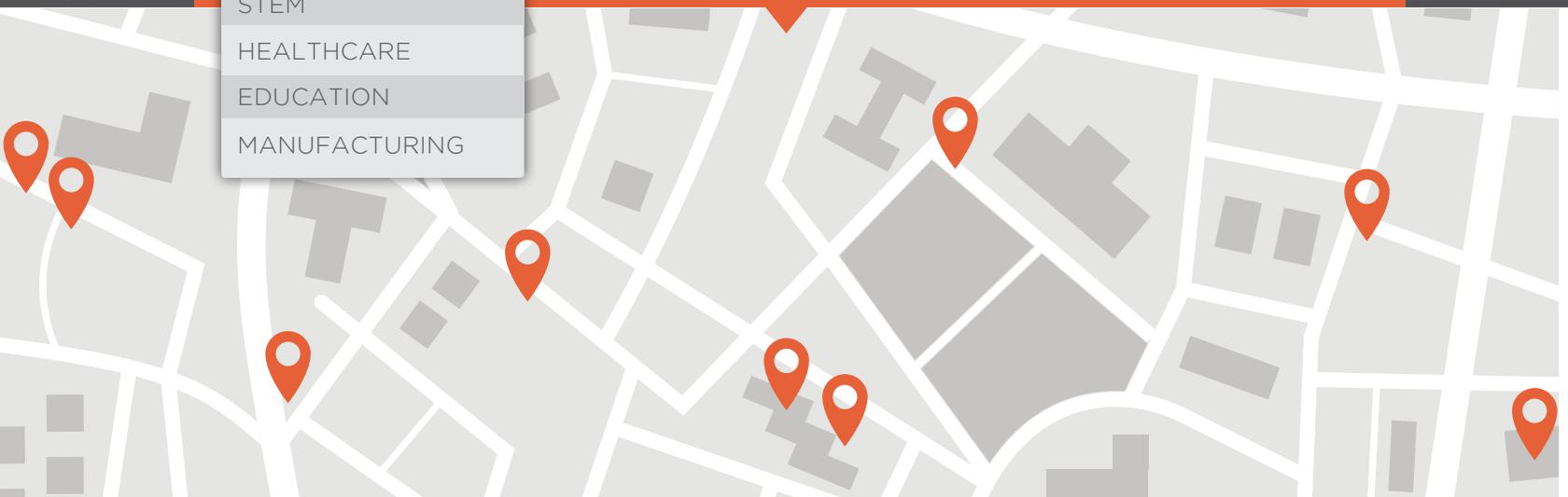
WHERE THE JOBS ARE

- ALL JOBS
- STEM
- HEALTHCARE
- EDUCATION
- MANUFACTURING

ANY LOCATION

CATEGORIES

SEARCH



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WHERE THE JOBS ARE

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We have been working with the underlying data for this report for a long time. The world of online job postings data is new territory for us and, before producing a report, we wanted to understand the data better. During that time, many individuals have worked with us and have shown great patience.

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*The views expressed in this publication are those of the authors and do not necessarily represent those of the Bill & Melinda Gates Foundation, Lumina Foundation, or the Joyce Foundation, their officers, or employees.*

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## The Growing Online College Labor Market

There are 3.7 million job openings each month in the American economy, up from 2.3 million at the height of the recession.<sup>1</sup> Between 80 and 90 percent of job openings for college-educated workers are now posted online.<sup>2</sup> For college graduates, the online job advertisements can be a viable tool for connecting real people with real jobs in real time.

Working with data from Burning Glass Technologies, one of the leading developers of online job advertisements data, we find that there are almost 2 million new job ads posted online each quarter for people with Bachelor's degrees (BAs) or better, and the number is growing each year.

This report outlines the strengths and weaknesses of the online labor market today for college graduates.<sup>3</sup> In it, we look at online demand for college-level jobs by education requirements, occupations, and industries. We also identify major employers by industry.

A note on terminology: readers who are not economists may be tempted to confuse “job openings” with “employment.” “Employment” refers to people who already hold a job. A “job opening” simply means there’s a vacancy in the job market. Moreover, a job opening may or may not mean there is about to be an increase in employment: an opening may reflect a newly created position, or it may simply reflect the need to replace a worker who is leaving. The former

increases employment, while the latter does not. For a variety of reasons, not every job opening actually results in a hire.

Finally, in this report, job opening refers to any position soliciting applicants, but job ad or job posting is used to mean strictly a job opening that is advertised online.



### ONLINE JOB ADS



Over the past decade or so, employers have gradually shifted from local newspapers to the use of online media to attract the necessary talent to fill job vacancies. By advertising job openings on their company websites, other classified sites, or fee-for-service job boards, employers have been able to increase their outreach beyond local labor markets. Current estimates are that about 60 to 70 percent of all job openings get posted online, with some differences in coverage by industry, occupation, and education.

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Source: Carnevale, Anthony P. et al. *Understanding Online Job Ads Data: A Technical Report 2014*.

Note: See accompanying technical report for a detailed discussion of biases in the coverage of online job ads.

<sup>1</sup> U.S. Bureau of Labor Statistics, Job Openings and Labor Turnover Survey (JOLTS), July 2013.

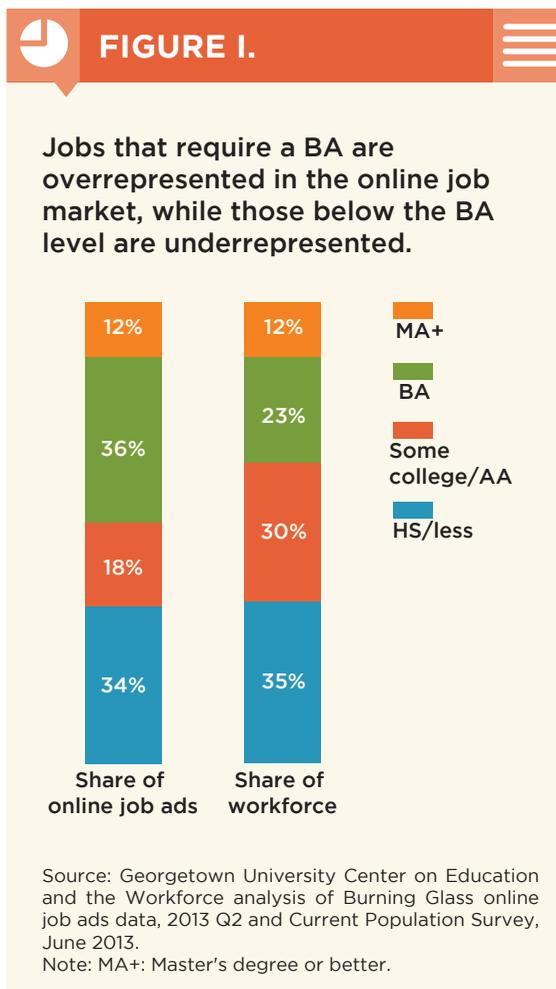
<sup>2</sup> For a technical evaluation on the coverage and quality of online job openings data, see the accompanying *Understanding Online Job Ads Data: A Technical Report, 2014*.

<sup>3</sup> Careful analyses by the Georgetown University Center on Education and the Workforce have established that the Internet ads are disproportionately aimed at the college labor market. Hence, this report focuses solely on job opportunities for Bachelor's degree-holders. Unless otherwise stated, the phrases “college labor market” and “college-educated” refer to the labor market for people with a Bachelor's degree or better.

### Half of online job ads require a BA or better.

Online job ads tend to overrepresent jobs that require a BA or better and underrepresent jobs that do not require a BA, because a sizable share of jobs that require less than a BA are not advertised online (Figure 1)<sup>4</sup>. Because online job ads

data are not representative of job openings in the sub-baccalaureate domain, our analysis is primarily restricted to the (BA or better) college labor market. Three out of four college job openings advertised online require only a BA; 20 percent require an MA; and 5 percent require a PhD.



Among college jobs advertised online,



**THREE OUT OF FOUR** require only a BA;



**20 PERCENT** require an MA; and



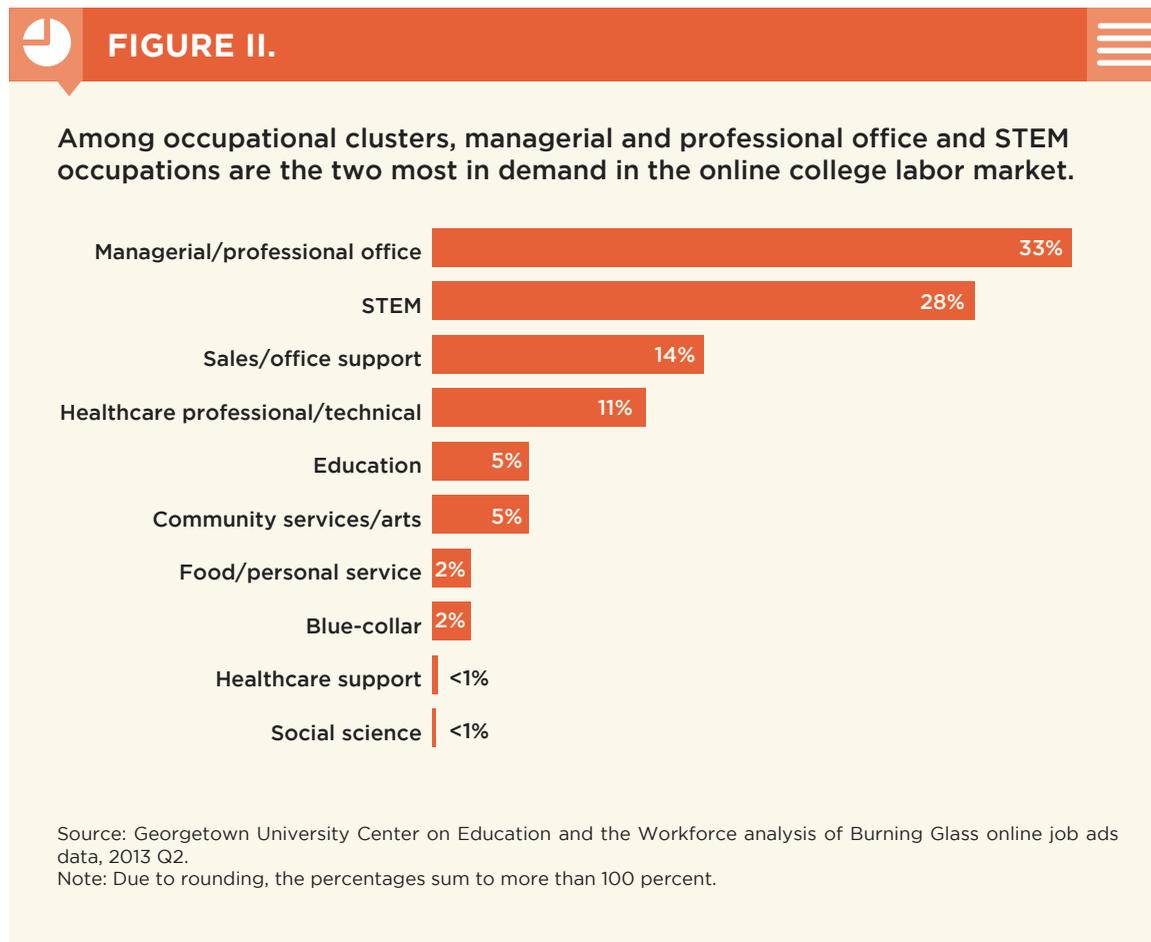
**5 PERCENT** require a PhD.

<sup>4</sup> Due to the lack of a better data source that provides the educational composition of the job openings, the educational distribution of the employment is used as a comparison. The official data source of job openings, Job Openings and Labor Turnover Survey (JOLTS), does not give a breakdown of job openings by education. See the accompanying *Understanding Online Job Ads Data: A Technical Report, 2014* for a detailed discussion.

**Managerial and professional office occupations are the most in-demand occupational cluster for college graduates.**

Eighty-six percent of college job ads are for white-collar occupations: managerial and professional office, science, technology, engineering, and mathematics (STEM), sales and office support, healthcare professional and technical, and social science occupations (Figure II).

Three out of four job ads for managerial and professional office occupations require a BA or better. Managerial and professional office occupations are the most in demand among occupational clusters, representing 33 percent of college job ads. Managerial and professional office occupations are made up of three smaller clusters: management (54 percent of job ads), business and financial operations (38 percent), and legal (8 percent).



### Among the college educated, software developers are the most in demand.

Among the 10 most in-demand occupations, there are four management occupations and three information technology (IT) occupations (Table I). The other three occupations are wholesale and manufacturing sales representative, registered nurse, and accountant or auditor. Application software developers are the most in demand, with 125,000 online job ads in the second quarter of 2013.

In terms of specific occupations, the top five — application software developer, IT professional, wholesale or manufacturing

sales representative, registered nurse, and accountant or auditor — accounted for 20 percent of all job ads for college graduates (Table I).

STEM occupations account for 28 percent of online college job ads, even though they are only 11 percent of college jobs in the United States. STEM occupations are the second most in-demand occupational cluster for college graduates. Two-thirds of STEM job ads require a BA and 11 percent require an advanced degree. Roughly three out of four STEM online job ads are for IT occupations; the rest are mostly for engineers and architects. Another 6 percent of job ads in the STEM cluster are for life/physical science occupations.



TABLE I.



### Software developer (applications) is the most in demand, with 125,000 online job ads in the second quarter of 2013.

Occupation	Number of online job ads
Software developer, applications	125,300
IT professional, NEC*	75,700
Sales representative, wholesale/manufacturing	63,300
Registered nurse	49,700
Accountant/auditor	48,700
Computer systems analyst	47,900
Medical or health services manager	46,800
Manager, NEC*	46,700
Sales manager	38,200
Financial manager	36,800

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

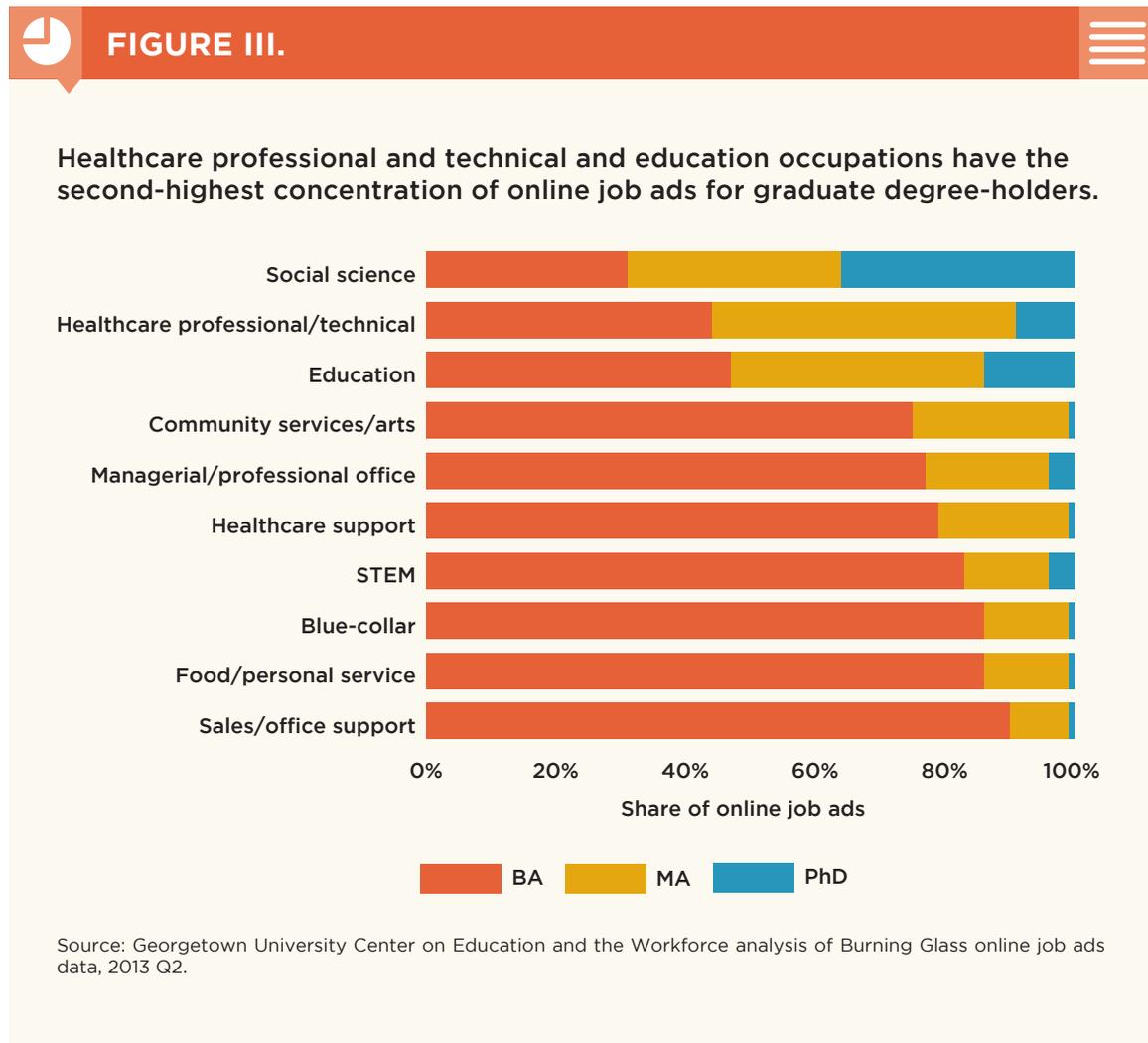
\* Not elsewhere classified.

