Community College Pathways

Melinda Mechur Karp, Ph.D.

Community College Research Center, Teachers College, Columbia University

The author gratefully acknowledges Takeshi Yanagiura for his excellent research assistance.

Community colleges have long played a key role in workforce preparation, especially for middle-skilled workers[1] (Cohen and Brawer, 1996). Today, these institutions are seen as a critical piece of the workforce development puzzle, especially since the United States does not have a formal system to train advanced technicians. The federal government invests in community colleges as training hubs for high-wage, high-skill, and high demand employment via the Advanced Technological (ATE) and Trade Adjustment Assistance Community College and Career Training (TAACCT) programs. Individual states do so as well.[2] Employers and employer groups frequently partner with community colleges to create programs that meet their hiring needs. And, given their open-access mission, community college training programs are often targeted at individuals most in need of access to middle-skill jobs such as displaced workers and veterans.

Community colleges' role in developing middle-skilled workers via associate degree programs is widely recognized, and the positive impact of associate degrees on individuals' earnings is well-established.[3] However, community colleges also provide other credentials at the sub-associate's degree level, including certificates and certifications. These credentials are less well-understood in terms of their labor market value and ability to serve as a stepping stone to further education and training. Importantly, it is unclear if community colleges have been able to leverage sub-associate degree credentials systematically, in ways that create coordinated and coherent education and training pathways.

[1] Throughout this paper, I use the terms "middle-skilled workers" and "advanced technicians" to refer to occupations that require some postsecondary credential but not a bachelor's degree. I use the term "advanced technical education" and "sub-baccalaureate education" to refer to training for these occupations.

[2] For example, Michigan has invested $50 million to help community colleges meet employer demand for workers in areas such as welding, machining, manufacturing automation, and transportation, while Florida provided $15 million to help colleges prepare individuals for jobs in advanced manufacturing.

[3] Bailey and Belfield (2011) examined more than 20 published studies and found that the average gain in earnings from an associate's degree is 13% for males and 22% for females. Other recent literature using data from a variety of sources also find consistently positive returns to the associate degree (see, for example, Dadgar & Weiss, 2014; Jaggars and Xu, 2015; Jepsen, Troske, & Coomes, 2014; Liu, Belfield, and Trimble, 2014). These positive returns hold true for career-focused degrees as well as in the aggregate (Bahr, 2014.)

This paper examines sub-associate degrees offered by community colleges, both in terms of their stand-alone impact and in terms of their connection to a broader education and training system. I argue that some sub-associate credentials have value in and of themselves, indicating that they are important ways for building the middle skills workforce and improving individual economic outcomes. I also argue that these credentials exist independently of one another and that there is little evidence that community colleges have found a way to connect them into a robust education and training *system*. Such a lack of a system is likely to impede our nation's ability to grow our middle-skills workforce over time.

1. Statement of the Problem: There are many avenues to producing skilled technical workers in the United States, but no clear system for doing so

A convergence of factors has led to consensus that the U.S. economy is dependent on growing the number of individuals who have completed college. First, employers complain that while there are many individuals seeking work, they cannot find individuals possessing the skills they need (Business Roundtable, 2014; Tyszkow, Sheets, & Fuller, 2014). Second, labor economists argue that our nation's future economic productivity is predicated on increasing the number of individuals who can fill the types of skilled jobs required by growing industries such as health care, technology, and skilled manufacturing (Carnevale, Smith, & Strohl, 2013). For example, science, technology, engineering and math (STEM) occupations are projected to grow 17% by 2018; "first-tier" support technician jobs requiring less than a bachelor's degree currently make up nearly one-third of jobs in these fields (Langdon, McKittrick, Khan, & Doms, 2011).

Third, as social mobility has stagnated, there is increasing recognition that a high school diploma is no longer sufficient for entrance into the middle class (Carnevale, et al., 2013). Rather, some postsecondary credential is a minimal requirement for success in 21st century America. Individuals may

see an increase in earnings even without completing college, but returns to education are highest for those who do (Belfield & Bailey, 2011; Oreopoulos & Petronijevic, 2013; Zeidenberg, Scott, & Belfield, 2015). Additionally, students who drop out of college (both four-year and two-year colleges) have higher unemployment rates and higher student loan default rates than students who complete (Nguyen, 2012). Such recognition has shifted attention from higher education access to higher education completion.

Completing college is a challenge for many Americans, however. Over 20% of Americans aged 25-64 have attended college but do not have a credential (Postsecondary Analytics, 2015). Among students who entered a community college for the first time in 2003-2004, only 39% of first-time students had received a two- or four- year degree after six years (Shapiro, Dundar, Yuan, Harrell, & Wakhungu, 2014). Moreover, college completion rates vary substantially among sub-groups; for example, low-income students have lower completion rates than their more economically-advantaged peers (U.S. Department of Education, National Center for Education Statistics, 2013). Thus, increasing the numbers of degree holders is an equity imperative as well as an economic one.

