INSTITUTE FOR DEFENSE ANALYSES

Impact of Professional Credentials on Employability

James Belanich
Emily A. Fedele
Christian Dobbins
John E. Morrison
Franklin L. Moses
Poornima Madhavan

March 2019

IDA Document D-10553

Log: H 19-000134

INSTITUTE FOR DEFENSE ANALYSES
4850 Mark Center Drive
Alexandria, Virginia 22311-1882

The Institute for Defense Analyses is a non-profit corporation that operates three federally funded research and development centers to provide objective analyses of national security issues, particularly those requiring scientific and technical expertise, and conduct related research on other national challenges.

About This Publication

This work was conducted by the Institute for Defense Analyses (IDA) under contract HQ0034-14-D-0001, Project BE-2-4570, "Review of Impact of Credentials and Licensure on Employability," for the Under Secretary of Defense (Personnel and Readiness), Voluntary Eduction Office. The views, opinions, and findings should not be construed as representing the official position of either the Department of Defense or the sponsoring organization.

For More Information

James Belanich, Project Leader
jbelanic@ida.org, 703-845-6606

Leonard J. Buckley, Director, Science and Technology Division
lbuckley@ida.org, 703-578-2800

INSTITUTE FOR DEFENSE ANALYSES

IDA Document D-10553

Impact of Professional Credentials on Employability

James Belanich
Emily A. Fedele
Christian Dobbins
John E. Morrison
Franklin L. Moses
Poornima Madhavan

Executive Summary

Background

This report supports the execution of a request outlined in National Defense Authorization Act FY19 for DoD to provide a review of the academic literature on the impact on a person's employability after obtaining a professional credential, specifically, licenses, certifications, and registered apprenticeships. To conduct the literature review on the relationship between employability and obtaining a professional credential (i.e., license, certification or completing a registered apprenticeship), we employed a systematic article-collection process guided by well-defined terms of interest and an established literature review framework. Articles the team obtained during the article-collection process were evaluated with respect to these parameters and subsequently organized into thematic categories to describe the relationship between professional credentials and employability.

Findings

In general, the literature indicates a positive impact on employability for those who obtain a professional credential, although there are some differences across the type of credential. The findings are organized into the four categories: (1) licenses and employability, (2) certifications and employability, (3) apprenticeships and employability, and (4) professional credentials and variables related to employability.

Licenses and Employability

One of the most consistent effects across the available literature on licensing and earnings is that workers who have a license to practice an occupation earn more than workers who do not possess a license in the same or similar occupations. Because individual states are the primary license issuer, many of the economic effects of licenses differ between states—different license requirements and different market or economic factors make it difficult to determine what is due to the license and what is due to economic conditions within states. In general, workers perceived licenses to be useful for getting a job, keeping a job, and marketing themselves to employers or clients and employers consider a license as an indication worker's qualification and legal ability to work in an occupation.

Certification and Employability

The literature indicates that professional certifications may provide an advantage in the hiring process in some occupations. Based on survey data, it appears as though most certification holders

and many hiring managers perceive a benefit to certifications in the hiring process. The influence of certifications on hiring vary across occupations; there are strong advantages in some occupations (e.g., information technology professionals, auto mechanics, and personal trainers) and mixed results in others.

The literature regarding the impact of certification on wages indicates that there are earning benefits for having a certification in some occupations. One of the longitudinal studies that tracked people over time found a significant earnings premium for certification holders during the early stages of their career. For some occupations (e.g., information technology or food service workers) the benefit seemed to be absent at the start of one's career but occurred later, as people gained additional experience on the job.

Apprenticeships and Employability

This review addressed registered apprenticeships only and in general found that completing an apprenticeship program had a positive influence on employability; reports described both the positive relationship of apprenticeships to earnings and detailed positive relationships with hiring across a broad range of skilled labor occupations. Both wage and employment data indicate that those who complete apprenticeships are hired at a greater rate than those in comparison groups (i.e., those who worked in similar fields but didn't participate in an apprenticeship and those who left the apprenticeships midway) and get paid more for their work. Surveys of employers and program participants also show that the majority perceive apprenticeship programs as very useful.

Professional Credentials and Variables Related to Employability

The academic literature indicates that the use of credentials influences the labor market from a supply and demand perspective. For example, mobility across states for some workers in licensed occupations may be limited if other states have more restrictive licensing requirements or do not accept another state's licenses. Also, a review of the literature indicates that avenues for long-term career advancement might be limited owing to the challenges and costs associated with recertification and reissuance of licenses that are mandatory to maintain worker competency and ensure career growth. These restrictions of the labor market may increase the benefits of holding a professional credential, in that the supply of qualified workers may be reduced. This may also cause increased costs to consumers for the services rendered by more highly paid credentialed workers.

There are also some demographic differences in the benefits of acquiring a professional credential. The findings indicate that both licenses and certifications provided a greater earning benefit to women than for men. It is not clear why these differences occur, but it may be due to the wage gap for women being reduced through the acquisition of a credential.

Contents

1. Introduction

When a person obtains a professional credential (e.g., license, certification, apprenticeship), the expectation is that the person has qualifications and competence to perform a particular job. A credentialing body or authority can be a professional society, organization, or governmental agency that establishes guidelines and standards that must be met for a person to obtain or maintain the credential. A credential can be accomplished through various methods like skill-based testing, completed training, and work experience. The assertion by the credentialing authority is that anyone who meets the standards possesses the knowledge, skills, ability, and other attributes that are expected for a person to contribute and perform well in the workforce. The validity of specific credentials or the credentialing authority may affect employment and employability in a number of ways, for example, industry hiring practices. An analysis of the relationship between credentials and employability may provide insight and context for understanding the value of credentials in terms of employability.

This report supports the execution of a request outlined in the National Defense Authorization Act FY19 for DoD to provide a review of the academic literature on the impact on employability after obtaining a professional credential, specifically, licenses, certifications, and registered apprenticeships. This request was preceded by various amendments of U.S. Code (e.g., 10 U.S.C. § 1143 and § 2015, and 38 U.S.C. 38 § 4114) aimed at facilitating the transition of members of the armed forces from service on active duty to civilian employment, DoD instructions (e.g., DoDI 1322.29), and the formation of the DoD Military Credentialing and Licensing Task Force in 2012 to identify military occupational specialties (MOSs) that could readily translate to in-demand civilian jobs. An earlier analysis (Chao and Rumsfeld 2005) found that 92% of Army MOSs have civilian job equivalents subject to licensure or certification and that while DoD did provide some facilitation of post-military career employment for service members, there was much more that could be done as of 2005. Chao and Rumsfeld (2005) identified some gaps and offered a framework for improving DoD's efforts to coordinate training of service members with their attainment of professional credentials

Through military training and tuition assistance, the DoD helps many service members obtain professional credentials that they can use after they leave the military. In addition to easing the transition to civilian life, credentials can be accepted for self-development requirements, help the Services by improving the performance of its members, and provide recruitment and retention incentives (DoD Credentialing Report to Congress 2013).[1] The United Services Military

[1] "NDAA Section 558 – Military Credentialing Pilot Program: Volume 1," United States Department of Defense, September 27, 2013, https://www.cool.navy.mil/pubs/CredentialingReportToCongress_VOL_1-FINAL.pdf.

Apprenticeship Program (USMAP)[2] and the DoD SkillBridge program[3] are two such assistance programs, offering formal and structured on-the-job training from a Department of Labor–registered apprenticeship or internship during active duty. Overall, the current literature review suggests that obtaining a professional credential has a positive impact on employability, but this impact is moderated by additional factors, including type of credential (e.g., license, certification, or apprenticeship), state, and industry/occupation. This literature review discusses these findings in detail.

The goals of this report are twofold: (1) provide a review of the academic literature and published research on the impact of employability after obtaining a credential or professional license and (2) synthesize findings of the literature review, aiming to categorize how certification, licenses, or registered apprenticeships that lead to industry-recognized credentials may have a significant impact. To conduct the literature review on the relationship between employability and obtaining or participating in a certification, license, or apprenticeship, we employed a systematic article-collection process guided by well-defined terms of interest and an established literature review framework. Any article the team obtained during the article collection process was evaluated with respect to these parameters and subsequently organized into thematic categories specific to the research focus at hand.

A. Definition of Credentials

Three types of credentials will be addressed in this literature review: licenses, certifications, and registered apprenticeships. The rationale for limiting the type of credentials to these three types is that they directly apply to a specific occupation (e.g., nurses, teachers, electricians), as opposed to other forms of credentials (e.g., micro-credentials and school certificates that supplement a current skill set, such as curriculum development) that are more general and may be applied to many different occupations. For the purpose of this literature review we developed definitions of the three types of credentials based on those used by the Department of Labor,[4] the Institute for Credentialing Excellence (Knapp et al. 2006), and the U.S. Military Services.[5] These definitions guided the search terms used and subsequent evaluation of the literature:

- *Licenses*—Credential awarded by a governmental licensing agency based on predetermined criteria that may include some combination of degree attainment, certifications, educational certificates, assessments (including state-administered

[2] https://usmap.netc.navy.mil/usmapss/static/trades.htm.

[3] https://www.military.com/hiring-veterans/resources/using-dod-skilbridge-to-recruit-qualified-veterans.html.

[4] https://www.bls.gov/cps/certifications-and-licenses.htm; https://www.bls.gov/cps/certifications-and-licenses-faqs.htm; https://www.careeronestop.org/explorecareers/plan/licensed-occupations.aspx; and https://www.dol.gov/apprenticeship/toolkit/toolkitfaq.htm#1a.

[5] Army (https://www.cool.army.mil/); Navy (https://www.cool.navy.mil/usn/index.htm); Air Force (https://afvec.us.af.mil/afvec/Public/COOL/Default.aspx); Marines (https://www.cool.navy.mil/usmc/).

exams), apprenticeship programs, or work experience; it conveys a legal authority to work in an occupation.

