



Noncredit Career Technical Education, Industry Credentials, and Labor Market Outcomes

Di Xu
Kelli Bird
Michael Cooper
Benjamin Castleman

Policy Brief #2
November 28, 2023

Noncredit Career Technical Education, Industry Credentials, and Labor Market Outcomes

Di Xu (Corresponding Author)
School of Education
University of California, Irvine
Email: dix3@uci.edu

Kelli Bird
School of Education and Human Development
University of Virginia

Michael Cooper
School of Education
University of California, Irvine

Benjamin Castleman
Batten School of Leadership and Public Policy
University of Virginia

Acknowledgments: This research was generously supported with grant funding from the Lumina Foundation (Award 2011-1114811) and the U.S. Department of Education’s Institute of Education Sciences (IES) to University of California Irvine (Award R305A220224). We thank the Virginia State Community College System (VCCS) for providing high-quality data and expert guidance on the state context for this research. We are also particularly grateful for the valuable feedback and comments provided by VCCS, Lumina Foundation, and IES. The opinions expressed are those of the authors and do not represent views of the funding agencies or the data-sharing partner.

Abstract

Industry-recognized certificates are one of the most common credential types associated with public workforce training programs, but little research has been conducted on the economic benefits of these credentials in the labor market. This paper provides one of the first quasi-experimental evidence on the labor market returns to industry-recognized credentials connected to community college workforce noncredit training programs. Based on a novel data that includes approximately 24,000 working-age adults enrolled in noncredit workforce training programs at the Virginia Community College System, we estimate an individual-level fixed effects model to estimate earnings premia net of fixed attributes and earnings time-trends. Our results indicate that earning an industry-recognized credential on average increases quarterly earnings by approximately \$1,000 and the probability of being employed by 2.4 percentage points, although there is substantial heterogeneity in economic return across different fields of study. We also find that the noncredit workforce training programs enroll a different segment of the population than credit-bearing programs at community colleges, thus providing an important alternative pathway to workforce opportunities for populations traditionally underrepresented in the credit-bearing sector.

I. Introduction

With rapid technological advances, the labor market increasingly exhibits a need for more frequent, ongoing skill development (Carnevale, Smith, & Strohl, 2010; Deming & Noray, 2020). Employers in many fields encounter difficulties finding adequately trained workers to satisfy their labor demand, while many workers remain un- or underemployed. The pandemic has only exacerbated these gaps, with eleven million job openings and six million unemployed workers as of the end of January 2023 (US Bureau of Labor Statistics, 2023). Accordingly, the federal and state governments increasingly prioritize workforce training in their policy agendas. This priority is reflected in the Biden Administration's Talent Pipeline Challenge, which supports partnerships between employers and training providers to build the workforce pipeline, and in the increasing number of states that have enacted legislation to fund targeted workforce development efforts, many of which lead to industry-recognized credentials (Education Commission of the States, 2020).

Training programs that lead to industry-recognized credentials, such as industry certifications or licenses, have been proposed as a strategy to create better alignment between postsecondary education and labor market demand (Deming et al., 2023). These credentials are awarded by organizations or professional associates (such as the American Association of Medical Assistants) for demonstration of competencies specific to a particular occupation. Unlike college-awarded certificates that are typically based on successful completion of a series of required college courses on a variety of topics, industry credentials are heavily focused on skills aligned with standards developed or endorsed by employers or industry associations, and thus signal that an individual possesses a set of skills necessary for a particular position. The supply of industry credentials has surged in recent years. According to a recent report (Deming et al., 2023) that focuses on more than 75,000 public job training programs deemed eligible for funding under the Workforce Innovation and Opportunity Act -- America's primary federal workforce development investment -- the most common credential type associated with an eligible training provider is an industry-recognized certificate or certification (encompassing over 21,000 programs).¹

As public, open-access institutions, community colleges are at the forefront of providing training that leads to an industry credential, often through *noncredit*-bearing training programs. These programs are highly focused on skill training that is designed to lead to a specific occupation within a short span of time. Compared with workforce training that community colleges offer *for college credit* (e.g., leading to a college-issued certificate), noncredit workforce programs are typically shorter in duration and tend to have lower costs. In addition, unlike credit-bearing programs with specific admission requirements, such as a high school diploma or equivalent, noncredit programs tend to have more flexible enrollment criteria, expanding access to postsecondary education among a wider range of learners from diverse backgrounds (Grubb et al., 2003; Lustig, 2005; Xu & Ran, 2020). Furthermore, noncredit programs often operate with greater agility, as they tend to have more flexible accreditation and oversight requirements compared to credit-bearing programs, allowing them to quickly adapt to evolving workforce demands and employer needs. (Arena, 2013; Frentzos, 2005; Grubb, Badway, & Bell, 2003; Harmon & MacAllum, 2003; Hickman & Quinley, 1997; Van Noy & Jacobs, 2009; Waks, 2004). Noncredit training programs are moreover very popular among students: Approximately five

¹ The report indicates that approximately 12,000 eligible programs result in an associate degree, and an additional 10,000+ programs lead to a community college-issued certificate.

million students enrolled in community college noncredit programs nationally, which represents 41 percent of total enrollment at two-year institutions. Two-thirds of noncredit student enrollments are explicitly focused on workforce training (e.g. D’Amico et al., 2022; D’Amico et al., 2014; Xu et al., 2022).

Despite the importance and popularity of noncredit training programs, however, there has been very little research on the composition of program participants; program success and industry credential attainment rates; or the economic returns to industry credentials associated with these programs.² We address this gap in literature by examining noncredit CTE programs offered within the Virginia Community College System (VCCS). In 2016 the Virginia legislature launched an innovative pay-for-performance funding mechanism to expand participation in community college noncredit CTE programs that lead to an industry-recognized credential in one of the high-demand fields, as identified by the Virginia Workforce Board. Known in Virginia as “FastForward” programs, these noncredit CTE programs offer short-duration training in a variety of fields that typically run between 6-12 weeks and can further lead to an industry-recognized credential if students successfully pass a credential-specific exam. One important implication of the state funding mechanism is a mandate on systematic, statewide collection of student-level data on program enrollment, completion, industry credential attainment, and labor market data for all individuals enrolled in FastForward since 2016.³ We draw on this unique administrative data that includes approximately 24,000 working-age adults enrolled in FastForward between 2016 and 2021, and further link it to employment and earnings data from the Virginia Economic Commission (VEC). To examine the labor market returns to earning an industry credential, we exploit the longitudinal nature of the VEC data, which contain quarterly earnings for all VCCS students before, during, and after their FastForward program participation, and use a comparative individual student fixed effects model (CIFE) to estimate the labor market impact of receiving an industry credential after completing a FastForward program in terms of both employment and quarterly earnings.

Our results indicate that FastForward programs enroll a substantially different segment of the population, including student groups that are increasingly underrepresented in traditional higher education. Specifically, 61 percent of FastForward enrollees have no prior or subsequent enrollment in any credit-bearing programs. Compared to students enrolled in short-duration credit-bearing certificate programs at VCCS, FastForward enrollees are more likely to be Black (34 percent versus 24 percent), males (59 percent versus 39 percent), and older students (76 percent aged 25+ versus 51 percent). In addition, more than 90 percent of the students in the sample successfully completed their FastForward program, and approximately 70 percent of the sample obtained an industry credential. These credential and attainment rates are much higher than we observe for VCCS credit-bearing workforce training programs that lead to a college-issued short-term certificates.⁴ Earning an industry-recognized credential on average increases quarterly earnings by approximately \$1,000. To contextualize this finding, given that the average quarterly earnings of FastForward enrollees in the quarters prior to FastForward

² A primary barrier to this research has been that noncredit programs and subsequent industry credential attainment are typically not included in state and national postsecondary datasets (D’Amico et al., 2017)

³ Eligible institutions must provide student-level data to the State Council of Higher Education for Virginia (SCHEV) in order to receive funding.

⁴ To put the program completion and industry credential attainment into context, among students enrolled in a short-term certificate in a credit-bearing program at VCCS, 31% earn a college-awarded certificate within two years.

enrollment is \$8,401, the estimated impact represents around an 11.5 percent increase in quarterly earnings. In addition, industry credentials also increase the probability of being employed by 2.4 percentage points on average. We find substantial heterogeneity in economic return across different fields of study, where credentials in the field of “Transportation and Materials Moving” (e.g., “Commercial Driver’s License”) and “Precision Production” (e.g., training in gas metal arc welding) are associated with the highest returns. We observe substantial sorting by race/ethnicity and gender across FastForward programs, but within programs, do not observe significant heterogeneity across student subgroups in economic returns to the program.