Policymakers, researchers, and foundations agree that the United States needs to encourage college completion in order to grow our workforce and improve social mobility. These stakeholders have called for a "completion agenda" aimed at increasing the number of credentials held by U.S. adults (see, for example, Executive Office the President, 2014; Lumina Foundation, 2014). As part of this agenda, the definition of "college completion" has expanded to include credentials outside of the bachelor's degree. For example, the Lumina Foundation includes sub-baccalaureate degrees, certificates, and other credentials when defining the postsecondary credentials that will help achieve their goal of ensuring that, by 2025, 60 percent of Americans hold a "high-quality postsecondary credential."[4]

[4] http://www.luminafoundation.org/our-work

U.S. educational institutions already provide postsecondary training and credentials for middle-skills jobs through a variety of venues ranging from private occupational schools to employer-based apprenticeship programs. What the United States lacks, however, is a clear *system* for providing such training and credentials. Credentials are offered in all sorts of settings, adhere to a range of standards, and exist under a complex system of state and accreditor oversight—a structure described by one stakeholder group as "chaos" (National Association of State Directors of Career Technical Education Consortium, 2013, p. 5). Disorganized training opportunities can be confusing to individuals seeking to upgrade their skills; disparate standards and curricula can also discourage employers from trusting or valuing credentials, due to opacity about is actually learned by individuals engaged in a given training opportunity or earning a given credential.

A training system provides clarity to stakeholders. A system—rather than a collection of disparate providers and credentials—would outline how individuals move from one training opportunity to another as they upgrade their skills; contain consistent curricula and standards across training providers; connect employers and providers to ensure needed skills are taught; and provide flexibility to workers and employers. As the President's Advanced Manufacturing Partnership (2014) noted, such systemization may increase employer use of credentials when hiring, thereby building a pipeline that works for both employers (in terms of reduced hiring costs and higher-quality employers) and individual workers (in terms of higher wages and greater workforce mobility).

2. Creating a U.S. middle-skills training system: The role of community colleges

If the U.S. is to move towards a more coherent training system for middle skills, the community college is a natural focal point. Approximately 7 million students per year attend community colleges (Kena et al., 2015) and these institutions award over 500,000 occupational credentials annually.[5] Rooted in local communities and charging lower tuition and fees, community colleges are more accessible than

[5] Author's calculation based on IPEDS data.

other higher education institutions. Their multiple missions to simultaneously serve business needs, provide terminal occupational degrees, and help students prepare for transfer make them uniquely positioned to help a wide range of individuals gain the skills required by a 21st Century economy. Community colleges provide many of the sub-baccalaureate credentials that are crucial to both building a middle-skills workforce and meeting the nation's college completion goals.

And yet, as with the American workforce training "system" generally, community colleges' role in developing the middle skills workforce is complicated. By design, community colleges are multi-faceted institutions—open to anyone and offering an array of credentials. They provide transfer-oriented associate degrees, terminal associate degrees, short-term certificates, industry-certification, apprenticeships, and non-credit worker training programs (sometimes known as contract training). Some students engage in multiple training opportunities simultaneously, such as when they earn a certification as part of an apprenticeship program. Other students engage in these training opportunities after having earned other credentials elsewhere.

In theory, the multiple approaches to providing middle-skills training in the community college could lead to a clearly-structured pathway by which individuals could continually upgrade their skills. For example, students could enter adult basic education programs to improve their literacy and numeracy skills, and then earn a certificate or industry-certification in order to gain access to a valued occupational area. They could return for an associate's degree in order to gain additional skills and educational and economic mobility, potentially even transferring to a baccalaureate degree program down the line.

However, though community colleges *could* serve as such a centralized hub for preparing middle-skills workers, they are not currently organized in this way. For example, community college contract and non-credit programs (which typically include pathways into higher education such as Adult Basic Education as well as employer-driven training and personal interest courses) function almost

completely independently from credit-granting programs. Some colleges offer the same certifications as both credit and non-credit options.

Therefore, it is not clear the extent to which community colleges *systematically* help prepare middle-skills workers. Instead, community colleges' organization—by design and for good reason—often appears haphazard, attending to specific situations or student needs. In the remainder of this paper, I examine the potential of community colleges to serve as an organizing force in a more comprehensive middle-skills training system.

I interrogate the community college role in two ways. First, I examine the extent to which credentials offered by community colleges help build the middle skills talent pipeline. I do this by examining the labor market returns to credentials and certifications, assuming that improved employment or wage premiums for credential holders serve as a proxy for their effectiveness in helping individuals gain the skills valued by employers in middle-skills occupations

Second, I examine the extent to which community colleges serve as a training *system* rather than a provider of disparate credentials. I do this by examining the extent to which certificates and certifications serve as a stepping stone to further education and training. I assume that such connectedness serves as a proxy for the extensiveness of a coherent and cohesive system linking education, workers, and labor market needs.

