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Stackable Credential Pipelines in Ohio

Evidence on Programs and Earnings Outcomes

Stackable credential initiatives aim to align education and training credentials and improve pipelines for workforce development in applied fields. They allow students to start with short-term education and training credentials and then build on these credentials to earn additional certificates and degrees as they advance in the workforce. Students can earn complementary credentials at the same level or work to progressively earn higher-level credentials or degrees, and these credentials can be earned within the same field or across fields of study to shape skills specific to a career.

By offering multiple on-ramps and off-ramps between employment and postsecondary education as students stack credentials over time, these programs can make postsecondary credentials more accessible for individuals who are balancing education with other life responsibilities and

might benefit from the greater flexibility they offer (Austin et al., 2012; Center for Occupational Research and Development, 2018; Wilson, 2016). Stackable programs might also align better with employer needs in fields in which a degree is not required for initial entry but in which workers might later require additional just-in-time training and credentials throughout their careers (Austin et al., 2012; Center for Occupational Research and Development, 2018).

In 2019, the RAND Corporation partnered with the Ohio Department of Higher Education (ODHE) to build a better understanding of how stack-

KEY FINDINGS

- There were large increases in certificate program offerings that exceeded growth in degree programs.
- Certificate programs commonly reported stackable features, and the percentage of new certificate programs that reported stackable features increased between 2014 and 2019.
- On average, individuals who earned a postsecondary certificate in Ohio saw a 16-percent increase in earnings, and individuals who stacked multiple credentials saw a 37-percent increase in earnings (approximately \$9,000 in earnings annually).
- The earnings gains from stacking credentials were highest when individuals started with health care certificates, stacked progressively (to higher levels of credentials), and stacked within a single field.
- Women and younger students experienced larger gains from credentials relative to men and older peers, while findings by race and ethnicity were mixed.

Abbreviations

IT	information technology
MET	manufacturing and engineering technology
ODHE	Ohio Department of Higher Education
OTC	Ohio Technical Center
TAACCCT	Trade Adjustment Assistance Community College and Career Training

able credential pipelines have played a role in the education and training of individuals in Ohio. The state has been a leader in developing stackable credential initiatives. Nearly 15 years ago, Ohio established legislation calling for stackable credential programs to be scaled statewide (Community Research Partners, 2008). ODHE more recently established statewide articulation agreements that award credit toward degrees for blocks of (credit and noncredit) coursework to allow individuals to stack credentials, and the state made changes to funding formulas to incentivize colleges to develop more certificate programs (Ohio Revised Code, undated, Section 3333.162). Federal funding has also helped support stackable programs; Ohio postsecondary institutions received \$55 million in funding from the U.S. Department of Labor's Trade Adjustment Assistance Community College and Career Training (TAACCCT) grants to build programs that were often designed to be stackable (U.S. Department of Labor, undated). RAND and ODHE were interested in exploring how institutions developed these pipelines of stackable credentials, how students were moving through them, and whether they led to improved outcomes for students.

The analysis in this report focuses on stackable credentials in three fields: health care, manufacturing and engineering technology (MET), and information technology (IT). These three fields accounted for more than half of all of the certificates awarded in the state over the period we examined, and they are fields in which many of the state's stackable credential efforts have been focused. For example, the federal TAACCCT grants were awarded primarily to develop programs in health care and manufac-

turing. Manufacturing is experiencing shocks (e.g., plant closings) and ongoing trends (e.g., automation) that may drive needs for upskilling and reskilling of workers. And, as we detailed in a prior report, health care and IT in particular are fields that offer jobs with meaningful wages and opportunities for individuals to develop their skills and advance their careers over time (Daugherty et al., 2020).

The period covered by our study (spanning the Great Recession) also provides an interesting context in which to examine stackable credentials, because Ohio and other states were undertaking efforts to retrain and reemploy large proportions of individuals who lost jobs because of the economic downturn.

Our first report examined which types of students earned multiple credentials, the types of credentials earned, and the pathways students took through institutions in stacking those credentials (Daugherty et al., 2020). This second report, which focuses on the period between 2005 and 2019, provides additional evidence on Ohio's stackable credential pipelines in two areas: (1) the programs available to students in Ohio public institutions and the degree to which these programs incorporated features common among stackable credential programs; and (2) earnings outcomes for certificate-earning students who went on to stack additional postsecondary education credentials. We were interested in understanding whether Ohio's stackable credential initiatives were leading to increased numbers of certificate program offerings at the state's public institutions and whether these programs were being designed to be stackable. We were also interested in understanding whether credential-stacking provided value to individuals and employers.

Our analysis drew on several data sources. Ohio maintains the Ohio Longitudinal Data Archive, a robust student longitudinal data system (see Ohio Longitudinal Data Archive, undated). We examined postsecondary education credentials from the 2004–2005 through 2018–2019 academic years and identified programs awarding credentials in our fields of interest and individuals who earned a certificate and potentially went on to stack additional credentials. Those data were linked with statewide records of employment and earnings from 2000 through 2019 based on the unemployment insurance

system. Finally, ODHE provided information from certificate program applications from 2014 through 2019. In all cases, we limited analysis to credentials awarded by public Ohio institutions because private nonprofit and for-profit institutions do not report data to ODHE; these institutions are also less subject to statewide initiatives around stackable credentials.

Our findings on program offerings indicate that the number of unique programs awarding certificates across colleges increased over time, and these certificate programs were commonly (and increasingly) being designed with features that literature suggests are important to stackable credential programs (Bragg, 2014; Ganzglass, 2014; Kozumplik et al., 2011). For example, new Ohio certificate programs were commonly developed in consultation with industry and aligned with industry licensures. More often than not, new certificate programs were embedded in existing degree programs, and there often were articulation agreements in place that facilitated stacking across institutions.

When we examined the earnings gains from stacking, we made within-individual comparisons to earnings before the individual's first certificate while also controlling for economic trends, the individual's college enrollment status, age, and other characteristics. We found that individuals' earnings increased by 16 percent after earning a certificate. Those who went on to stack credentials experienced an overall increase of 37 percent. We found that earnings gains varied by the types of credentials earned, where the credentials were earned, and the characteristics of the student earning the credentials, similar to what was found in prior studies of stackable credentials in California and Virginia (Bohn, Jackson, and McConville, 2019; Meyer, Bird, and Castleman, 2020).

This report is divided into two main sections, one for each of the two research aims; the first focuses on describing programs in Ohio, and the second focuses on examining earnings outcomes for certificate-earners who go on to stack credentials. Each section begins with a discussion of the literature, followed by our approach to analyzing data and our findings. A supplemental technical appendix (available at www.rand.org/t/RRA207-1) provides more detail on the data and our approach to the

analysis. We conclude with some final thoughts on the evidence regarding Ohio's stackable credential pipelines and the implications for these initiatives in Ohio and across the country.

Program Offerings in Ohio Postsecondary Institutions

What We Know About Stackable Program Offerings

The term *stackable credentials* is used broadly and might have different meanings for different audiences and purposes. The U.S. Department of Labor defined *stackable credentials* as “a sequence of credentials that can be accumulated over time to build up an individual's qualifications and help them to move along a career pathway or up a career ladder to different and potentially higher-paying jobs” (Employment and Training Administration, 2010, p. 6). We provide some additional definitions of credentials that can be stacked and types of stacking in the box on the next page.

Stackable credential initiatives typically call for the intentional design of programs and policies (e.g., articulation agreements) to facilitate seamless movement of students from one credential to another (Austin, 2012; Bragg, 2014; Ganzglass, 2014; Kozumplik et al., 2011). A core feature of stackable credential programs is that two or more credentials have shared coursework, so that students are making progress toward multiple credentials simultaneously (Ganzglass, 2014; Kozumplik et al., 2011). For example, an institution might develop a new certificate program that consists wholly or partially of coursework required for an existing associate's degree program. Awarding a credential for this smaller block of coursework might improve the likelihood that students complete a postsecondary credential even if they are unable to continue on to earn the associate's degree. When these shorter-term programs result in meaningful, industry-recognized credentials, they can provide an off-ramp for students who can later return to complete additional credentials. Institutions might also build new on-ramps to degrees by expanding their applied program offer-

Stackable Credentials: Key Definitions

Stackable credential terminology is often used in varying ways. In this box, we provide a brief overview of some of the key definitions we use in this report.

Types of Credentials

Degree: Credentials awarded by postsecondary education institutions for completion of blocks of general and field-specific educational coursework of two years (associate’s degree) or four years (bachelor’s degree).

Certificate: Credentials awarded by postsecondary education institutions for completion of blocks of educational coursework of two years or less that are typically focused on applied education preparing an individual for a specific job. Ohio institutions award the following three types of certificates:

- **Clock-hour certificates** do not award credit toward a degree and are awarded by OTCs, community colleges, and universities.
- **Short-term credit-bearing certificates** are awarded by community colleges and universities and require less than one year of full-time enrollment.
- **Long-term credit-bearing certificates** are awarded by community colleges and universities and require one or more years of full-time enrollment.

Certification or license: Credentials awarded by industry-recognized organizations that certify that an individual has demonstrated a particular body of knowledge and skills. We are able to capture certificate program alignment with certifications and licenses in our program analysis, but we are not able to account for stacking of these types of credentials in our data.

Types of Stacking

Progressive/vertical stacking: Individuals start with a certificate and go on to stack credentials up to the degree level, or individuals start with a noncredit certificate and go on to stack to any credit-bearing certificate or degree.

Independent/horizontal stacking: Individuals stack credentials at the same level, earning either multiple non-credit certificates or multiple credit-bearing certificates.

ings at the degree level, offering certificate-earners opportunities to deepen or broaden their technical knowledge and skills to advance their careers.

Stackable credential pipelines that articulate shorter-term credentials into longer-term programs are often referred to as “vertical” or “progressive” (e.g., Bailey and Belfield, 2017; Bohn and McConville, 2018; Maxwell and Gallagher, 2020). Students can also stack credentials “horizontally” or “independently” by earning multiple certificates (Bailey and Belfield, 2017; Maxwell and Gallagher, 2020). Some stackable credential pipelines might provide opportunities for both progressive and independent stacking through a “lattice” pathway, which provides students with a core set of coursework and then branches into specializations, allowing students to earn different

certificates and degrees based on that core set of coursework (e.g., Bohn and McConville, 2018).

While some stackable credential initiatives focus explicitly on credit-bearing educational programs, others aim to link a broader set of postsecondary credentials, including industry certifications and licenses and noncredit certificate programs (see the box, above). Individuals in Ohio have access to a robust set of noncredit certificate programs offered by Ohio Technical Centers (OTCs) and community colleges. In many cases, noncredit certificates at OTCs look similar to short-term credit-bearing certificate programs offered at community colleges, which provide students with similar content and meet similar learning objectives. Because these programs do not award college credit, they are commonly referred to in the state as “clock-hour certifi-

cates.” The initial stackable credential legislation in Ohio called for stackable credential pathways that spanned OTCs, community colleges, and universities and encouraged stacking of noncredit and credit-bearing credentials (Ohio Revised Code, undated, Section 3333.34).

