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Authors

Davis, Daniel
Binder, Amy

Publication Date

2019

DOI

10.1177/2378023119859711

Peer reviewed

SOCIUS

Original Article

Socius: Sociological Research for a Dynamic World
Volume 5: 1–23

DOI: 10.1177/2378023119859711
srd.sagepub.com
SAGE

Industry, Firm, Job Title: The Layered Nature of Early-Career Advantage for Graduates of Elite Private Universities

Daniel Davis[1] **and Amy Binder**[1]

Abstract

Using concepts associated with effectively maintained inequality theory and horizontal stratification, the authors ask whether the private-public dividing line is a "threshold of consequence" for early-career market entry. To address this empirically, the authors use a novel LinkedIn data set to analyze job pathways for the graduating class of 2016 from the top 25 private and top 25 public universities in the United States. In line with past qualitative research, the authors find evidence that elite private graduates enter high-status industries in greater proportion than their public university counterparts. They also tend to get jobs at more prestigious and higher paying firms and to attain more prestigious job titles. On the basis of the evidence, the authors call for more closely analyzing the layers of advantage that may accumulate to elite graduates during key transitional moments, such as during the postgraduation job search. The authors also shed additional light on how the private-public divide is a threshold of consequence for university graduates.

Keywords

elite private and public universities, effectively maintained inequality, thresholds of consequence, college-to-career, layers of advantage

Why do wealthy families go to such lengths to land their children at a handful of elite, mostly private, universities? The question is more relevant than ever in the wake of Operation Varsity Blues, the largest admissions scandal in U.S. history, in which the Federal Bureau of Investigation charged dozens of high-wealth families in 2019 with bribing coaches and cheating on admissions exams to get their children into top schools (Medina, Benner, and Taylor 2019). One answer to the "why" question can be found in the concepts of horizontal stratification of higher education (Davies and Zarifa 2012; Gerber and Cheung 2008) and trends toward effectively maintained inequality (EMI) (Lucas 2001). Proponents of these theories envision higher education as a competitive arena of qualitatively different categories of institutions that are ranked hierarchically, from best to worst. This is not a matter of positioning colleges and universities vertically, by the level of degrees they offer, but rather points to consequential thresholds that separate more advantageous institutional segments from others on a perceived metric of quality and prestige. Independent of how large or small the actual level of difference between categories of institutions may be, universities in distinctive categories are perceived to be significantly different in status. Parents, students, and even employers use these categorical, or symbolic, boundaries to distinguish higher education institutions from one another (Alon 2009; Binder and Abel 2019; Rivera 2015b). In such an arena, affluent families scramble—legally and illegally, as it turns out—to situate their children over the threshold into a better qualitative position relative to otherwise equal competitors, with future economic and social payoffs in mind.

Horizontal stratification and EMI are, at root, explanations for how economically advantaged households seek to hoard opportunities for their sons and daughters. However, these theories also point to a related phenomenon, which is that relatively similar student contenders who might otherwise do equally well in a meritocratic competition could end up doing quite differently in the long run if they fall on one side of a consequential institutional threshold rather than the other. This echoes Merton's (1968) classic article on the Matthew effect, in which the rewards in academic science careers are rationed to a limited number. Being just below the cutoff

[1]University of California, San Diego, La Jolla, CA, USA

Corresponding Author:
Daniel Davis, University of California, San Diego, Yankelovich Center for Social Science Research, 9500 Gilman Drive, La Jolla, CA 92093, USA.
Email: dbdavis@ucsd.edu

point—the figurative "41st chair"—will disadvantage a scientist compared with the gains in recognition, awards, and resources enjoyed by a competitor who was only marginally better but just above the cutoff in the 40th chair. A modern-day example is featured in Bol, de Vaan, and van de Rijt's (2018) research on young scientists' early-career trajectories. Here, although reviewers' scores of the winners and losers in a grant competition were only slightly different, over the following eight years, those who had won the initial grant went on to secure more than twice as much additional funding as did those who had barely missed the threshold. Early wins produce a signaling effect to later funders, which helps these winners accumulate grants in subsequent competitions. The same could be true of graduates of private universities who cross a symbolic threshold leading to later wins.

Although rarely in conversation with theories of horizontal stratification or EMI (or, for that matter, Merton's Matthew effect), past research has indicated that graduates of private elite universities enjoy distinct advantages over their public university peers. Employers in a few premier industries use elaborate recruitment strategies only on elite campuses to hire young employees, leaving the majority of the country's college graduates on the other side of a cutoff point, without even the possibility of applying for these jobs (Binder, Davis, and Bloom 2016; Rivera 2015b). Managers at elite firms evaluate graduates from top private universities more favorably in terms of "cultural fit" with their firms' current employees than for their cognitive skills (Rivera 2012), pointing to the status signaled by elite institutional attendance. Private elite students also beat the competition in other segments of the labor market, as indicated in audit studies. Gaddis (2015) found that employers from a wide range of industries favored similar résumés from students at three elite private universities compared with a public university in the same region. In Gaddis's study, job applications containing private elite university degrees received 1.7 times more responses from employers than did evenly matched applicants from the public institution. In an older study, Ishida, Spilerman, and Su (1997) showed that the signaling effect of prestigious universities is most pronounced at the beginning of applicants' careers, when there is little experience listed on résumés apart from having attended selective colleges and universities. Paralleling the findings of Bol et al. (2018) but applied to the college sector, these studies suggest how an elite university degree can be used as a stamp of quality sought by employers (Connelly et al. 2011; Ho 2009).

Separate from studying the actions of employers, sociologists have taken students as the unit of analysis to study the effects of attendance at elite institutions. Findings are not incontrovertible, but there is suggestive evidence that elite advantage is strong in multiple social and economic realms. Elite students enter social circles that are exclusive and can lead to social closure, including in marriage and friendship networks (DiMaggio and Powell 1983). Elite private universities produce top political leaders in the United States (Zarifa and Davies 2018). Students from elite colleges and universities attend graduate school in higher numbers and in higher status departments than do students who attend public universities (Posselt and Grodsky 2017). Brand and Halaby (2006) demonstrated that elite college attendance is strongly associated not only with college graduation and graduate school attendance but also with socioeconomic status of first job and enduring socioeconomic boosts in mid- and late career. Early gaps in job taking continue to persist years later, as students graduating from private elite universities enjoy a substantial wage premium relative to their public university cohort-mates (Katchadourian and Boli 1994). Thomas and Zhang (2005) found an early-career earnings gap of 20 percent between graduates from "high-quality private" and "low-quality public" universities, while Witteveen and Attewell (2017) demonstrated that for students 4 and 10 years after graduation, a large gap persists, particularly for men. In sum, much of the sociological literature points in the direction of strong advantages for the graduates of elite private universities.

Scholarly Skepticism about Elite Advantage: Selection Effects, Sociological Blinders, and the New Economy

Although these studies point to elite advantages in the workplace, there are pockets of skepticism about whether elite private universities, in and of themselves, offer much advantage. One variant of this argument is that selection effects are the key mechanism leading to better career outcomes for students of elite colleges and universities (Dale and Krueger 2002). Although in the aggregate, private elite university attendance may be associated with higher earnings (and, by extension, better jobs), once one controls for students' high school characteristics (such as test scores), and schools to which students applied and were accepted, elite advantage in earnings washes out (Hout 2002). More recent research confirms the main findings of this argument but adds granularity: with the exception of Black, Hispanic, and lower socioeconomic status students (Dale and Krueger 2014) and women working less than full-time year round (Ge, Isaac, and Miller 2018), there are null effects of attendance at private elite universities.

A separate argument is that assumptions about elite advantage are simply overblown: although access to private elite education is plagued with inequalities, career outcomes do not reflect those same inequities down the line in the job market. An example of this argument can be found in research conducted by Brint and Yoshikawa (2017), who showed that later career workers who are employed as "C-level" executives at top companies (or who are national political leaders) are as likely to have attended public universities as private institutions, although Brint and Yoshikawa's data also showed that highly successful alumni from private and public universities cluster into different labor market sectors.

Further challenging the notion that private elite university graduates do better in the labor market is research suggesting that elite advantage is not as durable in the new economy as

in past labor markets. Bessen (2015) argued that the rise of high-tech industries may contribute to a greater democratization of employment opportunities for all university graduates, as tech skills are often learned better on the job than in college classrooms. Heightened demands on public research universities to spur regional economic development have led public institutions to multiply their efforts to produce commercially viable technologies (Kenney and Mowery 2014), offer targeted and high-demand workforce training (Walshok, Munroe, and DeVries 2011), and forge new recruiting pathways with elite employers (Davis and Binder 2016). These developments could weaken the advantage of attending the most selective private universities because employers have a larger pool from which to search for employees with the highest skill sets. Hoekstra (2009) showed that attending the most selective state universities is associated with a post-graduation wage premium over less selective universities, suggesting that employers look favorably on flagship public universities. The *New York Times*, following research published by Chetty et al. (2017), recently named all of California's leading public research universities as "upward-mobility machines" (Leonhardt 2015).

