Majors that Matter:

Ensuring College Graduates Avoid Underemployment

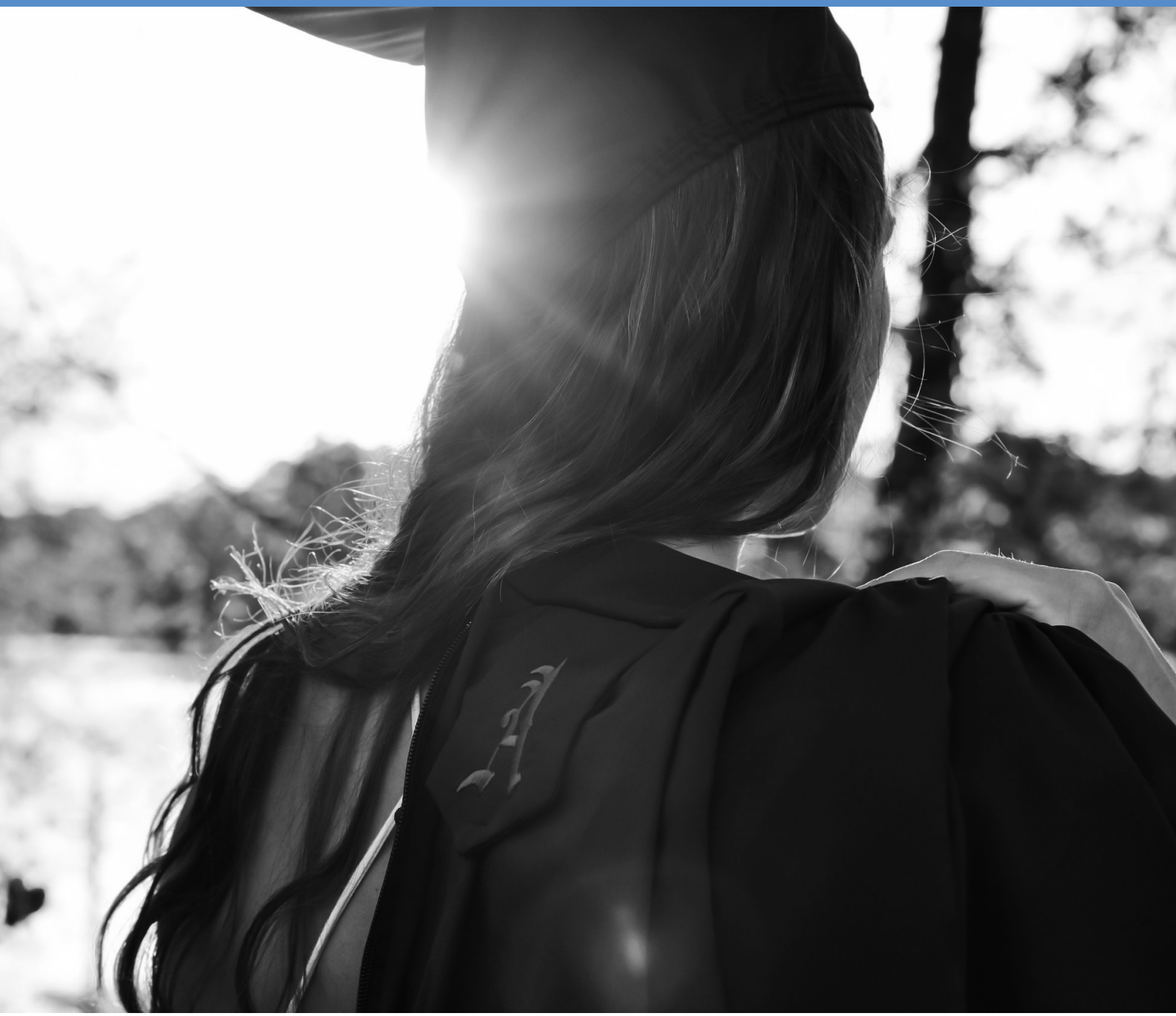

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Table of Contents

	Executive Summary	pg 4
	Introduction: Avoiding the Underemployment Trap	pg 8
1.	Evaluating the Risk of Underemployment When Choosing a Major	pg 12
2.	Avoiding Underemployment by Building the Skills to Succeed	pg 26
3.	Accruing Meaningful and Relevant Work Experiences Before Graduation	pg 40
4.	Conclusion	pg 44
5.	Methodology	pg 48
6.	Supplemental Data Tables	pg 56

Executive Summary

Previous research demonstrates that college graduates who start out underemployed often stay underemployed for years. That poses a basic question: how can the underemployment trap be avoided? Our first report, *The Permanent Detour*, found underemployment carries a substantial cost in both pay and career prospects. How can graduates holding bachelor's degrees ensure they will find college-level employment?

In this follow-up report, funded by the Strada Institute for the Future of Work, Burning Glass Technologies mines resume and job posting data to identify strategies to increase the likelihood of graduates finding appropriate work. The following are the three strategies and key findings that drive them:

Evaluate the Underemployment Risk when Choosing a Major

- The choice of major is crucial, and the outcomes vary widely. On average, 43% of college graduates are underemployed in their first job. When examined by major, underemployment rates vary by 50 percentage points, from 29% in engineering to 80% in personal and culinary services, a more than twofold difference in risk.
- While STEM majors outperform others, there are good choices for students in all fields. In their first jobs, liberal arts majors such as philosophy, foreign languages, and English have comparable rates of underemployment to the market at large. Biology majors, although in a STEM field, fare worse with a 51% underemployment rate.
- Students often choose majors in vocational fields to assure their career success. But many of these majors, including popular majors such as business, legal studies, and public administration, have some of the highest underemployment rates. This is troubling because these non-licensed occupational majors account for 4 in 10 bachelor's degrees awarded in the United States. Since 1970, the enrollment of students in these majors has increased 80%, compared to an 11% increase for STEM majors and a one-third decline in liberal arts majors[1].

Avoid Underemployment by Building the Skills to Succeed

- Having the right skills can make a big difference. Compared with underemployed graduates, properly employed psychology majors are twice as likely to have budgeting skills, and 20% more likely to have research skills.
- For all college majors, the acquisition of specific workplace skills can add up to 20% to a college graduate's earnings.
- Students in underperforming majors can significantly improve their prospects by selecting a high-demand specialization. Underemployment for business majors overall is 47%, but lower for those with

1. Burning Glass Technologies, calculation from National Center for Education Statistics, Digest of Educational Statistics 2017, "Table 322.10. Bachelor's degrees conferred by postsecondary institutions, by field of study," https://nces.ed.gov/programs/digest/d17/tables/dt17_322.10.asp?current=yes.

specializations in finance (33%) or marketing (41%). Business majors who specialize in hospitality or merchandising fare much worse, at 68% and 65%, respectively.

Accrue Meaningful and Relevant Work Experiences Before Graduation

- Internships and other work experience programs can provide students with an opportunity to build skills. For example, college graduates who become athletic trainers can both reduce their risk of underemployment and earn a salary premium if they have experience in rehabilitative services.
- A number of colleges are developing programs beyond internships that provide key skills to make graduates job ready.

Underemployment is a pervasive problem among recent college graduates, and it is easier to avoid than escape. With this report, we hope to provide students, parents, counselors, and higher education institutions with data-driven strategies for ensuring graduates' success.

Introduction

Avoiding the Underemployment Trap

A bachelor's degree has been, and continues to be, the clearest and most accessible path to a good job and middle-class wages. Over the course of a lifetime, a worker with a bachelor's degree will earn, on average, 30% more than one with an associate's degree and 75% more than someone with a high-school education. In dollar terms, that means the average college graduate makes $1 million more over a career than a worker with just a high-school diploma[2].

Yet that powerful advantage only pays off if graduates find college-level jobs. In recent years, far too many students find that they are not able to put their degree to work in the labor market, with a troubling impact on their earning potential.

The first paper in this series by Burning Glass Technologies and the Strada Institute for the Future of Work found that 43% of college graduates do not have a college-level role in their first job. Even more problematic, however, is that our research revealed that underemployment is persistent—that first job can set the tone for career success for as much as a decade. Of those who are underemployed in their first job, we found that two-thirds remain underemployed five years later. Of that group, three-quarters remain underemployed a decade after graduation.

Underemployment comes with a substantial cost. College graduates who are underemployed miss out on the earnings edge that comes with the bachelor's degree. The average starting salary for a bachelor's degree holder appropriately employed is $46,000. Graduates who are underemployed make only $36,000 on average, a 22% wage penalty.

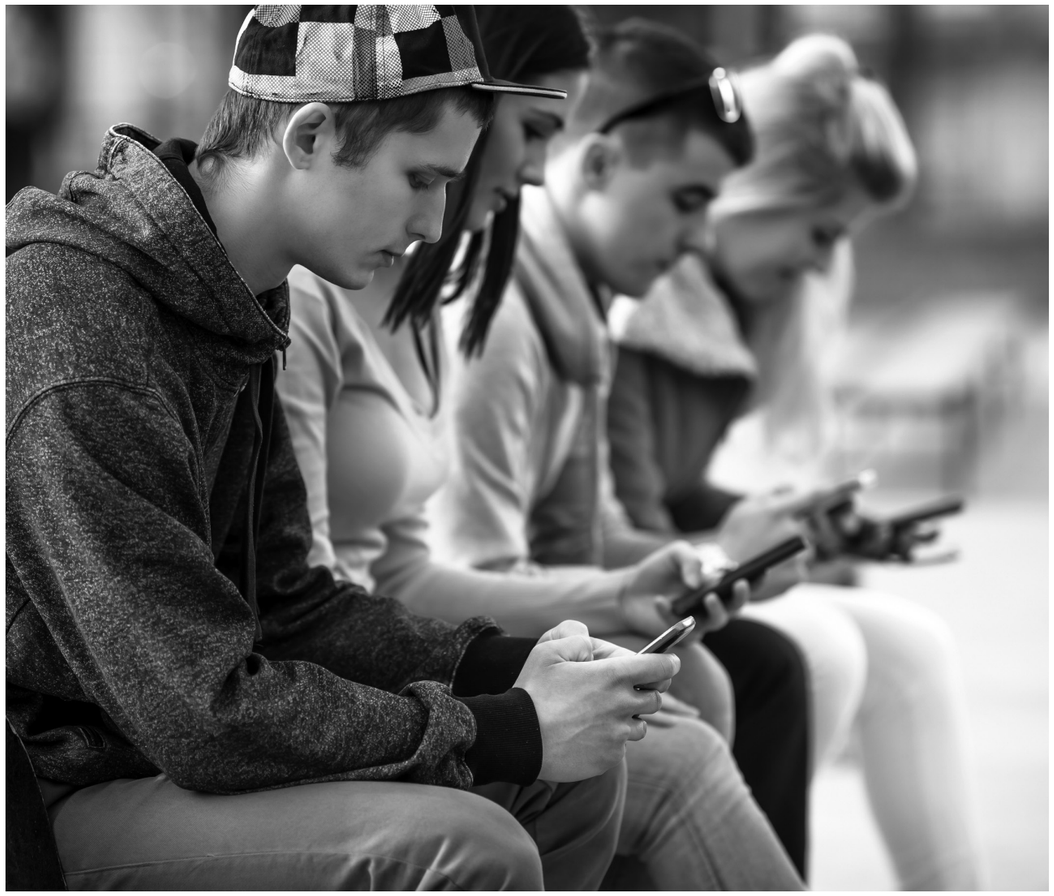
And while that earnings differential shrinks slightly during the following decade of work, it still adds up because college graduates who start off behind in the job market tend to stay behind. As a result, early-career underemployment has a lasting impact on a graduate's wallet, with forfeited earnings totaling nearly $149,000 over the first 15 years of their career.