3. Focusing on certificates and certifications: Rationale and methodology

In this paper, I focus on sub-associate degree credentials offered by community colleges, namely certificates and certifications. As already noted, there is already a substantial literature on associate degrees, but much less is known about sub-associate degree credentials. If we are to understand the extent to which community colleges' offerings form a coherent system of middle-skills workforce preparation, we need to understand all of the various types of training and credentialing they provide.

Moreover, many of the most prominent completion-oriented reforms focus on intermediate credentials. There is great enthusiasm for the concept of a "stackable" series of credentials, in which individuals who earn a short-term certificate can later build upon that credential by earning a long-term certificate and, later, an associate degree. Sub-associate degree credentials allow for the flexible "on- and off-ramps" called for by many workforce development experts (see, for example, The President's Advanced Manufacturing Partnership, 2014) and are emphasized in the newly-enacted federal Workforce Investment Opportunity Act. Some institutions and systems, such as the City Colleges of Chicago and some ATE consortia, are going as far as to formally embed sub-associate credentials into degree programs, so that students are able to obtain a credential and access to a well-paying job even if they have to stop out before earning a degree.

For purposes of this paper, I define *certificate* as a credential awarded by a postsecondary institution, recognizing completion of coursework in a discipline. Certificates for skilled technical jobs vary in length, usually lasting from a few months to more than an academic year. A *certification* is awarded to individuals who pass an assessment, usually sponsored by an industry or firm. Though the training necessary to earn a certification may be offered by a community college, the certification itself is offered by an external entity.[6]

This paper is based on an extensive review of the literature on certificates and certifications. A graduate research assistant and I examined known articles about the labor market impact of these two credentials. We also solicited suggestions from experts in the field, including ATE and TAACCCT grant evaluators and researchers who study the returns to higher education. We citation crawled the papers in our possession for additional resources, and conducted literature search in JSTOR and on

[6] Readers should also note that in this paper, I omit *professional licensure*, which is accreditation by a state or professional governing body permitting an individual to practice an occupation. Many fields require licensure in addition to a certificate or certification; licensure may therefore be a confounding influence on labor market impact.

GoogleScholar. We used keywords and phrases such as "certificates," "labor market returns to certificates," "non-labor market returns to certificates," and "industry-based certifications."

We only included research focused on individual outcomes, thereby excluding descriptive or policy-oriented pieces.[7] We also only included research that attempted to control for students' preexisting characteristics such as gender, race/ethnicity, age, family income, and field of study. For each study included, we summarized the data, methods, and findings, as well as the study's strengths and weaknesses. Looking across findings, we were able to draw conclusions and highlights methodological challenges and gaps in our knowledge.

4. Research on intermediate credentials

a. Certificates

Though we know less about certificates than we do about associate degrees, there is a growing body of evidence indicating that, in general, there is a positive labor market return to these credentials, as compared to earning only a high school diploma or completing some college without earning a credential (Bahr, Dynarski, Jacob, Kreisman, Sosa, & Weiderspan, 2015; Bailey & Belfield, 2011; Bailey, Kienzl, & Marcotte, 2004; Carnevale, Rose, & Hanson, 2012; Grubb, 1997; Jacobson & Mokher, 2009; Marcotte, Bailey, Borkoski, & Kienzl, 2005).[8, 9] For example, after reviewing available literature, Belfield

[7] This criterion ensured that our paper focuses on the outcomes to the credentials of interest. However, it means that some forms of training, particularly NSF's ATE centers, are not included, as published research focuses on description, implementation findings, or institutional outcomes (such as increased prestige) not relevant to our research questions.

[8] Most studies of wage returns to certificates employ either OLS or individual fixed effect approaches. Although the nature of available dataset usually dictates a choice of methodology, recent consensus is that an individual fixed effect model is theoretically more robust than OLS (Bahr, 2014; Belfield et al., 2014; Dadgar &Weiss, 2014; Jepsen et al., 2012; Stevens, Kurlaender, & Grosz, 2014; Xu & Trimble, 2014) due to its ability to control for unobservable variables that are correlated with earnings and the time-varying effect of observable variables such as demographics (Xu & Trimble, 2014). However, Jaggars & Xu (2015) recently argued that analysis would also need to account for differences in individual growth trajectories, maintaining that a multi-level growth curve model produces more accurate results than fixed effect model.

[9] Typically, studies using national sample data use high school graduates as the comparison group. Studies using state administrative data use college dropouts as the comparison group due to data limitations.