For IT occupations, the most lucrative opportunities are for software developers and computer programmers, who earn average annual salaries of \$92,000 and \$76,000, respectively. For architecture and engineering occupations, mechanical engineers are the most in demand, representing more than one-third of job ads for engineers or architects. Mechanical engineers earn \$87,000 annually.

Healthcare, education, and social science occupations have the highest concentration

of online college job ads for job candidates with advanced degrees (Figure III). More than half of the online college job ads for these occupations also require an advanced degree. By contrast, food and personal service, sales and office support, and blue-collar occupations have the lowest concentration of online college job ads for job candidates with advanced degrees. Fewer than 20 percent of ads in these occupations require advanced degrees.

For graduates with an MA, the best job



opportunities are in managerial and professional occupations, followed closely by the healthcare professional and technical occupations (Table II). In managerial and professional occupations, employers seek MA-holders for medical and health services managers, financial managers, and other types of management positions. In healthcare professional and technical occupations, employers are looking for physical therapists, nurse practitioners, speech-language pathologists, and registered nurses.

Job seekers with a BA will find the most opportunities among managerial and professional occupations, followed by STEM occupations (Table II). For graduates with PhDs, STEM occupations such as medical scientist, software developer, and chemist rank second in the number of job ads. For workers with an MA, STEM occupations rank third in demand.



TABLE II.



### Managerial and professional office occupations account for the largest number of job ads for college graduates.

Occupation group	BA	MA	PhD
Managerial/professional office	1	1	1
STEM	2	3	2
Sales/office support	3	6	6
Healthcare professional and technical	4	2	3
Community services/arts	5	5	7
Education	6	4	4
Food/personal service	7	7	8
Blue-collar	8	8	9
Healthcare support	9	10	10
Social science	10	9	5

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.



TABLE III.



### Software developer is the most in-demand occupation at the BA level, while lawyer is the most in demand at the graduate degree level.

Rank	BA	MA	PhD
1	Software developer	Lawyer (JD)	Lawyer (PhD)
2	Computer worker, NEC*	Software developer	Medical scientist, except epidemiologist
3	Sales representative, wholesale/manufacturing	Physical therapist	Physician/surgeon
4	Accountant/auditor	Nurse practitioner	Postsecondary teacher
5	Registered nurse	Medical/health services manager	Pharmacist
6	Computer systems analyst	Computer worker, NEC*	Software developer
7	Manager, NEC*	Speech-language pathologist	Medical/health services manager
8	Medical/health services manager	Manager, NEC*	Clinical, counseling, or school psychologist
9	Sales manager	Registered nurse	Physical therapist
10	Financial manager	Financial manager	Postsecondary vocational education teacher

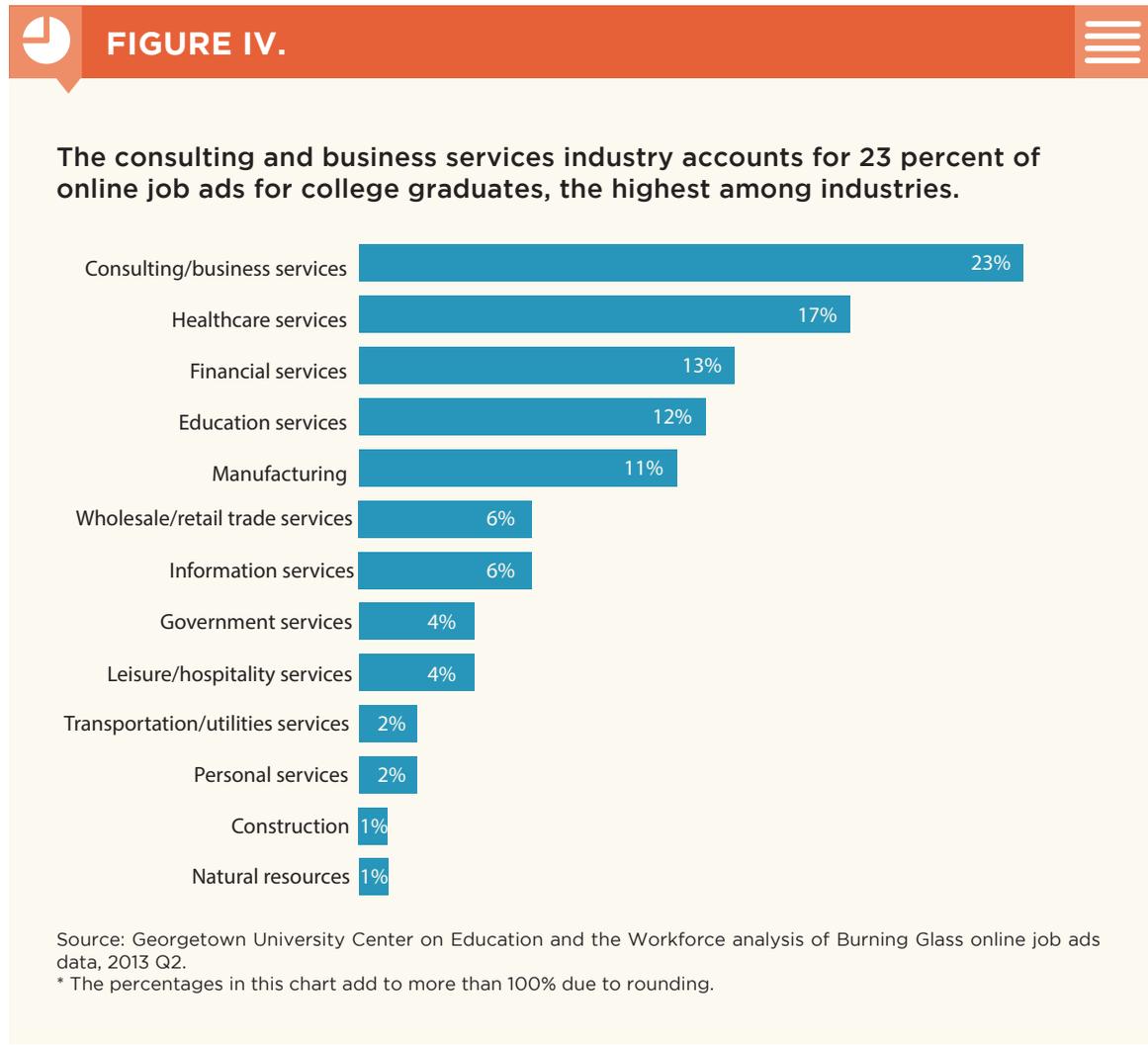
Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online ads data, 2013 Q2.  
\* Not elsewhere classified.

**Among industries, the consulting and business services industry and the healthcare services industry are the top online advertisers for college talent.**

Together, consulting and business services and healthcare represent two out of every five job ads (Figure IV). One out of four college job ads is for workers in the consulting and business services sector. The consulting and business services sector arose in the post-1983 restructuring of the postindustrial economy. It is characterized by highly educated professional contract workers, such as consultants, who constitute the complex organizational networks that individual business and organizations rely

on to produce final products and services. While most industries are restricted to one particular kind of business and organization, consulting and business services are integrated throughout the economy.

Two out of three jobs in consulting and business services require a BA or better, and 14 percent require an MA. There were 331,000 college job ads in consulting and business services in the second quarter of 2013. The top employers in consulting and business services by the number of job advertisements online for college graduates were Accenture, Deloitte Development, and IBM.



 **TABLE IV.**

The consulting and business services industry has the most online job ads for BA-holders; healthcare services has the most online job ads for MA-holders; and education services has the most online jobs ads for PhD-holders.

	BA	MA	PhD
Consulting/business services	1	3	2
Financial services	2	4	5
Healthcare services	3	1	3
Manufacturing	4	5	4
Education services	5	2	1
Wholesale/retail trade services	6	7	7
Information services	7	8	8
Leisure/hospitality services	8	9	10
Government services	9	6	6
Transportation/utilities services	10	11	11
Personal services	11	10	9
Construction	12	12	13
Natural resources	13	13	12

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

The healthcare services industry accounts for one out of six job ads for college-educated workers. Two out of five online job ads in the healthcare industry require a BA or better. Employers in the healthcare

industry who advertise the most online are the Hospital Corporation of America (HCA), Cleveland Clinic, and Providence Health & Services.



The healthcare services industry accounts for  
**ONE OUT OF SIX JOB ADS**  
 for college-educated workers.

# PART 1. OCCUPATIONS

The disappearance of routine office jobs, which once provided millions of Americans access to middle-class incomes, is a well-documented phenomenon.<sup>5</sup> One recent statistic vividly illustrates the magnitude of this trend: since the most recent recession (2007-09), nearly 2 million clerical jobs in the United States have disappeared, while 370,000 new managerial positions have opened up. Jobs that pay a living wage require more skill and education today than even just a decade ago, and these educational requirements are increasingly tied to occupation, not industry: whether an accountant works for a hospital in Minnesota or a software company in Palo Alto, he or she

is likely to need the same kind of educational qualifications. In this part of the report, we look at the occupational breakdown of online job ads for college graduates.<sup>6</sup>

## In-demand occupations that require a BA or better.

Managerial and professional office and STEM jobs together accounted for 1.1 million job ads, or three out of five college job ads, in the second quarter of 2013 (Table 1.1). Sales and office support occupations and healthcare professional and technical occupations together accounted for more than 450,000 online job ads.



TABLE 1.1.



Managerial and professional office occupations accounted for the largest share of job ads for college graduates.

Occupational cluster	Online job ads, BA+	Share of ads that require BA+ (%)
Managerial/professional office	605,600	75
STEM	507,100	80
Sales/office support	253,500	29
Healthcare professional and technical	200,300	54
Education	101,300	81
Community services/arts	94,300	61
Food/personal service	42,800	13
Blue-collar	40,200	8
Social science	7,900	93
Healthcare support	4,800	6
Total	1,857,800	48

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2

Note: BA+: Bachelor's degree or better.

<sup>5</sup> Jaimovich, Nir, and Henry Siu. *The Trend in the Cycle: Job Polarization and Jobless Recoveries*. NBER Working Paper No.18334, 2012 <http://www.nber.org/papers/w18334>.

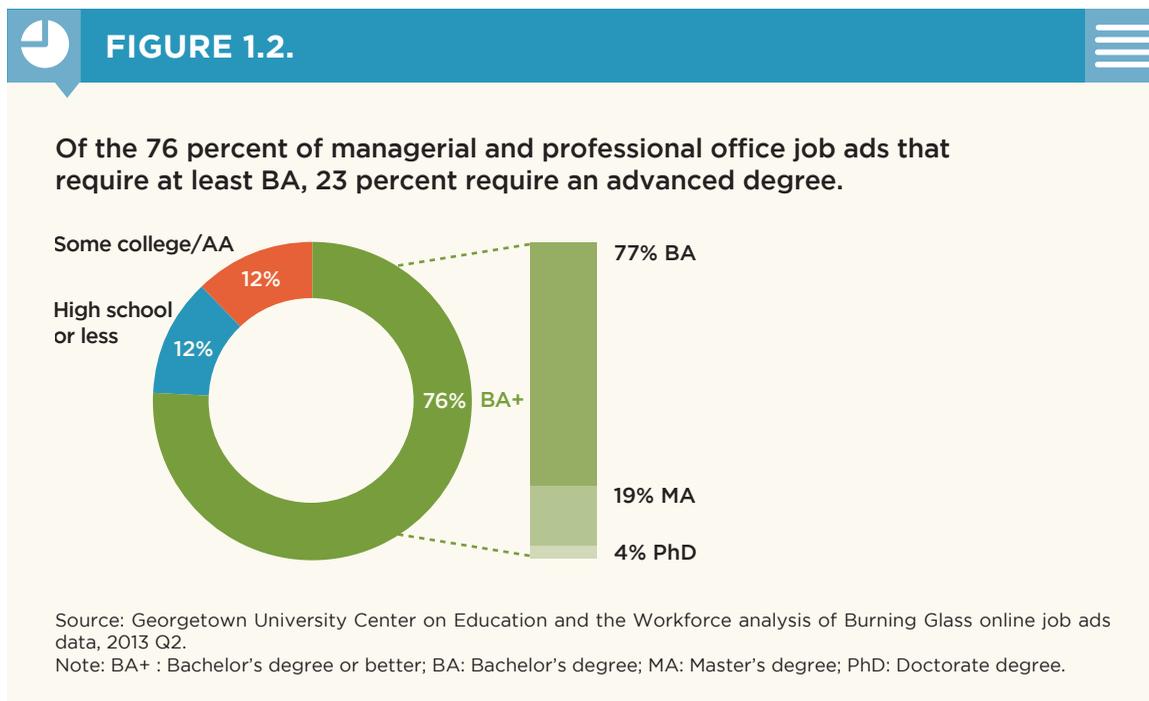
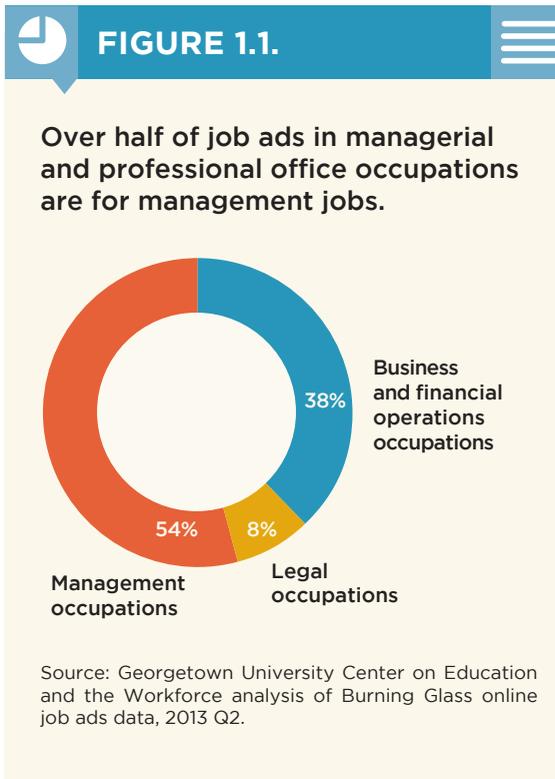
<sup>6</sup> Due to the nature of online ads data, the report focuses mainly on the occupational breakdown of ads requiring at least a Bachelor's degree.

## Managerial and professional office occupations

Managerial and professional office occupations account for one out of three online job ads for college graduates, the most among occupational clusters. In the second quarter of 2013, there were 606,000 online job ads for college graduates in managerial and professional occupations.

Managerial and professional office occupations comprise management, business and financial operations, and legal occupations (Figure 1.1). Management occupations represent more than half of the online job ads in this cluster, while business and financial operations occupations account for nearly 40 percent. The remaining 8 percent of online job ads are for legal occupations.

Three out of four online job ads for managerial and professional office occupations require a BA or better (Figure 1.2). Of those, three quarters require only a BA, 19 percent require an MA, and 4 percent require a PhD.



### Management occupations

*Management occupations account for more than half of online job ads in the managerial and professional office occupational cluster.*

There were 330,000 online job ads for management occupations in the second

quarter of 2013. The average salary of workers in management occupations is \$107,000. Medical and health services managers are the most in-demand management jobs, accounting for 47,000 online job ads, or 14 percent of all management job ads (Table 1.2). Sales managers, financial managers, and marketing managers are also in high demand.

**TABLE 1.2.**

**Among management occupations, medical or health services manager is the most in demand.<sup>7</sup>**

Occupation	BA+ ads	Share of subcluster ads (%)	Mean salary (\$)
Medical/health services manager	46,900	14	96,000
Manager, NEC*	46,800	14	105,000
Sales manager	38,200	12	117,000
Financial manager	36,800	11	120,000
Marketing manager	28,500	9	126,000
General/operations manager	22,900	7	114,000
Computer/information systems manager	11,100	3	126,000
Education administrator, postsecondary	10,100	3	97,000
Public relation/fundraising manager	9,900	3	106,000
Human resources manager	9,700	3	109,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.

\*Not elsewhere classified.

Management occupations account for more than

# HALF OF ONLINE JOB ADS

in the managerial and professional office occupational cluster.

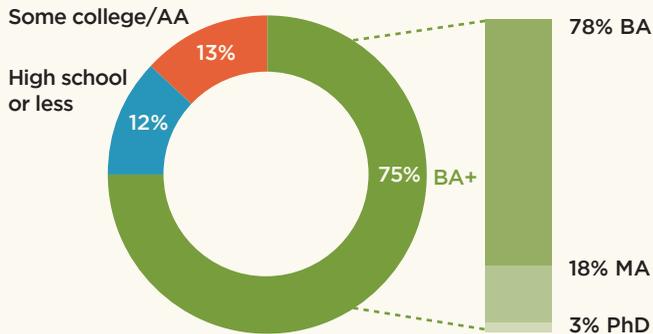
<sup>7</sup> Top 10 detailed occupations within each occupational subcluster are ranked by their respective share and only those with more than 100 ads are shown. Some subclusters may have fewer than 10 detailed occupations with more than 100 online job ads. In such cases, the table of detailed occupations may include fewer than 10.



FIGURE 1.3.



Of the 75 percent of management job ads that require at least a BA, 21 percent require an advanced degree.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

### Business and financial operations occupations

Business and financial operations occupations accounted for 230,000 online job ads, or 38 percent of the ads in the managerial and professional office occupational cluster. Accountant or auditor is the most in-demand business and financial operations occupation, accounting for 49,000 job ads, or one out of five job ads in this subcluster. Human resources specialist, financial analyst, and management analyst occupations are also in high demand.



