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REPORT

FINAL REPORT

Outcomes of Competency-Based Education in Community Colleges: Summative Findings from the Evaluation of a TAACCCT Grant

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I. INTRODUCTION

Between 2011 and 2014, the U.S. Department of Labor (DOL), Employment and Training Administration (ETA) awarded nearly $500 million per year in grants to individual community colleges and groups of institutions working together as consortia, through the Trade Adjustment Assistance Community College and Career Training (TAACCCT) grants program. The broad goals of the TAACCCT program were (1) to increase attainment of degrees, certificates, and other industry-recognized credentials that provide skills for employment in high-wage, high-growth fields; (2) to introduce or replicate innovative and effective curricula that improve learning that is relevant to employment; and (3) to improve employment outcomes for participants, especially those eligible for Trade Adjustment Assistance and other economically dislocated and low-skilled adult workers.

In October 2012, under Round 2 of the TAACCCT grants program, DOL awarded a $12 million grant to a consortium led by Sinclair Community College (SCC) in Dayton, Ohio, to fund a three-year project titled, "Adapting and Adopting Competency-Based IT Instruction to Accelerate Learning for TAA-Eligible, Veterans, and Other Adult Learners."[1] Under the grant, lead college SCC and co-grantees Broward College (BC) in Fort Lauderdale, Florida, and Austin Community College (ACC) in Austin, Texas, implemented programs that "adapted and adopted" the Western Governors University (WGU) model of competency-based education (CBE) in four information technology (IT) programs: programming at ACC, technical support at BC, and networking and software development at SCC. WGU served as a consultant to the colleges and Mathematica Policy Research acted as the external evaluator for the grant-funded project.

This report analyzes the education and employment outcomes of TAACCCT participants at the three consortium colleges during the first two and a half years of program implementation. It is the third of three evaluation reports, drawing on the previously published interim report (Person, Goble, and Bruch 2014)—which described the colleges' CBE models at baseline, when program services were first offered under the grant—and the implementation report (Person, Goble, Bruch, and Mazeika 2015)—which examined program development, implementation, and participation within and across the three colleges, highlighting cross-cutting challenges, successes, and lessons learned at the time of full program implementation. The two previous reports provide context for this final analysis of participant outcomes, and their findings may shed light on the ways program implementation may have shaped outcomes at the colleges. All three reports are designed to inform various stakeholders interested in understanding how competency-based programs may be implemented at community colleges and what outcomes their participants experience. Potential audiences for the report include DOL, policymakers interested in CBE or similar workforce development programs, the consortium colleges and other colleges considering such approaches, current or future students, and practitioners and researchers interested in CBE, community college workforce development, and postsecondary institutional change efforts.

[1] The original program period for Round 2 TAACCCT grants was scheduled to end on September 30, 2015; however, DOL extended the period in which grant-funded program services could be offered through March 31, 2016. The evaluation period continued, as originally scheduled, through September 30, 2016.

The report has four chapters. The remainder of this introductory chapter provides background on CBE approaches nationwide, summarizes key findings from the earlier studies of CBE implementation at the consortium colleges, and concludes with an overview of the research questions addressed here and the corresponding data and analytic methods. Chapter II describes the summative outcomes of participants in the grant-funded programs at each college, and Chapter III examines factors that influenced these outcomes. Chapter IV presents the results of quasi-experimental outcome analyses, examining how participants fared in comparison to nonparticipants in similar IT programs at the consortium colleges. Finally, Chapter V offers an integrative discussion of the summative outcome evaluation's findings, referencing earlier implementation findings to highlight overarching lessons for the field.

A. Prior research on competency-based education nationwide

Although there is no single, authoritative definition of CBE, a common feature of such approaches is that they require students to master clearly defined and measurable learning outcomes (the required "competencies") but allow variation in the time each student takes to demonstrate each competency. CBE contrasts with traditional models, in which each student may experience different learning outcomes (usually indicated by different grades), even though all students spend a fixed amount of time in each course (typically one academic term in college settings). Though not essential to CBE, most models currently implemented in the United States—especially in higher education—leverage technology to support students' independent movement through materials with individualized guidance provided by an instructor as needed (WGU 2016). The WGU model, which served as the consortium's point of departure in its TAACCCT-funded program development, includes these hallmarks (Person et al. 2014).

Evolution of competency-based approaches

Competency-based education has a long history in the United States, especially in employment training programs (Ford 2014; Hodge 2007; Tuxworth 1989), but also in K–12 and postsecondary education. Education institutions have implemented CBE models for at least a generation, but interest has surged in the past decade as administrators, particularly in postsecondary settings, have struggled to find ways to ensure high quality education while containing costs, potentially by leveraging new technologies (Ford 2014; Johnstone and Soares 2014; Steele et al. 2014). The federal government has supported the growing interest in CBE models in higher education. In 2009, DOL launched the Industry Competency Model Initiative, which was designed "to develop and maintain dynamic models of the foundation and technical competencies that are necessary in economically vital industries … [and] that are essential to educate and train a globally competitive workforce" (Competency Model Clearinghouse 2015). In 2013, the White House highlighted the promise of CBE models—including the WGU model—as an approach to make college more affordable (White House 2013). The U.S. Department of Education currently offers regulatory waivers for "experimental sites" to use CBE models, making it easier for institutions to align federal aid disbursements with CBE students' nontraditional schedules (U.S. Department of Education 2015).

Student outcomes in competency-based education

Despite the growing interest in CBE in U.S. education, little is known about the influence of such models on student outcomes, particularly at the postsecondary level. Several studies

published in the 1970s and 1980s examined mastery-based curricula in K–12 and postsecondary settings and found positive effects on student achievement outcomes (Guskey and Gates 1985, 1986; Kulik et al. 1979; Slavin 1984). However, the design and implementation of these programs was highly variable. One of the prominent programs studied in the earlier research was Learning through Mastery, which included group instruction with additional support for struggling students (Steele et al. 2014). Such an approach differs substantially from the flexibly paced, individualized approach used at WGU and other postsecondary institutions at the forefront current CBE efforts.

More recent evidence on CBE models has been mixed. One of the only rigorous recent studies of student outcomes associated with CBE models was conducted in K–12 settings and found heterogeneous effects on achievement. In this study, the three sites that offered CBE demonstrated either negative or insignificant positive effects on mathematics or reading achievement (Steele et al. 2014). At the postsecondary level, another recent study examined "adaptive learning technologies," a different but related approach to flexibly paced, individualized instruction. This approach uses software to customize instructional pace and sequencing according to student performance on diagnostic quizzes and assignments. A synthesis of quasi-experimental evaluations comparing adaptive learning technologies to traditional lecture, online, or blended models in general and developmental education courses in bachelor's and associate's degree programs found moderate positive impacts on learning assessments at three of seven sites, but no effects on course grades or course completion at most sites (Yarnall et al. 2016). The Sinclair consortium's TAACCCT-funded programs provide an opportunity to examine both education and employment outcomes of CBE models implemented in community college IT programs.

B. Implementation of TAACCCT-funded competency-based programs at consortium colleges

When consortium college leaders developed their TAACCCT grant proposal in early 2012, CBE models had not been widely applied in community colleges. Nevertheless, they believed that CBE could address a few common concerns. First, experience had shown that community college students—especially adult learners, with life experience and responsibilities—want flexible programs and course schedules with the possibility of acceleration. Second, leaders had observed employer demand for qualified individuals with appropriate job skills including, in some cases, specific credentials, especially industry certifications. Finally, the colleges all wanted to improve course and program completion rates—especially in online and distance learning—ideally while containing costs.

During the grant application stage, the colleges identified IT as an area of growing employer demand in their respective regions, and all three colleges had previously offered IT courses in traditional face-to-face, online, or blended modalities. Using TAACCCT grant funds, the three colleges developed new CBE courses in distinct IT programs with the goal of developing students' industry-relevant competencies and accelerating them into well-paid jobs and career ladders. The colleges each developed between 20 and 30 CBE courses in the IT field and packaged them as programs leading to short-term certificates, industry certifications, and associate's degrees.

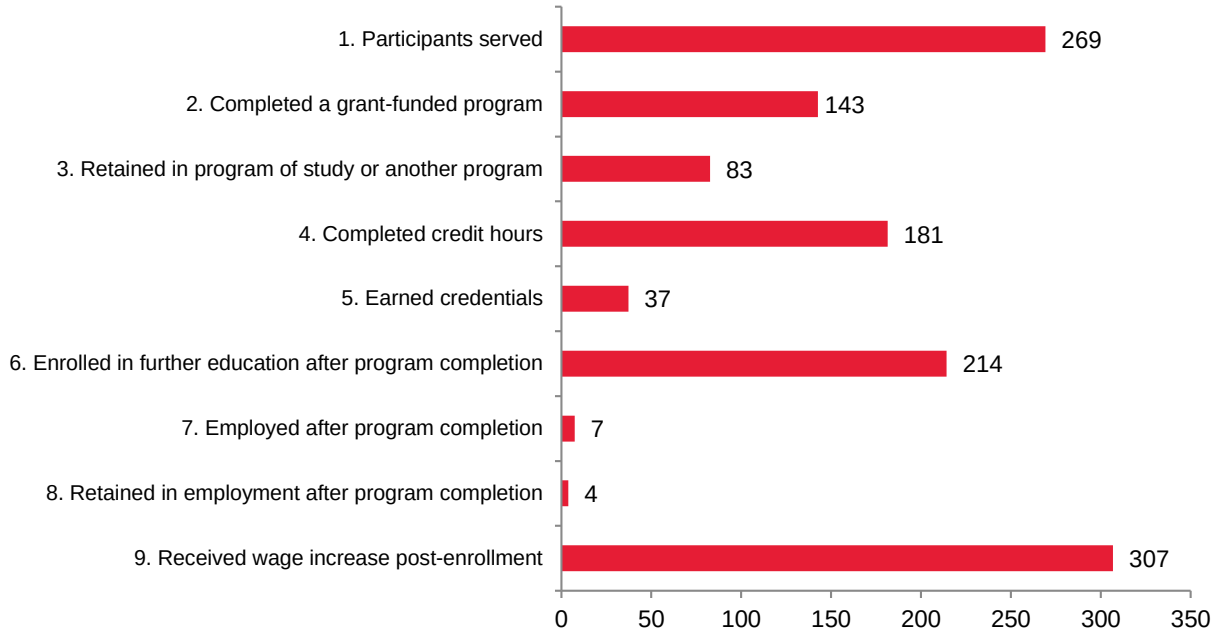
Each college developed somewhat different program offerings to fit its unique institutional and external contexts (Appendix A provides a detailed description of each college's model). However, the consortium colleges embraced a few common attributes, which most CBE models share, including WGU's:

- **Definition of relevant and measureable competencies.** CBE models require all learning outcomes (the essential competencies) to be precisely defined, objectively measurable, and reflective of skills that are necessary for a given position or field. Although the definition, measurement, and relevance of learning outcomes is a standard principle of sound instructional design (Gagné et al. 2004), and is especially important for distance learning (Bourdeau and Bates 1996), CBE makes definition, measurement, and relevance of outcomes explicit in a way that most traditional higher education models do not. Most CBE programs focus on preparation for specific jobs from which the competencies are derived, though not necessarily in all cases (for example, general education courses or programs). The consortium used state and industry standards to articulate the required competencies for the grant-funded IT programs.
- **Demonstration of competency through valid assessment.** Students in CBE programs must demonstrate mastery of each competency before moving on to the next and advancing through a course or program. Assessments must, therefore, be clearly linked to required competencies and accurately measure mastery. Some CBE models allow students to skip program content if they can demonstrate mastery on an assessment. The consortium required minimum proficiency typically corresponding to a B grade on key assessments and all colleges offered "test out" options with potential tuition savings for students.
- **Potential acceleration through the educational program.** Unlike traditional educational models, which hold "time (semesters or quarters) constant and [allow] the level of mastery (as reflected in grades) to vary" (Johnstone and Soares 2014, p. 16), CBE models allow time to vary but hold constant the minimum level of mastery. The result is that students may move through material at their own pace, allowing acceleration, especially for students who can draw on prior education or work experience. The consortium colleges set pace guidelines to ensure students' timely progress through course and program materials.
- **Need for high quality materials and timely support.** Because CBE models strongly emphasize student mastery and allow students to move through material independent of traditional academic schedules, the quality and availability of learning resources is paramount and should be continuously monitored. At the same time, independent learning requires students to have access to adequate help at the moment they need it. The consortium used instructional designers to help develop high quality materials and coaches to provide targeted learner supports from enrollment through completion.