Statewide and bilateral articulation agreements can help ensure that students can stack credentials across institutions and articulate noncredit credentials into credit-bearing ones (Ganzglass, 2014). OTCs, community colleges, and public universities in Ohio have long established bilateral articulation agreements to allow for the more seamless movement of students across institutions to stack credentials, according to discussions with state officials. More recently, Ohio has developed statewide articulation agreements that allow students to articulate blocks of coursework toward credit-bearing educational credentials at institutions across the state (Ohio Revised Code, undated, Section 3333.162). These initiatives span both clock-hour and credit coursework and explicitly target the fields in which stackable credentials are common, such as health care and engineering technology.

Finally, stackable pathways might also aim to provide stronger alignment between educational institutions and employers. For example, high-quality programs might consult with industry around program design, embed work-based learning opportunities, and help students gain employment after they have completed credentials (Austin et al., 2012; Center for Occupational Research and Development, 2018; Kozumplik et al., 2011).

There is limited evidence on the degree to which stackable credential programs have been scaled at a state or national level. The emerging literature on stackable credential programs typically focuses on single institutions or consortia, and the statewide research focuses on student patterns of credential-stacking and employment outcomes rather than providing detail on the programs being offered. One study used administrative data and program catalogs from California community colleges to explicitly document the degree to which credentials and programs offered in health care fields could be stacked (Bohn and McConville, 2018). The study used these data on the stackability of programs to characterize

the system’s stackable credential offerings. Findings suggest that students who were enrolled in well-defined sequences of stackable credentials were more likely to stack credentials than those who were enrolled in programs that were not stackable. We examined statewide program data in Ohio with a slightly different purpose: We were interested in understanding whether short-term program offerings expanded over time in response to the state’s stackable credential initiatives and whether certificate programs were being designed in ways that made them stackable.

Our Approach to Describing Program Offerings in Ohio Public Institutions

First, we were interested in measuring the total number of programs offered in our three fields of interest over time to determine whether institutions might be expanding the number and types of credentials offered to build out their pipelines of stackable programs. This part of the analysis drew on comprehensive administrative records of credentials from ODHE. Focusing on the 2004–2005 and 2018–2019 academic years, the data included more than 1.3 million credentials awarded in these three fields at the level of a clock-hour certificate, short-term certificate, long-term certificate, associate’s degree, or bachelor’s degree. The data covered credentials awarded across public institutions in Ohio, including OTCs, community colleges, and universities.

Throughout the study, we used the classification of instructional programs to identify programs offered in health care, MET, and IT. Examples of common short-term credentials in health care included certifications as a health aide, phlebotomist, dental hygienist, substance abuse and addiction counselor, nurse assistant, or emergency medical technician. Longer-term credentials included licensed practical or vocational nursing, medical insurance coding, massage therapy, and more-advanced certifications in emergency medical technology. Some common short-term credentials in MET included certifications in welding, automotive engineering, and electrical engineering. Longer-term credentials included heating, ventilation, and air conditioning

and more-advanced certifications in automotive and industrial technology. Credentials in IT tended to be categorized generally, as computer programming or computer and information sciences, although there were some more-specialized certificates in networking, web design, and security.

We used the program code associated with each credential to identify distinct programs within an institution, and we counted the number of programs awarding at least one credential during a given academic year. We then aggregated programs across all Ohio public institutions to determine how the number of programs awarding credentials at each level varied across fields and over time. We were able to include estimates of OTC programs only through 2013 because of data reporting changes that limited the comparability of data after this time.

Second, we were interested in learning more about the design of certificate programs and whether institutions were designing them in ways that might help encourage credential-stacking. In 2014, ODHE instituted a new approval process that required institutions to submit information about technical certificate programs and receive approval for them in order to receive state funding for student participa-

tion in these programs. An authorized representative from the corresponding academic department was required to provide this information through an online application form. In addition to signaling to institutions what types of things to consider as they designed new certificate programs, the application form captured data that offered evidence on the degree to which these programs might have been built in ways that facilitated stacking with other credentials. We were able to identify 415 applications for new certificate programs proposed from 2014 through 2019.

From the application data, we identified seven measures of “stackable features,” described in the box below, to characterize certificate programs. For example, we assume that a certificate might be more likely to be stackable if it is embedded in an existing degree program, aligned with industry-recognized credentials, and part of articulation agreements. And, as described previously, stackable programs often emphasize strong connections to employers, consulting with industry on program design, embedding experiential learning components, and assisting students with transitions into the workforce (Austin et al., 2012; Bohn and McConville, 2018; Center for

Stackable Features of Ohio Certificate Programs Drawn from Certificate Program Application Forms

Embedding of the certificate into degree programs: The form asked institutions whether the certificate is embedded in a degree program that is approved or pending approval.

Link to industry credentials: The form asked institutions to “identify the occupational license or industry certifications on the approved ODHE list” that were associated with the certificate program.

Consultation with industry around program design: The form asked institutions, “Does the institution consult with business and industry regarding this program?”

Support for students’ employment transitions: The form asked institutions to describe how they assist students with transition into the workforce or the continuation of their education leading to a degree program.

Experiential learning opportunities: The form asked institutions, “Is experiential learning a component of the program?”

Alignment with statewide articulation and transfer agreements: The form asked institutions to “Please list any ODHE articulation and transfer initiative in which this certificate program and its related courses are participating.”

Establishment of bilateral agreements: The form asked, “What bilateral articulation agreements, if any, are active for this program, or are being pursued?”

Occupational Research and Development, 2018; Community Research Partners, 2008; Ganzglass, 2014). We discuss these data in more detail in the technical appendix.

Our Findings on Program Offerings in Ohio Public Institutions

Figure 1 shows rapid growth in the number of certificate-level program offerings in all three of our focal fields. In health care, the number of programs awarding credentials at the short-term certificate level grew, on net, by 146 percent over 15 years, while the number of long-term certificate programs grew by 84 percent. In MET and IT, the growth was also substantial, with increases of 171 percent and 86 percent in short-term certificate programs and increases of 27 percent and 57 percent in long-term certificate programs, respectively. OTC certificate programs in health care and manufacturing also showed substantial growth over the nine years of data we observed, growing by 82 percent and 143 percent, respectively. OTC certificate programs in IT were the one exception, declining by a net 24 percent over nine years.

Data indicated somewhat less growth in program offerings at the degree level, and the findings varied by field. Health care degree programs showed substantial growth at both the associate's and bachelor's degree levels between 2004–2005 and 2018–2019; program offerings increased by 24 percent and 54 percent, respectively. The number of bachelor's degree programs in the other fields also grew; there was an increase of 11 percent for MET programs and an increase of 33 percent for IT programs over the 15-year period. However, associate's degree offerings declined by 16 percent in MET and 10 percent in IT.

To understand more about how certificate programs offered in Ohio institutions were being built, we examined data on seven features that are commonly associated with stackable programs. Figure 2 presents findings by field. The first two items are the most direct way in which programs might facilitate stacking: embedding certificates into degree programs and aligning certificates with industry certifications and licenses. Many of the certificate programs proposed for approval were embedded

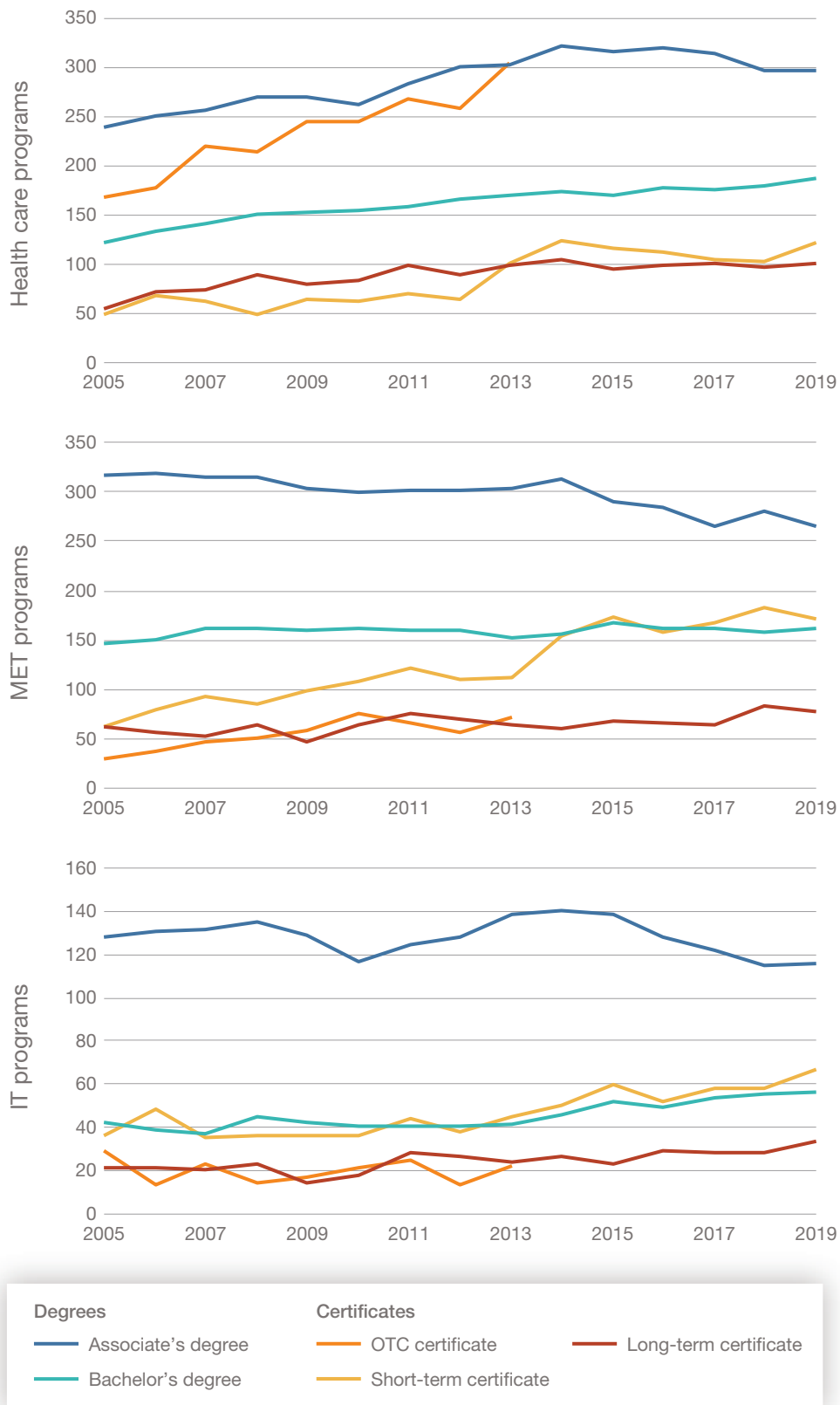
in degree programs, including 58 percent of MET certificate programs, 64 percent of IT certificate programs, and 39 percent of health care certificate programs. Across all three fields, approximately two-thirds of certificate programs were aligned to industry certifications and licenses. When institutions reported that their certificate programs were not aligned to industry licenses, they commonly cited several reasons for this: A license might not exist for that subfield and level of program, or the program might have a more general focus.