To the best of our knowledge, our paper is the first to estimate the returns to industry-recognized credentials connected to community college workforce noncredit training programs. Carruthers & Sanford (2022) provides evidence on the economic returns to certificates and diplomas awarded by noncredit programs through public technology centers, but these non-degree technology centers only enroll less than one percent of students postsecondary education. While there has been substantial work on the economic returns to non-degree credentials (e.g. Carruthers & Sanford, 2022; Darolia et al., 2023; Dynarski, Jacob, & Kreisman, 2017; Jacobson et al., 2005; Jepsen, Troske, & Coomes, 2014; Meyer, Bird, & Castleman, 2020; Stevens, Kurlaender, & Grosz, 2019; Xu & Trimble, 2015), prior research has exclusively focused on college-awarded credentials through credit-bearing programs, such as certificates and diplomas. The evidence we generate on the economic returns to noncredit training programs that lead to industry-recognized credentials is thus both novel and policy-relevant, given how closely these programs align with employer needs, their popularity among students, the low barriers to entry and flexible design. And by virtue of attracting and enrolling a much different segment of the population, our results show that noncredit training programs may be an important contributor to economic mobility for groups increasingly underrepresented in traditional higher education.

In addition, our study also advances our knowledge about noncredit CTE programs at community colleges, a sector that attracts a large proportion of postsecondary enrollment but, to date, with few close examinations due to lack of data. Compared with credit-bearing CTE at community colleges that typically require one to two years to complete, noncredit CTE programs tend to be substantially shorter in duration, are more affordable, and have more flexible enrollment criteria, thus having the potential to expand access to postsecondary education among learners from diverse backgrounds (Grubb et al., 2003; Lustig, 2005; Xu & Ran, 2020). As policymakers consider the implications of funding short-term noncredit programs, findings from this study will enable policy makers to learn more about who are attracted to noncredit CTE programs, how they perform academically, and whether popular credentials targeted by the noncredit training, such as industry certification, is associated with significant labor market gains.

II. Background:FastForward Programs in Virginia

A. Unique pay-for-performance funding model

VCCS has a long-standing commitment to providing noncredit workforce opportunities to its students. Prior to 2016, limited statewide guidance about the quality and goals of noncredit programs was available, and many programs lacked the validation of third party industry

credentials. In response to the increasing demand for skilled workers to fill available and emerging jobs in the Commonwealth, the General Assembly passed House Bill 66 during the 2016 session to establish the New Economy Workforce Grant Program (WCG) with the goal of providing a pay-for-performance model for funding noncredit works training through “FastForward programs” that leads to an industry-recognized credential in a high-demand field in the commonwealth. The high-demand fields were identified by the Virginia Board for Workforce Development based on criteria that consider the state’s economic development strategy, the degree to which an occupation requires advanced skills as measured by entry-level education, and assessment of annual statewide job openings, with a focus on occupations having more than 50 annual openings. Example occupational fields identified based on these criteria include construction, welding, certified medical assistant, and commercial driving.⁵ Eligible institutions for the WCG --- including the Virginia Community College System, the Southern Virginia Higher Education Center, and the New College Institute -- develop or align noncredit workforce training programs to meet the criteria and gain approval from their respective boards.

The unique pay-for-performance model for funding FastForward programs, the first of its kind, involves cost sharing among the state, the students, and the training institution, where the specific amounts of funding provided by the state are based on student performance. Specifically, upon enrolling, eligible students are required to pay only one-third of the total program cost.⁶ If a student completes the program earning a “Satisfactory” grade, the state and the training institution share the remaining costs evenly. If the student does not complete the program within 30 days of the course end date, the student is required to pay another one third of the total cost to the training institution whereas the state will pay zero for this training. If the student not only completes the program but also earns the industry-recognized credential within six months of completing the program, the state will fully reimburse the training institution for the remaining program costs (that is, two thirds of the total training costs), enabling the training institution to be reimbursed fully. As a result, this funding mechanism provides significant financial incentives to both the student and the institution for the student to complete the program; it also directly incentivizes the institution to promote credential attainment.

The unique funding support by the state has made the FastForward program a reasonably affordable option for students who want to upgrade their skills or acquire new ones. In the fiscal year of 2022, the average tuition for one third of the training cost was \$802, and capped at \$1,500. In addition, students enrolled in FastForward programs may also receive additional funding from other state sources, depending on students’ financial need and the specific program they are enrolled in. For example, if a student enrolled in a FastForward program is financially unable to pay any tuition and has a household income no higher than 200 percent of the national federal poverty level, they may qualify for Workforce Financial Assistance (FANTIC) that will cover one-third of the cost of the program, therefore exempting the student fully from payment for the training. These financial supports further reduce the cost for FastForward training, making the programs even more accessible.

B. Training duration and alignment with the local labor market

⁵ See Appendix Table 1 for the complete list of high-demand occupational fields and their associated enrollment at VCCS in the fiscal year of 2022. Detailed information about specific FastForward programs offered for various occupational fields at each training institution can be found on the Virginia Career Works website: <https://virginiacareerworks.com/workforce-credential-grant/>.

⁶ Students must be 18 years of age or older, have a valid social security number, and be a Virginia “domicile” in order to receive the tuition assistance from WCG.

FastForward programs are highly focused on job training that incorporate a combination of classroom instruction and hands-on skill demonstrations. They are designed to be short-term, typically lasting between 6 and 12 weeks. Thus, compared with workforce training offered through credit-bearing programs at VCCS that typically require one year (for short-term certificate programs) to two years (for associate degree or diploma programs) to complete, FastForward programs tend to be substantially shorter in duration. For example, two of the most popular FastForward programs are Commercial Driver’s License and Certified Medical Assistant training, which respectively consist of 168 and 180 contact hours. For comparison, full-time community college students in Virginia complete approximately 150 contact hours each semester.⁷

A critical feature of FastForward programs is that each program is designed to prepare students to earn a specific workforce credential that is competency-based, industry-recognized, and awarded by a third-party organization.⁸ For example, one of the most popular FastForward programs, Nurse Aide, meets the Virginia Board of Nursing’s requirement for Nurse Aide Training. Graduating students from the Nurse Aide program are eligible to take the national Nurse Aide Assessment Program (NNAAP) exam required by the Virginia Board of Nursing. Upon passing the NNAAP exam, students are awarded the Certified Nursing Assistant (CNA) credential, which certifies them as qualified nursing assistants and demonstrates their ability to provide quality care to patients. In some programs, the examination is included as part of the program, as the instructors are certified to conduct the exam. In many cases, though, the student must share proof of examination with the college after the program is completed. Some colleges are diligent in working with the student to get the proof.

Some of the credentials are also stackable on skills and connect to additional possible training and credential pathways in credit-bearing programs. For example, a student might complete a FastForward Manufacturing Technician program, and later enroll in a credit-bearing program to pursue a short-term certificate in Mechanical Maintenance and further pursue an Associate degree in Technical Studies.⁹

FastForward programs in Virginia have a clear and explicit focus on engaging local employers in collaborative efforts aimed at training credentialed workers to meet the Commonwealth’s workforce demands. These collaborations encompass a range of approaches, such as customized training (where colleges work closely with local businesses to design training that precisely meets the specific needs of a company), guaranteed interviews (where colleges collaborate with local business to guarantee job interviews for students who have successfully completed relevant training and industry certifications), and work-based learning opportunities (where employers offer work-based learning experiences to program participants). While the specific nature of these partnerships may vary across colleges and programs, they all aim to

⁷ A subset of workforce training programs are offered through both VCCS’s FastForward and credit-bearing sides, which prepare students for the same or similar third-party industry-recognized credentials. For example, both the credit-bearing Nurse Aide Career Studies Certificate Program and the Fastforward Nurse Aide Program prepare students for the Nurse Aide Competency Evaluation and Exams. In a separate work, we will investigate the relative impact of pursuing the training through the credit-bearing versus noncredit programs.

⁸ Considering that these credentials are provided by organizations outside of the traditional educational system, we refer to them as “industry credentials” in this paper to distinguish it from college credentials (such as certificates or college degrees) that are awarded by a postsecondary institution.

⁹ More detailed information about sample stackable credentials and career pathways can be found at Virginia’s FastForward website: <https://fastforwardva.org/career-mapping/sample-career-pathway-in-manufacturing/>

ensure that the training provided aligns with industry needs and facilitates a seamless transition from training to employment.