Given the cost and magnitude of the underemployment challenge, it is imperative that students, their families, guidance counselors, and universities have the tools and information to make informed decisions about selecting a university, a major, and skills. In this paper we focus on three core strategies:

2. Georgetown University Center on Education and the Workforce, "The College Payoff: Education, Occupations, Lifetime Earnings," 2011. https://www2.ed.gov/policy/highered/reg/hearulemaking/2011/collegepayoff.pdf.

- Evaluating underemployment risk when choosing a major;
- Seeking out the skills that can ensure a good first job, even for those in a poorly performing major; and
- Using work experience to build and demonstrate the skills that protect against underemployment.

To provide a practical tool, we have created an Underemployment Risk Indicator that can be used by students and parents in making decisions about programs of study, and by faculty and administrators in identifying areas for improving outcomes. With this, we hope to help students and educators alike make more informed choices about programs and courses—and about the skills that these courses teach. Degrees are not destiny, and even graduates from programs with high rates of underemployment can improve their chances with the right skills and preparation.



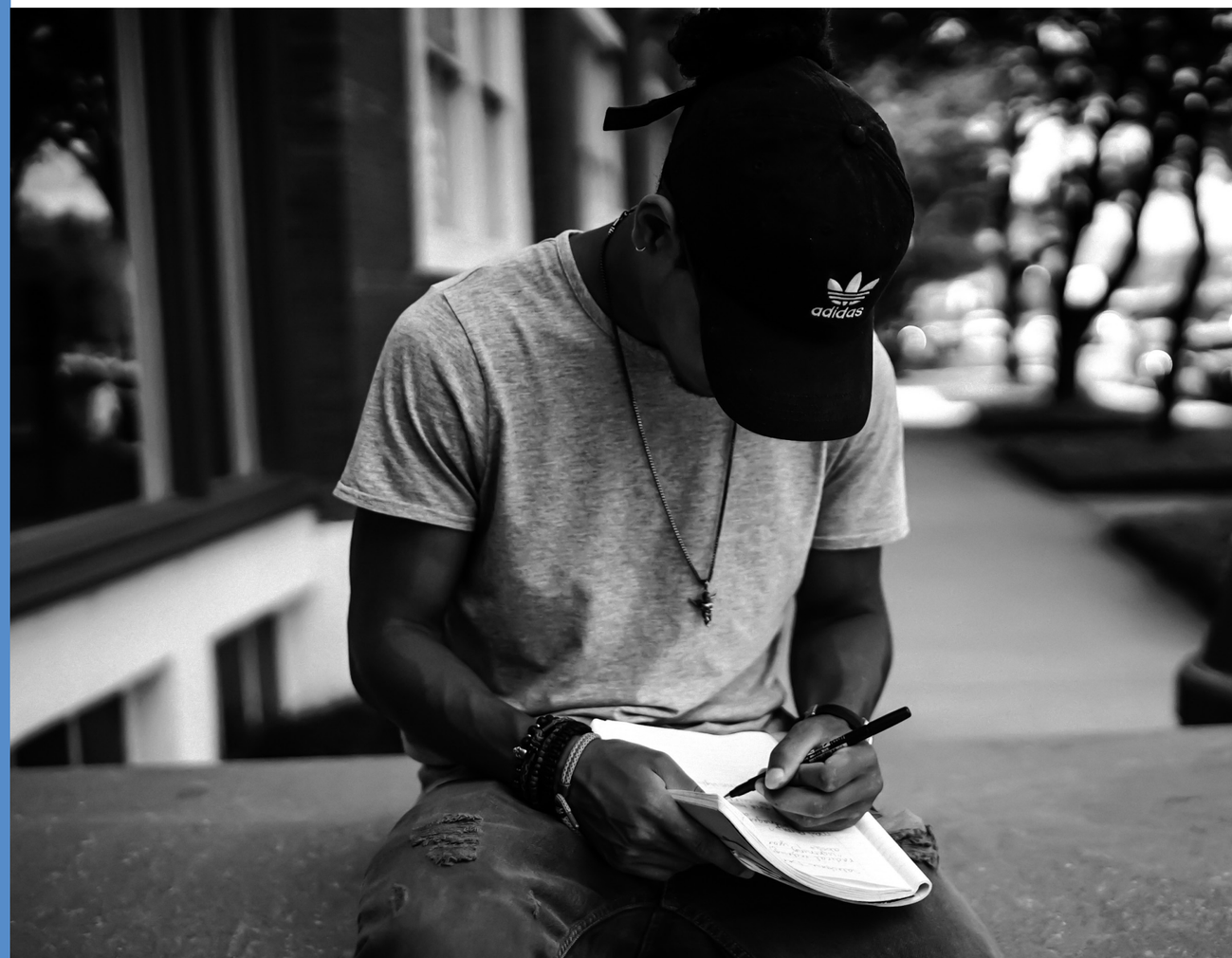
1.

Evaluating the Risk of Underemployment When Choosing a Major

Burning Glass Technologies
Majors that Matter: Ensuring College Graduates Avoid Underemployment

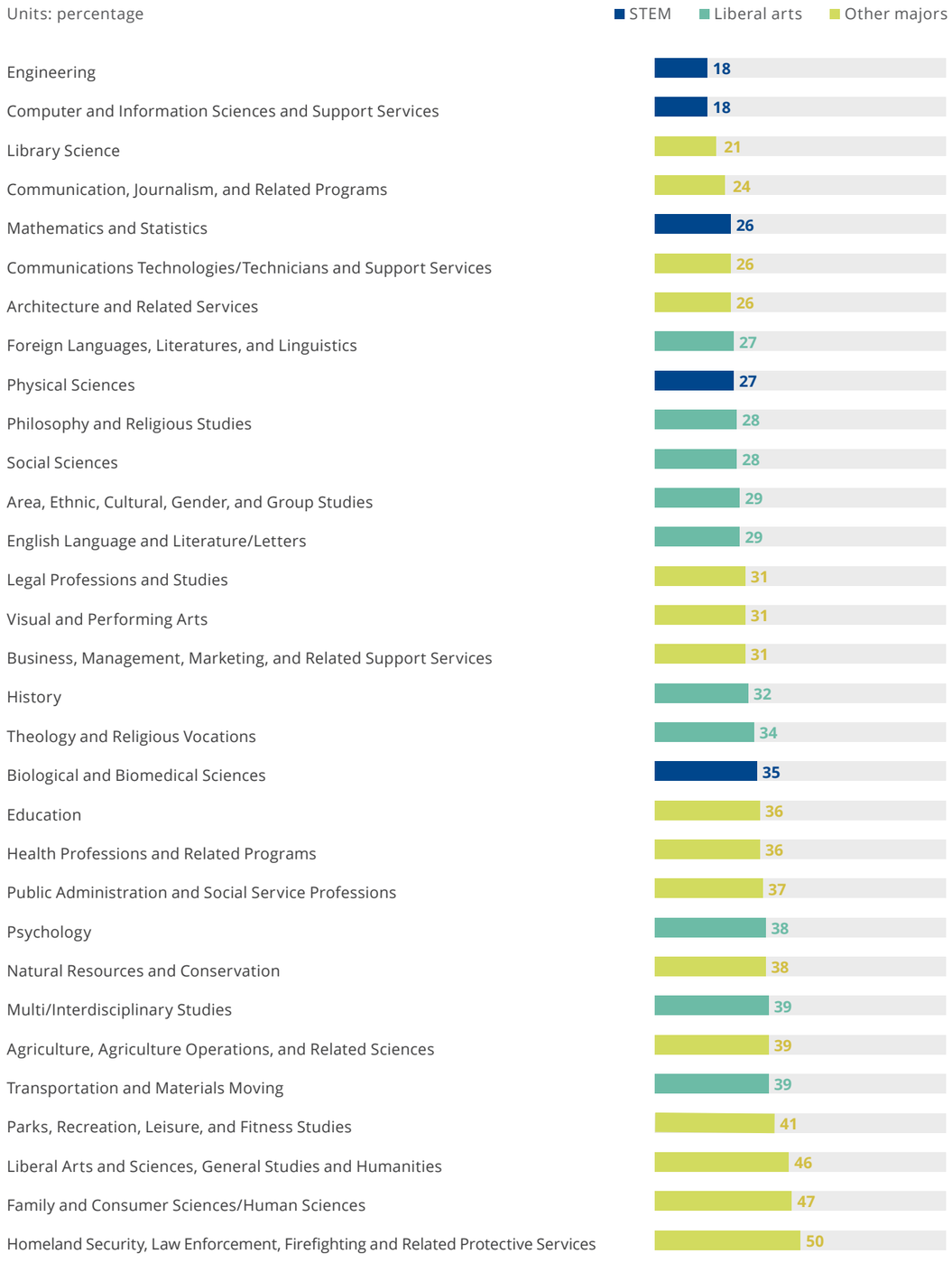
The STEM disciplines and the liberal arts are on opposite sides of a growing divide about the value of higher education. The public perceives STEM fields as practical, even necessary, in a fast-changing world. The liberal arts have become a favorite target of criticism, particularly among some politicians who see them as expendable given the rising cost of college. Study engineering, the thinking goes, and you will get a good job; a degree in philosophy prepares you to ponder the deeper meaning of working as a barista.

In reality, there is both some truth and some fiction to this way of thinking. Yes, in general, STEM graduates are less likely to be underemployed than those who studied the liberal arts—they account for about 15% of underemployed workers. Among all majors, engineering and computer science have the lowest probability of starting out underemployed and remaining so after five years. But not all STEM majors perform equally well when it comes to employability. More than one-third of recent biology graduates are underemployed.



Underemployment by Major

Probability of graduates being underemployed in their first job and five years later



Liberal arts majors do account for a larger share of underemployed workers, about 23%. But more bachelor's degrees are awarded in the liberal arts than in STEM each year. And what about that often-criticized philosophy degree? It ranks among the 10 majors with the lowest probability of underemployment. None of this means, of course, that recent graduates are landing jobs in their fields of study, only that they are securing jobs where the work demands a college degree.

Anthony P. Carnevale, director of the Georgetown University Center on Education and the Workforce, says employers see value in both STEM and liberal arts graduates. STEM majors are strong in specific skills and domain-specific knowledge, while liberal arts graduates possess communications and critical thinking abilities that help them transition from job to job over time.

In a recent report, the Georgetown Center measured the value of a major in terms of annual median earnings over the course of a worker's career. While STEM degree holders out earn their counterparts in the liberal arts, there is great variability within majors: the top 25% of humanities majors make more than the bottom 25% of graduates in architecture and engineering[3].

"There's plenty of overlap within majors," Carnevale says. "So, if students are picking majors solely on their expected paycheck, some of them will be sorely disappointed."

A Practical Tool: The Underemployment Risk Indicator

Clearly there is a need for a more data-driven approach to this question. To assess the overall risk and economic impact of underemployment by major, we have created an Underemployment Risk Indicator. The indicator highlights which majors warrant the most intensive review by students, counselors, and universities when working to assess and address underemployment challenges. The index uses three factors to assess the potential impact of underemployment:

- Probability of Underemployment: How likely is a graduate of this major to become underemployed?
- Cost of Underemployment: What is the financial cost of underemployment for graduates of this major, as measured by

3. Georgetown University Center on Education and the Workforce, "Five Rules of the College and Career Game," 2018. https://cew-7632.kxcdn.com/wp-content/uploads/CEW-FiveRulesReport-final.pdf.

the gap between the salaries of properly employed and underemployed graduates? In majors with a large gap, the opportunity cost of not earning a college-level job and becoming underemployed increases commensurately[4].