Beyond aligning certificate programs to industry certifications and licenses, there are several other ways in which stackable programs can be aligned with industry and support smooth transitions into and out of employment for students who enroll in them. Applications for certificate programs commonly reported consultation with industry and resources to help students transition into jobs (more than 90 percent of programs), although these were likely carried out at the institutional or departmental level rather than being specific features of a program. Experiential learning was somewhat less common, particularly in MET and IT fields (offered in 33 percent and 21 percent of programs, respectively). Clinical requirements for health care are common, so we might expect to find experiential learning opportunities in these programs.

To facilitate cross-institution stacking, institutions could align programs with statewide articulation and transfer agreements and institutions could establish bilateral agreements with other institutions. Statewide articulation agreements covered a limited set of programs and were not fully implemented in the earliest years covered by our data, so alignment was not an option for every program. Approximately half of all programs in each field reported alignment with statewide articulation and transfer agreements. Health care certificate programs were most likely to have bilateral agreements (62 percent, compared with 48 percent for MET programs and 38 percent for IT programs).

We also examined trends over time (by calendar year of application) to determine whether certificate programs were increasingly being developed to include stackable features. Figure 3 shows the results. The solid lines represent features that institutions

FIGURE 1
Ohio Institutions Offered More Certificate Programs Over Time

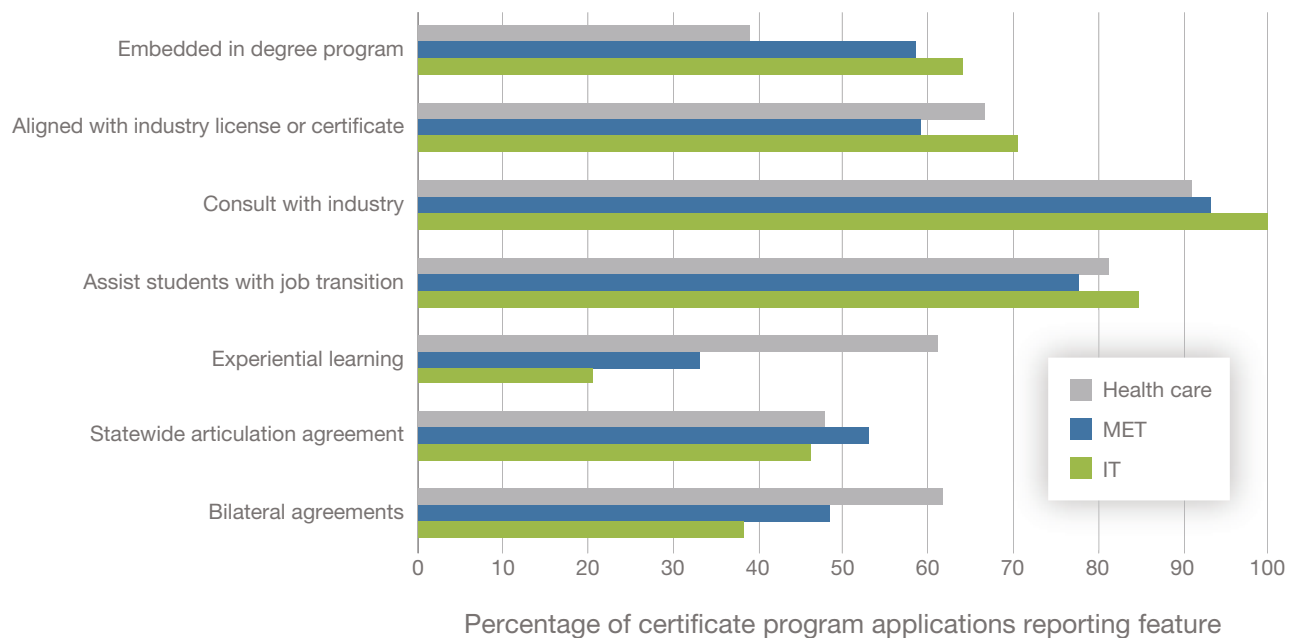


SOURCE: Author calculations based on data in the Ohio Longitudinal Data Archive.

NOTE: Results are based on the following numbers of credentials: 234,013 (health care, first panel); 101,871 (MET, second panel); and 32,495 (IT, third panel). Each academic year and field value shown represents more than ten credential records.

FIGURE 2

Many Programs Had Stackable Features, with Some Variation by Field



SOURCE: Author calculations based on data from certificate program approval forms.
 NOTE: The box on p. 6 provides definitions of measures, and the technical appendix provides further details.

reported more frequently in the later years of our trend data (2017–2019) than in the earlier years of our data (2014–2016), while the dashed lines represent features that were not reported more frequently in the later years. We saw the largest increase over time in certificate programs reporting that they were participating in bilateral articulation agreements, and this feature became nearly universal across new certificate programs in our later years of data. There was also a large increase in the percentage of institutions reporting that new certificate programs had been embedded into degree programs; the percentage doubled between 2016 and 2017 to more than 80 percent of institutions reporting embeddedness, followed by a dip in 2019. We also saw large increases in the percentage of institutions reporting experiential learning and efforts to assist students with job transitions. There was a slight increase in consultation with industry, although institutions reported that they did this frequently throughout the period of our data.

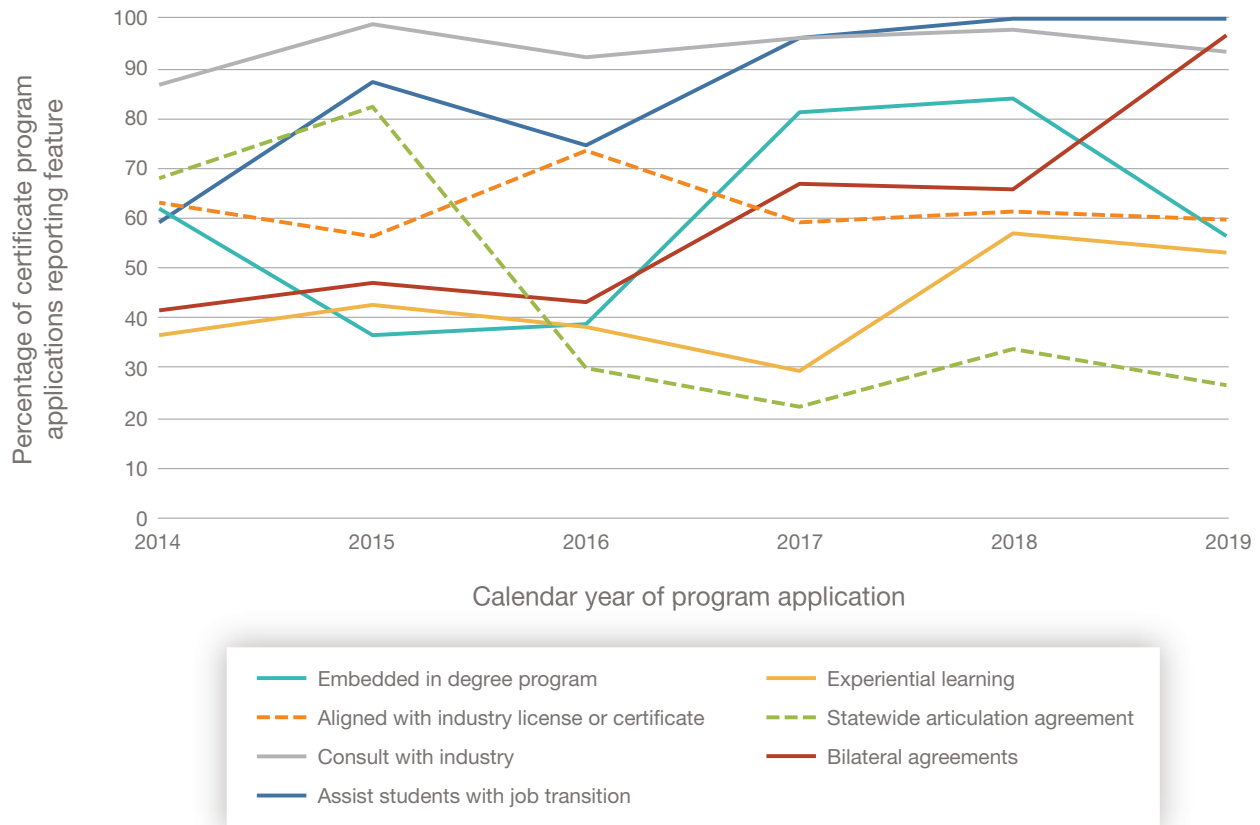
There were only two features for which we did not see an upward trend from the initial three years of data to the later years. The percentage of institutions that reported aligning certificate programs with

industry credentials was relatively steady over time. The only feature for which we observed a decline was participation in statewide articulation agreements; the percentage of institutions reporting this feature for new certificate programs dropped from more than 80 percent in 2015 to just 30 percent in 2016. We anticipated that we would see the opposite pattern because statewide articulation agreements were being scaled at this time. The most likely explanation for such a decline is that early respondents were less well-informed (than later respondents) about the details of statewide articulation agreements as these agreements were being developed and rolled out and might have optimistically overreported their participation in them (likely as a signal of interest in participation); as respondents became more familiar with these agreements, they responded more accurately, and numbers declined.

Of the seven possible features that institutions could offer, the average new certificate program offered 4.9 features as of 2019. This number increased from an average of 4.1 features in 2014, signaling an overall increase in the prevalence of stackable features across new certificate programs over time.

FIGURE 3

More Programs Reported Stackable Program Features Over Time



SOURCE: Author calculations based on data from certificate program approval forms.

NOTES: The box on p. 6 provides definitions of measures, and the technical appendix provides further details. Solid lines represent features for which there was an upward trend, defined as the percentage of programs that included the feature in the later years of implementation (2017–2019) being greater than the percentage of programs that included the feature in the earlier years of implementation (2014–2016). Dashed lines represent features that did not show an upward trend.