- *Certifications*—Credential awarded by a professional association or industry organization based on an individual demonstrating, through an examination process, that he or she has acquired the designated knowledge, skills, and abilities to perform a specific occupation; it does not convey a legal authority to work in an occupation, but indicates a capability to perform well.
- *Apprenticeships*—Registered Apprenticeships are an industry-based career-preparation system for skilled workers that includes business/employer involvement, structured on-the-job training, related instruction, and wages for the apprentice while working, and upon completion a nationally recognized credential; completion of a Registered Apprenticeship is documented by a Certificate of Completion that is issued by the Office of Apprenticeship of the U.S. Department of Labor (29 C.F.R. Part 29).

B. Literature Review Framework

The intent of this systematic literature review, following the process outlined by Kitchenham (2004) and Petticrew and Roberts (2006), is to address the impact of obtaining credentials on subsequent employability outcomes. "Credentials" and "employability" are broad terms that can be represented by a variety of concepts and expressions. Therefore, we developed a framework to provide context for the breadth of components that we would include as we reviewed the relevant literature, as shown in Figure 1. The general research question we addressed was: What is the impact of credentials on employability?

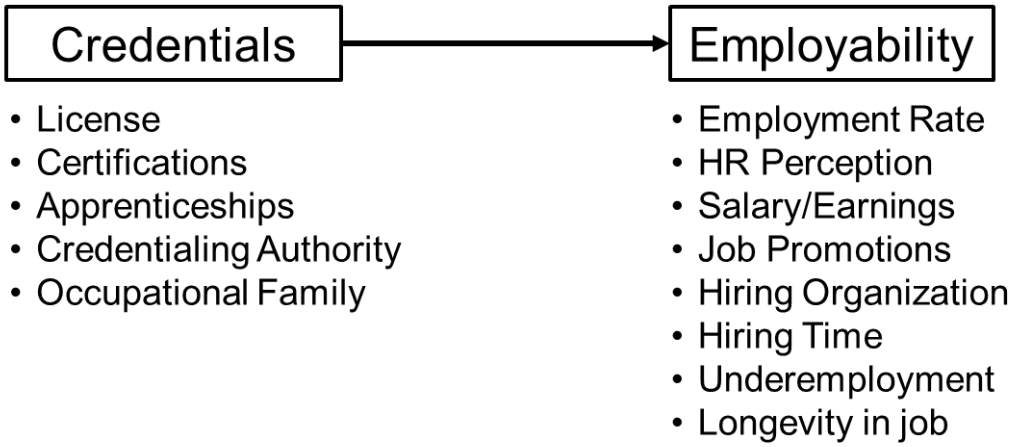

Figure 1. Framework for Analysis of the Impact of Credentials on Employability

The framework was developed to aid in the collection and organization of literature. Due to the nature of the topic, we expected the majority of the literature would address a segment of the framework rather than covering all or most aspects of the credentialing and employability

relationship. For example, a paper might only cover certifications in a single occupational family and the impact of obtaining the certification on a person's starting salary. By reviewing many articles that inform at least some components of the framework we were able to synthesize findings that showed established relationships, generalizing across credential types, occupations, and locations.

2. Method

The method used for the systematic literature review (i.e., determining the research question, collection of literature, rules for inclusion and exclusion, assessment of findings, and synthesis of results) followed the general procedures for a systematic review as described by Kitchenham (2004) and Petticrew and Roberts (2006). Based on the definitions outlined in the introduction and the established literature review framework, we found and evaluated for review 148 articles. Of these 148 articles, 50 met the defined parameters in our literature review framework and are included in the current literature review; 98 articles did not meet some aspect of the defined search parameters in the literature review framework (e.g., the article did not meet the definition of "credential") and were subsequently rejected and not included in the synthesis of findings.

A. Article-Collection Process

This literature review framework described in the introduction guided the article-collection process and evaluation of each article against the criteria that determined if the article was appropriate for the review. Given this, the categories for inclusion and exclusion were the application of the functional definition of the terms defined in the introduction, if the article addressed the relationship between credentials and employability, and the source of the article, as described in more detail below:

- *Application of definition*—The article must adhere to the functional definition of the applicable terms (i.e., license, certification, or apprenticeship). If the article did not adhere to the outlined definitions it was excluded. For example, articles on micro-credentials or obtaining a college degree (i.e., certificate) were excluded since these types of credentials are outside the scope of the current effort's focus (i.e., these are *types* of credentials, but crucially not related to the definitions outlined for this literature review).
- *Relationship between credentials/license and employability*—The article must address the relationship between the applicable term (i.e., license, certification, apprenticeship) and employability. Employability concerned, but was not limited to, employment rate, starting salary, weekly and annual wages, participation in fringe benefit programs, promotion rate, prestige of hiring organization, job longevity, underemployment, hiring time, and human resources (HR) perception. If the article did not address this relationship it was excluded.
- *Source of article*—The article must be from an academic journal (i.e., peer-reviewed source), a technical report (government or organization), published conference

proceedings, dissertation or thesis, or an edited book. Articles from blogs, general newspapers, or magazines were excluded.

In the article-collection process, articles were selected and evaluated for review using the definitions of licenses, certifications, and apprenticeships, and the literature review framework. The article-collection process employed two major resources to locate articles: the IDA library and document search sources.

1. IDA Library

The research team for this project provided the information-management professionals in IDA's library with search terms related to credentials, licenses, apprenticeships, and employability. All articles that the library's information-management professionals provided were initially screened for relevancy by two members of the research team. Those articles deemed applicable were assigned to the members of the research team for review. This process was exhaustive and iterative and continued until the library search results returned basically no new relevant articles, which implied that no additional articles would be found in subsequent searches. The IDA library conducted a total of three complete and exhaustive searches. In the first library search, 42 potential articles were located. Of these articles, the IDA research team deemed 19 appropriate for review based on the search parameters. In the second library search, with adjusted search terms, 51 potential articles were located. Of these articles, 22 were found to be appropriate for review. In the third and final round, 134 potential articles were located, but only 7 were applicable (this final large number of potential articles reflects a liberal expansion of key search terms, resulting in largely unrelated material).

All searches included at least two terms, one indicating a credential or type of credential and another indicating a relevance to employability. The two terms were linked with the Boolean logic term "AND" so that the results must include both Term 1 and 2. The use of AND was used to limit the search to articles that would address a relationship between the two terms; not restricting the search would have returned any document that had either term. For some searches a third term was included to further specify one of the first two terms. Table 1 shows an example of the search terms and the Boolean logic used.

Table 1. An Example of Some Terms Used for the Academic Literature Search

Term 1	Boolean	Term 2	Boolean	Term 3
Credential	AND	Employment	AND	Salary
OR		Employment rate		Earnings
Apprenticeship		Hiring rate		Information Technology
		Promotion rate		Medical professional
		Unemployment rate		Mechanic
		Underemployment		Electrician
		Job retention		Manufacturing
		Tenure		Engineering
				Service industry
				Vocational training
				Labor market outcome
				Labor market return

2. Document Search Sources

The research team also conducted additional searches and located articles on Google Scholar and databases such as ProQuest using search terms like "credential" and "employability" or "credential" and "employment" and "earnings." In addition, the reference sections of already reviewed articles were mined for further potential articles to evaluate. As the researchers reviewed articles, if they found a cited article that might be relevant they would download the article, review it, and determine its relevance for inclusion.

B. Article-Organization Process

A total of 148 articles were identified through the search processes, and they were reviewed by the team to determine if they met the inclusion criteria outlined above. The team determined that 52 articles were relevant. These articles were organized into four overall thematic categories for inclusion the literature review, based on the outlined definition parameters: (1) "licenses and employability" (15 articles); (2) "certifications and employability" (22 articles); (3) "apprenticeships and employability" (10 articles); and (4) the related category, "professional credentials and variables related to employability" (10 articles). (Note that some articles were applicable to more than one category and were categorized as such, which is why the sum of articles in each category exceeds the total number of articles included). The three main categories detail the direct link between the applicable search term and employability and highlight any significant impact that exists. The fourth category provided supporting evidence to the impact of credentialing on the employment market (i.e., quality of a credential within an occupational field, cost of services), which indirectly affects employability for those in a specific occupation.

The articles were ultimately characterized by the functional definition of any applicable terms and not necessarily on the use of the term within an article. In other words, if an article conflated or mixed terms according to our definitions, we characterized the article based on how the term

was being used and not the definition as provided in the article. For example, if an article spoke about the relationship between credentials and employability, but the definition of "credentials" within the article matched our working definition of "license," we characterized this article under "licenses and employability." Categorizing articles was an iterative process, and if during the literature review and synthesis of findings stage an article was found more appropriate for a different section then this article was recategorized.

3. Findings

The findings are organized into the four categories described in the article-organization process: (1) licenses and employability, (2) certifications and employability, (3) apprenticeships and employability, and (4) professional credentials and variables related to employability. The first three categories describe the direct link between the different types of credentials that we analyzed (i.e., licenses, certifications, and apprenticeships) and employability; the fourth category provides relevant evidence of the impact of credentialing on the labor market. The data and methods used across the cited literature are varied; however, most studies focus on analyzing established survey data sets (e.g., state-level data on demographics and employment, U.S. Census data, Current Population Survey Annual Social and Economic Supplement (CPS ASEC)) or on collecting data from structured surveys from specific populations of interest (e.g., employment information from local community colleges).

A. Licenses and Employability

Occupational licensure is often referred to as "the right to practice" in that it is explicitly illegal to work for compensation without first meeting government standards specified by the license (Kim and Chatterji 2018; Kleiner and Vorotnikov 2017; Kleiner and Krueger 2010). The right of U.S. states to enforce occupational regulation was first tested in 1882 when West Virginia passed a law requiring a license to practice medicine. That law was challenged by certain physicians in the state, and the case eventually went to the Supreme Court, who ruled in favor of the state (Dent v. West Virginia, 129 U.S. 114 (1889) as described in Kleiner 2015). This ruling not only established the right of a state to license certain professions but also gave the states preeminence over the Federal Government regarding the regulation of occupational licensing (Kleiner 2015). A few licenses are regulated at higher or lower levels of government, such as federally issued airline pilot licenses and locally granted taxi driver licenses. Nevertheless, most U.S. occupational licenses are administered at the state level (Kleiner and Krueger 2013).

