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Alternative and Independent: The Universe of Technology-Related "Bootcamps"

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The first three authors contributed equally to this work; names have been alphabetized.

Abstract

In recent years, nontraditional workforce training programs have proliferated inside and outside of traditional postsecondary institutions. A subset of these programs, bootcamps, advertise high job placement rates and have been hailed by policymakers as key to training skilled workers. However, few formal data exist on the number, types, prices, location, or other descriptive details of program offerings. We fill this void by studying the universe of bootcamp programs offered as of June 30, 2017. In this report, we discuss the attributes of the 1,010 technology-related programs offered in the United States, Canada, and online. We find more diversity among bootcamp providers and programs than would be expected from public discourse. This primarily relates to the mode of delivery (online vs. in person), intensity (part time/full time), cost, and program types. Based on the data we collected, we present a classification structure for bootcamps focused on five distinct program types.

Introduction

Policymakers, business leaders, the public, and the US government often echo the following refrain: the American workforce lacks workers with technical skills to fill the needs of employers as the country's jobs become less physically and more technologically demanding. Preparing a 21st-century workforce is a significant agenda item for policymakers and educators—one that has received considerable attention.[1] However, traditional postsecondary institutions are not well-equipped to fill these vocational needs; they are typically unable to rapidly respond to employers' quickly changing skill and credential requirements, and their programs are cost- and/or time-prohibitive for many students. This tension has fueled the emergence of "disruptive" nontraditional education models such as massive open online courses (MOOCs) and bootcamps/coding academies.

Bootcamps have differentiated themselves through short, intensive, in-person programs boasting both high placement rates and high beginning salaries (Lohr, 2015). According to popular media and industry players, the bootcamp industry has grown rapidly in the number and types of programs offered since it started in 2012 (Eggleston, 2017). However, despite the impact this emerging industry has made on higher education over the past 6 years, the size and scope of the sector and its impact remain unclear. Until now, the only data on these programs and outcomes of attendees have come from industry-affiliated groups.

Further limiting efforts to track their growth and effectiveness, bootcamps are unaccredited and therefore are not subject to the same governmental regulations or oversight as other postsecondary institutions—nor are they eligible for monetary support. Yet, uncharacteristically, two recent federal initiatives have paved the way for federal aid to support students enrolled in bootcamp programs (McKenzie, 2017; US Department of Education, 2016). These funding mechanisms are being explored despite a dearth of objective data on the programs and only speculative debate on their efficacy (McBride, 2016; Watters, 2012a).

In this report, we focus on technology-related bootcamp programs. Our data collection and analyses serve as the first comprehensive look at this new educational sector. We assess the media/popular perception of bootcamps and whether this depiction matches the reality of what is happening in this sector. Our data collection examined the following aspects of bootcamps: number, types, and subject areas of bootcamps; who provides bootcamp programs; type of instructional delivery (in-person/online) and intensity; cost of programs and availability of financial aid; admissions processes; formal networks of bootcamp providers; and location of programs.

The simplicity of our questions speaks to the almost complete lack of data and research on bootcamp programs. By establishing a descriptive baseline of the landscape of bootcamp programs, this report lays the foundation for further rigorous independent research to accurately represent the entire sector. With the size and scope of the universe having been established, future research can delve into additional characteristics and outcomes, both at the institution or program level as well as at the student level. This further research, which would build on the frame we have established, could help policymakers, students, and educational providers assess program efficacy, affordability, and impact on evolving labor markets.

Background and Literature Review

We anchor our study within a larger, though relatively scant, body of academic work on nontraditional higher education offerings by discussing prior research on related topics to learn about motivations and challenges facing bootcamps and assess previous efforts to collect data on bootcamps. First, we summarize the history of bootcamps, based primarily on media reports. Next, we examine research on accreditation to consider the implications of bootcamps' nonaccredited status. Finally, we discuss other types of alternative credential programs to which bootcamps may be similar.

[1] See, for example, statements from the current and previous presidential administrations for context of the push for improved early career job skills and training: (White House, 2016; Executive Order No. 13801 of Jun 15, 2017).

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History and Evolution of Bootcamps

As noted previously, bootcamps have not been rigorously studied. Thus, we rely on media coverage to establish the history and evolution of this educational model. Most reports reflect some combination of popular perception and data from industry organizations focused on recruiting new students. As such, we recognize the limitations inherent in relying on the media to establish this history; the media's portrayal does not always reflect reality. In fact, that very concern motivated this work and was borne out in our results. Hence, we present this history with a cautionary note—there is likely more to the evolution of bootcamps than we present here.

In the late 2000s, providers of free, open-access courses designed to help eager students learn to code exploded onto the educational scene. By 2012, a plethora of these courses (of varying quality) were available to the public. But as Watters (2012a) noted, one start-up, among many offering these free resources, changed course in a surprising way in 2012. Turning away from the free, online content they had been producing, Bloc began offering an 8-week online developer "bootcamp" that cost $3,000, with the rationale that by charging money, the program could personalize learning. This pivot, from a free resource to an intensive, costly learning program, marked a shift in the industry, as other organizations made similar changes. Since then, the bootcamp model has proliferated as an educational option (Watters, 2012b).

Initial media coverage conveyed a sense of awe at this "disruptive" innovation and its potential to shake up traditional higher education and the workforce (Andrews, 2013; Oliver, 2012; Watters, 2012a) and fill a sizeable skills gap (Rothwell, 2012; Watters, 2012b). As employers and policymakers encouraged students to enter technology fields, bootcamps became an attractive option. This new model purported to prepare new labor market entrants quickly and effectively to fill well-paying jobs in fields with tremendous demand. In 2015, the White House estimated that there were 5 million unfilled jobs in the United States, with 500,000 of those in "high-technology areas like software development, network administration and computer security" (Baker, 2015). Employers' needs for these skills is likely to intensify; the Bureau of Labor Statistics projects a 13.1 percent increase in jobs in "Computer and Mathematical" occupations between 2014 and 2024 (compared with a 6.5 percent increase in all jobs) (Bureau of Labor Statistics, 2017). Nearly half (42 percent) of employers had little confidence in traditional colleges and universities to train students with the skills needed for jobs in their industry (Hart Research Associates, 2015). Bootcamps, perhaps, could fill these needs.

Media coverage on bootcamps has been particularly focused on their potential to change the demographics of the tech industry's talent pool. The tech industry has well-documented gender and racial imbalances, and bootcamps could diversify educational pathways into the sector: approximately 18 percent of technology jobs and traditional computer science bachelor's degrees are held by women, whereas 35 percent of students at bootcamps are women (Lohr, 2015). Racial disparities persist, however: just 1 percent of graduates from coding bootcamps are black, reflecting a similar proportion of black employees at major tech companies like Facebook and Google (Kessler, 2015). Some bootcamps, such as Telegraph Academy (of which 85 percent of students are underrepresented people of color) and Black Girls Code, actively recruit and train students of color to try to change the supply-side demographics.

Bootcamps could also play a role in increasing access to technology jobs. Although the media noted the high cost of bootcamp programs, the prices were typically mentioned as part of a theoretical cost-benefit analysis (Korn & Weber, 2014; Truong, 2013; Watters, 2012a). Were students getting a bargain by substituting bootcamp programs for costly 4-year computer science degrees that may not have led to well-paying jobs in technology fields? Or were bootcamps taking advantage of students looking for a faster way to get a good job?

Since early media enthusiasm has mellowed, coverage has included more skepticism about bootcamps' educational models and unaccredited status.

Articles have questioned their job placement rates, efficacy, quality, and ability to self-regulate (Craig, 2014; Truong, 2013). *The Wall Street Journal* (Korn & Weber, 2014) reported a bootcamp backlash: employers who had hired some bootcamp graduates described their skills as inadequate. From these employers' view, high-intensity, short-duration courses were not sufficient for students to learn the fundamentals and specifics of programming from scratch.

Over time, the media presented a more nuanced view of traditional computer science bachelor's degree programs and bootcamp programs. Whereas bootcamps generally focused on practical skills, bachelor's degree programs offered a more comprehensive education that included computer science theory. Students coming out of traditional programs often required some "hand-holding" to get up to speed (Lewin, 2014; Lohr, 2015). Graduates of bootcamps had practical skills but little grounding in computer science fundamentals, limiting their value as employees (McBride, 2016; Nichols, 2015). Regardless, high-quality bootcamps were filling a need that traditional education had not (Lewin, 2014).

Recognizing the ways in which bootcamps were potentially filling skills gaps and the growing influence of this alternative educational approach, the federal government introduced new policies related to the bootcamp industry in 2015. First, the White House launched TechHire, an initiative focused on regions with more than 120,000 open technology jobs, to match students in those areas with training programs to fill job openings; a handful of coding bootcamps were identified as partners in this effort (The White House, 2015). Both the Post-9/11 and "Forever" G.I. Bills allow veterans to use their educational benefits at certain alternative education providers, including bootcamps (McKenzie, 2017). Also in 2015, the US Department of Education began the Educational Quality through Innovation Partnerships initiative, an experiment that offers federal funding to students enrolled in programs offered by nontraditional education providers—four of which were bootcamps—that partnered with traditional (Title-IV eligible) postsecondary institutions (US Department of Education, 2015, 2016). The initiative included a partnership between The Flatiron School and State University of New York (SUNY) Empire State College to offer a web development certificate program, with coursework provided by SUNY Empire State College and The Flatiron School (US Department of Education, 2016). The partnership allows The Flatiron School access to Empire State College's accreditation and bootcamp students access to federal financial aid, and provides Empire State College students access to a bootcamp as either a certificate or as part of their associate's or bachelor's degree coursework (SUNY Empire State College, 2016).

These initiatives were met with resistance from those concerned about introducing federal funding into an unregulated market, pointing to for-profit colleges that had left students in debt and poorly prepared for quality jobs (Schmidt, 2015; Shireman, 2015). Critics argued that without accountability and oversight or transparent and reliable data on student outcomes, monitoring quality would be difficult, creating opportunities for scandal (Kirkham, 2015; Smith, 2015).

In the past few years, as bootcamps have worked to establish their legitimacy and effectiveness to appeal to traditional postsecondary institutions and policymakers, the industry continues to experience rapid changes. Several well-known bootcamps closed abruptly in the summer of 2017, leaving experts to ponder the industry's future.[2] Traditional universities are beginning to compete directly with bootcamps; some have launched bootcamp programs of their own, whereas others have changed their 4-year computer science degree curriculum to more directly address the skills gaps bootcamps seek to fill. While overall growth in the bootcamp sector continues (Eggleston, 2017), future growth and potential public policy changes in this sector are unclear.

[2] Notably, two of the more recognizable bootcamps, Dev Bootcamp and IronYard, announced their closures 2 weeks after the end of data collection. Since then, focus in the popular media has turned to predicting whether these closures are an anomaly or signal a significant shift (most likely, consolidation) in the market (Young, 2017).

Accreditation

The accreditation of postsecondary institutions is designed to ensure that students receive a high-quality education, based on a rigorous set of standards. In addition, accreditation serves as a mechanism for institutions to gain access to federal funding. One of the hallmarks of bootcamps is that they, unlike nearly all other higher education institutions, eschew accreditation. In a review of the accreditation process in postsecondary education, Alstete (2004) wrote that "accreditation is required for recognition by governmental agencies, demanded by students, parents, and the community, and changing and evolving into an increasingly comprehensive system of self-renewal for institutions." However, although accreditation is often considered to be synonymous with quality assurance, there is some debate over its effectiveness. The American Council of Trustees and Alumni (2007) asserts that "accreditation does nothing to ensure educational quality" (p. 5), noting growing concerns about college quality and graduates' lack of employer-desired skills.

Accreditation is a voluntary process but opting out carries significant consequences for both institutions and students. Most notably, nonaccredited institutions have traditionally been ineligible for federal funding, including federal institutional grants and student federal financial aid (Alstete, 2004). By opting not to pursue accreditation, however, bootcamps free up resources (both in terms of money and labor hours) and maintain control over many aspects of the educational model, from data collection and reporting to program length requirements, which allows them more flexibility to meet current workforce and student learning needs. Recent federal initiatives loosening regulations that prohibit financial aid for students of nonaccredited institutions may make accreditation obsolete for alternative providers, and may foretell a significant shift in higher education's funding structure as these nontraditional providers continue to gain traction.

As bootcamps take seriously the need to publish externally audited outcomes data and address concerns about quality and transparency, new initiatives seeking to standardize outcomes reporting have emerged from within the bootcamp industry. The Council on Integrity in Results Reporting (CIRR), a nonprofit organization representing a coalition of bootcamps that have committed to a clear, standardized approach to collecting and reporting student academic and employment outcome data for their students, formed in 2017 (Fain, 2015a; CIRR, 2017).[3] Separately, a 25-member task force has drafted its own set of quality assurance standards and completed a public comment phase (Wan, 2017).

Bootcamps are also following regulatory processes in states that require them, including California where the California Bureau for Private Postsecondary Education approves providers based on "integrity, financial stability, and educational quality, including…appropriate assessment of students' achievement prior to, during, and at the end of [programs]" (Bureau for Private Postsecondary Education, n.d.). General Assembly, the largest bootcamp, went through the state regulatory process in eight states, reportedly finding the process to be beneficial in standardizing and improving their operations (Fain, 2015b).