Stackable Credentials and Earnings Outcomes

What We Know About Stackable Credentials and Earnings Outcomes

According to the U.S. Department of Labor’s definition of stackable credentials, these programs should lead to career advancement for individuals (Employment and Training Administration, 2010). Postsecondary education and training can increase an individual’s opportunities in the labor market in two ways: by increasing the individual’s productivity by building knowledge, skills, and abilities (e.g., Becker, 1993; Rosen, 1976) and by offering clear signals to employers about what the individual brings

to the workplace (e.g., Spence, 1973; Weiss, 1995). Examining employment outcomes can provide evidence on whether stackable credentials are achieving their intended aims of furthering individual career opportunities and meeting workforce needs.

Prior research attempts to disentangle the direct effect of schooling from other factors that might affect earnings (e.g., motivation) by estimating changes in earnings for an individual before and after the individual completes a postsecondary credential and, thus, controlling for any constant factors common to that individual’s earnings outcomes over time. Several papers have used Ohio data to estimate the returns to credentials, focusing on somewhat earlier cohorts of students relative to our study and

examining the returns from single credentials rather than stacking (Bettinger and Soliz, 2016; Minaya and Scott-Clayton, 2020). Findings from Ohio and other states have consistently found that credentials earned below the bachelor's degree level can increase earnings for individuals, although findings vary across states, fields, credential types, and demographic groups (Bahr et al., 2015; Belfield and Bailey, 2017; Bettinger and Soliz, 2016; Minaya and Scott-Clayton, 2020; Stevens, Kurlaender, and Grosz, 2018; Xu and Trimble, 2016).

A review of findings across studies indicated that associate's degrees provided the largest returns to earnings among sub-baccalaureate credentials, while returns from certificates were somewhat lower (Belfield and Bailey, 2017). The evidence was the least favorable for short-term certificates (i.e., one year or less of full-time enrollment); data from Ohio and Washington state indicated negative returns or no benefits to short-term certificates (Dadgar and Trimble, 2015; Minaya and Scott-Clayton, 2020), while other studies have shown positive returns that are somewhat lower than those of long-term certificates and often diminish over time (Bahr et al., 2015; Bettinger and Soliz, 2016; Jepsen, Troske, and Coomes, 2014; Liu, Belfield, and Trimble, 2015; Xu and Trimble, 2016). Studies that rely on state administrative data have not examined the differences in returns from noncredit and credit certificates, but a recent study relying on national survey data found higher returns from credit-bearing certificates (Hester and Kitmitto, 2020).

Regarding returns across different fields of study, the research suggests that credentials in technical fields led to larger increases in earnings than those in nontechnical fields, and health credentials typically provided the highest returns across all fields (Belfield and Bailey, 2017). For example, a study from California found that health care credentials led to returns that ranged from 12 percent to 99 percent, while non-health care programs led to returns that ranged from 5 percent to 10 percent (Stevens, Kurlaender, and Grosz, 2018). Studies using Ohio data documented positive returns from health care credentials at all levels and somewhat smaller returns from credentials in engineering technology and computer and information sciences, depending on period

and level of credential examined (Bettinger and Soliz, 2016; Minaya and Scott-Clayton, 2020).

These studies also commonly disaggregate findings by gender. Findings across states indicated that women saw larger gains, on average, from both certificates and associate's degrees (Belfield and Bailey, 2017). Multiple studies have found varied findings by gender depending on the type of certificate; in these studies, men saw higher returns from short-term certificates relative to women, and women experienced higher returns from long-term certificates (Bahr et al., 2015; Bettinger and Soliz, 2016).

More-recent research examines the gains in earnings for individuals who stack multiple credentials. Using national survey data, Bailey and Belfield, 2017, found that the employment gains for students who earned multiple credentials were mixed and could not be precisely estimated because of small sample sizes. A second study examined credentials from California community colleges and used changes in earnings for an individual over time to estimate the earnings gains that result from stacking credentials (Bohn, Jackson, and McConville, 2019). The authors found that students who initially earned a long (more than one year) certificate saw a 20-percent gain in earnings for a second credential and an additional 4-percent increase in earnings for the third credential, while credential-stackers who started with a short-term certificate saw gains of 6 percent each for their second and third credentials (Bohn, Jackson, and McConville, 2019). A third study relied on similar analyses of data from Virginia community colleges and found somewhat smaller but positive returns from stacking (Meyer, Bird, and Castleman, 2020); findings indicated that short-term certificate-earners saw the largest returns from stacking—in contrast to findings from analyses of California data. These studies also find higher gains for health care credentials relative to other fields (Bailey and Belfield, 2017; Bohn, Jackson, and McConville, 2019; Meyer, Bird, and Castleman, 2020).

The California and Virginia studies of returns from credential-stacking also examine variation by demographic characteristics. California findings suggested that among students who stacked credentials, those who were white and Asian saw the larg-

est earnings gains (Bohn, Jackson, and McConville, 2019), while Virginia findings indicated no returns from stacking for black students and large returns for white students (Meyer, Bird, and Castleman, 2020). These studies also found higher returns for individuals who were under the age of 25 relative to those over 25, commonly referred to as “adult learners” (Bohn, Jackson, and McConville, 2019; Meyer, Bird, and Castleman, 2020).

Our study builds on these studies by examining the returns from credential-stacking in a new context. Ohio is unique relative to many other states in that certificates are offered by all types of public institutions, including OTCs, community colleges, and universities. Both community colleges and universities in Ohio offer credit-bearing certificates that require up to two years of coursework and opportunities to continue on to longer-term credentials at the same institution. Statewide and bilateral agreements have also been a high priority for the state in recent years, offering opportunities for students to move across community colleges and universities and articulate clock-hour (i.e., noncredit) certificates from OTCs into credit-bearing certificate and degree programs at colleges and universities. Our data allowed us to estimate earnings gains as students moved across institutions and stacked credentials that ranged from clock-hour certificates to bachelor’s degrees, while studies in other states have focused on stacking within community colleges only (Bohn, Jackson, and McConville, 2019; Meyer, Bird, and Castleman, 2020). And finally, Ohio has unique eco-

nomic and employment conditions that differ from those in California and Virginia.

Our Approach to Examining Earnings Outcomes in Ohio

To build evidence on the earnings outcomes for individuals who earned certificates and went on to stack additional credentials at public institutions in Ohio, we made use of several statewide administrative data sources: (1) enrollment and completion records from Ohio public community colleges and universities that document certificates and degrees earned and student demographics, (2) enrollment and completion records from OTCs on certificates earned and student demographics, and (3) unemployment records that document quarterly earnings. All data were available from the 2004–2005 through 2018–2019 academic years, and lagged earnings records were available starting in 2000.

We examined individuals earning all types of educational certificates in Ohio, including those who earned a clock-hour certificate from an OTC and those who earned a short-term certificate or a long-term certificate from a community college or university. We focused the analysis on individuals who earned an initial certificate between the 2004–2005 and 2012–2013 academic years from a public post-secondary institution in Ohio. Focusing on these cohorts allowed us to follow individuals for six years after the award of their initial certificate to track the stacking of credentials and examine medium-term earnings outcomes as students built careers. We also

Our study builds on previous studies by examining the returns from credential-stacking in a new context. Ohio is unique relative to many other states in that certificates are offered by all types of public institutions, including OTCs, community colleges, and universities.

We followed an individual's earnings over time and compared changes before and after the individual earned a credential while accounting for individual characteristics, labor market conditions, and whether the individual was enrolled in college.

accounted for five years of pre-certificate earnings in our analysis.

It is important to note that we are measuring the returns from credential-stacking among individuals rather than the returns from stackable credential programs. When students earn multiple credentials, it does not necessarily mean that the programs they completed were designed to be stackable. For example, some students might pursue a second credential because they have decided to shift careers, or they might choose to pursue multiple credentials out of interest despite these programs not being intended to prepare students for career advancement within a single field. The ideal would be to combine program-level data on stackable features with student-level data to separately examine returns for programs with stackable features, but the mismatch in periods covered in our data sets (i.e., stackable features are documented only for programs developed in 2014 or later) and the infeasibility of collecting historical data prevented us from conducting this analysis.

Our approach to examining earnings gains aligns closely with the approach used to examine credential-stacking in California community colleges (Bohn, Jackson, and McConville, 2019). First, we examined earnings gains across different groups of certificate-earners, making comparisons between groups of students who did and did not go on to stack credentials within six years of the initial certificate. For those employed in Ohio, we examined two different earnings outcomes: average earnings in constant 2019 dollars and the percentage earning a *middle-class income*, which we defined as earning two times the federal poverty guideline for an individual. We

broke out the analyses by type of certificate the individual first earned, since research has shown different patterns in earnings for students who started with different types of certificates (Belfield and Bailey, 2017; Bohn, Jackson, and McConville, 2019).

Second, we estimated the returns from credentials for individuals. In an attempt to isolate the earnings gains that were driven by earned credentials from changes in earnings that might be driven by the labor market or individual characteristics, we followed an individual's earnings over time and compared changes before and after the individual earned a credential while accounting for individual characteristics, labor market conditions, and whether the individual was enrolled in college. More details on how we conducted these analyses are provided in the technical appendix.

We examined variation in the returns from credential-stacking across different types of credentials and individuals. We tested for statistical differences between the estimated returns for subgroups, and we report when differences are significant. As described earlier, prior research suggests that returns from stacking were higher when students started with longer-term certificates, stacked progressively, earned health care credentials, and stacked within the same field, and we were interested in comparing patterns in Ohio with those in other states (Bailey and Belfield, 2017; Bohn, Jackson, and McConville, 2019; Meyer, Bird, and Castleman, 2020). Findings on variation across credential type and field might also provide information to institutions and students in Ohio regarding which stackable credentials might provide the greatest value.

We defined certificate type based on a field that was provided directly in the data for credit-bearing credentials, and *long-term* certificate programs were defined as those requiring more than one year but less than two years of coursework. We classified the noncredit certificates reported in the OTC data separately, as clock-hour credentials. We used definitions in Bailey and Belfield, 2017, of *progressive stacking* and *independent stacking*; the former indicates students who earn a degree after first earning a credit-bearing certificate, and the latter indicates individuals who earn multiple short-term credentials. We modified the definition of progressive stacking for noncredit certificate-earners and considered completion of any credit-bearing credential after a noncredit certificate to be progressive stacking.

We also estimated returns separately by gender, race and ethnicity, and age to build evidence on how returns to stacking affect key subgroups. In provid-

ing new, flexible pathways for individuals who are not being sufficiently served by traditional degree programs, stackable credential pipelines might have the potential to support equity in postsecondary education. However, some have raised concerns that stackable credentials might track certain groups of students into short-term credentials that provide limited value (Giani and Fox, 2017). Evidence on the returns of credential-stacking by gender, race and ethnicity, and age can shed light on these questions.