While executing these programmatic innovations, grant leaders also dedicated substantial resources to capacity building and change management processes at the participating colleges with the aim of supporting successful, scalable, and sustainable CBE program implementation (Person et al. 2014; Person et al. 2015). Their efforts were largely successesful, though not without some challenges:

- **The consortium colleges successfully implemented their CBE models as planned, with few exceptions.** Teams at all three colleges completed a majority of their project milestones on time, as articulated and tracked in the implementation database developed by consortium leadership as a project management and monitoring tool. To the extent that the colleges deviated from their planned approaches, they typically did so to enhance or expand CBE offerings. BC experienced some implementation delays attributed to staff turnover and technical infrastructure issues.
- **The consortium exceeded the majority of performance targets specified in the grant agreement.** DOL worked with the consortium to specify targets on nine performance measures, which were then incorporated into the grant agreement. The consortium exceeded the specified performance target on five of these measures (Figure I.1). In particular, the colleges enrolled nearly three times as many participants as planned and, of these, more than three times as many as planned received a wage increase after enrollment. The consortium also exceeded the program completion target by nearly half. They did not meet the credential completion target, but there are at least two countervailing factors. First, programs were offered for three academic years, but most students entered in the second and third years of the grant, allowing less time for credential completion. Second, programs were designed to prepare students for college certificates and degrees, as well as industry certifications, but the latter credential is extended by third-party industry organizations, so data for these credentials were not available. Additionally, the consortium faced challenges meeting the two employment-related outcomes for participants not employed at program entry, largely because most participants were incumbent workers when they first enrolled in the programs.
- **Explicit attention to capacity building and change management advanced program scale and sustainability.** All three colleges ultimately scaled their programs. Of particular note, SCC's computer information systems (CIS) faculty chose to adopt the grant-funded CBE curriculum department-wide, which program leaders considered a major victory and which scaled parts of the curriculum to reach all CIS students. Both ACC and SCC were able to expand offerings into additional areas not planned under the grant, including visual communications and software testing. All three colleges planned to continue their CBE programs after the grant period, having secured college funding and institutional homes in the Accelerator lab at ACC, the online campus at BC, and in the CIS department and online campus at SCC.

Figure I.1. Consortium performance targets, percentage achieved



Source: College administrative and state wage record data; figures as of September 30, 2016

Note: The full list of performance measures follows (targets in parentheses): 1. Total unique participants served (2,325); 2. Total number of participants completing a grant-funded program of study (1,193); 3. Total number of participants retained in program of study or other grant-funded program (1,645; the figure cited here reflects the non-cumulative count from the 2016 report year); 4. Total number of participants completing credit hours (2,250); 5. Total number of participants earning credentials (1,420; the figure cited here may include duplicate counts of students earning both a certificate and a degree); 6. Total number of participants enrolled in further education after grant-funded program completion (386; the figure cited includes only participants with continued enrollment at grantee colleges); 7. Total number of participants employed after grant-funded program completion (803); 8. Total number of participants retained in employment after program completion (769); 9. Total number of participants employed at enrollment receiving wage increase post-enrollment (1,066).

Several overarching lessons emerged from the evaluation of program implementation at the consortium colleges:

- **There is no single "right" way to design or implement a CBE program**, but curriculum development requires a high degree of collaboration and standardization, which may be unusual for some colleges.
- **College cultural, procedural, and structural issues should be proactively addressed** because CBE programs may be at odds with normal ways of doing business. This is particularly true of many back-end processes—such as populating course sections or calculating faculty payloads—but also for cultural issues—such as determining who is responsible for reaching out to students when they fall behind.
- **CBE models should be one of multiple options available to college students** since they may not be appropriate for all students. Intensive intake processes help determine the best fit

and start students on the right path while enhanced learner supports may help students move independently through CBE courses and programs.

These implementation findings can enhance understanding of how and why different students at different colleges experienced the outcomes reported in the subsequent chapters.

C. Summative evaluation research questions, data, and analytic approach

Building upon the implementation findings discussed in earlier evaluation reports and summarized in the prior section, this report addresses four key research questions:

1. What are the cumulative education and employment outcomes of TAACCCT participants?
2. What factors are associated with TAACCCT participants' outcomes?
3. Do education outcomes differ for participants exposed to different course modalities or different levels of student support?
4. How do TAACCCT participants' education outcomes compare to those of nonparticipants?

In examining student outcomes, the report focuses on a subset of the specific education and employment outcomes highlighted by DOL in the TAACCCT grant solicitation and included in grantees' annual performance reports (APR).[2] Given the relatively short period covered by the evaluation, however, we also examine some additional near-term education outcomes of interest to the consortium colleges and other audiences.

The report draws on two key data sources:

1. College administrative data (program intake data, student transcripts, course history data, and self-reported student characteristics available through student records)
2. State wage record data (employment and wage data from state workforce agencies)

Using these data, we conducted descriptive and correlational analyses for research questions 1 through 3 and present the results in Chapters II and III. For research question 4, we used multivariate regression and matching methods to compare outcomes of participants and nonparticipants and present the results in Chapter IV. Appendix B provides more detail on the data and analytic approaches.

[2] Appendix C reports a more complete set of cumulative participant outcomes based on those required by DOL.

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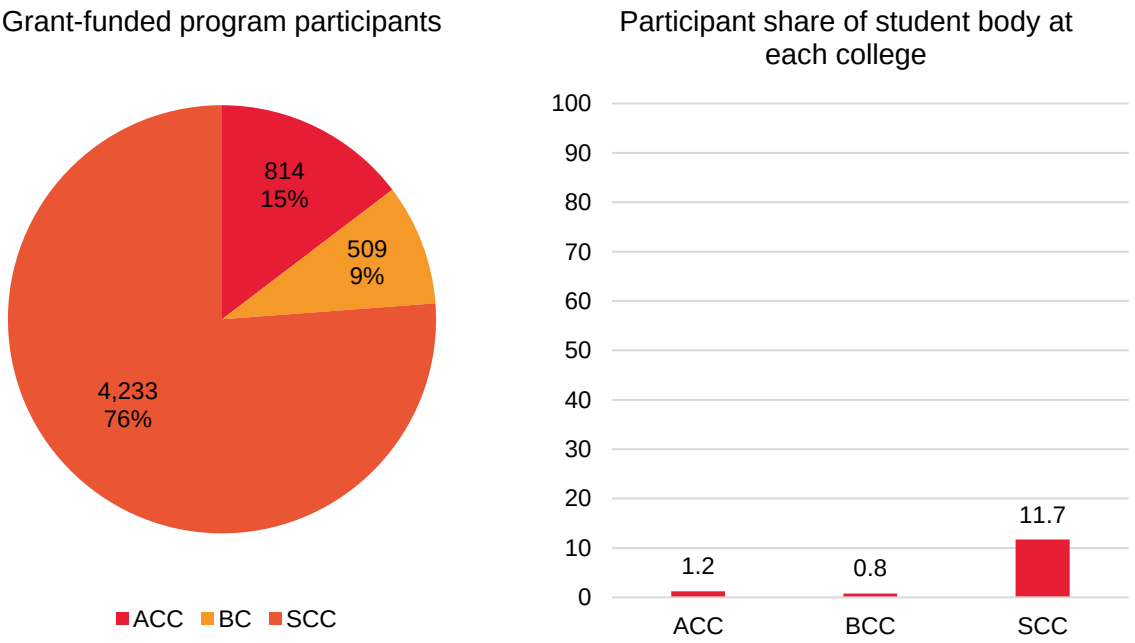
II. SUMMATIVE OUTCOMES ANALYSIS FOR PARTICIPANTS

In this chapter, we present the results of descriptive analyses of participants in the three colleges' grant-funded CBE programs to answer our first research question: *What are the cumulative education and employment outcomes of TAACCCT participants?* We begin by presenting information on the number and characteristics of participants. We then describe participants' cumulative education and employment outcomes. To report results, we use figures and abbreviated tables in the main text; full results tables appear in Appendix C.

A. Number and characteristics of TAACCCT program participants

From fall 2013 through the end of the grant-funded program period in spring 2016,[3] the consortium served 5,556 unique participants: 814 at ACC, 509 at BC, and 4,233 at SCC (Figure II.1).[4] The grant-funded programs made up a small part of ACC's and BC's total enrollment: just over 1 percent at ACC (total 2014–2015 enrollment = 66,234) and slightly less than 1 percent at BC (total 2014–2015 enrollment = 63,389). The program accounted for a much larger proportion of SCC's student body: 12 percent (total 2014–2015 school year enrollment = 36,110).

Figure II.1. Participants by college



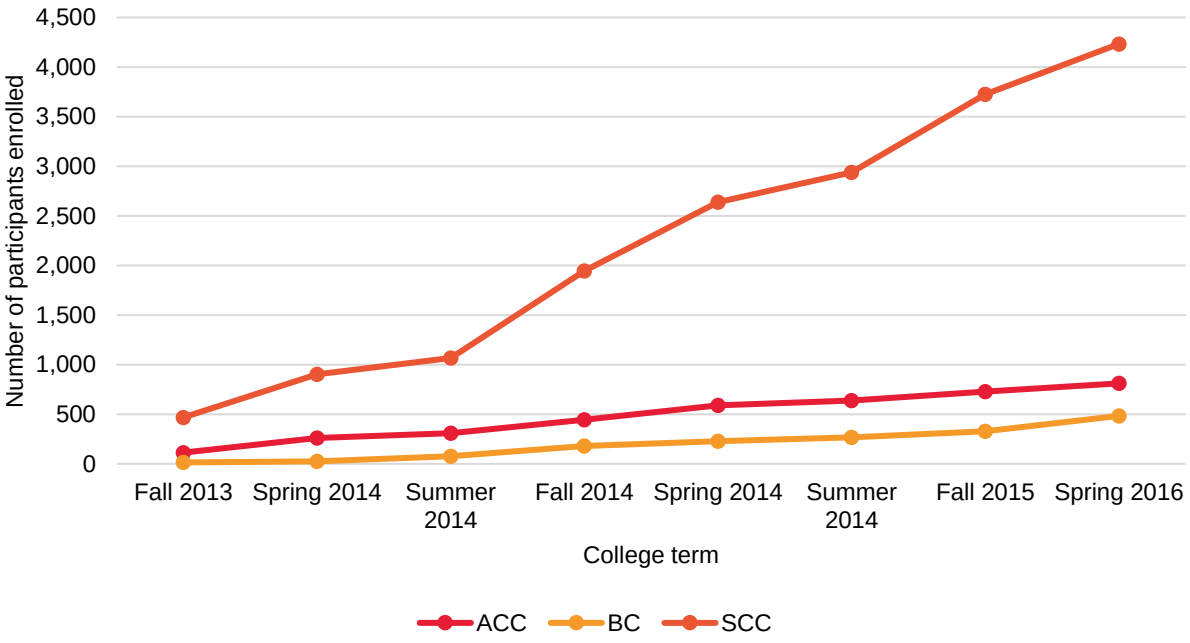
Source: College administrative data; Integrated Postsecondary Education Data System (IPEDS).

[3] The original program period for Round 2 TAACCCT grants was scheduled to end on September 30, 2015; however, DOL extended the period in which grant-funded program services could be offered through March 31, 2016.

[4] The participant count at BC differs slightly from college-reported counts for the APR due to data inconsistencies at the college.

Grant-funded program enrollment increased fairly steadily throughout the study period, with a steeper increase in fall 2014 at SCC (Figure II.2). As noted, the grant agreement stipulated enrollment targets, which the consortium greatly exceeded (Figure I.1).[5] The colleges also fared well in meeting their respective targets: ACC exceeded its target (684) by about 20 percent; SCC exceeded its target (867) by nearly 400 percent; and BC achieved over 98 percent of its target (517).

Figure II.2. Enrollment over time, by college



Source: College administrative data.

Note: Figure shows number of participants who enrolled in grant-funded programs in each term, by college. The total number of participants at each college was as follows: ACC: 814 (target: 684); BC: 509 (target: 517); and SCC: 4,233 (target: 867); consortium: 5,556 (target: 2,325). The consortium target is not the sum of the individual college targets.

Grant-funded CBE program participants were largely similar to community college students nationwide, but they were more likely to be incumbent workers

In many ways, participants in the colleges' grant-funded CBE programs were similar to community college students nationwide. Much like community colleges in general, the colleges' grant-funded CBE programs served individuals who were older and more experienced than the "traditional" college student (Figure II.3). Over half of program participants were age 25 or older, ranging from 52 percent at SCC to 87 percent at ACC. The average age of participants consortium-wide was 29 years, compared to 28 years for community college students nationwide (AACC 2016).

A large majority of participants at each college had prior postsecondary experience (at the college itself or at another institution), and many had already earned postsecondary credentials

[5] The consortium target is not the sum of the individual college targets.

(Figure II.3). Notably, approximately two-thirds of participants at ACC had earned a prior postsecondary credential (degree or certificate). At BC and SCC, approximately 20 percent of participants had earned a prior postsecondary credential.[6]

The percentage of CBE program participants who were women was lower than the nationwide average for community college students. Consortium-wide, 37 percent of participants were women (Figure II.3), compared to the national community college average of 57 percent (AACC 2016). However, this discrepancy likely reflects the relatively low percentage of women who pursue credentials in computer science; nationwide, women make up only 18 percent of associate degree-earners in computer and information sciences, though a majority of community college students are women (NSF 2015).