Alternative Credential Programs

Bootcamps are not the first alternatives to traditional postsecondary degrees, as both the diversity of offerings and the number of students pursuing alternative options have grown over the past decade (Brown & Kurzweil, 2017). However, research in this area is rare and generally limited to credentials awarded upon completion of a credential program (certificates) at accredited postsecondary institutions or a successful demonstration of skills through professional organizations (licenses and certifications) (Bielick et al., 2013; Ewert & Kominski, 2014). Despite a significant federal effort through the Interagency Working Group on Expanded Measures of Enrollment and Attainment (or GEMEnA) to collect better data on alternative credentials, the definition of alternative credentials used in federal

[3] These statistics include a description of graduation requirements, graduation rates, the percentage of graduates employed by whether their job is in their field of study and work intensity, graduate job title and salary, and the percentage of incoming students who hold a prior computer science degree.

surveys specifically excludes bootcamps by focusing on certificates, and certifications and licenses and thus on community colleges, other universities or colleges, trade schools or professional organizations (Bielick et al., 2013).[4]

Recently, several efforts have included additional forms of alternative credentials. Brown and Kurzweil (2017) and Credential Engine (2018) acknowledged other types of alternative credentials and educational pathways, including microdegrees, digital badges, nanodegrees,[5] MOOCs, and bootcamps—regardless of where they are offered. However, while both the authors provide some context for the universe of alternative credentials, they do not collect or report new data on bootcamps (Brown & Kurzweil, 2017; Credential Engine, 2018). Powers (2017) estimates that over 46 million people have earned an "Open Source Micro Diploma," while Thayer and Ko (2017) qualitatively analyze the challenges faced by students enrolled in coding bootcamps, Fain (2018) describes why alternative credentials in general are important in the current labor market, and Radford et al. (2014) assess employer receptivity to MOOCs when making hiring decisions.

Overall, we find the existing academic research on alternative credentials and pathways to be sorely lacking. Although the accreditation literature provides regulatory context, the existing research has not sufficiently addressed newer alternative credentials, particularly those outside of accredited institutions. Without independent, methodologically sound research driving the conversation surrounding bootcamps and other alternative credential programs, the limited sources of information on these types of programs are amplified in the media hype—and gloom—that surrounds them.

[4] The GEMEnA efforts to quantify alternative credentials started in 2009, led to a pilot survey in 2010, and resulted in a report issued in 2013. In the more than 8 years since the pilot survey and 5 years since the report was issued, alternative credentials have changed rapidly; the definitions GEMEnA created do not encompass bootcamps and other newer credentials.

[5] Microdegrees, digital badges, and nanodegrees are all examples of alternative certificates presented upon completion of short courses completed online that can be shared on social media or with employers.

Existing Data

One reason for the dearth of academic research on bootcamps is the lack of available data; the data that do exist are produced by the industry for marketing purposes, not independent research. As of this writing, three organizations have collected and published basic statistics on the bootcamp industry: Course Report, Switchup, and CIRR.

Course Report and Switchup are industry organizations operating directories for prospective bootcamp participants. Course Report published a *Market Sizing Report* in both 2016 and 2017 to quantify the growth of coding and data science bootcamps in the US and Canada (Eggleston, 2016a, 2017). In addition, Course Report publishes an annual report on outcomes and demographics of coding bootcamp alumni (Eggleston, 2016b). These statistics are cited in virtually every current publication on the topic (Pender, 2017; Brown & Kurzweil, 2017; Credential Engine, 2018; Thayer & Ko, 2017; Watters, 2017). Course Report's data are based on 95 coding bootcamps that reported graduating an estimated 22,900 students in 2017 (Eggleston, 2017). Switchup conducted voluntary surveys of about 826 bootcamp graduates from 76 full-time, in-person, programming or software engineering bootcamps between 2014 and 2016 (Switchup, 2016).

Both Course Report and Switchup use a narrow definition, focusing on full-time coding bootcamps (Eggleston, 2017; Switchup, 2016). These programs most closely align with media coverage; however, there is no evidence that these programs represent the industry in terms of enrollment. Because our goal is to understand and describe the entire bootcamp industry as opposed to one specific type of program, we use a broader definition that includes part-time, online, and international programs. Many of the providers in our database offer multiple types of programs; thus, adopting the narrower definition used by Course Report and Switchup would ignore a significant segment of the industry.

By all appearances, Course Report's and Switchup's primary focus is recruiting potential bootcamp

participants. Their websites include searchable bootcamp directories, reviews from graduates, and top 10 lists. The Course Report (2018) website is designed to help prospective students "find the best bootcamp for [them]."[6]

As noted previously, CIRR represents a coalition of bootcamps that have committed to a set of data quality standards. CIRR's first outcomes report was drawn from data provided by 13 reporting member bootcamps on their graduates in 2016. According to CIRR's report, 80 percent of graduates were placed in an in-field job within 180 days of graduation with an average starting salary of $70,412 (CIRR, 2017).

Whether the outcomes reported by these organizations are representative of the industry is unclear, but all three data sources likely suffer from selection bias. Established or higher quality bootcamps may be more likely to collect and report accurate data than newer or less effective bootcamps. The quality of the data collected and the extent to which the data accurately represent all bootcamp participants is unknown. Further, data collected for market research purposes may not be suitable for analysis due to a variety of potential methodological biases.

The collection of comprehensive data by an objective, third-party source is well past due to establish the landscape of this burgeoning field. Brown and Kurzweil (2017) and Credential Engine (2018) illustrate this need; these reviews of alternative postsecondary programs cited only Course Report's data on bootcamps, based on Course Report's narrow definition, despite the authors' otherwise broader focus. Whether these data are robust and reliable is impossible to evaluate without other sources of information by which to compare.

Independent Data Collection

Our research contributes an impartial scholarly perspective in pursuit of a fresh, critical view of bootcamp programs. In doing so, we challenge popular and industry assumptions and commonly held beliefs about this rapidly changing field. This work advances our understanding and encourages more transparency from an opaque and heterogeneous mix of bootcamp providers and programs. Our work has one primary purpose: to objectively describe the universe of bootcamp providers and programs worldwide. Without a comprehensive understanding of these providers and the programs they offer, the dialog will continue to be driven by media coverage, popular perception, and the subgroup of providers on which data are currently collected by industry groups. In this report, we describe:

1. the size of the bootcamp provider universe;
2. the type and number of programs and subjects offered;
3. the characteristics of these programs, including intensity, length, location, program area, price, financial aid offerings, and industry affiliations.

Data and Methods

2017 Bootcamp Universe Study: Data Collection

We started the data collection for the "2017 Bootcamp Universe Study," by generating a list of the information we aimed to collect about each bootcamp program. The dataset we created included columns for each data element (e.g., program length, price, and location), and rows for each program. We gathered the data on programs by visiting the website for each bootcamp institution (or provider) and each program offering. By the end of data collection, we had amassed data on approximately 1,400 programs offered by roughly 270 bootcamps worldwide.

Our dataset represents the universe of technology-related programs as of June 30, 2017. Data collection began in November 2016. Starting in March 2017, we revisited the websites for each bootcamp on which we had already collected data, updating or filling in missing data as needed. To ensure that the data we collected were up to date as of June 30, 2017, we cross-referenced our database with the Course Report and Switchup directories and performed additional

[6] Course Report's blog, in a post-mortem on the closure of Dev Bootcamp, wrote that "Dev Bootcamp changed thousands of lives, and built a great reputation with employers, so we are sad to see it go" (Crispe, 2017).

internet searches to check for new bootcamps or those we had previously missed.

We started with bootcamps listed in the Course Report and Switchup directories. Next, we turned to the directories provided by Skills Fund and Climb Credit, two private lenders focused on loans for bootcamp students. Finally, we used Internet searches and a snowball technique to identify additional bootcamps not listed in any of these directories. In this data collection, we used bootcamp websites to identify the courses offered at each bootcamp; each unique course offering (based on curriculum, intensity, length, and location) was considered a program.

Out-of-Scope Programs

Given the relative lack of definition around bootcamp programs, we set specific parameters to define whether a program was out of scope for the study. To be included, all programs had to be unaccredited, cohort based, and directed at adult learners; last a minimum of 1 week; and contain direct and substantial interaction with instructors or mentors. Programs also had to be technology-specific, such as coding or data science bootcamps. Thus, the following characteristics led to a program being labeled as out of scope and not included in further data collection or analysis:

1. Programs that were no longer offered and bootcamps that had closed before June 30, 2017.
2. Content was not related to science, engineering, math, or technology.
3. Programs were too short (less than one week).
4. Programs or bootcamps did not target adult learners.
5. Courses were eligible for university credit (unless a bootcamp developed the content and partnered with traditional institutions to provide it).
6. Programs or bootcamps provided insufficient information on our key data elements.

Table A.1 (in the Appendix) provides reasons why programs were determined to be out of scope (although, due to inherent limitations, this is not a representative sample of all out-of-scope programs).

Due to incomplete information on one or more of these key characteristics, we excluded 54 (of 1,441) programs otherwise determined to be in scope: of these, 20 were missing intensity, 45 were missing length, and 10 were missing location. Overall, we collected data on more than 2,000 programs at more than 500 bootcamps, including 900 that were ultimately excluded; 368 of these were no longer offered, and the remaining 532 were deemed out of scope for some other reason.

Data Elements

For every in-scope program, we collected four key characteristics: intensity (full-time or part-time), length, location, and program area. Program area includes three broad categories: software engineering, data science or engineering, and information technology/security. Software engineering was further broken down into web development, software/web design, mobile app development, software development/engineering, and other. For programs in the United States, Canada, or online, we also collected information on price (if denominated in US or Canadian dollars), admissions process (whether programs were competitive, had minimal requirements, or had no requirements), populations targeted in marketing materials or scholarships, CIRR affiliation, and type of financial aid offered (if any).

Using these data, we developed a classification schema with five distinct categories that encompass each in-scope bootcamp program. These categories are based on a thorough review of the data we had collected on data on program length, intensity, goals, and institutional affiliation. The categories and definitions are as follows:

1. **Comprehensive Career Preparation Program**: a program that advertises an intensive curriculum in which students graduate ready to be employed in the industry. Comprehensive career preparation programs are full- or part-time vocational programs offering comprehensive workforce skills with no official credential-based admissions requirements.
2. **Course**: a standalone course for specific, limited skills; not intended for students looking for a career change. While these programs are offered

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at independent bootcamps, they resemble a single traditional college course in curricular scope.

3. **University-Affiliated Program**: an unaccredited program (not eligible for university credit) affiliated with a traditional university.
4. **Fellowship Program**: often tuition free, a program that focuses on improving existing expertise, collaborating with other experts, and solving real-world problems. These often have credential-based admissions requirements.
5. **Postsecondary Education Replacement Program**: a full-time program lasting at least 1 year with an involved admissions process. These are similar in time investment to a traditional postsecondary degree and self-identify as an alternative to a traditional degree program.

Data Strengths and Weaknesses

Our data collection is the first comprehensive data collection focused on bootcamps conducted by an independent organization. Bootcamps cannot opt in or out and do not need to subscribe or consent for inclusion. The data collection is based entirely on information provided in marketing materials on program websites and, as such, treats each program equally. Thus, these data can be used to validate and update previous claims about the size of the industry and the types, characteristics, and prices of programs offered and provide additional detail on the options that potential students have. Our study thus fills an important void in a body of research that to date has been dominated by industry groups.

Our data include the universe of bootcamp programs on June 30, 2017, to provide stakeholders with crucial information about these providers and programs. To build our dataset, we gathered information from more than 500 websites, written in multiple languages, beginning by working from four existing online directories and augmenting those lists with our own web searches. As in any extensive baseline data collection, we may have missed some of the smaller providers, particularly small providers outside of North America. In addition, although we used the translate feature in our search engines, we may also have missed some providers and/or been unable to collect some data elements for providers with websites primarily in a language other than English.

The data we collected were constrained by public availability. Some data were missing or lacked important details. For example, price was missing for 10 percent of programs, and other basic program characteristics were missing for some programs as detailed above. While we gathered financial aid information for all programs, on most websites, the information on financial aid was limited to whether scholarships are offered. Thus, the available information on aid yielded little data on how many students receive aid or in what amounts. In addition, we abandoned data collection on other variables deserving study after encountering inconsistent availability; these include tax status (nonprofit/for-profit), year founded, venture capital/corporate funding, job placement statistics, and internship opportunities.

Methods

We examine bootcamps at both the bootcamp (provider) and program levels. Provider-level analyses allow us to look at the breadth of offerings at both the typical bootcamp and larger bootcamps. In addition, these analyses allow us to consider whether the industry is driven by a small number of large bootcamps or by many small bootcamps. Program-level analyses allow us to quantify the overall number of program offerings and identify patterns for programs with certain characteristics.

A program is a unique course of study within a bootcamp provider, based on curriculum, intensity, length, and location. Thus, a Web Development Immersive program offered by Tech Talent South in Winston-Salem, North Carolina, both full and part time, and in Wilmington, Delaware, only full time, is considered three programs. This reflects the options that potential students face when looking at programs. It also poses a limitation to our approach since we describe programs without the context of program size. Because bootcamps rarely publish how many students enroll in each program or how often programs are offered, we may be counting equally programs that are offered once per year for 10

students and programs that are offered 10 times per year for 20 students at a time. However, delineating the universe of programs is necessary before collecting student-level data.

Additionally, we examine the distribution of bootcamp programs across regional labor markets, defined by core-based statistical area (CBSA) (equivalent to a metropolitan area). These analyses show whether the industry is concentrated within certain labor markets and make comparisons to where tech industry jobs are located. Aggregations to CBSA are made using a crosswalk from the US Census Bureau (2015).