Such changes in the new economy and at the nation's top public universities, in combination with Brint and Yoshikawa's (2017) findings about later executive careers held by public university graduates, could indicate that graduation from elite institutions is becoming less salient in the face of the growing technocratic demands of the current labor market. It is also true, vis-à-vis the argument about selection effects, that many of the studies that find large gaps between public and private university graduates compare the "highest quality" institutions with a wide range of less selective institutions. For example, in Gaddis's (2015) audit study, batches of graduates' résumés from the three private campuses contained 75th percentile SAT scores averaging 1540 compared with scores of 1320 for the public university campus. In such a case, selection effects cannot be ruled out.

In this study, we develop a novel data set that allows us to weigh in on the debate about private elite advantage and whether a threshold of consequence between types of universities matters for early-career outcomes. Using a well-matched set of institutions drawn from the LinkedIn platform, we show patterns of job taking among recent college graduates, which, to this point, have gone unexplored. Specifically, we show different rates of entry by the nation's top public and private university students into the nation's largest industries, firms, and job titles. Our findings support elite-advantage arguments in the literature.

Methodology

Measuring Private versus Public University Status as a Threshold of Consequence

To examine whether public or private university attendance functions as a threshold of consequence largely independent of the quality of students attending institutions, we compared job outcomes for graduating seniors in the class of 2016 at the top 25 public and top 25 private universities, as found in *U.S. News & World Report*'s (*USNWR*) ranking of "Top National Universities." (*USNWR* maintains separate lists for regional universities and liberal arts colleges, which we do not include in this analysis.) Despite misgivings about the value and accuracy of *USNWR* rankings (Espeland and Sauder 2007), we decided to use these annual reports for two reasons. First, however valid the criticisms that are lodged about the uses and abuses of *USNWR* rankings, they are the leading source of information used by the general public, prospective students, university administrators—and, potentially, employers—to learn about universities' perceived positions relative to one another. Second, we are not the only sociologists to use this ranking system. Espeland and Sauder (2007) used *USNWR* rankings in their study of law schools, in which they demonstrated the power of the rankings to radically influence professional schools' admissions policies. Likewise, Gaddis's (2015) audit study of student applications for jobs from higher and lower ranked universities and Brint and Yoshikawa's (2017) study of the educational backgrounds of later career executives and national politicians also relied in part on *USNWR* rankings.

Table 1 provides a list of the universities in our sample, while Appendix A provides information about these campuses from the National Center for Education Statistics (NCES), such as their acceptance and graduation rates, mean SAT scores, and students' average earnings 10 years after admission.[1]

Using NCES data to compare SAT scores (a measure of the "quality" of students), we find that students at the 25 top private universities and the 25 top public universities are not vastly different in ability, a least as measured by standardized tests at the 75th percentile. Because NCES data are reported in quartiles, we chose to compare scores at the 75th percentile. The 100th percentile is simply a perfect score at most institutions, which provides minimal information on differences, while the raw mean would be quite skewed because public universities admit many more students than do private universities and have much greater heterogeneity in scores. The average 75th percentile SAT score for our private university students is 1558 (789 in math, 769 in reading) compared with 1408 (728 in math, 680 in reading) for the public university students in our sample. Our comparison groups differ in performance by about 10 percent, which we find acceptable considering that both sets of scores are two full standard deviations above the national average 75th percentile, or better than 99.7 percent of the population (Staffaroni 2018). This difference also compares quite favorably with differences in test scores reported in Gaddis's (2015) audit study, in which 75th percentile scores differed by more than 200 points.

[1]Earnings data came from College Scorecard data (https://collegescorecard.ed.gov).

Table 1. Private and Public Universities, 2016 *USNWR* Rankings.

Private Universities	Public Universities
1. Princeton University	1. University of California, Berkeley
2. Harvard University	2. University of California, Los Angeles
3. Yale University	3. University of Virginia
4. Columbia University[a]	4. University of Michigan
4. Stanford University	5. University of North Carolina, Chapel Hill
4. University of Chicago	6. College of William & Mary
7. Massachusetts Institute of Technology	7. Georgia Institute of Technology
8. Duke University	8. University of California, Santa Barbara
9. University of Pennsylvania	9. University of California, Irvine
10. California Institute of Technology	9. University of California, San Diego
10. Johns Hopkins University	11. University of California, Davis
12. Dartmouth College	11. University of Illinois Urbana, Champaign
12. Northwestern University	11. University of Wisconsin, Madison
14. Brown University	14. Pennsylvania State University
15. Cornell University	14. University of Florida
15. Vanderbilt University	16. The Ohio State University
15. Washington University, St. Louis	16. University of Texas, Austin
18. Rice University	16. University of Washington
18. University of Notre Dame	19. University of Connecticut
20. Emory University	19. University of Maryland, College Park
21. Georgetown University	21. Clemson University
23. Carnegie Mellon University	21. Purdue University
23. University of Southern California	21. University of Georgia
24. Tufts University	24. University of Pittsburgh[b]
25. Wake Forest University	25. University of Minnesota, Twin Cities

Note: Rankings from 2016 *U.S. News & World Report* (*USNWR*) "Top National Universities." We separated the top 25 public universities from the top 25 private universities for our comparison. In the original *USNWR* list, public and private institutions were integrated into the same running list of hundreds of "Top National Universities."

[a]Instances of the same rank denote ties in the *USNWR* ranks. Ties are listed alphabetically.

[b]The University of Pittsburgh is technically designated a "state-related" university.

LinkedIn Hiring Data

With our list derived from *USNWR*, and partial school data derived from the College Scorecard, we then used the LinkedIn platform to collect data on the jobs that our 2016 graduates took. Among other services attracting potential users, LinkedIn provides opportunities to search for jobs, build industry connections, and display work experience and credentials. More important for our study, however, LinkedIn contains self-reported graduation and employment data for people who build profiles on the site, and the site clusters this information on what are called alumni pages for each university. Also useful for our project, the alumni page for each university offers a dashboard tool, which allows researchers to limit searchable data to only those students who reported graduating from that university in specific years. Because our interest is on an important moment of career transition—what happens when a student graduates from college and enters the labor force—we collected data for a single recent year: those who graduated from 1 of our 50 sample universities in 2016. (The data set is available upon request.) This allowed us to zero in on young users' early job experiences rather than seeing an accumulation of jobs that older users' LinkedIn profiles would contain.

This strategy is not foolproof, as even young workers may list multiple places of employment within their first year after graduation, for example, if they quickly job-hopped, worked at more than one job simultaneously, or had internships or summer jobs at these firms during college. However, this kind of amassing of job titles is substantially lower for very recent graduates than for alumni who graduated several years prior. Given this, we consider our data to be indicative of early places of employment and mostly first jobs after graduation, although not in all cases the single first job taken after attaining a baccalaureate degree. We accessed the data in the summer of 2017, allowing one full year for those who had graduated in the spring term of 2016 to assume their postcollege jobs.

There are other ways that the LinkedIn platform is an imperfect data source for scholarly research, although we have made efforts to address its limitations. Most important, we suspect that some students are likelier than others to create LinkedIn profiles, such as those in professional first jobs compared with those who are employed in less prestigious lines of

work. However, this is less of a problem for us, because our analysis focuses on students who take jobs with the largest employers hiring from each university, as we describe below. Second, although students from all four-year colleges and universities are not equally likely to create LinkedIn accounts, we suspect that those who graduate from the nation's top private or public universities, and who take professional jobs with large employers, are more likely to do so at similar rates than peers from lower ranked institutions.

Finally, although it is possible that people who use LinkedIn may falsify the universities they attended and the degrees they earned, this seems unlikely as a widespread practice because of the public nature of LinkedIn profiles, promoting some level of accountability. In fact, one anonymous survey (Brown 2018) found that two thirds of LinkedIn users claimed that their profiles were completely accurate, with another quarter stating that their profiles were mostly accurate. Only about 11 percent admitted to having largely fabricated their profiles, and among the items fabricated, most said that they overstated their skills (55 percent), while only 10 percent said that they misrepresented their places of work Even fewer said that they made false claims about their educational background, the items we focus on. Although these LinkedIn data are self-reported and do not come from an outside audit, the numbers suggest that our findings are questionable at a rate of only about 1 profile per 100 (i.e., only 10 percent of the 11 percent who admitted to largely fabricating their profiles did so in the areas we examine: places of work and undergraduate alma mater). What is more, because there is public accountability, information contained on LinkedIn has been shown to be more accurate than résumés sent in privately to potential employers (Guillory and Hancock 2012).

The LinkedIn alumni page for each campus lists the 25 employers (and their associated industries) that hired the largest number of students from that university.[2] Because the alumni page focuses only on the top 25 companies hiring graduates, it does not show the many smaller employers that employ graduating seniors from each campus, which means that our study presents data on the slice of graduates who took positions at larger firms. Even so, using the dashboard to collect company and industry data for all 50 campuses in our sample, for students who graduated in 2016, our final data set produced information on more than 26,733 students who took jobs at 578 companies in 74 different LinkedIn-generated industry categories (from "accounting" to "wireless"). Our sample is substantial in size and represents 12.4 percent of the total 216,439 bachelor's degrees awarded in 2016 from our 50 universities. It is important to remember that the private universities in our sample graduated far fewer students than did the top public universities in 2016. Along the lines one might expect, the average number of bachelor's degrees awarded by the top 25 private universities is 1,800, compared with a mean of 6,858 for the 25 public universities, representing a ratio of 1 private student for every 3.8 public students. We keep this ratio in mind while reporting our results.