C. Rapid growth of program offering and enrollment

Descriptive statistics included in state reports indicate that VCCS noncredit program offerings and participation have substantially expanded since the introduction of FastForward programs (State Council for Higher Education for Virginia, 2023): the state funding support to FastForward programs increased steadily from 5 million in the fiscal year of 2017 to 13.5 million in fiscal year 2022. In the most recent fiscal year of 2022, more than 11,000 individuals were enrolled in training, which presents an 28% increase from the fiscal year of 2021.

Although hundreds of FastForward programs have been offered, the majority of the enrollments (61%) were from 10 programs, which concentrate in six occupational fields, including Transportation, Health Care, Welding, Construction, Information Technology, and Mechanics. Most of these programs are offered by multiple colleges at VCCS. Appendix Table 2 lists the names of these top 10 FastForward programs, the number of colleges offering each program, the total enrollment during the period of the study, and average program completion rates and industry credential attainment rates. According to the most recent report by the State Council for Higher Education for Virginia (2023), the enrollment in these programs seem to address but not exceed the annual job openings associated with each field based on calculations from Virginia Employment Commission short-term 2021-2023 projections, implying that there is room for further growth in enrollment in these FastForward programs.

III. Data and Sample

A. Data sources

An important implication of the HB 66 is that it led to the systematic, statewide collection of student-level data on FastForward program enrollment, program completion, industry credential attainment, and labor market performance. This data collection is important for verifying enrollment and course completion directly related to the level of funding provided by the state as well as to provide avenues to communicate the impact of FastForward training on the state's workforce development landscape. As a result of these financial drivers, VCCS has established a comprehensive data system for FastForward programs that includes four primary sources of data:

VCCS administrative data on FastForward programs. This data includes student-level enrollment in FastForward programs and completion records since its inception in fall 2016 until summer 2022, a handful of variables that provide demographic information for students enrolled in FastForward programs, and whether and when a student completed third-party industry-recognized credentials.¹⁰

VCCS administrative data from the credit-bearing side. This data includes students' enrollment records, transcript records, and degree attainment records VCCS's credit-bearing side between 2004 and 2022. On the credit-bearing side, students take college-level courses and earn

¹⁰ Note that VCCS offers noncredit programs that are not FastForward programs; these programs are typically less focused on skilled workforce training. We do not observe enrollment in these non-FastForward programs in our data. Similarly, we do not observe any noncredit enrollment prior to the start of FastForward.

a specific number of credits per course; students typically enroll in a specific program of study leading to a certificate or degree. By linking in this data, if a FastForward student enrolled in any of VCCS's credit-bearing programs either before or after their FastForward enrollment or earned any credentials from the credit-bearing training, we can observe it.

National Student Clearinghouse (NSC) data. The college administrative data are matched with enrollment and graduate data from the National Clearinghouse, which allows us to track the enrollment of FastForward students at higher education institutions outside of the VCCS starting in 2004.

Individual quarterly employment and earnings data provided by the Virginia Employment Commission (VEC), spanning from the first quarter of 2005 to the most recent available data, up to the first quarter of 2022. The VEC data, commonly referred to as UI data, encompasses information reported by all employers operating within the Commonwealth of Virginia, as mandated by reporting requirements. However, it is important to acknowledge two primary sources of missing earnings data within this dataset. First, as is widely known in the existing literature using UI data, a few categories of employment are not included in the UI data, including federal employment, self-employment, and individuals without a social security number (Foote & Stange, 2022). While approximately 4.5 percent of employees are estimated to be federal employees in Virginia (Virginia Employment Commission),¹¹ this number is likely to be substantially lower among students enrolled in FastForward programs which have a strong focus on skill development for regional employers. Additionally, the issue of missing social security numbers is expected to be limited among FastForward enrollees, as eligibility for WCG tuition assistance requires a valid social security number. Finally, using different sources of earnings data, Foote & Stange (2022) found that self-employment income does not meaningfully differ with credential completion at either two-year or four-year colleges. Accordingly, the inclusion of self-employment income has minimal impact on earnings estimates.

A second source of missingness arises from interstate mobility: Since we are only able to retrieve UI data in the state of Virginia, students working in other states would not be recorded in the local UI data. Nevertheless, studies comparing results based on UI data and national earnings data plus self-employment income indicate that bias is less pronounced when estimating economic returns for sub-baccalaureate credentials than when estimating economic returns to baccalaureate from four-year institutions, where the bias for short-term certificates is close to zero and insignificant (Foote & Stange, 2022). The potential issue of missing earnings due to inter-state mobility is even less concerning for FastForward enrollees, given the program's explicit emphasis on the local labor market.

B. Sample and key measures

A total of 44,651 students enrolled in at least one FastForward program from its inception in the 2017 fiscal year (July 2016 to June 2017) until the 2022 fiscal year (July 2021 to June 2022). We focus our analysis on students from the 2017 through 2021 cohorts (N= 35,910), since the most recent quarter of VEC data is 2022Q1. Of these FastForward participants, 11% do not have any employment records in the UI data between the first quarter of 2004 and the first quarter of 2021 and are thus removed from our analytical sample.¹² We further restrict our

¹¹ Information is retrieved from

https://virginiaworks.com/_docs/Publications/Press-Releases-and-Reports/PDF/2019-Benchmark-Report.pdf

¹² It should be noted that UI data are subject to two major sources of missing earnings information. First, a few categories of employment are not included in the UI data, including federal employment, self-employment, and

sample to students who began their FastForward enrollment between ages 20 and 50, so that our analysis is focused on working-age adults (this restriction further reduces the sample by 22%). Finally, we remove the students who are currently enrolled in FastForward (3%) based on the most recent data available, which extends up to the summer of 2022.

Key Treatment Measures. In our analysis, we define as “treated” by FastForward students who earn the industry credential associated with their program of study. We define our comparison group as students who either: (1) completed the FastForward program but failed to earn the industry credential; or (2) did not complete the FastForward program.¹³ As shown in Table 1 below, 68 percent of FastForward students in our sample earn a credential. Therefore, the comparison group of non-credential earners includes both FastForward students who did complete the program but did not earn the credential (23 percent of analytic sample), and also students who left the FastForward program without completing the training (8 percent of analytic sample). Approximately 13 percent of FastForward students in our analytic sample enrolled in more than one FastForward program during the window of our study. In these cases, we include the student in the “treated” group if the student earned at least one industry credential.

Key Outcome Measures. The two primary labor market outcomes we consider are employment and conditional quarterly earnings. For employment, we create an indicator equal to one if the student had any observed earnings in a particular quarter. For conditional quarterly earnings, we sum all of a student’s earnings from all employers within a given quarter (measured in real dollars 2022\$), and set the measure to be missing if the student had no observable employment during that quarter. Within a specific individual, we capped quarterly earnings at a ceiling of \$73,510 because these are outliers representing less than 0.1% of the sample but having the potential to exert a disproportionate influence on our estimates due to their extreme values.¹⁴ Following the recent literature that uses the UI data (e.g. Dynarski et al., 2017), we bottom-code any quarterly earnings record of \$10 or less to be missing since these records are likely misreported.

To construct each individual’s pre-FastForward labor market measures, we drop all quarters that occur prior to an individual’s first observed non-zero earning in the VEC data and include a maximum of 10 years of employment records prior to FastForward entry. Considering that most individuals are not active in the labor market below age 18, we impose age restrictions and drop quarters in which an individual was younger than 18. We also exclude quarters during a student’s FastForward spell, as our analysis focuses on comparing quarterly records before enrollment with records after exit. Our final analytic sample consists of 708,746 earnings records (77% of which correspond to non-zero earnings records) for a total of 23,901 students.

individuals without a social security number. Another source for missing data is interstate mobility: since we are only able to receive UI data in the state of Virginia, individuals working in other states throughout the entire study period would not be recorded in the local UI data.

¹³ A small proportion of students earned a credential without completing the FastForward program. These individuals only constitute less than one percent of credential earners. We still include these students in the “credential earners” category.

¹⁴ In a separate robustness check, we also excluded quarterly earnings records that are higher than \$73,510. This drops 476 earnings records and 0 students. The results (\$976.7 with a standard error of 90.2) are almost identical to those presented in Table 3 (\$964.5 with a standard error of 90.2).