& Bailey (2011) estimate the average return to certificates[10] ranges from 7% to 24%. Positive returns remain even after controlling for individuals' preexisting skills and abilities (Bahr, 2014; Jepsen, Troske, & Coomes, 2012; Dadgar & Weiss, 2014; Stevens, Kurlaender, & Grosz, 2014; Xu & Trimble, 2014). Importantly, the positive return remained even during the past recession (Belfield et al., 2014).

There is evidence that earning certificates can help individuals enter middle-skilled jobs even if they were previously unsuccessful in education. Using data from Florida, Jacobson & Mokher (2009) found that the wage premium for degree holders is largely explained by high school preparation and performance. For certificate holders, however, previous academic performance contributes less to the wage premium, indicating that certificates may be an effective pathway for low-performing students to enter high-skill, higher-wage jobs.

However, recent research also finds that the return to a certificate is profoundly heterogeneous, indicating that looking globally at outcomes is insufficient for making policy decisions. Short-term certificates[11] do not generally lead to higher wages, except for in a small number of fields. For example, data from Washington State (Dadgar & Weiss, 2014) and North Carolina (Belfield, et al., 2014) indicate that short-term certificates do not lead to higher wages *except* for in protective services and, for females in Washington, construction and education or childcare. Jepsen et al. (2014) estimated that short-term certificate increases quarterly wage by approximately $300[12] on average in Kentucky, but when the findings are broken down by field of study, only three subjects (Health, Services, and Vocational[13]) yield positive returns. Likewise, Stevens et al. (2014) and Bahr (2014) estimated that the wage effect of short-term certificate is positive in California, but the degree of return is substantially varied by subject. And

[10] Inclusive of all types of certificates, and the return is relative to high school graduates

[11] Definitions of short-term certificates vary among studies. Bahr (2014), for example, includes low-credit awards (1-5 credits) and short-term certificates (6 – 29 credits) while Stevens et al. (2014) include certificates requiring 6-18 credits as well as those requiring 18-30 credits. Typically, however, short-term certificates require one-year or less of education and fewer than 30 credits for completion.

[12] In 2008 dollars

[13] The authors grouped fields of study into six categories in their analysis: humanities, other academic subjects (i.e. social science and science), business, health, services, and vocational. The authors did not provide a further definition for vocational fields.

in Michigan, Bahr and his colleagues (2015) found that short-term certificates have no impact no wages for females, but led to a gain of $5,200 per year for men; they speculate that this is driven by the returns to certificates in manufacturing fields.

Research indicates that the returns to long-term certificates are similarly nuanced. Most research finds that long-term certificates[14] have an overall positive return (Bahr, 2014; Dadgar & Weiss, 2012; Jepsen et al., 2014; Stevens et al., 2014; Xu & Trimble, 2014) but the return varies substantially by occupational area.[15] For example, Dadgar and Weiss (2014) found positive returns to long-term certificates for health, nursing and transportation (for men), but not for other fields, including information science, engineering science, and construction.[16] Moreover, they found *negative* wage returns for cosmetology, education (for women) and business (for men). Similarly, using data from California, Stevens et al. (2014) found positive returns to long-term certificates for business, engineering, health, family/consumer sciences, and public/protective services but not information technology. In Michigan, Bahr and colleagues (2015) found positive returns for nursing and business for women, but not for other fields; for men, the positive impact of long-term certificates only held for nursing, technical fields such as engineering and science technologies, and protective services.

For the purposes of this paper, it should be noted that most studies aggregate occupations into broad fields—for example, combining various engineering-related certificates into a single category. Doing so means that subfields most relevant to the middle-skills workforce, such as fiber-optics, are combined with less-skilled occupational subfields. In fact, Bahr (2014) used data from California to analyze the return to certificates in 181 different subfield categories, and found that the returns varied within broader occupational fields. Also using data from California, Stevens and colleagues (2014) found

[14] Long-term certificates typically require one year or more of training.
[15] It should also be noted that returns are inconsistent across datasets; with the exception of health, most fields show positive returns in some datasets and not others.
[16] The full list of not statistically significant fields in this study includes: information science; communication and design; engineering sciences; mechanics, repairs, and welding; protective services; and, construction.

similar variation. These findings imply that the true value of certificates may be more fine-grained than most current research acknowledges.

Given regional higher education contexts and local labor markets, it should not be surprising that the value of certificates varies by geographic region. For example, Xu and Trimble (2014) found that short-term certificates[17] had different impacts in two different states: short-term certificates led to higher wages in allied health, cosmetology, and engineering sciences in Virginia, but not in North Carolina. However, short-term certificates in North Carolina had positive value in the protective services field, but not in Virginia. Moreover, the wage premium of a long-term certificate was positive in both states, but substantially more so in North Carolina. Though they are less rigorous, descriptive studies show similar variation across labor markets (Schneider, 2015).