Business and financial operations occupations accounted for

# 230,000

online job ads.



TABLE 1.3.



Among business and financial operations occupations, accountant or auditor is the most in demand.

Occupation	BA+ ads	Share of subcluster ads (%)	Mean salary (\$)
Accountant/auditor	48,700	21	70,000
Human resources specialist	28,000	12	59,000
Financial analyst	25,000	11	88,000
Management analyst	23,700	10	88,000
Market research analyst/marketing specialist	16,600	7	67,000
Personal financial advisor	12,700	6	91,000
Business operations specialist, NEC*	9,200	4	69,000
Logistician	8,900	4	75,000
Purchasing agent, except wholesale, retail, and farm products	8,300	4	61,000
Training/development specialist	7,500	3	59,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.

\*Not elsewhere classified.

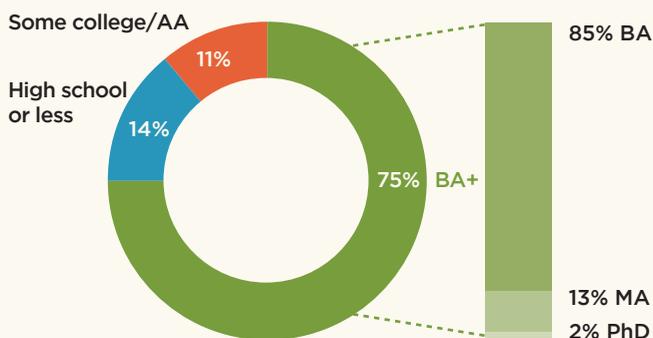
Note: BA+ : Bachelor's degree or better.



FIGURE 1.4.



Of the 75 percent of business and financial operations job ads that require at least a BA, 15 percent require an advanced degree.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

## Legal occupations

*Among the 25 occupational subclusters, legal occupations have the highest concentration of job ads requiring advanced degrees.*

The legal subcluster accounts for 45,000 job ads, including 35,000 job ads for lawyers. Lawyer is also the most in-demand occupation for workers with advanced degrees. Yet the labor market for the legal profession is not necessarily as positive as the job ads data suggest.

Driven by increasingly cost-conscious clients and competitive pressure from technological innovation and globalization, and further accelerated by the economic decline of recent years, the legal profession appears to some experts to be in the midst of structural change that may impact employment and earnings over the next several years, if not decades.<sup>8</sup> While legal employment has continued to expand in recent years, adding a total of 123,000 jobs since 2007, this expansion represents a mere 5 percent growth, which pales in

comparison to the 14 percent growth in this occupational subcluster between 1998 and 2004. This anemic growth has been insufficient to keep up with the supply of law school graduates. Between 2004 and 2011, there were more than 420,000 newly minted law school graduates but only 132,000 new jobs. What's more, employers are increasingly turning to paralegals and legal assistants to fill vacancies. Roughly two-thirds of law school graduates in the class of 2011 were in jobs that require passing the bar exam, a figure that was down more than 11 percentage points since 2008.<sup>9</sup> Another sign of change for the legal occupations subcluster is the rise of contingent and contract workers, with 87 percent growth between 2004 and 2008.<sup>10</sup>

There are signs, though, that the market is beginning to adjust. Applications to law schools nationally are down 15 percent over the past two years<sup>11</sup> and some law schools have responded by decreasing class sizes.<sup>12</sup> More importantly, the median starting salary for lawyers has dipped to \$60,000 from \$72,000 in 2009, which should augment the balancing process.

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<sup>8</sup> Henderson, William D. and Rachel M. Zahorsky, "Law Job Stagnation May Have Started Before the Recession-And It May Be a Sign of Lasting Change," *ABA Journal*, July 1, 2011 [http://www.abajournal.com/magazine/article/paradigm\\_shift](http://www.abajournal.com/magazine/article/paradigm_shift).

<sup>9</sup> National Association for Law Placement, "Class of 2011 Law School Grads Face Worst Job Market Yet Less than Half Find Jobs in Private Practice," *Employment for the Class of 2011-Selected Findings*, <http://www.nalp.org/uploads/Classof2011SelectedFindings.pdf>.

<sup>10</sup> Luo, Tian, Armar Mann, and Richard Holden. "The Expanding Role of Temporary Help Services from 1990 to 2008," *Monthly Labor Review*. Bureau of Labor Statistics (BLS). 2010.

<sup>11</sup> Smith, Mitch, "Prestigious Law School Reduces Admissions, Marks New Trend," *USA Today*, 2012 <http://usatoday30.usatoday.com/news/education/story/2012-05-01/hastings-law-school-admissions/54662710/1>.

<sup>12</sup> Rampell, Catherine, "Law School Admission Testing Plunges," *New York Times (Economix)* (blog). 2012 <http://economix.blogs.nytimes.com/2012/11/21/law-school-admission-testing-plunges>.

**TABLE 1.4.**

The lawyer occupation accounts for nearly four out of five job ads in the legal occupations subcluster.

Occupation	BA+ ads	Share of subcluster ads (%)	Mean salary (\$)
Lawyer	35,300	78	131,000
Paralegal/legal assistant	9,000	20	50,000
Judicial law clerk	500	1	47,000
Legal support worker, NEC*	400	1	60,000
Title examiner/abstractor/searcher	200	<1	45,000

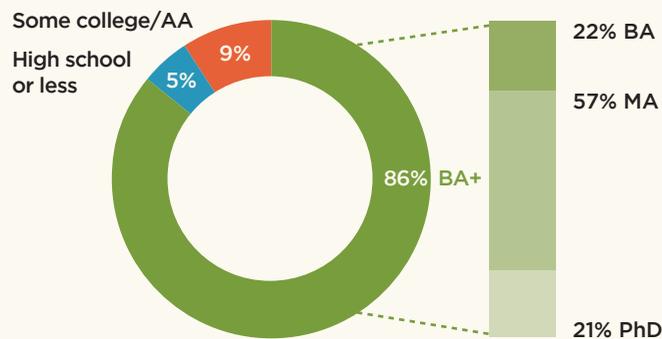
Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data

\*Not elsewhere classified

Note: BA+ : Bachelor's degree or better.

**FIGURE 1.5.**

Of the 86 percent of legal job ads that require at least a BA, 78 percent require an advanced degree.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

## STEM occupations

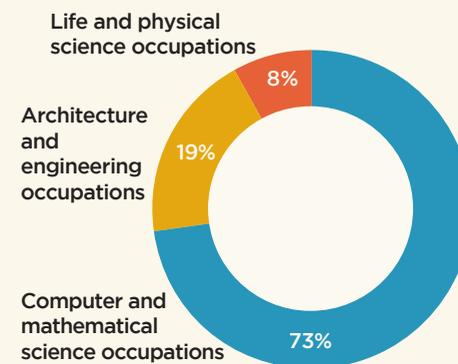
### Computer and math occupations make up three-fourths of the growing demand for STEM professionals.

STEM jobs are composed of three occupational subclusters: computer and mathematical science occupations, architecture and engineering occupations, and life and physical science occupations. In the second quarter of 2013, there were 370,000 online job ads for IT and mathematics occupations, accounting for nearly three out of four STEM online job ads. A total of 98,000 job ads were for architecture and engineering occupations, accounting for 19 percent of STEM job ads, and 8 percent of STEM job ads (37,000 ads) were for life and physical science occupations (Figure 1.6).

STEM is the occupational cluster with the second most job ads, accounting for 28 percent of all job ads for college graduates, while only 11 percent of college-educated employment is in STEM. Although this suggests growing employment demand for college-educated STEM workers, it is hard to establish a direct link between online opportunities and employment. STEM jobs, particularly those in IT, often rely on independent and short-term contract work, which means that one person may hold multiple contract positions at the same time.<sup>13</sup>

**FIGURE 1.6.**

### Computer and mathematics professionals are the most sought-after STEM talent.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

<sup>13</sup> Further, some employers, especially in the IT sector, advertise openings for resume harvesting purposes. Though we believe it is a small portion of the job ads, it is hard to estimate the size of this activity online.

### Computer and mathematics occupations

As technology continues to change job descriptions of workers across most industries, the people behind this very technology are also weathering changes. More than 50,000 computer and mathematical science jobs were lost during the recession, but those numbers quickly rebounded, with a net gain of 325,000 jobs since the end of 2007. That trend is still going strong, with software developer — the occupation with highest demand in

this subcluster — taking the number one spot as the occupation with the highest online demand for college graduates. The \$92,000 average annual salary also makes it one of the best paying in-demand occupations for college-educated workers.

Almost four out of five ads in this occupation group are for college graduates, mostly for applicants with a BA (Figure 1.7). There is little demand for workers with PhDs in computer and mathematics occupations.

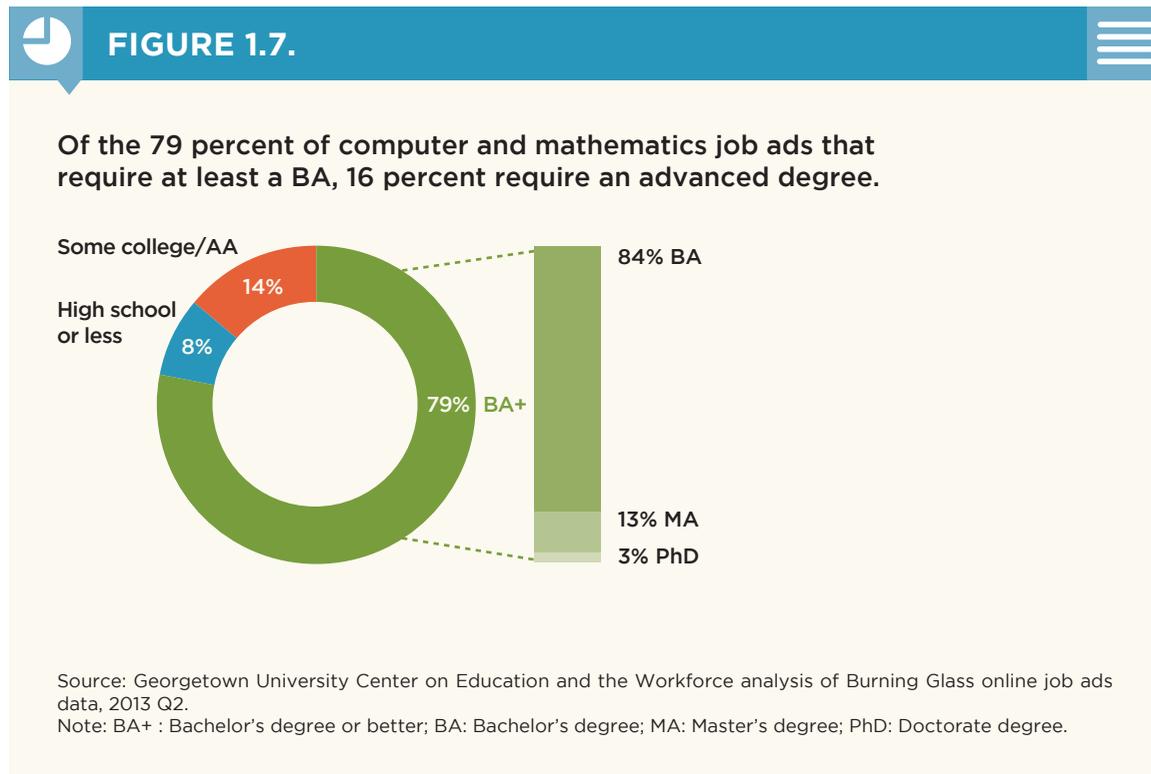




TABLE 1.5.



**Software developer (applications) is the most in-demand information technology and mathematics occupation.**

Occupation	BA+ ads	Share of subcluster ads (%)	Mean salary (\$)
Software developer (applications)	125,300	34	92,000
Computer worker, NEC*	75,700	20	81,000
Computer systems analyst	47,900	13	82,000
Computer user support specialist	18,700	5	52,000
Database administrator	17,800	5	77,000
Network/computer systems administrator	17,200	5	74,000
Web developer	14,900	4	82,000
Computer programmer	13,500	4	76,000
Information security analyst	9,800	3	82,000
Software developer (systems software)	8,700	2	100,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

\*Not elsewhere classified

Note: BA+ : Bachelor's degree or better.



## THE \$92,000 AVERAGE ANNUAL SALARY

makes applications software developers among the best paying in-demand jobs for college-educated workers.

### Architecture and engineering occupations

With the crash of the housing market, architecture and engineering employment declined by 65,000 jobs for college-educated workers during the recession. Yet, since the economy started to recover, it has added 208,000 new college jobs. Most of the ads are for engineers, not architects: mechanical, electrical, and civil

engineers account for well over half of all college graduate ads (Table 1.6). The recent recovery in construction has sparked some return in demand for architects as well.

Four out of five ads in this subcluster are for college graduates, and the vast majority of those are for workers with a BA (Figure 1.8). Mechanical and electrical engineers are the most in demand at all three education levels (BA, MA, and PhD).



**TABLE 1.6.**



**Among architecture and engineering occupations, mechanical engineer is the most in demand.**

Occupation	BA+ ads	Share of subcluster ads (%)	Mean salary (\$)
Mechanical engineer	18,800	19	87,000
Electrical engineer	16,300	17	89,000
Civil engineer	14,600	15	83,000
Engineer, NEC*	10,300	10	92,000
Industrial engineer	7,200	7	80,000
Chemical engineer	6,100	6	99,000
Architect, except landscape and naval	3,900	4	79,000
Environmental engineer	3,300	3	83,000
Electronics engineer, except computer	3,300	3	95,000
Materials engineer	1,900	2	101,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data

\*Not elsewhere classified

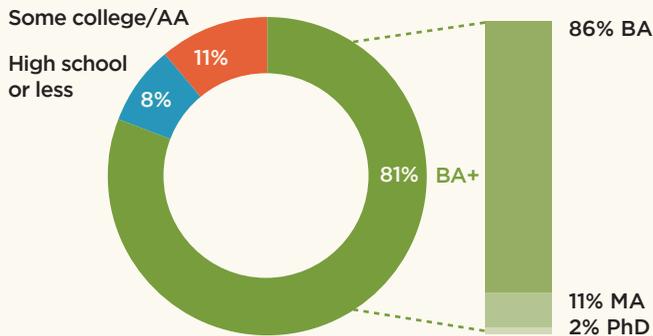
Note: BA+ : Bachelor's degree or better



FIGURE 1.8.



Of the 81 percent of architecture and engineering job ads that require at least a BA, 13 percent require an advanced degree.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

### Life and physical science occupations

This occupational subcluster escaped the worst of the recession: between December 2007 and January 2010, employers added over 25,000 jobs in this category. The number of jobs for college graduates in this subcluster expanded more slowly, by 9,000 jobs, during the prolonged economic recovery. Life and physical science occupations with the highest online demand include medical scientist, chemist, and science technician (Table 1.7).

With a mean annual salary of \$68,000, life and physical science jobs have an above-average demand for highly educated workers (Figure 1.9). Most of these occupations — 87 percent — demand at least a BA, and more than a third of all ads are looking for applicants with an MA.

**TABLE 1.7.**

**Among life and physical science occupations, medical scientist and chemist account for over half of all job ads.**

Occupation	BA+ ads	Share of subcluster ads (%)	Mean salary (\$)
Medical scientist, except epidemiologist	14,500	40	88,000
Chemist	4,400	12	75,000
Life/physical/social science technician, NEC*	2,200	6	46,000
Environmental scientist/specialist, including health	2,100	6	69,000
Biologist	1,900	5	73,000
Geoscientist, except hydrologist and geographer	1,400	4	98,000
Biological technician	1,400	4	43,000
Biological scientist, NEC*	1,300	3	73,000
Microbiologist	700	2	72,000
Conservation scientist	700	2	62,000

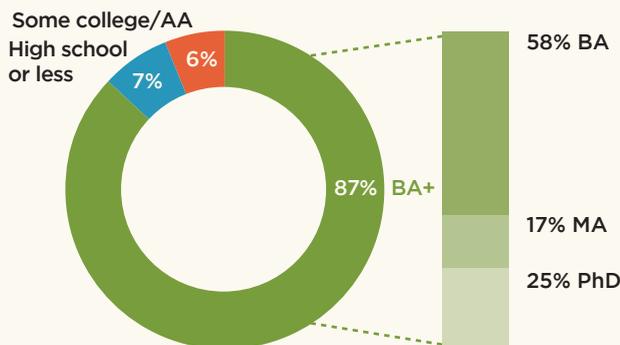
Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Current Population Survey employment data, second quarter of 2013.

\*Not elsewhere classified

Note: BA+ : Bachelor's degree or better

**FIGURE 1.9.**

**Of the 87 percent of life and physical science job ads that require at least a BA, 42 percent require an advanced degree.**



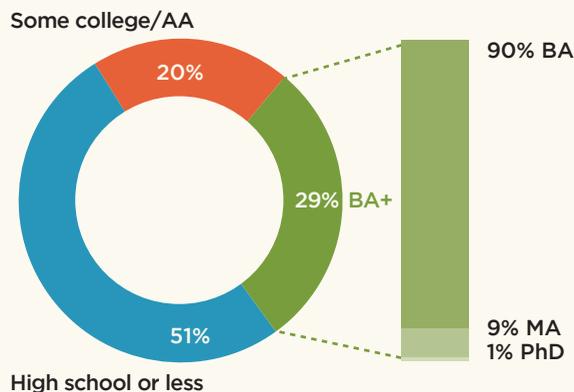
Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

## Sales and office support occupations


**FIGURE 1.10.**


**Of the 29 percent of sales and office support job ads that require at least a BA, 10 percent require an advanced degree.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

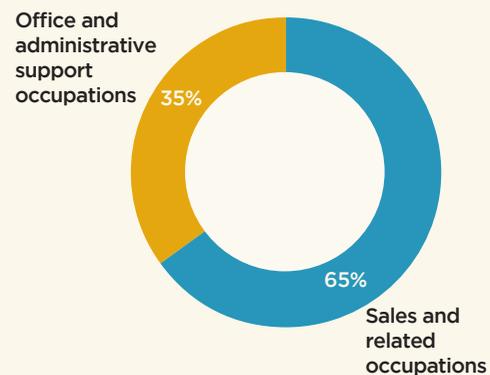
Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

Online recruiting for college-educated workers in the sales and office support occupations cluster outstrips their share in the current workforce. Almost a third of all ads in this occupational cluster seek college-educated talent; meanwhile, roughly a quarter of those currently employed in this field have a BA or better. Yet, over half of the online openings, especially in office support occupations, are for workers with a high school diploma or less (Figure 1.10).