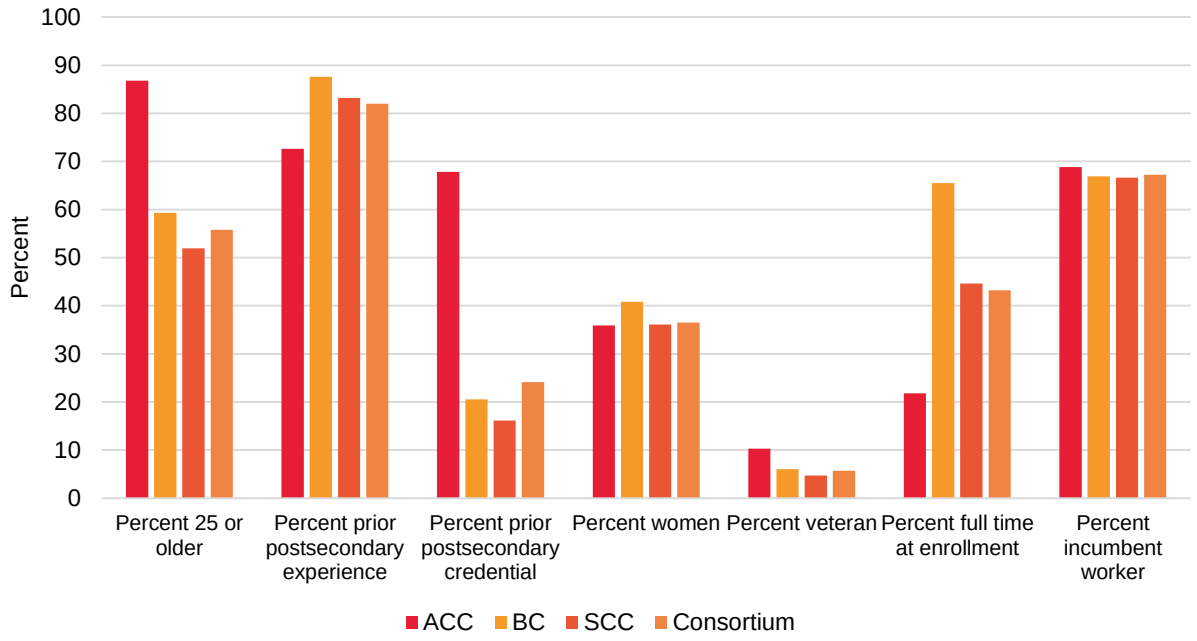
The consortium sought to engage veterans through the grant and the percentage of participants who were veterans was slightly higher than the national average for community college students. Consortium-wide, 6 percent of participants were veterans, ranging from 5 percent at SCC to 10 percent at ACC. Nationwide, about 4 percent of community college students are veterans (AACC 2016).

Consortium-wide, approximately 43 percent of participants were enrolled full-time in their initial grant-funded enrollment term, ranging from 22 percent at ACC to 66 percent at BC. Nationwide, 44 percent of community college students are enrolled full-time (NCEE 2013).

On one important dimension, grant-funded CBE program participants differed from community college students nationwide: they were more likely to be incumbent workers. Consortium-wide, about two-thirds of participants were employed at the time they entered the grant-funded program, ranging from 67 percent at BC and SCC to 69 percent at ACC (Figure II.3). In contrast, approximately 45 percent of two-year college students nationwide work while attending school (NCEE 2013).

[6] The colleges recorded information on prior postsecondary credentials in different ways, with ACC maintaining the most extensive records. The percentages we report for BC and SCC may be underestimates.

Figure II.3. Selected characteristics of program participants, by college and overall



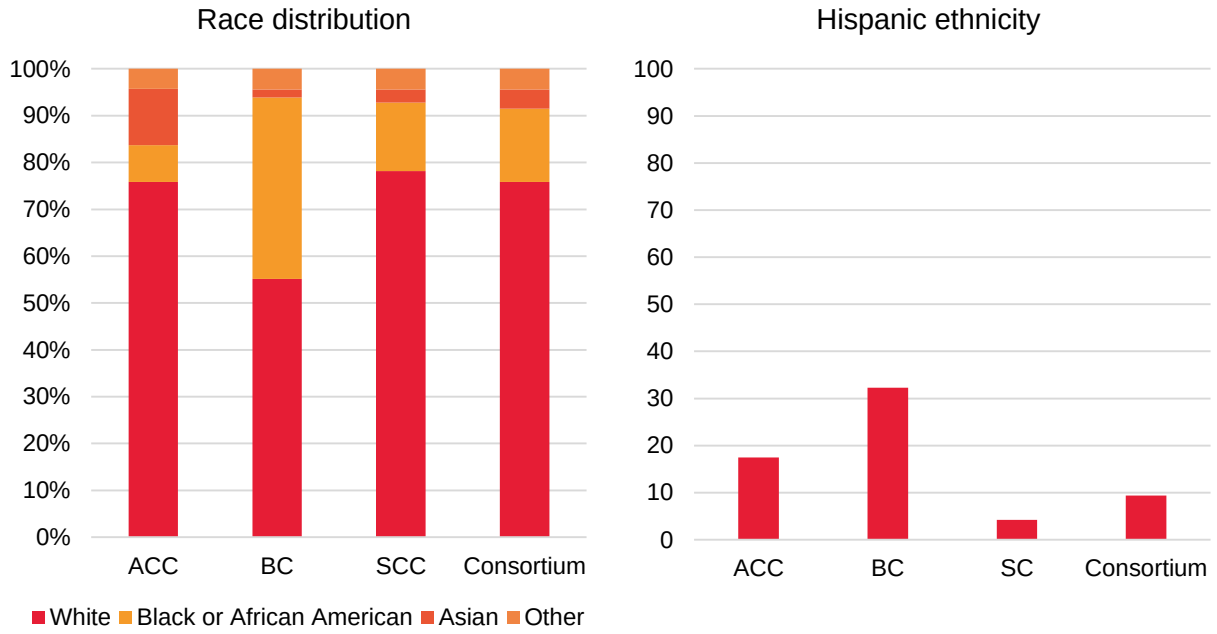
Source: College administrative and state wage record data.

Note: Figure shows percentage of participants with the indicated characteristic, by college and overall. The total number of participants at each college was as follows: ACC: 814; BC: 509; and SCC: 4,233.

Finally, despite the focus of the grant program, very few participants reported that they were TAA-eligible (not reported in Figure II.3). At BC, there were so few TAA-eligible participants that the college did not record data on this characteristic, and at ACC and SCC, fewer than 2 percent of participants reported being TAA-eligible.

Figure II.4 shows the racial and ethnic distributions of grant-funded CBE program participants. At each college, the majority of participants was white. The percentage of black or African American participants ranged from 8 percent at ACC to 39 percent at BC. The percentage of Hispanic participants ranged from 4 percent at SCC to 32 percent at BC. Nationwide, 49 percent of community college students are white, 14 percent are black or African American, and 22 percent are Hispanic (AACC 2016).

Figure II.4. Race/ethnicity of program participants, by college and overall



Source: College administrative data.

Note: Figure shows percentage of participants reporting the indicated race/ethnicity category, by college and overall. The total number of participants at each college was as follows: ACC: 814; BC: 509; and SCC: 4,233.

B. Cumulative education and employment outcomes for participants

The TAACCCT grant program identified several participant outcome indicators for analysis through grantee evaluations and annual performance reporting. This section focuses on the key outcomes of program completion, credential completion, employment, and earnings. Appendix C summarizes participant outcomes for the remaining indicators.

A large proportion of participants completed industry certification preparatory courses, college certificates, or degrees.

Consortium-wide, 35 percent of participants completed any grant-funded program of study (Figure II.5), defined as completing any one of the following:

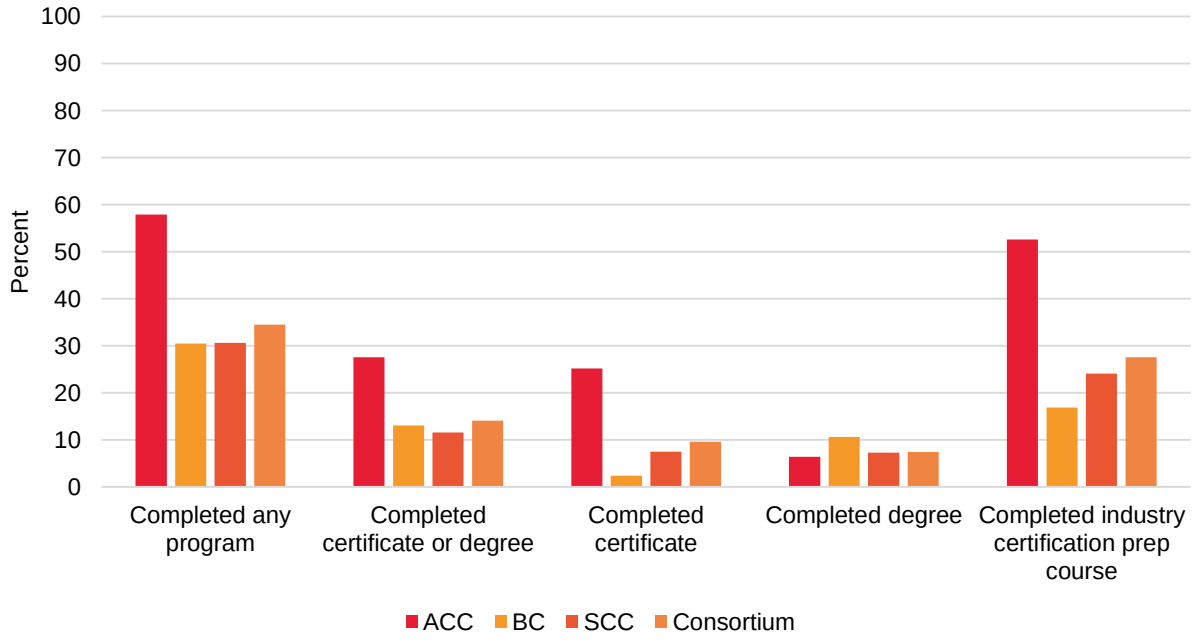
- **Industry certification preparatory courses.** Industry certification is an important requirement for many IT jobs. The consortium colleges designed a host of courses that, upon successful completion, would qualify students to sit for industry certification examinations in high-demand fields, including network administration and security and software testing (for example, through courses for Cisco Certified Network Associate, Microsoft Certified Solutions Associate, International Software Testing Qualifications Board, Computing Technology Industry Association [CompTIA] Network+, and CompTIA Security+). To complete an industry certification, participants would have had to pass an examination offered by the relevant entity (for example, CompTIA for Network+ and Security+ certifications). Although the consortium colleges proactively sought, through their courses, to prepare students for certification, they did not have access to data documenting which

students passed the industry certification examinations. As such, we do not report here on completion of industry certifications.

- **Certificates.** Colleges awarded short-term technical certificates in a variety of specialties such as network engineering, system administration, programming and software development, web development, and user and computer support. These certificates typically required completion of four to six courses and were typically designed to take less than a year to complete.
- **Associate's degrees.** Participants could earn associate of science and associate of applied science degrees in IT-related specializations such as computer programming, web programming, and network engineering. In this chapter, we also report on participants' completion of associate's degrees in other fields (such as associate of arts degrees), given that grant-funded courses may count toward other non-IT associate degree requirements.

Consortium-wide, the most common type of program completion involved industry certification preparatory courses, which 28 percent of all consortium participants completed. Fewer participants earned certificates (10 percent) or degrees (7 percent).

Figure II.5. Selected education outcomes for participants, by college and overall



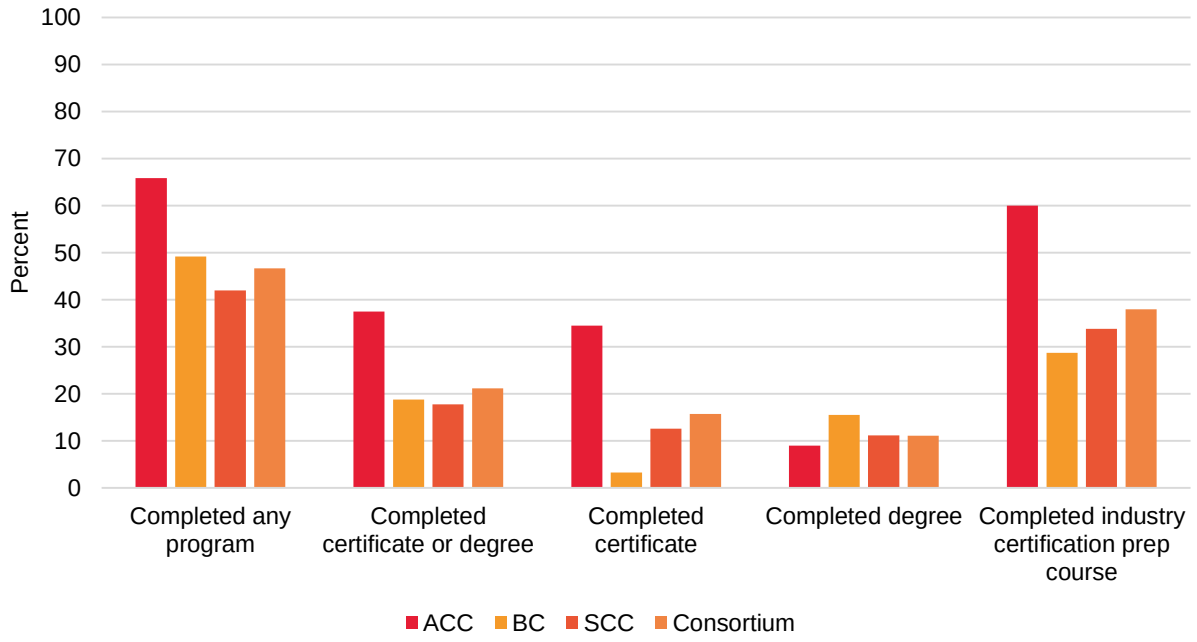
Source: College administrative data.