Table 1 presents summary statistics for our sample and shows similarities and differences across students by type of certificate first earned: OTC certificate, short-term certificate, and long-term certificate. The table shows that among OTC certificate-earners, 13 percent of students went on to stack credentials, and these students primarily earned additional OTC certificates in the same field. For short-term certificate-earners, almost half went

TABLE 1
Summary Statistics for Our Sample of Certificate-Earners in Ohio

Characteristic	Percentage of Certificate-Earners		
	OTC Certificate	Short-Term Certificate	Long-Term Certificate
Rate of credential-stacking			
Stacked additional credential(s) within six years	13	49	43
Stacked in the same field within six years	12	40	38
Stacked progressively within six years	2	33	36
Field of study			
Health care	92	68	81
MET	6	23	17
IT	2	9	2
Demographic characteristic			
Women	70	56	71
White	92	80	81
Black	5	9	10
Hispanic	1	2	2
Asian	<1	1	1
Adult learner (ages 25 and older at time of certificate)	64	67	70

SOURCE: Author calculations based on Higher Education Information System data and OTC data in the Ohio Longitudinal Data Archive.

NOTE: The total numbers of individuals in each group are as follows: 4,761 (OTC certificate), 10,568 (short-term certificate), and 12,913 (long-term certificate). "Stacked progressively" denotes a degree for short- and long-term certificate-earners, and it denotes any credit-bearing credential for OTC clock-hour certificate-earners. Age is missing for a majority of OTC certificate-earners.

on to stack. Four out of five stackers stayed within the same field, and nearly as many stacked to the degree level. The picture was similar for long-term certificate-earners. Health care predominated across all certificate types, but it was the most common for OTC certificates.

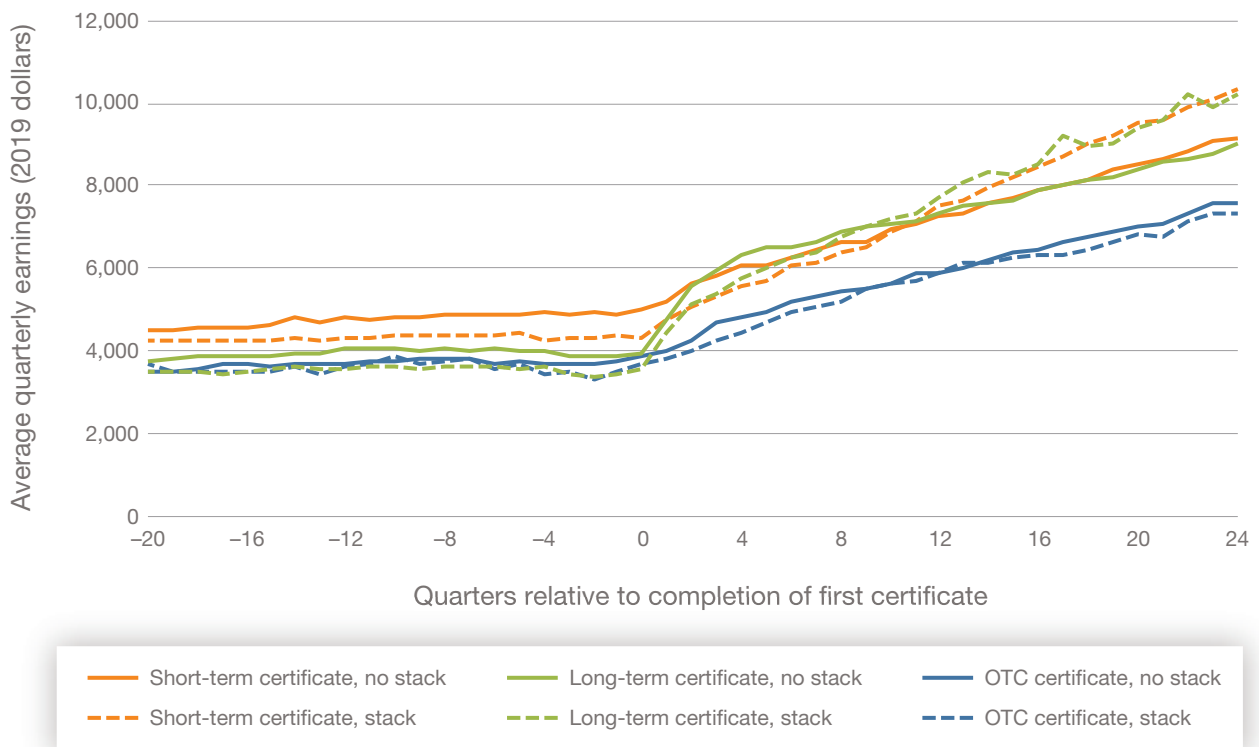
Adult learners—individuals ages 25 and older—accounted for approximately two-thirds of both short- and long-term certificate-earners, and the racial and ethnic breakdown of short- and long-term certificate holders was also similar (approximately 80 percent white and 10 percent black, reflecting Ohio’s overall demographics). Short-term certificate-earners were more likely to be men (44 percent, versus 29 percent for long-term certificate-earners and 30 percent for OTC certificate-earners), likely because women are overrepresented in health care fields, where long-term certificates are more

common. OTC certificate-earners were younger and more likely to be white than those earning credit-bearing certificates and were more likely to be in health care programs.

Our Findings on Earnings Outcomes in Ohio

Figure 4 presents trends in earnings for employed individuals in the quarters before and after they received their initial certificate. The figure compares stackers and non-stackers and breaks students out by type of initial certificate earned. We found that all of the groups of students saw increased rates of earnings growth after the completion of a certificate, consistent with the patterns found in prior studies (Belfield and Bailey, 2017; Bohn, Jackson, and McConville, 2019). Earnings were remarkably constant in the

FIGURE 4
Certificate-Earners Who Stacked Credentials Had Higher Long-Term Earnings



SOURCE: Author calculations based on data in the Ohio Longitudinal Data Archive.

NOTE: Each data point is an average of earnings among employed individuals in one of the groups. The numbers of unique individuals in each group are as follows: 4,126 (OTC certificate, no stack), 635 (OTC certificate, stack), 5,377 (short-term certificate, no stack), 5,190 (short-term certificate, stack), 7,410 (long-term certificate, no stack), and 5,501 (long-term certificate, stack). Each individual appears in several quarters. Wages are adjusted to constant dollars as of the second quarter of 2019 using the Consumer Price Index.

quarters before the first certificate, at around \$4,000 per quarter, or \$16,000 per year in 2019 dollars. Earnings immediately began to increase after the first certificate, more than doubling in the six years following the completion of the initial certificate.

Average earnings after six years were similar for short-term and long-term certificate-earners. Long-term certificate-earners started at lower levels of initial earnings relative to short-term certificate-earners but saw a faster rate of growth after earning the certificate. Other studies have shown bigger differences in average post-certificate earnings among individuals earning short- and long-term certificates (Bohn, Jackson, and McConville, 2019; Meyer, Bird, and Castleman, 2020). OTC certificate-earners had somewhat lower average earnings after six years, earning an average of \$7,500 per quarter compared with at least \$9,000 per quarter for individuals who earned credit-bearing certificates.

Finally, we found that patterns of earnings growth differed between individuals who earned short- and long-term certificates and went on to stack additional credentials and certificate-earners who did not go on to stack credentials. Credit-bearing certificate-earners who went on to stack initially had earnings growth that lagged relative to their non-stacking counterparts, but their average earnings surpassed those for non-stacking certificate-earners within three years. For example, individuals who initially earned a long-term certificate and went on to stack credentials saw their average earnings increase by approximately \$1,000 per quarter after four quarters, while their non-stacking counterparts saw increased earnings of approximately \$1,500 per quarter, on average. This lower initial growth in earnings could be attributable to the continued enrollment of these individuals in postsecondary institutions as they went on to earn additional credentials (something we account for in our later regression analysis). However, when we examined earnings six years after award of the initial certificate, individuals who stacked credentials were averaging \$1,200 more per quarter than individuals who had not gone on to stack credentials. We did not, however, see much difference in earnings patterns for individuals who did and did not stack credentials among those who had initially earned an OTC certificate. Table 1 indicates

that patterns of stacking differed for OTC certificate-earners relative to short- and long-term certificate-earners—few OTC students stacked progressively—and this might have contributed to the findings. We explore the lower returns to stacking for OTC certificate-earners later in the report.

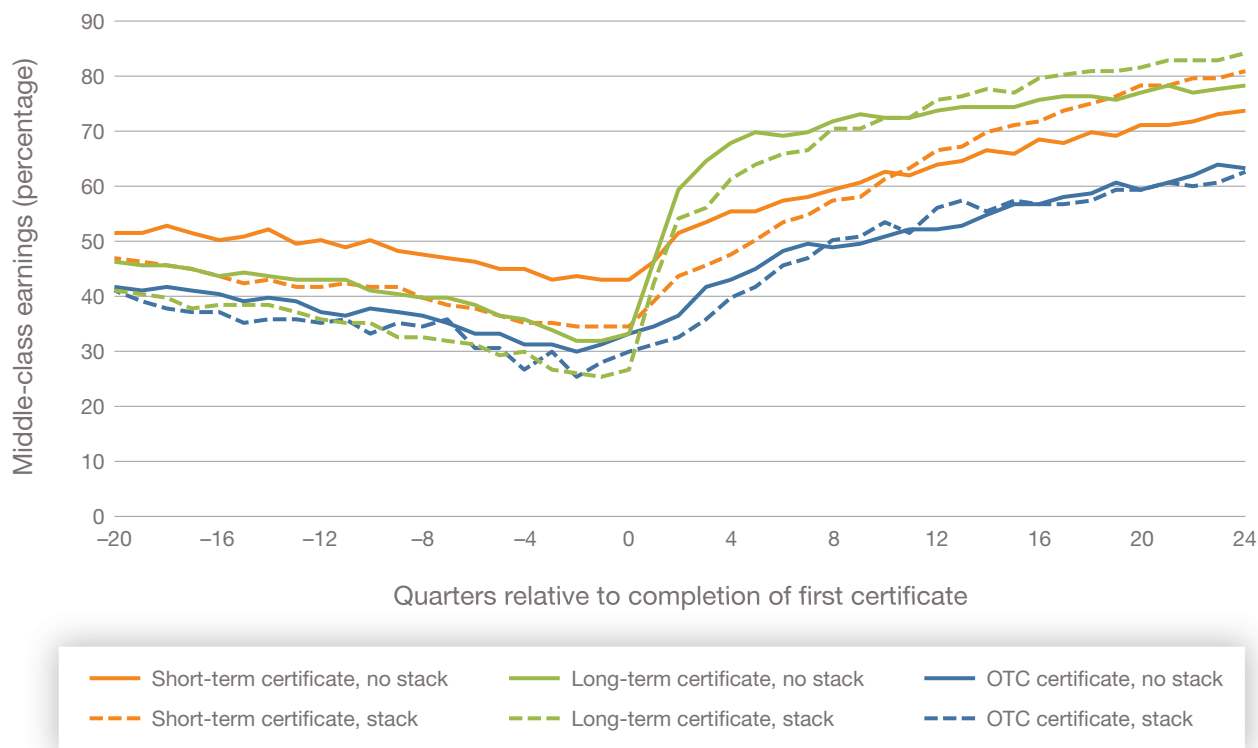
When we examined patterns for an alternative employment outcome—percentage of individuals earning a middle-class income—the findings looked similar (see Figure 5). The rate of earning a middle-class income before the first certificate ranged from 40 percent to 50 percent. By six years after the first certificate, rates had grown from 60 percent to 85 percent. As with the average earnings results in Figure 4, short-term certificate-earners started at the highest baseline. However, the percentage of short-term certificate-earners earning middle-class wages was quickly surpassed by the percentage of long-term certificate-earners. Over time, the stackers who started from short-term certificates surpassed the non-stackers who started from long-term certificates. Within both credit-bearing certificate groups, stackers surpassed non-stackers approximately ten quarters after having earned the initial certificate. There was little evidence of an earnings premium for stacking among OTC certificate-earners.