C. Summary statistics

Leveraging the various sources of information available, we first delineate key facts about the FastForward training programs in Virginia, including the characteristics of students, their enrollment patterns between the noncredit and credit-bearing sectors, program completion and industry credential attainment, and labor market performance. Table 1 presents these characteristics for both the full population of all FastForward enrollees since the inception of the program in 2016 until 2022 (N=44,651, column 1), as well as the students included in our analytical sample (N=23,901, column 2).

Panel A in Table 1 shows student demographic characteristics. Overall, the characteristics of the sample are fairly comparable to those of the population of the FastForward enrollees. The results of the sample description indicate that 58 percent of FastForward enrollees in the sample are males. White students consist of around half of the enrollment, followed by Black students for over one third of the enrollment. The average age of the sample is 33 years old, with more than three quarters of the students aged 25 + at the time of enrollment. To contextualize the demographic characteristics of the FastForward students, Appendix Table 3 presents demographic characteristics among VCCS students enrolled in short-duration, credit-bearing certificate programs. These programs, such as the certificate program in “Advanced medical Coder” or in “Office Professional Technologies” (which require 20 credits and 16 credits, respectively), also heavily focus on workforce training and typically take one year or less to complete. A comparison between the two tables indicate that FastForward programs seem to attract and enroll a different segment of the population than credit-bearing programs at community colleges. Specifically, compared with credit-bearing certificate programs, FastForward enrolls a substantially higher share of Black students (37% versus 24%), male students (58% versus 39%), and older students (76% 25 years of age or older versus 51%).

Panel B describes students’ course enrollment patterns within FastForward programs, as well as individuals’ enrollment in the credit-bearing sector prior to and after FastForward enrollment. The results indicate that the vast majority of students enrolled in only one FastForward program, with the average enrollment duration of 1.5 quarters. To capture students’ enrollment between FastForward and credit-bearing programs, we break down students into four distinct categories: (1) FastForward students who never enrolled in any credit-bearing program either prior to or after their enrollment in FastForward programs; (2) FastForward students whose initial enrollment was in a FastForward program and who then enrolled in subsequent credit bearing programs either within or outside of VCCS; (3) FastForward students with a history of enrollment in the credit sector and complete their postsecondary experience to date in FastForward; and (4) FastForward students who enrolled in the credit sector both prior to and after their FastForward enrollment. To provide a longer enrollment tracking period after FastForward program enrollment, we restrict our analyses to only the earliest two cohorts of students in our sample (2016-2017 and 2017-2018 cohorts, N=8,633).

Our analysis suggests that the majority of FastForward students — 61 of all of the FastForward enrollees and 54 percent of the analytical sample — have no prior or subsequent enrollment in the credit-bearing sector. While 42 percent (33% plus 9%) of the students in our sample had prior credit-bearing enrollment, less than 20 percent of those students earned a degree or certificate from this prior enrollment. This suggests that noncredit may provide a pathway to training and industry credentials for students who were not successful on the credit-bearing side. However, very few FastForward enrollees — less than 12 percent in both the

population (8% plus 3%) and in our sample (9% plus 3%) — pursue subsequent training in the credit-bearing sector, and among these students, only one fifth eventually received any credit-bearing credentials, including Bachelor’s degree, Associate, Diploma, or Certificate) by summer 2022. These patterns suggest that there is little student flow from FastForward to additional credit-bearing training despite increasing state efforts to grow the share of workers that “stack” credentials to maintain job-relevant skills in a rapidly transforming labor market (Meyer et al., 2022).

Panel C summarizes the academic outcomes of students enrolled in FastForward programs, including FastForward completion and industry credential attainment. Overall, FastForward programs have an extremely high program completion rate, where 92 percent of the enrollments in our sample earned a letter grade of “satisfactory”, indicating successful completion. Approximately 68 percent of students in our sample further obtained an industry credential. Yet, underlying the overall high industry credential attainment rates is important variation between programs in credentialing. As shown in Appendix Table 2, some highly enrolled programs, like Clinical Medical Assistant, have high industry credential attainment rates (82.5%). However, other highly enrolled programs, like Nurse Aide, have much lower attainment rates (51.3%). While several factors can contribute to the variations in credentialing rates across programs, one potential explanation is that the labor market value of industry credentials may vary depending on the specific fields of occupation, which can result in different incentives for students to complete a credential after their training. We delve deeper into this aspect in Section V.C., where we provide a more detailed exploration of how the labor market values industry credentials in various occupational fields.

Table 1. Student Descriptive Statistics

<i>Panel A: Student Characteristics</i>		Population of FF Enrollees (2016-2022)	Analytical Sample
Gender			
	Female	36%	39%
	Male	59%	58%
	Unspecified	5%	3%
Race			
	White	49%	46%
	Black	34%	37%
	Hispanic	6%	6%
	Asian	4%	4%
	Other	7%	7%
Age			
	24 and younger	27%	24%

	25-29	16%	22%
	30+	57%	54%
	mean	34.4	32.7
Panel B: Enrollment Patterns			
FastForward Courses			
	1	78%	81%
	2	12%	11%
	3+	10%	8%
Credit Enrollments (2016-2017) cohorts			
	No Credit enrollments	61%	54%
	Credit only after FF	4%	3%
	Credit only before FF	28%	33%
	Credit before and after FF	8%	9%
Panel C: Academic Outcomes			
	Training Completion	89%	92%
	Credential Completion	65%	68%
Number of Students		44,651	23,901

IV. Empirical Framework

A. Challenges to identification

Our primary aim is to identify the labor market returns to earning an industry credential for students enrolled in the FastForward program.¹⁵ The major challenge to identification is that some individual characteristics, such as motivation and ability, may influence both credential attainment and earnings. Table 2 presents estimates of probability of obtaining an industry credential based on available student demographic and pre-enrollment earnings records. The results presented in column 1 relate various student-level characteristics to credential completion, and indicate that white, male, students enrolled in later cohorts, younger students, and individuals with higher average quarterly earnings prior to enrolling in FastForward are more likely to receive an industry credential. Yet, the magnitude of the majority of the estimates attenuate once we control for program fixed effects (column 2). For example, the magnitude of the positive association between male and industry credential attainment decreases by half once

¹⁵Ideally, we would also want to estimate the economic returns to completing the FastForward program. However, due to the extremely high program completion rate, the comparison group (individuals who did not complete the FastForward training) consists of very few observations, which makes it difficult to justify the parallel trends assumption to enable us to use the comparative individual fixed effects model.

we control for the specific program a student enrolled in, suggesting that between-individual variations in credential attainment is partly driven by students' differential sorting into programs with higher or lower average credential attainment rates.

Table 2. Predictions of Industry Credential Attainment

	Without Program Fixed Effects		With Program Fixed Effects	
Race				
Black	-.13 (.007)	***	-.13(.007)	***
Hispanic	-.07 (.014)	***	-.05(.013)	***
Asian	-.17 (.018)	***	-.05(.016)	***
Other	-.04 (.013)	***	-.07(.012)	***
Missing	-.05 (.011)	***	-0.08(.010)	***
Gender				
Male	.08 (.006)	***	.04(.008)	***
Unspecified	.08 (.016)	***	.07(.015)	***
Cohort				
2018	.03 (.010)	***	.00(.009)	
2019	.05 (.009)	***	.03(.009)	***
2020	.06 (.010)	***	-.00(.009)	
2021	.05 (.009)		-.03(.009)	***
Age	-.007 (.0032)	**	-.003(.003)	
Age ²	.000 (.0000)	*	.000(.000)	
Prior Wages (\$1000s)	.003 (.0005)	***	.005(.001)	***
No Prior Employment	.08 (.014)	***	.10(.013)	***
N	23,901		23,901	
Reference categories: White, Female, Cohort 2017				
No prior employment is an indicator if the student had any positive quarterly earnings before starting FastForward				

B. Comparative individual fixed effects model

To address potential omitted variables bias, we employ a comparative individual fixed effects (CIFE) model to examine changes in an individual's quarterly earnings before versus after receiving an industry-recognized credential relative to changes for individuals who completed a FastForward program but did not earn a credential. The comparative individual fixed effects (CIFE) model has been commonly used in the job training literature (Dyke et al., 2006; Jacobson et al., 2005) and has been adapted to examine labor market returns to postsecondary credentials

in the last decade (e.g. Meyer, Bird, & Castleman, 2020; Cellini & Chaudhary, 2011; Dadgar & Weiss, 2014; Jepsen, Troske, & Coomes, 2014; Stevens, Kurlaender, & Grosz, 2019; Xu & Trimble, 2015). By conducting a within-individual comparison of changes in earnings trajectories before and after earning a credential, the individual fixed effects approach effectively controls for student characteristics (either observed or unobserved) that remain constant within a student across time.