A Benefit of Using LinkedIn: The Ability to Study Multiple Layers of Analysis

Unlike other data sources, the LinkedIn alumni dashboard tool allows us to analyze job taking along three dimensions: industry, firm, and job title. (The platform also allows researchers to examine alumni's majors, or "what they studied"; "where they live," in cities and countries; and "what they are skilled at," from skills such as specific software competencies to public speaking ability. We do not analyze those other dimensions here.) We decided to focus on all three of these levels, not simply on company names, because past research gives us reason to believe that some of the effect of private versus public attendance plays out at a more macro layer of analysis. For example, we know that some industries—such as elite investment banking—hire almost exclusively from private universities. Conversely, differences in status could also occur at a more micro level of analysis than the firm alone. For example, elite private university graduates may occupy more prestigious job titles than public graduates even within the same firms and industries.

Although the alumni dashboard data provide sufficient information for looking at trends at the industry and firm levels, to get at the job title level, we had to conduct a more targeted search using case studies. We chose Amazon and Google as case illustrations for this level of analysis. We selected these two companies because they are the two largest employers of recent graduates in our sample and because they represent the rise of Internet technology firms as a leading career aspiration for recent graduates of top universities (Binder et al. 2016). Our rationale for having the more detailed Amazon and Google case studies is, first, to see if these top desirable tech firms hire graduates from public and private universities at similar or different rates (the same as the overarching research question applied to the larger collection of data). Second, we also wanted to see if they hire them into the same job titles at similar rates. This is a critical question because leaders in the tech world often promote their industry as less interested than more traditional sectors in the status of the institutions that educate their employees and thus as a more equitable, meritocratic sector overall. However, if the tech sector follows the same patterns that favor elite private university graduates, we would have to be skeptical about such claims. Appendix B gives detailed information on how we gathered the individual profile data for Amazon and Google workers; Appendices C and D explain how we

[2]These pages were later limited by LinkedIn, and at the time of this writing, they list only the top 15 employers for each campus. We collected data for two of our case campuses after this shift (the 25th of each list, Wake Forest University and the University of Minnesota, Twin Cities).

categorized job titles into census occupational codes and work types for the Amazon and Google workplaces.

Findings

Industry: Private University Graduates Enter More Prestigious Industries at Higher Rates

The LinkedIn dashboard tool generated 74 industry categories that our sample of students entered. We reduced this number into a more manageable list of 30 industry categories, combining related industry titles. For example, our "banking and financial services" industry category is a blend of LinkedIn's "banking," "investment banking," "financial services," and "venture capital and private equity" categories. Our "retail" industry category is a combination of LinkedIn's "retail," "wholesale," and "supermarkets." Appendix E provides the full list of the 74 industries, which we reduced to 30.

To begin our analysis, we use Tableau visualizations to identify the top industries (by hiring volume) in which our 26,733 public and private university undergraduates found jobs. In this section, we focus on the top 6 industries out of our set of 30 because, as Figure 1 shows, the 24 additional industries drop off sharply in the number of students they hire directly out of our 50 universities. In a later section we briefly describe patterns in the nondominant 24 industries to see how things look similar or different in the remaining segments of the labor force.

As seen in Table 2, the same six industries show up as top employers for both private and public university graduates, suggesting that these currently are the largest employment sector "pulls" for young workers who have LinkedIn profiles coming out of top universities in the United States. Graduation from a private versus a public university is statistically significantly associated with differing rates of entrance into these dominant industries, as evidenced by a χ^2 test of independence ($\chi^2[5, N = 19{,}125] = 1{,}185.73$, $p < .001$). Private university graduates are overrepresented in these top sectors, especially in the most prestigious of them.

The three most entered industries by private elite university students are (1) computers and Internet, (2) management consulting, and (3) banking and financial services. This matches qualitative studies revealing that elite students perceive high tech, banking, and management consulting as the most desirable and prestigious job destinations in today's economy (Binder et al. 2016; Roose 2014). The next leading industry choices for workers from private universities are (4) healthcare, (5) accounting, and (6) aerospace.

For the public university graduates in our sample, (1) computers and Internet also take top billing as the industry hiring the largest number of students, and (2) the hospital and healthcare industry hires the second largest volume of recent graduates. Although the "hospital and healthcare" sector is included in the top six industries for both private and public job seekers, it ranks second for public graduates but sixth for private graduates; this is potentially also because "hospital and healthcare" does not include medical school, which LinkedIn categorizes under graduate school.[3]

Next comes (3) "accounting," which consists mainly of jobs with the "big four" large auditing firms: Deloitte, KPMG, Ernst & Young, and PricewaterhouseCoopers. For the public university graduates, management consulting shows up fourth on the list, but it is noticeably dominated by jobs at Deloitte, which claimed 63 percent of the public university workers in the "management consulting" industry overall (compared with only 31 percent of the private university students in management consulting). Although Deloitte does do consulting work, and is listed by LinkedIn in the "management consulting" category, it more frequently is categorized as an auditing and accounting firm; in fact, Deloitte is the largest of the "big four" accounting firms (http://big-4accountingfirms.org). It is, in any case, along with other firms in the "accounting" industry, a top employer for public university graduating seniors but less so for private university graduates. The next industries hiring the largest numbers of top public university students are (5) airlines and aerospace and, finally, (6) banking and financial services, an industry that, as we saw previously, is dominated by graduating seniors from private universities.

Overall, the early picture that emerges from examining LinkedIn data for industry entry is that private university and public university students who have LinkedIn profiles enter these six leading industries at different rates, and that private university students exhibit a strong advantage in certain industries (particularly banking and consulting) when one takes into account the much smaller number of graduating seniors from private institutions. Because these are high-paying industries (Roose 2014), this is partial evidence that private university advantage may be an enduring fact in the today's labor market. Yet as we demonstrate in the next two sections, private university graduates also experience advantages by entering more highly ranked firms within several of the top six industries compared with their public university peers, and they occupy more high-profile job titles, even in the technology field, which at first glance (see Table 1) appears to be a more equitable playing field.

Firm: Private University Graduates Enter More Highly Ranked Firms within Each Industry

Management Consulting versus Accounting. Looking more closely at specific firms within our 30 industries provides a

[3]Because graduate school is different from the regular labor market, we excluded it from our list of top seven. However, it is useful to note that graduate school (which includes professional schools) was the third most frequent destination directly out of school for private elite students, but only the eighth most frequent destination for public university graduating seniors.