The remainder of our results focus on regression-adjusted estimates of income returns of a credential, or the percentage increase in quarterly earnings that individuals experienced after earning a credential. With this approach, we attempt to account for past earnings, current enrollment, age, and prevailing economic trends. All of the estimates that we focus on are statistically significant at the 5-percent level unless noted as small or insignificant. The estimation approach and the richness of our data lead most estimates to be very precise, meaning that the confidence intervals around the estimates are relatively small. In most cases, we can rule out effects that are more than a few percentage points higher or lower than our reported estimate.

Figure 6 compares returns for individuals who only earned a certificate with returns for individuals who stacked multiple credentials, breaking out findings by the field and type of initial certificate earned. When we averaged returns across our full sample, earning the initial certificate led to a

FIGURE 5

Certificate-Earners Who Stacked Credentials Were More Likely to Earn Middle-Class Wages



SOURCE: Author calculations based on data in the Ohio Longitudinal Data Archive.

NOTE: Each data point is an average of earnings among employed individuals in one of the groups. The numbers of unique individuals in each group are as follows: 4,126 (OTC certificate, no stack), 635 (OTC certificate, stack), 5,377 (short-term certificate, no stack), 5,190 (short-term certificate, stack), 7,410 (long-term certificate, no stack), and 5,501 (long-term certificate, stack). Each individual appears in several quarters. *Middle-income wages* are defined as more than two times the poverty guideline for that year for the 48 contiguous states.

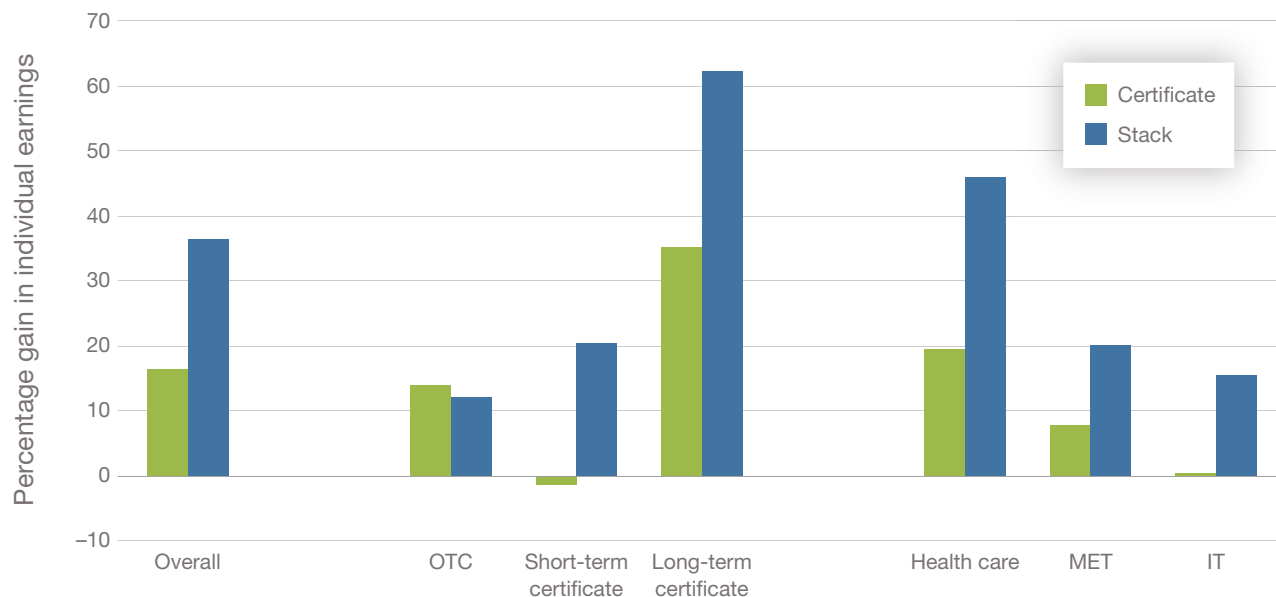
16-percent increase in earnings, and stacking credentials led to an overall 37-percent increase in earnings. The 37-percent overall increase is equivalent to approximately \$9,000 in additional wages annually. Individuals who only earned a certificate and did not stack credentials experienced earnings gains after earning long-term and OTC certificates (35 percent and 14 percent, respectively), but not after earning a short-term certificate (a slight negative estimate that is not statistically significant). These findings of lower returns for short-term credit-bearing certificates relative to long-term certificates are similar to findings in other studies (e.g., Belfield and Bailey, 2017; Bohn, Jackson, and McConville, 2019). We found that when individuals went on to stack additional credentials, doing so boosted estimated earnings (by an additional 21 percent for those with

short-term certificates and 27 percent for those with long-term certificates). OTC certificate-earners who went on to stack did not see any additional earnings gains beyond those from the initial certificate.

We found large differences in the estimated returns from stacking by field (Figure 6). Health care certificate-earners gained the most both from the first certificate (a 19-percent increase in earnings) and from stacking (a 46-percent increase). MET certificate-earners gained 8 percent from the first certificate and 20 percent from stacking credentials. IT certificates alone did not yield a positive return (they yielded a small estimate that was not statistically significant), but stacking credentials following an IT certificate resulted in a 15-percent overall increase in earnings. Our finding of higher estimated returns from credentials in health care fields was

FIGURE 6

Estimated Returns from Credential-Stacking Vary by Type of First Certificate and by Field



SOURCE: Author calculations based on data in the Ohio Longitudinal Data Archive.

NOTE: Bars represent regression estimates; results with standard errors and confidence intervals are reported in the technical appendix. Each grouping represents the results of one regression that controls for current college enrollment, age, individual fixed effects, and quarter fixed effects. The overall group includes 28,239 unique individuals, and the numbers of individuals in each subgroup are as follows: 4,761 (OTC certificate), 10,567 (short-term certificate), 12,911 (long-term certificate), 937 (health care), 4,901 (MET), and 1,401 (IT).

consistent with findings from other studies (Belfield and Bailey, 2017; Bettinger and Soliz, 2016; Bohn, Jackson, and McConville, 2019; Meyer, Bird, and Castleman, 2020; Minaya and Scott-Clayton, 2020).

Table 2 presents detailed findings by type and field of initial certificate, although we are unable to separately estimate returns for OTC certificate-earners in fields other than health care because of small sample sizes in these fields. The table also breaks results out into returns for those stacking progressively, or vertically (column 3)—i.e., credit-bearing certificate-earners going on to earn degrees and clock-hour certificate-earners going on to earn credit-bearing credentials—and those stacking independently, or horizontally (column 2). Column 1 shows the estimated increase in earnings from completing a certificate and not stacking credentials.

Findings suggest that OTC health care certificate-earners did not see much of a difference in earnings when stacking credentials at the same level but saw substantial earnings gains when they went on to stack credit-bearing credentials or degrees (a

total average increase of 33 percent). The earnings gains for OTC certificate-earners who went on to stack credit-bearing credentials were similar to those for short-term certificate-earners who stacked to the degree level. This suggests that the limited earnings gains that we saw for OTC certificate-earners in Figure 6 were driven by the tendency of stackers to earn multiple noncredit credentials from an OTC, with few OTC certificate-earners going on to stack credit-bearing credentials (Table 1).

Findings for short-term and long-term certificate-earners indicated higher returns for those who went on to earn a degree. In health care, we found returns of 36 percent for short-term certificate-earners and 88 percent (more than double the individuals' pre-certificate baseline) for long-term certificate-earners who went on to earn a degree, compared with returns of 8 percent and 32 percent for those who stacked multiple certificates but did not earn a degree. Stacking to the degree level also generated higher returns than stacking certificates for MET and IT certificate-earners. In those

TABLE 2

Estimated Returns Are Higher for Individuals Who Stack Progressively

Characteristic	Total Percentage Increase After Earning a Certificate	Total Percentage Increase for Independent (Horizontal) Stacking	Total Percentage Increase for Progressive (Vertical) Stacking
First certificate was earned at an OTC			
Health care	14	13	33
First certificate is a short-term credit-bearing certificate			
Health care	-1	8	36
MET	4	7	23
IT	-1	2	19
First certificate is a long-term credit-bearing certificate			
Health care	43	32	88
MET	11	12	24
IT	2	14	20

SOURCE: Author calculations based on data in the Ohio Longitudinal Data Archive.

NOTE: Numbers are regression estimates; full results with standard errors and confidence intervals are reported in the technical appendix. Each grouping represents the results of one regression that controls for current college enrollment, age, individual fixed effects, and quarter fixed effects. The designation of "progressive stacking" corresponds to a degree for short- and long-term certificate-earners and any credit-bearing credential for OTC clock-hour certificate-earners. The sample sizes for each group are as follows: 4,369 (OTC, health care), 7,156 (short-term certificate, health care), 2,414 (short-term certificate, MET), 997 (short-term certificate, IT), 10,412 (long-term certificate, health care), 2,191 (long-term certificate, MET), and 308 (long-term certificate, IT).

fields, additional certificates led to very small or no increases in wages. Interestingly, individuals who earned a MET or IT certificate and went on to stack progressively had remarkably similar overall returns whether the individual started with a short-term or a long-term certificate.

Our definition of credential-stacking allowed individuals to count as having stacked regardless of whether the additional credentials earned were in the same field. The majority of credential-stackers (86 percent overall) earned all of their credentials within the same field, and cross-field stacking was most common among IT certificate-earners (27 percent of IT certificate-earners stacked at least one credential in a different field). Stacking within the same field might be more likely to represent progress through a series of aligned credentials, so we might expect to see greater returns from stacking within a field than we would for cross-field stacking.