Sales and related occupations account for 65 percent of job ads for this occupational cluster. Office and administrative support occupations account for the other 35 percent.


**FIGURE 1.11.**


**Two-thirds of online sales and office support college job ads are in sales and related occupations.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

## Sales occupations

Sales jobs were particularly hard hit during the downturn, but have since started to recover. The rebound has been most favorable toward those with college degrees, with 533,000 jobs added in this field. The online demand for college graduates in this cluster is mostly concentrated among wholesale and manufacturing sales representatives

and sales supervisors, but there are also opportunities for retail salespersons.

Today, roughly 20 percent of those working in sales have a college degree, whereas 37 percent of job ads seek college-educated workers (Figure 1.12). This gap may reflect a shift to a more skilled economy, or it may reflect a job market taking advantage of a temporarily large supply of educated candidates.

**TABLE 1.8.**

**Among sales occupations, sales representative, wholesale or manufacturing, is the most in demand.**

Occupation	BA+	Share of subcluster ads (%)	Mean salary (\$)
Sales representative, wholesale/manufacturing	63,300	38	64,000
First-line supervisor of retail sales workers	26,000	16	41,000
Retail salesperson	24,200	15	25,000
Sales representative, technical/scientific products	15,100	9	86,000
Securities/commodities/financial services sales agent	7,300	4	99,000
First-line supervisor of non-retail sales workers	5,800	4	82,000
Insurance sales agent	4,500	3	63,000
Real estate sales agent	3,700	2	52,000
Sales representative, services, NEC*	3,400	2	64,000
Sales engineer	2,200	1	99,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.

\*Not elsewhere classified.

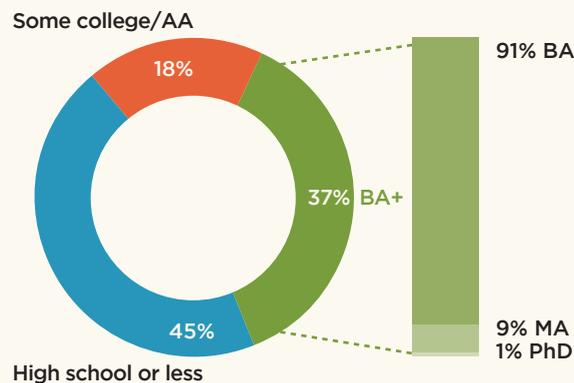
Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.



FIGURE 1.12.



**Of the 37 percent of sales job ads that require at least a BA, 10 percent require an advanced degree.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.  
Note: Percentages sum to more than 100% due to rounding.

### Office support occupations

The number of jobs in this area had been steadily declining even before the recession, and the recession only exacerbated that trend. An increasing number of jobs are being held by

workers with a BA, while employment for advanced degree-holders has remained stagnant. The largest numbers of online office support job ads are for customer service representatives (16,000), office supervisors (14,000), and secretaries/administrative assistants (12,000). Four out



The largest number of online office support job ads are for **CUSTOMER SERVICE REPRESENTATIVES.**



TABLE 1.9.



Among office support occupations, customer service representatives account for 18 percent of online job ads.

Occupation	BA+ ads	Share of subcluster ads (%)	Mean salary (\$)
Customer service representative	16,200	18	33,000
First-line supervisor of office and administrative support workers	13,900	16	52,000
Secretary/administrative assistant, except legal/medical/executive	12,200	14	33,000
Bookkeeping/accounting/auditing clerk	6,400	7	36,000
Executive secretary/administrative assistant	5,900	7	48,000
Production, planning, or expediting clerk	5,300	6	45,000
Office clerk, general	4,000	4	29,000
Human resources assistant, except payroll/timekeeping	2,100	2	38,000
Stock clerk/order filler	1,900	2	24,000
Interviewer, except eligibility and loan	1,900	2	31,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.

Note: BA+ : Bachelor's degree or better.

of five workers employed in office support occupations have less than a four-year degree. The online demand is consistent with that educational distribution, with job ads for college graduates accounting for 21 percent of office and administrative support job ads (Figure 1.13).

## ONE-FIFTH OF OFFICE SUPPORT

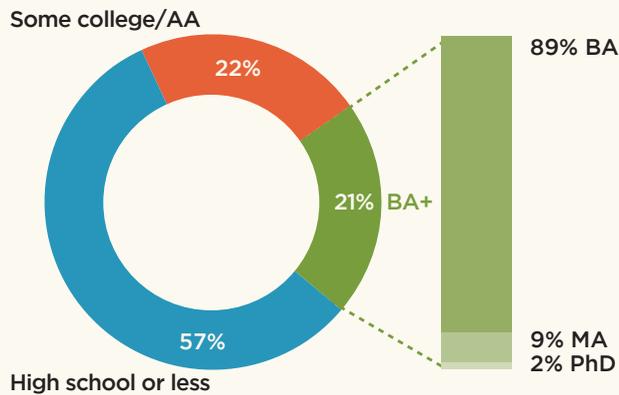
online job ads require a at least a BA.



FIGURE 1.13.



Of the 21 percent of office support job ads that require at least a BA, 11 percent require an advanced degree.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

## Healthcare professional and technical occupations

Over the past few decades, job growth among healthcare professionals has proven to be nearly recession-proof, but after employment peaked in late 2009 at 7.85 million, hiring slowed down. Yet, this general observation obscures the underlying trends that show continued significant growth in jobs for workers with a BA or better, with 353,000 jobs added since January 2010. At the same time, there has been a decline in the employment of workers with less than a BA, with 245,000 jobs lost over the same time period.

With the rollout of the Patient Protection and Affordable Care Act and sequester-driven cuts in Medicare reimbursement, this occupational cluster is likely facing some major changes. At present, online job ads data for the second quarter of 2013 show that healthcare professional and technical occupations represent the fourth-largest cluster by online demand for college graduates, accounting for 11 percent of all job ads that require a college degree. Registered nurse is the most sought-after profession in this group, accounting for a



TABLE 1.10.



### Registered nurse is the most in-demand healthcare professional and technical occupation.

Occupation	BA+ ads	Share of cluster ads (%)	Mean salary (\$)
Registered nurse	49,700	25	69,000
Physician/surgeon, NEC*	21,300	11	185,000
Physical therapist	21,000	10	80,000
Occupational therapist	13,600	7	75,000
Nurse practitioner	11,700	6	53,000
Speech-language pathologist	8,400	4	72,000
Pharmacist	8,200	4	112,000
Physician assistant	7,300	4	89,000
Internist, general	5,500	3	189,000
Family/general practitioner	4,900	2	154,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.

\*Not elsewhere classified.

Note: BA+ : Bachelor's degree or better.

quarter of all job ads for college graduates, followed by physician and surgeon (not elsewhere classified), and physical therapist.

In this occupational cluster, job ads data actually show a lower concentration of demand for college graduates than employment data, with 54 percent of all job ads seeking candidates with at least a BA, compared with 61 percent of healthcare professional and technical

workers employed today who meet that requirement (Figure 1.14).

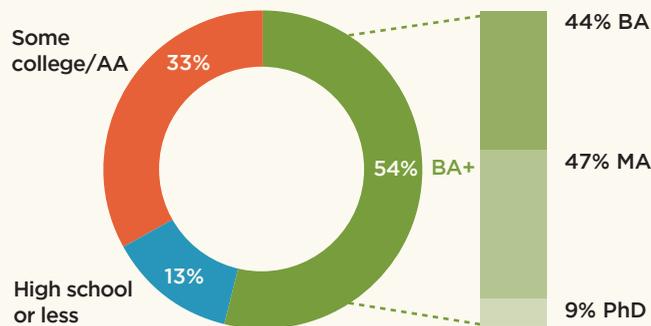
The healthcare professional and technical cluster also plays an important role in the demand for workers with advanced degrees. The cluster accounts for the second-largest share of job ads that call for an MA, and the third-largest share of job ads seeking candidates with a PhD.



FIGURE 1.14.



Of the 54 percent of healthcare professional and technical job ads that require at least a BA, 56 percent require an advanced degree.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

## Education, training, and library occupations

Despite a recent stall in overall college enrollment, due to significant declines in for-profit and two-year public institutions, labor demand for education-related professions remains strong. There are over 100,000 job ads in education, training, and library occupations, or 5 percent of all online job ads for college graduates. However, this occupational group is confronting broad state and local government funding cuts. Employment of college graduates within the education, training, and library occupations cluster has slowed during the recovery, with 165,000 jobs added since January 2010, compared to 299,000 added during the recession years (December 2007 -

January 2010), a period of strong growth in college enrollment. Postsecondary teacher (not elsewhere classified) is the most in-demand occupation, with a respectable \$74,000 average annual salary, followed by secondary school teacher and middle school teacher (Table 1.11).

Four out of five workers in the education, training, and library sciences cluster hold a BA or better, a figure that roughly matches the 81 percent of job ads that seek candidates with a BA or better (Figure 1.15).



TABLE 1.11.



Among education occupations, postsecondary teacher accounts for 15 percent of online job ads.

Occupation	BA+ ads	Share of cluster ads (%)	Mean salary (\$)
Postsecondary teacher, NEC*	15,100	15	74,000
Secondary school teacher	13,600	13	57,000
Middle school teacher	13,300	13	56,000
Elementary school teacher	7,700	8	55,000
Teacher/instructor, NEC*	6,200	6	37,000
Vocational education teacher, postsecondary	6,100	6	53,000
Special education teacher, NEC*	5,300	5	56,000
Business teacher, postsecondary	5,100	5	87,000
Instructional coordinator	3,100	3	62,000
Self-enrichment education teacher	2,400	2	41,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.

\*Not elsewhere classified.

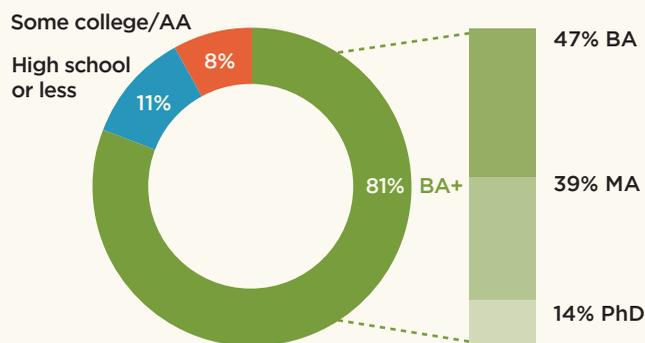
Note: BA+ : Bachelor's degree or better.



FIGURE 1.15.



Of the 81 percent of education, training, and library job ads that require at least a BA, 53 percent require an advanced degree.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

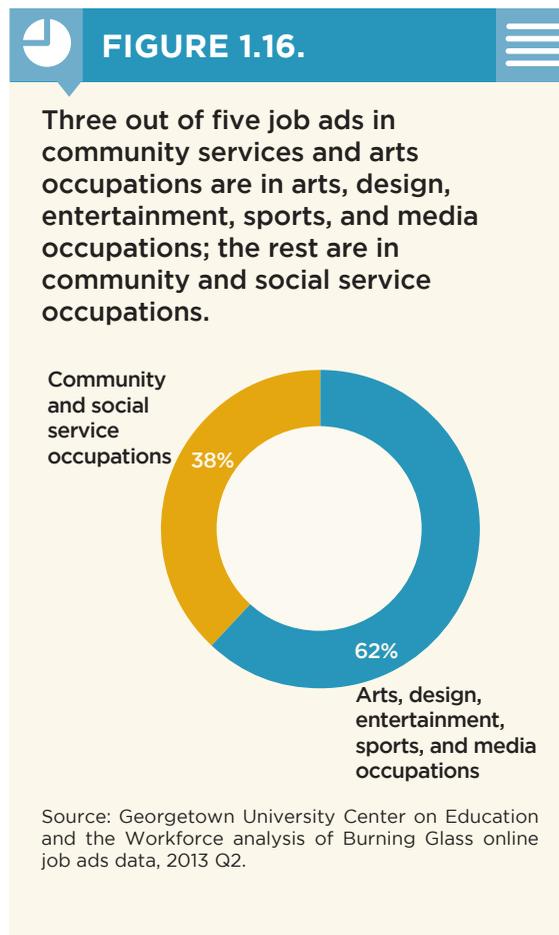
Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

## Community services and arts occupations

Often concentrated in the nonprofit sector, workers in community services and arts occupations tend to fall on the higher end of the educational attainment spectrum, despite lower wages. Jobs in this occupational cluster are split between community service professionals, such as guidance counselors and social workers, and workers involved in the creative fields of arts, design, entertainment, sports, and media, such as authors, producers, reporters,

and designers. Three out of five online job ads are in arts, design, entertainment, sports, and media occupations.

Roughly two-thirds of those employed in this occupational cluster are college graduates, and roughly two-thirds of the job ads also demand applicants with college degrees (Figure 1.17). Twenty-five percent of those college job ads are for applicants with advanced degrees.



Two out of three online job ads

## IN COMMUNITY SERVICES AND ARTS OCCUPATIONS

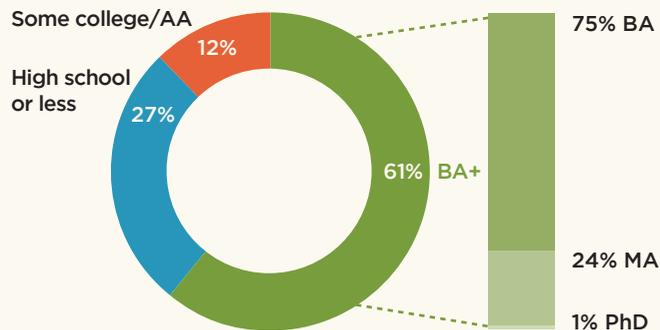
require a BA or better.



FIGURE 1.17.



**Of the 61 percent of community services and arts job ads that require at least a BA, 25 percent require an advanced degree.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

### Arts, design, entertainment, sports, and media occupations

This subcluster is the main contributor to labor demand in the community services and arts cluster, with nearly 58,000 job ads in the second quarter of 2013. It's also the better paying of the two subclusters in community services and the arts occupations, by some 20 percent. While there is strong demand for public relations specialists and coaching jobs, there are a considerable number of job ads for writers, producers, and reporters as well.

Overall, 55 percent of ads require a college degree, a smaller share than the percentage of college graduates currently employed in this field (62 percent). Of all the ads for college-educated applicants, 86 percent seek candidates with just a BA, while the remainder mostly aim at those with MAs (Figure 1.18).

 **TABLE 1.12.**

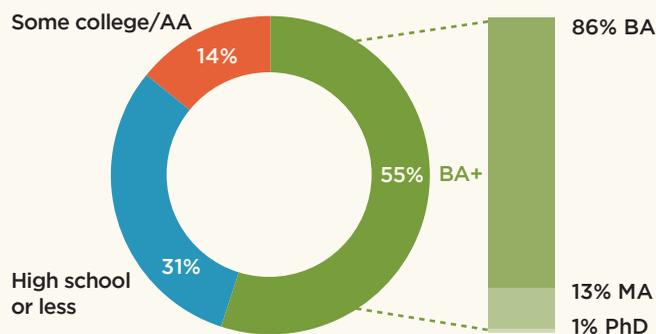
Among arts, design, sports, and media occupations, public relations specialist accounts for 11 percent of online job ads.

Occupation	BA+ ads	Share of subcluster ads (%)	Mean salary (\$)
Public relations specialist	6,500	11	60,000
Coach/scout	5,400	9	36,000
Graphic designer	4,900	8	49,000
Editor	4,400	8	60,000
Commercial/industrial designer	4,300	7	64,000
Technical writer	3,900	7	67,000
Writer/author	3,600	6	68,000
Producer/director	2,600	4	92,000
Reporter/correspondent	2,200	4	44,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.  
Note: BA+ : Bachelor's degree or better.

 **FIGURE 1.18.**

Of the 55 percent of arts job ads that require at least a BA, 14 percent require an advanced degree.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.  
Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

### Community and social service occupations

The community and social service occupations with the highest demand for college-educated workers are educational, guidance, school, and vocational counselor and social worker. Together, these occupations accounted for 37 percent of the online demand for occupations in this cluster.

With only 2 percent of all college job ads, there is a relatively close alignment between the share of people already employed in this field who have a college education and the share of college graduates sought in online job ads (71 percent for employment, 74 percent for openings), but job ads looking specifically for applicants with a BA exceed the number of workers with that credential 41 percent to 33 percent.