We specifically estimate the following regression model:

$$\begin{aligned}
 Outcome_{iq} = & IndividualFE_i + QuarterFE_q + IndividualTimeTrend_{iq} + \\
 & + \beta_1 Age_{iq} + \beta_2 Age_{iq}^2 + \beta_3 HighestCreditAward_{iq} + CurrentlyEnrolled_{iq} \\
 & + \sum_{q=-j}^{-1} (\gamma_q PreFF_{iq}) + \sum_{q=1}^k (\gamma_q PostFF_{iq}) + \beta_4 EverEarnedCredential_i + \\
 & + \beta_5 PostFF_{iq} * EverEarnedCredential_i + \epsilon_{iq}
 \end{aligned}$$

Where $Outcome_{iq}$ is the labor market outcome for individual i in quarter q . We consider two outcomes: (1) indicator for any employment, and (2) quarterly earnings conditional on employment, measured in real wages (2022\$). $EverEarnedCredential_i$ is equal to one for all individuals i who ever earned their noncredit credential, $PostFF_{iq}$ is an indicator equal to one for the quarters after an individual earned a FastForward credential (or after FastForward exit for those who never earned a credential), and $\hat{\beta}_5$ is the estimate of the impact of credential attainment on the employment outcome. $CurrentlyEnrolled_{iq}$ is an indicator equal to one for all quarters during which the individual is enrolled in a credit-bearing program (either at VCCS or a non-VCCS institution). Note that quarters when an individual is enrolled in FastForward are excluded from the sample. We also control for an individual's highest level of credit-bearing credential with $HighestCreditAward_{iq}$, which is a set of indicators equal to one for all quarters after the individual earned a certificate, associate degree, bachelor's degree, or graduate degree. Finally, we include individual fixed effects, temporal quarter fixed effects, individual-specific time trends, and quarter-level fixed effects relative to the students entry and exit from FastForward (i.e. indicator for one quarter prior to FF enrollment; indicator for five quarters after FF exit). We cluster robust standard errors at the individual-level.

As shown above, 21 percent of FastForward students enrolled in more than one FastForward program during the window of our study, and 13 percent of students completed more than one credential. The majority of students who enrolled in multiple programs had a gap between enrollment spells of one quarter or less (72 percent). Therefore, for all students, we currently define their FastForward enrollment period using the beginning date of their first FastForward enrollment and the end date of their last FastForward enrollment. We define $EverEarnedCredential_i$ based on whether the student earned at least one credential, but not necessarily having earned a credential in every FastForward program they enrolled in. In subsequent analyses, we will conduct robustness checks using alternative definitions of these variables.

It is important to note that we use the earnings trajectories of FastForward students who did not complete an industry credential as the comparison condition. As shown in Table 2, the majority (roughly three-quarters) of students in the comparison sample completed the FastForward training. As a result, our estimate is likely to be an understatement of the overall impact of the FastForward program if the training provided through these programs is associated with significant labor market value itself.

C. Tests of identifying assumptions

A key identifying assumption of a CIFE model is the parallel trends of the “treatment” (i.e. credential earners) and comparison group. We therefore produce event studies, presented below, to show that FastForward credential earners had similar earnings trends in the quarters leading up to FastForward participation as FastForward participants who did not earn a credential. We estimate a version of the above regression model, where we remove $EverEarnedCredential_{iq}$ and include an interaction between the quarterly fixed effects and whether the individual ever earned a noncredit credential:

$$\begin{aligned}
 Outcome_{iq} = & IndividualFE_i + QuarterFE_q + IndividualTimeTrend_{iq} + \\
 & + \beta_1 Age_{iq} + \beta_2 Age_{iq}^2 + \beta_3 HighestCreditAward_{iq} + \beta_4 CurrentlyEnrolled_{iq} + \\
 & + \sum_{q=-j}^{-1} (\gamma_{q1} PreFF_q + \delta_{q2} PreFF_q * EverEarnedCredential_i) \\
 & + \sum_{q=1}^k (\gamma_{q1} PostFF_q + \delta_{q2} PostFF_q * EverEarnedCredential_i)
 \end{aligned}$$

We then plot the values of $\sum_{q=-j}^{-1} \delta_{q2}$ and $\sum_{q=1}^k \delta_{q2}$, relative to $\delta_{02}=0$ (such that $q = 0$ is the term before earning a FF-related credential or exiting FF). For the event study, we center each individual’s quarterly panel around their FastForward entry and exit. “Last” is the last quarter before an individual begins the FastForward program. This is the reference quarter for the earnings estimates. “First” is the first quarter after the individual leaves FastForward. For the event studies we present in this brief, we bin the analytic sample at 5 years prior to and 2 years after FastForward credential completion or exit (i.e. $j = 20$ and $k = 8$ in above equation), resulting in a sample of 794,178 individual by quarter observations (611,517 with non-zero earnings records).

V. Results

A. Event study analysis

Figure 1 shows an event study plot for the analytical sample. The relevant section of the plot to test parallel trends is to the left of the first vertical line, which represents the last period before FastForward enrollment. We also use the event study to graphically explore potential

impacts of credential attainment; this is represented by the section of the plot to the right of the second vertical line, which is the first quarter after FastForward exit. The smaller vertical lines over each quarter are the confidence intervals, using robust standard errors, for the regression estimate of the difference in earnings or employment between credential earners and the comparison group at each time point compared with their difference in the reference period. We use the last quarter before students enrolled in FastForward (“last” on the x-axis) as the reference period. Accordingly, the point estimates describe the extent to which the earnings gaps between the credential earners and those who did not earn a credential are different from their earnings gaps in the last quarter before a student enrolled in FastForward.

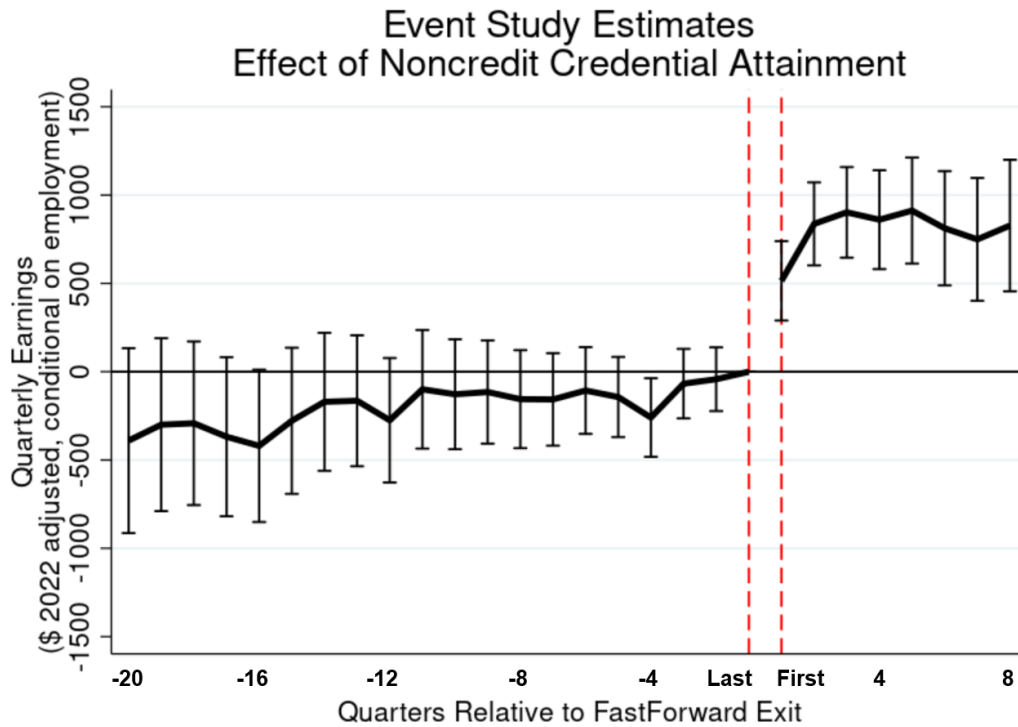
The results indicate that the estimated coefficients of the 20 pre-program quarters are generally small and statistically indistinguishable from zero. The result from a joint F test on all pre-FF coefficients does not reach statistical significance either ($p=0.52$). This pattern is consistent with the parallel trends assumption: In the absence of the industry-recognized credential, the average quarterly earnings for the two groups of students would likely have evolved in parallel.