Since the Supreme Court ruling, occupational licensing became increasingly prevalent at the state level. By 1900, licenses were required for physicians, dentists, and lawyers in most states. The number of occupations requiring a license has grown from 30 in 1920 to 1,100 occupations that are regulated by at least 1 state through a license or certification as of 2003 (Kleiner 2015); licenses today are required in both white collar (requiring a degree such as physicians) and blue collar (not requiring a degree such as electricians) professions. The proportion of U.S. workers covered by state-level licensing laws has also increased, from less than 5% in 1950 to as much as 29% in 2006 (Kleiner and Krueger 2010). Generally speaking, license holders view their license

as important for employability (i.e. getting and keeping a job) and career growth (i.e. improving skills and marketability) (Cronen, McQuiggen, and Isenberg 2017).

The sections that follow describe the effect that licenses have on different aspects of employability. Licenses obviously have a direct effect on hiring rate—job seekers who do not have a license will not be considered for an occupation that requires a license. Research on licensing has focused instead on other aspects of employability, for example, earnings and earning potential, which will be discussed in this section. A relevant literature search produced 15 studies with 2 major findings relating to the effects of licensing on employability: (1) licensing influences earnings in some capacity, depending on the state and occupation, and (2) licensing influences additional labor market outcomes, for example, hours worked per week and unemployment rates.

1. Effect of Licensing on Earnings

One of the most consistent effects across the available literature on licensing and earnings, shown in different populations and using diverse research methods, is that workers who have a license to practice an occupation earn more than workers who do not possess a license in the same or similar occupations. The data are based on several state and nationwide surveys of U.S. workers in a wide variety of occupations requiring licensure in some states but not in others, including blue collar (e.g., electricians, plumbers, barbers) and white collar professions (e.g., teachers, accountants, attorneys, nurses, physicians). Kleiner and Vorotnikov (2017) analyzed state-level survey data obtained from the Harris Polling organization. The survey asked individuals 18 or older who were in the labor force questions about their employers, job functions, and demographics. Of the 9,850 people surveyed, 28.43% were licensed. The survey data also revealed that people with licenses have an increase in *hourly* earnings of 11% compared with those without a license. Note, however, that the size of the earning premium varies considerably from state to state. Kleiner and Vorotnikov (2017) also found that licensing had a significantly positive effect on earnings in 16 U.S. states and no effect in 35 states. For states where the earning premium was significant, the advantage in earnings ranged from 21% in Missouri to 47% in Maine. These differences are due in part to the variable economic conditions among the states, but also due to large disparities in state occupational regulations (Summers 2007).

Looking at nationwide data, Kim and Chatterji (2018) analyzed the 2008 Survey of Income and Program Participation (SIPP), a national representative longitudinal survey conducted by the U.S. Census Bureau. The survey contains information on survey respondents' income, employment history, program participation, and demographics. The authors were primarily interested in how license and certifications influence *monthly* gross earnings, controlling for a wide variety of factors such as demographics, education level, and occupational category. Results from ordinary least squares (OLS) regression showed that licenses were associated with an increase in *monthly* earnings of 5.9%. Analyzing *weekly* earnings, Kleiner and Krueger (2010) found that licensed employees have a 10%-15% advantage in weekly earnings over their non-licensed counterparts. In a similar light, Gittleman and Kleiner (2016) compared the labor market

advantages of union membership with having an occupational license, analyzing longitudinal data from the National Longitudinal Survey of Youth (NLSY79) from 1970 to 2010. They found that having a license significantly increased a license holder's wages (i.e., log earnings increased by 0.019 points for those with a license compared with those without a license). Kleiner and Krueger (2010) also note that the license premium for weekly earnings is about the same as for being a union member. But the effect of both requiring a license and belonging to a union is even greater, a 24% increase in hourly wages over either one alone.

Although the licensing advantage on earnings is a pervasive effect nationwide, this advantage varies considerably not only by state but also by occupation. For example, based on a federal survey conducted by Cronen, McQuiggan, and Isenberg (2017; the Adult Training and Education Survey), license holders are most likely to work in health care (31%) and education and library occupations (16%); 47% of these license holders make more than $50,000 annually. Additional studies on other occupations include Thornton and Timmons (2013), who examined the effects of having a massage therapist license using longitudinal data from the American Community Survey for the years 2000 to 2009 in which 10 states enacted licensing legislation. They used an OLS solution to determine the effect of state licensing on hourly earnings and found an earnings advantage of having a massage therapist license ranging from 11.8% to 15.6%, depending on which control variables were added to the regression model, consistent with nationwide findings of a 10% to 15% license advantage (Kleiner and Krueger 2010). In comparison, certain provisions to a barber license provide a substantially larger advantage (Timmons and Thornton 2010). For the barbering occupation, every state requires licensing of some sort; however, some states require license applicants to undergo an apprenticeship program in addition to graduating from barber school. Barbers in states requiring apprenticeships and licenses earn nearly 22% more than barbers working in states that only require the license. On the other hand, Timmons and Thornton (2008) found a smaller license premium, but still positive, for radiologic technologists (RTs) across the 35 of 51 states require RTs to be licensed. These researchers found that RTs working in a state with licensing statutes earn 3.3% more than those working in states without such statutes. Although the licensing advantage is smaller for RTs, it is nevertheless statistically reliable.

In line with the previous point that the effect of licensing on earnings varies by occupation, additional research highlights earning differences between and within occupations. Within the nursing occupation, Law and Marks (2017) found a larger licensing premium for practical nurses (5%–10%) compared with registered nurses (5%–6%). The effect is even larger for minority practical nurses, who showed a 10%–12% advantage for having a license. Kleiner and Park (2010) examined dental hygienists who are licensed in some states to practice some activities independently, without supervision of a dentist. They found that in states where hygienists can be self-employed, hygienists report about 10% higher earnings, but dentists in those states have 16% lower earnings. These findings suggest that even within specific fields there are additional variables (e.g., type of license or ability to practice independently) that influence the degree to which licenses allow for increased earnings.

Finally, the effect of licensing on earnings also varies by demographic information, specifically gender, as noted by Kim and Chatterji (2018). As mentioned above, these authors analyzed the SIPP survey and found a license premium for monthly earnings. In addition to this finding, Kim and Chatterji (2018) reveal an important gender variation in the effects of licenses and certifications on monthly earnings: Holding a license was associated with a 3.4% increase in monthly earnings for men, but at 8.1%, the increase for women was more significant. Further, when the authors expanded their regression model to include additional factors like age, race/ethnicity, marital status, number of children, immigration/citizenship, English proficiency, disability, and region of license, the monthly earnings premium for men dropped to 2.3%, however, for women the earnings premium associated with license-holding remained significantly greater, at 7.0%. Baird, Bozick, and Harris (2017) found additional support of gender effects and demographic differences, but their analysis did not distinguish between license and certifications, so it is not possible to determine the magnitude of the effect from their findings.

In summary, the research shows that license holders have a statistically significant advantage in earnings. The magnitude of this benefit for license holders is, however, moderated by state, prevalence of licensing, occupation, licensing in competing occupations, and gender.

2. Effects of Licensing on Additional Employability Outcomes

Although most research on licensing has focused on the effects on earning, some research has examined additional employability outcomes (e.g., health benefits or additional hours worked). Bailey and Belfield (2018) recently examined the license premium for three levels of college education: some college, associate degree, and a bachelor's/advanced degree. Data on individuals come from the 2017 CPS ASEC, which includes information on earnings, hours and weeks worked, and labor market participation for over 80,000 working-age persons. College-educated workers who had a license, compared with those who did not, reported (1) higher earnings, (2) more hours worked per week, and (3) lower unemployment. In general, these effects were larger for associate degrees than for the other college levels and larger for academic associate degrees than for vocational associate degrees.

Being licensed provides strong earning benefits, increased hours of work, and lower unemployment, but license holders do not seem to benefit over union members in terms of additional employment benefits, like health care. Gittleman and Kleiner (2016) analyzed longitudinal data from NLSY79 from 1970 to 2010 and found that in general, license holders were 12%–13% more likely to have access to employer-provided health insurance and 17%–19% more likely to participate in retirement plans than those without a license. However, when additional variables were included in the regression equations (e.g., demographics, job types, years of schooling/experience, and state of residence), the economic advantage to licensing was reduced.

B. Certification and Employability

Certification indicates that a person, having completing specific occupational training and demonstrating abilities through some practical testing, is well qualified for a specific occupation (Albert 2017; Cronen, McQuiggan, and Isenberg 2017). Certification is a type of professional credential different from educational degrees or educational certificates (education certificates are more similar to degrees than to a professional credential). Both certifications and educational degrees require some amount of coursework and examination; but they differ in who awards the credential (i.e., professional organization for certifications versus educational institution for degrees). A certification represents competency-based skills and a capability to perform a specific job; Cisco-certified network associate and National Institute for Automotive Service Excellence (ASE) certified automotive technicians are examples of certifications. Degrees are awarded in a more general field of study like biology or mathematics. Furthermore, unlike a license, certification does not convey a legal authority to work in an occupation, but nonetheless might be a requirement to work in an occupation (e.g., automotive technician certification) (Albert 2017).

The number of certifications has grown substantially over the past few decades (Bartlett et al. 2005), due largely in part to the skills demanded by the changing economy. Certifications are often divided into two types, vendor-specific certifications and vendor-neutral certifications (Lasheen 2015; Quan, Dattero, and Galup 2007). Vendor-specific certifications are granted by specific vendors and demonstrate someone's knowledge of that vendor's products (e.g., Microsoft information technology (IT) certifications). Vendor-neutral certifications are often granted by professional associations (e.g., National Institute for Automotive Service Excellence). Industry-sponsored credentials are well established and found in a wide range of fields (e.g., IT, automotive service, building trades, health care, and hospitality); the two most common professions for certification holders are health care (17%) and business management and operations (14%) (Cronen, McQuiggan, and Isenberg 2017). Despite this, literature on the benefits of certifications is not as well established as literature on licenses; research on the benefit and value of certification is still in its infancy (DeSilets 2007; Lester, Fertig, and Dwyer 2011) (as reported by Thompson 2014).