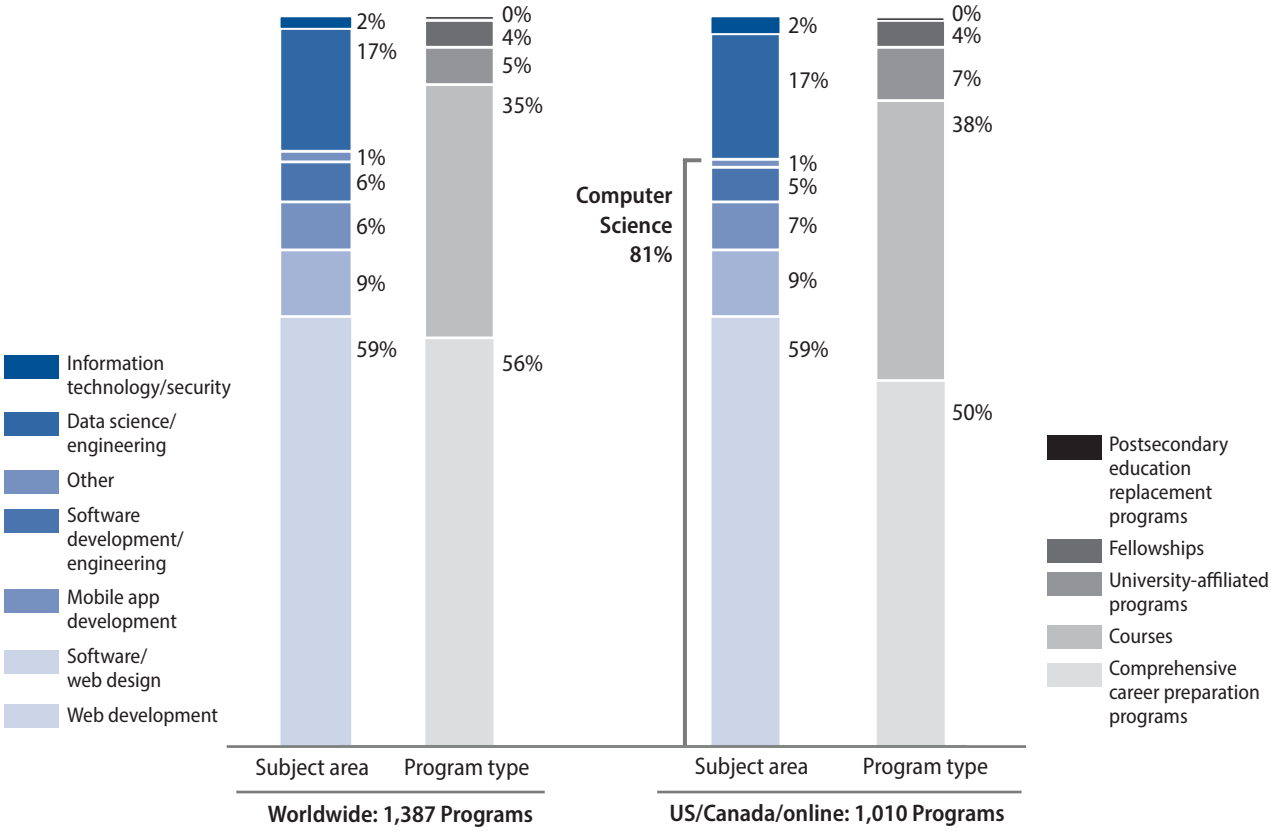
The statistics produced for this report are descriptive. Because they are based on a universe rather than a sample, statistical tests were not appropriate.

Analyses and Findings

Results

We identified 1,387 unique programs offered in 48 countries, 44 US states, and online. From this list, we classified the programs into five types (described previously): comprehensive career preparation programs (774 worldwide, 56 percent of programs); courses (485, 35 percent); university-affiliated programs (71, 5 percent); fellowship programs (52, 4 percent); and postsecondary education replacement programs (5, 0.4 percent) (Figure 1). Then, we identified the subject area taught: worldwide, 81 percent of programs taught computer science and a majority (59 percent) of all programs taught web development (Figure 1). We found fewer programs teaching data science/engineering (17 percent) or information technology/security (2 percent).

Figure 1. Bootcamp programs: program types and subject areas, by percentage



Notes: Statistics represent the universe of bootcamp programs offered worldwide (or online) as of June 30, 2017. A single program is offered uniquely by a bootcamp for each location, intensity (full time/part time), and length. Detail may not sum to totals due to rounding.

Source: 2017 Bootcamp Universe Study.

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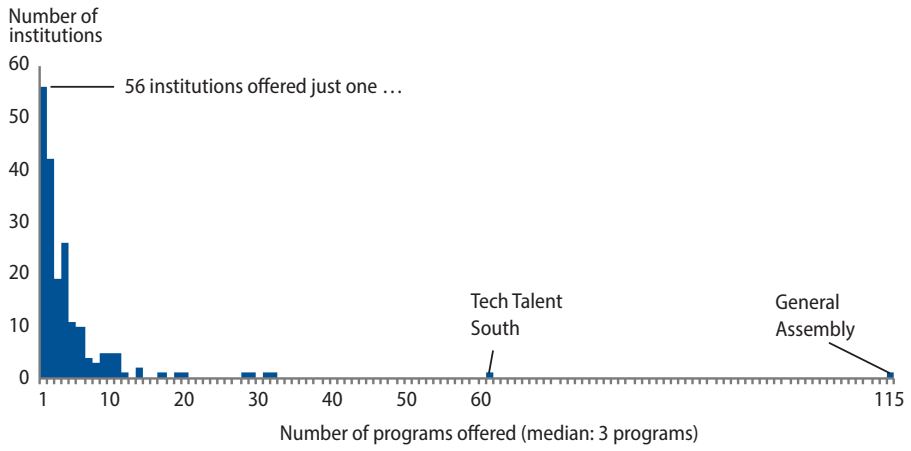
In the main analysis, we focus on the 1,010 programs (73 percent of all programs) offered in the United States, Canada, or online.[7] First, we address the research question regarding the number of providers. Second, we examine program types and attributes, focusing on comprehensive career preparation programs. Third, we compare the locations of bootcamp programs to local labor markets. Lastly, we compare our results to published statistics from Course Report.

Figure 2. Frequency of the number of bootcamp programs offered at each bootcamp



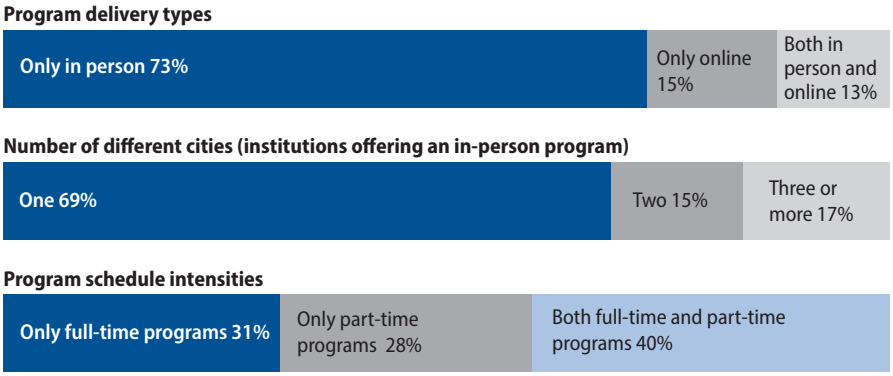
Notes: Statistics represent the universe of bootcamps offering bootcamp programs in the United States, Canada, or online as of June 30, 2017. A single program is offered uniquely by a bootcamp for each location, intensity (full time/part time), and length.

Source: 2017 Bootcamp Universe Study.

Bootcamp (Provider) Overview

In the United States, Canada, or online, there were 1,010 programs at 198 bootcamps as of June 30, 2017. In Figures 2 and 3, we present statistics aggregated to the bootcamp level to characterize the number and breadth of bootcamp offerings (for more statistics on the number and type of programs offered at bootcamps, see Appendix Tables A.3 and A.4). Although there were many programs and providers, most bootcamps were small, with a median of three and a mode of one program offered (Figure 2). Only nine bootcamps offered more than 15 programs. General Assembly, by far the largest provider, offered 115 programs (11 percent of all programs). For this reason, some of our analyses look at statistics with and without General Assembly programs included.

Figure 3. Bootcamps offering bootcamp programs with specific characteristics, by percentage



Notes: Statistics represent the universe of bootcamps offering bootcamp programs in the United States, Canada, or online as of June 30, 2017. A single program is offered uniquely by a bootcamp for each location, intensity (full time/part time), and length. Details may not sum to totals due to rounding.

Source: 2017 Bootcamp Universe Study.

Bootcamps primarily focused on delivering material in person. Just 15 percent of bootcamps offered only online programs, while 73 percent offered only in-person programs, although more than a quarter (27 percent) offered at least one online program (Figure 3). Of the 169 bootcamps offering in-person

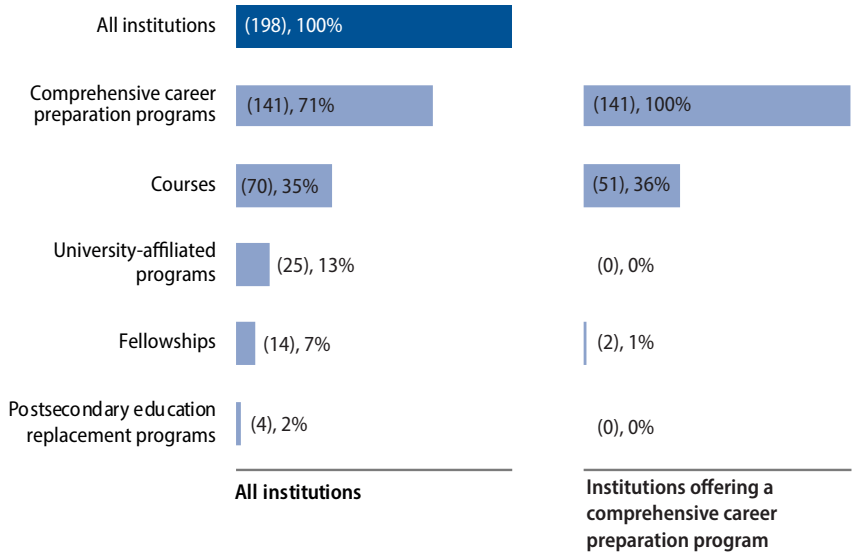
[7] The distribution of the programs in the United States, Canada, and online is similar to the worldwide distribution. We focus on US, Canadian, and online programs due to concerns about coverage, particularly for smaller bootcamps or those that advertise in a language other than English. See the section on Data Strengths and Weaknesses for a discussion of these issues. For more statistics on the program types and subject areas offered in different regions, see Appendix Table A.2.

programs, more than two-thirds (69 percent) offered programs in only one city, and only 28 providers (17 percent) offered programs in three or more cities. Bootcamps offered a balance of full-time and part-time programs (40 percent of institutions offered both). Most bootcamps (71 percent) offered at least one comprehensive career preparation program, while 35 percent offered a course (Figure 4). The other types of programs were less common. Of those offering a course, 73 percent also offered a comprehensive career preparation program.

Comprehensive Career Preparation Programs

As discussed previously, most discussions about bootcamps implicitly refer to comprehensive career preparation programs. We identified 507 comprehensive career preparation programs—over half of all bootcamp programs—offered at 141 different bootcamps in the US, Canada, or online (Figure 1). Of these, 86 percent were in computer science, 10 percent were in data science, and 4 percent were in information technology/security (Figure 5; for detailed statistics on comprehensive career preparation programs by subject area, see Appendix Table A.5). Consistent with overall numbers, as well as the media characterization, most of the computer science programs were in web development (61 percent), followed by software/web design

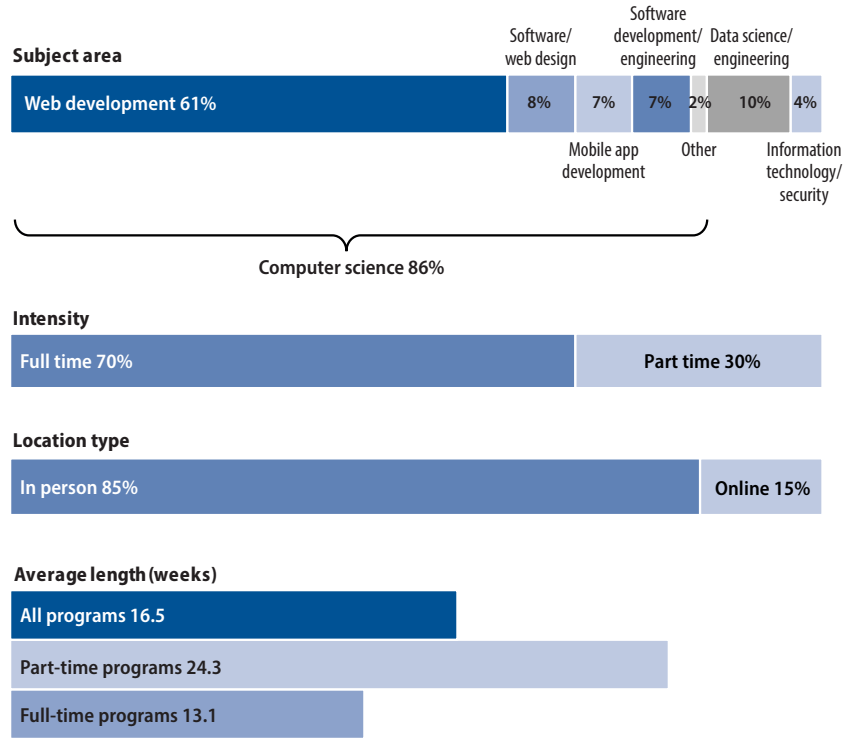
Figure 4. Bootcamps offering different bootcamp program types, by number and percentage



Notes: Statistics represent the universe of bootcamps offering bootcamp programs in the United States, Canada, or online as of June 30, 2017. A single program is offered uniquely by a bootcamp for each location, intensity (full time/part time), and length.

Source: 2017 Bootcamp Universe Study.

Figure 5. Characteristics of comprehensive career preparation programs, by percentage



Notes: Statistics represent the universe of comprehensive career preparation programs offered in the United States, Canada, or online as of June 30, 2017. A single program is offered uniquely by a bootcamp for each location, intensity (full time/part time), and length. Details may not sum to totals due to rounding.

Source: 2017 Bootcamp Universe Study.