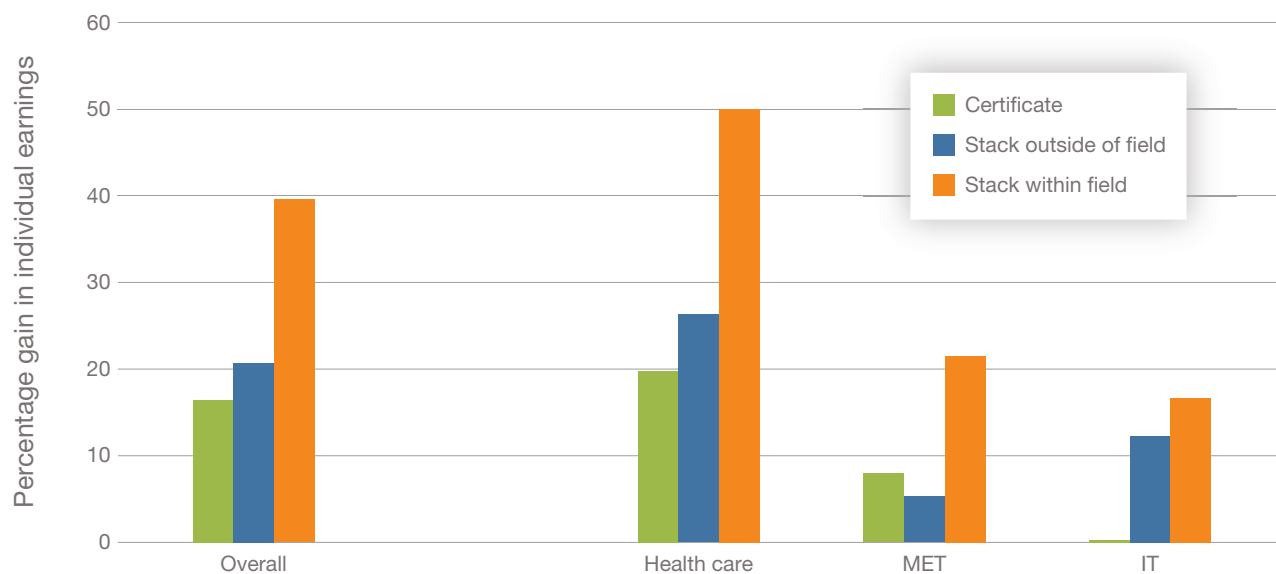
The results in Figure 7 confirm our expectations that stacking within a field led to greater benefits in terms of increased earnings. The green bar in each

grouping is the increase that follows certificates, the blue bar is the increase that follows stacking, and the orange bar is the increase that follows stacking within a field. The bars for stacking within a field are higher and represent statistically significant earnings gains relative to stacking outside a field, except in IT. The types of certificates that students earned in IT were general and applicable across a variety of fields, more so than specific trades or medical certifications, and going into other fields therefore apparently yielded the most benefit relative to a certificate alone (which, for IT certificates, resulted in no earnings gains). For health care certificate holders, there was also a benefit to stacking even if it was not in health care, but the same was not true in MET. For MET certificate holders, stacking increased earnings only if the next credential was also in MET.

To examine the implications of stacking for populations that have traditionally been under-represented in postsecondary education, we examined returns by gender, race and ethnicity, and age (Figure 8). Our estimates account for differences

FIGURE 7

Returns from Credential-Stacking Within the Same Field Are Greater for Health Care and MET than for IT



SOURCE: Author calculations based on data in the Ohio Longitudinal Data Archive.

NOTE: Bars represent regression estimates; results with standard errors and confidence intervals are reported in the technical appendix. Each grouping represents the results of one regression that controls for current college enrollment, age, individual fixed effects, and quarter fixed effects. The overall group includes 28,239 unique individuals, and the numbers of individuals in each subgroup are as follows: 21,937 (health care), 4,901 (MET), and 1,401 (IT).

in certificate-earners’ demographic characteristics, which vary by certificate type and field. We did not have access to data on socioeconomic status, so we were unable to examine returns of stackable credentials for low-income individuals.

Women appear to have accrued much larger returns than men, both from the first certificate and from the additional credential or credentials they stacked (with a 47-percent overall increase in earnings for women who stack, versus a 22-percent increase for men). Women were overrepresented in health care fields, and returns to credentials in these fields tended to be higher, so this was an important contributor to differences by gender. We further break out the estimates into gender-by-field groupings in the technical appendix and show that patterns in earnings gains by gender vary across fields, with women seeing higher earnings gains from stacking in health care and IT and men seeing higher gains from stacking in MET.

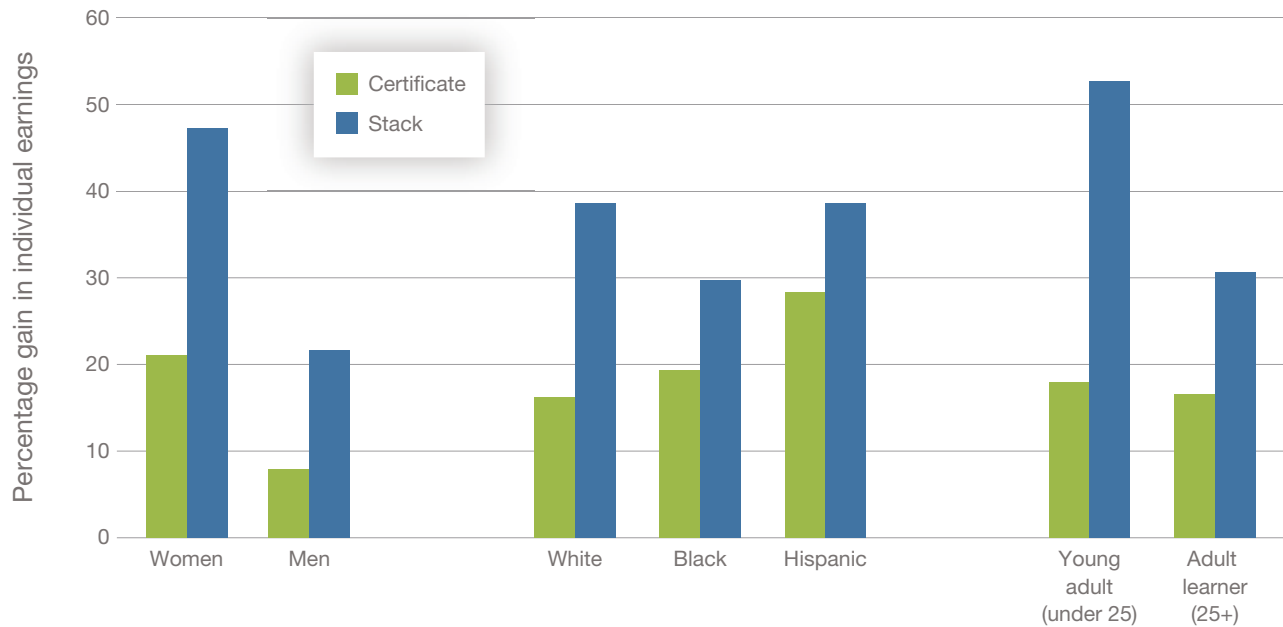
The overall return from stacking was also much larger for individuals who earned a certificate under

the age of 25 (53 percent) than for adult learners (31 percent). The overall returns from stacking were statistically significantly higher for white students (38 percent) than for black students (30 percent). We found that these higher returns from stacking for white students are driven by the returns from the additional credential or credentials stacked because earnings gains from the initial certificate were similar for black and white students. Hispanic students accrued significantly larger earnings gains from the initial certificate than either white or black students but had similar overall returns from stacking to white students. We do not present findings for other racial and ethnic groups because of small sample sizes. Race and ethnicity and age groups are evenly distributed across fields, so selection into fields cannot explain the differences in returns across these groups.

Overall, our results indicate positive returns from stacking credentials for most individuals in Ohio. Those who saw the largest increases in earnings from stacking credentials were those who started

FIGURE 8

Estimated Returns from Credential-Stacking Vary by Student Demographics



SOURCE: Author calculations based on data in the Ohio Longitudinal Data Archive.

NOTE: Bars represent regression estimates; results with standard errors and confidence intervals are reported in the technical appendix. Each grouping represents the results of one regression that controls for current college enrollment, age, individual fixed effects, and quarter fixed effects. The numbers of individuals in each subgroup are as follows: 18,380 (women), 9,859 (men), 23,407 (white), 2,526 (black or African American), 434 (Hispanic), 12,403 (young adult), and 12,130 (adult learner).

with long-term certificates, those who stacked credentials progressively or vertically, and those who earned credentials in health care. Women, younger students, and white students also had higher returns overall from credential-stacking, even when we controlled for their selection into different fields and certificate types.

Discussion and Conclusion

Ohio postsecondary institutions and state policymakers have pursued several initiatives to build pipelines of stackable programs in such fields as health care, MET, and IT, yet little was known about the programs being offered, the degree to which students were moving through these pipelines to stack credentials, and whether the stacking was translating into improved earnings. Our first report demonstrated that more students were earning certificates over time and that students were increasingly likely to stack credentials, and it also described the types

of students stacking credentials and their progress through Ohio institutions (Daugherty et al., 2020). This report provides additional evidence on Ohio’s stackable credential pipelines, documenting the earnings gains for individuals who stacked credentials and the programs that Ohio institutions offered to facilitate credential-stacking. We found promising evidence in both areas, suggesting that the state’s stackable credential initiatives might be helping support an expanded set of stackable program offerings and that the stacking of credentials provides value to individuals and employers in Ohio. We also found several potential areas for improvement. In this section, we document our key findings, limitations, areas for additional research, and implications for the field and Ohio’s efforts to scale stackable credentials.

Stackable Program Offerings in Ohio

Our findings indicate that there was substantial growth in certificate programs (particularly short-term certificate programs) and somewhat less growth

There was substantial growth in certificate programs (particularly short-term certificate programs) and somewhat less growth in degree programs over the time that Ohio was rolling out its stackable credential initiatives.

in degree programs over the time that Ohio was rolling out its stackable credential initiatives. The period we examined spanned the Great Recession and the economic recovery, during which high levels of federal and state investment encouraged education and training providers to expand the workforce training programs they offered at the certificate level. For example, the particular growth that we see in short-term certificate programs between 2012–2013 and 2014–2015 might have been driven by TAACCCT grants, which awarded funding to several institutions to develop new short-term programs in MET and health care fields, resulting in the design or redesign of more than 100 programs across the state (Ohio TechNet, 2017). State and institutional representatives in our advisory group offered several other explanations for the large increases in certificate programs, including changes to the state funding formula that provided colleges with funding for certificate program completions, a growing recognition that short-term certificates could qualify for financial aid, the emphasis of advocacy organizations and states on short-term programs as an opportunity for institutions to increase graduation rates and provide meaningful credentials to students who would have

otherwise dropped out, and initiatives to expand postsecondary participation among students in adult education.