Note: Figure shows percentage of participants achieving each education outcome, by college and overall. The total number of participants at each college was as follows: ACC: 814; BC: 509; and SCC: 4,233.

Figure II.5 presents results for all participants, regardless of the timing of their initial enrollment in the CBE program. Clearly, participants who enrolled later in the study period had less time to complete a program. For participants who first entered a grant-funded program between fall 2013 and fall 2014 (that is, during the first four terms in which the colleges offered

grant-funded programming), completion rates were higher (Figure II.6). Consortium-wide, just under half (47 percent) of these early participants completed a program; specifically, 38 percent completed an industry certification preparatory course, 16 percent completed a certificate, and 11 percent completed a degree.[7]

Figure II.6. Selected education outcomes for participants who first enrolled in a grant-funded program between fall 2013 and fall 2014, by college and overall



Source: College administrative data.

Note: Figure shows percentage of participants who first enrolled in a grant-funded course between fall 2013 and fall 2014 and achieving each education outcome, by college and overall. The total number of participants at each college who enrolled during this period follows: ACC: 443; BC: 181; and SCC: 1,946.

Participants completed programs in relatively short amounts of time

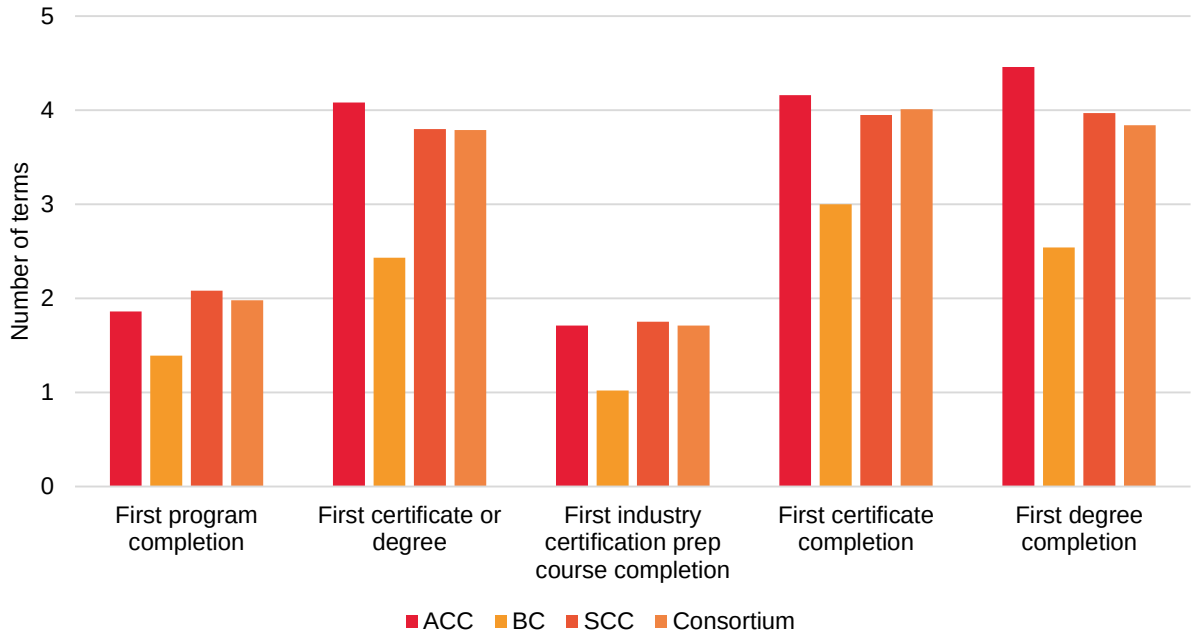
On average, program completers took approximately two terms from the time they entered the grant-funded program to complete their first program of study (Figure II.7). As would be expected, industry certification preparatory courses took the least amount of time to complete (under two terms after initial program enrollment, on average), followed by certificate programs and associate's degrees (both of which took approximately four terms after initial enrollment, on average). The relatively short time required for associate's degree completion (expected time to complete such degrees is typically two years or six academic terms[8]) could reflect programmatic efforts to support acceleration but could also reflect the fact that most students began the CBE programs with some prior college experience (Figure II.3) and may already have earned some

[7] Individual participants may have completed more than one program.

[8] All of the participating colleges followed an academic calendar of three terms (fall, winter/spring, and summer), although the CBE programs were designed to allow flexibility within the structure of these terms.

credits before beginning their CBE programs. Even so, the programs appear to offer a path to completion by appealing to and offering flexibility needed by some nontraditional (older, more experienced, often working) students.

Figure II.7. Time to completion for participants, by college and overall



Source: College administrative data.

Note: Figure shows the average number of terms program that completers needed to complete their first program of study. The total number of participants at each college was as follows: ACC: 814; BC: 509; and SCC: 4,233.

Employment rates started and remained high

Across the consortium, participant employment rates started and remained high over the course of the grant-funded program period. Table II.1 reports employment rates at initial grant-funded program enrollment and at the end of the study period. The table includes data on employment and wages from each participant's initial term of enrollment in a grant-funded program through the first quarter of 2016 (January–March 2016), the most recent fiscal quarter for which wage and employment data were available.[9]

Wages for employed participants increased after program enrollment

Consortium-wide, wages increased from initial program enrollment through the end of the study period. Table II.1 reports average wages for employed participants at initial enrollment in a grant-funded program and at the end of the study period. Employed participants' wages increased after program enrollment, with the average quarterly wage for participants consortium-wide increasing from $6,654 in their initial enrollment term to $7,498 at the end of the study

[9] Wage and employment data were available through 2015 Q4 (October–December 2014) for BC.

period (a 13 percent increase).[10] The increase compares favorably with national wage growth over the same period: nationwide, quarterly wages grew by approximately 7 percent over this period (calculated from Bureau of Labor Statistics data). It is important to note, however, that the employment and wage trends in Table II.1 reflect many factors, including local and national economic conditions, as well as program effects (if any). In other words, the analyses are purely descriptive such that we cannot attribute the trends to effects of the colleges' grant-funded CBE programs.

Table II.1. Employment rates and average wages at initial enrollment and end of study period, by college and overall

	ACC	BC	SCC	Consortium
Employment rate at enrollment in grant-funded program (percent)	68.8	66.9	66.6	67.2
Employment rate at end of study period (percent)	70.8	66.9	66.7	67.4
Employment rate growth (percent)	2	0.0	0.1	0.1
Average wage at enrollment in grant-funded program (dollars)	$10,324.30	$7,152.50	$5,888.00	$6,653.80
Average wage at end of study period (dollars)	$11,599.70	$8,575.50	$6,579.60	$7,497.94
Average wage growth (percent)	12.4	19.9	11.7	12.7

Source: College administrative and state wage record data.

Note: Table contains employment rates and average wages at initial grant-funded enrollment and at the end of the study period. The initial grant-funded enrollment term differed by participant (Figure II.2). The end of the study period corresponds to Q1 2016 (for ACC and SCC) or Q4 2015 (for BC). The total number of participants at each college was as follows: ACC: 814; BC: 509; and SCC: 4,233.

[10] The end of the study period corresponds to Q1 2016 (for ACC and SCC) or Q4 2015 (for BC).

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III. FACTORS INFLUENCING OUTCOMES FOR PARTICIPANTS

Chapter II presented the results of descriptive analyses of cumulative education and employment outcomes for TAACCCT participants. In this chapter, we report the results of additional descriptive analyses exploring factors that influenced participants' outcomes to address our second research question: *What factors are associated with TAACCCT participants' outcomes?* We also examine how exposure to different course modalities and levels of student support at SCC influenced outcomes, shedding light on our third research question: *Do outcomes differ for participants exposed to different course modalities or different levels of student support?* As in Chapter II, we use figures and abbreviated tables in the main text to report results; full results tables appear in Appendix C.

We begin by describing how participant characteristics such as gender, race/ethnicity, and prior postsecondary experience were associated with the key outcomes of program completion (that is, completion of a TAACCCT-funded program as defined by DOL, which includes completion of industry certification preparatory courses) and credential completion (that is, completion of a certificate or degree).[11] Recognizing the compressed period within which participant outcomes could be observed (ranging from one to eight academic terms, depending on the timing of initial program enrollment), we also examine the more proximal participant outcome of gatekeeper course completion. Gatekeeper courses are those that a college either formally or informally requires for further study in a field; they aim to provide students with a necessary foundation for more advanced study. We also examine whether successful completion of gatekeeper courses predicted credential completion.

Finally, we discuss how program and credential completion differed for participants exposed to different course modalities and levels of student supports at SCC. The analysis is limited to SCC because it was the only consortium college to offer distinct modalities and supports to TAACCCT program participants. This information may be particularly useful for audiences interested in programmatic factors associated with student success in CBE programs.

A. Participant characteristics and program and credential completion

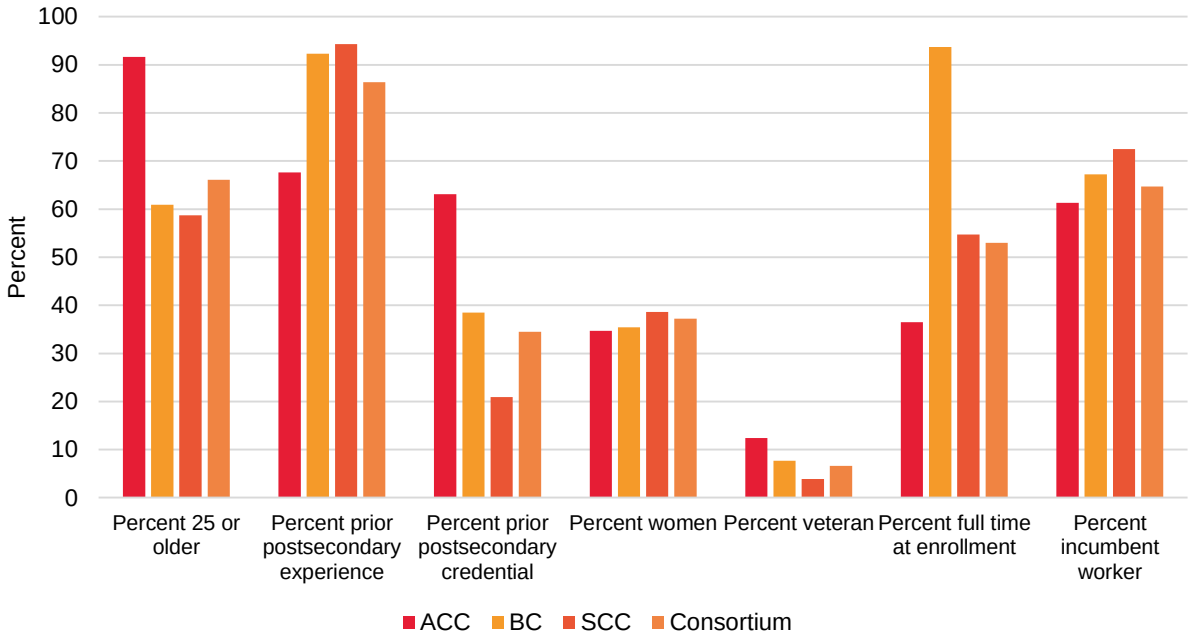
Completers tended to be older, experienced students and many were enrolled full-time

Figure III.1 presents selected characteristics of credential completers. Most were age 25 or older (about two-thirds across all three colleges) and a large majority of the participants who completed credentials had prior postsecondary experience (86 percent percent consortium-wide). A substantial proportion had already completed a postsecondary credential: 35 percent consortium-wide, ranging from 21 percent at SCC to 63 percent at ACC. Finally, across the consortium, the majority of participants who completed credentials enrolled full-time upon initial entry into the grant-funded program: 53 percent consortium-wide, ranging from 37 percent at ACC to 94 percent at BC. Patterns for program completers (that is, participants completing

[11] We focus on program and credential completion because they are critical outcomes for TAACCCT participants and because the available data on these outcomes are comprehensive and complete. Although employment outcomes are also important, data are available only through the end of the study period, leaving us with a very short period to observe post-completion outcomes.

industry certification preparation courses, as well as certificates and degrees) were similar but less pronounced (Appendix Table C.III.1).

Figure III.1. Selected characteristics of participants who completed credentials, by college and overall



Source: College administrative data.

Note: Figure shows percentage of participants who completed a credential with the indicated characteristic, by college and overall. The total number of credential completers at each college was as follows: ACC: 214; BC: 64, and SCC: 492.

CBE programs may help level the playing field for some nontraditional students, but other predictors of program and credential completion varied

The descriptive data presented in Figure III.1 and Appendix Tables C.III.1 and C.III.2 describe some characteristics of program- and credential-completing participants but do not shed much light on the relationships between those factors and completion. To examine such relationships, we assessed bivariate correlations between our completion outcomes and key participant characteristics measured at baseline (that is, at the time of initial program enrollment), including those in Figure III.1 and others of potential interest to policymakers and practitioners:

- Age
- Gender
- Race/ethnicity
- English language learner (ELL) status
- Pell eligibility

- Expected family contribution
- High school GPA
- Took developmental English or writing course
- Took developmental mathematics course
- Full- or part-time student status
- Incumbent worker status
- Veteran status
- TAA eligibility[12]

We conducted the analysis separately for each college and by pooling participants from all three colleges.[13] In the pooled analysis, we also included college indicators as covariates in the regression. Appendix Table C.III.7 presents the full results of the analysis.