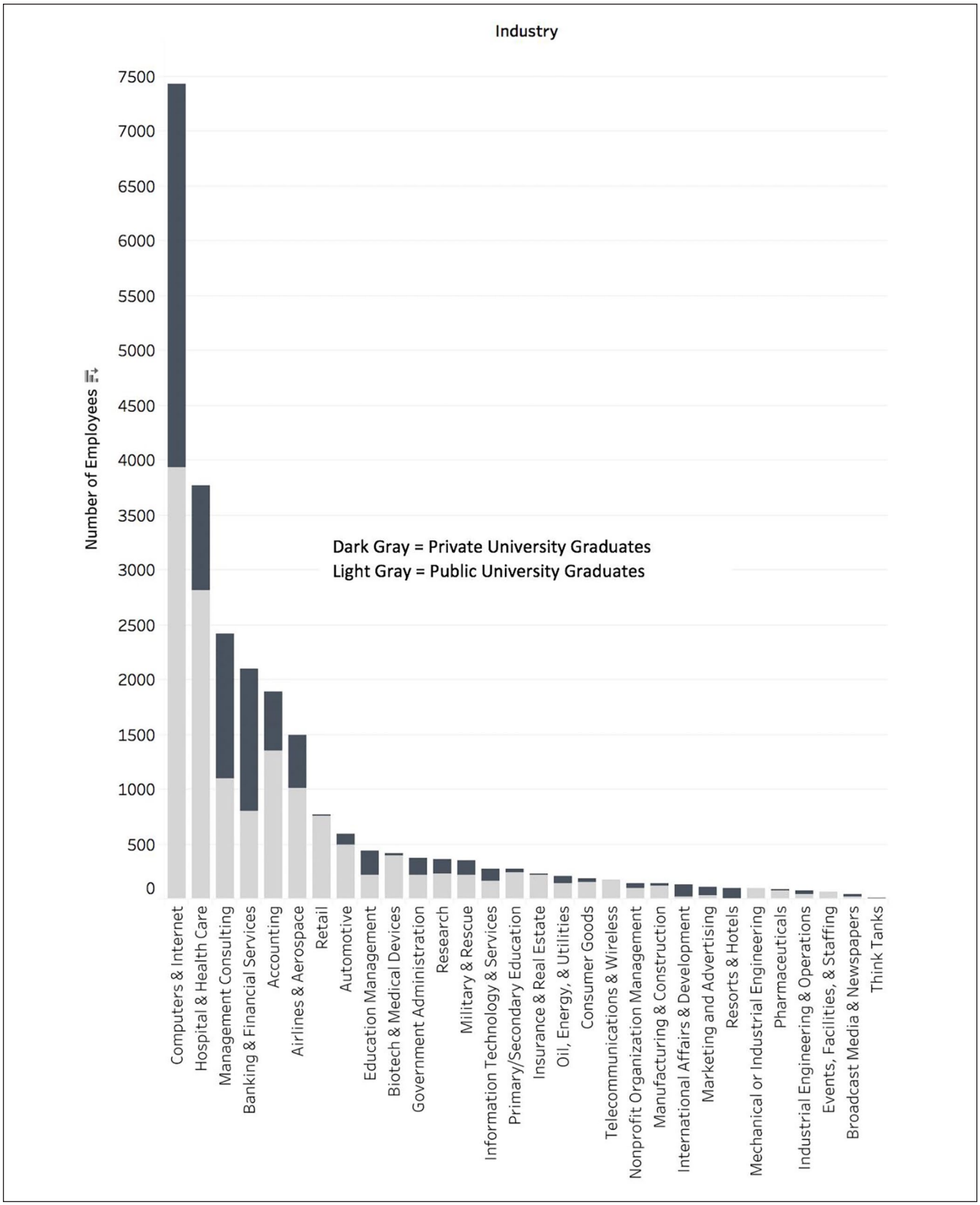

Figure 1. Number of students hired, by industry, for the top 25 public and private universities.
Source: Collection of LinkedIn alumni employment data for our 50 case campuses.

Table 2. Dominant Industries, by Private and Public Universities.

Private Universities' Top Industries	Number Employed	Public Universities' Top Industries	Number Employed
Computers and Internet	3,504	Computers and Internet	3,932
Management consulting	1,322	Hospital and healthcare	2,820
Banking and financial services	1,294	Accounting	1,349
Hospital and healthcare	957	Management consulting	1,096
Accounting	545	Airlines and aerospace	1,008
Airlines and aerospace	493	Banking and financial services	805

Source: Collection of LinkedIn alumni employment data for our 50 case campuses.

Table 3. The Top Seven Consulting and Accounting Firms.

Bank Name	Firm Type	Private *n*	Private %	Public *n*	Public %
McKinsey & Company	Big three	245	17.2	0	0
Boston Consulting Group	Big three	107	7.5	0	0
Bain & Company	Big three	118	8.3	13	0.7
Deloitte	Big four	406	28.6	693	34.9
PricewaterhouseCoopers	Big four	226	15.9	558	28.1
EY	Big four	277	19.5	586	29.6
KPMG	Big four	42	3.0	133	6.7
Total		1,421	100	1,983	100

Source: Collection of LinkedIn alumni employment data for our 50 case campuses.
Note: In order of prestige (big three before big four) and then by size of annual profits.

finer grained lens for analyzing early job taking by recent graduates. Firms that make up the management consulting and accounting industries provide illustrative examples, as suggested by our brief discussion of Deloitte. In our sample, students from private universities went to work for 17 different management consulting firms, while public university graduates found opportunities at just five. More telling are the hiring patterns at the "big three" management consultant firms (Szczerba n.d.), the three most prestigious management consulting firms in the industry and the largest in the world by revenue: McKinsey & Company, Boston Consulting Group, and Bain & Company. For graduating seniors in the class of 2016 in our sample, McKinsey hired 245 workers from private universities and none from public universities; Boston Consulting hired 107 from private universities and none from public universities; Bain hired 118 from private universities and 13 from public universities, the last of which all came from the University of Virginia, which has a long-standing recruitment program with Bain and is considered one of the nation's most elite public universities (Bain & Company 2019). This is consistent with earlier research on how elite consulting firms recruit almost exclusively from elite universities, resulting in the exclusion of other graduating seniors (Binder et al. 2016; Ho 2009; Rivera 2012). At these firms, salaries for starting analyst positions are $71,000 to $112,000 per year (Butcher 2018).

Outside of the top three management consulting firms, the "big four" auditing and accounting firms (Deloitte, PricewaterhouseCoopers, Ernst & Young, and KPMG) are the largest of their type by revenue, globally, and were major recruiters of public university graduates in our data set. These firms bill some of their services as "management consulting" and "strategy," but they are better known for their less glamorous services of auditing and accounting. At the big four, entry-level associates have a starting salary in the range of $40,000 to $68,000, considerably less than in the private university–dominated industry of management consulting (Avadhut 2019). Table 3 provides a breakdown of early career entry into consulting and accounting firms.

Looking at hiring trends at the big three management and strategy consulting firms and the big four auditing and accounting firms, private university graduates were hired for entry positions into the big three at a rate of 36 to 1 (compared with their public counterparts), while public university graduates had a 2 to 1 edge over private university graduates at the big four firms. With so many more public university graduates than private, this means that private graduates are still overrepresented even at the big four, but public graduates enter the big four in much greater numbers than the big three management and strategy consulting firms. A χ^2 test of independence indicates a statistically significant association between type of firm (i.e., accounting vs. management consulting) and type of university attendance ($\chi^2[6, N = 3{,}404] = 736.96$, $p < .001$).

Why might this be? These industry and firm types, themselves, are symbolically distinctive. The big three are held in considerably higher esteem among consultants than are the big four (IGotAnOffer 2018). With their focus on strategy,

Table 4. The Top 10 Banks by New Hire Volume.

Bank Name	Vault 50 Rank[a]	Private *n*	Private %	Public *n*	Public %
Goldman Sachs	2	306	28.3	28	4.7
Morgan Stanley	3	209	19.3	59	9.9
J.P. Morgan Chase	8	125	11.6	98	16.4
Credit Suisse	10	46	4.3	0	0.0
Bank of America	11	159	14.7	0	0.0
Citi Bank	19	115	10.6	18	3.0
Wells Fargo	26	13	1.2	101	16.9
Capital One	Unranked	92	8.5	108	18.1
PNC	Unranked	8	0.7	108	18.1
Vanguard	Unranked	8	0.7	77	12.9
Total		1,081	100	597	100

Source: Collection of LinkedIn Alumni employment data for our 50 case campuses.
[a]The Vault Banking 50 ranking is based on prestige as determined by the perceptions of bankers.

vision, and leadership, the big three work with top executive clients, and they allow even their youngest analysts face time with those clients (McDonald 2013). In these jobs, prestige of alma mater counts (Rivera 2012). In contrast, the big four focus on accounting, with an emphasis on helping improve business processes. The big four are more willing to serve the middle layers of large corporations and smaller firms than is typical of the big three. It appears from our data that where greater prestige is at a premium in these two related industries, private university graduates get jobs in firms with higher status and higher salaries.

Banking versus Insurance. The LinkedIn data show that patterns found in the consulting industry similarly exist in the banking and financial services industries. A bank's prestige is related not only to the size of its holdings but also to whether it is associated more with investment banking than with retail banking (Ross 2018). In practice, banks have been able to perform both investment and retail services since the 1999 repeal of the Glass-Steagall Act. Nevertheless, bank prestige still favors investment banking, as evidenced in an annual ranking by bankers: the Vault Banking 50 list of top banks to work for. Table 4 shows a list of the top 10 banks, by volume of hiring, in our sample that were included in the 2016 Vault Banking 50 list and their ratio of hiring graduates from private and public universities (Vault 2019). The Vault metric considers banking employees' views of the prestige of other banks (not their own), as well as their views of how positive their bank is as a place to work, on the basis of several metrics of engagement. As shown in Table 4, the more prestigious the bank, the more likely it is to hire private university graduates. Sometimes this is to the near exclusion of public graduates, such as with Goldman Sachs, which hired 306 (or 92 percent) of the graduates in our sample from private universities. A χ^2 test of independence reveals a statistically significant association for the likelihood of entering different banks on the basis of public versus private university attendance ($\chi^2[9, N = 1{,}678] = 726.64$, $p < .001$). As the prestige ranking of a bank declines, the representation of public university graduates increases, with only J.P. Morgan Chase slightly bucking the trend. Such results echo qualitative studies on elite recruitment, such as Rivera's (2012, 2015a) studies.

However, the LinkedIn findings offer an additional observation from the finance industry, which is that insurance is almost entirely the domain of public graduates (at least among those who have LinkedIn profiles). In fact, only 12 graduates from private universities in our sample were hired by insurance firms at all, and all 12 of them were Northwestern graduates who took positions at Allstate, which has its corporate headquarters near Northwestern's Evanston campus. Meanwhile, sizable numbers of recent public graduates head to firms such as Nationwide (61), Travelers (36), Liberty Mutual (35), Aetna (26), Cigna (19), and State Farm (14). Private university students do not follow suit.

High-Tech Firms. Whereas consulting and banking careers are esoteric to many, all college graduates, whether from private or public colleges and universities, have heard of high tech, and a large number are interested in working in the industry (Clark 2014). Leaders in the sector also have loudly professed their willingness to hire employees regardless of their educational backgrounds, so long as they have the skills for the job.[4] Does the high level of interest from students, combined with the tech ideology of employment meritocracy, lead to a more equitable industry for hiring recent graduates of top public and top private universities? We answer this question using data from both our original collection from the alumni dashboard and our targeted case study analysis of Google and Amazon.