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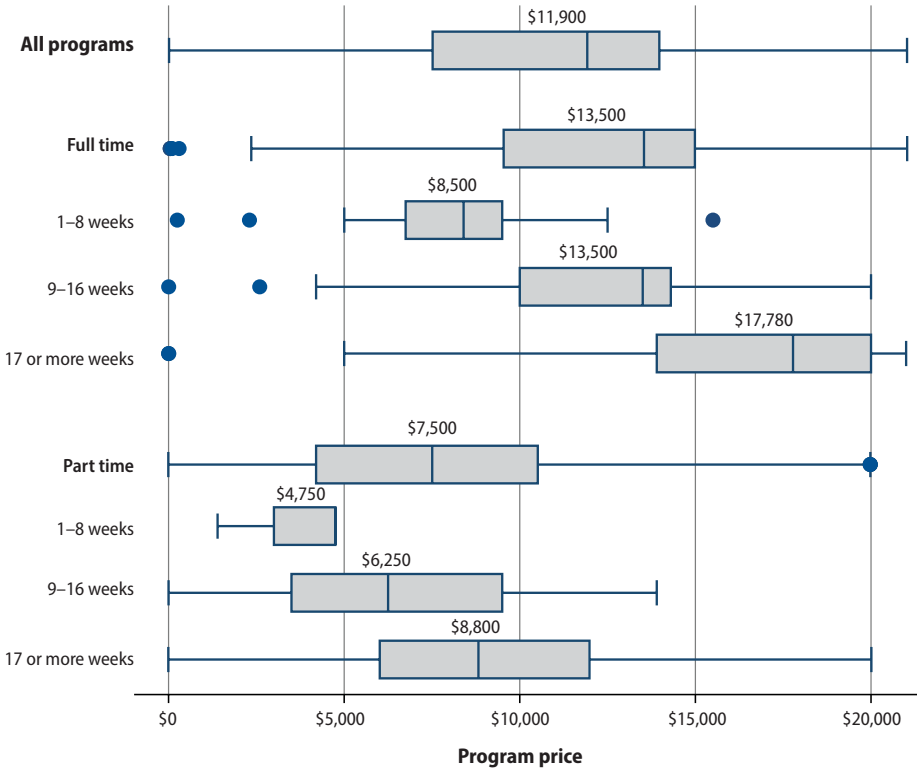
Figure 6. Comprehensive career preparation program prices, by program intensity and length



Notes: Statistics represent the universe of comprehensive career preparation programs offered in the United States, Canada, or online as of June 30, 2017. A single program is offered uniquely by a bootcamp for each location, intensity (full time/part time), and length. Prices are included only for programs for which prices were listed in US or Canadian dollars. Prices for programs denominated in Canadian dollars were converted to US dollars based on the exchange rate on June 30, 2017 (1.2982 $CAN per 1 USD; exchange rate was obtained at https://www.federalreserve.gov/releases/h10/20170703 on July 12, 2017). Prices shown are medians. Boxes represent the interquartile range (25th to 75th percentiles), and the tails denote the range of prices from the 10th to 90th percentiles. All values outside of these ranges are represented by dots.

Source: 2017 Bootcamp Universe Study.

(8 percent), mobile app development (7 percent), and software development/engineering (7 percent). Further, most comprehensive career preparation programs were full-time (70 percent) and lasted an average of 13 weeks—similar to the length of a traditional semester. Part-time programs lasted an average of 24 weeks. A large majority (85 percent) of comprehensive programs were delivered in person, with few fully online programs.

Price/Financial Aid

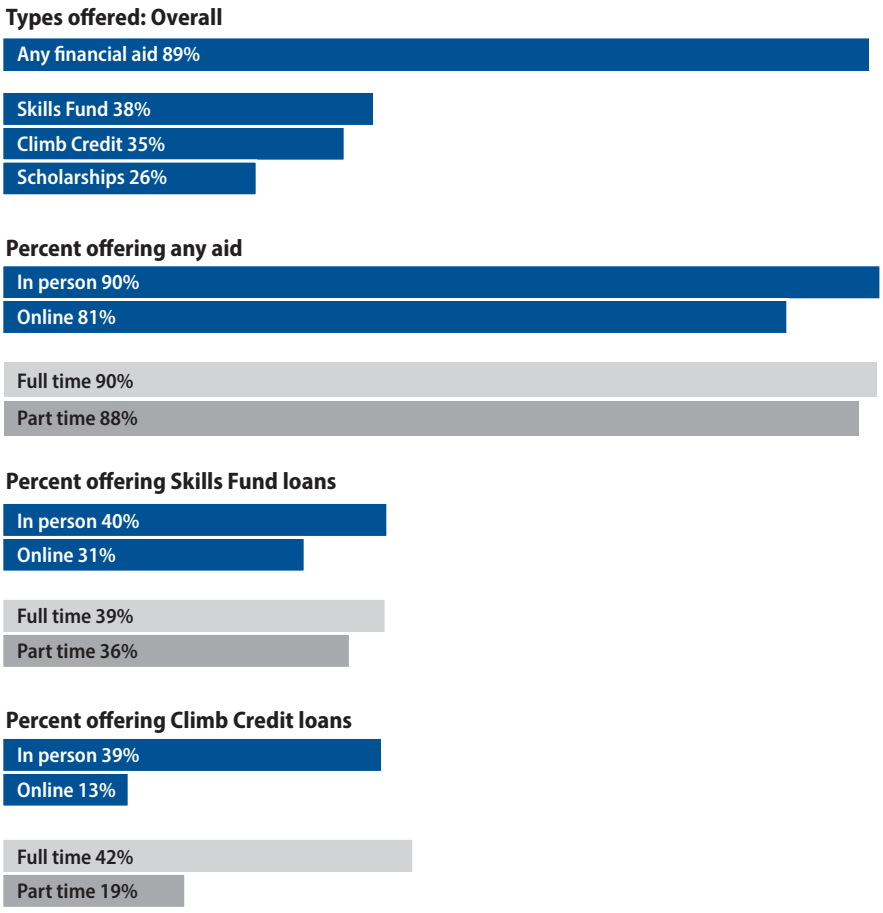
Bootcamps represent a significant financial investment for most students. While they require a shorter time investment relative to traditional options, it is important to consider the cost of these programs. For the 92 percent of programs that listed prices on their websites, the median price of a comprehensive career preparation program was $11,900 and the typical price (defined by the interquartile range) was between $7,500 and $13,950 (Figure 6).[8] On a per week basis, the median price for full-time programs was $1,050 (we do not calculate price per week for part-time programs, as they range in intensity). Full-time programs typically had higher prices (a median of $13,500) than part-time programs (a median of $7,500). Longer programs were also more expensive than shorter programs: the median price ranged from $8,500 for a full-time, 1–8 week, high-intensity program to $17,780 for a full-time program of 17 weeks or more. In 2015–2016, the median in-state tuition/fees for an entire academic year was $8,778 for undergraduate programs and $11,303 for graduate programs (National Center for Education Statistics, 2016). Thus, the median cost of a 9–16–week full-time comprehensive career preparatory program is similar to a year of graduate education at a public postsecondary institution.

Most bootcamps' websites addressed price as a potential barrier for students who would like to attend their programs: 89 percent of comprehensive career preparation programs advertised some form of financial aid (Figure 7). These offers included scholarships, (private) loans, an affiliation with state or local government grants, and income-

[8] Prices were available and denominated in US or Canadian dollars for 91 percent of programs. We convert prices for programs denominated in Canadian dollars to US dollars based on the exchange rate on June 30, 2017 (1.2982 $CAN per 1 USD; exchange rate was obtained at https://www.federalreserve.gov/releases/h10/20170703 on July 12, 2017).

based repayment (under which programs receive portion of graduates' salaries when they enter the labor market). Although income-based repayment programs among bootcamps have received considerable media attention, they were so rare among bootcamp programs (less than 1 percent offered this type of aid) that we did not include those data in Figure 7. A few companies specialize in private student loans for bootcamps and other alternative programs. These include Skills Fund (offered for 38 percent of comprehensive career preparation programs) and Climb Credit (35 percent).[9] Although most comprehensive career programs advertised the availability of financial aid, slightly more than one-quarter (26 percent) of programs offered any scholarship support; in most cases, students who need financial aid must take out loans.

Figure 7. Financial aid offered for comprehensive career preparation programs, by percentage



Notes: Statistics represent the universe of comprehensive career preparation programs offered in the United States, Canada, or online as of June 30, 2017. A single program is offered uniquely by a bootcamp for each location, intensity (full time/part time), and length.

Source: 2017 Bootcamp Universe Study.

Although most programs offered financial aid, certain program characteristics were associated with whether a comprehensive career preparation program offered certain types of aid. For example, in-person programs offered financial aid more often than online programs (90 vs. 81 percent). In addition, larger proportions of in-person programs than online offered aid through Climb Credit (39 vs. 13 percent) and offered scholarships (28 vs. 18 percent). Similarly, 42 percent of full-time programs compared with only 19 percent of part-time programs offered aid through Climb Credit. While financial aid can increase access to programs, there is very little information about what aid packages look like for students with different levels of need.

Admissions Criteria

Comprehensive career preparation programs generally had admissions requirements and were thus not open access. During our review of admissions processes for bootcamp programs, we found details on "competitive admission" requirements for 59 percent of programs (Figure 8). These requirements included aptitude/logic testing and/or interviews (including assessment of applicant "fit"). An additional 16 percent of programs had other "minimal requirements" such as existing coding skills or diploma/degree requirements. Roughly 4 out of 5 full-time and in-person programs had some admission requirements, and 62 percent had competitive requirements. Although part-time

[9] Notably, General Assembly no longer offers Skills Fund assistance. Excluding General Assembly programs from the denominator, 43 percent of programs offer Skills Fund assistance.

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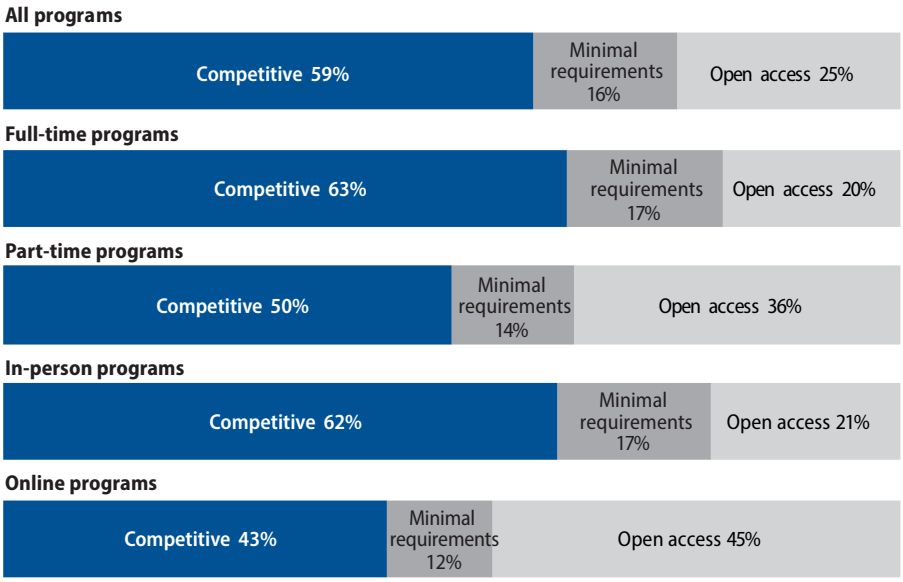
and online programs had less stringent admissions, only 36 percent of part-time programs and 45 percent of online programs were open access. Unlike traditional postsecondary institutions, these programs make very little information on acceptance rates publicly available.

Figure 8. Admissions policies at comprehensive career preparation programs, by percentage



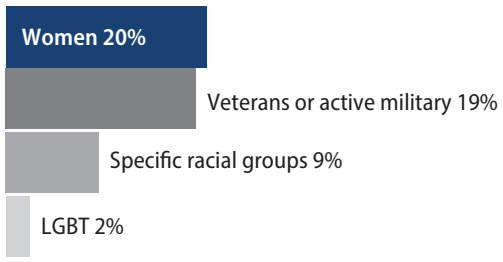
Notes: Statistics represent the universe of comprehensive career preparation programs offered in the United States, Canada, or online as of June 30, 2017. A single program is offered uniquely by a bootcamp for each location, intensity (full time/part time), and length. Details may not sum to totals due to rounding.

Source: 2017 Bootcamp Universe Study.

Target Populations

Early speculation about bootcamps suggested they could be new pathways to science and technology jobs for underrepresented populations in technology careers. Many programs' marketing materials specifically stated an interest in participation from certain student groups; some also offered scholarships or exclusive admissions (i.e., women-only programs). Specifically, nearly 20 percent of comprehensive career preparation programs explicitly targeted women and current or former military members (19 percent) (Figure 9). Fewer did so for underrepresented racial groups (9 percent) or LGBT persons (2 percent). Few programs listed the demographic characteristics of their students, preventing us from comparing the target populations to the population of students enrolled.

Figure 9. Targeted populations at comprehensive career preparation programs, by percentage



Notes: Statistics represent the universe of comprehensive career preparation programs offered in the United States, Canada, or online as of June 30, 2017. A single program is offered uniquely by a bootcamp for each location, intensity (full time/part time), and length.

Source: 2017 Bootcamp Universe Study.

Industry Affiliations

In response to calls for transparency in quality and outcomes, the bootcamp industry has responded with initiatives aimed to increase the legitimacy of bootcamps and their programs. The most notable at this writing was CIRR, with which 87 bootcamps were affiliated. The affiliated bootcamps offered 72 percent of comprehensive career preparation programs; of the 28 percent of programs not affiliated with CIRR, more than half (17 percent of all programs) were offered by General Assembly (Figure 10). CIRR-affiliated programs were more likely to be full-time (78 percent of CIRR-affiliated programs vs. 68 percent of other programs). Full-time, CIRR-affiliated programs were similar to non-CIRR-affiliated programs in price, while part-time CIRR-affiliated programs were more expensive ($12,000 vs. $7,500).