We found few clear, systematic associations between participant characteristics and program or credential completion in the bivariate analyses. Age was positively and significantly related to program completion at BC and to credential completion at ACC, SCC, and in the pooled analysis. Being enrolled full time at program entry was positively and significantly related to program and credential completion at all colleges (Table III.1). Other relationships were less consistent. For example, female students were less likely than male students to complete programs at SCC and in the pooled analysis, but gender was not a significant predictor of credential completion. In addition, compared to nonwhite students, white students were more likely to complete programs and credentials in the pooled analyses, but this variable was not a significant predictor in the college-specific analyses. Prior postsecondary experience was negatively and significantly related to program and credential completion at ACC, but positively and significantly related to these outcomes at SCC and in the pooled analysis. Finally, incumbent workers were less likely to complete at ACC, but not at the other colleges.

We also conducted college-specific and pooled multivariate analyses to assess the associations between each characteristic and the outcome, holding all other characteristics constant. (Such a multivariate analysis is appropriate when baseline characteristics are correlated as they are here; see Appendix Tables C.III.3 through C.III.6.) In the multivariate analysis, we regressed the program or credential completion indicator on all baseline characteristics which showed at least one significant bivariate correlation (that is, we excluded English language learner status and veteran status from the multivariate regression).

[12] Not available for BC.

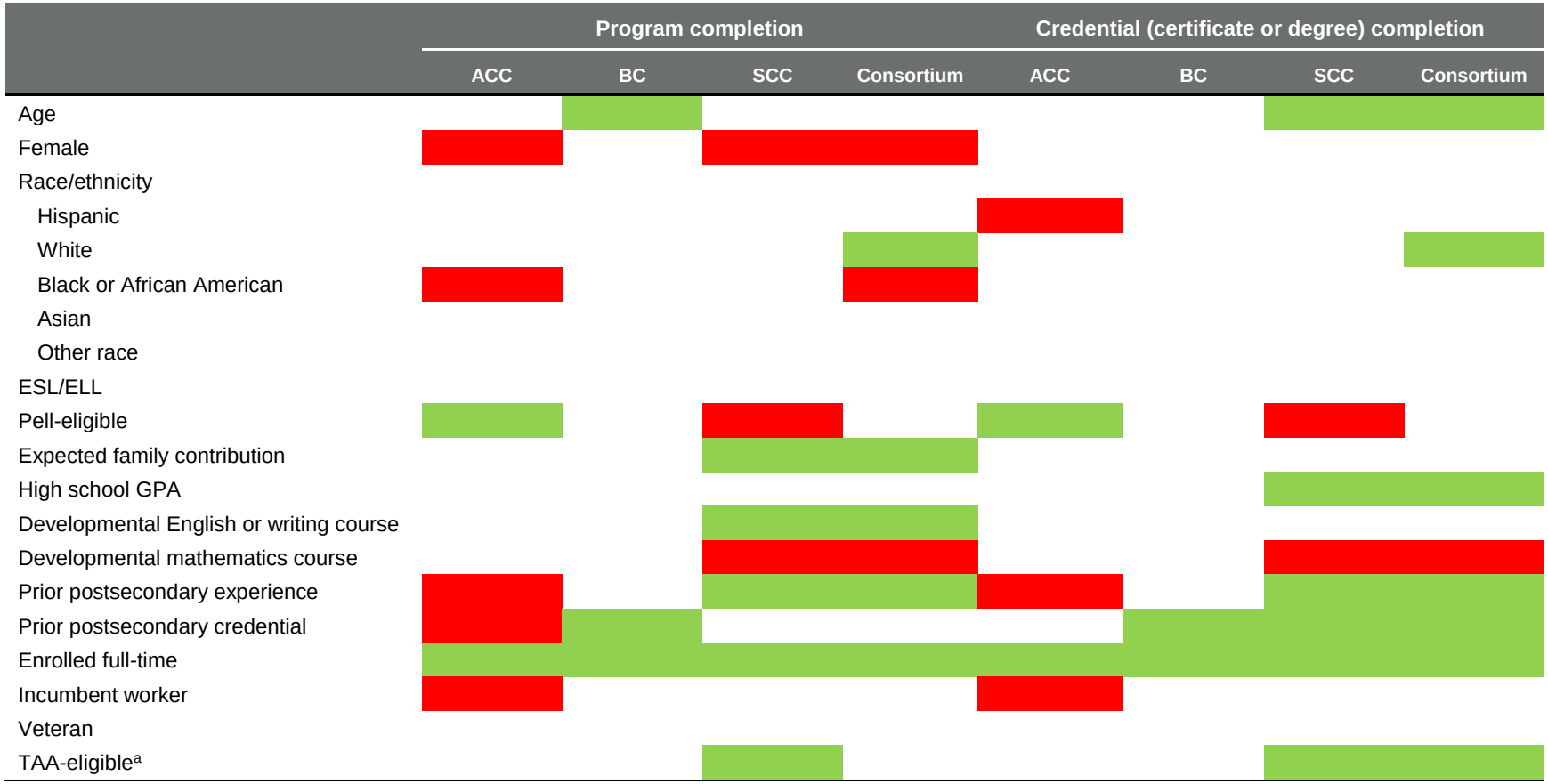
[13] It is important to keep in mind that statistical significance is related to sample size: the larger the sample size, the more likely a statistic is to be significantly different from zero, all else equal. Differences in statistical significance between results for SCC and those for other colleges may reflect the much larger sample size at SCC. In addition, in the pooled analysis, SCC makes up approximately three-fourths of the sample, so it is unsurprising that consortium-wide results are similar to SCC results.

In the multivariate analyses, age and full-time student status continued to be positively and significantly related to program and credential completion; incumbent worker status was not significantly associated with program or credential completion in any of the multivariate analyses (Table III.2; Appendix Table C.III.8 contains full results of the analysis). Other results were less consistent across colleges and outcomes. For example, women were less likely than men to complete programs at ACC, SCC, and in the pooled analysis; but they were no less likely than men to complete credentials. In addition, Hispanic students were less likely to complete programs and credentials at ACC than non-Hispanic students, and black students were less likely to complete programs than white students in the pooled analysis. Prior postsecondary experience was positively and significantly related to program and credential completion at SCC and in the pooled analysis but not a significant predictor of these outcomes at ACC or BC.

The inconsistency of our findings for many participant characteristics suggests that the predictors of program and credential completion in largely online CBE programs may vary depending on institutional and other factors. This conclusion is in line with findings on student success in online courses and programs more generally, which have failed to demonstrate strong, consistent trends across different states and institutional contexts (Hart 2012).

On the other hand, the CBE programs implemented at the consortium colleges may help level the playing field for some nontraditional students who tend to lag in national studies of completion (Choy 2002). In particular, older students appear more likely to complete CBE programs than their younger counterparts and incumbent workers fared no worse than students who were not working.

Table III.1. Factors influencing completion outcomes for participants, bivariate analyses, by college and overall



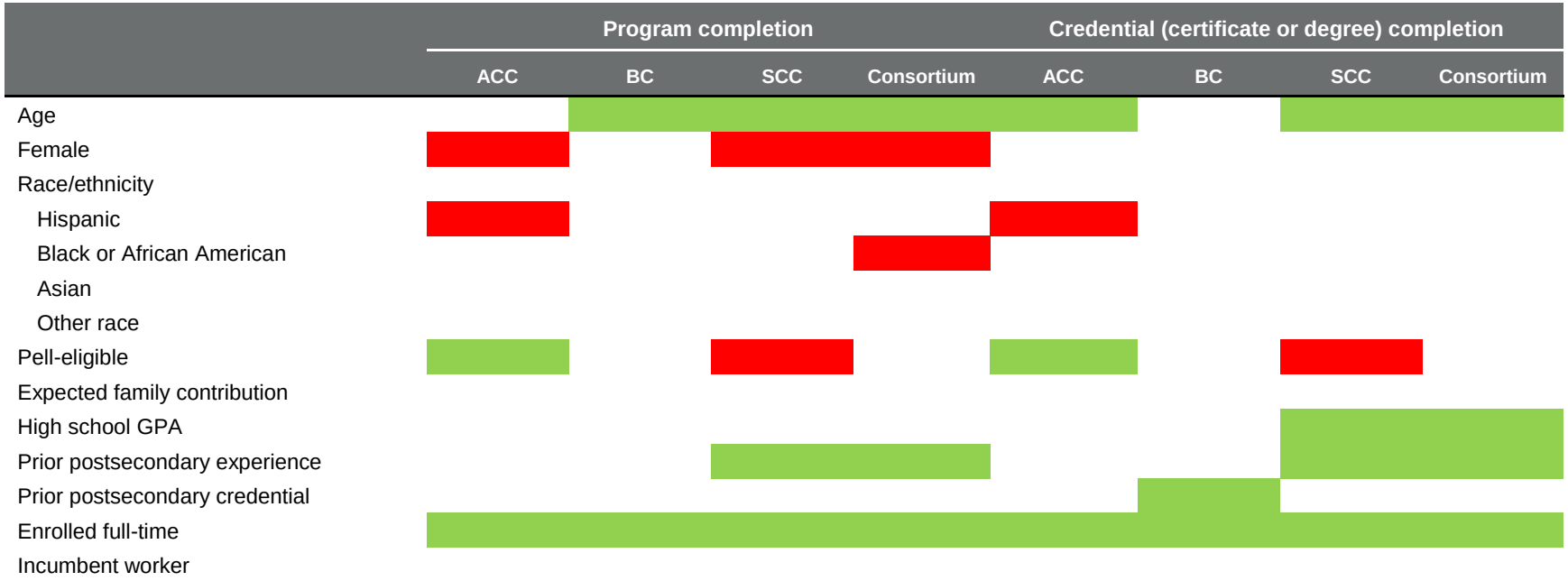
Source: College administrative and state wage record data.

Note: Green cells indicate bivariate correlations that were positive and significant. Red cells indicate bivariate correlations that were negative and significant.

[a] Not available for BC.

ESL = English as a second language; ELL = English language learner; GPA = grade point average; TAA = Trade Adjustment Assistance.

Table III.2. Factors influencing completion outcomes for participants, multivariate analyses, by college and overall



Source: College administrative and state wage record data.

Note: Green cells indicate bivariate correlations that were positive and significant. Red cells indicate bivariate correlations that were negative and significant. "White" is the omitted race category (since the race categories are mutually exclusive). Regression models excluded the developmental coursetaking variables because of insufficient variation (that is, low prevalence on these measures). They also excluded the TAA-eligibility variable because of insufficient variation at ACC and SCC and because this variable was not available for BC.

[a] Not available for BC.

ESL = English as a second language; ELL = English language learner; GPA = grade point average; TAA = Trade Adjustment Assistance.

B. Gatekeeper courses and credential completion

Program leaders at each college identified several courses as foundational or gatekeeper courses—that is, courses they viewed as necessary for or as strong predictors of future success, even though they were not necessarily prerequisites for other courses. Table III.2 lists these courses, provides a brief description of each, and reports the number of participants who attempted and completed each course. Completion rates varied, but in most cases, at least half of participants who attempted each course completed it.

Table III.3. Completion of gatekeeper courses

Course	Course description	Number of participants who attempted course	Number of participants who completed course	Percentage of participants who completed course
ACC				
COSC 1336, Programming Fundamentals I	Introduces the fundamental concepts of structured programming. Topics include software development methodology, data types, control structures, functions, arrays, and the mechanics of running, testing, and debugging.	505	347	68.7
BC				
CIS1000c Introduction to Computer Science	This course is designed to provide students with a broad perspective of the field of Computer Science, from core issues and concepts inherent to the discipline of computing, to the various sub-disciplines of computer science. Topics include: Number Systems and Data Representation; Computer Components and Architecture including Gates and Circuits; Problem Solving and Systems Development Methodologies; Low-Level and High-Level Programming Languages; Abstract Data Representations and Algorithms; Operating Systems, File Systems and Directories; Information Systems; Artificial Intelligence; Simulation, Graphics, and Other Applications; Networks and The World Wide Web.	121	60	49.6
CET2742c Advanced Networking	This course is for support professionals who are new to networking services and will be responsible for installing, configuring, managing, and supporting a network infrastructure that uses various networking services. It also provides students with the prerequisite knowledge and skills required for implementing and administering directory services such as Microsoft Active Directory.	25	7	28.0
SCC				
BIS 1120, Introduction to Software Applications	Use word processing, spreadsheet, database and presentation software applications to create reports, spreadsheets, databases and presentations for business and other applications.	2,209	1,565	70.8

Course	Course description	Number of participants who attempted course	Number of participants who completed course	Percentage of participants who completed course
CIS 1107, Introduction to Operating Systems	Introduction to operating systems and their concepts. Both the command line interface, with commonly used instructions, and a graphical interface will be used to manage and administer the current Microsoft Windows and Linux operating systems.	1,809	1,299	71.8
CIS 1111, Introduction to Problem Solving & Computer Programming	Introduction to problem solving techniques used in programming. Students learn to use tools such as flowcharts and pseudocode to plan solutions. Using current programming languages, students will design, code and test programs using the basic structures of sequence, selection, iteration, functions and one dimensional arrays.	1,120	755	67.4
CIS 1130, Network Fundamentals	Introduction to computer networking. Topics include network standards and the Open Source Interconnection (OSI) model, topologies and Ethernet standards, network hardware, remote connectivity, wireless networking, in-depth TCP/IP, network security, network troubleshooting and network management.	1,152	891	77.3

Source: College administrative data; college course catalogs.