Evidence from studies assessing the impact of certifications suggest that obtaining a certification positively influences hiring rates and job retention, in addition to earning potential, but this influence is significantly moderated by occupation type. A relevant literature search produced 22 reports with two major findings: (1) certification robustly influences hiring, and (2) certification positively influences wages, but this finding varies by occupation.

1. Certification and Hiring

Certifications are a way for the credential holder to demonstrate qualifications and knowledge, and they provide a way for people to obtain valuable skills that are needed by the national, state, or local workforce. Obtaining certification therefore may lead to increased hiring rates. Across a number of occupations, obtaining a certification influences hiring rates. Cronen,

McQuiggan, and Isenberg (2017) reported data from the Adult Training and Education Survey that was administered as part of the 2016 National Household Education Surveys Program surveying a national representative sample of 47,744 people in the United States. One of the goals of the survey was to capture the prevalence of non-degree credentials (i.e., occupation certifications) and the perceptions of the usefulness of these credentials in the labor market. Results were that 80% of workers perceived certification as important for getting and keeping a job, and 85% of certification holders reported that the certification was for their current job.

A similar hiring trend appears in Whittington (2017), who analyzed survey results from varied industry representatives (e.g., medical, paralegal, IT, accounting) to see if obtaining certifications in career technical programs at a community college increased hiring opportunities. The data show that of the 61 respondents, 32.78% of those who responded listed some type of national or state certification as a requirement to work in their industry, which included medical technicians, maintenance, cosmetology, paralegal, IT, and accounting. Further, Whittington (2017) reported that 68.85% of respondents said that they give hiring preferences to potential employees if they had a national certification. Note that there is an asymmetry across studies in perception of certifications where the certificate holder (Cronen, McQuiggan, and Isenberg 2017) views the potential of the certificate for hiring as much greater than how industry representatives view the certificate's hiring value (Whittington 2017). At the same time, these perceptual differences between these two studies can be attributed to drastically different research goals and population sizes.

Although there are hiring benefits from having a certification, this finding varies significantly by occupation. One of the most popular and fastest growing fields today in which to obtain a certification is IT (Lasheen 2015; Bureau of Labor Statistics, 2019a). For example, Wright (2015) notes that the Bureau of Labor Statistics in 2014–15 expected an employment growth rate of 37% in information security analysts through 2022, whereas other non-IT occupations are only expected to grow by 11% (Bureau of Labor Statistics, 2019b). Cybersecurity positions are a type of IT job where one is more likely to require a certification than other IT jobs (Burning Glass Technologies 2015). IT certifications, which are required for almost all IT positions, have become the norm for IT education, and they affect hiring decisions and other issues related to employment, like promotion rate and job stability (Lasheen 2015). To understand if hiring preference is given to potential candidates who possess certain IT certifications and to what extent these certifications are valued upon hiring, Todd (2015) analyzed the perception of IT certifications by HR and IT professionals. Todd (2015) surveyed two different groups with 36 HR participants and 36 IT participants in Arkansas and revealed that 50% of the IT participants did not hold an IT certification, but that the majority of HR respondents found these certifications to be valuable when hiring (37.14% reported IT certifications as valuable when hiring and another 25.71% reported them as very valuable).

The preference for potential employees to have an IT certification is also found in Hunsinger and Smith (2009), who showed in a survey of 240 hiring managers across the southeastern United

States that over 85% of respondents would prefer their next IT employee to have one IT certification. In an older study, Bartlett et al. (2005) also reported a similar finding based on a survey of 33 HR executives with at least 245 IT employees in geographically dispersed firms across the United States: 62.5% of employers rated IT industry-sponsored certifications as either important or very important for hiring decisions. Taken together, these studies establish a trend that the IT certifications are viewed as important and influence hiring decisions.

To more concretely quantify the influence of IT certifications on hiring practices, Lasheen (2015) looked at the value of IT certifications (specifically, the Microsoft Certified Information Technology Professional certification) compared with an academic degree in IT. Lasheen (2015) surveyed 334 IT professionals in the Washington, DC, metropolitan area (using an online survey) and found that IT certification plays a major role in IT employment decisions for hiring (in addition to earnings). Lasheen (2015) reported a statistically significant relationship between hiring and type of credential, where those involved in the hiring process favored IT certifications (e.g., Microsoft) over 2- to 4-year academic degrees. On the other hand, those with *academic* IT degrees (2- to 4-year degrees) were less likely to be laid off and more likely to have higher earnings.

The above studies show that IT certifications are seen as positive for hiring. However, the support isn't always so clear. For example, Wiershem, Zhang, and Johnston (2010) surveyed 141 directors of university IT departments and found that they valued experience (60%) more so than certification (40%) in job candidates. Likewise, Heise (2009) reported that of 56 surveyed IT hiring managers, 65% of employers prefer some kind of certification, but 84% reported that they had hired IT-certified employees who did not perform tasks to the hiring mangers' expectations.

Other occupations show that certifications have varying degrees of influence on hiring. In the fitness industry there is a positive influence of certification on hiring. Robinson, Graham, and Bauer (2006) surveyed 394 health clubs in Massachusetts and showed that 80% of hiring managers value certifications over a bachelor's degree in exercise science as employment requirements for personal trainers. In the automotive industry, Thompson (2014) surveyed 157 graduates of automotive programs; respondents indicated a slightly positive hiring influence of an ASE certification (3.90 mean response on a 5-point scale), in addition to positive benefits in terms of getting a job and being promoted. Kolo (2006) also found a positive relationship between ASE certification and job performance: technicians who possessed ASE certifications performed better on the job. Finally, Weber (2006) studied non-managerial food service employees and their managers at 114 fine dining restaurants in Louisiana and found that both managers and employees had a moderate level of agreement that certification assists decision-makers in the hiring process.

The reviewed literature in this subsection highlights that certifications influence hiring practices across multiple occupations, IT being the largest studied occupation. Findings show that certification generally benefits hiring, but this is heavily moderated by occupation.

2. Certification and Earnings

In addition to hiring practices, certifications may lead to increased earnings, but these results vary by occupation and gender. A positive link between certification and earnings was reported by Albert (2017) who analyzed the Educational Longitudinal Survey (ELS), a survey of 15,362 students in 750 schools who were high school sophomores in 2002 and surveyed 10 years later, in 2012 (sample cohort at time of survey between 25and 26 years of age). The variable of interest in this analysis was logged employment-related income (i.e., earnings) as predicted by holding a certification. This relationship was analyzed via four nested regression models. Results show that certification is a robust, consistent, and significant predictor of income, showing an annual earnings premium ranging from 13.6% to 24.5%, a finding that is independent of various background characteristics, such as someone who self-selects into a certification program or someone's employment history. While this survey only analyzed data for an early career cohort, is it one of the only data sources that allows for analysis of characteristics before labor market entry (e.g., past employment and earnings).

Gittleman, Klee, and Kleiner (2018), who assessed earnings across many industries from the national Survey of Income and Program Participation survey, found that certification and licensing increased earnings for a wide variety of occupations such as registered nurses, elementary and middle school teachers, home health aides, truck drivers, secondary school teachers, lawyers, managers, hairdressers, physicians, and accountants. Those with certifications (not licenses) earn approximately 7.5% higher earnings on average than unlicensed and uncertified workers according to an analysis covering 2008–2013. In general it appears as though certification holders tend to have good salaries, as reported in Cronen, McQuiggan, and Isenberg (2017), where half the certification holders reported making more than $50,000, a third making between $20,000–$50,000, and only 17% making less than $20,000.

Turning to specific industry findings, Lasheen (2015) investigated the effect of certifications in earnings, focusing on IT certifications compared with 2- to 4-year academic degrees (in addition to hiring rates; see previous section). In a survey of 188 IT professionals, Lasheen (2015) showed that there is no statistically significant relationship between IT certification and starting salary, but did show a significant relationship between type of credential and *current salary*: those with an academic degree earned more on average than those with just an IT certification, and those with an IT certification and an academic degree had the highest earning potential (more likely to earn more than $80,000). In comparison, Quan, Dattero, and Galup (2007) found a more definitive result for IT certifications, showing that the overall value of IT certifications was associated with increased earnings in each of 9 jobs (e.g., software development, computer operations) and 10 industries (e.g., government; computer/network consultant) (the authors do not note the percent increase).

Additional industry-specific findings highlight the differing effects of certifications across industries. Thornton and Timmons (2013) found for certified massage therapists that certification had a positive but small effect on earnings. Weber (2006) showed in a study in Louisiana of food

servers in 64 fine restaurants that managers agree more strongly than employees that certification enables a worker to gain additional compensation. A survey of 157 employees with ASE certification and 5 or more years of work experience (Thompson 2014) indicate that ASE certification may not help increase earnings.

Finally, significant earning premiums for those who hold certifications vary by gender. In addition to analyzing licenses, Kim and Chatterji (2018) analyzed monthly earning premiums and certifications using the SIPP survey data set. Holding a certification was associated with an 8.6% increase in monthly earnings for men and a 12.4% increase for women. While the authors report that this difference between men and women was not significant, when they account for education-by-certification interactions, certification holding was associated with a large earnings premium for women at the master's degree level. For men, an earning premium was only found for the high-school graduation level.