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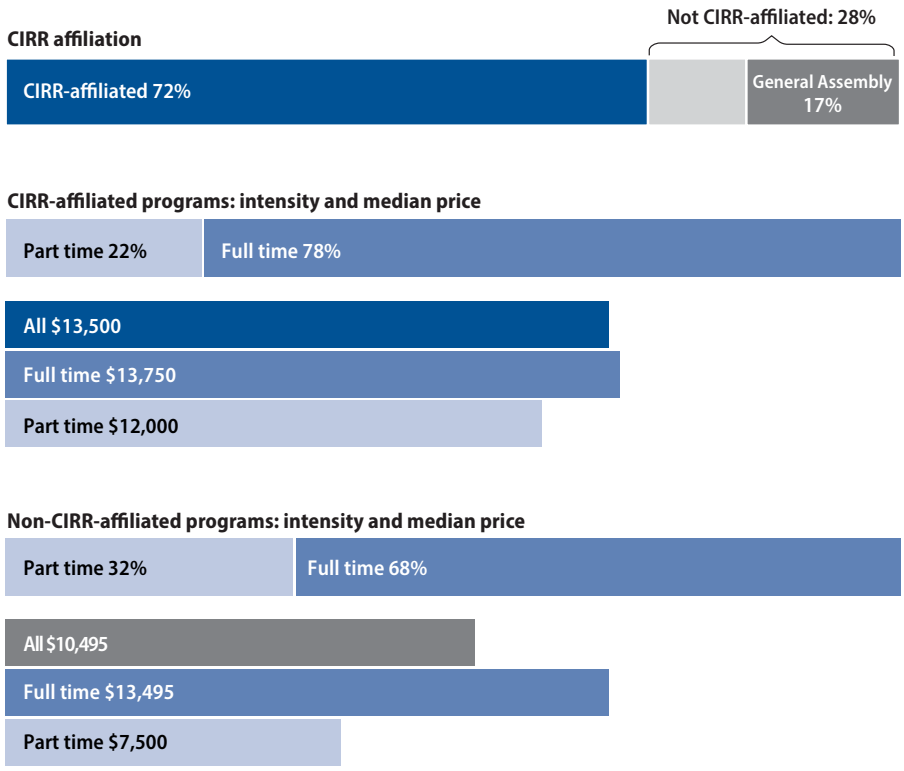
Bootcamp Courses

In addition to comprehensive career preparation programs, 388 courses were offered at 70 different bootcamps in the United States, Canada, or online (Table 1). These shorter programs aimed to teach a specific skill or programming language (for beginning or advanced students) instead of leading to a specific job or career. Alternatively, bootcamps offered courses as introductions for students to try before committing to a comprehensive career preparation program, to give comprehensive career preparation program graduates a chance to learn a new skill, or as standalone courses. As mentioned previously, we found that most bootcamps offering courses also offered a comprehensive career preparation program.

Figure 10. Industry affiliations of comprehensive career preparation programs, by percentage



Notes: Statistics represent the universe of comprehensive career preparation programs offered in the United States, Canada, or online as of June 30, 2017. A single program is offered uniquely by a bootcamp for each location, intensity (full time/part time), and length.

Source: 2017 Bootcamp Universe Study.

The courses bootcamps offered contained similar content to that of comprehensive career preparation programs: 78 percent were in computer science, with most in web development. However, more than one in five courses were in data science/engineering in contrast to only 10 percent of comprehensive career preparation programs. Most courses were part time (93 percent), were delivered in person (81 percent), and lasted an average of 8 weeks.

Price/Financial Aid

Courses cost less than comprehensive career preparatory programs, reflecting the more focused curriculum. The median price of a course was $2,567 and the interquartile range was $1,250 to $3,950; longer programs typically had higher prices.

Financial aid was somewhat less common for courses though most (77 percent) offered aid of some kind. Skills Fund assistance was offered for 24 percent of courses, and Climb Credit was offered for 36 percent of courses. Scholarships were offered for 22 percent of courses.

Admissions Criteria

Courses were more accessible than comprehensive career preparation programs. Thirty-nine percent of courses had no requirements for admission, while an additional 45 percent had only minimal requirements. Only the remaining 15 percent had competitive admission requirements.

Other Bootcamp Programs

This section focuses on two other types of bootcamp programs: university-affiliated programs and fellowship programs. Postsecondary education replacement programs were included in our study and definition but omitted here as there were very few (four) of such programs.

Table 1. Characteristics of courses, university-affiliated programs, and fellowships

	Courses	University-affiliated programs	Fellowships
Number of programs[a]	**388**	**71**	**40**
Number of bootcamps	**70**	**25**	**14**
Program area			
Computer science	77.6%	81.7%	42.5%
Web development	58.5%	70.4%	15.0%
Software/web design	12.1%	2.8%	0.0%
Mobile app development	5.4%	1.4%	20.0%
Software development/engineering	1.3%	7.0%	7.5%
Other	0.3%	0.0%	0.0%
Data science/engineering	22.2%	15.5%	57.5%
Information technology/security	0.3%	2.8%	0.0%
Intensity			
Full time	7.0%	32.4%	95.0%
Part time	93.0%	67.6%	5.0%
Average length (weeks)—all	**7.9**	**18.3**	**11.6**
Full-time programs	4.4	12.0	10.4
Part-time programs	8.2	21.4	[b]
Location type			
In person	81.2%	100.0%	92.5%
Online	18.8%	0.0%	7.5%
Price (USD)[c]			
Average total price	$2,567	$8,081	$2,973
25th percentile	$1,250	$6,500	$0
Median total price	$2,250	$9,500	$0
75th percentile	$3,950	$9,995	$7,000
Financial aid			
Offering any assistance	77.3%	40.8%	95.0%
Skills Fund	23.7%	0.0%	5.0%
Climb Credit	35.6%	8.5%	5.0%
Scholarships	21.6%	8.5%	2.5%
Admissions policy			
Competitive	15.5%	15.5%	72.5%
Minimal requirements	45.1%	12.7%	25.0%
Open access	39.2%	71.8%	2.5%

[a] A single program is offered uniquely by an institution for each location, intensity (full time/part time), and length. Details may not sum to totals due to rounding.

[b] Fewer than 10 cases.

[c] Prices for Canadian programs were converted to US dollars on June 30, 2017, based on the exchange rate reported at https://www.federalreserve.gov/releases/h10/20170703 (retrieved July 12, 2017).

Source: 2017 Bootcamp Universe Study.

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University-Affiliated Programs

University-affiliated programs are unaccredited programs offered by an accredited university (usually with a well-known name). These are often offered through a continuing education or extension school. We identified 71 of these programs; of these, 48, or 68 percent, were operated by Trilogy Education Services (TES). TES programs were branded in alignment with each university (e.g., UT Austin Boot Camp) but shared common formats (length, areas, intensity) and marketing materials, including websites, changed only to match the name and colors of the host institutions. They also appear to be similarly priced, although most did not provide price data on their website or marketing materials.

Students at university-affiliated programs may believe the programs they are attending are credentials offered by the affiliated university. Research on for-profit colleges has found that students largely fail to distinguish between for-profit and nonprofit institutions (Hagelskamp, Schleifer, & DiStasi, 2014); this could also be happening with university-affiliated bootcamps.

Unlike comprehensive career preparation programs, most university-affiliated programs were part time (68 percent) (Table 1). University-affiliated programs' fields of study were similar to those of comprehensive career preparation programs and bootcamp courses: 82 percent were in computer science, with 70 percent in web development and 15 percent in data science/engineering. Part-time programs lasted an average of 21 weeks, while full-time programs lasted an average of 12 weeks. TES-affiliated institutions all offered a part-time program, and some offered a similar full-time program. All university-affiliated programs we identified were delivered in person.

Fellowship Programs

Fellowship programs are generally tuition free and are aimed at degree-seeking students/graduates or professionals with prior experience in a field. They focus on broadening students' existing skillsets and solving real-world problems to prepare individuals for careers. We identified 40 fellowship programs. Unlike the other program types, 58 percent of fellowship programs were in data science/engineering (Table 1). Many of these focused on turning bachelor's or higher degree holders with high-level quantitative skills into industry-ready data scientists. Forty-three percent of fellowship programs were in software engineering and 20 percent of programs were in mobile app development, the highest proportion of any program type. Nearly all (95 percent) fellowship programs were full time, and the average full-time program lasted 10 weeks. Most fellowship programs were free (the median price was $0), and the average price was $2,973. Nearly all (93 percent) of programs were delivered in person.

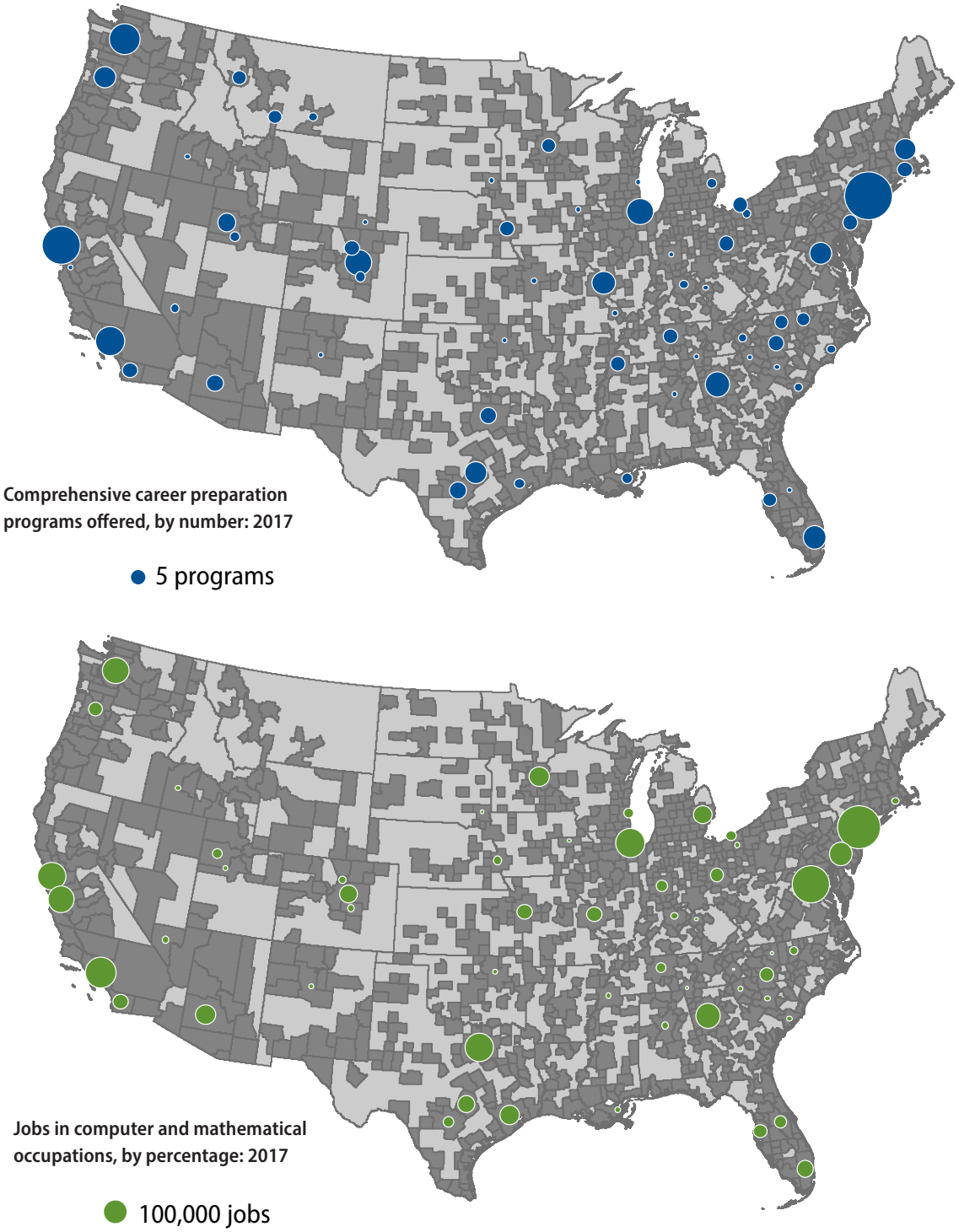
Bootcamp Geography

Bootcamp programs have the potential to provide job training in economically depressed areas, but only if they are accessible to students in those areas. Given how many bootcamp programs are offered in person, location is a critical component of access. Our geographic analyses identified 798 US-based programs offered in 68 different CBSAs across 44 states. The 405 comprehensive career preparation programs in the United States were similarly distributed across 64 CBSAs. Figure 11 and Table A.6 show the distribution of comprehensive career preparation programs, by CBSA.

Although programs were offered in nearly every state, programs were concentrated in only a few CBSAs. The top 10 CSBSAs accounted for more than half (54 percent) of all bootcamp programs and comprehensive career preparation programs (50 percent). The New York–Newark–Jersey City, NY-NJ-PA CBSA, which accounts for slightly more than 4 percent of the US population, was home to 13 percent of programs offered and 12 percent of comprehensive career preparation programs.

Some stakeholders have hypothesized that bootcamps are responding to labor markets where demand for technology jobs is not being met. Figure 12 compares the distribution of comprehensive career preparation programs and jobs in computer and mathematical occupations, by US CBSA. Figures 11 and 12 show that there is a correlation between the number of bootcamps in a metropolitan region and the number of jobs in computer and mathematical occupations: more populous regions have more of both. However,

Figure 11. Number of comprehensive career preparation programs and number of jobs in computer and mathematical occupations, by core-based statistical area



Notes: The map of comprehensive career preparation programs (top) represents the universe of comprehensive career preparation programs offered in each core-based statistical area (CBSA) as of June 30, 2017. A single program is offered uniquely by an institution for each location, intensity (full-time/part-time), and length. Kahului-Wailuku-Lahaina, HI (not pictured) has one comprehensive career preparation program. For the map of jobs in computer and mathematical occupations in 2017 (bottom), statistics are shown only for CBSAs with at least one comprehensive career preparation program.

Sources: 2017 Bootcamp Universe Study and Occupational Employment Statistics, Bureau of Labor Statistics.