 **TABLE 1.13**

**Among community and social service occupations, counselor (educational, guidance, school, or vocational) and social worker are the most in demand.**

Occupation	BA+ ads	Share of subcluster ads (%)	Mean salary (\$)
Educational/guidance/school/vocational counselor	7,300	20	57,000
Social worker, NEC*	6,000	17	54,000
Mental health counselor	5,400	15	43,000
Health educator	3,000	8	52,000
Healthcare social worker	2,500	7	51,000
Clergy	2,100	6	48,000
Social/human service assistant	2,100	6	31,000
Child/family/school social worker	2,000	6	44,000
Substance abuse/behavioral disorder counselor	1,000	3	41,000
Marriage/family therapist	1,000	3	49,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.

\*Not elsewhere classified.

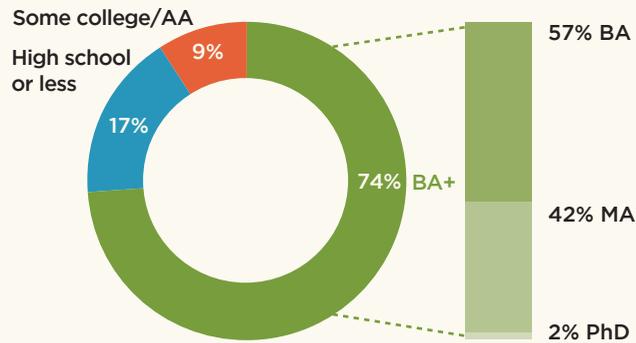
Note: BA+ : Bachelor's degree or better.



FIGURE 1.19.



Of the 74 percent of community and social service job ads that require at least a BA, 44 percent require an advanced degree.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

Note: Percentages sum to more than 100% due to rounding.



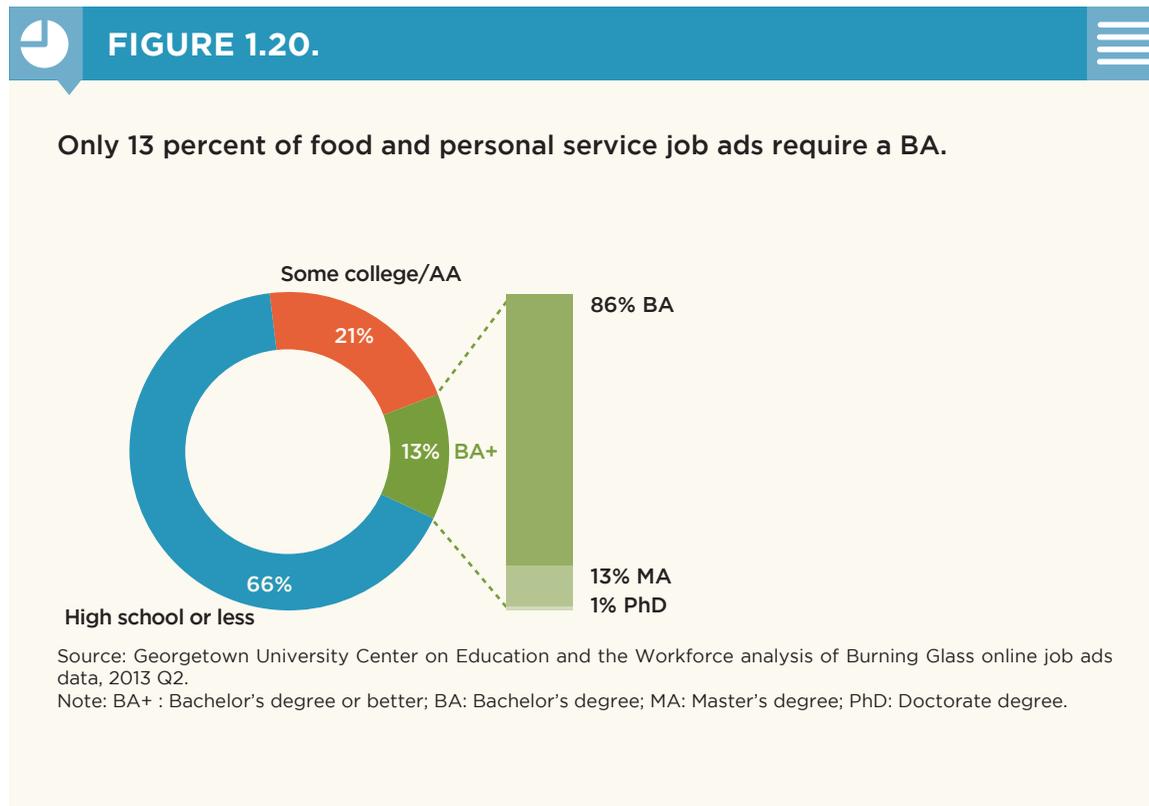
## SCHOOL COUNSELOR IS THE BEST PAYING

community and social service occupation for college graduates.

## Food and personal service occupations

Food and personal service occupations offer among the lowest salaries in our study. There are relatively few opportunities in this area for college graduates (Figure 1.20) — though, as noted in a previous CEW report, *The Undereducated American*,<sup>14</sup> those workers who have a BA command a considerable wage premium.

Eighty-five percent of those now working in this cluster lack a college degree, and workers with advanced degrees make up just 2 percent of the labor force. Job ads follow a similar pattern in food and personal service occupations: only 13 percent require a college degree, and 86 percent of those only require a BA (Figure 1.20).



<sup>14</sup> Carnevale, Anthony P., and Stephen J. Rose. *The Undereducated American*. Washington, D.C.: Georgetown University Center on Education and the Workforce, 2011.

Food and personal service occupations comprise four occupational subclusters: food preparation and serving, personal care and service, protective service, and building and grounds cleaning and maintenance occupations (Figure 1.21). Two out of five online college job ads for food and personal service occupations are in the food preparation and serving-related occupational subcluster; one-third are in personal care and service; and one-fifth are in protective service occupations. A mere 5 percent of food and personal service online job ads are for building and grounds cleaning and maintenance job openings.

### Food preparation and serving-related occupations

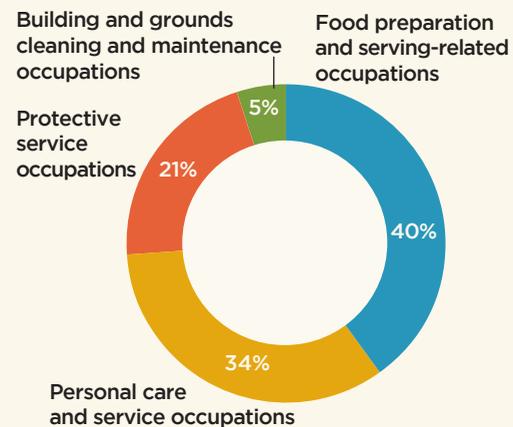
Only 9 percent of those employed in this subcluster are college graduates, and some of those are likely to be students or other part-time workers temporarily supplementing their income. Moreover, 95 percent of food-related jobs that surfaced after the recession have gone to those with no college experience. Not surprisingly, then, opportunities for college graduates are also scarce in the job ads data (Figure 1.22), and median salaries are among the lowest of any occupational group, at \$19,000. The highest demand in this sector is for supervisors of food preparation workers (50 percent of ads for food preparation and serving-related occupations). Supervisor, chef, and head cook are the highest-paying food preparation and serving-related occupations.



FIGURE 1.21.



**Food preparation and serving-related occupations represent 40 percent of food and personal service job ads.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.



TABLE 1.14.



**Among food preparation and serving-related occupations, supervisor accounts for half of the online job ads.**

Occupation	BA+ ads	Share of subcluster ads (%)	Mean salary (\$)
First-line supervisor of food preparation/serving workers	8,600	50	32,000
Chef/head cook	1,300	8	47,000
Cook, restaurant	900	5	23,000

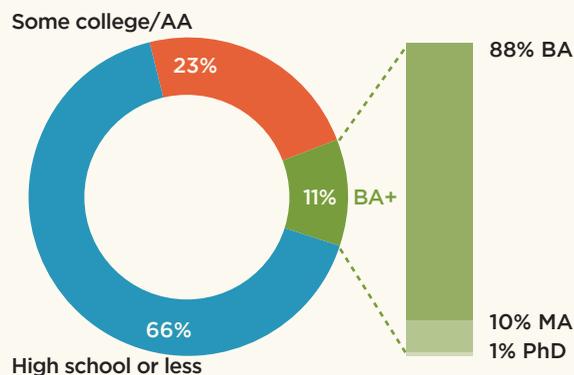
Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.  
 Note: BA+ : Bachelor's degree or better.



FIGURE 1.22.



**Of the 11 percent of food preparation job ads that require at least a BA, only 11 percent require an advanced degree.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.  
 Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.  
 Note: Percentages do not sum to 100% due to rounding.

### Personal care and service occupations

Employment growth in personal care and service jobs has been particularly strong since the first quarter of 2011. But that growth has been heavily dependent on jobs held by less-educated workers, who accounted for the majority of all job gains since the downturn. Job ads for childcare

workers account for 20 percent of personal care and service online job ads, and fitness trainers and aerobics instructors account for 19 percent. Eighteen percent of those currently employed in this field are college-educated, matching the 18 percent of online job ads aimed at college graduates (Figure 1.23).



**TABLE 1.15.**



#### Among personal care and service occupations, childcare worker is the most in demand.

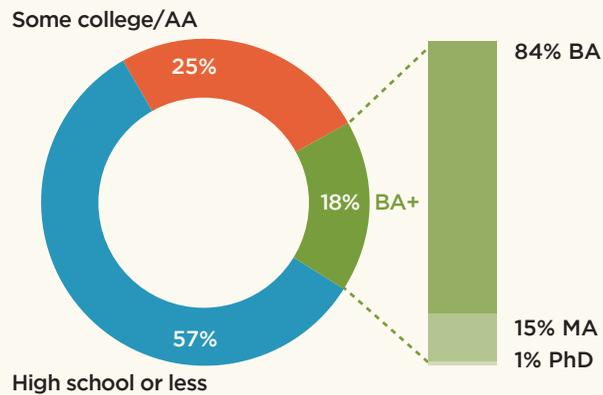
Occupation	BA+ ads	Share of subcluster ads (%)	Mean salary (\$)
Childcare worker	3,000	20	21,000
Fitness trainer/aerobics instructor	2,800	19	31,000
Recreation worker	1,800	12	23,000
First-line supervisor of personal service workers	1,300	9	38,000
Residential advisor	1,200	8	26,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.

Note: BA+ : Bachelor's degree or better.

**FIGURE 1.23.**

Only 18 percent of personal care and service job ads require a BA.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.  
 Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

**Protective service occupations**

The protective service subcluster proved resilient throughout the downturn, adding 210,000 jobs at all education levels — 93,000 of which were for college graduates. Since then, though the protective service subcluster has seen a decline of 170,000 jobs overall, college-educated workers still gained 45,000 jobs between January 2010 and July 2013. Of all the ads seeking college graduates, 19 percent are for detective and criminal investigator, and another 19 percent are for security guard (Table 1.16).

Protective service occupations proved resilient throughout the downturn, adding **210,000 JOBS.**



TABLE 1.16.



Among protective service occupations, detective or criminal investigator is the most in demand.

Occupation	BA+	Share of subcluster ads (%)	Mean salary (\$)
Detective/criminal investigator	1,800	19	76,000
Security guard	1,700	19	27,000
Protective service worker, NEC*	1,700	18	34,000
Private detective/investigator	1,500	17	49,000
Lifeguard/ski patrol/other recreational protective service worker	600	6	21,000
First-line supervisor of protective service workers, NEC*	600	6	49,000
Police/sheriff's patrol officer	500	5	58,000
Correctional officer or jailer	200	3	44,000
First-line supervisor of firefighting and prevention workers	200	2	71,000
First-line supervisor of police and detectives	100	1	81,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.

\*Not elsewhere classified.

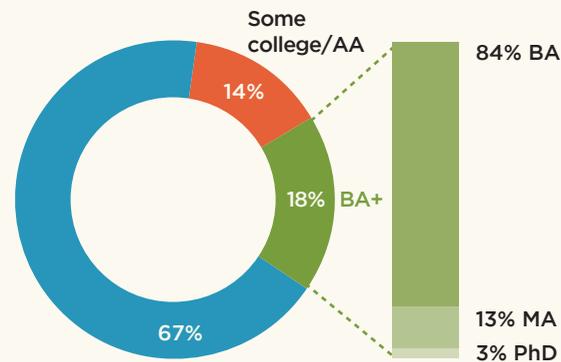
Note: BA+: Bachelor's degree or better.



FIGURE 1.24.



Of the 18 percent of protective service job ads that require at least a BA, 16 percent require an advanced degree.



High school or less

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

Most of the college-educated workers in the food and personal service occupations work in protective service jobs, where 29 percent have an undergraduate degree. That compares to 18 percent of job ads in this category that seek college graduates.

### Building and grounds cleaning and maintenance occupations

The job growth in this cluster has been among workers with only a high school diploma, and jobs for the college educated have grown much more slowly since the end of the recession. There are some jobs in this subcluster that require a postsecondary credential, but most jobs do not require any formal postsecondary education or

training. (There are some ads that seek candidates with specific credentials, such as certifications from the International Society of Arboriculture or the Professional Land Care Network, which do allow for further advancement in the field.) Online job ads data reveal a similar education distribution, with 97 percent of job ads aimed at workers without a college degree.

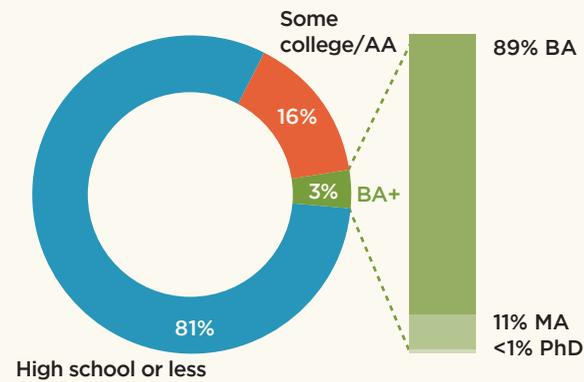
Supervisory roles offer the few opportunities for college graduates in this field. Most often college graduates view this work as alternative income or as something to carry them through periods when they are between jobs.



FIGURE 1.25.



Only 3 percent of building and grounds cleaning and maintenance job ads require a BA or better.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.



## 97 PERCENT

of building and grounds cleaning and maintenance job ads are aimed at workers without a college degree.

## Blue-collar occupations

### Most blue-collar job ads do not require anything more than a high school education.

The “blue-collar jobs” tag is a holdover from a bygone era when all washing machine repairmen wore denim overalls and such jobs required only a high school education. But one part of that description still holds true: for the most part, these are not jobs that employ college graduates. Blue-collar employment saw some of the most precipitous declines in the recent recession, and there hasn't been much growth in these jobs since the recovery took hold. Only 6 percent of construction workers and only 8 percent of those employed in production occupations and installation, maintenance, and repair jobs have any kind of college education. It's always

possible that this could change, but at these levels it's difficult to parse the job ads data to find any significant trends in the opportunities for the college graduate in any of the four occupational subclusters.<sup>15</sup>

### Even among blue-collar jobs, select occupations seek college graduates.

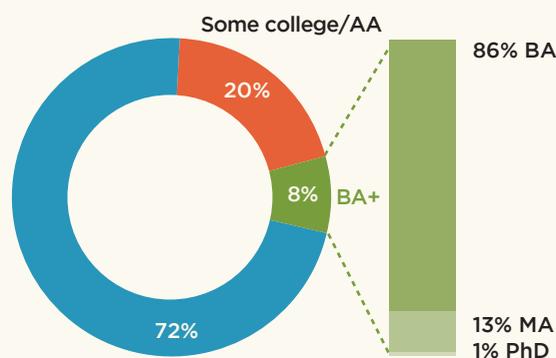
That doesn't mean opportunities for college graduates are nonexistent. Airline pilot and flight engineer, ship engineer, and building inspector are technically considered blue-collar jobs, and these usually require a BA. Supervisory positions often require applicants to have a college degree, as do positions for tester, sorter, and sampler in production occupations.



**FIGURE 1.26.**



### Only 8 percent of blue-collar job ads require a BA.



#### High school or less

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

<sup>15</sup> Job ads with missing education requirements also disproportionately fall within blue-collar occupations.

## Healthcare support occupations

Employment growth in healthcare support occupations has heavily favored those with Associate's degrees or some college experience, while employment growth among those with BAs has significantly slowed since the beginning of the recovery.

Online job ads match these trends. A handful of occupations are responsible for the majority of healthcare support job ads for college graduates. These include massage therapist, physical therapist assistant, nursing assistant, and medical assistant.



**TABLE 1.17.**



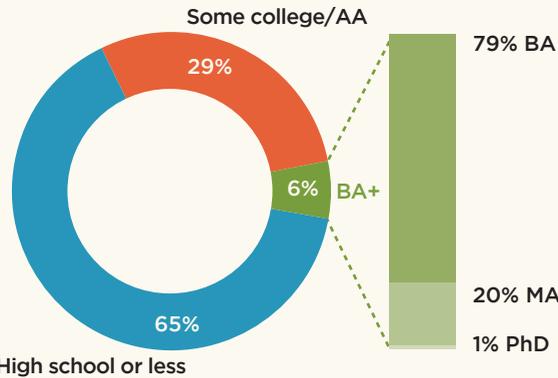
**Among healthcare support occupations, massage therapist is the most in demand.**

Occupation	BA+ ads	Share of cluster ads (%)	Mean salary (\$)
Massage therapist	1,200	24	40,000
Physical therapist assistant	900	19	25,000
Nursing assistant	900	18	25,000
Medical assistant	500	10	30,000
Occupational therapy assistant	300	7	52,000
Dental assistant	300	6	35,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.  
Note: BA+ : Bachelor's degree or better.