[4]For example, Thomas Friedman (2014) wrote an article about the openness of high-tech firms such as at Google.

Table 5. Top 10 Technology Firms by New Hire Volume.

Company	Private *n*	Private %	Public *n*	Public %
Google[a]	887	28.7	492	14.4
Amazon[b]	600	19.4	1,024	29.9
Microsoft	423	13.7	558	16.3
Apple	281	9.1	216	6.3
IBM	248	8.0	199	5.8
Oracle	238	7.7	423	12.4
Facebook	171	5.5	78	2.3
Intel	138	4.5	353	10.3
LinkedIn	54	1.7	33	1.0
Salesforce	51	1.6	44	1.3
Total	3,091	100	3,420	100

Source: Collection of LinkedIn alumni employment data for our 50 case campuses.
[a]Listed in order of volume of hires of private graduates.
[b]Combined number listing Amazon and Amazon Web Services.

Table 5 shows robust hiring from both private and public universities to the top 10 firms, by new hire volume, in the tech industry. However, a χ^2 test of independence reveals a statistically significant association for likelihood of entering different tech firms on the basis of public versus private university attendance ($\chi^2[9, N = 6,511] = 427.00, p < .001$). Because the ratio of private university graduates to public university graduates in our sample is 1 to 3.8, similar raw numbers indicate an overrepresentation of private university workers in the high-tech industry as a whole. What is more, our Amazon and Google case studies reveal that the job titles that private and public university graduates are offered in the computer and Internet industry may differ in ways that lead to additional elite advantage, a subject we turn to next.[5]

To conduct our case studies, we went beyond our initial data collection to manually collect the job titles posted on LinkedIn by every student from our 50 case campuses who had accepted a job at either Google or Amazon in the calendar years 2016 or 2017. There are 1,343 students in our sample who ended up in positions at Google or Amazon. This number is about half the size of the 3,003 Google and Amazon employees produced by the original alumni dashboard collection because, for this analysis, we omitted any student who did not indicate a clear job title.

As shown in Table 6, private university graduates are more likely to take jobs at Google, while public university graduates are more likely to find work at Amazon, among young workers with LinkedIn profiles. A χ^2 test of independence reveals a statistically significant association between university type and at which of the two firms graduates found work ($\chi^2[1, N = 1,343] = 81.019, p < .001$). The relevance of this pattern becomes even clearer when we look at specific job titles occupied by recent graduates at each firm.

Table 6. Amazon and Google Employees, from Private and Public Universities.

	Private *n*	Private %	Public *n*	Public %
Amazon	186	33.3	456	58.2
Google	373	66.7	328	41.8
Total	559	100	784	100

Source: On the basis of the individual LinkedIn profiles of 2016 graduates from our case campuses.

Job Title: Private University Graduates Enter More Prestigious Types of Work within Each Firm in the Amazon and Google Case Study

Of the 1,343 workers who fit our sample criteria, there are 253 distinct job titles posted on their LinkedIn pages (after merging a few because of variations or misspellings of the same job). To standardize these titles across our two firms, we matched them with the nearest occupational titles associated with 2010 census occupational codes. We were able to match these 253 job titles with 56 census occupational codes (see Appendix D), which gave us the ability to compare occupational prestige scores developed in the General Social Survey and keyed to census occupational codes (Hout, Smith, and Marsden 2014; Smith and Son 2014). We further collapsed the 56 occupational codes into 11 distinct types of work of our own devising, which are listed in Table 7. Appendix E illustrates how we broke down census occupational titles into work types.

A χ^2 test of independence reveals a statistically significant association between being a public versus private graduate and the type of work one ends up doing at Amazon and Google ($\chi^2[30, N = 1,343] = 276.536, p < .001$). Across both private and public university students, the majority of new hires into these two companies (747 of the 1,343 graduates [56 percent]) found jobs in the area of software and applications development. In this category of jobs, the absolute number of employees from public universities (413) outnumbers those who graduated from private universities (334). However, again, considering that there are 3.8 times as many public as private university graduates from the campuses in our sample, the fact that private university graduates constitute 45 percent of the software and applications development jobs means that they are overrepresented compared with their public university counterparts in the technical core of these firms.

Although these rates of technical employment are informative, it is outside of software and application development that private university students' overrepresentation in prestigious jobs titles becomes more noticeable. Private university

[5]Alphabet became the parent company of Google in late 2015. However we could not find any of our graduates who wrote "Alphabet" rather than "Google" on their profiles.

Table 7. Number of Workers at Google and Amazon, by Public and Private University, by Company, and by Type of Work.

	Google		Amazon	
Work Type	Private[a]	Public	Private	Public
Software and applications developers	236 (64%)	230 (70%)	98 (54%)	183 (41%)
Marketing and PR	47 (13%)	30 (9%)	31 (17%)	28 (6%)
Computer hardware, information, and networks	35 (9%)	15 (5%)	3 (2%)	6 (1%)
Human resources	20 (5%)	13 (4%)	10 (5%)	46 (10%)
Operations and production	7 (2%)	6 (2%)	22 (12%)	114 (26%)
Statisticians and logisticians	7 (2%)	8 (2%)	6 (3%)	13 (3%)
Legal and compliance support	5 (1%)	6 (2%)	0 (0%)	4 (1%)
Engineers	4 (1%)	4 (1%)	2 (1%)	8 (2%)
Sales and customer service	4 (1%)	12 (4%)	1 (0%)	14 (3%)
Budget and finance	3 (1%)	1 (0%)	9 (5%)	24 (5%)
Administrative support	1 (0%)	2 (1%)	1 (0%)	3 (1%)

Source: Based on the individual LinkedIn profiles of 2016 graduates from our case campuses.
Note: PR = public relations.
[a]Ranked in descending order of the types of work private university graduates do at Google.

students significantly outnumber public university students in "marketing and PR" (public relations) and in "computer hardware, information, and networks" positions. Public university graduates, on the other hand, are overrepresented in three traditionally low-status roles: warehouse and fulfillment distribution jobs in "operations and production" (81 percent), telephone-based customer service type roles under "sales and customer service" (84 percent), and secretarial and clerical work under "administrative support" jobs (71 percent), most of these at Amazon. These findings about job titles are consistent with Brint and Yoshikawa's (2017) and Wai's (2013) research on university-industry linkages, which indicates that private elite college graduates are more highly represented in industries and jobs emphasizing "symbolic" material (information, PR), compared with the more concrete and mundane tasks found in operations, production, and administrative support.

Applying occupational prestige scores to these job titles—as calculated from the General Social Survey and mapping on to census occupational codes—fleshes out this divergence. The possible range of prestige in our sample is between engineers at the top, with prestige scores of 94.42 (out of a possible 100), down to warehouse fulfillment workers at the bottom, with prestige scores of 12.92. As noted earlier, most of the recent graduates from our sample who worked at Google or Amazon, whether from private or public universities, were hired into software development positions, which carry a relatively high prestige score of 78.22. However, prestige scores by university type (private, public) diverged when it came to other types of work.

"Marketing and PR," one of the job titles overrepresented by private graduates, has an average prestige score of 77.22. The most commonly held position in this category is "brand specialist," with a prestige score of 79.2, which 23 private graduates held, compared with 13 public university alumni. In the "computer hardware, information, and networks" category, the average prestige score was 90.23. The most commonly held position in this category is "associate product manager," with a prestige score of 90.5. There were 16 private university graduates in this latter position compared with four public graduates.

In contrast, the prestige scores are lower for most job categories dominated by public university graduates. In "operations and production," in which jobs have an average prestige score of 60.3 (with the most common position listed as "area manager" at 64.8), 53 public graduates from our sample worked in this area, compared with 16 private alumni. In "human resources," (HR) in which jobs have an average prestige score of 59.8 (the most common positions are "senior HR assistant" and "recruiting coordinator," each with a prestige score of 59.5), public graduates outnumber private graduates 33 to 7.

Taken together, the mean occupational prestige score for private graduates (in all jobs outside of software development) is 74.29, a considerably higher mean score than public university graduates' 65.92. Similarly, using an alternative set of prestige scores developed by Sharkey (2014)—again, not counting software developers—private university graduates scored an average of 45.96 while public university graduates scored an average of 34.63. By these measures of occupational prestige (General Social Survey and Sharkey), when graduates from elite private universities are hired by Google and Amazon, they are more likely to be given roles associated with higher prestige and, presumably, greater pay.

Finally, as indicated above, our data suggest that private university graduates are more likely to work for Google than for Amazon, among early graduates with LinkedIn profiles. Although both are Internet companies, Amazon is a digital/retail hybrid, requiring many warehousing and distribution workers, retail-related customer support workers, and the

staffing and human resources workers needed to fill these high-turnover positions—all of which are more commonly held jobs among public university graduates (see Table 7).