The return to certificate also varies by gender, particularly for long-term certificates. Most studies find that women benefit from earning a certificate to a greater degree than men (Bailey & Belfield, 2011; Bailey et al., 2004; Belfield et al., 2014; Dadgar & Weiss, 2014; Grubb, 1997; Jepsen et al., 2014; Marcotte et al., 2005; Stevens et al., 2014). This variation by gender may reflect the gendered nature of the labor market—women are more likely to earn certificates in fields like health care, which have more consistently-positive impacts than certificates in other fields.

Surprisingly, few papers discuss the impact of earning certificates by race or ethnicity. The few that do, however, find that minorities benefit to a lesser extent than individuals from majority background. Marcotte et al. (2005) found that black males receive a lower pay by 28% on average compared to non-Hispanic white males holding the same credential.[18] Carnevale and colleagues (2012)

[17] Referred to as "Career Study Certificates" in North Carolina

[18] However, this effect disappears once high school fixed effects are controlled for. This suggests that minority students may earn less due to their clustering in certain types of high schools, rather than race or ethnicity alone.

found that African-Americans benefit less from certificates even after accounting for their previous work experience and skills.[19]

Thus, it appears that as stand-alone credentials, certificates do hold value, though their impact is profoundly heterogeneous. From a systems perspective, however, the evidence is murkier. There is some evidence that employers value stackable credentials. Bailey and Belfield (2014) find that the wage premium for certificates varies depending on individuals' highest educational attainment; certificates add more wage premium when stacked on top of a lower level of credential such as GED and high school diploma. The timing of obtaining a certificate is also important, as its wage effect turns positive only when individuals earn certificates prior to obtaining an associate or bachelor's degree.

Surprisingly, we could find no studies examining the extent to which certificate holders subsequently earn an associate's degree. Though obviously only suggestive, our own calculations of data from the National Center for Education Statistics Beginning Postsecondary Studies dataset found that only 7 percent of first-time students who earned a certificate went on to earn an associate's degree.

Transfer to a four-year institution is uncommon for most certificate completers (Stevens et al., 2014), indicating that certificates serve as terminal credentials rather than stepping stones to degrees for many individuals. Jepsen et al. (2014) reported that certificate recipients are less likely to transfer into 4-year institutions than associate degree recipients. Xu & Trimble (2014) also showed that both short- and long-term certificate recipients in North Carolina expressed a lower interest in transferring into 4-year institutions at the time of matriculation at a community college, compared to associate degree recipients and students who actually transferred from community college to 4-year institutions. The reasons for the low propensity to transfer for certificate seeking students still need to be explored, but Belfield & Bailey (2011) suggests that certification programs in general may have a "diversion effect" that discourages them from pursuing further education. These findings imply that despite the

[19] Measured by Armed Services Vocational Aptitude Battery (ASVAB)

enthusiasm for including certificates in a broader educational pathway into the labor market, certificates do not currently serve this purpose.

b. **Certifications**

Though the research on certificates is rapidly-growing, we found few rigorous studies of certifications, either from an individual or a systems perspective. Recall that certifications are awarded based upon successfully passing an assessment, rather than by accruing credit. Moreover, certifications are offered via an array of entities, all of which lie outside of the community college. They are offered by an industry groups, professional organizations, and individual companies. Certifications can focus on a narrow set of skills (food handling) or a broader set (Computer Aided Design). According to the Lumina Foundation for Education (2015), there are 4,000 entities offering certifications in the United States. The Louisiana Department of Education's website, for example, lists over 90 certifications available to residents of the state. Preparation for certification exams may be offered through many different types of institutions.

Community colleges' involvement in preparing students for certifications is highly variable. In a study of fifteen community colleges' IT certification programs, Jacobs and Grubb (2006) found that colleges engaged in six different approaches to certification, and often engaged in more than one approach simultaneously. Therefore, "community college certifications" encompass approaches such as aligning curricula with certification exams, creating certification exam preparation programs, or becoming a certification testing center. Students can prepare for certifications via credit-bearing courses (often as part of a broader certificate or degree program) or non-credit courses (often through employer contract training).

Though this varied approach is responsive to employer needs and ensures multiple access points to students, it is an open question as to whether or not such a varied approach enables certifications to

serve as a step on an educational pathway into middle-skilled careers. As Jacobs and Grubb (2006) point out, certification programs often exist separately from other courses, pathways, and even college support services, potentially diverting students away from pathways to further education rather than serving as an on-ramp. Though their study was conducted a decade ago, the landscape of certifications appears to have only grown more complex and fragmented over time, and so this concern likely remains valid.