**FIGURE 1.27.**

**Only 6 percent of healthcare support job ads require a BA.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.  
 Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

Generally, healthcare support occupations do not require college degrees. Only 12 percent of healthcare support workers have college degrees, and only 6 percent of healthcare support online job ads require a college degree. Most (65 percent) healthcare support job ads are geared toward those with a high school diploma or less, which is higher than the share of workers in this category (40 percent). Half of those employed today in healthcare support boast an Associate's degree or some college course work, an educational credential sought by only about 30 percent of job ads.



**ONLY 6 PERCENT**  
 of all healthcare support  
 job ads are geared toward  
 those with a Bachelor's  
 degree or better.

## Social science occupations

There are few online job ads for social science occupations, coinciding with their low share of employment. However, social science occupations have the highest concentration of online job ads that require advanced degrees. Social science occupations offer the fewest job ads for college-educated workers, with just 8,000 postings. However, this occupational cluster has one of the highest concentrations of college-educated workers, especially those with MAs. In fact, social science occupations require college

graduates almost exclusively: 95 percent of those employed in this field are college graduates, and 92 percent of online job ads call for at least a BA. Further, among ads that require a BA or better, seven out of 10 call for an advanced degree.

Social science research assistant is the most in-demand social science occupation, while political scientist and economist are the highest paid occupations, with annual salaries of \$105,000 and \$100,000, respectively.



**TABLE 1.18.**



**Among social science occupations, social science research assistant is the most in demand.**

Occupation	BA+	Share of cluster ads (%)	Mean salary (\$)
Social science research assistant	900	22	41,000
Social scientist/related worker, NEC*	500	13	79,000
Political scientist	500	13	105,000
Economist	500	12	100,000
Survey researcher	400	11	48,000
Urban/regional planner	400	9	67,000
Psychologist, NEC*	200	6	86,000
Anthropologist/archeologist	200	6	59,000
Sociologist	200	4	79,000

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2 and Occupational Employment Statistics data.

\*Not elsewhere classified.

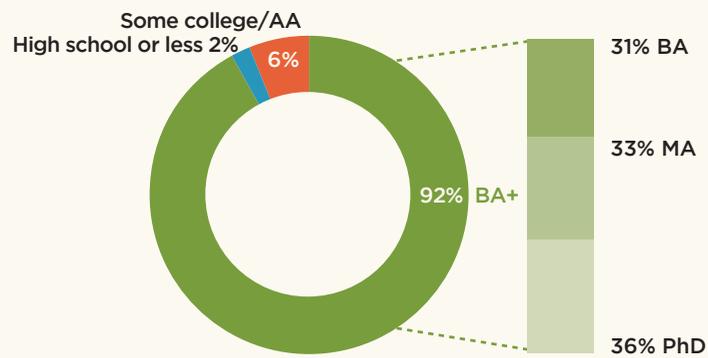
Note: BA+ : Bachelor's degree or better.



FIGURE 1.28.



Of the 92 percent of social science job ads that require at least a BA, 69 percent require an advanced degree.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.



## PART 2. INDUSTRIES

Consulting and business services represent 23 percent of the online job ads in the second quarter of 2013, the highest share among industries (Table 2.1). Healthcare services, financial services, education services, and manufacturing round out the top five industries. Together, the top

five industries account for 76 percent of online job advertisements. Consulting and business services and education services had the highest shares of online job ads that require a BA or better, with two out of three openings for the college educated.

 **TABLE 2.1.**

**The top five industries — consulting and business services, healthcare services, financial services, education services, and manufacturing — accounted for 76 percent of online job ads for college-educated workers in the second quarter of 2013.**

Industry	BA+ job ads, 2013 Q2	Industry share of BA+ job ads (%)	Share of ads that require a BA+ (%)
Consulting/business services	330,000	23	66
Healthcare services	240,000	17	42
Financial services	180,000	13	50
Education services	170,000	12	69
Manufacturing	160,000	11	57
Wholesale/retail trade services	90,000	6	28
Information services	80,000	6	64
Government services	50,000	4	44
Leisure/hospitality services	50,000	4	21
Transportation/utilities services	30,000	2	28
Personal services	30,000	2	38
Construction	10,000	1	30
Natural resources	10,000	1	47
<b>Total</b>	<b>1,440,000</b>	<b>100</b>	<b>47</b>

Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: Postings with missing industry information were excluded. Hence, the total number of openings by industry does not match with the total by occupations.

Note: BA+ : Bachelor's degree or better.

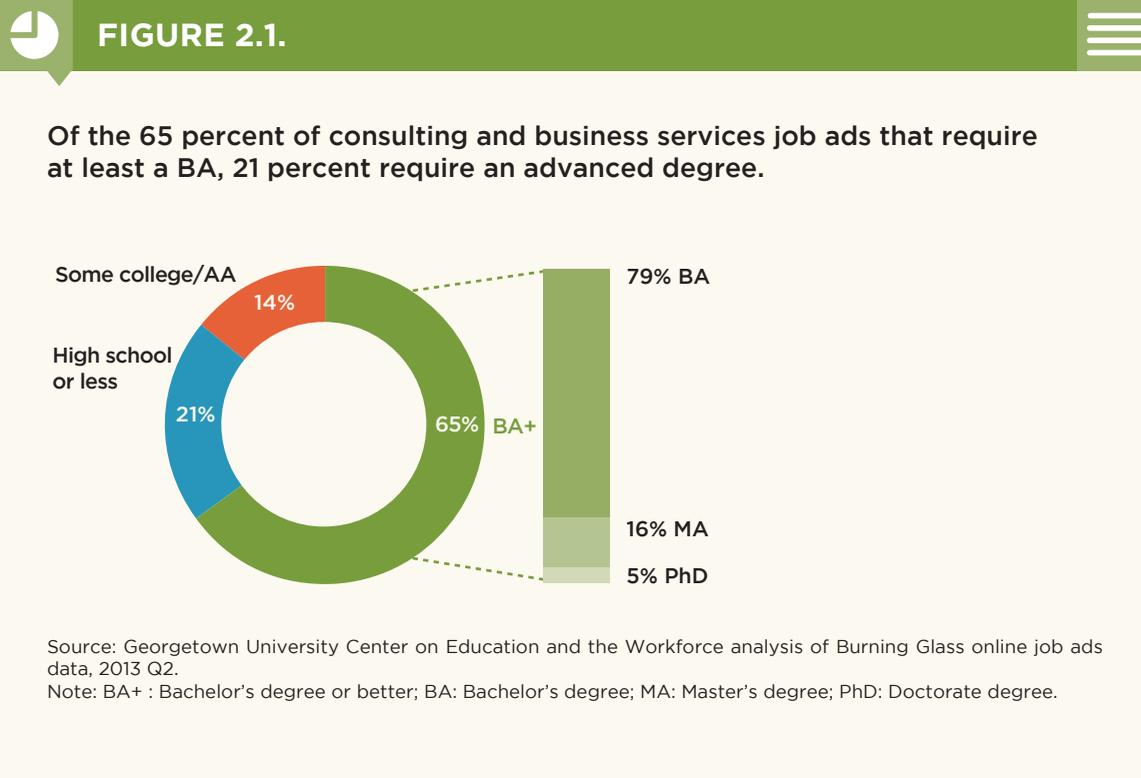
## Consulting and business services

The consulting and business services sector, an array of high-wage, high-skill industries ranging from computer systems design to advertising, tops the list of industries with opportunities for college graduates: its 330,000 job ads account for 23 percent of online job ads for college graduates. This sector accounted for a fifth of all opportunities for candidates with MAs and a quarter of all opportunities for those with PhDs.

Within this sector, 16 percent of college job ads are for applicants with an MA,

and 5 percent are for those with a PhD (Figure 2.1). Only the education services and government services industries have a higher concentration of opportunities for those who hold PhDs. Among those employed in this sector, nearly half (48 percent) have a BA — the fourth-highest concentration of BA-holders of any industry sector.

Major employers in this sector include Accenture, Deloitte Development, and IBM.<sup>16</sup>



<sup>16</sup> Major employers for each sector referred to in this section are those that had the largest number of online job ads within the sector in 2013 Q2.

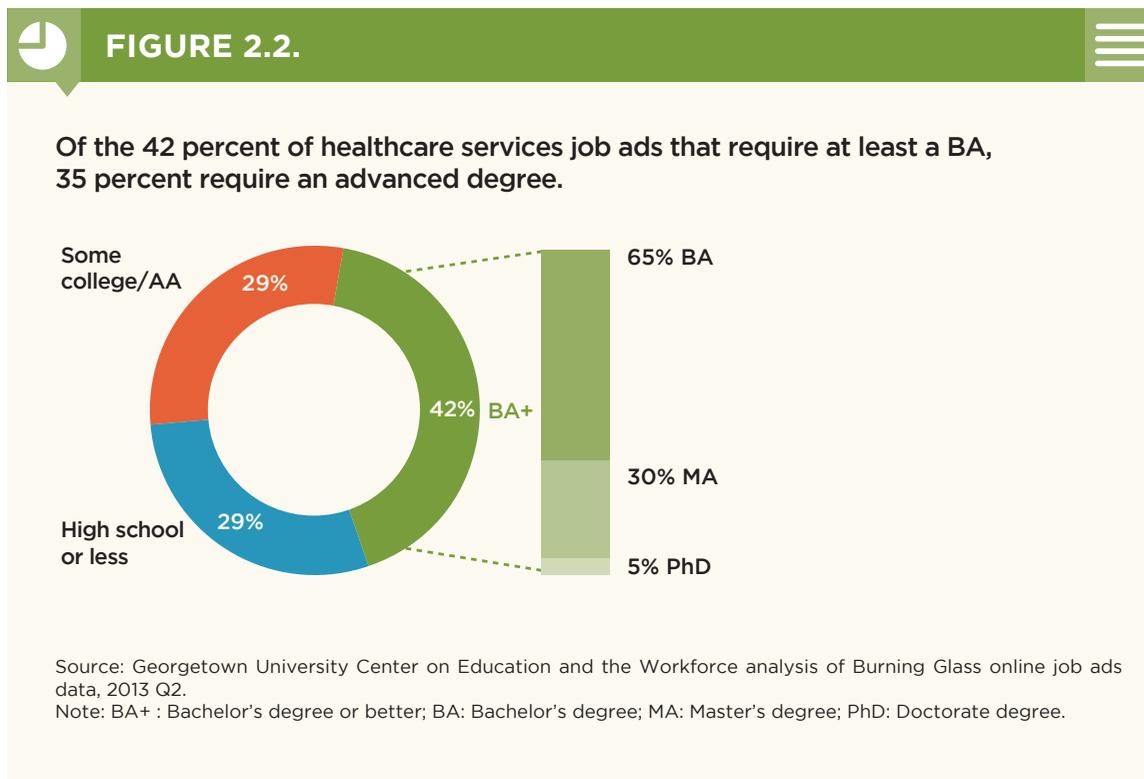
## Healthcare services

The healthcare services sector is composed of firms that provide various types of healthcare and social assistance services to individuals.<sup>17</sup> The Hospital Corporation of America (HCA), Cleveland Clinic, and Providence Health & Services have the most online job ads in the healthcare services industry. This sector generated the second most opportunities for college-educated workers in the second quarter of 2013, with 240,000 job ads, or 17 percent of the total number of ads for college graduates.

This industry also offers the most online job ads for workers with MAs — 27 percent of all job ads for MA-holders fell into this

category. It also has the second-highest concentration of job ads for advanced degree-holders after education services: 35 percent of healthcare services job ads that require at least a BA require an advanced degree.

These figures, based on online job ads data, shed some light on the employment demand for college graduates in a sector currently in the midst of significant transition due to the recent rollout of the Patient Protection and Affordable Care Act, as well as sequestration cuts to Medicare reimbursements.

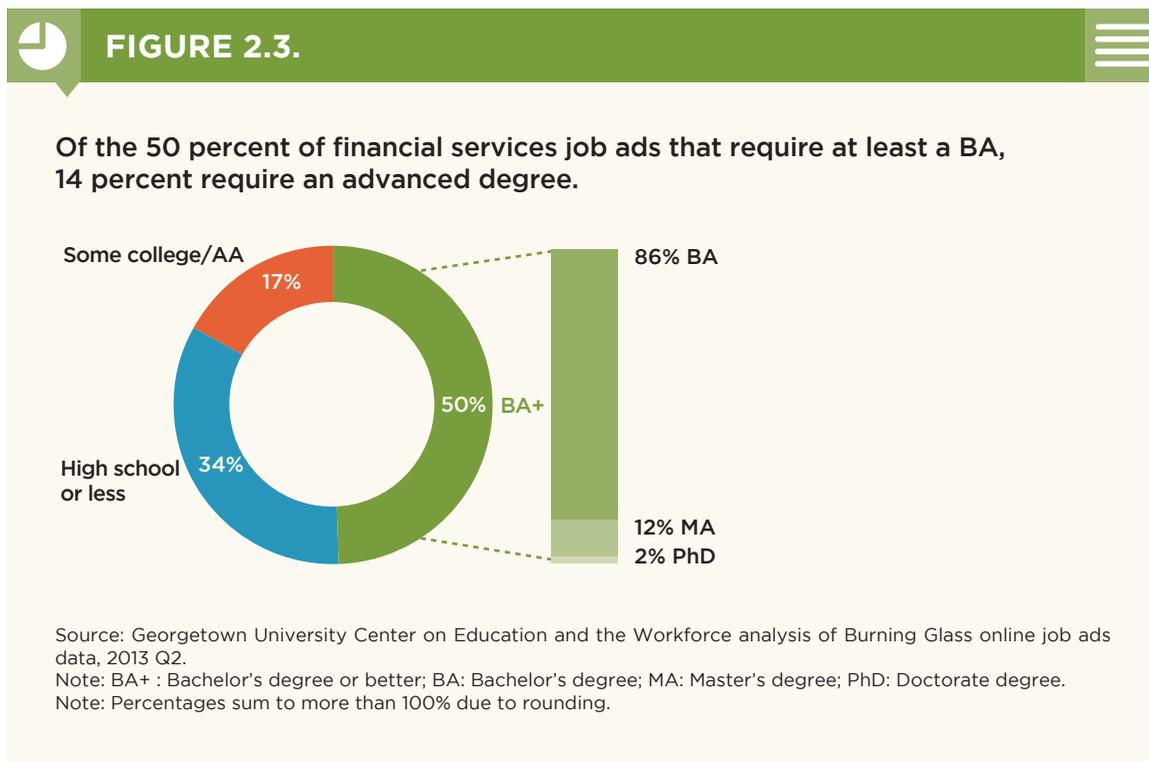


<sup>17</sup> U.S. Census Bureau. 2012 North American Industry Classification System (NAICS). 2012. <http://www.census.gov/eos/www/naics/>.

## Financial services

With 180,000 job ads, the financial services sector accounts for 13 percent of all job ads for college graduates. Among those already employed in this industry, college graduates make up half of the workforce. Major employers in the industry include UnitedHealth Group, JPMorgan Chase Co., and Kaiser Permanente.

The financial services industry is fourth in terms of the number of opportunities for workers with MAs, as well as for those with PhDs.



## Education services

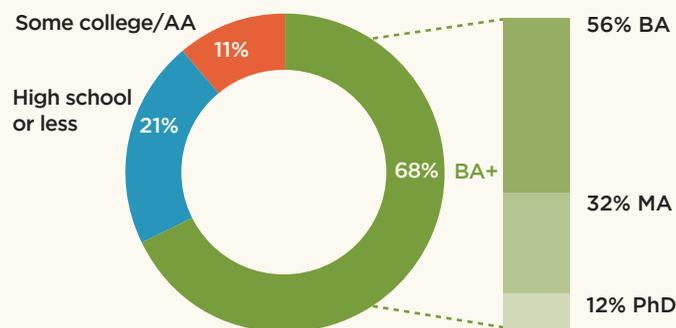
Twelve percent of all job ads (170,000) for college graduates were in the education services sector, which is made up of public and private schools, colleges, universities, training centers, and other establishments that provide instruction and training in a variety of subjects.<sup>18</sup> Major employers in the industry include Kaplan Inc., ITT Educational Services Inc., and the University of California. It also has the highest concentration of college-educated workers (68 percent).

For job seekers with advanced degrees, the education services sector offers the second-highest number of opportunities: 20 percent of all job ads for workers with MAs and 30 percent of job ads for workers with PhDs are in this industry.



**FIGURE 2.4.**

**Of the 68 percent of education services job ads that require at least a BA, 44 percent require an advanced degree.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

<sup>18</sup> U.S. Census Bureau. 2012 North American Industry Classification System (NAICS). 2012, <http://www.census.gov/eos/www/naics/>.

## Manufacturing

As manufacturing companies continue to shift operations back to the United States, job opportunities are on the rise. According to The Reshoring Initiative (February 2013), nearly 10 percent of job gains in manufacturing since January 2010 can be attributed to overseas jobs returning to U.S. shores.<sup>19</sup> Manufacturing accounts for 11 percent of all job ads for college graduates. Major employers in this sector include General Electric Co., General Dynamics, and Hewlett-Packard.