- Occupational Concentration of Graduates: To what extent does the major have a clear career path for graduates? We examined the percentage of graduates working in the 10 most common occupations associated with the degree they hold. This concentration analysis suggests how effective a major is in offering a track into a field.

Majors such as fitness, biology, and legal studies that have high underemployment and above-average wage penalties have the highest risk levels as measured by the Unemployment Risk Indicator, while the lowest-risk fields are in STEM and other career-focused majors.

This framework offers a new way of looking at the underemployment problem. For higher education, it highlights areas where concerted work may be required to improve outcomes, whether through curricular alignment, academic and career advising, or through more programmatic work-based learning.

For students, the indicator offers a tool for avoiding problematic majors, or at least for understanding if they will need to do more to embark on a stronger career path.

Factors to Consider: Oversupply

In some fields, there are simply too many graduates for the relevant occupations to absorb.

Burning Glass has developed a supply-demand model that compares the number of open positions to the number of available workers in the field for each occupation and major. Issues of supply and demand contribute to the underemployment challenges for certain majors, like business and biology, although it is important to note that oversupply does not fully account for underemployment.

As a general principle, students are well served to avoid majors that are oversupplied—that is, those on the left side of the graph below. The job market for these is crowded, the risk of underemployment increases, and students must work harder to distinguish themselves to employers. In cases where the specific career track that a

4. See Appendix 2 for a complete table of cost of underemployment information.

Underemployment Risk Indicator

Units: percentage

A Probability of Underemployment B Cost of Underemployment C Occupational Concentration D Bachelor's Conferrals

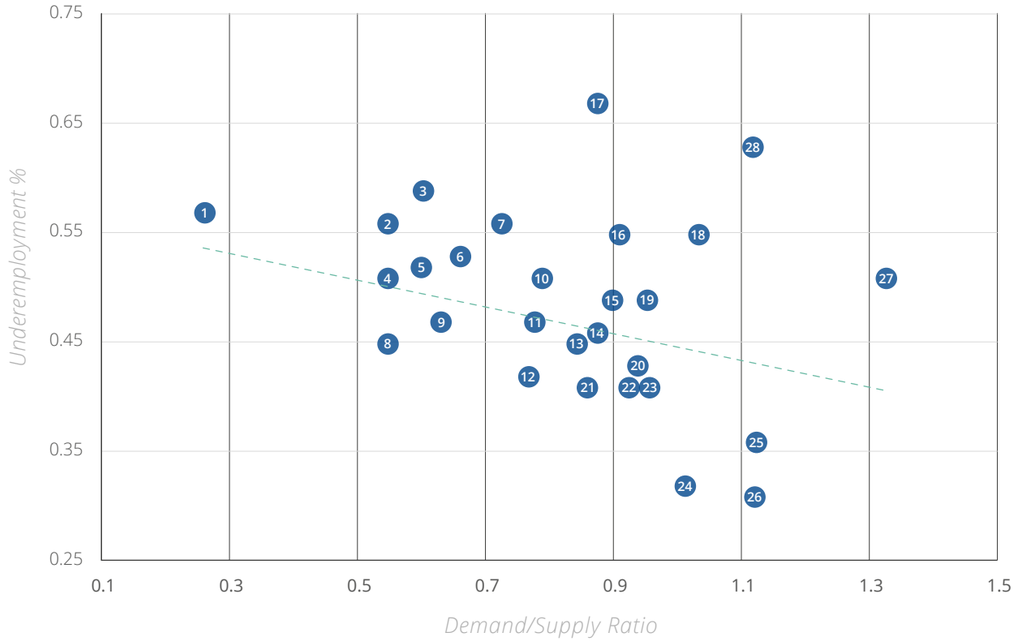
	Major	A	B	C	D
1	Parks, Recreation, Leisure, and Fitness Studies	63	23	34	51,128
2	Biological and Biomedical Sciences	51	28	29	115,706
3	Agriculture, Agriculture Operations, and Related Sciences	55	20	24	19,597
4	Multi/Interdisciplinary Studies	53	23	27	49,049
5	Liberal Arts and Sciences, General Studies, and Humanities	54	21	29	43,869
6	Homeland Security, Law Enforcement, Firefighting, and Related Protective Services	65	8	31	62,504
7	Psychology	54	20	30	118,805
8	Natural Resources and Conservation	53	18	26	17,596
9	History	49	25	31	25,686
10	Legal Professions and Studies	47	30	37	4,281
11	Area, Ethnic, Cultural, Gender, and Group Studies	47	24	27	7,856
12	Transportation and Materials Moving	61	9	31	4,596
13	Health Professions and Related Programs	49	28	46	234,177
14	Family and Consumer Sciences/Human Sciences	57	11	32	25,403
15	Social Sciences	44	24	28	136,432
16	Business, Management, Marketing, and Related Support Services	47	22	33	375,253
17	Foreign Languages, Literatures, and Linguistics	43	24	28	18,570
18	Mathematics and Statistics	39	31	32	22,864
19	English Language and Literature/Letters	45	22	29	42,942

20	Public Administration and Social Service Professions	53	11	28	35,146
21	Education	50	15	37	88,738
22	Physical Sciences	40	23	31	30,231
23	Visual and Performing Arts	45	20	40	93,547
24	Theology and Religious Vocations	49	8	26	9,973
25	Philosophy and Religious Studies	43	13	26	10,320
26	Communication, Journalism, and Related Programs	39	17	32	93,149
27	Architecture and Related Services	41	13	30	8,978
28	Communications Technologies/Technicians and Support Services	39	19	44	4,915
29	Computer and Information Sciences and Support Services	30	35	57	65,296
30	Engineering	29	21	40	124,719
	Overall	47	22	-	-

student wants runs through an oversupplied major, students should ensure that they enroll in a program with a proven track record of placing graduates and where they will develop the skills needed to gain success in the market.

While supply-demand dynamics associated with a given major can explain some of the underemployment we have observed, it is not a perfect correlation. There are several majors, such as transportation and public administration, that are undersupplied, but where we also see very high levels of underemployment. Our model focuses on college-level jobs for each major. In those cases, there are common jobs, such as Transportation and Distribution Managers, that are undersupplied in the market. The high rates of underemployment for graduates from these majors, and others in the top right quadrant of the graph, suggest misalignment between the programs and the skills that the job market demands.

Relationship Between Underemployment and Supply



1. Agriculture, Agriculture Operations, and Related Sciences
2. Liberal Arts and Sciences, General Studies and Humanities
3. Family and Consumer Sciences/Human Sciences
4. History
5. Education
6. Biological and Biomedical Sciences
7. Psychology
8. Foreign Languages, Literatures, and Linguistics
9. English Language and Literature/Letters
10. Theology and Religious Vocations
11. Visual and Performing Arts
12. Physical Sciences
13. Philosophy and Religious Studies
14. Social Sciences
15. Business, Management, Marketing, and Related Support Services
16. Multi/Interdisciplinary Studies
17. Homeland Security, Law Enforcement, Firefighting and Related Protective Services
18. Public Administration and Social Service Professions
19. Legal Professions and Studies
20. Architecture and Related Services
21. Mathematics and Statistics
22. Communications Technologies/Technicians and Support Services
23. Communication, Journalism, and Related Programs
24. Computer and Information Sciences and Support Services
25. Library Science
26. Engineering
27. Health Professions and Related Programs
28. Transportation and Materials Moving

Factors to Consider: Occupational but Not Practical?

Many college graduates, of course, end up working in fields unrelated to their major. It's important to remember that in this study our definition of underemployment is measured solely by the evidence that degree holders secured a college-level job—not that they have achieved employment within their field of study.

That said, there are certain college majors that seem more closely aligned to appropriate employment for recent graduates. Majors designed to prepare students for licensed occupations, such as nurses, engineers, architects, and teachers, typically have lower underemployment rates. That's partly because most graduates in these fields must pass exams independently certified by state bodies. As a result, these programs typically have a well-defined, standardized curriculum.

On the other end of the spectrum are majors that are more general. Business is the most common of these majors, but this group also includes legal studies; public administration and social services professions; and parks, recreation, leisure, and fitness studies.

That these majors should perform so poorly in underemployment is troubling because they comprise such a large share of degree conferrals, accounting for nearly 4 in 10 bachelor's degrees awarded by American colleges[5]. Graduates in these majors make up nearly half of the underemployed in our study.

Enrollment in these programs has proliferated in recent decades. Since 1970, the number of students in these nominally occupational majors has increased 80%. By comparison, enrollment in STEM fields rose 11% over the same time, while liberal arts enrollment declined by about a third[6].

What's the trouble with these majors? Unlike the majors targeting licensed occupations, these programs have less external pressure to ensure that graduates are job ready. While they propose to prepare graduates for a narrow band of fields, they are often not well aligned with the labor market and do not provide graduates with the skills they need.

5. Burning Glass Technologies, calculation from National Center for Education Statistics, Digest of Educational Statistics 2017, "Table 322.10. Bachelor's degrees conferred by postsecondary institutions, by field of study," https://nces.ed.gov/programs digest/d17/tables/dt17_322.10.asp?current=yes, accessed Sept. 14, 2018.
6. Ibid

At the same time, because they are career focused, many of these programs lack the explicit intellectual exploration and development of noncognitive skills emphasized in the humanities. Communications, creativity, and critical thinking are often credited with improving workers long-term job prospects. The authors of the seminal book on college learning, Academically Adrift: Limited Learning on College Campuses, for instance, studied the academic performance of students on two dozen college campuses and found that business majors had the weakest gains in their first two years on a national test of writing and reasoning[7].

With these programs, "you're not getting the hard skills and you're not getting the soft skills," says Doug Webber, an associate professor of economics at Temple University, who studies earnings by academic field. "It's a double whammy."

In other cases, many of the jobs for which these programs prepare people do not actually require a bachelor's degree. Family and consumer sciences majors[8] often end

7. Arum, Richard and Roksa, Josipa; "Academically Adrift: Limited Learning on College Campuses," University of Chicago Press, 2011
8. This category also includes degrees in Human Development or Early Childhood Education.

up in early education or child care jobs, such as preschool teacher, that often do not require a degree.

Or take legal studies: about one in three graduates in this field has trouble finding appropriate employment. Becoming a lawyer requires a graduate degree. But a third of paralegal jobs don't demand a bachelor's degree, just an associate's degree or a certificate. Also, paralegal is not a job with clear advancement potential. A worker with a bachelor's degree in this field may struggle to find appropriate work after graduation and lack a route to a long-term career.

While underemployment is a measure of whether workers are employed in jobs requiring college-level skills, not whether those jobs are in their field of study, it can be telling to examine the jobs commonly held by recent graduates by major. One way to do that is to look at the percentage of graduates in a major working in the 10 most common occupations associated with that degree. Perhaps unsurprisingly, licensed occupations like health and education, and STEM occupations such as computer science, are among those most likely to place graduates into jobs related to their field of study.

These are degrees that have clear occupational targets. In general, degrees with more concentrated and specific career outcomes for graduates typically have lower underemployment rates than those without a clear pathway to work.