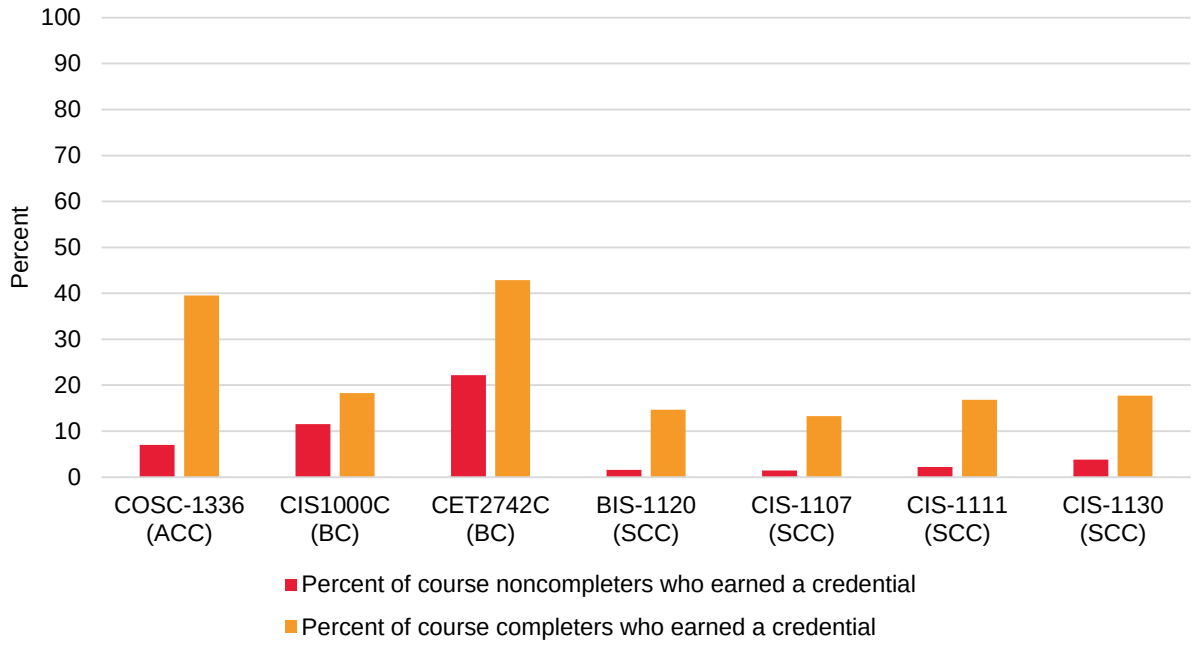
Note: The total number of participants at each college follows: ACC: 814; BC: 509; and SCC: 4,233.

COSC = computer science; CIS = computer information systems; CET = computer engineering technology; BIS = business information systems.

Credential completion rates were higher for participants who completed gatekeeper courses compared to participants who took but did not complete such courses

To explore whether gatekeeper course completion predicted educational success, we examined whether credential completion rates were higher for participants who completed gatekeeper courses as compared to those who attempted but did not complete the courses. The pattern across the three colleges is clear: credential completion rates were higher for participants who completed gatekeeper courses (Figure III.2).

Figure III.2. Gatekeeper course completion and credential completion



Source: College administrative data.

Note: Figure shows credential completion rates by course completion status. The differences between credential completion rates for gatekeeper course completers versus noncompleters were statistically significantly different from zero at ACC and SC, but not at BC. Table III.3 reports the number of participants who attempted and completed each gatekeeper course.

COSC = computer science; CIS = computer information systems; CET = computer engineering technology; BIS = business information systems.

C. Course modality, student supports, and credential completion

SCC designated different participant groups depending on both the course modality and level of supports to which participants were exposed. This resulted, in part, from the CIS department faculty decision to adopt the grant-funded CBE curriculum for other modalities, including traditional instructor-led online, hybrid, and web-enhanced face-to-face courses (Person et al. 2015). Table III.4 describes SCC's so-called treatment groups or "T groups." The T1 group experienced self-directed, flexibly-paced online courses and was eligible for special case management from academic and career coaches—the package of CBE program components developed under the TAACCCT grant. The T2 group was eligible for more limited academic coaching and took instructor-led, traditionally paced online courses. The T3 group was not eligible for grant-funded academic coaching and took instructor-led, face-to-face sections of the same or similar IT courses. These three groups provide a basis to compare different elements of the CBE model.

The remaining T groups were much smaller. The T4 group took flex-paced hybrid courses, combining online and face-to-face elements. The T6 group took a flex-paced online course and had access to less intensive academic support. Finally, the T7 group took a multiple-modality

course and was eligible for some academic coaching. In the analyses that follow, we combine these last three groups (T4, T6, and T7).[14]

SCC placed students into T groups based on knowledge gained through the intake process, leading to differences in student characteristics between groups. The grant-funded CBE program intake process consisted of screening assessments, admissions interviews, and early academic coaching to determine the best path for the student and help develop a plan for completing it (Person et al. 2015). We examined key baseline characteristics of each T group (Appendix Table C.III.12) and found, perhaps unsurprisingly, that students differed across groups: T1s were better prepared academically than T2s or T3s. In particular, they had significantly higher high school GPAs and significantly higher proportions of the T1 group had prior postsecondary experience and credentials (Figure III.3).

Participants with access to fully online, flexibly paced CBE courses and the most enhanced academic coaching achieved higher program and credential completion rates

SCC's T groups offer a unique opportunity to examine the relationships among course modality, student supports, and educational outcomes. Of the three largest T groups, T1s included the highest proportion of program and credential completers: 49 percent completed a program; 22 percent completed a credential, compared to 23 and 9 percent for T2s and 36 and 13 percent for T3s (Table III.4), implying that the full CBE model leads to greater academic success. However, because differences in credential completion rates could reflect underlying student differences rather than effectiveness of aspects of the CBE model, we conducted multivariate analyses to examine the issue.

Table III.4. Sinclair Community College participant "T" groups

T group	Course modality	Student supports	Number of students	Percent completing program	Percent completing credential
T1	Self-paced online	Eligible for special case management from an academic coach	409	48.7	21.5
T2	Traditional online	Eligible for special case management from an academic coach	2,042	22.7*	9.1*
T3	Face-to-face	Not eligible for special case management from an academic coach	1,699	35.6*	12.5*
T4, T6, T7	Self-paced hybrid course, self-paced online course, or multiple-modality course	Eligible for less intensive academic support	83	36.1*	7.2*

Source: College administrative data, college data dictionary.

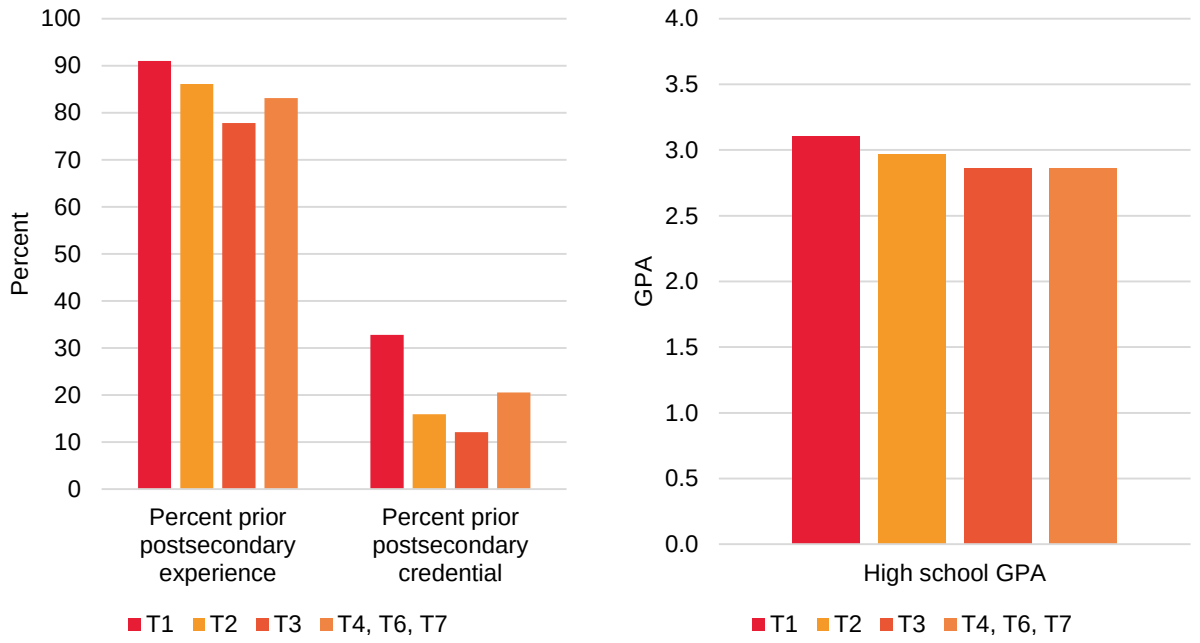
Note: Table shows the number of students within each SCC participant "T" group and the percentage within each group completing a program and a credential (that is, a degree or certificate). T5s and T8s were considered nonparticipants and are discussed in Chapter IV.

* Significantly different from the T1 group at the 0.05 level, two-tailed test.

[14] SCC considered the T5 and T8 groups nonparticipants (see Chapter IV). T5s had declared a major in a grant-funded program but did not take any grant-funded courses and were not eligible for special case management from an academic coach. T8s took no grant-funded courses and were not eligible for academic coaching.

Even after controlling for these differences, however, T1s had significantly higher program and credential completion rates than the other groups. When we include key baseline characteristics in multivariate regressions of program and credential completion on T group indicators, we find that the differences in credential completion rates between T1s and other groups remain statistically significant (Appendix Table C.III.13).

Figure III.3. Baseline characteristics of T groups, Sinclair Community College



Source: College administrative data.

Note: The first panel of the figure shows the percentage of participants in SCC's T groups with prior postsecondary experience and with prior postsecondary credentials. The second panel shows the average high school GPA for each T group. Table III.4 reports the total number of participants in each T group. T1s are statistically significantly different from T2s, T3s, and the combined T4, T6, and T7 group in all cases shown.

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IV. COMPARING OUTCOMES OF PARTICIPANTS AND NONPARTICIPANTS

As part of the TAACCCT grant requirements, DOL directed grantees to use the most rigorous quantitative evaluation design appropriate for each grantee's particular combination of institutional capacity building and participant training activities (DOL 2012). Although the consortium served considerable numbers of participants over the program period, grant leaders focused a great deal of their efforts on program development and capacity building at the participating colleges, such that program components continued to evolve well into the final year of the grant-funded program period (Person et. al 2014, 2015). As such, an experimental evaluation design would not have been appropriate. Nevertheless, to support the rigor of the evaluation, each college provided data on a potential comparison group comprising students enrolled in traditional (that is, non-CBE) courses and programs of study similar to the TAACCCT-funded CBE programs.

In this chapter, we describe results of analyses comparing educational outcomes of TAACCCT-funded CBE program participants and similar nonparticipants to answer our fourth research question: *How do TAACCCT participants' outcomes compare to those of nonparticipants?* We focus on credential completion because it is important in the contexts of postsecondary education and employment and was a primary goal of the grant.[15] We also examine completion of gatekeeper courses as a proximal outcome for two reasons: (1) the study period spanned only 2.5 years, giving us a short period within which to measure certificate and degree completion; and (2) our analysis of outcomes for participants in Chapter III provided evidence that gatekeeper course completion predicted credential completion.

A. Modeling the relationship between CBE program participation and education outcomes

Examination of the full pool of potential comparison group members showed that participants and nonparticipants varied substantially on key baseline characteristics (Appendix Table C.IV.1). In particular, participants were older than nonparticipants, and much higher percentages had prior postsecondary experience and credentials. These differences are likely the result of the colleges' intensive intake processes, which explicitly sought to place students on the optimal path to success. Specifically, students who were deemed unready (academically or otherwise) for the independent nature of the CBE programs were directed by program intake staff to other offerings within the department or college (Person et al. 2015).

The substantial differences observed between participant and comparison groups threaten the credibility of estimates of the relationship between TAACCCT-funded CBE program participation and educational outcomes. To bolster the credibility of the comparison, we used several methods to account for the differences between participants and nonparticipants. However, these methods can account only for observable differences between groups—that is, the differences we can measure using variables available in the data and applied in our estimation models.

[15] Employment and earnings are other important outcomes, but we lack data on these outcomes for nonparticipants.

First, we examined the percentages of participants and comparison students who completed (1) a gatekeeper course and (2) a credential (degree or certificate) and calculated the unadjusted mean difference in completion rates between the two groups for each college and for the consortium as a whole (analysis 1).