Manufacturing accounts for

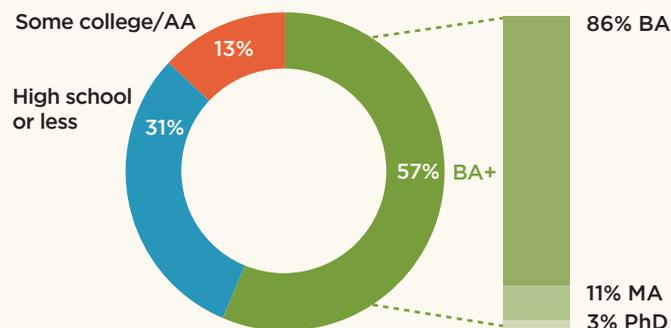
**ONE OUT OF 10**

online job ads for college graduates.



**FIGURE 2.5.**

Of the 57 percent of manufacturing job ads that require at least a BA, 14 percent require an advanced degree.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

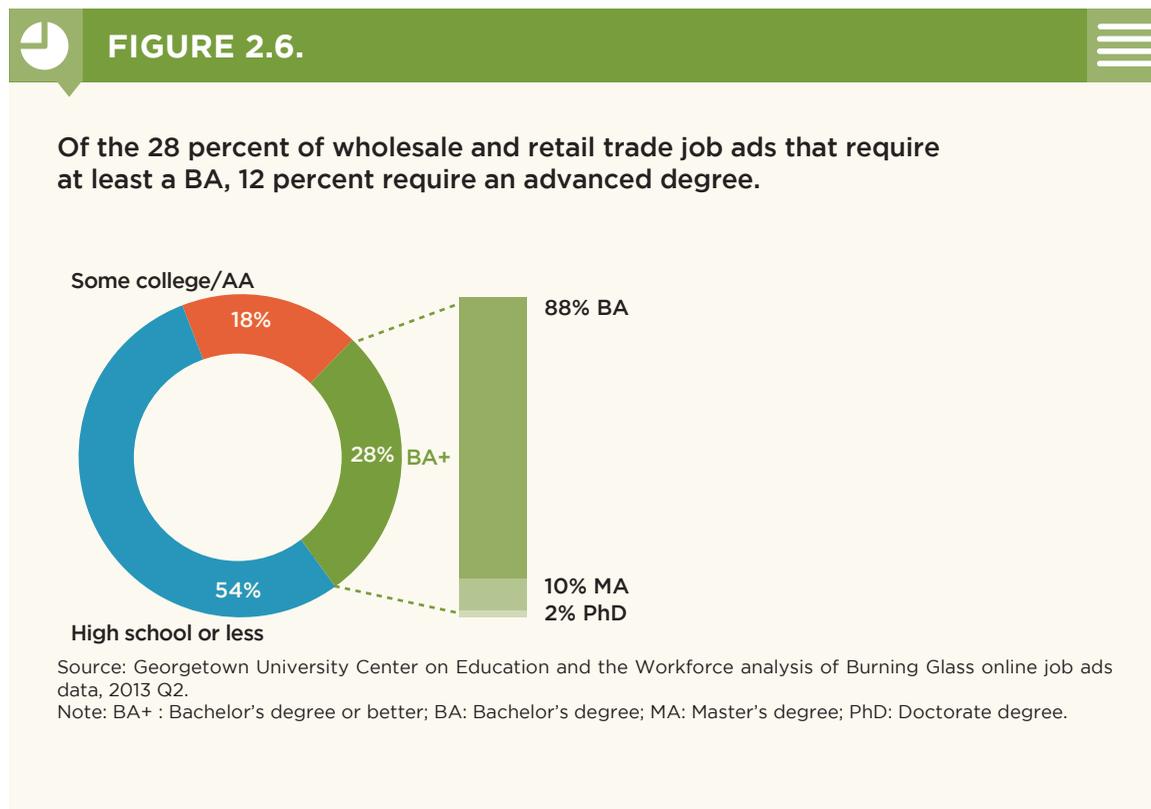
<sup>19</sup> Plumer, Brad. "Back to 'Made in America?'" *The Washington Post*, May 1, 2013, <http://www.washingtonpost.com/blogs/wonkblog/wp/2013/05/01/is-u-s-manufacturing-set-for-a-comeback-or-is-it-all-hype/>.

## Wholesale and retail trade services

The number of job ads in wholesale and retail services for the college-educated workforce reached 90,000 in the second quarter of 2013 — a figure that represents 6 percent of all ads for college graduates. Less than a third of all job ads in this industry, though, are aimed at college graduates, putting this industry near the bottom in terms of opportunities for

college graduates (Figure 2.6). Altogether, only 3 percent of all job ads in this sector are for applicants with MAs, and 1 percent were specifically aimed at those with PhDs.

Major employers with the largest numbers of online college job ads in this industry include Amazon, eBay, and Intel Corp.

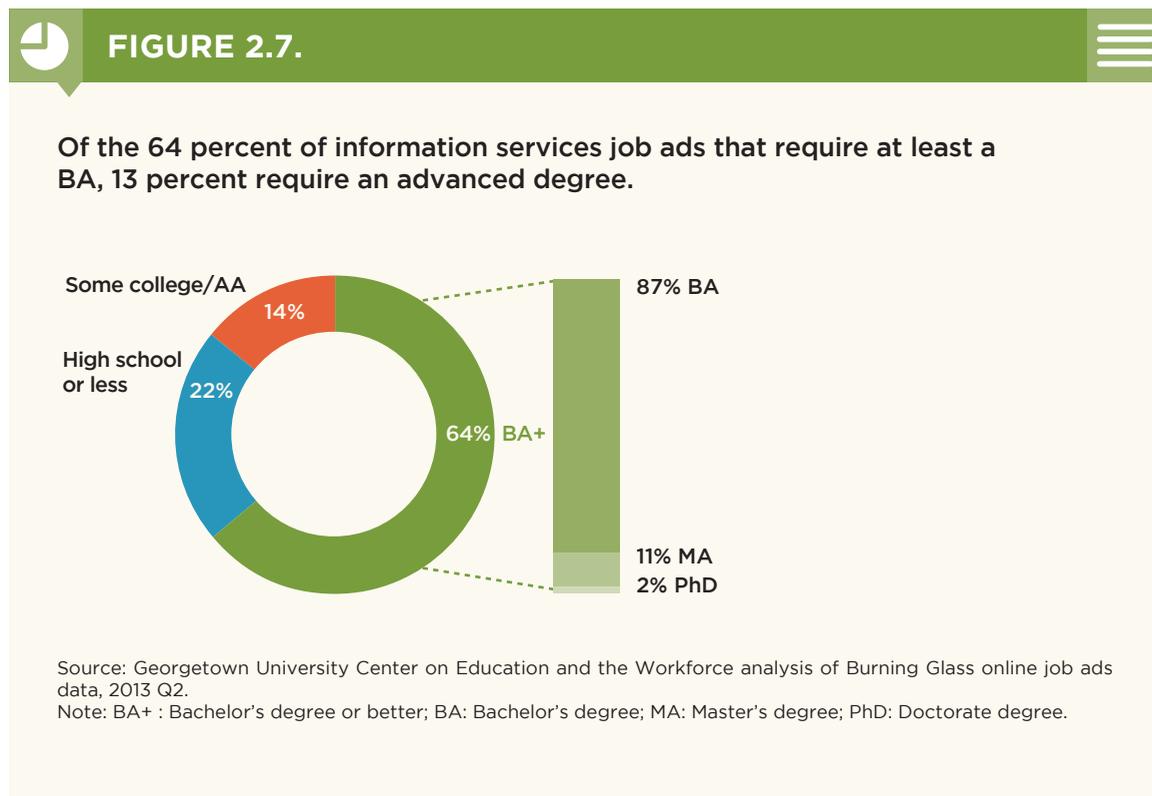


## Information services

The information services industry accounts for only 80,000 job ads, or 6 percent of all online job opportunities for college graduates. The information services industry is the only sector that experienced job losses during both the recession and the subsequent recovery, reflecting the decline of traditional print and broadcast media. Digital media were another story: web service portals and

companies engaged in software publishing, data processing, and Internet hosting or publishing have shown job gains since the beginning of the recovery.

Major employers as defined by the largest number of job ads in this industry include Verizon Communications Inc., Microsoft Corp., and Thomson Reuters.



## Government services



### BUDGET CUTS AND SEQUESTRATION

have taken a toll on government jobs.

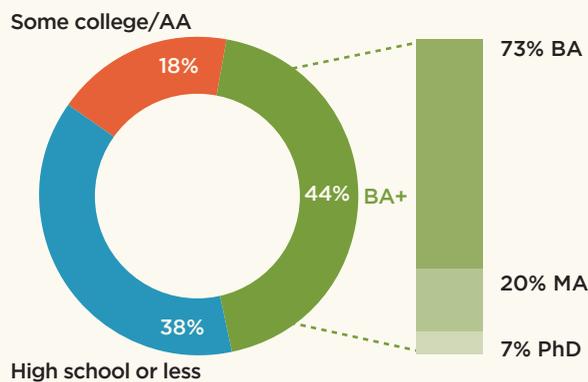
The government services sector's 50,000 job ads account for 4 percent of all job opportunities for the college educated, with major employers ranging from the U.S. Department of Veterans Affairs to the state governments of Colorado and Louisiana. Budget cuts during the recession and, more recently, sequestration have caused this sector to struggle with maintaining employment demand.



**FIGURE 2.8.**



**Of the 44 percent of government services job ads that require at least a BA, 27 percent require an advanced degree.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

## Leisure and hospitality services

A mere 4 percent of all job ads for college graduates come from the leisure and hospitality services sector, where the major job advertisers include Compass Group, Aramark, and Wyndham Worldwide Corp.

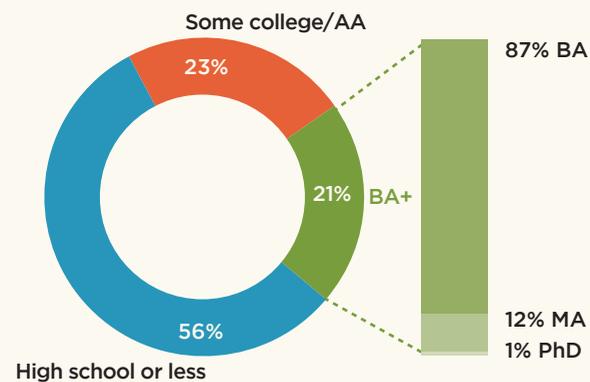
Only 21 percent of leisure and hospitality services job ads are aimed at college graduates. Of those, just 12 percent are for graduate degree-holders, and 1 percent are for PhD-holders.



**FIGURE 2.9.**



**Of the 21 percent of leisure and hospitality services job ads that require at least a BA, 13 percent require an advanced degree.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

## Transportation and utilities services

Only 2 percent of all college job ads stem from the transportation and utilities services sector, and of all ads in this sector, 27 percent are for college graduates. Major job advertisers in the industry include Philips Electronics North America Corp., Xcel Energy Inc., and United Parcel Service Inc.

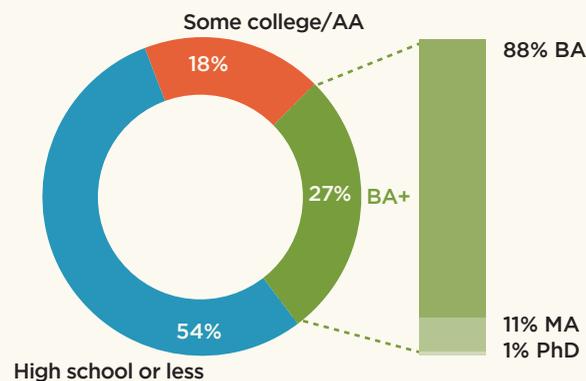
The transportation and utilities services industry is not a major employer of advanced degree-holders. This sector accounts for only 1 percent of job ads for workers with MAs and 1 percent of job ads for workers with PhDs.



FIGURE 2.10.



Of the 27 percent of transportation and utilities services job ads that require at least a BA, 12 percent require an advanced degree.



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

Note: Percentages add up to less than 100% due to rounding.

## Personal services

The personal services industry, which includes everything from dry cleaners to personal trainers, ranked third from the bottom in terms of online job ads for college graduates: its 30,000 job ads represent only 2 percent of all job ads for the college-educated workforce, as well as only 2 percent of job ads for workers

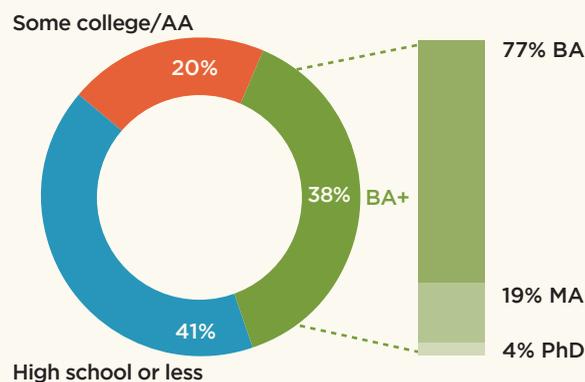
with advanced degrees. Within this sector, college graduates account for 23 percent of the workforce, while 38 percent of job ads are targeted toward college graduates. Major job advertisers in this industry include Ulta Salon, Cosmetics, and Fragrance Inc., American Cancer Society Inc., and Catholic Charities.



**FIGURE 2.11.**



**Of the 38 percent of personal services job ads that require at least a BA, 23 percent require an advanced degree.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

## Construction

The construction industry is dominated by workers without a BA, and it offers very few opportunities for college-educated workers: its 10,000 job ads for college graduates account for just 1 percent of all job ads. College graduates account for only 14 percent of actual employment, the lowest share in any sector of the nation's economy.

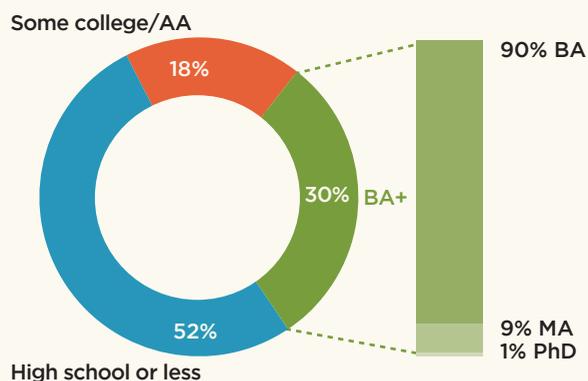
Technip USA Inc., Kiewit Co., and D.R. Horton Inc. account for the most online job ads among employers.



**FIGURE 2.12.**



**Of the 30 percent of construction job ads that require at least a BA, 10 percent require an advanced degree.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

## Natural resources

The natural resources sector ties construction for the fewest job ads for college graduates. Its 10,000 job ads account for 1 percent of all job ads for the college educated. Among online job ads in the natural resources industry, 48 percent are for applicants with a BA or better, and of those, 10 percent require an MA. Another 3 percent are for applicants with a PhD.

There are two factors that contribute to the relatively high concentration of job ads seeking candidates with a BA or better in this industry. First, employment of college graduates in this field has grown

in recent years from 14 percent of the sector's workforce in 2008 to 20 percent of the sector's workforce in 2013. Second, as mentioned in the beginning of this report, college graduates tend to be overrepresented in the job ads data. Due to the small number of job ads, the natural resources industry is a sector in which this overrepresentation is particularly noticeable.

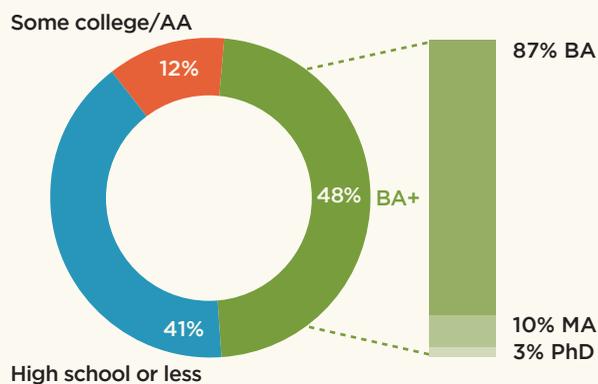
Major employers in the natural resources industry include Baker Hughes Inc., Chevron U.S.A. Inc. (Texaco), and Royal Dutch Shell plc (Shell Oil).



**FIGURE 2.13.**



**Of the 48 percent of natural resources job ads that require at least a BA, 13 percent require an advanced degree.**



Source: Georgetown University Center on Education and the Workforce analysis of Burning Glass online job ads data, 2013 Q2.

Note: BA+ : Bachelor's degree or better; BA: Bachelor's degree; MA: Master's degree; PhD: Doctorate degree.

# APPENDICES

## I. Online job ads as real-time proxy for labor demand

This research project makes use of online job ads data obtained from one real-time labor market data provider, Burning Glass Technologies (BGT). BGT browses more than 15,000 websites and compiles job ads into one comprehensive database. Most importantly, from one job ad BGT is able to parse the employer name, job title, salary, education requirements, certifications and skills, among nearly 70 other data elements. The data are further refined using an algorithm that eliminates duplicate job ads. This presents a fundamental change in the way labor market information is captured, in that it attempts to fill an increasing void in traditional data by making analyses more current and feasible. The following sheds additional light on several crucial elements of the data collection process — spidering, parsing and de-duplication.

**The “spidering” process:** Vendors employ spiders to collect a wealth of job ads information based on a fixed schedule and a predetermined basket of websites. While there is not necessarily an optimal frequency, routine spidering can make the data more susceptible to artificial spikes. For example, if spiders only collect data bi-weekly, unless corrected for, a spike that is seemingly unrelated to the actual labor demand will appear every two weeks. To avoid such fluctuations and sometimes the loss of postings, large job boards are given more preference over individual employer sites, which by design are less frequently updated. Nevertheless, the basket of sites is typically carefully monitored and updated to ensure the most current and complete stream of online job listings.