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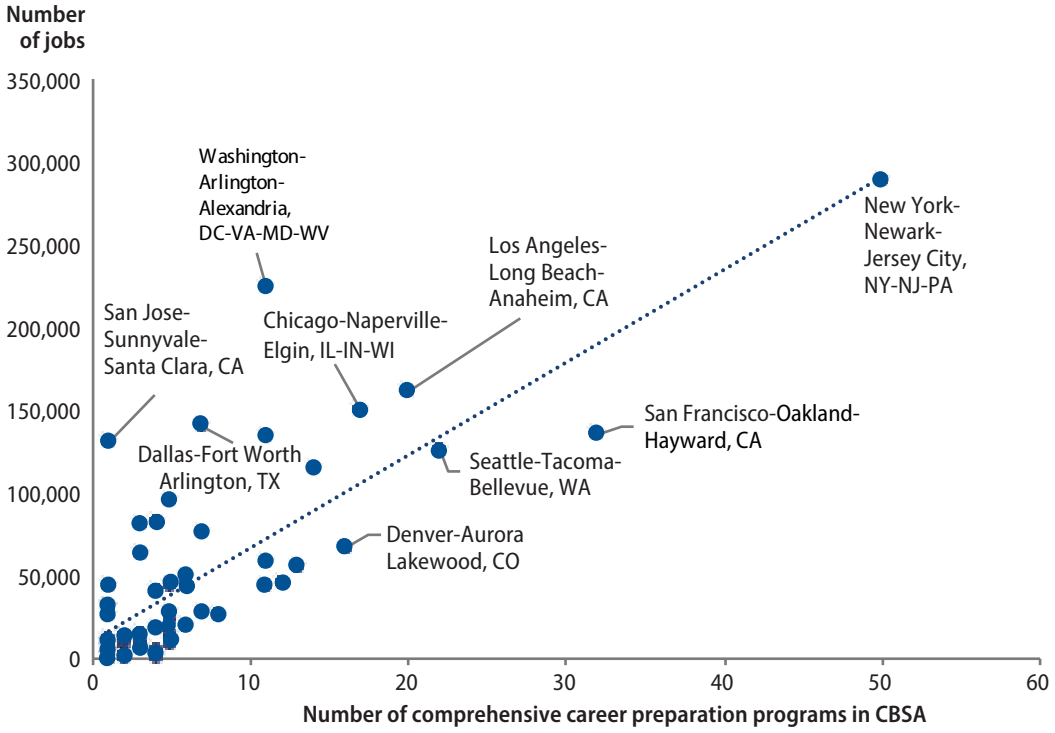
some regions are relatively underserved (those above the trendline in Figure 12) by bootcamps—relative to the number of jobs in computer and mathematical occupations—and others are overserved (those below the trendline in Figure 12). The Dallas/Fort Worth area, for example, has seven comprehensive career preparation programs and 140,000 computer or mathematical jobs, whereas the Denver area has 16 programs and 67,000 jobs. In short, concentration of comprehensive career preparation programs does not align as well with the labor market demand as would be expected based on media coverage. Further research should analyze whether bootcamps are responding to local labor needs.

Comparison to Existing Data (Course Report)

We report results from the first independent data collection to quantify the scale and characteristics of bootcamp programs. Since 2014, Course Report, an industry-affiliated organization, has published reports on the industry. In this section, we align our data with the definitions used in Course Report's latest *Market Sizing Report* to compare our results to theirs (Eggleston, 2017). We find that aligning our data to theirs yields comparable statistics but excludes sizeable parts of the industry. The Course Report definition includes only 24 percent of the 1,010 programs in our data.

Course Report's definition includes programs that are unaccredited, based in the US or Canada, full time, in person, and focused on full-stack web development, mobile development, or front-end web development. This excludes the 56 percent of programs that were part time, 15 percent that were online, and 43 percent that focused on different subjects. Using the restricted definition, we find results nearly identical to Course Report's. We find 240 programs offered at 98 bootcamps; Course Report reports identified 95 bootcamps (Table A.7). The average price of a program in the subset aligned with Course Report

Figure 12. Number of computer and mathematical jobs and number of comprehensive career preparation programs, by core-based statistical area



Notes: Statistics represent the universe of comprehensive career preparation programs offered in each US core-based statistical area (CBSA) as of June 30, 2017. Includes only CBSAs with at least one comprehensive career preparation program. A single program is offered uniquely by a bootcamp for each location, intensity (full time/part time), and length.

Source: 2017 Bootcamp Universe Study; Occupational Employment Statistics, 2016.

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was $11,000; Course Report reports an average price of $11,400. We found an average length was 10.5 weeks; Course Report reports 14.1 weeks.

Course Report does not report on other characteristics including admissions criteria or industry affiliations. Of the programs included in Course Report's definition, 58 percent had competitive admissions and 18 percent were affiliated with CIRR.

Discussion and Conclusion

Bootcamps have been portrayed at their best as an innovative new educational model that may be poised to disrupt the education industry. They are characterized at their worst as fly-by-night for-profits with all the transparency, effectiveness, and staying power of technology start-ups during the dot com boom. Our work sought to bring these institutions into focus by providing clear, factual information about their structure, program offerings, and other institutional characteristics. Because of this research, we no longer need to rely on industry groups or the media to provide this basic information and can thus dispel some of the myths surrounding these educational providers.

For example, bootcamps are typically depicted as short, intense, vocational coding and web-development programs designed for students who are looking to move into high-skill technology careers through a single comprehensive program. In fact, the program type that most closely resembles the media's portrayal of a typical bootcamp—comprehensive career preparation programs—comprises only 50 percent of all programs offered by bootcamps in the US, Canada, or online. The other half of bootcamp program offerings, however, defy this depiction. About 38 percent of programs are courses, which are not intended for career changers and resemble single college courses in the amount of material presented. Seven percent of programs are offered by traditional accredited institutions but are ineligible for university credit; and about 4 percent of programs are fellowship programs or postsecondary education replacement programs, which both have intense admissions processes and are designed for individuals with specific skills. The subject areas these institutions teach extend beyond web development, also encompassing data science and information technology/security.

Our data also reveal the extent to which General Assembly dominates the bootcamp market; an important consideration as the federal government experiments with expanding access to financial aid or providing other pathways to federal aid for these for-profit entities. Similarly, as recently closings of high-profile bootcamps make clear, this is a rapidly changing market with many mostly small providers, a handful of medium-size providers, and one large, dominant provider. This dynamic is important to consider as these institutions continue to compete for market share.

Although this research establishes definitive answers to some of the most basic questions regarding bootcamps, research in this area is only just beginning. This foundational work has raised many more questions than it has answered; in today's climate, perhaps the most pressing question centers around access. Our data raise questions regarding whether the programs designed for individuals looking to receive the necessary training to enter a lucrative, high-demand career field by way of a comprehensive career preparation program are truly open to all.

Unlike traditionally open-access MOOCs and microcredentials, 59 percent of comprehensive career preparation programs have competitive admissions requirements that include logic or coding tests, interviews, and/or assessments of "fit"; requirements more stringent and less transparent than many colleges and universities. Meanwhile, very little information is available on admission rates. The extent to which bootcamp programs are facilitating the entrance of individuals reflecting new segments of the demographic spectrum into the tech labor force, in accordance with popular perception, deserves additional attention; with entrance requirements that rival or surpass traditional higher education's, bootcamps' impact on the supply side and implications for reducing gender, racial, and wealth gaps is unclear but worthy of future study.

However, admissions are only one barrier to entry. Most (85 percent) of comprehensive career replacement programs are offered in person only. While in-person programs may be a key pedagogical characteristic of comprehensive career preparation programs, they limit access for many students who cannot move for their education. We found that 50 percent of US comprehensive career preparation programs are located in just 10 CBSAs. These same CBSAs account for just 29 percent of computer and mathematical jobs in the United States, suggesting that many students who could benefit from technology-related workforce training do not have access to a comprehensive career preparation program. A study of Georgia Tech's online computer science master's program suggested that program location could be a significant barrier; Goodman, Melkers, and Pallais (2017) found that the increased flexibility of an online program for mid-career students was key to their enrollment in any additional education.

Lastly, prices for comprehensive career preparation programs are significant. Median tuition for a full-time comprehensive career preparation program is $13,500; roughly equivalent to three semesters of undergraduate study or one year (two semesters) of graduate study at a public, in-state university at which students are eligible for federal, state, and institutional loan and grant aid. Although financial aid from colleges or bootcamps may make covering these costs feasible for students, the extent to which financial aid is available for bootcamp students is unclear and, because the lenders in this market are private entities, so are the terms and availability of the educational loans for this sector.

The stringent admissions requirements at many comprehensive career preparation programs, the in-person pedagogical model, the geographic concentrations of these programs, and the cost—which, on average, exceeds the cost of one year of graduate school at a public institution—may deter many potential students with fewer financial resources. This evidence, combined with Eggleston's (2016b) finding that 76 percent of bootcamp graduates have at least a bachelor's degree, may indicate that rather than providing a shortcut to a high-paying career for students who cannot afford the time or cost of a traditional 4-year institution, comprehensive career preparation programs are simply providing vocational training to well-resourced students who have already demonstrated their academic proficiency by earning a bachelor's degree.

In sum, bootcamps and the programs they offer vary widely in format and content but may serve a much narrower group of students than public discourse would indicate. Our research lays the groundwork for better understanding the industry and should serve as a springboard for further study tackling questions regarding the industry and its students. Future research should seek to learn more about cost and financial aid, program offerings, and student outcomes from a representative set of institutions. To better understand this rapidly-changing and alternative educational option, future research should learn from bootcamp students about access by demographic characteristics, completion rates, and post-completion outcomes including debt and employment.

References

Alstete, J. W. (2004). *Accreditation matters: Achieving academic recognition and renewal* (ASHE-ERIC Higher Education Report, *30*[4]). Hoboken, NJ: Wiley.

American Council of Trustees and Alumni. (2007). *Why accreditation doesn't work and what policymakers can do about it.* Retrieved from https://www.goacta.org/images/download/why_accreditation_doesnt_work.pdf

Andrews, M. (2013, July 17). Relevance in the marketplace. *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/blogs/stratedgy/relevance-marketplace

Baker, P. (2015, March 9). Obama opens US effort to fill high-paying tech jobs. *The New York Times*. Retrieved from https://www.nytimes.com/2015/03/10/us/obama-kicks-off-us-effort-to-fill-high-paying-tech-jobs.html

Bielick, S., Cronen, S., Stone, C., Montaquila, J., & Roth, S. (2013). *The Adult Training and Education Survey (ATES) pilot study: Technical report* (NCES 2013–190). Retrieved from https://nces.ed.gov/pubs2013/2013190.pdf

Brown, J. & Kurzweil, M. (2017). *The complex universe of alternative postsecondary credentials and pathways.* Retrieved from https://www.amacad.org/content/publications/publication.aspx?d=22786

Bureau for Private Postsecondary Education. (n.d.). *Approved institutions.* Retrieved from https://app.dca.ca.gov/bppe/default.asp

Bureau of Labor Statistics. (2017). *Employment projections: Table 1.1 Employment by major occupational group, 2014 and projected 2024*. Retrieved from http://www.bls.gov/emp/tables/emp-by-major-occupational-group.htm

Council on Integrity in Results Reporting. (2017). *Published data.* Retrieved from http://cirr.org/data

Course Report. (2018). *Course Report.* Retrieved from https://www.coursereport.com/

Crispe, I. (2017). *14 alternatives to Dev Bootcamp*. Retrieved from https://www.coursereport.com/blog/dev-bootcamp-alternatives#impact

Craig, C. (2014, May 23). Boot camp backlash: Cracks in the code academies. *InfoWorld.* Retrieved from http://www.infoworld.com/article/2608334/it-training/boot-camp-backlash--cracks-in-the-code-academies.html

Credential Engine. (2018). *Counting US secondary and postsecondary credentials.* Retrieved from http://credentialengine.org/content/articles/Counting_US_Secondary_and_Postsecondary_Credentials_April_2018.pdf

Eggleston, L. (2016a, June 22). 2016 coding bootcamp market size study. *Course Report*. Retrieved from https://www.coursereport.com/reports/2016-coding-bootcamp-market-size-research

Eggleston, L. (2016b, September 14). 2016 Course Report alumni outcomes & demographics study. *Course Report*. Retrieved from https://www.coursereport.com/reports/2016-coding-bootcamp-job-placement-demographics-report

Eggleston, L. (2017, July 19). 2017 coding bootcamp market size study. *Course Report*. Retrieved from https://www.coursereport.com/reports/2017-coding-bootcamp-market-size-research

Ewert, S., & Kominski, R. (2014). *Measuring alternative education credentials: 2012. Household Economic Studies*. Washington, DC: US Census Bureau, Economics and Statistics Administration, US Department of Commerce.

Executive Order No. 13801 of Jun 15, 2017. *3* C.F.R. 28229–28232 (2017).

Fain, P. (2015a, October 21). New lender for a new market. *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/news/2015/10/21/skills-fund-aims-be-accreditor-and-private-lender-growing-boot-camp-sector

Fain, P. (2015b, September 18). When regulation pays. *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/news/2015/09/18/general-assembly-leads-coding-boot-camps-regulated-side-higher-education

Fain, P. (2018). On-ramps and off-ramps: Alternative credentials and emerging pathways between education and work. *Inside Higher Ed* (Special Report). Retrieved from https://www.insidehighered.com/content/alternative-credentials-and-emerging-pathways-between-education-and-work

Goodman, J., Melkers, J., & Pallais, A. (2017). *Can online delivery increase access to education?* NBER Working Paper No. 22754. Retrieved from https://www.nber.org/papers/w22754.pdf

Hagelskamp, C., Schleifer, D., & DiStasi, C. (2014). *Profiting higher education? What students, alumni and employers think about for-profit colleges. A research report by public agenda*. Retrieved from https://files.eric.ed.gov/fulltext/ED547411.pdf

Hart Research Associates. (2015). *Falling short? College learning and career success.* Presented to The Association of American Colleges and Universities. Retrieved from https://www.aacu.org/leap/public-opinion-research/2015-slides

Kessler, S. (2015, August 24). Where are the women in tech? Coding bootcamps. *Fast Company.* Retrieved from https://www.fastcompany.com/3050171/where-are-the-women-in-tech-coding-bootcamps

Kirkham, C. (2015, April 14). *US fines Corinthian Colleges $30 million over false job placement rates*. Retrieved from https://www.latimes.com/business/la-fi-corinthian-colleges-fine-20150414-story.html

Korn, M. & Weber, L. (2014, May 20). Coding schools tone down rosy job script. *The Wall Street Journal*. Retrieved from https://www.wsj.com/articles/coding-schools-tone-down-rosy-job-script-1400629627

Lewin, T. (2014, October 13). Web-era trade schools, feeding a need for code. *The New York Times*. Retrieved from https://www.nytimes.com/2014/10/14/us/web-era-trade-schools-feeding-a-need-for-code.html

Lohr, S. (2015, July 28). As tech booms, workers turn to coding for career change. *The New York Times*. Retrieved from https://www.nytimes.com/2015/07/29/technology/code-academy-as-career-game-changer.html