Next, we calculated adjusted mean differences, which represent estimates of the mean difference in completion rates between the participant and comparison groups after adjusting for the following key baseline characteristics (analysis 2):

- Age
- Gender
- Race/ethnicity
- ELL status
- Pell eligibility
- Expected family contribution
- High school GPA[16]
- Took developmental English, writing, or mathematics course
- Full- or part-time student status
- Veteran status
- TAA eligibility[17]

Finally, we used a propensity score matching method that involved selecting one or more comparison students who were similar to each participant in terms of the baseline characteristics listed above (analysis 3). Using the matched groups, we then estimated the relationship between program participation and outcomes. This procedure supports a closer "apples to apples" comparison by comparing only those individuals who are similar on the observed characteristics.

B. Comparing outcomes for participants and nonparticipants

Gatekeeper course completion rates were slightly lower for participants than for comparison students

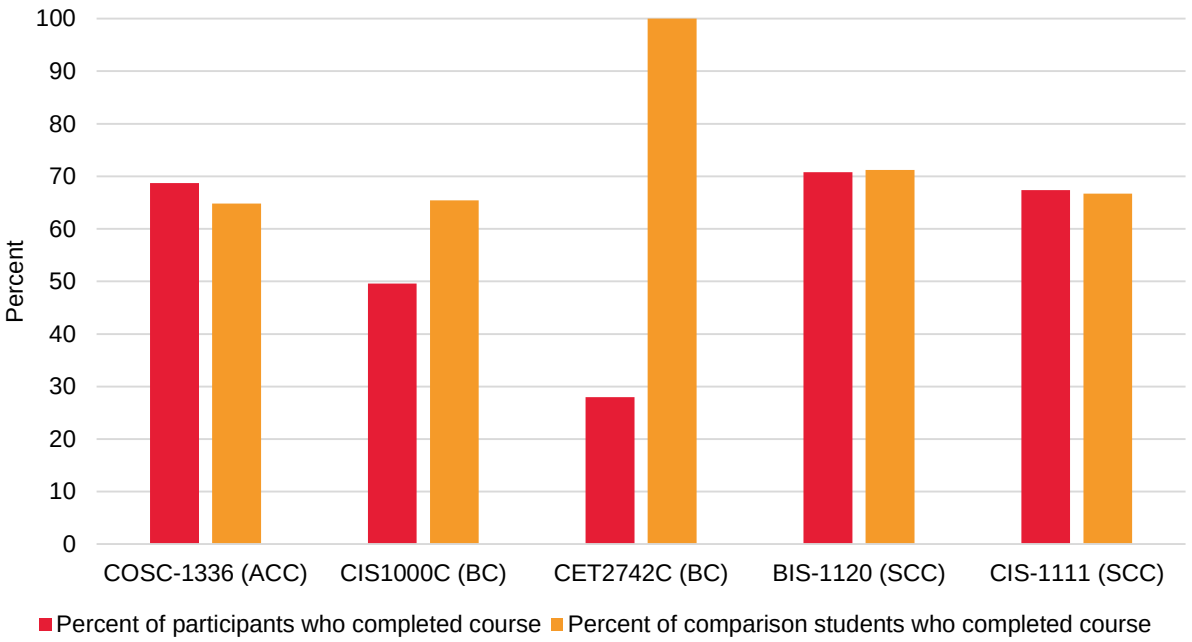
The colleges offered versions of many of the gatekeeper courses discussed in Chapter III to comparison students that were not funded by the TAACCCT grant, enabling us to examine gatekeeper course completion rates for participants and comparison students. Gatekeeper course completion rates varied by course (Figure IV.1). At ACC, similar percentages of participants and comparison students completed COSC-1336 (Programming Fundamentals). At BC, lower percentages of participants completed CIS 1000c (Introduction to Computer Science) and CET 2742c (Advanced Networking). Finally, at SCC, participants and comparison students had

[16] Not available for comparison students at ACC.

[17] Not available for BC or for comparison students at ACC.

similar completion rates for BIS 1120 (Introduction to Software Applications) and CIS 1111 (Introduction to Problem Solving and Computer Programming).

Figure IV.1. Gatekeeper course completion for participants and comparison students, by college and overall



Source: College administrative data.

Note: Figure shows percentages of participants and comparison students who completed each gatekeeper course. Appendix Table C.IV.2 reports the number of participants and comparison students who attempted and completed each gatekeeper course.

In general, we found that gatekeeper course completion rates were slightly lower for participants than for comparison students. Table IV.1 reports differences between gatekeeper course completion rates from the three analyses detailed above: (1) differences in unadjusted rates; (2) differences in rates adjusted for the baseline variables; and (3) differences in rates for the matched sample of participants and comparison students (Appendix Tables C.IV.3 and C.IV.5 present full results).[18] After adjusting for the key baseline characteristics listed previously, we found that the gatekeeper course completion rate for ACC was lower for participants than for comparison students but that the difference was not statistically significant; in addition, the rates were not significantly different in the matched comparison group analysis. At BC, though the rates differed depending on estimation method, they were not significantly different in the matched comparison group analysis. At SCC, and consortium-wide, the rates significantly lower for participants, but these differences were small.

[18] For BC and SCC, which each identified two gatekeeper courses offered to both participants and comparison students, a student who completed either gatekeeper course was considered a gatekeeper course completer.

Table IV.1. Adjusted and unadjusted differences between gatekeeper course completion rates for participants and comparison students, by college and overall

Mean differences	ACC	BC	SCC	Consortium
Unmatched samples				
Analysis 1 (unadjusted)[a]	3.9	-27.7*	-4.5*	-3.4*
Analysis 2 (adjusted)[a]	-2.8-	-23.8*	-6.3*	-7.0*
Matched samples				
Analysis 3[b]	-7.3	-13.1	-3.4*	-4.6*

Source: College administrative data.

Note: Table presents differences between gatekeeper course completion rates for participants and comparison students from three analyses. Tables C.IV.3 and C.IV.5 present full regression results.

[a] These analyses used imputed data.

[b] This analysis used propensity score matching, in which each participant was matched to one or more similar comparison students.

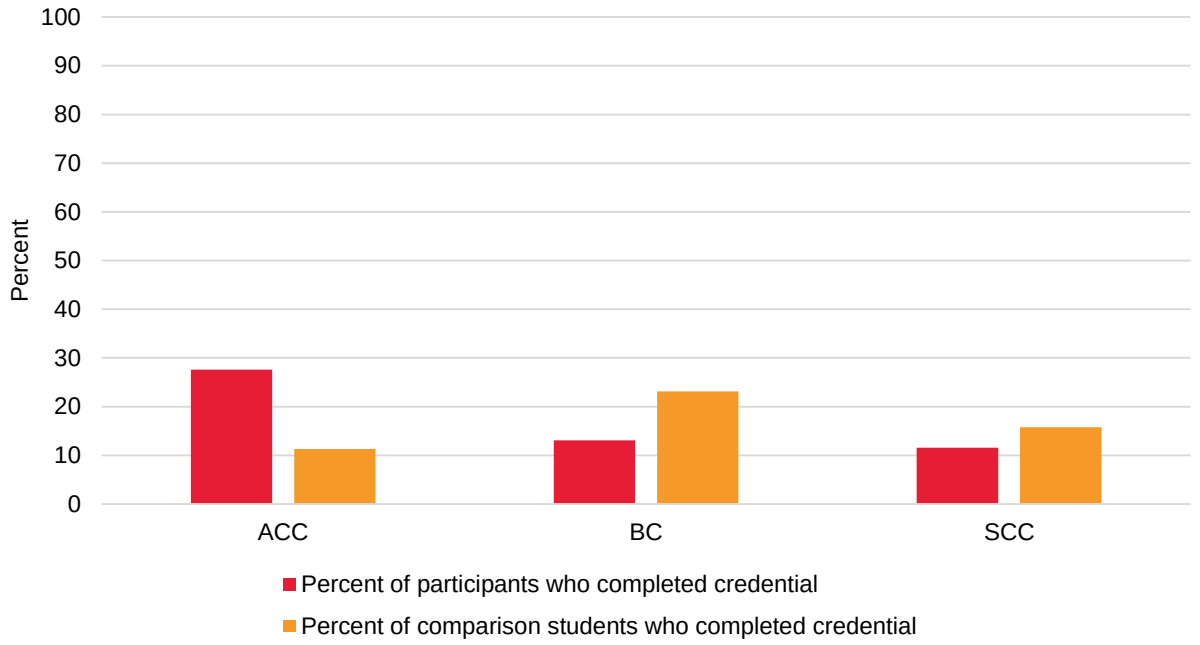
* Significantly different from zero at the 0.05 level, two-tailed test.

Differences in participants' and nonparticipants' credential completion rates varied by college and may reflect unobservable differences between the groups

To compare credential completion rates for participants and nonparticipants, we conducted analyses similar to those with gatekeeper course completion as the outcome of interest; that is, we calculated (1) differences in unadjusted completion rates; (2) differences in rates adjusted for the baseline variables listed previously; and (3) differences in rates for the matched sample of participants and comparison students.

At ACC, the unadjusted credential completion rate from analysis (1) was significantly higher for participants than for comparison students. At BC and SCC, the unadjusted credential completion rates were significantly lower for participants than for comparison students (Figure IV.2; Table IV.2; Appendix Tables C.IV.4 and C.IV.5 present full results).

Figure IV.2. Credential completion for participants and comparison students, by college and overall



Source: College administrative data.

Note: Figure shows percentages of participants and comparison students who completed a credential (certificate or degree). The total number of participants and comparison students at each college follows: ACC: 814 participants, 7,548 comparison students; BC: 509 participants, 186 comparison students; and SCC: 4,233 participants, 5,975 comparison students.

Results from analyses (2) and (3) were also inconsistent across the colleges. At ACC, credential completion rates were significantly higher for participants than for comparison students in the unmatched and matched samples (Table IV.2). At BC, the adjusted difference from analysis (2) was negative—program participants tended to have lower completion rates than nonparticipants, as in analysis (1)—but this difference was not significant. However, in the matched comparison group analysis (3) for BC, participants had a significantly higher credential completion rate than comparison students. At SCC, the difference was negative and significant in analyses (2) and (3), but the magnitude of the difference was relatively small.

Furthermore, our estimates of the difference in credential completion rates of participants and nonparticipants were not robust to different model specifications—that is, the estimates change from one analytic model to the next. Consortium-wide, the differences between credential completion rates of the participant and nonparticipant groups were small (Table IV.2). The sign and significance level of the difference varied by model: it was slightly above but not significantly different from zero in analysis (1), and negative and significantly different from zero in analyses (2) and (3).

An important limitation of this analysis is the small number of variables that could be measured prior to enrollment for both participant and nonparticipant groups. The variables included here explain very little of the variation in the outcome measure—less than 8 percent

consortium-wide.[19] This low coefficient of variation, coupled with the inconsistency of the results in Table IV.2, suggest that the differences in credential completion rates may reflect unobserved differences between participants and nonparticipants.

Table IV.2. Adjusted and unadjusted differences between credential completion rates for participants and comparison students, by college and overall

Mean differences	ACC	BC	SCC	Consortium
Unmatched samples				
Analysis 1 (unadjusted)[a]	16.3*	-10.1*	-4.2*	0.2
Analysis 2 (adjusted)[a]	10.8*	-14.4*	-6.0*	-3.0*
Matched samples				
Analysis 3[b]	22.3*	7.6*	-5.4*	-2.6**

Source: College administrative data.

Note: Table contains differences between credential completion rates for participants and comparison students from three analyses. Tables C.IV.4 and C.IV.5 present full regression results.

[a] These analyses used imputed data.

[b] This analysis used propensity score matching, in which each participant was matched to one or more similar comparison students.

* Significantly different from zero at the 0.05 level, two-tailed test.

[19] This statistic came from regressions using non-imputed data (not reported).

V. DISCUSSION AND OVERARCHING LESSONS

In this chapter, we summarize our key findings for each research question:

1. What are the cumulative education and employment outcomes of TAACCCT participants?
2. What factors are associated with TAACCCT participants' education outcomes?
3. Do education outcomes differ for participants exposed to different course modalities or different levels of student support?
4. How do TAACCCT participants' education outcomes compare to those of nonparticipants?

We briefly discuss how the findings relate to features of program implementation at the consortium colleges and highlight lessons for the field from the consortium's experience with grant-funded CBE programs. In addition to the consortium's implementation achievements documented in earlier evaluation studies (Person et al. 2014, 2015), analysis of participants' education and employment outcomes further demonstrates that these programs were successful in some areas, but much remains to be learned.

TAACCCT participants achieved positive education and employment outcomes

Together, the consortium colleges exceeded most of their outcome targets and, although they did not meet their ambitious credential completion target, the observed completion results compare favorably to national trends among community college students. A substantial proportion of participants (35 percent) completed grant-funded CBE programs within the approximately 2.5-year period from program launch in fall 2013 through the end of the spring 2016 term. Programs included industry certification preparatory courses, college certificate programs, and associate's degree programs; however, industry certifications were not tracked by the evaluation, as such credentials are issued by industry groups whose data were not available for the study.[20] Regardless of when they first entered the CBE program, about 14 percent of participants completed a certificate or associate's degree. Of the participants who entered CBE programs in the first half of the study period, approximately 21 percent completed a certificate or degree. This completion rate is in line with completion rates nationwide, which stand at about 20 percent for first-time, full-time students completing within 150 percent of expected time to credential (AACC 2016), and it compares favorably with completion at the participating colleges, where the same rates range from about 6 to 17 percent (IPEDS 2016).