To our knowledge, there is no comprehensive listing of all certifications available in the United States, nor is there an accountability system that collects outcomes data for certification-holders, or even accounts for how many individuals pass certification exams. The Lumina Foundation (2015) estimates that fewer of 10 percent of certifications are subject to third-party review or accreditation. Taking the example of Louisiana again, there are 33 organizations issuing a nationally or internationally recognized certification, but only two report an average salary of certificate holders. Thus, from a systems perspective, certifications do not appear to be embedded in a coherent pathway.

From an individual pay-off point of view, the high degree of variation in certifications and lack of comprehensive data makes it hard to assess their impact or value. We found only one study examining the labor market impact of certifications. Vakhitova & Bollinger (2011) compared Microsoft certification holders to a similar sample of non-certification holders, both within and outside of IT. They found that holding a Microsoft certification provided a wage premium of 29% over all workers, but when comparing only workers in IT fields, the premium dropped to 5%.[20] Moreover, they found that difference Microsoft credentials had different wage premiums (there are eight in total), ranging from insignificant to 30%.

[20] This study does not control for participants' previous educational attainment—both certification and comparison groups included individuals holding a variety of degrees. Therefore, it is difficult to tease out the impact of the certification itself. Moreover, readers are cautioned that this study is not comparable to those of certificate holders, which do control for previous education.

However, this study examines a single industry certification and can hardly be considered representative of certifications generally. Moreover, the study uses data from 2000—entirely different labor market conditions than today, especially in the IT field. It does, however, imply that like certificates, different certifications hold different value.

c. Challenges in assessing the impact of certificates and certifications

The above literature review indicates that there is still much to be learned about the value of the intermediate credentials offered by community colleges. These weaknesses in the available literature are, to some extent, a result of data limitations. Such limitations are most obvious for certifications, as we have already noted.

Even the data for certificates are limited, however. National datasets record certificates in very broad occupational areas, such as health or technical trades. However, as we have seen, such broad categories may not sufficiently represent the reality of middle-skills occupations; more fine-grained coding that accounts for sub-fields may be necessary. And while state administrative databases allow for such analyses, most researchers group sub-fields in order to more easily present findings and ensure large sample sizes.

Moreover, state databases do not usually record the occupation in which certificate-holders are employed. We therefore can assess the impact of earning a certificate in a given field, but not how certificates relate to employer demands. Perhaps certificate-holders are unable to gain employment in their field of study—indicating that these intermediate credentials do not meaningfully meet the needs of the skilled technical workforce. Or, perhaps, certificates build skills that are applicable across a range of middle-skilled occupations—thereby increasing their value as a tool for labor market mobility. Current datasets do not enable us to investigate this potential impact of certificates in the labor market.

Most importantly from a policy perspective, there is little research examining sub-associate degrees as a broader piece of the workforce ecosystem. Few studies examine the extent to which certificates are truly stackable. Available data do not allow us to assess the alignment between sub-associate and associate degree programs; the extent to which individuals move from one type of credential program to another; or the value employers place on individuals gaining additional credentials. Moreover, most studies of certificates and certifications examine outcomes for just a single type of credential, rather than examining the value-add of earning multiple credentials. Available research also focuses on economic returns, rather than broader outcomes such as soft skills.

Nor does the research examine the employer perspective, investigating the extent to which employers view intermediate credentials as a stepping stone to new skills or as a criteria for promotion. Nearly ten years ago, Jacobs and Grubb (2006) pointed IT certification programs at community colleges did not provide individuals with the general education skills necessary for success in degree programs; current research does not investigate whether this has changed in the intervening years or if it is different in other occupations.

5. Reflections on the evidence: Community college pathways *could* be leveraged to create a coherent advanced technical education system

The research reviewed here indicates that the credentials offered by community colleges, as currently organized, may not serve as a coherent system for developing the middle-skills workforce. Individual credentials are beneficial—for example, many long-term certificates have positive labor market outcomes—but others, like short-term certificates, have less value. And as a whole, it is not clear that these various credentials work together in ways that grow individuals' skills or the workforce itself over time. It is hard to know for sure, however, given data limitations and gaps in the research.

The available evidence provides tantalizing clues about how community colleges *could* serve as hubs for building a middle-skills workforce preparation system, however. Most importantly, there is strong evidence that intermediate credentials need to be tightly coupled to labor market needs. For example, the consistently positive returns to health-related certificates may stem from health care programs' close ties to industry requirements (perhaps due to licensing regulations) and the fact that the health care industry has relatively high wages (Xu & Trimble, 2014). The relatively strong manufacturing industry in Michigan may make certificates in technical fields more valuable Michigan than in other states (Bahr et al., 2015). Xu and Trimble (2014) also speculate that the difference in wage premiums for long-term certificates between North Carolina and Virginia[21] may be due to the fact that, in Virginia, such certificates are awarded to students who complete general education requirements, rather than requirements directly related to an occupation. Carnevale et al. (2012) provide additional evidence for the need for tight coupling when they find that the average wage is 31% higher for certificate completers[22] with a job related to their credential subject than those with non-related occupation.