In contrast, in the quarters immediately following FastForward exit, we observe a substantial positive increase in average quarterly earnings for credential earners relative to individuals who did not earn a credential. Specifically, in the first post-FastForward quarter, (marked by the vertical line labeled “first”), receiving an industry-recognized credential increases quarterly earnings by approximately \$500 relative to the reference period (the last quarter before an individual enrolled in FastForward). Considering that the average quarterly earnings among credential earners in the quarter before earning a credential is \$9,781, this represents a 5% relative increase in earnings.¹⁶ It is worth noting that this is likely to be a conservative lower bound estimate of the economic returns to earning an industry credential. This is because some individuals might take one or more quarters after their FastForward exit to obtain an industry credential.¹⁷ Accordingly, these individuals might not have realized the associated earnings benefits during the first quarter post FastForward. Indeed, the estimated earnings premium rises after this first quarter, reaching around \$800 in the second quarter following FastForward exit and it appears to remain relatively stable in the two years post-FastForward exit. In our future explorations with a longer tracking window, we will examine the extent to which these short-term earnings premiums persist in the long run.

¹⁶ In addition to earnings conditional on employment (i.e. exclude quarters with zero earnings), we have also created event study plots for probability of employment (i.e. whether a non-zero earning is observed in a given quarter). The figures are included in Appendix Figure 1 and the patterns are fairly similar to those presented in Figure 1.

¹⁷ Specifically, 15 percent of credential earners obtained the industry credential in the first post-FastForward quarter, and an additional 4 percent required more time to obtain the credential.

Figure 1. Event Study Plot



B. Main effects based on the CIFE model

In view of the parallel trends and promising graphical evidence on positive impacts of the credential on earnings, we conduct our formal analysis on two outcomes using the CIFE model: earnings conditional on employment, and whether employed in a given quarter. The results are shown below in Table 3. In addition to analysis on our primary analytical sample (**sample a**, presented in column 1), we further conduct robustness checks on three additional samples to examine the extent to which the results may vary based on different sample restrictions: **sample b** (column 2) restricts to students who have at least 8 non-missing quarters of employment observable in the 3 years prior to their FastForward enrollment and at least 1 non-missing quarter of employment after program exit;¹⁸ **sample c** (column 3) builds on **sample a** but further excludes students who received any postsecondary award prior to enrolling in FastForward and

¹⁸ Considering that the CIFE model identification rests on observing earnings both before and after the FastForward program within each individual, this sample restriction enables us to test the parallel trends more effectively by focusing only on individuals with ample earnings records. However, it is important to note that this sample restriction would remove individuals who are only sporadically employed prior to FastForward enrollment and may bias the estimates downward for the employment outcome (i.e. whether an individual has any nonzero earnings in a given quarter). Thus, we only conduct robustness checks using this restricted sample (sample b) on the outcome of earnings conditional on employment.

students who continued their education in credit-bearing programs after Fastforward enrollment. This has the effect of evaluating the impact of an industry-recognized credential on labor market outcomes of individuals with limited postsecondary training in the credit-bearing sector. Finally, **sample d** (column 4) also examines the effect of an industry credential on students with limited postsecondary credit-bearing experiences but builds on **sample b** that includes pre- and post-program employment restrictions.

The estimates shown in column 1, based on our primary analytical sample (sample a), indicate that earning an industry-recognized credential on average increases quarterly earnings among those who are employed by \$966 (around 10 percent increase from quarterly earnings the quarter before enrollment). The estimates based on other samples are fairly consistent. In addition, earning an industry credential also increases the probability of being employed by 2.4 percentage points (thus increasing the average employment rate from 78% employment in the quarter before enrollment to 80 percent). This suggests that the economic value of earning an industry credential through the FastForward program is driven by both extensive margins of increasing the probability of being employed, and intensive margin of increased earnings conditional on employment. The estimates are fairly consistent across columns 1-4, indicating that estimated labor market value of industry credentials are fairly robust to different sample and model specifications.

Table 3 Estimated Effects of Attaining an Industry Credential on Employment and Earnings based on Different Samples

	Different Samples							
	A (Full Sample)		B (Restriction on Employment)		C (Restriction on for-credit credential/enrollment)		D (Both Restrictions)	
Earnings Conditional on Employment	\$964.5	***	\$914.7	***	\$1,065.8	***	\$1,023.8	***
	(90.2)		(99.1)		(99.0)		(108.5)	
Probability of Employment	.024	***	-		0.018	***	-	
	(0.006)				(0.007)			
Sample Restrictions								
At least one post-FF quarter with nonzero earnings			x				x	
At least 8 quarters from 3y pre-FF with nonzero earnings			x				x	
exclude those with a credit award earned					x		x	
exclude those with credit enrollments after starting FF					x		x	
Number of Unique Students	23,901		16,935		18,739		13,276	
N for earnings conditional on employment	547,567		464,248		411,188		349,065	
N for employment	710,235		-		529,883		-	

Notes: *p<.10, **p<.05, ***p<.01 Robust standard errors in parentheses clustered at the student level. All of the models include individual fixed effects, time (quarter) fixed effects, individual-specific time trends, age and age squared, time fixed effects relative to both FastForward entry and FastForward exit, a time-varying indicator for if a student is enrolled in a credit program, and time-varying indicators for after any credit awards earned (certificate, associate, bachelor's, and graduate degree). Quarters when a student is enrolled in FastForward are excluded.

C. Heterogeneous impacts by different training fields, subgroups of students, and cohorts

Table 4 shows the estimated effects of FastForward programs on earnings conditional on employment and the probability of employment across various fields of study, shedding light on the potential variation in FastForward's labor market impacts across different career pathways. While the majority of the fields are associated with significant earnings premia, the benefits vary substantially among fields. Among the six main fields examined, "Transportation" seems to produce particularly high earnings gains, where receiving an industry credential in this field is associated with an average quarterly earnings premium of \$1,851.

In addition, the probability of employment also sees positive changes in several fields, reinforcing the notion that FastForward programs may enhance participants' employability in certain industries. These fields encompass a broad spectrum, ranging from technology-related disciplines (e.g. "Computer and Information Sciences") to healthcare and precision production, providing participants with diverse career options aligned with their interests and aspirations. Lastly, it is crucial to bear in mind that certain fields, such as "Mechanic and Repair Technologies," enroll fewer students. As a result, the precision of estimates in these fields is somewhat limited due to the smaller sample sizes. Therefore, these preliminary findings underscore the importance of conducting further research with more extensive student cohorts.

We also delve into potential variation in the impact of earning an industry credential among different subgroups, considering factors such as gender, race, and the age at which students enrolled in FastForward. Preliminary findings suggest that these benefits appear to be more pronounced among younger students and males. However, it is important to recognize that the observed differential economic returns for subgroups may be influenced, at least in part, by students' choices in enrolling in programs associated with varying average earnings premiums, as demonstrated in Table 4.

To gain a deeper understanding of this phenomenon, we explore the composition of students within different fields of study. This demographic examination, detailed in Appendix Table 4, reveals significant differences in student enrollment across various fields. For example, more than 80 percent of students enrolled in "Transportation" programs, the field with the highest earnings, are males. When we run a model to estimate subgroup-specific returns to earning an industry credential and include controls for field of study, we do not find significant demographic variation in earnings returns. This finding suggests that the differential returns across subgroups to FastForward by race, gender, and age is primarily due to student selection into different types of programs.

Finally, considering that the FastForward program has expanded substantially across the VCCS since its inception, we are interested in exploring whether the labor market returns to earning an industry credential through these programs might have changed over time. For example, if the local labor market is saturated with individuals with a particular skill, there might be diminishing returns to earning an industry credential in a relevant field over time. The analysis that breaks down the analytical sample by cohort (defined by the fiscal year when a student entered a FastForward program) yields fairly consistent estimates across cohorts. Still, it is important to note that for the more recent cohorts, the observable time period post FastForward enrollment is quite limited.