Factors to Consider: Is the Major Only Valuable If You Go on to Grad School?

This issue isn't confined to non-licensed occupationally specific majors, of course. Biology, a STEM discipline, and psychology, in the liberal arts, have similar challenges—and similar probabilities of underemployment.

These are two of the most popular undergraduate majors, together accounting for 12% of the bachelor's degrees awarded each year. Yet they offer no clear route to work for those who decide not to continue their studies beyond the undergraduate level. A psychology graduate requires further schooling to become a psychologist; to work as a doctor, a pharmacist, or even often as a research scientist, a biology major needs to earn a graduate or professional degree.

Despite those challenging prospects, relatively few students in these fields go on to earn higher degrees. There are nearly a quarter-of-a-million undergraduate degrees conferred in these two fields annually and fewer than 100,000 of the recipients follow up with a graduate or professional credential. That means that 80% of graduates in these fields are looking for a job without earning a related technical degree at the master's level or higher.

Despite those odds, for many years faculty members in psychology advised students based on the idea that they would all go on to graduate school and become "mini-me's," says Drew C. Appleby, an expert in career planning for psychology majors.

To reduce underemployment, professors need to do a better job helping students take the skills they hone in their majors and apply them to seemingly unrelated professions, says Appleby, the author of a book, The Savvy Psychology Major. He developed a required career course at the two institutions at which he taught, Marian College in Indiana and Indiana University-Purdue University at Indianapolis, to help students explore career options.

Over time, psychology as a field has come to address the issue of career planning more directly, with the American Psychology Association now urging undergraduate programs to be more proactive in advising so-called "career-seeking" students.

Percentage of graduates working in the top 10 occupations of this major

Units: percentage	Percentage of graduates in the field	Probability of Underemployment
Computer and Information Sciences and Support Services	57	30
Library Science	51	34
Health Professions and Related Programs	46	49
Communications Technologies/Technicians and Support Services	44	39
Engineering	40	29
Visual and Performing Arts	40	45
Education	37	50
Legal Professions and Studies	37	47
Parks, Recreation, Leisure, and Fitness Studies	34	63
Business, Management, Marketing, and Related Support Services	33	47
Family and Consumer Sciences/Human Sciences	32	57
Mathematics and Statistics	32	39
Communication, Journalism, and Related Programs	32	39
History	31	49
Homeland Security, Law Enforcement, Firefighting and Related Protective Services	31	65
Transportation and Materials Moving	31	61
Physical Sciences	31	40
Architecture and Related Services	30	41
Psychology	30	54
English Language and Literature/Letters	29	45
Liberal Arts and Sciences, General Studies and Humanities	29	54
Biological and Biomedical Sciences	29	51
Foreign Languages, Literatures, and Linguistics	28	43
Public Administration and Social Service Professions	28	53
Social Sciences	28	44
Multi/Interdisciplinary Studies	27	53
Area, Ethnic, Cultural, Gender, and Group Studies	27	47
Natural Resources and Conservation	26	53
Philosophy and Religious Studies	26	43
Theology and Religious Vocations	26	49
Agriculture, Agriculture Operations, and Related Sciences	24	55

2.

Avoiding Underemployment by Building the Skills to Succeed

Majors matter, but in the world of work, they're not the only thing that does.

Our research suggests that when it comes to the job search, skills afford a significant advantage. Having the right skills—or mix of skills—makes a difference. Skills can help graduates stand out in crowded fields, avoid underemployment even in majors in which few students find good jobs, and earn a salary premium. And they can serve as an insurance policy. Among workers who find themselves in noncollege jobs, skills can be key to escaping the trap of underemployment.

Our analysis of the skills gap shows that the problem cuts across fields and includes both hard and soft skills. For example, there is strong demand for more Market Research Analysts who know the database programming language SQL, for Mechanical Engineering Technicians with project management experience, and for Budget Analysts with good oral communication skills.

Having skills that are in demand can make students more attractive job candidates and reduce their risk of underemployment. Even in fields in which there is relatively low underemployment, like computer science, there are a number of skills that employers say are hard to find and for which they will pay a premium. Conversely, even in fields in which there is high underemployment, there are skills students can acquire that lead directly to high-demand jobs. Properly employed psychology graduates, for example, are twice as likely to advertise budgeting skills and 20% more likely to advertise common baseline skills such as writing, research, and leadership.

This changes the problem from one of aligning majors to advising students. A student in any major can reduce the risk of underemployment with the right additional skills. The challenge becomes one for academic advisors, who should know what skills their program provides and how to enhance them to prepare students for the job market.

Case Study: The General Business Major

To understand how this could work, we explore the case of business degrees. Each year, one of every five graduates who walks across the stage at commencement to collect a diploma is a business major, making it far and away the most popular undergraduate major.

In general, business majors are more likely to be underemployed than average (47% for business vs. 43% overall). But not all business degrees are created equal. Just a third of recent finance graduates are

underemployed. Employment prospects are worse for graduates of general business majors or for business majors in specialties where demand for college graduates is relatively low.

Accounting and finance look a lot more like programs in STEM or in licensed occupationally specific majors, with coursework focused on giving students job-ready skills. Accounting majors, for example, are likely to learn how to read cash-flow statements and conduct audits, skills they will use on the job. Finance majors practice designing investment portfolios.

Not only are graduates in these fields less likely to be underemployed, but they land first jobs closely tied to their major.

For students majoring in business, the skills they develop clearly matter for their long-term career outcomes. Business majors have a diffuse set of occupational targets, and students should work to ensure that they have the skills needed to stand out in one or more of the common occupational tracks followed by business majors, such as accounting, marketing, and human resources.

Underemployment by Specialized Business Degree

Percent Underemployed

Units: percentage

Selected Specialized Business Degrees	
Hospitality Administration/Management	68
Specialized Sales, Merchandising, and Marketing Operations	65
Human Resources Management, and Services	49
Business Administration, Management, and Operations	48
Accounting and Related Services	43
Marketing	41
Finance and Financial Management Services	33

Top First Occupations by Specialized Business Major

College-level occupations

Hospitality Administration /Management	Specialized Sales, Merchandising, and Marketing Operations	Human Resources Management and Services	Business Administration, Management, and Operations
Hotel, Motel, and Resort Desk Clerks	Retail Salespersons	Human Resources Specialists	Customer Service Representatives
First-Line Supervisors of Food Preparation and Serving Workers	First-Line Supervisors of Retail Sales Workers	Human Resources Managers	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
Waiters and Waitresses	Merchandise Displayers and Window Trimmers	Human Resources Assistants, Except Payroll and Timekeeping	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive
General and Operations Managers	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	Customer Service Representatives	Retail Salespersons
First-Line Supervisors of Office and Administrative Support Workers	Purchasing Agents, Except Wholesale, Retail, and Farm Products	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	First-Line Supervisors of Retail Sales Workers
Food Service Managers	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	First-Line Supervisors of Office and Administrative Support Workers	General and Operations Managers
Retail Salespersons	Customer Service Representatives	First-Line Supervisors of Retail Sales Workers	First-Line Supervisors of Office and Administrative Support Workers
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	Sales Managers	Retail Salespersons	Accountants and Auditors
Customer Service Representatives	Office Clerks, General	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	Human Resources Specialists
Cooks, Restaurant	Executive Secretaries and Executive Administrative Assistants	Office Clerks, General	Sales Managers

College-level occupations

Accounting and Related Services	Marketing	Finance and Financial Management Services
Accountants and Auditors	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	Accountants and Auditors
Bookkeeping, Accounting, and Auditing Clerks	Market Research Analysts and Marketing Specialists	Financial Analysts
Financial Managers	Retail Salespersons	Customer Service Representatives
First-Line Supervisors of Office and Administrative Support Workers	Marketing Managers	Financial Managers
Customer Service Representatives	Sales Managers	Management Analysts
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	Customer Service Representatives	Securities, Commodities, and Financial Services Sales Agents
Retail Salespersons	First-Line Supervisors of Retail Sales Workers	Bookkeeping, Accounting, and Auditing Clerks
Financial Analysts	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	Personal Financial Advisors
Cashiers	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
Computer Occupations, All Other	General and Operations Managers	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive

The table below highlights how business majors can distinguish themselves from the pack. Employers value additional data skills from Business Analysts, relationship skills such as account management and negotiation from Sales Representatives, and in general, a familiarity with business tools such as enterprise resource planning software and applicant tracking systems, which is often best gained in the context of internships and work-based learning.

It should be noted, of course, that the skills listed below are not the complete set of skills needed to get these jobs. Accounting graduates still need to know general ledger accounting and financial reporting practice. These skills are the icing on the proverbial cake, ensuring that job seekers are well qualified and that they don't get caught in the trap of underemployment.

A General Approach to Skills Development

Across all majors, students need to acquire the skills that will give them an advantage as they search for employment. In majors with high underemployment risk rankings or without clear occupational targets, while institutions need to take greater responsibility for student outcomes, it is particularly critical that students take the initiative to chart a career course for themselves.

In many majors, this means identifying a clear and achievable occupational target, and then building a plan to develop the skills needed to gain a foothold in these fields. As described above, generalist majors, such as business, should focus on pathways to common college-level jobs for the major, else students run the risk of being nearly, but not fully, qualified for a broad range of jobs.

The liberal arts have similar dynamics. Previous Burning Glass research has shown that there are 1.4 million job postings potentially open to liberal arts graduates, and 10 career clusters that offer strong career potential. Students not planning to pursue a graduate course of study should identify a target career track—marketing, human resources, communications, and research are among the good options—and develop a plan to build those skills within their major or through elective courses, internships, and other learning opportunities. Liberal arts graduates with skills in these fields can command a five-

Distinguishing Skills for Business Majors

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Human Resources Specialists	$47,349	Technical Recruiting	$2,243	29%	Occasional
		Social Media	$1,777	51%	Moderate
		Applicant Tracking System	$1,563	33%	Moderate
Management Analysts	$67,460	Change Management	$2,047	21%	Moderate
		Risk Management	$1,653	19%	Occasional
		Budgeting	$1,027	18%	Moderate
Market Research Analysts and Marketing Specialists	$42,947	Market Strategy	$2,066	27%	Moderate
		SQL	$917	28%	Occasional
		Salesforce	$567	43%	Moderate
		Adobe Creative Suite	$328	33%	Moderate
Accountants and Auditors	$53,959	Process Improvement	$1,751	2%	Occasional
		Generally Accepted Accounting Principles	$660	3%	High
		Enterprise Resource Planning software	$508	20%	Moderate
Financial Analysts	$59,500	Process Improvement	$1,421	37%	Moderate
		Financial Forecasting	$1,157	35%	Occasional
		SQL	$908	39%	Medium
		Articulating Value Propositions	$5,231	36%	Medium
Technical Sales Representatives	$65,379	Sales Engineering	$4,559	22%	Occasional
		Negotiation Skills	$2,326	11%	Occasional
		Account Management	$1,507	77%	High

Table 'Distinguishing Skills for Business Majors' Notes:
For each occupation, we provide the following indicators for in-demand skills that face gaps in the market and offer a salary advantage to job seekers.
A full version of this table that includes several common occupational targets for students in each degree is included in Appendix 2.
Demand level: How commonly do employers ask for the listed skill?
Skill gap: What % of positions calling for that skill are unable to be filled by current supply?
Salary premium: On average, how much extra do employers pay for postings advertising this skill?
More details on the methodology for each indicator are included in Appendix 1.

year salary premium of anywhere from $14,000 to $32,000, depending on the specific area[9].