C. Apprenticeships and Employability

Apprenticeships can be registered with state and federal agencies and lead to formal professional credentials indicating career preparation or they can be unregistered and not clearly linked to specific outcomes. The registered apprenticeships allow program participants to receive documentation of completion from the Office of Apprenticeship of the U.S. Department of Labor, as well as eligibility to work on federally funded construction projects.[6] Registered apprenticeship programs also receive technical assistance and help marketing registered programs. The Department of Labor distinguishes five components of typical apprenticeship programs:[7]

1. Business involvement that allows such programs to exist, either through sponsoring from an individual employer or group of employers, sometimes in partnership with unions, councils, or industry associations.
2. Structured on-the-job training is hands-on, based on national industry standards, and comes from experienced mentors at the job site.
3. Related instruction comes from a collaboration of business and education partners to develop technical and academic competencies, which may be online, at school, or on the job site and may be provided by community colleges, technical schools, or apprenticeship training schools.
4. Offer rewards for skill gains in the form of pay increases as the participants meet skill benchmarks.
5. Graduates of registered apprenticeship programs receive nationally recognized credential indicating full occupational qualification.

---

6 http://www.dol.gov/whd/programs/dbra/faqs/trainees.htm.

7 https://www.dol.gov/apprenticeship/toolkit/toolkitfaq.htm#1a.

The value of apprenticeship programs is to supplement on-the-job training with classroom instruction as the foremost means of preparation for skilled workers in industries such as construction and manufacturing, particularly in the "metal trades."[8] For example, a recent inventory of Michigan's registered apprenticeship programs shows the top-five occupations are electrician, construction craft laborer, carpenter, roofer, and pipe fitter (Public Sector Consultants 2017).

Evidence from studies assessing the impact of apprenticeship programs suggests that completion of apprenticeships results in greater hiring rates, more working hours, and higher earnings. These findings are based on programs sponsored by an individual business or an employer association offering immediate employment for participants and a structured plan to move from a low, no-skill position to full occupational proficiency.[9] A relevant literature search produced 10 reports with two major findings: (1) apprenticeships have a positive impact on earnings, and (2) apprenticeships have a positive impact on hiring. The following sections detail the relationship of apprenticeship programs to employability, including earnings and hiring benefits.

1. Apprenticeships and Earnings

Earnings represent the most commonly reported outcome from the literature on apprenticeship programs and are important for answering questions about return on the investment in apprenticeships. Earnings for apprenticeships include worker earnings, quarterly earnings, and estimated career earnings. This section discusses the financial benefits of participation in apprenticeship programs, focusing first on earnings in general and then discussing earning potential related to specific occupations. In general, Cronen, McQuiggan, and Isenberg (2017) report that 62% of work-experience program respondents said that the work experience credential was useful for increasing pay.

Hollenbeck and Huang (2017) evaluated the effect of apprenticeships on short-term and long-term net quarterly earnings in Washington State's workforce training system. The Workforce Board of Washington State assessed the difference in quarterly earnings between program participants and a comparison group of similar individuals, showing that the net gain from apprenticeship participation was above and beyond the cost of the program itself. Findings showed increased quarterly earnings of about $3,700 in the short term (3 quarters after program exit) and about $3,400 in the long term (9–12 quarters beyond the program). In an older Washington State study, Hollenbeck (2008) similarly showed support for apprenticeship benefits with respect to earnings, with hourly rates around $6 above non-apprenticed employees and quarterly earnings between $2,000 and $2,500 above non-apprenticed employees. In an even older study, Kamimura (1998) showed a similar finding for Washington State. There, employment training surveys

[8] https://www.cool.army.mil/credentialing_basics/credential_types.htm.

[9] https://www.doleta.gov/oa/apprenticeship.cfm.

showed that wages increased the most for apprenticeship programs in comparison to other adult job training programs such as private career schools or job prep training. The median hourly earnings for apprenticeship program participants 6–9 months after completion showed the highest absolute increase (about $18) and the greatest percent increase (69%). Taking these three studies together, the data over time establish a consistent trend of earning benefits from participating in apprenticeships.

Earning benefits from apprenticeships are found in several states. For example, a review of apprenticeships in the state of Michigan by Public Sector Consultants (2017) showed wage increases for program participants. The average annual earnings for those completing apprenticeships was about 15% more than those who just earned associate degrees; the wage rates over the period of apprenticeship also increased on average by 51%. Reed et al. (2012) showed similar data from the Registered Apprenticeship Partnership Information Data System (RAPIDS) providing comparisons of the labor market characteristics for 10 states. This study matched registered apprenticeship program data from Florida, Georgia, Iowa, Kentucky, Maryland, Missouri, New Jersey, Ohio, Pennsylvania, and Texas with similar non-participants working in the same fields. Apprentices completing programs earned on average about $6,000 more per year and an estimated $240,000 more over the course of their careers than workers in the same field who did not participate in apprenticeships. Finally, additional information for Florida comes from Schneider and Columbus (2017), who compared median graduate earnings of degree or credential holders from Florida public institutions to median state household earnings. Of the 1,300+ programs included, apprenticeships have the highest "success rate," or median graduate earnings above the median state household earnings ($49,400). Apprenticeship programs in Tennessee technical colleges also resulted in estimated earnings for most programs exceeding the state's 2015 median household income of $47,300 as reported by the Census Bureau (2015).

A few reports addressed the effect of apprenticeships on specific occupation earnings. Wein (2016) used the RAPIDS database to show that those completing apprenticeship programs in 2015 made average hourly earnings of $25, whereas the average 2015 program entry earning was $14. For those completing an apprenticeship program between 2010 and 2015, the average hourly earnings increased 38%. Sheet metal workers experienced the greatest percentage gain (93%), while elevator installers and repairers showed the greatest net gain ($15). A study of 2012–2013 data by the Workforce Training and Education Coordinating Board (2015) provided results of those completing an apprenticeship in the state of Washington. State wage data from over 3,000 apprentices covered a range of occupations; the largest concentration was seen in construction. Findings show that earnings for those completing the program were $16,000 more than for those who left the program before completing it. A relatively recent study by Timmons and Thornton (2010) estimated the positive effect of apprentice programs on barber earnings. Eighteen states and D.C. offer apprenticeships as alternatives to barber school, while nine states demand both barber school training and apprenticeship. Micro-level data from the 2000 U.S. Census indicated that those employed in states requiring apprenticeship earn about 22% more than those in states

without such requirements. The authors go on to note that along with the increase in earnings, such provisions double the length of time it takes to acquire a license.

2. Apprenticeships and Hiring

Apprenticeship programs offer a distinct opportunity for employment advantages. Unlike other credentialing programs, apprenticeship participants work while learning, gaining valuable on-the-job experience. Many studies analyzing apprenticeship program earnings outcomes also analyzed employment-related outcomes. For these studies, employment advantages can refer to hiring rate, hours worked, and employer/employee perceptions of the importance of apprenticeships when filling a job position.

The Workforce Training and Education Coordinating Board (2015) studied employment outcomes of registered apprenticeships in Washington State during 2012–2013 and found positive impacts of apprenticeships on employment rates. Participants who completed a program had employment rates that were 11% higher than others who left early. Two to three years after leaving the program, employment rates for all participants proved on average about 10% higher than the control group of non-participants. In addition, survey results showed that 55% of participants perceived that the apprenticeship was essential for hiring. Also assessing apprenticeships in Washington State, Hollenbeck and Huang (2017) reported higher employment rates for apprenticeship program participants than for non-participants in the short term net (i.e., within 1 year of completion) but non-significant results in the long-term. Hollenbeck's earlier study (2008) also found short-term benefit for those that participated in apprenticeships. Another older study from Washington State (Kamimura 1998), surveyed apprenticeship program graduates and found that 93% were employed 6–9 months after leaving the program, compared with 86% of those who attended community and technical college preparatory training.

A report from Public Sector Consultants (2017) concerning apprenticeships in the state of Michigan covered a range of common occupations. A survey of mostly union employers within the electrical and construction trades indicated that 75% of respondents considered apprenticeships very important to meeting skilled labor needs. Similarly, 71% considered apprenticeship programs very important for recruiting and retaining skilled labor. The results of the 2016 Adult Training and Education Survey conducted by the U.S. Census Bureau provided Cronen, McQuiggan, and Isenberg (2017) with information on perceptions of employment and hiring. From the umbrella category of work experience programs, which includes apprenticeships, 64% of participants reported their work experience program as very useful in getting a job. Only 49% of respondents with post-secondary certificates and 60% of respondents with post-secondary certifications reported their certificates and certifications has being very useful in getting a job. On the other hand, 80% of those with licenses reported them as very useful in getting a job.

D. Professional Credentials and Variables Related to Employability

In the earlier sections we discussed the direct effects of professional credentials on employability of individuals who obtain a license, a certification, or participate in an apprenticeship. Our literature review revealed several variables other than employability that are affected by professional credentials. For example, findings from the relevant literature show that professional credentials can both benefit and hinder workers, employers, and consumers. Certification and licensing requirements benefit consumers through improving quality of service and protecting public health and safety. In the health-care field, for instance, the competence of some practitioners may be difficult for prospective patients to evaluate and the consequences of inferior work can be severe. In such fields, licensing serves as an indicator of competence and can also provide recourse for consumers when practitioners fail to adequately deliver services. However, professional credentialing systems can also place burdens on workers, employers, and consumers by restricting the scope of a worker's practice or enforcing stringent credentialing requirements. In this section, we review specific outcomes of professional credentials that do not directly address employability, but have important ramifications for employment outcomes and the labor force at large. The discussion will be restricted to certifications and licenses. A relevant literature search produced 10 articles with 3 major findings: (1) credentials are a way to invest in and establish a career pathway leading to growth prospects extending beyond immediate employability); (2) credentials influence labor market value, where the use of credentials influences supply and demand; and (3) credentials can restrict long-term career advancement by placing restrictions on recertification and increasing costs.

1. Career Pathways

Credentialing requirements require practitioners to invest in developing and maintaining occupational skills that are meant to enable long-term career paths for credentialed workers. The question, however, is whether there is sufficient evidence that credentials provide long-term career growth and whether professional credentials serve as a robust way to ensure employability during the span of an individual's career.