This coupling needs to extend beyond connection credentials and employer-valued skills. Community colleges also need to ensure that the credentials they offer are in fields valued by their local labor markets, for if students are prepared for occupations in which they cannot find employment, their credentials will be less valuable. Particularly given Carnevale and colleagues' 2012 study finding that median wages for certificate-holders is substantially larger for those employed in the occupational field in which they hold a credential, it seems reasonable to assume that community college training pathways should prepare students for occupations needed locally—rather than occupations that are in

[21] Recall that their study found that the wage premium of a long-term certificate is positive in both states, but substantially more so in North Carolina.
[22] Inclusive of all program lengths and fields of study

demand nationally or have large overall wage premiums. In other words, policies and systems need to be crafted with local contexts in mind.

The National Science Foundation's Advanced Technical Education (ATE) program[23] has supported connections between industry and training programs for 20 years. Though evaluations of ATE generally do not employ the rigorous statistical methods included in this review, they provide additional evidence that strengthening employer-community college linkages could support the development of stronger community college pathways to middle skills jobs. A 2006 report (Germuth, Gullickson, Lawrenz, & Henssen, 2006) found that business and industry representatives believe that ATE centers benefitted them by increasing the number and quality of available technicians, thereby improving their business outcomes and saving them money.

A more recent evaluation (Kornhauser, Barnett, & McPhail, 2014) illustrates the importance of tight coupling between industry and education. An ATE consortium created an in-depth curriculum to train automotive technicians. Upon its release, industry partners indicated that the content did not meet their needs. The consortium revised its curriculum and released a new version year later. That version—created with in-depth employer feedback and validated by industry partners—was generally viewed positively by employer partners surveyed and interviewed for the evaluation, the majority of whom indicated that they used or planned to use related assessments.

Not all occupations and colleges have such close connections between employers and education programs. This is somewhat ironic given community colleges' traditional role in being responsive to employer needs, offering contract training, and preparing students for immediate labor market entry. National surveys of employers find that many have a hard time discerning the specific skills held by

[23] The ATE program supports collaborations between education and industry that build training capacity for skilled technician jobs. The program emphasizes building and delivering training curricula; professional development; and the development of cross-institutional career pathways, all in the service of improving technician education and growing the number of skilled technicians in the United States. For more information, see http://www.atecenters.org/about-us/ or http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5464.

credential holders, making those credentials minimally useful for hiring decisions (see, for example, Franklin & Lytle, 2015).

Should tighter coupling with employer demands and more attentiveness to local labor markets occur, it seems reasonable to think that community colleges' role in preparing middle skills could become more systemic. And yet, the research also highlights challenges with creating a system in which intermediate credentials and associate degrees are aligned into clear and coherent pathways with on- and off-ramps. First is the question of what we are really talking about when we examine "intermediate credentials." Currently, definitions of various credentials are inconsistent. "Certificates," for example, encompass an array of credentials, spanning just a few courses to intensive two-year-long programs. Some researchers even use the words of certificate and certification interchangeably (Lang & Weinstein, 2012; Vakhitova & Bollinger, 2011).

Such lack of consistency has research implications and may contribute to the heterogeneous findings reported here. More importantly, it is difficult to create a coherent system when stakeholders cannot even agree on what goes into such a system. Qualitative research finds that employers, students, and educators often find intermediate credentials amorphous and difficult to understand (Lumina Foundation, 2015). Thus, a key challenge for the field is developing clear and consistent definitions of what intermediate credentials are and what they signify. [24] Without this important step, employers may not value credentials when seeking to fill open positions, and students will not be able to generate a clear understanding of the potential value of earning an intermediate credential.

Moreover, lack of clarity inhibits the creation of an actual system. For example, many employer-college consortia, including ATE and more recent initiatives such as the newly-announced College

[24] On June 12, 2015, the Lumina Foundation announced a "national dialogue" on credential systems, aimed at creating such consistency and building a more coherent credentialing pathway. http://connectingcredentials.org/national-dialogue/

Employer Collaborative,[25] allow for substantial implementation variation. The same employer-driven curriculum may be embedded into degree programs, offered through contract training, or offered on-line as stand-alone content. While this flexibility may increase access via multiple on-ramps, it may also create confusion as to what the employer-driven curriculum really contains, and what obtaining the resulting credential really means.

A second challenge is any series of credentials enables individuals to access training points easily and when they need to do so. But in many instances, it is not clear how individuals find out about training opportunities for middle-skills jobs. Do some workers have more access than others? To what extent to individuals understand the potential pathways offered by intermediate credentials? In many instances, it is assumed that employers will help their workers navigate training opportunities, but what happens to displaced workers, or those whose employers do not know about or do not value intermediate credentials?