In virtually any field, there are certain skills that offer a leg up. Having such a skill will often distinguish a graduate as qualified for higher-order work. Alternatively, this can be a simple matter of supply and demand. Many of the skills that we identify here are characterized by significant skill gaps—that is, current supply is insufficient to fill a high percentage of openings. Some skills, such as those in technology or using data, may not have been part of the traditional toolkit for a given occupation. Having those skills gives new entrants an advantage over those with long tenures.

Case Studies in Adding Value to a Degree

For students in majors with high risk rankings and specific occupational goals, acquiring the skills that employers most value or struggle to fill is key to landing that first career-track job. Graduates majoring in parks, recreation, and fitness studies are at the top of the Underemployment Risk Indicator, with nearly two-thirds (63%) of these graduates likely to be underemployed, with a 23% salary penalty. One potential career track for these majors is to become Athletic Trainers. According to our data, real-world experience makes a big difference here: Athletic Trainers with experience working in a clinical setting and providing rehabilitation support are at a distinct advantage compared to their peers.

Even among majors with low risk rankings such as computer science, there are still substantial numbers of students who are underemployed and would benefit from additional skills. Employers, for instance, need more web developers with knowledge of AngularJS, a commonly used web development framework developed by Google. Employers demand soft skills in these roles as well.

The next table shows a selection of skills that computer science graduates can add to their portfolio which allow them to stand out among their peers and command higher salaries.

9. Schneider, Mark and Sigelman, Matthew. Saving the Liberal Arts: Making the Bachelor's Degree a Better Path to Labor Market Success, American Enterprise Institute, 2018.

Distinguishing Skills for Athletic Trainers

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Athletic Trainers	$39,895	Concussion Diagnosis / Treatment	$1,995	59%	Moderate
		Clinical Experience	$1,385	36%	Moderate
		Rehabilitation Services	$1,358	25%	Occasional

It may be easier for computer science majors and other graduates in fields with clear occupational targets to figure out the most beneficial skills to acquire. Students in majors with less certain pathways to work should focus on one or more prospective occupations and develop the skills that will help distinguish them to employers. Below are examples for Family and Consumer Sciences and Public Administration majors.

Distinguishing Skills for Computer Science Majors

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Software Developers, Applications	$83,642	Agile Development	$2,184	30%	Moderate
		Scalability Design	$1,924	39%	Occasional
		Scrum	$1,288	39%	Moderate
		AngularJS	$1,251	61%	Moderate
		Big Data	$1,115	41%	Occasional
Web Developers	$76,138	Product Management	$2,510	29%	Occasional
		AngularJS	$2,224	48%	High
		Adobe Creative Suite	$2,166	12%	Moderate
		ReactJS	$1,960	80%	Moderate
		Scrum	$1,933	32%	Moderate

Develop Complementary Skills

Another approach to standing out in the market is to add skills that are different, but complementary, to the ones developed in your major. Ron Riggio, an author and professor of leadership organizational psychology at Claremont McKenna College, suggests to his students that they take a course in database management or statistical analysis. Adding a technical competency pairs well with their people skills. "You want to be the whole package," he says.

Students in engineering or the hard sciences, by contrast, might want to take

Distinguishing Skills for Family and Consumer Sciences Majors

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Medical and Health Services Managers	$72,206	Process Improvement	$1,718	48%	Low
		Acute Care	$1,437	47%	Low
		Advanced Cardiac Life Support (ACLS)	$541	46%	Low
Farm and Home Management Advisors	$45,978	Microsoft PowerPoint	$3,927	55%	Medium
		Budgeting	$2,772	45%	Medium
		Resource Management	$2,297	27%	Medium
		Presentation Skills	$1,945	50%	Medium
Dietitians and Nutritionists	$49,369	Process Improvement	$1,058	27%	Low
		Quality Assurance and Control	$767	33%	Medium
		Long-Term Care	$646	27%	Medium
		Budgeting	$602	26%	Low

Distinguishing Skills for Public Administration and Social Services Majors

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Social and Community Service Managers	$46,246	Strategic Planning	$1,349	33%	Low
		Financial Management	$1,163	27%	Low
		Behavioral Health	$912	42%	Medium
Operations Research Analysts	$54,096	Project Management	$1,389	37%	Medium
		SQL	$766	42%	Medium
		Leadership	$687	35%	Low
		Budgeting	$642	35%	Medium
Social and Human Service Assistants	$38,212	Behavioral Health	$912	23%	Medium
		Planning	$793	18%	High
		Staff Management	$374	29%	Medium
		Treatment Planning	$349	18%	Medium

an elective that is heavy on writing and public speaking. Writing is among the top 10 most common skills listed in job postings for engineering and information technology (13% of postings) with customer service and public speaking not far behind. A management course could be a good addition to students' core subjects for those interested in applying for supervisory positions in their field. Skills such as supervision, strategic planning, and budgeting are critical for career advancement across a broad range of fields. Business-focused Babson College, for instance, requires students to take half of their courses in the liberal arts.

Sometimes students acquire skills in their majors that will make them attractive to prospective employers, but they may not understand how those skills apply to specific jobs. Some of what students learn in their classes is "overt" subject matter expertise, says Appleby, the psychology career-guide author. But "covert" learning is happening, too, in the form of the skills students hone while doing coursework. Appleby says psychology majors will pick up active listening and learn to write well.

Appleby says he frequently meets former students he describes as "sheepish" because they have pursued careers in fields not obviously associated with psychology, such as real estate or marketing. "They'll say, I'm not using what I learned, and I tell them, of course you are."

It is important for students in majors without clear occupational targets to focus on making their covert learning explicit so that upon graduation they have developed a clear set of marketable skills that allow them to successfully transition into the job market.

Skills as an Insurance Policy

Having the right skills can help graduates land better jobs. But even when workers are underemployed, having certain in-demand skills can boost their wages.

Retail managers are among the most common jobs for underemployed college graduates. While it's not a great job or a clear target for most bachelor's

candidates, there are ways that people in those roles can build skills to command a salary premium. Supervisors of retail sales workers with strong analytical skills can earn 7% or $2,400 annually over the average role. Those with performance management skills can earn 6.4% or $2,200 extra. Each of these skills is undersupplied, suggesting that employees with these skills are in stronger bargaining positions.

Acquiring the right mix of skills could help students avoid, or escape, underemployment. Take the position of Human Resources Specialist. In that field, there are unmet employer needs for workers with know-how in budgeting, social media, or the mechanics of the recruitment process. So, a student interested in human resources might do well to take a course in accounting or marketing to stand out in the application process. And not all the skills employers demand are technical in nature. Hiring managers also want—and can't find enough of—candidates for HR Specialist openings who speak Spanish, are creative, and show leadership ability.

3.

Accruing Meaningful and Relevant Work Experiences Before Graduation

One way that students can gain experience and skills for a career is via internships, co-ops, or parallel work experiences. Employers signal their longer-term needs by the skills they request of interns, and successful internships can show students can put their skills to use. Previous Burning Glass research has shown that employers have become more specific in the skills they demand of interns, and expect them to show up ready to work[10].

Providing students with hands-on experiences can help make the connections between major and work more explicit. Carleton College and the Stevens Institute of Technology, among others, offer short job-shadowing stints to give students a window into the mechanics of the job in their major.

Other institutions, such as the University of Maryland's School of Public Policy, require its students to do internships. "Getting into the workplace helps students figure out what they do and don't like, and how it relates to what they are studying," says C. Bryan Kempton, the director of career services at Maryland's School of Public Policy.

Colleges as well as faculty members in specific majors need to do more to help students make these connections, says Matthew T. Hora, director of the Center for Research on College-Workforce Transitions at the University of Wisconsin, Madison.

One start would be better tracking of the pathways between majors and jobs. Too often, departments don't have an accounting

10. Burning Glass Technologies, "State of American Internships, 2016," https://www.burning-glass.com/research-project/internships-2016/.

of where their graduates go, Hora says. It would be meaningful for students to see how earlier generations of students made use of their degrees. Knowing the most common occupations among alumni that are outside of their field of study could help give students realistic routes to careers.

Some colleges, such as Denison University, have adopted short, major-specific courses aimed at helping students prepare for careers. Others, including Wake Forest, have extended advising past commencement, working with graduates in their first five years after college—the critical period when it comes to underemployment.

At Babson, students take a year-long course in their first year, Foundations of Management and Entrepreneurship, that requires them to create, start, manage, and sell a business. Every student plays a role and they get a taste of different careers they can have with a business degree, says Donna Sosnowski, director of career services and an instructor in the course. "From day one," she says, "there's an integration of their academic coursework and practical application."

Major Changes

Making better connections with employers who hire their students also can influence what colleges, and majors, teach. Babson, for instance, added an undergraduate concentration and a graduate major in analytics after hearing from employers that they needed job candidates with those skills. Prior research from Burning Glass shows an expected 15% growth in analytics skills over the next five years. That growth will be concentrated in positions where adding an analytics concentration onto a business degree can enable students to stand out with the right mix of hybrid skills[11].

Hora, who is also an assistant professor of adult and higher education at Wisconsin, says four-year institutions could learn something from their two-year counterparts. Because of their workforce development mission, community colleges routinely make use of occupational advisory boards to give them up-to-date feedback about changing employment needs. While many four-year colleges have similar constructs, their convenings are infrequent (typically once or twice a year) and their discourse can sometimes lack tactical focus. A more intensive and data-driven approach could be useful at four-year colleges.

When it comes to the majors, more substantive changes might be needed to ensure they give students concrete skills that mirror the competencies demanded in specific fields or provide students with a firmer grounding in the soft skills that translate across multiple professions.

As one model, reformers might look to work from the Carnegie Foundation for the Advancement of Teaching. This report examined 10 colleges of business that integrated liberal arts learning and practical training[12]. Although its focus was not employability, the report may offer models for creating a more well-rounded worker in the largest of these occupationally related fields.

Carnegie found that most business programs are too narrow and frequently fail to promote intellectual curiosity, underemphasize flexibility of mind, and provide too little understanding of real business challenges. In outlining how to integrate the liberal arts into undergraduate business programs, Carnegie provided a roadmap, so that students following more general majors not only will be more effective but also will understand the world better and find their place in it more easily. And for many students who go to college, no matter their major, that is often their goal.

11. Burning Glass Technologies, "The Quant Crunch: How the Demand for Data Science Skills Is Disrupting the Job Market," 2017. https://www.burning-glass.com/research-project/quant-crunch-data-science-job-market/.

12. Carnegie Foundation for the Advancement of Teaching, "Rethinking Undergraduate Business Education: Liberal Learning for the Profession," 2011. http://cepa.stanford.edu/content/rethinking-undergraduate-business-education-liberal-learning-profession.

4.

Conclusion

Good career outcomes for college graduates aren't decided during the second semester of senior year. Rather, they are the product of a series of choices along the way—and for many students, these choices are not as purposeful or well-informed as they should be.

Previous research from the Strada Education Network and Gallup found that most students seek advice about a major from family and friends, not counselors or college advisors. No wonder about 30% of students switch majors at least once, according to the U.S. Education Department. And even then, Strada and Gallup found considerable regret among college graduates about their choice of major: more than a third of people surveyed say they would pick a different field of study if they had the chance to enter college all over again.