Patterns in Less Dominant Industries: Overrepresentation of Public University Graduates

Having demonstrated what patterns look like in four of the six dominant industries hiring from our sample (banking and financial services, management consulting, accounting, and computer and Internet), we can also use our data set to comment on noteworthy trends in the nondominant industries in the LinkedIn sample, that is, the 24 industries that make up the rest of our sample. Although we do not go through these industries with the same precision as in earlier sections, we note that all findings reported here are statistically significant.

In the telecommunications and wireless industry, firms such as AT&T and Qualcomm hired exclusively public university students from our 2016 sample. Biotechnology and medical device firms such as Eli Lilly, Illumina, and Genentech hired 96 percent of the sample from public universities. Pharmaceutical companies such as Bayer and Pfizer hired 90 percent public university students, while manufacturing and construction firms such as John Deere and Turner Construction hired 85 percent of their 2016 employees from public universities. Automotive firms such as Ford and GM hired 84 percent of new employees from our sample from public universities. Many of these are excellent jobs in good industries, offering professional career ladders. Yet we find that these nondominant industries reveal within-industry hierarchies that speak to some of our earlier findings, though to a lesser extent than in the dominant industries because they hire fewer workers. Although we do not have the space in this article to look at these hierarchies in greater detail, for example, in the automotive industry, whereas Ford and GM employed a small percentage of workers from private universities, the more prestigious Tesla hired workers only from private universities. The less prestigious Michelin tire company and Enterprise Rent-A-Car employed workers only from public universities.

A few nondominant industries from the sample were more likely to hire graduates from private universities. Again, although we do not go into great depth here, some of these trends bolster our earlier findings about private elite graduates' gravitation toward seemingly elite segments. In the international affairs and development industry, for example, agencies such as the U.S. Department of State, the World Bank, and the International Monetary Fund hired 89 percent of their new employees from private universities. The remaining 11 percent of workers in this industry came from public universities; all of the public graduates went into the Peace Corps. Education management shows similar patterns. Public universities sent 1.4 percent of their graduates into this industry, while private universities sent a similarly small 2.3 percent of their graduates into the sector. However, 84 percent of those hired by Teach for America (TfA) in this sector came from private universities. Although not "education management" in the traditional sense, we placed TfA in this category rather than with permanent teachers for multiple reasons: no teaching credential is required, there are alternative pay and placement structures, and there are atypical continuation rates as teachers after completion of the TfA program. In more traditional education sectors, teaching positions in grade schools and high schools were filled largely by graduates of public universities, a robust 88 percent. Perhaps not surprisingly, students from top private universities who choose to go into education rarely enter career pathways to become permanent teachers; they either sign up with TfA—and more than 80 percent leave their positions within three years (Kavanagh and Dunn 2013)—or take other jobs in a separate education management sector.

Public university graduates in our sample overwhelmingly filled the retail-oriented industry jobs reported in the LinkedIn data set. Of the 774 employees working for companies such as Walgreen's, Starbucks, and Home Depot, 97 percent graduated from public universities. Of the 185 employees in consumer goods, such as Coca-Cola and Black & Decker, 81 percent were from public universities. Government administration (local, state, and federal) is more equitable, drawing 59 percent of recent graduates from public universities and 41 percent from private universities. However, of these numbers, the Centers for Disease Control and Prevention (CDC) claimed more than half of all of the private university early career workers in government administration, and all graduated from Emory, which physically neighbors the center. Removing the CDC from the sample, we found that 73 percent of those in the government administration industry graduated from public universities; these workers took jobs in city and county governments, the U.S. Food and Drug Administration, the U.S. Census Bureau, state legislatures, and staff positions in the U.S. House of Representatives. Notably, only students from private universities in our sample—11 employees—obtained positions working in the U.S. Senate, which is arguably a more prestigious governmental destination.

Conclusion

Our examination of LinkedIn data, although an imperfect data source, suggests that students from top private universities and top public universities have different pathways into the labor market in terms of the industries and firms they enter and even their job title placements within the same firms. Notably, the highest paying of the top industries—banking and financial services, management consulting, and computers and Internet—have an overrepresentation of private elite graduates. Our findings reinforce Gaddis's (2015) audit study of a wide range of employers, as well as qualitative work studying elite employers (Binder et al. 2016; Ho 2009; Rivera 2015a), which shows that top private graduates

are more attractive to employers compared with other applicants. Even among those applying to work for tech companies, an area often celebrated for greater meritocratic norms in hiring, private university graduates are overrepresented in engineering and software development roles, as well as in marketing and PR. Meanwhile, public university graduates do find engineering positions, but they also take many more jobs in less compensated and less prestigious positions in the warehouse, customer service, and administrative support. The sectors into which private elite graduates are hired more frequently are also higher paid, lending support to studies about the persistence of wage gaps over time (Brand and Halaby 2006; Witteveen and Attewell 2017). This set of unequal outcomes would not be so troubling if the nation's private elite universities were not dominated by affluent families (Chetty et al. 2017). But because they are, we suspect a doubling down on economic and social advantage. What is more, graduates of elite institutions are then able to pass along their advantages to their children, via "legacy" admissions to their alma mater (Karabel 2005; Stevens 2009).

Our findings echo the literature on EMI, and the power of thresholds of consequence. They suggest that graduates of the most elite public research universities, with SAT scores only about 10 percent below their elite private university counterparts, are highly underrepresented in certain high-wealth and high-status industries. Although there are limitations to what we can know from our data set in terms of students' selection into LinkedIn itself, as well as their characteristics such as grade point average and family background, we suspect that students who attend private universities cross a threshold of consequence in the minds of employers, particularly so in cultural industries, as Brint and Yoshikawa (2017) pointed out. As prior research has shown, hiring managers at top firms often overlook merit-based differences in applicants (e.g., competence, intelligence, or any technical skill) to simply go for the prospective employees about whom they feel "excitement" (Rivera 2015a), a feeling more often exhibited toward private university graduates.

The early gains in the labor market for private graduates are significant when viewed one unit of analysis at a time. But with our data, we see evidence that advantages stack on top of each other at the industry, firm, and job-title levels. Researchers who look only at a single variable in complex moments of life transition may miss the bigger picture of how inequalities within the higher education and labor sectors are produced for private and public graduates. Several gains, when multiplied, can produce large gaps. Manzoni and Streib (2019) argued that rather than focusing on changing where students attend college and what they major in, we should help direct students toward the highest paying industries and firms. Although this may not be incorrect, we show that much will need to be done to dampen the signaling power of consequential thresholds.

Future research would be useful for determining if this gap widens as private graduates move into midcareer on higher tracks, or if it shrinks, as students move farther away in time from the influence of their prestigious alma maters, as Brint and Yoshikawa (2017) suggested. Future scholars might also ask if these advantages (and disadvantages) work in similar ways for men and women, lower and upper income students, first-generation and multiple-generation students, and students who are members of historically underrepresented racial and ethnic groups (see Dale and Krueger 2014; Ge et al. 2018). Finally, although outside the scope of this study, future researchers could also compare how majors influence the career opportunities of graduates from top public universities compared with top private institutions. Perhaps private elite students do a better job of aligning their majors with prestigious industries than do top public university students. Although deserving closer examination, qualitative research in this area suggests that choice of major matters little for graduates of elite private universities entering certain industries, with the prestige of their institution overshadowing whatever they happened to major in (Binder et al. 2016; Rivera 2015b; Roose 2014). LinkedIn and other data sources, despite their challenges, present new ways for investigating these questions.

Appendix A. Institutional Data, by University.

	Undergraduates	Graduation Rate	Degrees Awarded	Acceptance Rate	75th Percentile SAT Reading	75th Percentile SAT Math	Salary 10 Years After Enrollment ($)
Public campus							
Georgia Institute of Technology	14,463	83	3,607	25.7	730	770	75,800
University of California, Berkeley	27,496	91	7,906	16.9	750	790	61,800
University of Maryland, College Park	26,889	86	7,308	48.1	690	730	61,700
University of Virginia	15,788	94	4,015	29.8	720	740	60,700
University of Michigan	28,120	90	7,059	28.6	730	770	60,100
University of California, Los Angeles	29,581	91	8,471	17.9	710	760	58,700
University of California, San Diego	26,584	87	7,207	35.7	680	770	58,600
University of Illinois Urbana-Champaign	32,170	85	8,096	60.0	690	790	57,600
University of California, Davis	28,239	84	7,855	42.2	630	700	56,300
University of Connecticut	18,451	82	5,530	48.8	650	690	55,800
College of William & Mary	6,260	90	1,591	36.5	730	740	55,400
University of California, Irvine	25,245	87	7,148	40.6	620	710	55,100
University of Texas at Austin	39,057	80	10,105	40.3	680	730	54,900
University of Washington	30,022	84	7,738	45.3	660	710	54,800
University of Wisconsin–Madison	29,579	84	6,922	52.6	660	760	54,200
University of North Carolina at Chapel Hill	17,951	90	4,557	26.9	700	720	54,100
University of Florida	32,376	87	8,267	45.9	680	690	53,100
University of California, Santa Barbara	20,606	81	5,373	35.7	660	730	52,500
Clemson University	17,740	82	4,166	50.5	660	680	50,900
University of Pittsburgh	18,655	82	4,527	55.4	680	700	50,700
University of Minnesota Twin Cities	30,511	78	7,807	44.4	700	750	49,800
Pennsylvania State University	40,179	86	11,174	56.4	630	670	48,500
University of Georgia	27,335	85	7,128	53.9	670	670	48,500
The Ohio State University	44,131	83	10,840	54.1	670	740	43,700
Purdue University	15,091	47	7,045	55.9	630	690	38,300
Sum	642,519	NA	171,442	NA	NA	NA	1,371,600
Average	25,701	84	6,858	41.9	680	728	54,864