Third, as colleges embed intermediate credentials into degree programs, it is important to avoid unintended consequences. While this approach may improve alignment, it may also create new barriers and challenges. For example, associate degree programs typically have entry requirements that certificate programs do not. The fact that students do not need to pass placement exams to take certificate courses serves as an important access point for students who have not been successful in prior educational endeavors; recall Jacobson & Mokher's (2009) finding that certificates are a particularly beneficial for lower-achieving high school students. If, however, students must now pass assessment exams in order to access certificate programs as part of a broader degree program, this sub-set of students may actually *lose* access to middle-skills credentials by virtue of being sent to developmental education rather than directly to a certificate program.

[25] http://www.jff.org/services/addressing-employer-needs/college-employer-collaborative

Moreover, research indicates that short-term certificates do not generally pay off in the labor market—therefore, is it useful to embed them in associate degree programs? Certainly their short-term nature means that they are more accessible and more easily completed than longer-term certificates and degrees. But from a workforce development perspective, investment in these credentials may not be effective, given their uncertain labor market outcomes. It is possible that students will accrue credentials, but that those credentials will not have any labor market payoff. This challenge is magnified for certifications, for which we have virtually no information on their value in the labor market.

6. Implications for policy, recommendations and conclusions

This paper examined community colleges' role in preparing middle skills workers, particularly focused on sub-associate degrees and the extent to which various community college credentials connect to one another systematically. Examining these two issues is important as states and community colleges seek to develop stackable or embedded credentials that build upon one another within the U.S. context, which lacks a centralized workforce development system.

It is clear that less is known about certificates and certifications than is optimal for making informed policy decisions. There is a need for better data on these credentials, particularly certifications. Such data needs would enable more fine-grained analyses of outcomes at the local or sub-occupational level, as well as a better understanding of the interconnection between various credentials and their non-pecuniary benefits.

The available research indicates that outcomes are highly contextual. Within the relatively broad category of "certificates," it appears that different types of certificates have different value, with long-term certificates showing more benefit than short-term certificates. Moreover, the value of intermediate credentials varies by field and sub-field—with long-term certificates showing value in fields like health care but not education and childcare, and certifications showing differential impact even within a single field such as IT.

Research indicates that community colleges are a key driver of technician education, but do not yet operate as a system in most cases. Certificates do not appear to be tightly-coupled to labor market needs; employers do not always understand what certificates mean in terms of the competencies held by those holding the credential; and various credentials do not connect clearly to one another. Given these findings, a number of policy recommendations emerge.

a. ***Support data and research*** in order to truly understand the impact of intermediate credentials, as well as how they fit together as a system.
    i. *Grow the available data*. Data on certifications, in particular, should be incentivized. Industry organizations, for example, could be encouraged or supported as they share and aggregate data on which certifications they offer, who holds these certificates, and the wages of certification-holders. Ideally, these data should be connected to other data systems, such as state student-unit record systems, state UI systems or the National Student Clearinghouse, at the individual level.
    ii. *Encourage more fine-grained outcomes studies.* The value of and need for sub-associate degree credentials appears to vary by local labor market. And yet, most studies take a national perspective or focus on a single state. They also focus on large occupational areas. Studies that examine local labor market contexts and/or sub-fields within middle-skills occupations should be incentivized and funded.

b. Continue to encourage tighter coupling between employers and community college.
    i. Support programs like ATE and the College Employer Collaborative in order to incentivize the development and use of curricula that are driven by employer needs. Such support should go beyond curriculum development, however, to ensure that employers know about, understand, and value the training being developed, and that

curricula are distributed in ways that create systematic on-ramps for a variety of types of students.

ii. *Help colleges understand and respond to local labor market needs,* particularly on the credit side. If the value of advanced technical training programs is truly local, than colleges need to offer programs that are valued in their labor market rather than those which hold high value nationally. And yet, colleges have a difficult time discerning which programs and certificates are valuable; on the credit site, they also have trouble "shedding" programs that do not hold value. Colleges should be incentivized to align their offerings with local needs, and supported while they engage in this often-difficult process.

c. Focus on system-building, rather than credentialing.

i. *Adopt consistent terminology across initiatives.* As colleges and employers strengthen middle-skills training efforts and seek to align them with traditional degrees, a hodge-podge of terms are being used. Adopting consistent terminology for various initiatives ("stackable," "embedded," "competency-based") could help create coherence and enable cross-sector and cross-partnership conversations about overlaps and alignment.

ii. *Ensure that pathways efforts are consistently implemented and understood.* Current efforts tend to focus on building specific pathways that may or may not be used in the same way across, or even within, institutions. Employers and students thus have a hard time understanding the value of various training opportunities and credentials. More consistency in delivery would reduce the need for sophisticated information about different options.

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