Our analysis of program application data suggested that many of the recent certificate programs developed in Ohio were being designed to be stackable and that programs were increasingly designed to be stackable over time. The design of strong programs with stackable features might help explain our findings that demonstrate high rates of credential-stacking and promising earnings outcomes. However, our prior report found that students stacking credentials to the associate's degree level were earning excess credits and spending more time in college than students who went directly to the associate's degree (Daugherty et al., 2020), suggesting that there might be room for improvement in aligning these programs to ensure that students are not duplicating coursework as they move through multiple credentials. More-detailed data collection across a wider variety of programs would help strengthen these conclusions.

With very little research documenting statewide patterns in the development of stackable programs, it was important to build more evidence on how programs have changed in response to stackable credential initiatives. There were, however, limitations to our examination of stackable programs. We relied on self-reported data from institutions, and these data were not independently verified and might have overstated the degree to which programs were designed with stackable features. Our sample was limited in that it covered all programs that were submitted for approval rather than those that were ultimately approved and awarding certificates, and we could not examine programs offered prior to 2014 (meaning that there was limited overlap with the certificate programs examined in our earnings analysis). The only other attempt to systematically characterize program stackability across the state required time-intensive coding of program documentation (Bohn and McConville, 2018). State officials and researchers could benefit from more-systematic data on the features of postsecondary programs to track how program design is evolving with the scaling of stackable credentials.

Continued research on stackable programs is also needed to unpack the relationships between program offerings and student outcomes. For example, it would be valuable for institutions to have more causal evidence on how adding certificate programs and building out programs with stackable features might contribute to improved educational and employment outcomes for students. It is also critical to understand how statewide initiatives supporting stackable credential programs are implemented and how these statewide initiatives change patterns of credential-stacking and student outcomes.

Earnings Gains for Individuals Stacking Credentials

We found substantial earnings gains for individuals who stacked credentials in Ohio. Translating the percentage gains in earnings relative to pre-certificate median earnings, we found that the overall increase for stackers represents roughly \$9,000 per year in additional income. The increase in earnings from completing a stack, 37 percent on average, is larger than the estimates of returns from stacking in the California and Virginia studies (Bohn, Jackson, and McConville, 2019; Meyer, Bird, and Castleman, 2020) and on the higher end of the ranges in research on single-credential returns (e.g., Bailey and Belfield, 2017; Stevens, Kurlaender, and Grosz, 2018). One possible explanation for these larger estimated returns is that our data allowed us to track students across a wider variety of institutions (including universities) and across a wider variety of educational credentials (with some students earning bachelor's degrees).

We estimated that starting with a short-term certificate and going on to earn stackable credentials led to earnings gains of 19 percent, which was similar to the 22-percent gains found in a California study (Bohn, Jackson, and McConville, 2019). However, our findings differed from those in California in that all gains came from stacking, and there were no gains in income after the initial short-term certificate. Another recent study of Ohio data found no income gains for short-term certificates (Minaya and Scott-Clayton, 2020), and these findings collectively suggest that institutions in Ohio might need to

closely examine their short-term certificate programs to ensure that the credentials for those programs are providing value to students and employers.

Our study was the first to examine earnings gains for students who stacked noncredit and credit-bearing credentials. We found that individuals who earned noncredit (clock-hour) certificates from OTCs saw higher gains from the initial certificate relative to those who started with a short-term credit-bearing certificate at a community college or university, but they saw no gains from stacking additional credentials. One factor driving low returns from stacking for OTC certificate-earners was that most stackers earned additional noncredit certificates rather than credit-bearing credentials; the few who went on to stack credit-bearing credentials saw substantial gains. The challenges that students face while transitioning between noncredit and credit-bearing programs have been well-documented in the literature (e.g., Education Strategy Group, 2020; Price and Sedlak, 2018). ODHE has recently rolled out several initiatives to address these challenges, including statewide articulation agreements that provide college credit for noncredit coursework and programs. Expanding and encouraging stronger use of these initiatives could help improve the returns from stacking for OTC certificate-earners by facilitating higher rates of progression into credit-bearing credentials.

We found substantial earnings gains for individuals who stacked credentials in Ohio. The overall increase for stackers represents roughly \$9,000 per year in additional income.

In general, we found that students who stacked credentials progressively saw substantially larger gains in earnings than those who stacked credentials at the same level.

In general, we found that students who stacked credentials progressively—i.e., OTC clock-hour certificate-earners who went on to earn credit-bearing credentials and credit-bearing certificate-earners who went on to earn degrees—saw substantially larger gains in earnings than those who stacked credentials at the same level. This finding aligns with prior research that suggests that earning degrees typically yields higher returns relative to earning shorter-term credentials (e.g., Belfield and Bailey, 2017; Bettinger and Soliz, 2016; Bohn, Jackson, and McConville, 2019; Minaya and Scott-Clayton, 2020). It also aligns with work in California that found that progressive stackable credential programs are associated with better student outcomes (Bohn and McConville, 2018). These findings of lesser benefits to stacking multiple certificates suggest that institutions should look carefully at pathways that encourage this type of stacking to ensure that they are leading to improved career outcomes for students.

Consistent with prior studies (Belfield and Bailey, 2017; Bettinger and Soliz, 2016; Bohn, Jackson, and McConville, 2019; Meyer, Bird, and Castleman, 2020; Minaya and Scott-Clayton, 2020), we found that health care credentials provided higher returns than credentials in other fields (both initial certificates and credentials stacked by individuals who

earned health care credentials). Health care fields are governed by strict state standards and occupational licensing and commonly require individuals to complete exams and obtain licenses, and educational programs (e.g., nursing) often have competitive enrollment processes. These barriers to entry that restrict who can enter the workforce can lead to increased earnings for individuals with health care credentials (e.g., Kleiner and Krueger, 2013). In addition, health care certificate programs are often longer than programs in IT and MET and more likely to offer opportunities for experiential learning, and these program differences may also contribute to differences in outcomes.

Our findings on the returns from stacking for traditionally underserved populations were similar to those found in California data (Bohn, Jackson, and McConville, 2019); there were greater returns for women, white students, and students who completed their initial certificate before the age of 25. Virginia data showed similar racial and ethnic patterns but found no differences in returns to stacking by gender (Meyer, Bird, and Castleman, 2020). In Ohio data, we found that Hispanic students had the highest average earnings gains earning a certificate, and returns for black students and white students were similar. Disparities appeared only after individuals went on to stack credentials. This finding differs from findings in California that indicated higher returns for white students, both for the initial certificate and for stacking (Bohn, Jackson, and McConville, 2019). In our prior report, we also found that black students and adult learners were less likely to go on to stack credentials in Ohio (Daugherty et al., 2020).

Prior research has raised concerns that the modularization of postsecondary education might work against equity by diverting traditionally underserved populations into shorter-term programs (Arum, Gamoran, and Shavit, 2007; Giani and Fox, 2017), so institutions and states might need to take particular care to ensure that students are moving through stackable credential pipelines in equitable ways. Examples of efforts to support equity in stackable credential pipelines might include providing more information and proactive guidance on program selection and reenrollment, easing administrative burden by automatically awarding credits, and

States might need to address systemic barriers to credential-stacking, such as ensuring that all students have access to stackable programs in their local institutions and addressing barriers to credit for prior noncredit training.

supplementing job-transition support. States might also need to address systemic barriers to credential-stacking, such as ensuring that all students have access to stackable programs in their local institutions and addressing barriers to credit for prior noncredit training.

There were several limitations to our analyses of earnings, limitations that are common across studies of credentials and earnings outcomes. Our decision to follow earnings only six years beyond the initial certificate limited our ability to make conclusions about longer-term earnings, and we did not attempt to map trajectories of individual earnings growth over time. This decision also limited our sample to individuals with a history of earnings prior to earning a credential, which means that the findings cannot be generalized to individuals without an employment record (e.g., younger students). The long period of follow-up also limited our ability to examine individuals who completed their first certificates in more-recent years, when Ohio was scaling its large statewide articulation agreements and developing

new, stackable programs with federal TAACCCT funding. Moreover, we examined a limited set of employment outcomes. The potential for employment, the choice to be self-employed, or mobility out of state are all beyond the capacity of our data.

There are several areas in which additional research on earnings might be of value. Identifying better measures of stackable programs and incorporating those measures into outcomes analysis could shed light on whether institutional efforts to build stackable programs offer value and which efforts (e.g., embedding in degree programs, including experiential learning) offer the most value. It might also be worthwhile to conduct broader analysis across fields, states, and credential types to more systematically identify which program and contextual factors might contribute to variation in earnings. More research to unpack the disparities in earnings gains by race, ethnicity, age, and gender might be valuable in identifying the drivers of inequity and pointing to solutions to ensure that all students are fully able to benefit from stackable credential programs.

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About This Report

States and institutions across the United States are pursuing stackable credential initiatives that focus on building programs and policies that support the ability of individuals to more easily earn and combine multiple credentials. Stackable credentials aim to provide more-flexible pathways through postsecondary education, allowing individuals to start with short-term credentials and begin entry-level work in a field and then gradually stack credentials and develop their careers over time. Yet little research has been conducted on whether institutions are scaling stackable programs, how students are stacking credentials, and whether these programs benefit individuals and employers.

Ohio has been a leader in pursuing stackable credential initiatives and has a history of legislation; statewide articulation agreements in applied fields; and robust postsecondary educational program offerings that range from non-credit training to applied bachelor's degrees. In 2019, the RAND Corporation partnered with the Ohio Department of Higher Education to build a better understanding of how stackable credential pipelines have played a role in the education and training of individuals in Ohio. This report examines data on credentials completed in Ohio between 2005 and 2019 in health care, manufacturing and engineering technology, and information technology. The authors describe the programs available to students in Ohio public institutions and the degree to which these programs incorporated "stackable" features. They then use data on earnings to estimate the earnings gains for individuals who complete certificates and multiple credentials. These findings provide important information for policymakers and practitioners in Ohio and across the United States who are adopting and scaling stackable credential initiatives; they also add to a growing body of research literature on the value of short-term programs and pathways of credentials.

RAND Education and Labor

This study was undertaken by RAND Education and Labor in partnership with the Ohio Department of Higher Education. RAND Education and Labor is a division of the RAND Corporation that conducts research on early childhood through postsecondary education programs, workforce development, and programs and policies affecting workers, entrepreneurship, and financial literacy and decisionmaking. This study was sponsored primarily through funding from the U.S. Department of Education's Institute of Education Sciences, including grant number R305H190033 to the RAND Corporation. Funding from the ECMC Foundation also helped support early work that laid the groundwork for this report. The opinions expressed in this report are the authors' alone and do not represent the views of the Institute of Education Sciences or the ECMC Foundation.

More information about RAND can be found at www.rand.org. Questions about this report should be directed to Lindsay Daugherty at ldaugh@rand.org, and questions about RAND Education and Labor should be directed to educationandlabor@rand.org.



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