(continued)

Appendix A. (continued)

	Undergraduates	Graduation Rate	Degrees Awarded	Acceptance Rate	75th Percentile SAT Reading	75th Percentile SAT Math	Salary 10 Years After Enrollment ($)
Private campus							
Massachusetts Institute of Technology	4,474	92	1121	7.9	790	800	94,200
Harvard University	7,333	98	1767	5.4	800	800	90,900
Georgetown University	7,168	94	1801	16.8	760	760	90,100
Stanford University	6,994	94	1669	4.8	780	800	85,700
Yale University	5,528	96	1359	6.3	800	800	83,200
University of Pennsylvania	10,666	95	2910	9.4	770	800	82,400
Carnegie Mellon University	5,964	88	1351	21.7	750	800	81,800
Princeton University	5,260	97	1280	6.5	790	800	80,500
Columbia University	8,102	95	2015	6.8	790	800	78,200
Duke University	6,501	95	1879	10.8	770	800	77,900
California Institute of Technology	1,001	91	254	8.1	800	800	74,200
Cornell University	14,226	93	3634	14.1	750	780	73,600
University of Notre Dame	8,425	96	2146	18.7	760	780	71,600
University of Southern California	18,519	92	5080	16.6	730	770	70,400
Dartmouth College	4,214	95	1069	10.6	780	780	70,000
Johns Hopkins University	5,862	93	1498	12.8	770	800	69,800
Tufts University	5,236	93	1361	14.3	750	770	66,500
Washington University in St. Louis	7,032	94	1727	16.5	770	800	66,300
Northwestern University	8,576	93	2326	10.6	760	800	65,900
University of Chicago	5,869	92	1397	7.9	800	800	65,500
Vanderbilt University	6,857	92	1716	10.7	790	800	64,500
Rice University	3,879	92	1008	15.3	770	800	64,300
Brown University	6,320	96	1561	9.3	780	790	63,100
Emory University	6,770	89	1931	25.3	730	770	61,500
Wake Forest University[b]	4,866	88	1137	30.3	690	720	60,200
Sum	175,642	NA	44,997	NA	NA	NA	1,852,300
Average	7,026	93	1,800	12.7	769	789	74,092

Source: National Center for Educational Statistics 2016 institutional-level data; earnings data from the College Scorecard.
Note: NA = not available.
[a]Campuses in order of salary 10 years after enrollment.
[b]Wake Forest SAT scores were not reported in National Center for Educational Statistics data and were retrieved from http://www.prepscholar.com/sat/s/colleges/Wake-Forest-SAT-scores-GPA.

Appendix B

Data-Gathering Strategy for the Amazon and Google Case Studies

To view the individual profiles of LinkedIn users working at Amazon and Google, we spent several weeks requesting more than 3,000 users who work at these two firms to accept our LinkedIn "connection." LinkedIn allows users to see the profiles of not only their direct connections but also the connections of connections up to two degrees of separation. More than 1,000 Amazon and Google workers from our case campuses accepted our connection, allowing us to see virtually every Amazon and Google worker's profile from our 50 case campuses who graduated in 2016: 1,343 graduates in all.

We examined the pages of only those who had graduated with their bachelor's degrees in 2016 and subsequently took jobs at Amazon or Google in the calendar year 2016 or 2017. We discarded the rest. We gathered job titles and then matched those titles with census occupational codes. There were a total of 253 distinct job titles in the LinkedIn pages, which we matched to 56 census occupational codes (see Appendix D for a breakdown). We then further collapsed those 56 codes into 11 distinct types of work (see Appendix E for a breakdown). This allowed us to have a standardized way to compare the types of work done at these two companies by graduates of private versus public universities.

Appendix C

Amazon and Google Job Titles, by Census Occupational Codes and Titles

20. General and Operations Managers
- Area manager
- Business manager
- Program manager
- Shift manager
- Supply chain manager

40. Advertising and Promotions Managers
- Marketing manager
- Media manager

50. Marketing and Sales Managers
- Associate product marketing manager
- Content marketing manager
- Digital marketing manager
- Digital strategy lead
- Product manager
- Project marketing manager
- Strategic account manager
- Strategic partner manager

60. Public Relations and Fundraising Managers
- Community manager

110. Computer and Information Systems Managers
- Associate team lead
- GIS operations lead
- IT team leader
- Partner technology manager

140. Industrial Production Managers
- Group manager
- Junior interstock manager
- Manager I
- Manager II
- Quality area manager
- Senior product manager

150. Purchasing Managers
- Associate vendor manager
- Authorization for expenditure manager
- Vendor manager

160. Transportation, Storage, and Distribution Managers
- Delivery station liaison
- Inbound area manager

310. Food Service Managers
- Instock manager at Amazon Fresh

520. Wholesale and retail buyers, except farm products
- Junior sales coordinator
- Strategic vendor specialist

540. Claims Adjusters, Appraisers, Examiners, and Investigators
- Compensation operations coordinator

565. Compliance Officers
- Interim quality assurance advisor
- Payments compliance

630. Human Resource Workers
- Administrative business partner
- Associate lead
- Associate staffing channels specialist
- Associate, executive recruiting
- Connections advisor
- Diversity specialist
- Engagement coordinator
- Engineering sourcer
- Hardware staffing program manager and strategy specialist
- Hiring event coordinator
- HR business partner
- Lead recruiting coordinator
- Machine learning recruiting specialist
- Online candidate specialist
- People analyst
- People operations coordinator

- Recruiter
- Recruiting coordinator
- Sourcer
- Sourcing recruiter
- Sr. human resources assistant
- Staffing operations analyst
- Staffing operations specialist
- Staffing services associate
- Staffing services associate recruiter
- Talent supply chain engagement senior coordinator
- Tech staffing strategy and ops
- Technical recruiter

650. Training and Development Specialists

- Learning coordinator
- Team lead and training developer

700. Logisticians

- Analyst
- Business development analyst
- Business intelligence analyst
- Business intelligence engineer
- Business operations associate
- Category analyst
- Data analyst
- Data scientist
- Embedded site merchandiser
- Escalations program specialist
- Logistics specialist
- New business strategist
- Operations engineer
- Project engineer
- Quality assurance data analyst
- Researcher
- Senior data analyst
- Senior data associate
- Strategist
- Strategy and insights associate
- Strategy and operations analyst
- Transportation analyst

725. Meeting, Convention, and Event Planners

- Event coordinator
- Marketing event specialist
- Marketing events coordinator
- Program coordinator

735. Market Research Analysts and Marketing Specialists

- Account strategist
- Ads quality evaluator
- Ads vertical manager
- Adwords account strategist
- Associate account strategist
- Brand specialist
- Campus ambassador
- Catalog specialist
- Concept and design intern
- Content review coordinator
- Creative technologist creative lab associate
- Customer solutions engineer
- Marketing coordinator
- Marketing specialist
- Marketing strategy
- Online marketing coordinator
- Product marketing
- Social media and content specialist
- Trends curator

820. Budget Analysts

- Financial associate
- Financial intern

840. Financial Analysts

- Associate financial analyst
- Corporate finance analyst
- Finance rotation program analyst
- Financial analyst
- Financial analyst II
- Operations finance analyst

1005. Computer and Information Research Scientists

- AI resident
- Lead narrative designer
- Machine learning scientist
- Machine perception

1006. Computer Systems Analysts

- Associate product management intern
- Associate product manager
- Investigations specialist
- Product associate
- Product design engineer
- Product technology manager
- Technical solutions consultant
- Technical staff

1020. Software Developers, Applications and Systems Software

- Application developer
- Designer
- Digital and device content developer
- DoubleClick ad platforms engineer
- Front end software engineer
- Knowledge engineer
- Search rank engineer
- Software development engineer
- Software development engineer II
- Software development engineer III
- Software development engineer intern
- Software engineer and product specialist
- Software quality operations associate

- User experience design intern
- User experience designer
- User experience research assistant
- User experience research participant coordinator
- User experience researcher
- User research coordinator
- UX designer
- UX research assistant III
- UX research coordinator
- UX research moderator
- UX research operations

1030. Web Developers
- Interaction designer

1050. Computer Support Specialists
- IT resident
- Platform innovator
- Visual data specialist

1105. Network and Computer Systems Administrators
- Technical infrastructure lead

1106. Computer Network Architects
- Network operations
- Network operations residency program

1200. Actuaries
- Agency account strategist

1220. Operations Research Analysts
- Industry insights research coordinator
- Research assistant
- Research intern
- Research resident
- Student researcher
- Summer undergraduate research fellow