Table 4 Heterogeneous Effects by Program Field

Field of Study (by CIP category)*	Outcome	Estimate	Prior Averages	n	N
Computer and Information Sciences and Support Services (11)	Earnings Conditional on Employment	749.0 (642.2)	9,633		44,627
Example FastForward Program: “Certified Associate in Python Programming”	Probability of Employment	0.059 ** (0.030)	0.76	1,891	60,361
Construction Trades (46)	Earnings Conditional on Employment	583.5 ** (276.6)	11,547		63,418
Example FastForward Program: “Carpentry Level 1”	Probability of Employment	0.031 (0.019)	0.82	2,796	78,221
Mechanic and Repair Technologies/Technicians (47)	Earnings Conditional on Employment	20.9 (444.5)	8,096		27,596
Example FastForward Program: “HVAC Excellence Employment Ready Certification”	Probability of Employment	0.024 (0.036)	0.80	1,211	34,189
Precision Production (48)	Earnings Conditional on Employment	1,058.8 *** (313.9)	8,404		51,545
Example FastForward Program: “Gas Metal Arc Welding”	Probability of Employment	0.057 *** (0.021)	0.78	2,202	65,454
Transportation and Materials Moving (49)	Earnings Conditional on Employment	1851.5 *** (161.5)	8,631		159,209
Example FastForward Program: “Commercial Driver’s License”	Probability of Employment	0.016 (0.011)	0.79	7,329	212,126
Health Professions and Related Clinical Sciences (51)	Earnings Conditional on Employment	442.7 *** (126.3)	5,761		160,970
Example FastForward Program: “Clinical Medical Assistant”	Probability of Employment	0.052 *** (0.011)	0.77	6,922	210,138
Other (13, 15, 36, 52)	Earnings Conditional on Employment	284.6 (393.4)	12,284		39,996
Example FastForward Program: “Teacher License”	Probability of Employment	0.016 (0.020)	0.79	1,585	49,699

* CIP codes are translations provided by VCCS to create comparisons between noncredit programs and for-credit fields of study.

"Prior Averages" show the average quarterly earnings conditional on employment (in 2022\$) and average quarterly proportion employed for each field of study before FastForward entry

Example programs are examples only and not representative of all FastForward programs in a given category

VI. Discussion and Conclusion

Millions of students actively seek workforce training via noncredit programs at community colleges annually. These programs hold the promise of addressing crucial skills gaps in the U.S. economy by providing students the opportunity to acquire skills closely matched to labor market demands and to prepare them for industry-recognized credentials. Drawing upon the distinctive dataset gathered from the WCG program in Virginia, our study endeavors to offer one of the first pieces of evidence regarding the labor market value associated with industry credentials attained through noncredit programs offered at community colleges.

Taken together, the results presented above yield a number of interesting findings. First, we found that students enrolled in FastForward programs tend to be older in age than typical students enrolled in short-duration credit-bearing certificate programs. In addition, FastForward programs also serve a larger proportion of male students and Black students than credit-bearing certificate programs in Virginia, in which both males and Black students tend to be underrepresented. These descriptive characteristics are in line with previous findings showing that, compared with credit-bearing programs at community colleges, students enrolled in noncredit workforce training programs are more likely to be adult learners and from lower socioeconomic backgrounds (e.g. D’Amico et al., 2017; Xu & Ran, 2020). From a postsecondary educational access perspective, noncredit CTE programs such as FastForward may provide an important alternative pathway to skills and workforce opportunities for populations traditionally underrepresented in the credit-bearing sector.

Secondly, employing a comparative individual fixed effects model, our main analysis identifies substantial and positive effects resulting from the acquisition of an industry credential through the FastForward program, both in terms of the extensive margin (i.e., the likelihood of employment) and the intensive margin (i.e., conditional quarterly earnings). Specifically, the attainment of an industry-recognized credential generates an average increase of more than \$1,000 in quarterly earnings. Additionally, the acquisition of an industry credential also increases the probability of employment by 3 percentage points. The magnitude of the earnings returns surpasses the estimated benefits associated with short-term certificates conferred by credit-bearing certificate programs at community colleges, as indicated by existing literature (e.g. Dynarsky et al., 2018; Jepson et al., 2014; Xu & Trimble, 2016). While future research is still needed to ascertain the comparative advantages of industry credentials versus college-issued certificates within a specific field of study, our analysis contributes to the growing body of empirical evidence suggesting substantial economic gains, both statistically and monetarily, through the acquisition of industry-recognized credentials via short-term noncredit training programs offered at community colleges, exemplified by the FastForward program.

Thirdly, we conducted several heterogeneity analyses to assess whether the benefits associated with earning an industry credential may vary by fields of study and among different subgroups of students. Our findings indicate that the earnings premium resulting from obtaining an industry credential appears to vary substantially across different fields, where the fields of transportation (example FastForward program: “Commercial Driver’s License”) and precision production (example FastForward program: “Gas Metal Arc Welding”) seem to be associated with particularly pronounced earnings premium. After controlling for selection into program type, students from various demographic backgrounds tend to experience similar benefits from obtaining an industry credential. In light of these findings, it is desirable to promote the accessibility of industry credentials to a broader demographic spectrum, fostering greater

inclusivity and socioeconomic mobility, especially in fields that demonstrate higher earnings premiums. Further research and targeted interventions in fields with substantial earnings premiums can contribute to a more equitable and prosperous future for all.

Last but not least, one important issue with noncredit education, borne out by policy discussions as well as indicated in the existing literature, is the lack of state financial support to either the training institution or students enrolled in noncredit short-duration programs, thus creating financial constraints to both training participants and institutions (e.g., D’Amico et al., 2017). As policymakers across the country consider how funding mechanisms may influence the quality of short-term noncredit programs, as well as student enrollment and outcomes of these programs, the performance-based funding formula Virginia used in funding noncredit workforce training seems to be very effective in yielding both a high program completion and industry credential attainment rates. Compared with course completion rates reported in existing studies on noncredit workforce training that are typically around 75 percent (e.g., Xu & Ran, 2020), the average completion rate for FastForward programs at VCCS is substantially higher. While the industry credential attainment rate is lower, at around 70 percent, it still markedly outperforms the college-awarded certificate attainment rates in short-duration credit-bearing certificate programs, which typically hovers around 30 percent. Accordingly, findings from analyses of the FastForward programs in Virginia offer valuable insights for policymakers and stakeholders seeking to identify effective ways to support workforce development and economic growth.

References

- American Association of Community Colleges (2018). 2018 fact sheet. Washington, DC. Retrieved from <https://www.aacc.nche.edu/wp-content/uploads/2018/04/2018-FastFacts.pdf>
- Carnevale, A. P., Smith, N., & Strohl, J. (2010). Help wanted: Projecting jobs and education requirements through 2018. Georgetown University, Center on Education and the Workforce.
- D'Amico, M. M., Morgan, G. B., Katsinas, S. G., Adair, J. L., & Miller, M. T. (2017). A national analysis of noncredit community college education: Enrollment, funding, accountability, and contextual issues. *Community College Journal of Research and Practice*, 41(4–5), 288–302. <https://doi.org/10.1080/10668926.2016.1251349>
- Deming, D., Gable, A., Lipson, R., & Zvaigzne, A. (2023). Navigating Public Job Training. Harvard Project on Workforce. Retrieved on 11/2/2023: https://889099f7-c025-4d8a-9e78-9d2a22e8040f.usrfiles.com/ugd/889099_06ca8851a90f43c98534daeffdb80479.pdf
- Deming, D. J., & Noray, K. (2020). Earnings dynamics, changing job skills, and STEM careers. *The Quarterly Journal of Economics*, 135(4), 1965–2005. <https://doi.org/10.1093/qje/qjaa021>
- Dynarski, S., Jacob, B., & Kreisman, D. (2018). How important are fixed effects and time trends in estimating returns to schooling? Evidence from a replication of Jacobson, Lalonde, and Sullivan, 2005. *Journal of Applied Econometrics* 33 (7): 1098–1108.
- Foote, A. & Stange, K. (2022). Attrition from administrative data: problems and solutions with an application to postsecondary education. Working Paper 30232, National Bureau of Economic Research.
- Jacobson, L., LaLonde, R., & Sullivan, D. (2005). Estimating the returns to community college schooling for displaced workers. *Journal of Econometrics*, 125(1–2), 271–304.
- Jepsen, C., Troske, K., & Coomes, P. (2014). The labor-market returns to community college degrees, diplomas, and certificates. *Journal of Labor Economics*, 32(1), 95–121.
- Meyer, K., Bird, K. A., & Castleman, B. L. (2022). Stacking the deck for employment success: Labor market returns to stackable credentials. *Journal of Human Resources*, Published online before print June 10, 2022, DOI: <https://doi.org/10.3368/jhr.1120-11320R2>
- State Council for Higher Education for Virginia (2023). New Economy Workforce Credential Grant Annual Report 2022. Retrieved on 11/2/2023 from <https://www.schev.edu/home/showpublisheddocument/2785/638206851061430000>
- Stevens, A. H., Kurlaender, M., & Grosz, M. (2019). Career technical education and labor market outcomes: Evidence from California community colleges. *Journal of Human Resources*, 54(4), 986–1036.