**Extraction and parsing:** Once the data are located, they are extracted, parsed, and coded into specific data elements. Some vendors use systems that require words to be in a somewhat rigid and predetermined sequence, pattern, or format, such as lexical systems. Others, like BGT, rely on a more flexible approach that utilizes an algorithm to properly sort through and process each ad. Among other things, it focuses on the context and sentence structure to determine the form, subject, and meaning of each job listing. This contextual approach is also largely dependent on a large taxonomy of keywords and variables, which is essentially the bridge that translates job ads into the coded data elements. When the posting context is unclear or missing, the coding process is enhanced via semantic analyses or text mining inference, both of which contribute to the final interpretation.

**De-duplication:** Given the excess scraping — the practice of copying identical job ads from one job board to another — and replication across the web, vendors attempt to minimize the number of duplicate job ads. BGT, for example, uses robust algorithms to identify a series of identically parsed variables in job ads, such as location, employer, and job title. Time frames are important, too: based on industry research, BGT employs a 60-day window for job ads, meaning that after 60 days, the same job posting would be considered new. Again, by focusing on the content of the ad rather than its basic fields, BGT currently achieves a near 90 percent accuracy rate.<sup>20</sup>

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<sup>20</sup> <http://burning-glass.com/technology/coding-interpretation/>

**Data limitations: A job ad does not always translate into a job opening.**

Despite the innovative approach, several lingering issues remain — namely, a real-time versus accuracy tradeoff. While government statistics are notorious for lagging behind real-time events, their validity is rarely questioned. On the other hand, online ads arrive via a daily feed, but they are also crafted for recruitment purposes and not necessarily for analysis. Moreover, they often omit critical information of interest to researchers. Unlike traditional labor market data, job ads can also be influenced by factors other than true labor demand, which are discussed in more detail below.

Job ad distribution does not exactly mirror that of the actual labor market. While online job boards matching job seekers to vacancies have proliferated, they are not yet fully representative of job openings in all industries. Our estimates indicated that about 60 to 70 percent of the total job openings are captured in the online job postings data.<sup>21</sup> Chief reason for the lack of coverage is employers targeting job seekers who are more likely to do their job search online. This inadvertently introduces bias, as the share of openings for higher-skilled occupations tends to outnumber that for lower-skilled jobs. For example, online ads within math and computer science occupations are much more plentiful than are those for construction workers. This theme is well established in industry analysis; the distribution is skewed toward professional sectors, such as healthcare, finance and management, rather than agriculture and mining. It can also reflect

wide differences in recruiting methods. While most white-collar professions rely on the Internet for recruiting, blue-collar industries are more likely to fill vacancies via other methods.

Similarly, jobs posted online vary by the level of education required by the job opening. We believe that a main source of bias in the ads data is due to differences in Internet access among job applicants, which varies significantly by education. In addition, data on education requirements are also compromised due to firms' and recruiters' omission of such information. When available — in slightly over half of all ads<sup>22</sup> — the parser correctly identifies education level nearly nine out of 10 times. Surprisingly, over 20 percent of ads with no education information seek out highly skilled professionals. These job ads often come with an implicit assumption of an advanced degree or licensure, such as JDs for lawyers or MDs for physicians. The remaining job ads with missing education requirements are dispersed across a wide range of industries and occupations.

While a considerable education bias persists, for the purposes of this report job ads for college graduates are assumed to be more representative of actual labor market conditions. Using a back-of-the-envelope approach, we estimate about 30 to 40 percent of job openings for some college and Associate's degree-holders and 40 to 60 percent of job openings for workers with a high school diploma get posted online. By contrast, 80 to 90 percent of the openings seeking candidates with BAs and better are estimated to be posted online.

<sup>21</sup> As we discuss later, this number varies by education, industry, and occupation groups. Also, see the *Understanding Online Job Postings Data: A Technical Report* for a more detailed discussion.

<sup>22</sup> The next section of the appendix discusses our correction methodology for missing data.

Lastly, previous analyses suggest that a large fraction of false positive job ads stem from meta-data encryption, an issue that arises when spiders capture both header and footer data along with the job ads text. Fortunately, this problem is limited to select job boards and to some extent has been alleviated with new and improved spiders that exclude the meta-data when scraping the web. Context errors also generate a number of false positives. That is, even when algorithms are precise, parsing through the context of each ad remains a very delicate process because many keywords are interrelated and acutely context-sensitive.

**Full reliance on algorithms to sort through the complexity of online job ads does not come without continued challenges.**

Despite the issues detailed above, job ads still serve as a useful gauge of college labor demand. Many of the pitfalls associated with job ads data have seen substantial improvements, but many of them will remain a function of the underlying advertisement content and the effectiveness of artificial intelligence at accurately deconstructing the information into robust variables. Nevertheless, there are advantages to this approach over the traditional survey-based method, mainly in that it hones in on variables that were previously either inaccessible or prohibitively expensive to get. Although job ads data should be carefully used in conjunction with traditional labor market data, its emergence has already complemented segments of labor research.

## II. Adjustments to the data

### Imputing education requirement for ads data

Missing information in the dataset limits the scope for analysis. If the degree of omission is systematically different, deletion of observations with missing data can result in biased estimates. However, the imputation of missing values can enable analysis using standard techniques for complete data. The imputation approach used in this report combines the hot-deck and cold-deck imputation methods. The hot-deck approach uses information from the non-missing observations in the dataset to impute the missing. The cold-deck approach uses information data from another dataset.

Education requirements are available for only 52 percent of job ads data, largely due to the nature of the data. More often than not, the job ads fail to state the preferred education level of the applicant, as opposed to a parser error in capturing the information. Missing education requirements can arise for several reasons. One is that employers may not be fixed on a particular level of education, but are flexible and willing to compromise experience for education. Alternatively, job ads may not state the education requirement because the education level is implicit and is well understood both by the employer and the job-seeker: a lawyer, for example, is expected to have a law degree and to have passed his or her state bar exam. Nevertheless, the number of missing values in the data is too high simply to base the imputations on the characteristics of the non-missing data alone. We therefore use the American Community Survey (ACS) to derive education demand. We

consider variation in education to be across occupations and fairly similar within occupations. For example, regardless of the industry he or she is employed in, an engineer will most likely have at least a BA.

As seen in table A.1 below, the education distribution of three age cohorts – the 25 to 34 age cohort, the 35 to 44 age cohort, and the 45 to 54 age cohort – in ACS data was examined. With 31.4 percent of the cohort with a BA or better, the middle age cohort (35 to 44) was slightly more educated than the other two age cohorts. The shares among the younger (25 to 34) and older (45 to 54) cohorts were 30.9 percent and 29.9 percent, respectively. Overall, the younger cohorts are more educated than the 45 to 54 cohort.

Existing research supports the idea that the “revealed preference” of employers, as defined by the education attainment of current incumbents, is a good proxy for education demand in the market. Thus, we assume that the education requirements of non-missing ads are indicative of true education demand. Comparisons of education attainment of current employment to online ads data suggest that labor demand is skewed toward the more educated, which reflects the combined effect of both the inherent bias in ads data and the possible recent trend of upskilling across the job market. That is, in the post-recession era, employers have retained the upper hand and are able to hire candidates with higher levels of education.

 **TABLE A.1.**

**Education distribution percentages of the three age cohorts**

<b>Educ. Category</b>	<b>Age 25-34</b>	<b>Age 35-44</b>	<b>Age 45-54</b>	<b>Total</b>
Less than HS	12.1	11.4	10.2	11.2
HS diploma	25.9	27.4	29.2	27.5
Some college	22.7	20.9	21.6	21.7
AA	8.5	9.1	9.2	8.9
BA	22.2	20.2	18.5	20.3
MA	6.4	7.8	7.9	7.4
Professional	1.6	2.2	2.3	2
PhD	0.7	1.2	1.3	1
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
Observations (weighted).	36,510,182	38,541,084	38,049,351	113,100,617
BA+	30.9	31.3	29.9	30.7

Source: Georgetown University Center on Education and the Workforce analysis of American Community Survey Data (ACS), 2006-2010.

Note: BA+: Bachelor's degree or better.

### The correction procedure

To obtain the best of both worlds, we look for a middle ground — a cross-fertilization of the education distribution of current employment and online ads. Say the education requirement was missing from 60 percent of the postings for a given occupation in a given state: we keep the 40 percent of the ads with education information as they are. However, to avoid the 40 percent dictating the imputation process, half of the missing values are imputed with the education distribution of the current employment in that state and the other half is further split between the ACS and the ads distribution according to the percentage of missing values in the postings for a particular occupation in the state. Then, the other half is divided 60-40. It follows that the 60 percent of the second half is imputed again through the ACS and the remainder is assigned through the job ads distribution. Thus, in this example, 80 percent of the weight is determined using the ACS distribution and the remaining 20 percent is made up from the job ads data.

The imputations utilize the education distribution of the 25 to 44 age group currently employed in the ACS survey. This group was chosen because its members are slightly more educated than the older cohort and more representative of the current demand for college graduates. We make use of as much occupation detail as possible from the ACS data, mainly at the five-digit occupational code level. If the number of observations at the five-digit occupation code level in a given state was too small to estimate a proper education distribution, education distribution at the

regional level and then the national level was applied for that five-digit occupation. For occupations at the four-digit or three-digit levels, the imputations were done at corresponding levels of detail. Whenever job ads data did not have a five-digit occupation code, the imputation was based on the conforming education distribution of the three-digit level.

### III. Professional and business services history and structure

Professional and business services, referred to in the rest of the report as consulting and business services, is a super-sector that essentially consists of a wide variety of outsourced professional workers and is projected to experience continued growth in employment and output between 2010 and 2020, up 25 and 90 percent, respectively. It represents three core areas initially derived from 1997 NAICS definitions: professional, scientific, and technical services. In addition, administrative support and waste management and remediation services were previously incorporated under the Standard Industry Classification (SIC) system as part of the more broadly defined services division, but under NAICS, each represents its own distinct sector. Additionally, management of companies and enterprises did not exist under SIC — instead, management activities were included in each of the other industrial classifications. While the NAICS is updated every five years — most recently in 2012 — there have been very minimal changes to this super-sector over time. Lawyer, engineer, architect, business consultant, accountant, event coordinator, computer programmer, and building contractor are a few examples of occupations that fall into this diverse

industry. The distribution of education requirements of jobs within the industrial sector is also as varied as occupations within it. Overall, 64 percent of occupations in this sector require postsecondary education and training beyond high school. However, such aggregate analysis can be misleading due to the wide dispersion. For example, virtually all lawyers have obtained a BA or better, relative to just one-fifth of office clerks. Nevertheless, both occupations are well within the bounds of this sector.

**Professional and business services sectors, subsectors, and industries (via BLS):**

- *Professional, scientific, and technical services: NAICS 541:* This field is characterized primarily by the high level of human capital and the

expertise and training of its employees. It consists of a single subsector of the same name, and includes the following wide range of industry groups:

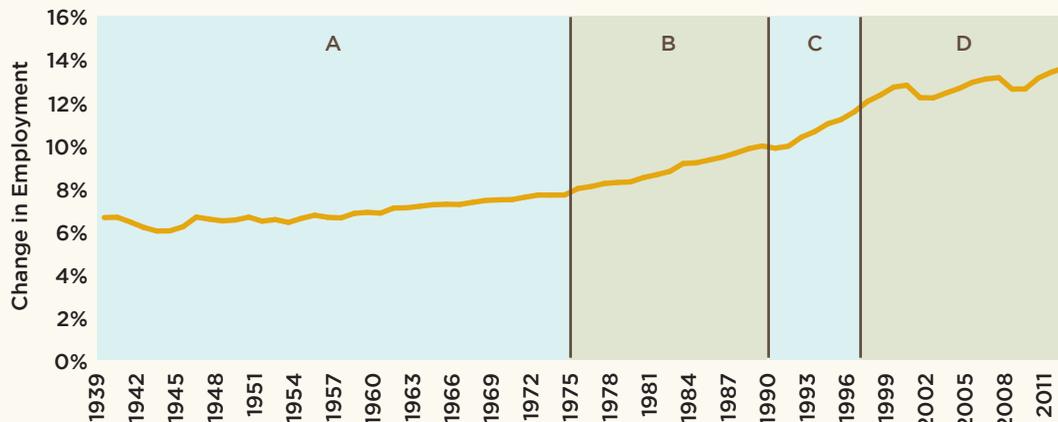
- Professional, scientific and technical services: NAICS 541:
  - › Legal services: NAICS 5411
  - › Accounting, tax preparation, bookkeeping, and payroll services: NAICS 5412
  - › Architectural, engineering, and related services: NAICS 5413
  - › Specialized design services: NAICS 5414
  - › Computer systems design and related services: NAICS 5415
  - › Management, scientific, and technical consulting services: NAICS 5416



**FIGURE A.1.**



**Professional and business services industry (1939-2013)**



**A** - After we began measuring the sector in 1939, initial growth was slow. Over the 40-year time frame to the mid-1970s, professional and business services grew by close to 2 percent of all non-farm payroll employment.

**B** - Professional and business services grew by 2 percentage points from 8 percent of all non-farm payroll employment to 10 percent of these jobs over a 15-year time frame (1975 to 1990).

**C** - The rate of growth of this sector as a percent of all jobs increased tremendously in this six-year time frame. Professional and business services grew by 2 percentage points from 10 percent of all non-farm payroll employment jobs to 12 percent of these jobs over a six-year time frame (1990 to 1996).

**D** - The Great Recession took its toll on the rate of growth of this industry. Falling from its peak in 2000, professional and business services continues to fluctuate and has recently grown to nearly 14 percent of payroll employment in 2012. Source: Georgetown University Center on Education and the Workforce Analysis of Current Population Survey (CPS) (Monthly nonfarm employment), 1939-2013.

- › Scientific research and development services: NAICS 5417
- › Advertising and related services: NAICS 5418
- › Other professional, scientific, and technical services: NAICS 5419
- *Management of companies and enterprises: NAICS 55:* This sector consists of a single subsector in which firms primarily conduct management activities for other corporations or enterprises.
- *Administrative and support and waste management and remediation services: NAICS 56:* This sector consists of firms that perform support activities for other establishments, such as waste removal or administrative support, which are frequently undertaken in-house. It consists of the subsectors and industry groups listed below.
  - *Administrative and support services: NAICS 561*
    - › Office administrative services: NAICS 5611
    - › Facilities support services: NAICS 5612
    - › Employment services: NAICS 5613
    - › Business support services: NAICS 5614
    - › Travel arrangement and reservation services: NAICS 5615
    - › Investigation and security services: NAICS 5616
    - › Services to buildings and dwellings: NAICS 5617
    - › Other support services: NAICS 5619
  - *Waste management and remediation services: NAICS 562*
    - › Waste collection: NAICS 5621
    - › Waste treatment and disposal: NAICS 5622
    - › Remediation and other waste management services: NAICS 5629

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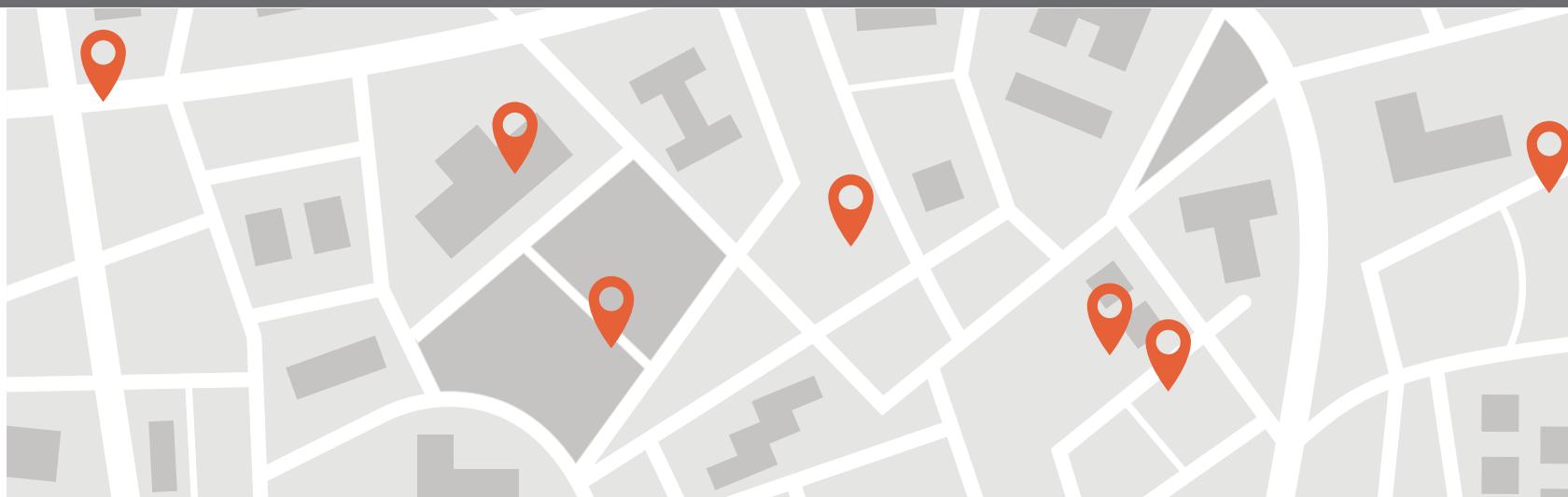






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*The Online College Labor Market* comprises a full report, an executive summary, and a technical report. All reports can be accessed online at [cew.georgetown.edu/onlinejobmarket](http://cew.georgetown.edu/onlinejobmarket).



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