1241. Statisticians
- Quantitative analyst

1290. Miscellaneous Mathematical Science Occupations
- Test associate III

1320. Aerospace Engineers
- Aerospace systems engineer

1360. Civil Engineers
- Structures test engineer

1400. Computer Hardware Engineers
- Anti-abuse engineer
- Cloud support engineer
- Developer platform engineer
- Developer programs engineer III
- Full-stack engineer
- Hardware development engineer
- Hardware engineer

1410. Electrical and Electronics Engineers
- Controls engineer
- Engineer
- Engineering resident
- Research software engineer
- Site reliability engineer intern

1430. Industrial Engineers, Including Health and Safety
- Capacity planning analyst
- Environment, health, & safety specialist

1460. Mechanical Engineers
- Mechanical engineering
- Mechanical product engineer

1530. Engineers, All Other
- Site reliability engineer
- Support engineer
- Visual search engineer
- Voice user interface designer

1550. Engineering Technicians, Except Drafters
- Bilingual engineer
- Innovation and design engineer
- Innovation and design engineer II

1860. Miscellaneous Social Scientists and Related Workers
- Junior linguist
- Linguist
- Metrics and evaluation analyst

2025. Miscellaneous Community and Social Service Specialists, Including Health Educators and Community Health Workers
- Community leaders program

2145. Paralegals and Legal Assistants
- Legal assistant
- Legal associate
- Legal investigations associate
- Legal online operations
- Legal scholar
- Legal specialist

2160. Miscellaneous Legal Support Workers
- Policy fellow
- Risk investigator

2630. Designers
- Fashion specialist

2825. Public Relations Specialists
- Artist relations and original content

2840. Technical Writers
- Technical writer

2860. Miscellaneous Media and Communication Workers
- Game producer
- Verifier
- Visual designer

3540. Other Healthcare Practitioners and Technical Occupations
- Onsite medical representative

4710. First-Line Supervisors of Non-retail Sales Workers
- Account executive
- Account manager

4840. Sales Representatives, Services, All Other
- Ambassador
- Associate
- Inbound demand generation representative
- Merchant and seller support associate
- Online sales representative
- Retail brand specialist
- Sales development representative
- Sales operation analyst
- Sales operation coordinator
- Sales operation specialist
- Seller support specialist

5240. Customer Service Representatives
- Customer experience consultant
- Customer service representative III
- Expertise customer development representative
- Global customer care
- Prime now associate
- Quality assurance engineer
- Support specialist

5350. Order Clerks
- Shipping clerk

5610. Shipping, Receiving, and Traffic Clerks
- Operations
- Process assistant
- Warehouse associate

5700. Secretaries and Administrative Assistants
- Administrative assistant
- General manager's administrative assistant

7700. First-Line Supervisors of Production and Operating Workers
- Lead fulfilment associate
- Operations area manager
- Operations area manager II
- Operations lead
- Operations leadership intern
- Operations manager
- Operations team leader
- Outbound area manager
- Outbound manager I

8950. Helpers, Production Workers
- Supplier support specialist

9640. Packers and Packagers
- Fulfillment associate

Appendix D

Census Occupational Code Job Titles within Types of Work

Administrative Support
5700. Secretaries and administrative assistants
3540. Other healthcare practitioners and technical occupations

Budget and Finance
1200. Actuaries
820. Budget analysts
540. Claims adjusters, appraisers, examiners, and investigators
840. Financial analysts
150. Purchasing managers
520. Wholesale and retail buyers, except farm products

Computer Hardware, Information, and Networks
1005. Computer and information research scientists
110. Computer and information systems managers
1400. Computer hardware engineers
1106. Computer network architects
1006. Computer systems analysts
1105. Network and computer systems administrators
1050. Computer support specialists
1030. Web developers

Engineers
1320. Aerospace engineers
1530. Engineers, all other
1410. Electrical and electronics engineers
1430. Industrial engineers, including health and safety
1460. Mechanical engineers
1360. Civil engineers
1550. Engineering technicians, except drafters

Human Resources
630. Human resource workers
650. Training and development specialists

Legal and Compliance Support
2145. Paralegals and legal assistants
565. Compliance officers
2160. Miscellaneous legal support workers

Marketing and PR
40. Advertising and promotions managers
60. Public relations and fundraising managers
2825. Public relations specialists
735. Market research analysts and marketing specialists
50. Marketing and sales managers
725. Meeting, convention, and event planners
2860. Miscellaneous media and communication workers
2025. Miscellaneous community and social service specialists, including health educators and community health workers
1860. Miscellaneous social scientists and related workers
2630. Designers

Operations and Production
310. Food service managers
20. General and operations managers
8950. Helpers, production workers
1220. Operations research analysts
9640. Packers and packagers, hand
5350. Order clerks
7700. First-line supervisors of production and operating workers
140. Industrial production managers
5610. Shipping, receiving, and traffic clerks
160. Transportation, storage, and distribution managers

Sales and Customer Service
5240. Customer service representatives
4710. First-line supervisors of non-retail sales workers
4840. Sales representatives, services, all other

Software and Applications Developers
1020. Software developers, applications and systems software

Statisticians and Logisticians
1290. Miscellaneous mathematical science occupations
700. Logisticians
1241. Statisticians
2840. Technical writers

Appendix E. Merged LinkedIn Industry Categories.

LinkedIn Industry Categories	Merged Categories
• Accounting	Accounting
• Airlines/aviation	Airlines and aerospace
• Aviation and aerospace	
• Defense and space	
• Automotive	Automotive
• Banking	Banking and financial services
• Investment banking	
• Venture capital and private equity	
• Financial services	
• Biotechnology	Biotech and medical devices
• Medical devices	
• Broadcast media	Broadcast media and newspapers
• Newspapers	
• Computer software	Computer and Internet
• Computer hardware	
• Computer electronics	
• Semiconductors	
• Computer networking	
• Internet	
• Consumer goods	Consumer goods
• Wine and spirits	
• Food and beverages	
• Apparel and fashion	
• Education management	Education management
• Libraries	
• Event services	Events, facilities, and staffing
• Staffing and recruiting	
• Recreational facilities and services	
• Museums and institutions	
• Health, wellness, and fitness	

(continued)

Appendix E. (continued)

LinkedIn Industry Categories	Merged Categories
• Government administration	Government administration
• Legislative office	
• Law school	Graduate school
• Medical school	
• Hospital and healthcare	Hospital and healthcare
• Individual and family services	
• Mental health care	
• Mechanical or industrial engineering	Industrial engineering and operations
• Chemicals	
• Logistics and supply chain	
• Packaging and containers	
• Information technology services	Information technology and services
• Information services	
• Computer network and security	
• Insurance	Insurance and real estate
• Real estate	
• International affairs	International affairs and development
• International trade and development	
• Management consulting	Management consulting
• Professional training and coaching	
• Paper and forest products	Manufacturing and construction
• Transportation/trucking/railroad	
• Construction	
• Machinery	
• Marketing and advertising	Marketing and advertising
• Media production	
• Military	Military and rescue
• Public safety	
• Law enforcement	
• Nonprofit organization management	Nonprofit organization management
• Oil and energy	Oil, energy, and utilities
• Utilities	
• Pharmaceuticals	Pharmaceuticals
• Primary and secondary education	Primary and secondary education
• Research	Research
• Farming (Monsanto only)	
• Hospitality	Resorts and hotels
• Gambling and casinos	
• Retail	Retail
• Wholesale	
• Supermarkets	
• Telecommunications	Telecommunications and wireless
• Wireless	
• Think tanks	Think tanks

Source: LinkedIn generated industry titles for firms in our sample.

Acknowledgments

We would like to thank the Kauffman Foundation for generous funding. We would also like to thank April Sutton, Edward Hunter, Kevin Beck, and our reviewer and editors for valuable comments on earlier drafts. Additional thanks to Carey Blakely for editing support and to Marialexia Zaragoza, Ian Barrett, and Rachel Davis for data collection support.

ORCID iD

Daniel Davis https://orcid.org/0000-0001-6915-0523

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Author Biographies

Daniel Davis is a postdoctoral scholar at the University of California, San Diego, Extension and is on the sociology faculty at San Diego State University. He is a cultural sociologist by training and uses mixed methods to study organizations, work, regional economies, higher education, and startups and the many links, opportunities, and inequalities among them. His 2017 book *Contingent Academic Labor: Evaluating Conditions to Improve Student Outcomes* maps out some of the causes and challenges of an overreliance on adjunct faculty members and offers solutions to improve those conditions. His article "Selling Students" examines the transformation of university career services on the basis of the emergence of corporate partnership programs, whereby select firms can pay fees for direct access to student talent.

Amy Binder is a professor of sociology at the University of California, San Diego. Studying higher education from a cultural, political, and organizational perspective, she focuses on how students are deeply influenced by the universities they attend. Her 2013 book *Becoming Right: How Campuses Shape Young Conservatives* is a comparative case study of right-leaning college students at two universities. Her 2016 coauthored article "Career Funneling" answers the question of why so many Harvard and Stanford students flock to first jobs in a narrow band of occupations: finance, technology, and consulting. She recently completed a multipart series of articles studying elite students' transitions to the labor market and currently is at work on a new book about campus politics.