An investment as large as a bachelor's degree should not have such a high level of buyer's remorse. The three-part strategy we have outlined in this report provides a guide to students and their families for how to make better-informed college decisions, at least in terms of success in the job market, and for how to achieve better outcomes regardless of program of study. This approach depends on higher education's willingness to make changes to empower and inform those decisions:

Be transparent about the skills needed in the job market and the employability outcomes for each major. By sharing labor market outcomes by major and the skills critical to college-level jobs, students and parents could make smarter choices and avoid the underemployment trap. Institutional leaders and academics have largely objected to such efforts, however, worried that students would flock to majors in engineering, computer science, and other fields with low underemployment.

But those concerns are often overblown. "Not everyone is going to be good at, or like, being a computer scientist," says Andy Chan, vice president for personal and career development at Wake Forest University.

In addition, greater transparency could help students appreciate the great variation in salaries within fields: a certain share of workers with degrees in the arts, for instance, outearn those who studied computer science. Further, if colleges are taking active steps to help students achieve better career outcomes, the differences in underemployment rates across majors will be significantly reduced.

Either way, students deserve the right to make eyes-wide-open decisions about the heavy investment that degree programs represent.

Assist students in transferring their skill sets from any major to a job. Majors don't have to be destiny. Students learn important skills in classes outside their major, in their residence halls, and in jobs and internships. But often they don't know how to translate those competencies from one context to another.

Colleges should build more explicit practices into the undergraduate experience that help students reflect on what they learn and how it can be used in other situations, including on the job. Such experiences collected over the course of the four years of college might prove invaluable to a new graduate on the search for an appropriate job.

Strengthen general programs with career pathways to specific jobs. In many programs, minor adaptations to curriculum may go a long way toward ensuring that graduates achieve good career outcomes. But, even for students in programs with no direct alignment to the market (such as liberal arts majors), providing opportunities to acquire and demonstrate skills extra-departmentally is key. Skills and the work experiences to document those skills go a long way toward enabling students to demonstrate their value and avoid the underemployment trap.

Colleges need to arm students with knowledge of career pathways early in their student journey. These pathways could, for example, help guide students to a range of courses that supply them the hands-on technical skills and to co-curricular activities, including internships, that provide them with the additional skills sought by today's employers.

In addition, institutions could bolster their alumni programming so that current undergraduates become acquainted with graduates from their departments. By doing so, students can reverse engineer career trajectories to better understand the skills alumni have, the jobs they held, and the training they received—all of which can give students realistic routes to take through college and into the job market.

What students study at college often signals to employers the skills they have and the qualities they bring to a job. Majors can help put students on the pathway to a long-term career, or they can dead-end them in underemployment.

But it doesn't have to be the latter. If institutions work more purposefully to bolster curriculum and enhance guidance and advising with an eye toward career success and if students think more deliberately and strategically about the skills they will need to be successful in their chosen profession, they can make the transition from college to career more effectively. Educators can, and must, help.

5.

Methodology

Part 1: Data Sources Used in the Report

The data used in this paper were primarily extracted from Burning Glass Technologies' unique data assets: a database of more than 800 million job postings providing a detailed view into the jobs and skills that employers demand and a database of more than 80 million resumes illuminating the actual career progression of American workers. We also drew from federal surveys and administrative data sets relating to degree completion, majors, and workers' earnings.

Resume Data

The analyses of workers' career outcomes were pulled from Burning Glass's resume database, which captures the detailed work history and education of millions of workers across the United States. Resumes are collected from Burning Glass's partners. Resumes were included in this study if they met the following criteria: the worker has a bachelor's degree and at least five years of work experience thereafter. The analyses in this report were based on four million resumes that met these criteria, covering work experiences from 2000 to 2017. Further details about our treatment of the resume data are described in Part 2 of the Appendix.

This report was based on aggregate career path and skills data and no personally identifiable information was used by researchers. Burning Glass Technologies has developed a database of millions of recent resumes. When a resume enters the system, the name, address, and other identifying details are encrypted so that they are not accessible to the research team. Researchers

compile resumes with similar characteristics so that they can determine which types of transitions and career progressions commonly occur at a population level.

Job Postings Data

To supplement traditional sources of labor market data with more detailed information on employer demand for jobs, skills, and specific credentials, Burning Glass mined its comprehensive database of over 800 million online job postings. Burning Glass collects job postings from close to 50,000 online job boards, newspapers, and employer sites on a daily basis and de-duplicates postings for the same job, whether it is posted multiple times on the same site or across multiple sites. Burning Glass then applies detailed text analytics to code the specific jobs, skills, and credentials requested by employers.

O*NET

O*NET[13] is a government-sponsored, publicly available database containing hundreds of standardized and occupation-specific descriptors on almost 1,000 occupations covering the entire U.S. economy. O*NET tracks job trends and analyzes skill level by occupation, that is, whether the skills necessary for a particular job are taught in high school, entail some college, or require a bachelor's degree or more. The O*NET database was initially populated by data collected from occupation analysts; this information is updated by ongoing surveys of each occupation's worker population and occupation experts.

American Community Survey

The American Community Survey (ACS)[14] is an ongoing annual survey of Americans that provides data on jobs and occupations, educational attainment, and veteran status, among other topics.

Part 2: Overview of Resume Analyses

The resume dataset is a Burning Glass Technologies proprietary dataset, sourced from Burning Glass partners. This dataset includes information about an individual's demographics, career path, and employers.

The resume dataset contains information about an individual's location, level of educational attainment, the institutions at which he or she studied, the major, and any

13. O*NET Resource Center, "About O*NET," https://www.onetcenter.org/overview.html, accessed Aug. 30, 2018.
14. U.S. Census Bureau, "About the American Community Survey," https://www.census.gov/programs-surveys/acs/about.html, accessed Sept. 10, 2018

certifications held. The dataset also contains information about an individual's career path, for example, occupation and time spent in any workplace and role, years of experience, employer name and location, and industry. In addition, an individual resume may list skills and the years of experience with any particular skill. All personally identifiable information such as name, address, and contact information are encrypted and not available to researchers.

Resume Sample Selection

To capture the work history, educational attainment, and resulting underemployment of workers over the life of their careers, Burning Glass selected a total of four million resumes for inclusion in this study, based on the following criteria:

- Individuals in the selected group must have commenced their first job during or after the year 2000, where an individual's first job was classified as the first job listed on a resume.
- The time worked in the first job must have been longer than six months, to avoid internships and other short-term projects.
- Individuals must have occupational information about a first job and the job five years later. For a subsample of resumes, we also assessed underemployment 10 years later, where job data were available.
- Individuals must hold a bachelor's degree or higher. This restriction was imposed because the underemployment of workers was calculated within the sample of workers with bachelor's degrees or higher.
- At each point in the analysis, individuals must have had civilian employment, as military occupations have a distinct hiring system for which research on underemployment is not germane.

Coding Occupation and Education from Resumes

For this analysis, we collected information for our samples based on an individual's occupation in a first job, five years later, and 10 years later (where available). Our occupation coding is based on the occupational definitions provided by O*NET[15], which extends the U.S. Department of Labor's Standard Occupational Classification System[16].

Occupation coding is conducted according to a proprietary classification system developed by Burning Glass, which includes a blend of

15. O*NET Resource Center, "The O*NET-SOC Taxonomy," https://www.onetcenter.org/taxonomy.html, accessed Aug. 20, 2018.
16. Bureau of Labor Statistics, "Standard Occupational Classification," https://www.bls.gov/soc/, accessed Sept. 10, 2018.

human-generated rules and machine-learning systems to ensure that each job is correctly coded into the correct occupational category.

We analyzed individuals' education by categorizing the undergraduate program of study according to the National Center for Education Statistics' Classification of Instructional Programs (CIP)[17].

Predicting Gender in Resumes

To study the effect of gender on underemployment, we used the gender R package to determine the gender of an individual in the resume sample. The R package uses an estimated date of birth (1970–2000) and the first name from the resume to predict the gender of an individual based on historical Social Security Administration data[18,19]. Using this approach, we estimated the probability of each individual in the sample as being a particular gender and used a cutoff threshold probability of 0.6 or higher to conclude that an individual was of the predicted gender. Individuals for whom no gender prediction was possible were not included in the sample for the gender-specific analyses. The gender analysis was done prior to further analysis of the data, and the gender data available to researchers was attached to anonymized records. At no time were names or other personally identifiable information available to researchers.

Part 3: Calculating Expected Salary using Data from the American Community Survey (ACS)

Since resumes do not typically include salary information, we used the Census Bureau data to estimate salary based on the occupational and demographic characteristics of each worker. We used pooled one-year samples from 2012 to 2017. We focused on individuals aged 22 to 27 years old (recent college graduates) and restricted the sample to those who were working and in the labor force, had at least a bachelor's degree, were not enrolled in any educational program, and worked at least 30 hours per week[20]. For these people, we looked at their gender, their major, occupation, and salary for the periods of 2012 to 2017. Incomes were restricted to those between $15,000 and $200,000 per year.

To arrive at the cost of underemployment, we estimated the average salary of the underemployed for each major and then compared that with the average salary of properly employed graduates with the same major. We then express the cost as the percentage of salary that individuals are losing because they are not properly employed.

To estimate the 15-year losses, we calculated present value estimates for five-year average salaries for three cohorts, 22 to 26, 27 to 31, and 32 to 36. For present value we used growth rates estimated directly from the ACS data and a discount rate of 3.5%.

Part 4: Supply-Demand Model and Key Skills

Our work with the U.S. Chamber of Commerce[21] we developed a supply-demand model that compares the number of open positions to the number of available workers in the field for each occupation and major[22].

To measure demand, we used an econometric model that starts with total postings collected by Burning Glass by occupation and normalizes those to equal the total number of national openings reported by the Bureau of Labor Statistics' Job Openings and Labor Turnover Survey (JOLTS). Supply is measured based on the total number JOLTS has for workers separating from their job. We then estimated a turnover rate for each occupation based on data from the Census's Current Population Survey (CPS). We determined the available number of workers by multiplying the churn rate by the total employment in each industry and occupation. To estimate supply and demand by major, we applied the distribution of college majors to occupation data from ACS. Demand and supply are then compared to determine the ratio used as a summary statistic for each major.

The supply-demand is also used to estimate gaps in key skills. Using postings data, we estimated demanded skills from employers,

17. See https://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55 for more information. For the purpose of this analysis, we merge CIP code 14 (Engineering Technologies and Engineering-Related Fields) and CIP code 15 (Engineering) and treat them as a single major.
18. This R package uses historical datasets from the U.S. Social Security Administration, the U.S. Census Bureau (via IPUMS USA), and the North Atlantic Population Project to provide predictions of gender for first names for particular countries and time periods. https://cran.r-project.org/web/packages/gender/gender.pdf.
19. Blevins, Cameron, and Lincoln Mullen. "Jane, John… Leslie? A Historical Method for Algorithmic Gender Prediction." DHQ: Digital Humanities Quarterly 9, no. 3 (2015).
20. Here, we follow the same selection criteria as in Abel, Jaison R., and Richard Deitz, "Underemployment in the early careers of college graduates following the Great Recession." In Education, Skills, and Technical Change: Implications for Future US GDP Growth. University of Chicago Press, 2017.
21. Burning Glass Technologies, "Different Skills, Different Gaps: Measuring and Closing the Skills Gap," https://www.burning-glass.com/research-project/skills-gap-different-skills-different-gaps/. 2018.
22. One important extension of this model, over the work with the U.S. Chamber of Commerce, is that it considers both the number of workers who are retiring and the new flow of students.

by using the recall rate[23] from the latest year of available data. For supply of skills, we used the average recall from postings data from the past five years. Here the assumption was that the skills that employers sought during the past five years were also what employees and students possess today. Hence an implicit assumption is that the labor market responds to employer demand, but with some lag. To get the specific number of skills demanded and supplied, we multiplied supply and demand numbers from the model above, with the appropriate recall rates.