Dill and Morgan (2018) conducted case studies of career programs in 20 health-care organizations and showed that certification provided only limited opportunities for long-term advancement for those in paraprofessional positions. The organizations studied included large health systems, community health centers, behavioral health centers, and long-term care organizations. Across organizations, the most common type of career program was one that culminated in a paraprofessional credential (i.e., a credential that indicates competency in a particular component or aspect of a task, but does not provide license to practice as a fully qualified professional). Some examples of paraprofessional credentials include nursing assistant, teacher's assistant, or instructional paraprofessional. Although these types of programs offer pathways to jobs that promise increased career growth along with small earnings increases, these gains did not

usually amount to more than an extra dollar per hour in earnings, even after obtaining the paraprofessional credential.

While the case study analysis by Dill and Morgan (2018) suggest that credentials for paraprofessionals do not contribute to career growth via earnings, they did find a career pathway benefit for those with professional credentials. For example, professional nursing programs appeared to be the most effective in providing workers with substantial career pathway growth; hospital workers who trained to become registered nurses had an average increase in earnings of $6.25 per hour. Also, Dill and Morgan (2018) only focused on health care professions, an occupational family with many state and nationwide regulations on career pathways (i.e., licenses). In other words, health-care employees might benefit more strongly from traditional, regulated education avenues leading to career pathway success and not from other credential types like paraprofessional credential.

Another career pathway to continued growth is pursuing stackable credentials (i.e., a sequence of credentials accumulated over time that are intended to move an individual along a career pathway). Stackable credentials serve as a way to enhance the labor market prospects of middle-skilled workers. For example, an individual might enroll in a certificate program to become an accounting clerk, then enroll in a second program to become a payroll clerk or business assistant, and finally complete an associate's degree in accounting (Bailey and Belfield 2017). Bailey and Belfield (2017) conducted an analysis of two national data sets, the National Student Clearinghouse data set for cohort 2014–2015 and the National Longitudinal Survey of Youth data set, an older survey data set from 1997, and two college-level data sets, the North Carolina Community College System and the Virginia Community College System. The authors wanted to understand the relationship between stackable credentials and labor market value in terms of whether the credential leads to a degree and whether there is a wage benefit to the credential holder. The authors found small but positive and inconsistent *earning* gains from credential combinations. However, the authors also noted that credentials provide some sort of value in the labor market by adding to the worker's earning power exclusively in the near term, but there was less long-term impact, a finding similar to that for apprenticeship earnings (see previous section). They also found that stackable credentials may act as pathways into higher education systems as individuals develop their career interests.

Finally, maintaining credentials, a specific career pathway issue addressed in the literature for professional credentials, highlights a potential need for improving the recertification process. Lysaght and Altschuld (2000) reviewed the process for ongoing credentialing and recertification being used across a variety of professions, with particular emphasis on health professions, to maintain practitioner competency after initial certification/licensure and to ensure long-term career growth of credential holders. The authors considered the following issues: (1) regulation practices (e.g., certification, licensure), (2) levels of accountability for continued competency (after certification/licensure), (3) approaches to monitoring competency by professional groups, (4) roadblocks to effective monitoring, and (5) sufficiency of current competency-assurance methods

and avenues for improvement. Results revealed that approximately 50% of state licensing boards in health professions use mandatory continuing education for ensuring continuing competency. Similarly, the use of continuing education is a recertification requirement in many other fields, such as insurance (100% of certifying bodies require only continuing education to recertify), accounting and finance (67%), and science and engineering (13%). But Lysaght and Altschuld (2000) identified three roadblocks to effective competency monitoring and recertification: (1) prohibitive costs associated with continuing education and recertification, (2) the need for continuous validation of recertification tests, and (3) difficulty in reaching agreement on what constitutes "best practices" across fields. The authors concluded that most professions must address their current systems for recertification and maintaining competency based on prevailing theories of knowledge and skill acquisition, and transfer of skills to practice, if credentials are expected to be an effective pathway to long-term career development.

2. Labor Market Value

The labor market refers to the supply of and demand for labor in which employees provide the supply and employers the demand. It is a major component of any economy and is strongly tied to the availability of goods and services. Due to the economic evolution to automation of many manufacturing jobs, there has been a demand shift to higher skilled workers (in blue collar and skilled-service industries) who understand new technologies, thereby providing incentive for attaining additional education or "stacking on" more credentials. Education is one of the major variables that adds value to the labor market; education beyond high school leads to higher employment rates and wages, and a wide range of career opportunities for the workforce. Moreover, supply and demand for skills and knowledge in the labor market contribute to the demand for professional credentials and subsequent employment.

According to Carnevale et al. (2018), the labor market can be divided into three categories based on skill level of the workforce: low-skilled, or workers with a high school diploma or less; middle-skilled, or workers with professional credentials above a high school diploma but not a 4-year college degree; and high-skilled, or workers with a 4-year college degree or higher. In the United States, middle-skilled jobs in particular have seen significant growth in recent years; middle-skilled professionals currently account for nearly 24% of the labor force (Carnevale et al. 2018). Such professionals include firefighters, law enforcement officers, electricians, mechanics, programmers, some health-care professionals, and other field-specific technicians. Carnevale et al. (2018) analyzed data from a U.S Census Bureau population survey to highlight the relationship between middle-skilled jobs and the labor market. Results revealed that the middle-skilled tier of employment has seen the most innovative changes to education and education-employment pipelines (e.g., apprenticeships, customized training, and certifications and licenses) in recent years. Furthermore, middle-skilled jobs play a key role in fostering economic opportunity, in that new competitive requirements accelerate the demand for additional education and training in the form of professional credentials.

One such example of the labor market creating demand for professional credentials comes from Amour-Garb (2017), who conducted a survey of business council members in New York State to gather evidence on whether credentials lead to filling long-term skills gap in STEM (i.e., science, technology, engineering, and mathematics) fields. More than 80% of respondents said that they were strongly interested in partnering with local community colleges to create a pipeline for employment that can lead to long-term employment opportunities for workers in STEM fields, where some of the occupations require licenses or may be associated with professional certifications (e.g., Professional Engineering license, Registered Architect license, IT security certifications). Respondents further stated that creating a more streamlined process to obtain the required credentials will lead to a stronger STEM workforce. Note, however, that such credentials would have to be carefully monitored to ensure worker competency over time via appropriate recertification practices and reissuance of licenses.

3. Licenses Can Restrict the Credentialed Workforce

The final finding that extends beyond immediate employability deals with restricting the credentialed workforce. An in-depth review of licensing practices conducted by the Department of Treasury (2015) revealed that licensing may make it more difficult for some workers to enter the labor market. Although through the course of this literature review it has been generally shown that obtaining a professional credential like a license is tied to an earnings benefit to the credential holder, acquiring the mandatory credentials may pose a substantial load on aspiring licensees in terms of required education or experience, exams, and fees. This system is especially burdensome for some potential professional credential holders in low- and middle-income occupations, and it can be a barrier for new military veterans trying to transition to civilian life (American Legion 2017; Chao and Rumsfeld 2005).

Workers are restricted from entering the labor market due to stringent restrictions on practitioners' scope of practice and strict licensing requirements that limit the supply of labor and increase the cost of services. In addition, since many occupations are licensed at the state level, licensed practitioners typically have to acquire a new license when they move across states (Kleiner 2006). This entails various procedural hurdles such as paying fees, filling out administrative paperwork, submitting an application, and waiting for it to be processed. The resulting costs in both time and money can discourage people from moving or lead them to exit their occupation. For example, military spouses, who are 10 times more likely to move across state lines than their civilian counterparts (Department of Treasury 2015), are negatively affected by a highly restricted professional credentialing system. Such licensing restrictions generate inefficiency in the labor market, because workers unable to migrate easily to the jobs for which they are most qualified.

Furthermore, recent evidence shows that states vary dramatically in their rates of licensure and training required to receive a license, suggesting that states are not treating licensing policies for occupations equivalently (Kleiner 2006). For example, Pagliero (2010) explored the link

between licensing exam difficulty and entry-level salaries, looking specifically at the bar exam. Using data on exam difficulty from 1984 to 2005 (i.e., minimum bar quality standard to pass), Pagliero (2010) estimated the median salary from a measure of exam difficulty and a time variable and found a significant impact of exam difficulty, such that an increase of 1 on the multistate portion of the bar exam implies a $1,100 increase in entry salary. This means that a 1% increase in difficulty of the bar exam correlates with a 1.7% increase in entry-level salary. He concluded that states that have harder bar exams seem to have higher entry salaries. While states have broad discretion in regulating licenses, the U.S. Congress in recent years has enacted or introduced legislation designed to remove or reduce barriers that licensure processes impose on entry to the workforce; for example, the New Hope Act in 2017 (H.R. 2155) in an attempt to allow state agencies using Federal funds to review licenses that pose unwarranted barrier to entry).

Credentialing practices benefit the labor market by generating a large middle-skilled workforce for essential professions and by creating incentives for further education. However, the restrictions and regulations associated with credentialing, particularly licensure, may place undue burdens on some segments of the population, thereby having a negative impact on employment outcomes and driving up costs of services. The important issues to consider in evaluating this tradeoff include the risk posed to the public by practitioners without appropriate credentials, the extent to which credentialing requirements lead to quality improvements, and the impact of credentialing on the costs of goods and services, practitioner supply, and mobility.

4. Summary and Conclusion

This literature review found that, in general, obtaining professional credentials has a positive impact on a person's initial entry and earnings in an occupation. There are some differences across the types of credentials and across occupations or workplace locations. We organized the literature into four categories:

1. Licenses and Employability (15 articles).
2. Certifications and Employability (22 articles).
3. Apprenticeships and Employability (10 articles).
4. Credentials and Variables Related to Employability (10 articles).

Each is summarized in turn.

A. Licenses and Employability

One of the most consistent effects across the available literature on licensing and earnings is that workers who have a license to practice an occupation earn more than workers who do not possess a license in the same or similar occupations. This was shown in different occupations (i.e., white collar and blue collar occupations) and using various research methods, indicating that it is a robust finding. The amount of earnings benefit varied across states and occupations, with studies showing wage increases that range between 3%–47%, with 10%–20% describing the typical results. Additional advantages of licensure includes increased hours of work and lower unemployment compared with those in a similar profession with no license. However, this does not seem to extend to other benefits like health insurance.