McBride, S. (2016, December 6). Want a job in Silicon Valley? Keep away from coding schools. *Bloomberg Technology*. Retrieved from https://www.bloomberg.com/news/features/2016-12-06/want-a-job-in-silicon-valley-keep-away-from-coding-schools

McKenzie, L. (2017, August 24). Military victor for alternative providers. *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/news/2017/08/24/new-gi-bill-includes-75-million-noncollege-provider-program-veterans

National Center for Education Statistics. (2016). *2016 digest of education statistics.* Retrieved from https://nces.ed.gov/programs/digest/2016menu_tables.asp

Nichols, S. (2015, October 23). Coding academies are nonsense.*TechCrunch.* Retrieved from https://techcrunch.com/2015/10/23/coding-academies-are-nonsense/

Oliver, A. C. (2012). Is a computer science degree worth the paper it's printed on? *InfoWorld*. Retrieved from https://www.infoworld.com/article/2615800/it-training/is-a-computer-science-degree-worth-the-paper-it-s-printed-on-.html

Pender, K. (2017, July 18). Dev Bootcamp couldn't tough out industry shakeout. *San Francisco Chronicle*. Retrieved from https://www.sfchronicle.com/business/networth/article/Dev-Bootcamp-couldn-t-tough-out-industry-11297909.php

Powers J. F. (2017). *Open source micro diplomas: New credentials for new learning* (CUNY Academic Works). New York, NY: City University of New York. Retrieved from https://academicworks.cuny.edu/gc_etds/2001/

Radford, A. W., Robles, J., Cataylo, S., Horn, L., Thorton, J., & Whitfield, K. E. (2014). The employer potential of MOOCs: A mixed-methods study of human resource professionals' thinking on MOOCs. *The International Review of Research in Open and Distributed Learning*, *15*(5). https://doi.org/10.19173/irrodl.v15i5.1842

Rothwell, J. (2012, June 1). The need for more STEM workers. *The Avenue.* Retrieved from https://www.brookings.edu/blog/the-avenue/2012/06/01/the-need-for-more-stem-workers/

Schmidt, C. (2015, October 11). *Coding bootcamps don't need accreditation, so why are they chasing it?* Retrieved from https://www.linkedin.com/pulse/coding-bootcamps-dont-need-accreditation-so-why-chasing-clint-schmidt/

Shireman, R. (2015, September 2). *How not to destroy quality at coding boot camps.* Retrieved from https://tcf.org/content/commentary/how-not-to-destroy-quality-at-coding-boot-camps

Smith, A. (2015, May 27). *FTC tangles with for-profits*. Retrieved from https://www.insidehighered.com/news/2015/05/27/federal-trade-commission-charges-ashworth-college-deceptive-marketing

Steven M., Schroeder, J., Riper, D. V., & Ruggles, S. (2017). *IPUMS National Historical Geographic Information System: Version 12.0* [Database]. Minneapolis, MN: University of Minnesota. https://doi.org/10.18128/D050.V12.0

SUNY Empire State College. (2016, August 15). *US Department of Education selects SUNY Empire State College, Flatiron School, and ANSI to participate in EQUIP Program* [Press release]. Retrieved from https://development.esc.edu/news/releases/2016/equip-federal-financial-aid.html

Switchup. (2016). *The official SwitchUp survey—2014 to 2016*. Retrieved from https://www.switchup.org/research/are-coding-bootcamps-worth-it-job-placement-market

Thayer, K., & Ko, A. J. (2017). Barriers faced by coding bootcamp students. Paper presented at 13th Annual ACM International Computing Education Research (ICER) Conference, Tacoma, WA. Retrieved from https://www.switchup.org/rankings/coding-bootcamp-survey-2016 https://doi.org/10.1145/3105726.3106176

Truong, A. (2013, December 17). Become an iOS developer in 8 weeks: The truth about hack schools. *Fast Company*. Retrieved from https://www.fastcompany.com/3023456/become-an-ios-developer-in-8-weeks-the-truth-about-hack-schools

US Census Bureau. (2015). *Delineation files*. Retrieved from https://www.census.gov/geographies/reference-files/time-series/demo/metro-micro/delineation-files.html

US Department of Education. (2015, October 15). Federal Register Notice inviting postsecondary educational institutions to participate in experiments under the Experimental Sites Initiative; federal student financial assistance programs under Title IV of the Higher Education Act of 1965, as amended. *Federal Register, 80*(199). Retrieved from https://ifap.ed.gov/fregisters/attachments/FR101515InvitationtoParticipateintheExperSitesInitiative.pdf

US Department of Education. (2016, August 16). *Fact sheet: ED launches initiative for low-income students to access new generation of higher education providers.* Retrieved from https://www.ed.gov/news/press-releases/fact-sheet-ed-launches-initiative-low-income-students-access-new-generation-higher-education-providers

Wan, T. (2017, June 14). What is "quality"? Task force seeks comment on higher-ed outcomes reporting standards. *EdSurge*. Retrieved from https://www.edsurge.com/news/2017-06-14-what-is-quality-task-force-seeks-comment-on-higher-ed-outcomes-reporting-standards

Watters, A. (2012a, May 13). Paying to learn (to program). *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/blogs/hack-higher-education/paying-learn-program

Watters, A. (2012b, December 16). Top ed-tech trends of 2012: Learning to code. *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/blogs/hack-higher-education/top-ed-tech-trends-2012-learning-code

Watters, A. (2017, July 22). Why are coding bootcamps going out of business. *Hack Education*. Retrieved from http://hackeducation.com/2017/07/22/bootcamp-bust

White House. (2015, March 9). *Fact sheet: President Obama launches new TechHire initiative* [Press release]. Retrieved from https://obamawhitehouse.archives.gov/the-press-office/2015/03/09/fact-sheet-president-obama-launches-new-techhire-initiative

White House. (2016, February 4). *Fact sheet: President Obama proposes new 'first job funding to connect young Americans with jobs and skills training to start their careers*[Press release]. Retrieved from https://obamawhitehouse.archives.gov/the-press-office/2016/02/04/fact-sheet-president-obama-proposes-new-first-job-funding-connect-young

Young, J. R. (2017, August 3). Coding bootcamps won't save us all. *EdSurge*. Retrieved from https://www.edsurge.com/news/2017-08-03-coding-boot-camps-won-t-save-us-all

Appendix

Table A.1. Programs determined to be out of scope

Reasons for excluding a program	Number of programs excluded
Total	**900**
Accredited	19
Enterprise	12
For kids	28
Insufficient information	54
Lack of substantial instruction and/or interaction	4
Not an education company	7
Not cohort based	68
Closed or not currently offered	368
Too short (less than 1 week)	183
Online tutorial or massive open online course	36
Not STEM	121
At institution with in-scope programs	344

Source: 2017 Bootcamp Universe Study.

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Table A.2. Distribution of bootcamp programs, by type and primary subject area

	Worldwide		United States/ Canada/online		United States		Canada		Online		International	
	Percentage distribution	Number of programs	Percentage distribution	Number of programs	Percentage distribution	Number of programs	Percentage distribution	Number of programs	Percentage distribution	Number of programs	Percentage distribution	Number of programs
Program type												
Comprehensive career preparation programs	55.8%	774	50.2%	507	50.8%	405	42.4%	25	50.3%	77	70.8%	267
Courses	35.0%	485	38.4%	388	35.2%	281	57.6%	34	47.7%	73	25.7	97
University-affiliated programs	5.1%	71	7.0%	71	8.9%	71	0.0%	0	0.0%	0	0.0%	0
Fellowship programs	3.7%	52	4.0%	40	4.6%	37	0.0%	0	2.0%	3	3.2%	12
Postsecondary education replacement programs	0.4%	5	0.4%	4	0.5%	4	0.0%	0	0.0%	0	0.3%	1
Subject area												
Computer science	81.4%	1129	80.6%	814	80.1%	639	96.6%	57	77.1%	118	83.6%	315
Web development	59.0%	818	58.9%	595	59.5%	475	64.4%	38	53.6%	82	59.2%	223
Software/web design	9.2%	127	9.0%	91	7.5%	60	22.0%	13	11.8%	18	9.5%	36
Mobile app development	6.4%	89	6.5%	66	7.0%	56	10.2%	6	2.6%	4	6.1%	23
Software development/ engineering	5.6%	77	5.0%	50	4.6%	37	0.0%	0	8.5%	13	7.2%	27
Other	1.3%	18	1.2%	12	1.4%	11	0.0%	0	0.7%	1	1.6%	6
Data science/engineering	16.9%	235	17.1%	173	17.0%	136	3.4%	2	22.9%	35	16.4%	62
Information technology/ security	1.7%	23	2.3%	23	2.9%	23	0.0%	0	0.0%	0	0.0%	0

Notes: Statistics represent the universe of bootcamp programs offered worldwide (or online) as of June 30, 2017. A single program is offered uniquely by an institution for each location, intensity (full time/part time), and length. Detail may not sum to totals due to rounding.
Source: 2017 Bootcamp Universe Study.

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Table A.3. Average, median, and maximum number of programs offered by US and Canadian STEM-related alternative credential institutions offering specific programs as of June 30, 2017, by program types and characteristics

	All institutions			Program type					
				Comprehensive career preparation programs			Course		
	Average	Median	Max	Average	Median	Max	Average	Median	Max
Program type	5.1	3	115	3.6	2	56	5.5	3	59
Program area									
Computer science	4.6	2	81	3.4	2	45	4.9	2	36
Web development	3.8	2	45	2.8	2	21	4.1	2	24
Software/web design	3.1	2	23	2.2	1	11	2.8	2	12
Mobile app development	3.7	2	22	4.0	2	22	2.3	2	6
Software development/engineering	1.8	1	4	1.8	1	4	1.0	1	1
Other	1.7	1	6	2.3	1	6	1.0	1	1
Data science/engineering	4.6	2	34	2.5	1	11	5.4	3	23
Information technology/security	2.9	2	9	2.9	2	9	1.0	1	1
Intensity									
Full time	3.1	2	56	3.1	2	56	2.7	2	8
Computer science	3.0	2	45	.0	2	45	2.9	2	8
Web development	2.4	2	16	2.4	1	16	2.6	2	8
Software/web design	2.1	1	11	2.2	1	11	1.0	1	1
Mobile app development	4.0	2	22	4.0	2	22	2.0	2	3
Software development/engineering	1.4	1	4	1.4	1	3	0.0	0	0
Other	2.3	1	6	3.5	4	6	0.0	0	0
Data science/engineering	3.2	2	11	2.9	2	11	1.0	1	1
Information technology/security	2.8	2	6	2.8	2	6	0.0	0	0
Part time	4.2	2	59	2.3	2	13	5.6	3	59
Computer science	3.6	2	46	2.2	2	12	5.0	2	36
Web development	3.0	2	34	2.1	2	10	4.1	2	24
Software/web design	2.6	2	12	1.2	1	2	2.9	2	12
Mobile app development	2.0	1	6	1.3	1	2	2.4	2	6
Software development/engineering	1.4	1	3	1.3	1	2	1.0	1	1
Other	1.0	1	1	1.0	1	1	1.0	1	1
Data science/engineering	3.9	2	23	1.5	1	4	5.3	3	23
Information technology/security	2.0	2	3	1.8	2	3	1.0	1	1
Location type									
Online	5.1	2	110	.7	2	55	5.9	3	55
In person	2.8	2	14	1.9	2	8	2.8	2	7

Notes: Statistics refer to the number of programs offered at each institution for institutions that offer programs with specified characteristics. A single program is offered uniquely by an institution for each location, intensity (full time/part time), and length. Programs of the same name are counted more than once if they are offered in more than one city or in more than one format (intensity, length).

Source: 2017 Bootcamp Universe Study.

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Table A.4. Number and percent of US and Canadian bootcamps offering specific programs types and characteristics

	All institutions		Program type			
			Comprehensive career preparation programs		Course	
	Average	Median	Average	Median	Average	Median
Number of bootcamps offering	198	100.0	141	71.2	70	35.4
Program area						
Computer science	178	89.9	127	90.1	61	87.1
Web development	155	78.3	109	77.3	56	80.0
Software/web design	29	14.6	19	13.5	17	24.3
Mobile app development	18	9.1	9	[a]	9	[a]
Software development/engineering	28	14.1	21	14.9	5	[a]
Other	7	a	4	[a]	1	[a]
Data science/engineering	38	19.2	21	14.9	16	22.9
Information technology/security	8	[a]	7	[a]	1	[a]
Intensity						
Full time						
Computer science	124	62.6	103	73.0	9	[a]
Web development	107	54.0	90	63.8	8	[a]
Software/web design	15	7.6	14	9.9	1	[a]
Mobile app development	11	5.6	8	[a]	2	[a]
Software development/engineering	19	9.6	16	11.3	0	[a]
Other	4	[a]	2	a	0	[a]
Data science/engineering	20	10.1	12	8.5	1	[a]
Information technology/security	4	[a]	4	[a]	0	[a]
Part time						
Computer science	124	62.6	57	40.4	55	78.6
Web development	111	56.1	46	32.6	50	71.4
Software/web design	23	11.6	9	[a]	16	22.9
Mobile app development	11	5.6	3	[a]	7	[a]
Software development/engineering	17	8.6	11	7.8	5	[a]
Other	3	[a]	2	[a]	1	[a]
Data science/engineering	28	14.1	12	8.5	16	22.9
Information technology/security	6	[a]	5	[a]	1	[a]
Intensity						
Only full time	62	31.3	75	53.2	6	[a]
Only part time	56	28.3	27	19.1	60	85.7
Both full time and part time	80	40.4	39	27.7	4	[a]

(continued)

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Table A.4. Number and percent of US and Canadian bootcamps offering specific programs types and characteristics *(continued)*

	All institutions		Program type			
			Comprehensive career preparation programs		Course	
	Average	Median	Average	Median	Average	Median
Program type offered by institution						
Comprehensive career preparation programs	—	—	141	100.0	51	72.9
Courses	—	—	51	36.2	70	100.0
University-affiliated programs	—	—	0	[a]	1	[a]
Fellowships	—	—	2	[a]	2	[a]
Postsecondary education replacement programs	—	—	0	[a]	0	[a]
Location type						
In person	169	85.4	117	83.0	53	75.7
Online	54	27.3	41	29.1	26	37.1
Only in person	144	72.7	100	70.9	44	62.9
Only online	29	14.6	24	17.0	17	24.3
Both in person and online	25	12.6	17	12.1	9	[a]
Number of cities (excludes online courses)						
One	116	68.6	97	82.9	50	94.3
Two	25	14.8	20	17.1	7	[a]
Three or more	28	16.6	24	20.5	13	24.5

— Not available.