Part 5: Salary Model and Skills Premia

Burning Glass Technologies has developed a deep neural network model[24] to predict the salary of postings that do not contain that information. While someone could estimate average salaries directly from postings data, only 15% of posting contain salary information. However most of postings contain information that can be used to precisely estimate the salary, such as education, experience, job titles, skills, etc. Using the predicted salary, can lead to more accurate estimates of salary premia, due to the increased sample size.

While neural network models are great for predictions, the results they produce are not easily interpreted. To estimate the effect of a feature on salary, we used a Dropped Feature Analysis (DFA). Given a set of input features we can make a prediction with the model. If we drop a single feature prior to input, we may also obtain a prediction with the model. This prediction will be different; it may be greater than or less than the original prediction. If the predicted value is less than the base salary (all features are included) this indicates that this feature is important to this input set. Using this method, we can estimate the added value of each skill on an individual posting or on an occupation.

23. Recall rate for skills is defined as the percentage of postings that are calling for a specific skill.
24. Chewning, Keith, Liu, Zhiyuan, and Gaurav, Manish. "Learning a Semantic Representation of Atomic Entities for Salary Prediction." In Proceedings of KDD 2018. ACM, New York, 2018.

6.

Supplemental Data Tables

Table 1: Underemployment by Major (Two-Digit CIP Code)

A Underemployed (First Job)
B Underemployed (Five Years after First Job)
C Overall % Underemployment (Time 1 X Time 5)

Major	A	B	C
Personal and Culinary Services	81%	86%	70%
Homeland Security, Law Enforcement, Firefighting and Related Protective Services	65%	77%	50%
Parks, Recreation, Leisure, and Fitness Studies	63%	74%	47%
Transportation and Materials Moving	61%	76%	46%
Family and Consumer Sciences/Human Sciences	57%	72%	41%
Agriculture, Agriculture Operations, and Related Sciences	55%	71%	39%
Liberal Arts and Sciences, General Studies and Humanities	54%	73%	39%
Psychology	54%	70%	38%
Natural Resources and Conservation	53%	71%	38%
Multi/Interdisciplinary Studies	53%	73%	39%
Leisure and Recreational Activities	53%	70%	37%
Public Administration and Social Service Professions	53%	71%	37%
Biological and Biomedical Sciences	51%	69%	35%
Education	50%	72%	36%
Theology and Religious Vocations	49%	70%	34%
Health Professions and Related Programs	49%	74%	36%
History	49%	64%	32%
Area, Ethnic, Cultural, Gender, and Group Studies	47%	61%	29%
Legal Professions and Studies	47%	65%	31%
Business, Management, Marketing, and Related Support Services	47%	66%	31%

English Language and Literature/Letters	45%	65%	29%
Visual and Performing Arts	45%	69%	31%
Social Sciences	44%	64%	28%
Foreign Languages, Literatures, and Linguistics	43%	63%	27%
Philosophy and Religious Studies	43%	64%	28%
Architecture and Related Services	41%	65%	26%
Physical Sciences	40%	68%	27%
Communication, Journalism, and Related Programs	39%	62%	24%
Communications Technologies/Technicians and Support Services	39%	67%	26%
Mathematics and Statistics	39%	68%	26%
Library Science	34%	62%	21%
Computer and Information Sciences and Support Services	30%	61%	18%
Engineering	29%	61%	18%

Table 2: Cost of Underemployment by Major (Two-Digit CIP Code)

A Employed Professionals B Underemployed Professionals C Cost of Underemployment

Major	A	B	C
Computer and Information Sciences and Support Services	$63,672	$41,513	35%
Mathematics and Statistics	$54,909	$37,852	31%
Legal Professions and Studies	$47,157	$33,220	30%
Health Professions and Related Programs	$51,882	$37,320	28%
Biological and Biomedical Sciences	$48,036	$34,623	28%

History	$46,359	$34,809	25%
Foreign Languages, Literatures, and Linguistics	$44,361	$33,495	24%
Area, Ethnic, Cultural, Gender, and Group Studies	$47,155	$35,680	24%
Social Sciences	$51,220	$38,764	24%
Multi/Interdisciplinary Studies	$43,910	$33,660	23%
Physical Sciences	$49,626	$38,065	23%
Parks, Recreation, Leisure, and Fitness Studies	$44,369	$34,354	23%
English Language and Literature/Letters	$42,286	$32,983	22%
Business, Management, Marketing, and Related Support Services	$51,292	$40,111	22%
Engineering	$62,566	$49,324	21%
Liberal Arts and Sciences, General Studies, and Humanities	$42,581	$33,668	21%
Agriculture, Agriculture Operations, and Related Sciences	$44,591	$35,592	20%
Visual and Performing Arts	$41,870	$33,430	20%
Psychology	$41,800	$33,458	20%
Communications Technologies/Technicians and Support Services	$42,485	$34,611	19%
Natural Resources and Conservation	$41,599	$34,110	18%
Communication, Journalism, and Related Programs	$43,271	$36,063	17%
Education	$37,251	$31,747	15%
Architecture and Related Services	$45,609	$39,856	13%
Philosophy and Religious Studies	$45,079	$39,416	13%
Public Administration and Social Service Professions	$38,404	$34,259	11%
Family and Consumer Sciences/Human Sciences	$37,110	$33,169	11%

Transportation and Materials Moving	$49,443	$44,756	9%
Theology and Religious Vocations	$35,466	$32,532	8%
Homeland Security, Law Enforcement, Firefighting, and Related Protective Services	$41,353	$37,949	8%

Table 3: Career Cost of Underemployment

A Employed Professionals B Underemployed Professionals C Present Value Cost of Underemployment over Five-Year Period

Major	A	B	C
Expected Salary: Ages 22–26 inclusive	$46,104	$35,566	$50,973
Expected Salary: Ages 27–31 inclusive	$57,809	$45,262	$50,029
Expected Salary: Ages 32–36 inclusive	$68,408	$54,241	$47,508

Table 4: Supply Demand by Major (Two-Digit CIP Code)

A Demand / Supply Ratio B Underemployment

Degree	A	B
Agriculture, Agriculture Operations, and Related Sciences	0.26	55%
Foreign Languages, Literatures, and Linguistics	0.55	43%
Liberal Arts and Sciences, General Studies and Humanities	0.55	54%
History	0.55	49%
Education	0.6	50%
Family and Consumer Sciences/Human Sciences	0.6	57%
English Language and Literature/Letters	0.63	45%
Biological and Biomedical Sciences	0.66	51%

Psychology	0.73	54%
Physical Sciences	0.77	40%
Visual and Performing Arts	0.78	45%
Theology and Religious Vocations	0.79	49%
Philosophy and Religious Studies	0.84	43%
Military Technologies and Applied Sciences	0.85	67%
Mathematics and Statistics	0.86	39%
Homeland Security, Law Enforcement, Firefighting and Related Protective Services	0.88	65%
Social Sciences	0.88	44%
Business, Management, Marketing, and Related Support Services	0.9	47%
Multi/Interdisciplinary Studies	0.91	53%
Communications Technologies/Technicians and Support Services	0.92	39%
Architecture and Related Services	0.94	41%
Legal Professions and Studies	0.95	47%
Communication, Journalism, and Related Programs	0.96	39%
Computer and Information Sciences and Support Services	1.01	30%
Public Administration and Social Service Professions	1.03	53%
Engineering	1.12	29%
Library Science	1.12	34%
Transportation and Materials Moving	1.12	61%
Science Technologies/Technicians	1.17	50%
Health Professions and Related Programs	1.33	49%

Table 5: Key Skills for A Successful Career

Table 5 contains detailed information about transition opportunities from select majors and the skills that are most valuable to job seekers. This table has been designed to highlight certain skills that early job seekers can focus on to distinguish themselves from their peers and to avoid the trap of underemployment. For each of the largest bachelor's degree categories, we present a selection of common first-step occupations. For each of these occupations, we have provided a set of skills that are advantageous to job seekers because they are in demand, have a skill gap in the current market, and can boost job seekers salaries[25]. The skills included here are of course not a complete set of skills that job seekers can develop. Instead, these skills represent specific targets that can allow graduates to stand out, assuming they also meet the core skill requirements for each role.

For liberal arts majors (CIP codes 5, 16, 23, 24, 30, 38, 39, 42, 45, 50, and 54), we have not offered specific occupation pathway recommendations because these majors do not typically offer graduates a direct and obvious path into specific careers. Instead, for these majors we point to occupations across a range of roles for which they may be able to qualify, such as Public Relations Specialists, Social Science Researchers, Human Resource Specialists, Technical Sales Representatives, and Marketing Specialists.

Table 5.1: Key Skills Across Majors

Business, Management, Marketing, and Related Support Services

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Human Resources Specialists	$47,349	Technical Recruiting	$2,243	29%	Low
		Social Media	$1,777	51%	Medium
		Applicant Tracking System	$1,563	33%	Medium
Management Analysts	$67,460	Change Management	$2,047	21%	Medium
		Risk Management	$1,653	19%	Low
		Budgeting	$1,027	18%	Medium
Market Research Analysts and Marketing Specialists	$42,947	Market Strategy	$2,066	27%	Medium
		SQL	$917	28%	Low
		Salesforce	$567	43%	Medium
		Adobe Creative Suite	$328	33%	Medium
Accountants and Auditors	$53,959	Process Improvement	$1,751	2%	Low
		Generally Accepted Accounting Principles (GAAP)	$660	3%	High
		Enterprise Resource Planning (ERP) software	$508	20%	Medium
Financial Analysts	$59,500	Process Improvement	$1,421	37%	Medium
		Financial Forecasting	$1,157	35%	Low
		SQL	$908	39%	Medium
Technical Sales Representatives	$65,379	Articulating Value Propositions	$5,231	36%	Medium
		Sales Engineering	$4,559	22%	Low
		Negotiation Skills	$2,326	11%	Low
		Account Management	$1,507	77%	High

25. See Appendix 1 for additional technical details on the supply demand and salary models used to create this table.

Table 5.2: Key Skills Across Majors
Communication, Journalism, and Related Programs

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Public Relations and Fundraising Managers	$48,617	Negotiation Skills	$2,326	11%	Low
		Account Management	$1,507	77%	High
Public Relations Specialists	$44,940	Corporate Communications	$6,240	40%	Medium
		Raiser's Edge (A cloud-based fundraising & relationship management software)	$2,552	46%	Low
		Salesforce	$1,559	38%	Low
		Corporate Communications	$3,778	8%	Medium
		Planning	$1,308	7%	High
		Content Development	$1,286	26%	Medium
		Market Strategy	$1,026	24%	Low
		Analytical Skills	$941	32%	Low

Table 5.3: Key Skills Across Majors
Biological and Biomedical Sciences

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Microbiologists	$50,578	Good Laboratory Practices (GLP)	$2,392	27%	Medium
		Biochemistry	$1,742	36%	Medium
		Quality Management	$711	39%	Medium
		Problem Solving	$451	25%	Medium