US Bureau of Labor Statistics. (2023). Job openings and labor turnover summary, February 1, 2023, <https://www.bls.gov/news.release/jolts.nr0.htm>; The employment situation, February 3, 2023. <https://www.bls.gov/news.release/empsit.nr0.htm>.

Virginia Employment Commission. Summary Analysis of Virginia 2018 and 2017 Benchmark Revisions of Nonagricultural Employment and Unemployment. Retrieved on 11/2/2023 from https://viriniaworks.com/_docs/Publications/Press-Releases-and-Reports/PDF/2019-Benchmark-Report.pdf

Xu, D., & Ran, F. X. (2020). Noncredit education in community college: Students, course enrollments, and academic outcomes. *Community College Review*, 48(1), 77-101.

Appendix Table 1. Enrollment and Sample Programs by Occupational Field in FY 2022

Occupational Field	Enrolled	Sample Program
Computer and Mathematical	1,061	CompTIA A+
Construction and Extraction	2,380	Highway Construction
Education, Training and Library	75	Teaching License
Healthcare Practitioners and Technical	316	Pharmacy Technician
Healthcare Support	1,591	Certified Nurse Aide
Installation, Maintenance and Repair	1,271	Electrical and electrical systems
Office and Administrative Support	602	Billing and Coding Specialist
Production	1,243	Welding
Public Administration	12	Public Administration Specialist Certification
Transportation and Material Moving	2,982	Commercial Driver's License
All	11,533	

Source: New Economy Workforce Credential Grant Annual Report FY2022 (February, 2023) by State Council for Higher Education for Virginia (SCHEV).

Appendix Table 2. Ten most common FastForward programs

Program Name	Enrollment		Completed Training	Earned Credential
	Frequency	Percent		
Commercial Driver's License Class A Endorsement	6,392	26.7%	90.2%	76.2%
Clinical Medical Assistant (NHA)	2,163	9.0%	92.6%	82.5%
Certified Nurse Aide	1,512	6.3%	87.4%	51.3%
VDOT Asphalt Field Level 1	1,281	5.4%	97.8%	87.6%
VDOT Asphalt Field Level 2	1,050	4.4%	98.1%	92.4%
CompTIA A+	979	4.1%	93.3%	23.4%
Shielded Metal Arc Welding (SMAW)	907	3.8%	94.8%	80.3%
Phlebotomy Technician (NHA)	828	3.5%	94.6%	76.8%
Core-Introductory Craft Skills	739	3.1%	96.5%	86.3%
VDOT Asphalt - Slurry Seal	554	2.3%	98.0%	93.0%

Note: To produce this table, we used data structured at the student-program level. Earning a grade of satisfactory indicates successful program completion. Enrollment Percent represents percentage of total FastForward enrollment. This may not sum to 100% for all programs as students can enroll in multiple programs

Appendix Table 3. Characteristics of students enrolled in VCCS credit-bearing sector, by fall term

	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020	Fall 2021
	(1)	(2)	(3)	(4)	(5)	(6)
Gender						
Female	62.4%	60.9%	61.3%	62.0%	61.8%	63.7%
Male	37.5%	39.0%	38.6%	37.8%	38.0%	36.1%
Unspecified	0.1%	0.0%	0.1%	0.2%	0.3%	0.3%
Race						
White	59.1%	60.6%	58.4%	55.5%	57.6%	55.6%
Black	25.1%	23.7%	24.1%	26.4%	24.9%	28.1%
Hispanic	6.8%	6.8%	7.7%	8.1%	7.7%	5.9%
Asian	3.9%	4.3%	4.7%	4.9%	4.7%	4.8%
Other	5.0%	4.7%	5.2%	5.2%	5.1%	5.7%
N	8,650	7,401	7,297	7,346	6,827	7,846
<p>Note. The data used to produce this table was retrieved from the Virginia State Council for Higher Education website: https://research.schev.edu/info/Reports.Guide-to-the-Fall-Headcount-Enrollment-Reports. We include the percent of students enrolled in credit-bearing programs earning awards less than one year. To calculate the proportion of students within each race category, we removed the missing observations. Missing values range from 1% to 4% depending on the year.</p>						

Appendix Table 4. Characteristics of Students by Field of Study

		Computer and Information Sciences	Construction Trades	Mechanic and Repair Technologies / Technicians	Precision Production	Transportation and Materials Moving	Health Professions and Related Clinical Sciences	Other
Cohort	2017	21.3%	15.6%	5.3%	25%	19.5%	18.5%	22.1%
	2018	13.6%	22%	7.1%	20.9%	17.9%	15.8%	18.4%
	2019	23.8%	23.6%	28.8%	22.2%	18.3%	20.6%	23.4%
	2020	12.7%	21.6%	32.3%	15.6%	19.7%	19.5%	18.6%
	2021	28.6%	17.2%	26.6%	16.3%	24.6%	25.5%	17.5%
Whether Completed FF Training		94.4%	95.3%	95.6%	94.1%	90.6%	89.9%	95.2%
Whether Earned a Credential		26.9%	81.7%	79.3%	74.9%	77.1%	61.5%	67.1%
Race	White	32.2%	67.2%	42.3%	50.7%	38.6%	45.2%	67.9%
	Black	36.8%	17.9%	47.3%	35.3%	47.5%	37.8%	19.2%
	Hispanic	10.9%	5.5%	3.6%	3.7%	3.8%	7.8%	2.8%
	Asian	14.5%	3.4%	1.4%	0.8%	1.7%	3.7%	2.5%
	Other	5.5%	6.1%	5.5%	9.6%	8.4%	5.6%	7.6%
Gender	female	28.6%	7%	24.4%	18.7%	12.6%	91.2%	39%
	male	69.7%	87.9%	72.3%	79.5%	82.9%	7.9%	57.8%
	unspecified	1.7%	5.1%	3.3%	1.9%	4.5%	0.9%	3.1%
Age	20-24	15.8%	23.9%	29.7%	28.6%	17.7%	32.9%	11.8%
	25-29	24.7%	21%	25.6%	23%	22.4%	22%	17.4%
	30+	59.5%	55.1%	44.7%	48.5%	59.9%	45.1%	70.8%
	mean	33	33	31	31	33	31	36
Quarterly earnings pre-FF entry	Non Credential Earners	\$9,172.43	\$10,828.04	\$8,091.45	\$8,024.96	\$7,850.77	\$5,446.39	\$13,324.42
	s.d.	(7922)	(8924)	(6846)	(7003)	(6497)	(4591)	(10936)
	Credential Earners	\$11,133.68	\$11,688.81	\$8,097.56	\$8,534.12	\$8,865.16	\$5,952.67	\$11,703.86
	s.d.	(9314)	(8544)	(6686)	(6908)	(6873)	(4767)	(9595)
Quarterly earnings post-FF exit	Non Credential Earners	\$13,880.58	\$14,310.36	\$12,374.11	\$10,638.66	\$9,711.75	\$6,747.45	\$17,647.27
	s.d.	(10312)	(9978)	(8424)	(6921)	(7439)	(4731)	(12885)
	Credential Earners	\$19,414.62	\$15,863.02	\$12,088.80	\$13,086.06	\$12,592.89	\$7,665.23	\$16,192.78
	s.d.	(12776)	(8993)	(6621)	(8374)	(7496)	(4672)	(11324)
Total Students		7.9%	11.7%	5.1%	9.2%	30.6%	28.9%	6.6%
		1,895	2,802	1,214	2,207	7,345	6,933	1,586

Notes: -CIP code categories: 11: Computer and Information Sciences and Support Services; 46: Construction Trades; 47: Mechanic and Repair Technologies/Technicians; 48: Precision Production; 49: Transportation and Materials Moving; 51: Health Professions and Related Clinical Sciences; Other:

-"Credential Earners" and "Non Credential Earners" columns represents the student groups within the sample who are ever observed earning a VCCS noncredit FastForward Credential or are not, respectively

-Cohorts are defined by the VCCS fiscal year (e.g. cohort 2017 represents enrollments from July 1, 2016 - June 30, 2017)

-Earnings are measured in 2022 dollars with standard deviations in parentheses

Appendix Figure 1. Event Study Plot for Probability of Employment