[a] Fewer than 10 cases.

Notes: Statistics represent the universe of bootcamps offering bootcamp programs in the United States, Canada, or online as of June 30, 2017. A single program is offered uniquely by an institution for each location, intensity (full time/part time), and length. Detail may not sum to totals due to rounding.

Source: 2017 Bootcamp Universe Study.

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Table A.5. Comprehensive career preparation programs: subject area and characteristics

	All subjects	Subject area							
		Computer science					Other	Data science/ engineering	Information technology/ security
		Computer science total	Web development	Software/web design	Mobile app development	Software development/ engineering			
Total percentage	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total number of programs	507	434	310	42	36	37	9	53	20
Intensity									
Full time	69.63%	70.74%	69.03%	73.81%	88.89%	62.16%	[a]	66.04%	55.00%
Part time	30.37%	29.26%	30.97%	26.19%	11.11%	37.84%	[a]	33.96%	45.00%
Median price	$11,900	$11,000	$10,085	$11,500	$13,500	$12,500	[a]	$15,950	$11,950
Full-time programs	$13,500	$12,973	$12,000	$13,950	$13,500	$13,750	[a]	$15,950	[a]
Part-time programs	$7,500	$7,500	$7,500	$9,500	[a]	$11,500	[a]	$6,600	[a]
Median price per week (full-time programs)	$1,050	$1,046	$908	$1,250	$1,125	$1,083	[a]	$1,329	[a]
Financial aid									
Offering any assistance	89.0%	90.1%	91.0%	90.5%	100.0%	89.2%	[a]	88.7%	65.0%
Skills Fund	38.3%	38.5%	38.4%	40.5%	22.2%	59.5%	[a]	32.1%	50.0%
Climb	35.1%	36.2%	30.6%	57.1%	69.4%	35.1%	[a]	35.8%	10.0%
Scholarships	26.2%	28.6%	34.8%	2.4%	13.9%	24.3%	[a]	15.1%	5.0%
Average length (weeks)—all	16.5	16.4	16.3	15.9	14.8	20.3	[a]	16.5	18.2
Full-time programs	13.1	13.1	13.3	11.3	13.9	13.6	[a]	12.2	13.8
Part-time programs	24.3	24.3	23.1	28.9	[a]	31.2	[a]	24.8	[a]
Admissions policy									
Competitive	59.0%	56.9%	50.6%	66.7%	91.7%	56.8%	[a]	77.4%	55.0%
Minimal requirements	16.2%	17.7%	21.0%	14.3%	8.3%	5.4%	[a]	3.8%	15.0%
No requirements	24.9%	25.3%	28.4%	19.0%	0.0%	37.8%	[a]	18.9%	30.0%
Target population									
Women	19.9%	20.3%	22.3%	7.1%	13.9%	29.7%	[a]	24.5%	0.0%
Veterans or active military	18.9%	19.1%	23.5%	7.1%	2.8%	16.2%	[a]	24.5%	0.0%
Racial groups	9.3%	7.8%	8.4%	4.8%	2.8%	13.5%	[a]	24.5%	0.0%
LGBT	2.4%	0.9%	1.3%	0.0%	0.0%	0.0%	[a]	15.1%	0.0%
CIRR[b] affiliation	17.2%	17.1%	15.8%	14.3%	8.3%	43.2%	[a]	7.5%	45.0%
CIRR[b] affiliation (excluding General Assembly)	19.3%	19.0%	16.4%	19.4%	21.4%	43.2%	[a]	9.5%	45.0%
Location type									
In person	84.%8	85.5%	85.2%	81.0%	100.0%	75.7%	[a]	73.6%	100.0%
Online	15.2%	14.5%	14.8%	19.0%	0.0%	24.3%	[a]	26.4%	0.0%

[a] Fewer than 10 cases; [b] Council on Integrity in Results Reporting.

Notes: Statistics represent the universe of comprehensive career preparation programs offered in the United States, Canada, or online as of June 30, 2017. A single program is offered uniquely by an institution for each location, intensity (full time/part time), and length. Prices are included only for programs where prices were listed in US or Canadian dollars. Prices for programs denominated in Canadian dollars were converted to US dollars based on the exchange rate on June 30, 2017 (1.2982 $CAN per 1 USD; exchange rate was obtained at https://www.federalreserve.gov/releases/h10/20170703 on July 12, 2017). Detail may not sum to totals due to rounding.

Source: 2017 Bootcamp Universe Study.

 https://doi.org/10.3768/rtipress.2019.rr.0033.1902

Table A.6. Program type and area of US bootcamp programs, by core-based statistical area (Metropolitan or Micropolitan Statistical Area)

Core-based statistical area	All programs		Comprehensive career preparation programs		Jobs in computer and mathematical occupations	
	Number	Percent of total	Number	Percent of total	Number	Percent of total
Total (United States only)	798	100%	398	100%	4,165,140	100%
Akron, OH	2	0.3%	2	0.5%	7,820	0.19%
Albuquerque, NM	6	0.8%	1	0.2%	8,980	0.22%
Asheville, NC	4	0.5%	2	0.5%	1,940	0.05%
Atlanta-Sandy Springs-Roswell, GA	28	3.5%	14	3.5%	114,580	2.75%
Austin-Round Rock, TX	29	3.6%	11	2.7%	58,880	1.41%
Baltimore-Columbia-Towson, MD	3	0.4%	0	0.0%	62,290	1.50%
Billings, MT	2	0.3%	2	0.5%	1,230	0.03%
Birmingham-Hoover, AL	1	0.1%	1	0.2%	12,050	0.29%
Boise City, ID	4	0.5%	1	0.2%	8,840	0.21%
Boston-Cambridge-Newton, MA-NH	31	3.9%	11	2.7%	133,660	3.21%
Boulder, CO	8	1.0%	5	1.2%	12,860	0.31%
Bozeman, MT	4	0.5%	4	1.0%	—	—
Cape Girardeau, MO-IL	1	0.1%	1	0.2%	460	0.01%
Cedar Rapids, IA	3	0.4%	1	0.2%	6,030	0.14%
Charleston-North Charleston, SC	8	1.0%	2	0.5%	9,990	0.24%
Charlotte-Concord-Gastonia, NC-SC	18	2.3%	5	1.2%	43,500	1.04%
Chattanooga, TN-GA	1	0.1%	1	0.2%	4,520	0.11%
Cheyenne, WY	2	0.3%	1	0.2%	900	0.02%
Chicago-Naperville-Elgin, IL-IN-WI	36	4.5%	17	4.2%	149,500	3.59%
Cleveland-Elyria, OH	6	0.8%	5	1.2%	28,390	0.68%
Colorado Springs, CO	3	0.4%	3	0.7%	14,430	0.35%
Columbia, SC	1	0.1%	1	0.2%	10,830	0.26%
Columbus, OH	8	1.0%	6	1.5%	43,420	1.04%
Dallas-Fort Worth-Arlington, TX	19	2.4%	7	1.7%	139,740	3.35%
Denver-Aurora-Lakewood, CO	26	3.3%	16	4.0%	66,960	1.61%
Detroit-Warren-Dearborn, MI	3	0.4%	3	0.7%	63,810	1.53%
Durham-Chapel Hill, NC	13	1.6%	4	1.0%	17,370	0.42%
Greenville-Anderson-Mauldin, SC	2	0.3%	1	0.2%	7,100	0.17%
Houston-The Woodlands-Sugar Land, TX	8	1.0%	3	0.7%	80,780	1.94%
Indianapolis-Carmel-Anderson, IN	2	0.3%	1	0.2%	31,540	0.76%
Kahului-Wailuku-Lahaina, HI	2	0.3%	1	0.2%	400	0.01%
Kansas City, MO-KS	3	0.4%	1	0.2%	44,310	1.06%
Las Vegas-Henderson-Paradise, NV	4	0.5%	2	0.5%	12,810	0.31%
Lexington-Fayette, KY	1	0.1%	1	0.2%	4,950	0.12%
Little Rock-North Little Rock-Conway, AR	3	0.4%	0	0.0%	10,910	0.26%
Los Angeles-Long Beach-Anaheim, CA	36	4.5%	20	4.9%	161,410	3.88%

(continued)

Table A.6. Program type and area of US bootcamp programs, by core-based statistical area (Metropolitan or Micropolitan Statistical Area) *[continued]*

Core-based statistical area	All programs		Comprehensive career preparation programs		Jobs in computer and mathematical occupations	
	Number	Percent of total	Number	Percent of total	Number	Percent of total
Louisville/Jefferson County, KY-IN	2	0.3%	2	0.5%	13,860	0.33%
Memphis, TN-MS-AR	6	0.8%	5	1.2%	9,540	0.23%
Miami-Fort Lauderdale-West Palm Beach, FL	16	2.0%	13	3.2%	54,470	1.31%
Milwaukee-Waukesha-West Allis, WI	1	0.1%	1	0.2%	25,930	0.62%
Minneapolis-St. Paul-Bloomington, MN-WI	4	0.5%	4	1.0%	82,440	1.98%
Missoula, MT	4	0.5%	4	1.0%	1,250	0.03%
Nashville-Davidson-Murfreesboro-Franklin, TN	8	1.0%	5	1.2%	23,290	0.56%
New Orleans-Metairie, LA	9	1.1%	3	0.7%	7,550	0.18%
New York-Newark-Jersey City, NY-NJ-PA	104	13.0%	50	12.3%	289,130	6.94%
Omaha-Council Bluffs, NE-IA	7	0.9%	6	1.5%	19,270	0.46%
Orlando-Kissimmee-Sanford, FL	6	0.8%	1	0.2%	31,090	0.75%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	11	1.4%	5	1.2%	95,260	2.29%
Phoenix-Mesa-Scottsdale, AZ	13	1.6%	7	1.7%	76,340	1.83%
Pittsburgh, PA	1	0.1%	0	0.0%	35,550	0.85%
Portland-Vancouver-Hillsboro, OR-WA	21	2.6%	11	2.7%	43,130	1.04%
Providence-Warwick, RI-MA	10	1.3%	5	1.2%	15,170	0.36%
Provo-Orem, UT	6	0.8%	3	0.7%	9,890	0.24%
Raleigh, NC	1	0.1%	0	0.0%	34,530	0.83%
Salt Lake City, UT	24	3.0%	8	2.0%	26,450	0.64%
San Antonio-New Braunfels, TX	11	1.4%	7	1.7%	28,580	0.69%
San Diego-Carlsbad, CA	8	1.0%	6	1.5%	49,360	1.19%
San Francisco-Oakland-Hayward, CA	70	8.8%	32	7.9%	135,380	3.25%
San Jose-Sunnyvale-Santa Clara, CA	7	0.9%	1	0.2%	130,550	3.13%
Seattle-Tacoma-Bellevue, WA	45	5.6%	22	5.4%	125,650	3.02%
Sioux Falls, SD	1	0.1%	1	0.2%	4,430	0.11%
St. Louis, MO-IL	13	1.6%	12	3.0%	46,000	1.10%
Tampa-St. Petersburg-Clearwater, FL	5	0.6%	4	1.0%	41,230	0.99%
Tulsa, OK	1	0.1%	1	0.2%	8,440	0.20%
Urban Honolulu, HI	5	0.6%	5	1.2%	8,140	0.20%
Washington-Arlington-Alexandria, DC-VA-MD-WV	27	3.4%	11	2.7%	223,490	5.37%
Wilmington, NC	5	0.6%	2	0.5%	1,870	0.04%
Winston-Salem, NC	6	0.8%	4	1.0%	4,740	0.11%
Outside of CBSA	9	1.1%	7	1.7%	—	—

— Not available.

[a] The total does not equal 100% as no data are available for the Bozeman, MT, CBSA, and jobs outside of CBSAs, and CBSAs with no bootcamps are not included in this analysis.

Notes: Statistics represent the universe of comprehensive career preparatory programs offered in the United States, Canada, or online as of June 30, 2017. A single program is offered uniquely by an institution for each location, intensity (full time/part time), and length.

Source: 2017 Bootcamp Universe Study; Occupational Employment Statistics, 2016.

Table A.7. Number and characteristics of programs included in Course Report bootcamp definition

	All programs	Comparison to Course Report
Total	**100.0%**	
Number of programs	240	—
Number of bootcamps	98	95
Program area		
Computer science	100.0%	100.0%
Web development	81.7%	94.8%
Mobile app development	18.3%	5.2%
Price (USD)		
Average total price	$10,717	$11,400
25th percentile	$11,050	—
Median total price	$7,750	—
75th percentile	$13,750	—
Average length	10.5	14.1
Admissions policy		
Competitive	57.9%	—
Minimal requirements	22.1%	—
No requirements	20.0%	—
CIRR affiliation	17.5%	—

— Not available from Course Report 2017 Market Sizing Report. (Eggleston, 2017).

Notes: Statistics represent the universe of bootcamp programs: full-time, in-person bootcamp programs focused on full-stack web development, mobile development, or front-end web development offered in the United States or Canada as of June 30, 2017. A single program is offered uniquely by a bootcamp for each location, intensity (full time/part time), and length. Prices are included only for programs where prices were listed in US or Canadian dollars. Prices for programs denominated in Canadian dollars were converted to US dollars based on the exchange rate on June 30, 2017 (1.2982 $CAN per 1 USD; exchange rate was obtained at https://www.federalreserve.gov/releases/h10/20170703 on July 12, 2017). Details may not sum to totals due to rounding.

Source: 2017 Bootcamp Universe Study. Course Report 2017 Market Sizing Report. (Eggleston, 2017).

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