		Laboratory Testing	$422	21%	Medium
Biological Scientists	$57,106	Chemical Engineering	$4,166	36%	Low
		Biochemical and Cell-Based Assays	$1,507	37%	Medium
		Mammalian Cell Culture	$1,165	42%	Medium
		Flow Cytometry	$1,136	47%	Medium
Medical Scientists	$60,622	Drug Discovery	$5,445	14%	Low
		Biotechnology	$2,837	10%	Medium
		Drug Development	$2,384	21%	Medium
		Project Management	$1,913	10%	Medium
Medical and Clinical Laboratory Technologists	$52,339	Biochemistry	$3,949	10%	Low
		Transfusion	$2,232	23%	Low
		Specimen Collection	$1,533	22%	Low
		Clinical Pathology	$1,517	26%	Medium

Table 5.4: Key Skills Across Majors
Computer and Information Sciences and Support Services

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Software Developers, Applications	$83,642	Agile Development	$2,184	30%	Medium
		Scalability Design	$1,924	39%	Low
		Scrum	$1,288	39%	Medium
		AngularJS	$1,251	61%	Medium
		Big Data	$1,115	41%	Low

Web Developers	$76,138	Product Management	$2,510	29%	Low
		AngularJS	$2,224	48%	High
		Adobe Creative Suite	$2,166	12%	Medium
		ReactJS	$1,960	80%	Medium
		Scrum	$1,933	32%	Medium
Computer Hardware Engineer	$87,874	Machine Learning	$3,419	66%	Medium
		Computer Vision	$2,885	65%	Medium
		Altium (Circuit Design Software)	$2,856	9%	Low
		MATLAB	$1,913	20%	Medium

Table 5.5: Key Skills Across Majors
Engineering

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Civil Engineers	$69,472	Traffic Engineering	$4,947	24%	Low
		Transportation Engineering	$1,079	36%	Low
		Microstation	$1,046	14%	Medium
		Business Development	$853	13%	Medium
Electrical Engineers	$75,344	MATLAB	$1,630	42%	Medium
		Firmware	$1,505	36%	Low
		Systems Engineering	$1,501	33%	Medium
		PCB Layout and Design	$1,450	32%	Low
		Human Machine Interface (HMI)	$1,137	33%	Medium

Mechanical Engineers	$72,120	PTC Creo	$4,341	35%	Low
		Systems Engineering	$2,544	37%	Medium
		Prototyping	$1,450	40%	Low
		Geometric Dimensioning and Tolerancing (GD&T)	$1,344	33%	Low

Table 5.6: Key Skills Across Majors
Family and Consumer Sciences/Human Sciences

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Medical and Health Services Managers	$72,206	Process Improvement	$1,718	48%	Low
		Acute Care	$1,437	47%	Low
		Advanced Cardiac Life Support (ACLS)	$541	46%	Low
Farm and Home Management Advisors	$45,978	Microsoft PowerPoint	$3,927	55%	Medium
		Budgeting	$2,772	45%	Medium
		Resource Management	$2,297	27%	Medium
		Presentation Skills	$1,945	50%	Medium
Dietitians and Nutritionists	$49,369	Process Improvement	$1,058	27%	Low
		Quality Assurance and Control	$767	33%	Medium
		Long-Term Care	$646	27%	Medium
		Budgeting	$602	26%	Low

Table 5.7: Key Skills Across Majors
Health Professions and Related Programs

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Registered Nurses	$72,909	Hospital Experience	$5,978	92%	High
		Surgical Services	$3,508	50%	Low
		Critical Care Nursing	$2,945	88%	High
		Neonatal Intensive Care Unit (NICU) Experience	$1,036	42%	Low
Health Educators	$57,539	Oncology	$4,612	30%	Low
		Creativity	$1,174	50%	Medium
		Presentation Skills	$1,048	34%	Medium
Occupational Health and Safety Specialists	$58,225	Hazard Analysis	$1,897	45%	Medium
		Project Management	$1,783	29%	Medium
		Environmental Compliance	$645	29%	Low

Table 5.8: Key Skills Across Majors
Homeland Security, Law Enforcement, Firefighting, and Related Protective Services

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Probation Officers and Correctional Treatment Specialists	$48,119	Motivational Interviewing	$9,169	56%	Medium
		Risk Assessment	$2,762	61%	Medium
Detectives and Criminal Investigators	$67,821	Intelligence Operations	$2,972	39%	Medium
		Project Management	$1,547	56%	Medium
		Geospatial Intelligence	$1,488	39%	Low
		Threat Analysis	$1,171	46%	Medium
Private Detectives and Investigators	$48,389	Anti-Money Laundering (AML)	$4,774	51%	Medium
		Personnel Management	$2,845	70%	Medium
		Statistical Reporting	$1,243	72%	Medium

Table 5.9: Key Skills Across Majors
Legal Professions and Studies

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Paralegals and Legal Assistants	$44,124	E-Discovery	$2,809	19%	Low
		Legal Document Preparation	$2,098	5%	Low
		Trial Preparation	$1,718	1%	Medium

Table 5.10: Key Skills Across Majors
Mathematics and Statistics

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Management Analysts	$67,460	Change Management	$2,047	21%	Medium
		Risk Management	$1,653	19%	Low
		Budgeting	$1,027	18%	Medium
Actuaries	$73,986	Budgeting	$2,297	34%	Medium
		Product and Equipment Pricing Information	$1,946	40%	Medium
		SQL	$667	26%	Medium
		Statistics	$336	50%	Low
Statisticians	$72,818	Clinical Data Interchange Standards Consortium (CDISC)	$7,342	30%	Medium
		Java	$1,190	38%	Low
		Python	$536	60%	Medium
		Clinical Data Review	$1,518	28%	Medium

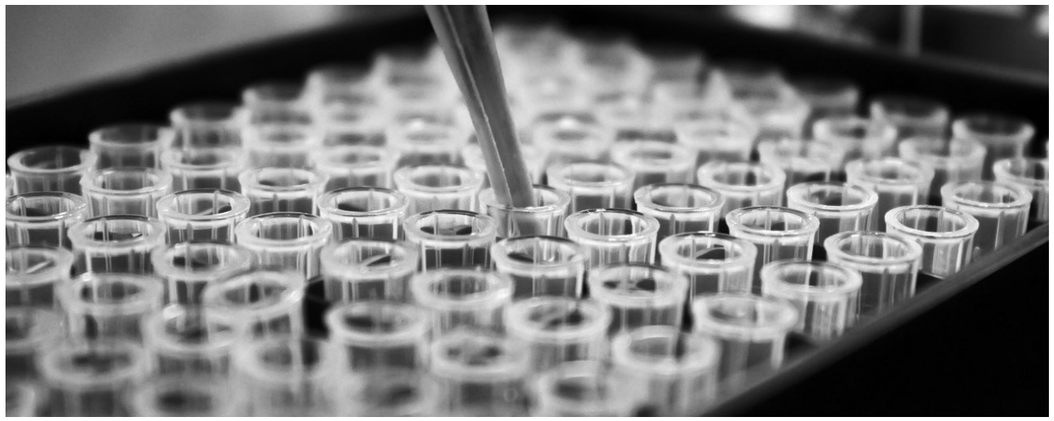


Table 5.11: Key Skills Across Majors
Natural Resources and Conservation

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Environmental Engineers	$69,366	Engineering Design and Installation	$1,140	25%	Medium
		Hydrologic Modeling	$1,134	41%	Medium
		Civil 3D	$745	46%	Medium
Environmental Scientists and Specialists, Including Health	$57,446	Data Analysis	$1,039	24%	Low
		Site Investigations	$809	10%	Low
		Business Development	$496	8%	Medium

Table 5.12: Key Skills Across Majors
Physical Sciences

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Chemists	$52,743	HPLC-MS assays / LC-MS	$2,515	34%	Low
		Manufacturing Processes	$1,744	24%	Low
		Laboratory Equipment	$1,688	20%	Medium
Chemical Technicians	$40,525	Analytical Chemistry	$1,417	14%	Medium
		Biochemistry	$613	6%	High
		Calibration	$528	5%	Medium

Table 5.13: Key Skills Across Majors
Psychology

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Educational, Guidance, School, and Vocational Counselors	$40,118	Academic Counseling	$2,124	4%	Medium
		Vocational Rehabilitation	$1,149	3%	Low
		Mentoring	$1,003	7%	Low
		Budgeting	$875	0%	Medium
Mental Health Counselors	$31,857	Building Effective Relationships	$3,491	29%	Medium
		Clinical Experience	$3,429	38%	Medium
		Family Therapy	$3,254	39%	Medium
		Clinical Psychology	$2,193	35%	Low
Mental Health and Substance Abuse Social Workers	$47,417	Clinical Experience	$1,826	25%	Medium
		Psychotherapy	$1,435	15%	Medium

Table 5.14: Key Skills Across Majors
Parks, Recreation, Leisure, and Fitness Studies

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Athletic Trainers	$39,895	Concussion Diagnosis / Treatment	$1,995	59%	Medium
		Clinical Experience	$1,385	36%	Medium
		Rehabilitation Services	$1,358	25%	Low

Table 5.15: Key Skills Across Majors
Public Administration and Social Service Professions

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Social and Community Service Managers	$46,246	Strategic Planning	$1,349	33%	Low
		Financial Management	$1,163	27%	Low
		Behavioral Health	$912	42%	Medium
Operations Research Analysts	$54,096	Project Management	$1,389	37%	Medium
		SQL	$766	42%	Medium
		Leadership	$687	35%	Low
		Budgeting	$642	35%	Medium
Social and Human Service Assistants	$38,212	Behavioral Health	$912	23%	Medium
		Planning	$793	18%	High
		Staff Management	$374	29%	Medium
		Treatment Planning	$349	18%	Medium

Table 5.16: Key Skills Across Majors
Social Sciences

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Market Research Analysts and Marketing Specialists	$42,947	Market Strategy	$2,066	27%	Medium
		SQL	$917	28%	Low
		Salesforce	$567	43%	Medium
		Adobe Creative Suite	$328	33%	Medium
Urban and Regional Planners	$57,953	Community Planning	$3,690	32%	Medium
		Land Use	$1,612	32%	High
		Project Management	$919	32%	High
		Creativity	$598	45%	Medium
Social Science Research Assistants	$59,548	Budgeting	$5,615	26%	High
		Data Science	$2,372	46%	Low
		Tableau	$1,738	17%	Low
		R	$671	31%	Medium

Table 5.17: Key Skills Across Majors
Transportation and Materials Moving

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Transportation, Storage, and Distribution Managers	$47,819	Warehouse Management Systems	$2,562	50%	Low
		Process Improvement	$1,717	51%	Medium
		Analytical Skills	$1,475	49%	Low
		Enterprise Resource Planning (ERP)	$1,315	47%	Low
Construction Managers	$67,646	People Management	$2,932	25%	Low
		Quality Management	$2,636	32%	Medium
		Estimating	$1,587	29%	Medium
		Microsoft Project	$1,023	30%	Medium

Table 5.18: Key Skills Across Majors
Visual and Performing Arts

A Occupational Average Entry-Level Salary B Salary Premium C Skill Gap D Demand Level

Target Occupations	A	Skill Name	B	C	D
Art Directors	$64,936	Digital Design	$4,318	4%	Medium
		Adobe Creative Suite	$2,124	9%	High
		Project Planning and Development Skills	$1,758	13%	Low
Multimedia Artists and Animators	$60,065	Cinema 4D	$5,137	12%	Medium
		Prototyping	$3,791	7%	High
		User Research	$2,374	10%	Medium
		Adobe Creative Suite	$1,535	2%	High

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