Because individual states are the primary license issuer, many of the economic effects of licenses differ between states—different license requirements and different market or economic factors make it difficult to determine what is due to the license and what is due to economic conditions within states. In general, workers perceived licenses to be useful for getting a job, keeping a job, marketing themselves to employers or clients, and improving work skills.

B. Certifications and Employability

The literature indicates that professional certifications provides an advantage in the hiring process in some occupations. Based on survey data, it appears as though most certification holders and many hiring managers perceive a benefit to certifications in the hiring process. The influence of certifications on hiring vary across occupations; there are strong advantages in some

occupations (e.g., IT professionals, auto mechanics, and personal trainers) and mixed results in others. The occupation with the most studies about hiring was IT, where certifications seemed to provide a clear hiring advantage.

The literature regarding the impact of certification on wages indicates that there may be an earning benefit for some occupations. One of the longitudinal studies that tracked people over time found a significant earnings premium for certification holders during the early stages of their career. For some occupations (e.g., IT or food service workers) the benefit seemed to be absent at the start of one's career but occurred later, as people gained additional experience on the job.

C. Apprenticeships and Employability

This review only addressed registered apprenticeships and in general found that completing an apprenticeship program had a positive influence on employability; reports described both the positive relationship of apprenticeships to earnings and detailed positive relationships with hiring across a broad range of skilled labor occupations. Both wage and employment data indicate that those who complete apprenticeships are hired at a greater rate than those in comparison groups (i.e., those who worked in similar fields but didn't participate in an apprenticeship and those who left the apprenticeships midway) and get paid more for their work. Surveys of employers and program participants also show that the majority perceive apprenticeship programs as very useful.

D. Professional Credentials and Variables Related to Employability.

Career pathways and the labor market can be influenced by the development of certification practices and licensing requirements in occupations or geographic locations. For example, mobility across states for some workers in licensed occupations may be limited if other states have more restrictive licensing requirements or do not accept another state's licenses. Also, a review of the literature indicates that avenues for long-term career advancement might be limited owing to the challenges and costs associated with recertification and reissuance of licenses that are mandatory to maintain worker competency and ensure career growth. These restrictions of the labor market may increase the benefits of holding a professional credential, in that the supply of qualified workers may be reduced. This may also cause increased costs to consumers for the services rendered by more highly paid credentialed workers.

The literature also indicates that there may be demographic differences in the benefit of professional credentials. The findings indicate that for both licenses and certifications, there was a greater earning benefit to women than for men. It is not clear why there are these differences, but it may be due to the wage gap for women being reduced through the acquisition of a credential.

E. Conclusions

This report supports the execution of a request outlined in the National Defense Authorization Act FY19 for DoD to provide a review of academic research on the impact of professional

credentials on employability. The DoD has worked to facilitate and enhance recruiting and retention, promote in-service professional development, and ensure seamless transition of members of the armed forces from service on active duty to civilian employment by instituting several programs (e.g., COOL and DoD SkillBridge) and policies in the past 15 years or so to help transitioning Service members get professional credentials. This is a positive activity, because the research literature indicates that the acquisition of professional credentials improves employment outcomes.

While the benefits of professional credentials are positive, the benefits differ depending on credential type, occupation, employment location, etc. An understanding of these difference may help Service members make well-informed future career choices. The DoD is helping Service members earn professional credentials that may improve post-service employability opportunities and providing additional information through DoD resources like COOL and the DoD Transition Assistance Program,[10] which may help to optimize the benefit of DoD's credentialing programs. Continued efforts to refine DoD's efforts to coordinate training of Service members with their attainment of professional credentials and improving post-service employability is recommended.

[10] https://www.dodtap.mil/links.html.

References

Albert, Kyle. 2017. “The Certification Earnings Premium: An Examination of Young Workers.” *Social Science Research* 63 (March 2017): 138–149.

American Legion. 2017. “The State of Credentialing of Service Members and Veterans: Challenges, Successes, and Opportunities.” Indianapolis: IN: The American Legion. https://www.legion.org/sites/legion.org/files/legion/publications/25VEE0517%20The%20State%20of%20Credentialing_0.pdf.

Armour-Garb, Allison. 2017. “Bridging the STEM Skills Gap: Employer/Educator Collaboration in New York.” The Public Policy Institute of New York State, Inc. http://www.ppinys.org/reports/2017/PPI-Skills-Gap-Report.pdf

Bailey, Thomas, and Clive R. Belfield. 2017. “Stackable Credentials: Awards for the Future?” CCRC Working Paper No. 92. Columbia College Research Center. New York: Teachers College, Columbia University. https://ccrc.tc.columbia.edu/media/k2/attachments/stackable-credentials-awards-for-future.pdf.

Bailey, Thomas, and Clive R. Belfield. 2018. “The Impact of Occupational Licensing on Labor Market Outcomes of College-Educated Workers.” CCRC Working Paper No. 104. New York, NY: Teachers College, Columbia University. https://ccrc.tc.columbia.edu/media/k2/attachments/impact-occupational-licensing-labor-market.pdf.

Baird, Matthew D., Robert Bozick, and Mark Harris. 2017. “Postsecondary Education Employment and STEM Employment in the United States.” Santa Monica, CA: RAND Corporation. https://www.rand.org/content/dam/rand/pubs/research_reports/RR2100/RR2115/RAND_RR2115.pdf

Bartlett, K. R., S. K. Horwitz, M. Ipe, and Y. Liu. 2005. “The Perceived Influence of Industry-Sponsored Credentials on the Recruitment Process in the Information Technology Industry: Employer and Employee Perspectives.” *Journal or Career and Technical Education* 21 (2) (Spring 2005): 51–65.

Bureau of Labor Statistics. 2019a. “Computer and Information Technology Occupations.” *Occupational Outlook Handbook.* Accessed March 21, 2019. https://www.bls.gov/ooh/computer-and-information-technology/home.htm.

Bureau of Labor Statistics. 2019b. “Information Security Analysts.” *Occupational Outlook Handbook*, 2014–15. Accessed March 17, 2019. http://www.bls.gov/ooh/computer-and-information-technology/information-security-analysts.htm.

Burning Glass Technologies. 2015. “Cybersecurity Jobs, 2015.” https://www.burning-glass.com/wp-content/uploads/Cybersecurity_Jobs_Report_2015.pdf.

Carnevale, A. P., J. Strohl, J. Ridley, and A. Gulish. 2018. “Three Education Pathways to Good Jobs.” Washington, DC: Georgetown University, Center on Education and the Workforce. https://cew.georgetown.edu/cew-reports/3pathways/.

Census Bureau. 2015. American Community Survey, “Median Household Income (in 2015 Inflation-Adjusted Dollars).” https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t.

Chao, E. L., and D. H. Rumsfeld. 2015. “Study on Coordination of job Training Standards with Certification Standards for Military Occupational Specialties. Washington, DC: U.S. Department of Labor and U.S. Department of Defense. https://www.scribd.com/document/1656692/Department-of-Labor-credentialing-study.

Cronen, S., M. McQuiggan, and E. Isenberg. 2017. “Adult Training and Education: Results from the National Household Education Surveys Program of 2016.” NCES 2017-103rev. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. https://nces.ed.gov/pubs2017/2017103rev.pdf.

Department of Treasury. 2015. “Occupational Licensing: A Framework for Policymakers.” Washington, DC: Department of the Treasury Office of Economic Policy, the Council of Economic Advisers, and the Department of Labor. https://obamawhitehouse.archives.gov/sites/default/files/docs/licensing_report_final_nonembargo.pdf.

DeSilets, L. D. 2007. “Nursing Professional Development Certification.” *The Journal of Continuing Education in Nursing* 38 (1): 12–13.

Dill, Janette S., and Jennifer Craft Morgan. 2018. “Employability among Low-Skill Workers: Organizational Expectations and Practices in the US Health Care Sector.” *Human Relations* 71 (7): 1001–22. https://journals.sagepub.com/doi/pdf/10.1177/0018726717734035.

Gittleman, M., Mark A. Klee, and Morris M. Kleiner. 2018. “Analyzing the Labor Market Outcomes of Occupational Licensing.” *Industrial Relations* 57 (1): 57–100. https://doi.org/10.1111/irel.12200.

Gittleman, Maury, and Morris M. Kleiner. 2016. “Wage Effects of Unionization and Occupational Licensing Coverage in the United States.” *ILR Review* 69 (1): 142–72. https://journals.sagepub.com/doi/pdf/10.1177/0019793915601632.

Heise, J. M. 2009. “Professional Certifications Versus Skills: A Study of Professional Certifications from the Perspective of the Certified and Their Employers.” PhD diss, Capella University.

Hollenbeck, Kevin, and Wei-Jang Huang. 2017. “Net Impact and Benefit-Cost Estimates of the Workforce Development System in Washington State.” *Employment Research* 24 (1): 1–4. https://doi.org/10.17848/1075-8445.24(1).

Hollenbeck, Kevin. 2008. “State Use of Workforce System Net Impact Estimates and Rates of Return.” Presented at the Association for Public Policy Analysis and Management (APPAM) Conference, Los Angeles, CA. https://research.upjohn.org/cgi/viewcontent.cgi?article=1006&context=confpapers.

Hunsinger, D. Scott, and Michael Alan Smith. 2009. “IT Certification Use by Hiring Personnel.” *Journal of Computer Information Systems* 50 (2): 71–82. https://doi.org/10.1080/08874417.2009.11645386.

Kamimura, Gary. 1998. “Apprenticeships in Washington: Effective, Underutilized.” Report for Washington State Employment Security, Olympia, Labor Market and Economic Analysis Branch.

Kim, Jeounghee, and Sangeeta Chatterji. 2018. “Gender and Educational Variations in Earnings Premiums of Occupational Credentials.” Center for Women and Work, Rutgers, The State University of New Jersey. https://smlr.rutgers.edu/sites/default/files/documents/Centers/gender_and_educational_variations_in_earnings_premiums_of_occupational_credentials.pdf.

Kitchenham, Barbara. 2004. “Procedures for Performing Systematic Reviews.” Keele University Technical Report TR/SE-0401. NICTA Technical Report 0400011T.1. http://www.inf.ufsc.br/~aldo.vw/kitchenham.pdf.

Kleiner, Morris M. 2006. *Licensing Occupations: Ensuring Quality or Restricting Competition?* Kalamazoo, MI: W.E. Upjohn Institute for Employment Research. DOI: 10.17848/9781429454865.

Kleiner, Morris M. 2015. “Reforming Occupational Licensing Policies.” Discussion Paper 2015-01. Washington, DC: The Hamilton Project. https://www.brookings.edu/wp-content/uploads/2016/06/THP_KleinerDiscPaper_final.pdf.

Kleiner, Morris M., and Alan B. Krueger. 2010. “The Prevalence and Effects of Occupational Licensing.” *British Journal of Industrial Relations* 48 (4): 676–87. https://doi.org/10.1111/j.1467-8543.2010.00807.x.

Kleiner, Morris M., and Alan B. Krueger. 2013. “Analyzing the Extent and Influence of Occupational Licensing on the Labor Market.” *Journal of Labor Economics* 31 (2) The Princeton Data Improvement Initiative (Part 2, April 2013): S173–S202.

Kleiner, Morris M., and Evgeny Vorotnikov. 2017. “Analyzing Occupational Licensing among the States.” *Journal of Regulatory Economics* 52 (2): 132–58. https://doi.org/10.1007/s11149-017-9333-y.

Kleiner, Morris M., and Kyoung Won Park. 2010. “Battles among Licensed Occupations: Analyzing Government Regulations on Labor Market Outcomes for Dentists and Hygienists.” NBER Working Paper No. 16560. DOI: 10.3386/w16560.

Knapp, J., L. Fabrey, M. Rops, and N. McCurry. 2006. *TERM06 ICE’s Basic Guide to Credentialing Terminology*. Washington, DC: Institute for Credentialing Excellence.

Kolo, E. 2006. “Does Automotive Service Excellence (ASE) Certification Enhance Job Performance of Automotive Service Technicians?” PhD diss., Virginia Tech. http://hdl.handle.net/10919/26646.

Lasheen, M. A. 2015. “Technical Certifications in Information Technology as Compared to Traditional Academic Credentials: Impact on Earnings and Employability.” PhD diss., Northcentral University.

Law, Mark T., and Mindy S. Marks. 2017. "The Labor-Market Effects of Occupational Licensing Laws in Nursing." *Industrial Relations: A Journal of Economy and Society* 56 (4): 640–61. https://doi.org/10.1111/irel.12190.

Lester, Scott W., Jason Fertig, and Dale J. Dwyer. 2011. "Do Business Leaders Value Human Resource Certification?" *Journal of Leadership & Organizational Studies* 18 (3): 408–14. https://doi.org/10.1177%2F1548051811404422.

Lysaght, Rosemary M., and James W. Altschuld. 2000. "Beyond Initial Certification: The Assessment and Maintenance of Competency in Professions." *Evaluation and Program Planning* 23 (1): 95–104. https://psycnet.apa.org/doi/10.1016/S0149-7189(99)00043-9.

Pagliero, Mario. 2010. "Licensing Exam Difficulty and Entry Salaries in the US Market for Lawyers." *BJIR* 48 (4): 726–39. https://doi.org/10.1111/j.1467-8543.2010.00810.x.

Petticrew, Mark, and Helen Roberts. 2006. *Systematic Reviews in the Social Sciences: A Practical Guide.* Malden, MA: Blackwell Publishing.

Public Sector Consultants 2017. "Benefits of Michigan Apprenticeship Programs." Report prepared for Michigan Building and Construction Trades Council, Michigan State Conference International Brotherhood of Electrical Workers, Southeastern Michigan Chapter & Michigan Chapter, and National Electrical Contractors Association.

Quan, Jim J., Ronald Dattero, and Stuart D. Galup. 2007. "Information Technology Wages and the Value of Certifications: A Human Capital Perspective." *Communications of the Association for Information Systems* 19:6.

Reed, Debbie, Albert Yung-Hsu Liu, Rebecca Kleinman, Annalisa Mastri, Davin Reed, Samina Sattar, and Jessica Ziegler. 2012. *An Effectiveness Assessment and Cost-Benefit Analysis of Registered Apprenticeship in 10 States.* Oakland, CA: Mathematica Policy Research.

Robinson, E. M., L. B. Graham, and M. A. Bauer. 2006. "The National Strength and Conditioning Association is the Preferred Certification for Personal Training Employment in Southeastern Massachusetts." *Journal of Strength and Conditioning Research* 20 (2): 450–51. DOI: 10.1519/R-16844.1.

Schneider, Mark, and Rooney Columbus. 2017. "Degrees of Opportunity. Lessons Learned from State-Level Data on Postsecondary Earnings Outcomes." American Enterprise Institute, October. http://www.aei.org/publication/degrees-of-opportunity-lessons-learned-from-state-level-data-on-postsecondary-earnings-outcomes/.

Summers, Adam B. 2007. "Occupational Licensing: Ranking the States and Exploring Alternatives." Policy Study 361. Washington, DC: The Reason Foundation. https://reason.org/wp-content/uploads/2007/08/762c8fe96431b6fa5e27ca64eaa1818b.pdf.

Thompson, John. 2014. "The Perceived Benefits of Automotive Service Excellence (ASE) Certifications for Graduates of Four-Year Automotive Technology Programs." Dissertation submitted for the degree of Doctorate of Education in Adult and Lifelong Learning, University of Arkansas.

Thornton, Robert J., and Edward J. Timmons. 2013. "Licensing One of the World's Oldest Professions: Massage." *Journal of Law and Economics* 56 (2) (May 2013): 371–88. doi:10.1086/667840.

Timmons, Edward J., and Robert J. Thornton. 2008. “The Effects of Licensing on the Wages of Radiologic Technologists.” *Journal of Labor Research* 29 (4): 333–46. https://doi.org/10.1007/s12122-007-9035-9.

Timmons, Edward J., and Robert J. Thornton. 2010. “The Licensing of Barbers in the USA.” *British Journal of Industrial Relations* 48 (4): 740–57. https://doi.org/10.1111/j.1467-8543.2010.00811.x.

Todd, Kelley. 2015. “Examining Employability as Associated with IC^3, MOS, and ACA Certifications.” Dissertation submitted for the degree of Doctor of Education in Human Resource and Workforce Development Education. University of Arkansas.

Weber, M. J. W. 2006. “Employer and Employee Implications for Certifications: An Application for Professional Food Servers.” Dissertation, University of Grenoble, France.

Wein, Michelle A. 2016. “An Analysis of Registered Apprenticeships in Michigan.” State of Michigan Department of Technology, Management and Budget, Bureau of Labor Market Information and Strategic Initiatives. http://milmi.org/Portals/198/publications/Apprenticeship_Report_2016.pdf.

Whittington, A. G. 2017. “Investigating Employability: A Study to Ascertain Whether Attaining Stackable Credentials Increases Opportunity for Employment for Career Technical Graduates.” Unpublished dissertation, Mississippi State University.

Wiershem, David, Guoying Zhang, and Charles R. Johnston. 2010. “Information Technology Certification Value: An Initial Response From Employers.” *Journal of International Technology and Information Management* 19 (4): 89–iv.

Workforce Training and Education Coordinating Board. 2015. “2015 Workforce Training Results.” Accessed December 2018. http://wtb.wa.gov/Documents/Apprenticeship2015.pdf.

Wright, M. A. 2015. “Improving Cybersecurity Workforce Capacity and Capability: Addressing the Education-to-Workforce Disparity.” *ISSA Journal*, October: 14–20. https://cdn.ymaws.com/www.issa.org/resource/resmgr/journalpdfs/feature1015.pdf.

Abbreviations

ASE	Automotive Service Excellence
CPS ASEC	Current Population Survey Annual Social and Economic Supplement
DoDI	Department of Defense Instruction
ELS	Educational Longitudinal Survey
HR	human resources
IT	information technology
MOS	military occupational specialty
NLSY79	National Longitudinal Survey of Youth
OLS	ordinary least squares
RAPIDS	Registered Apprenticeship Partnership Information Data System
RT	radiologic technologists
SIPP	Survey of Income and Program Participation
STEM	science, technology, engineering, and mathematics
USMAP	United Services Military Apprenticeship Program

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED *(From–To)*
March 2019	Final	JAN 2018 – MAR 2018

4. TITLE AND SUBTITLE

Impact of Professional Credentials on Employability

5a. CONTRACT NUMBER
HQ0034-14-D-0001

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Belanich, James
Fedele, Emily A.
Dobbins, Christian
Morrison, John E.
Moses, Franklin L.
Madhavan, Poornima

5d. PROJECT NUMBER
BE-2-4570

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Institute for Defense Analyses
4850 Mark Center Drive
Alexandria, VA 22311-1882

8. PERFORMING ORGANIZATION REPORT NUMBER

IDA Document D-10553

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Under Secretary of Defense (Personnel and Readiness)
Force Education & Training
1500 Defense Pentagon, Room 1E525
Washington, DC 20301

10. SPONSOR/MONITOR'S ACRONYM(S)

OUSD(P&R)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited (13 June 2019).

13. SUPPLEMENTARY NOTES

14. ABSTRACT

This report is a review of the academic literature on the impact on a person's employability after obtaining a professional credential, specifically, licenses, certifications, and registered apprenticeships. In general, the literature indicates a positive impact on employability for those who obtain a professional credential, although there are some differences across the type of credential. The findings are organized into the four categories: (1) licenses and employability, (2) certifications and employability, (3) apprenticeships and employability, and (4) professional credentials and variables related to employability.

15. SUBJECT TERMS

apprenticeship; certifications; credentials; employability; licenses

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Kun, Boris
Uncl.	Uncl.	Uncl.	SAR	41	19b. TELEPHONE NUMBER *(include area code)* (703) 614-1877

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18