These figures may be especially remarkable given that large proportions of CBE program participants were working and/or enrolling in the programs less than full-time. Indeed, examination of participants' baseline characteristics showed that CBE program participants were in many ways similar to community college students nationwide but more likely to be incumbent workers. Specifically, 67 percent of all participants were incumbent workers at the time of their initial enrollment in the program—compared to 45 percent nationwide—and employment rates remained high throughout the study period.

[20] Given the number of students completing industry certification preparatory courses, it is reasonable to assume that credential completion rates would be higher if industry certification data were available for analysis.

Wages for employed participants tended to increase after program enrollment although, as noted in Chapter II, the nonexperimental evaluation design does not allow us to attribute the observed increases directly to the program. Nevertheless, these findings are consistent with the hypothesis that CBE programs support incumbent workers' job success, given the programs' explicit emphasis on the employment relevance of program content and flexibility of program structure. The findings suggest that the colleges' CBE models can offer a feasible path to credential completion and potential career advancement for individuals who need to keep working while seeking a college education.

CBE programs may help level the playing field for some nontraditional students, but other predictors of program and credential completion varied

Most completers had prior postsecondary experience, and a substantial proportion had completed a prior postsecondary credential. In addition, most were older than 25, and many were enrolled full-time at CBE program entry. These findings align with program leaders' emphasis on the importance of maturity, academic preparation, and motivation for success in CBE programs; indeed, program intake procedures were designed to ensure that program participants had such characteristics (Person et al. 2015).

When we investigated relationships between participant characteristics and education outcomes, we found few clear, systematic associations between these characteristics and program or credential completion. Although nontraditional students tend to lag in national studies of completion (Choy 2002), older students tended to have higher CBE program and credential completion rates, while incumbent workers fared no worse than their counterparts who were not working. In addition, full-time students appeared to fare better than students enrolled part-time, though this finding could be due to factors other than baseline enrollment status. The inconsistency of our findings for other participant characteristics suggests that the predictors of program and credential completion in largely online CBE programs may vary depending on institutional and other factors. This conclusion is in line with findings on student success in online courses and programs more generally, which have failed to demonstrate strong, consistent trends across different states and institutional contexts (Hart 2012).

Our examination of CBE gatekeeper courses showed generally, but not universally, high rates of course completion. Gatekeeper courses are considered important student success milestones and may be an obstacle to credential completion (Goldrick Rab 2010; Offenstein and Shulock 2010). At all colleges, credential completion rates were higher for participants who completed gatekeeper courses than for their counterparts who attempted but did not complete the courses. This finding bolsters the case for examining gatekeeper course completion as a leading indicator of later credential completion.

Participants with access to fully online, flexibly paced CBE courses and the most enhanced academic coaching achieved higher program and credential completion rates

Course modality and the nature of student supports are issues that any college must consider in developing CBE programs. Most CBE courses were offered fully online, but the consortium colleges grappled with how best to structure student supports and tried several approaches during the course of the grant (Person et al. 2015). SCC took a distinctive approach, offering several combinations of course modality and supports to each of several participant groups. This

approach provided an opportunity to examine the relationship between different program components and participants' outcomes.

Multivariate analysis showed that the group with access to the fully online, flexibly paced CBE courses and the most enhanced academic coaching had the highest rate of program and credential completion. These findings are in line with qualitative findings from the implementation analysis where participant interviews suggested that students had generally positive opinions of the services offered as part of the CBE programs (Person et al. 2015). It is important to note, however, that the present analysis did not account for the extent to which students actually participated in the particular modality or took up corresponding supports.

Analyses of participant and comparison student gatekeeper course and credential completion rates yielded mixed findings

Across the consortium, we found that gatekeeper course completion rates were slightly lower for participants than for comparison students. In contrast, our comparison of CBE program participants' credential completion outcomes with those of comparison students yielded inconsistent findings across colleges. At ACC, participants were, on average, significantly more likely than comparison students to complete a credential. This finding was robust to different analysis methods. In contrast, at BC and SCC, results varied by analysis method and do not suggest a strong relationship between grant-funded program participation and credential completion.

Study limitations and directions for future research

The findings give rise to several issues that merit consideration, especially with respect to limitations of the evaluation. In particular, analyses were limited to available data and the statistical models for the comparison group analyses explained very little (less than 10 percent) of the variation in outcomes between participants and comparison group members. Put differently, the available data could not account what factors might be driving students' outcomes. Rather, differences in credential completion rates might reflect unmeasured differences between participants and nonparticipants. Such unmeasured differences are especially likely given the intensive intake process the colleges used to select CBE program participants. In this context, it is difficult to find comparable nonparticipants and conduct a true "apples to apples" comparison.

On the other hand, even though the evaluation cannot address whether students enrolling in the CBE programs would have done better or worse had they instead enrolled in the colleges' traditional IT programs, it is possible that many program participants would not have enrolled at all had the CBE programs not been available. This assertion is warranted in light of the large proportions of participants who worked while studying and who chose to enroll part-time in the programs. Moreover, students interviewed for the implementation study repeatedly emphasized the appeal of the CBE programs' flexibility, which allowed them to balance college with work and family obligations in a way that traditional programs—even traditional online programs—did not (Person et al. 2015).

The findings presented in this report are mixed, but they do suggest potential benefits of CBE programs, at least for some students. Further research, especially on mature CBE programs,

is needed to promote deeper understanding. In particular, experimental evaluation is required for a credible estimation of the impacts of CBE programs on participants' outcomes. It would be especially helpful if such research could follow subjects for a longer period of time, given the present evaluation period allowed, at most, 2.5 years for observation of two-year degree completion. Moreover, a longer evaluation period would help to determine whether CBE approaches support job success and career advancement as their proponents maintain they should and as our analyses of participants' employment outcomes suggest. Descriptive research could also shed more light on the particular support services that might best be combined with self-directed, flexibly paced CBE curricular models. Finally, with CBE sometimes touted as a way for both students and postsecondary education systems to save money, future research should address the cost-effectiveness of CBE programs.

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APPENDIX A

COLLEGE CBE MODELS

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Figure A.1. Austin Community College: Accelerated Programmer Training competency-based model

- APT is housed in the computer studies (CS) department. Offers CBE programs leading to seven certificates (design coder, web developer, Java, C++, database, user support, and software testing) and two Marketable Skills Awards (networking and programming). Additional courses prepare students to sit for industry certification exams (A+, Net+, and Security). With general education courses, CBE courses can be stacked into five associate of applied science degrees (computer programming, programming with web specialization, programming with user support specialization, IT with user support specialization, and IT with applications specialization).
- Additional CBE programming includes a visual communications certificate program; Capital Academy, a program aimed at high school students, which combines CBE and emporium approaches; Career Expressway, a program for individuals with some college who are under- or unemployed; and Women in IT, which uses 12 confidence-building modules to support women seeking to enter IT and earn ACC credentials in the field.

INDUSTRY AND WORKFORCE RELATIONSHIPS

- **Employers.** Extensive network of local industry partners expanded under grant; provide input on curriculum development, recruitment, and transition support.
- **Other partners.** Partnership with state workforce agency to offer career development workshops. Collaboration with Austin Chamber of Commerce to host recruiting events. Partnership with local nonprofit Capital IDEA to offer Career Expressway.

CURRICULUM DEVELOPMENT

Development and mapping of competencies
- Industry experts and chamber of commerce provide input on skill needs.
- Instructional designer (ID) and instructors translate learning objectives from traditional courses into competencies and map these to course materials and assessments.

Development and packaging of programs and courses
- ID and instructors develop learning resources and online course materials based on competencies; process guided by CBE course design guidelines developed by ID.
- Courses reviewed with rubric by small group of faculty, department chair, and program director; industry partners have opportunity to review courses.
- As of spring 2016, 41 CS courses were revamped for CBE. Four CS certificates and one visual communications certificate offered in entirely CBE formats.

Assessment development
- Instructors develop assessments for the courses they teach.
- Adapt existing assessments and questions from certification exams, create new items aligned with competencies.

Accreditation and articulation
- CBE programs accredited through the college's accreditation; did not require additional approval because they are course-based and not substantially different from existing programs.
- Articulation does not differ from traditional CS courses or programs; developing articulation agreement with WGU.

Key staff
- Instructional designer
- CS faculty and adjuncts who teach CBE courses
- CS department chair

CURRICULUM DELIVERY

Scheduling and staffing
- Staffing determined by CS department chair.
- Most instructors are full-time faculty; some long-term adjuncts.
- CBE instructors also teach traditional CS courses.
- Combine multiple CBE sections to meet faculty load requirements using existing load formula.

Registration policies and procedures
- CBE courses offered in 16-, 12-, and 8-week sessions.
- Students enroll at only those time points.
- Course catalog includes traditional and CBE sections for the same courses. CBE sections are restricted to accepted program participants.

Course delivery
- Courses offered through CS department.
- All courses are fully online except one hybrid course.
- Assessments delivered in-person at college or testing centers.
- Assessments graded by instructors.

Key staff
- CS faculty and adjuncts who teach CBE courses
- CS department chair

LEARNER SUPPORT

Recruitment, screening, and enrollment
- Recruitment primarily through ACC advising staff.
- Student support specialist and CS department chair interview every student and advise on program fit.
- Assessment of readiness for online course work informs screening.
- Offer one-stop intake events for interviews, intake assessments, and financial aid.

Retention support
- Student support specialist provides enrollment management support, tracking enrollment, and reaching out when students withdraw or fail to re-enroll.
- Students can contact student support specialist for support with courses, but specialist does not have access to grades or course progress.

Transition support
- Trainer from state workforce partner teaches workshops on applying and interviewing for jobs; industry partners conduct mock interviews.
- Virtual job fairs connect students with industry partners.
- Students create online portfolios that industry partners have first access to before the public.

Key staff
- Student support specialist
- Coordinator of outreach and student support
- CS department chair

COLLEGE CONTEXT

- **Student population.** Approximately 66,000 unique enrollments in 2014-15; 22 percent enroll full-time; 38 percent are age 25 or older; 23 percent take all or some courses via distance learning.
- **Leadership**. Strong presidential support for CBE; active dean spearheaded program development.
- **College culture and climate.** CBE new to ACC, but leadership interested in flexible emporium models for developmental subjects. Distance learning programs had high demand but poor completion rates; CBE viewed as potential solution.
- **Organizational structure and processes.** Prior to grant, CS department offered most of the same courses in traditional and distance learning 16-, 12-, and 8-week sessions. CS faculty load for traditional courses was based on credit hours.

EXTERNAL CONTEXT

- **Local labor market.** Strong local demand for IT workers and pressure from chamber of commerce to produce more skilled workers, more quickly.

Figure A.2. Broward College: Accelerated IT Training Programs competency-based model

- Accelerated IT Training Programs (ATP) housed in the computer science and engineering (CSE) department. Offers CBE programs leading to two stackable certificates (IT support specialist and IT analyst) and one associate of science degree (computer systems specialist). CBE courses prepare students to sit for 10 industry certification exams (A+; Linux+; Certified Internet Webmaster; Microsoft Office Specialist; MTA Windows Networking Fundamentals, Security Fundamentals, and Server Fundamentals; Net+; Security+; and Server+). Certificates and certification prep courses can be stacked into several other associate of science degrees.
- Additional CBE programming includes seven flex-paced general education courses that students can take as part of the associate of science degree programs.

INDUSTRY AND WORKFORCE RELATIONSHIPS

- **Employers.** Contracted with industry partner coordinator in 2014, to develop partnerships with employers that would focus on recruiting and mentoring students.
- **Other partners.** Collaboration with state workforce agency and other partners centralized through BC rather than direct through ATP program.

CURRICULUM DEVELOPMENT

Development and mapping of competencies
- Program-level competencies are drawn from the Florida Department of Education state standards.
- Most courses had outlines with learning outcomes already aligned with competencies prior to grant.

Development and packaging of programs and courses
- A team of two instructors develops learning resources for each course based on existing course outlines.
- Instructional designers work with instructors to build the course shells in the learning management system, D2L.
- Courses reviewed with Quality Matters rubric.
- As of spring 2016, developed courses for an associate degree, two certificates, and 10 industry certifications.
- CBE courses include CS and general education courses.

Assessment development
- Assessments are developed by different instructors than those who develop and teach the courses.
- All assessment items are original content.

Accreditation and articulation
- CBE programs accredited as part of college's 2013 accreditation process; because CBE programs course-based and not substantially different from existing programs, did not require additional approval.
- Articulation does not differ from traditional CSE courses or programs; developing articulation agreement with WGU.

Key staff
- Instructional designer
- CSE faculty and adjuncts who teach CBE courses
- Quality Matters reviewers

CURRICULUM DELIVERY

Scheduling and staffing
- Staffing determined by associate dean of CSE department.
- Some instructors are adjuncts who are not bound by union contract; CBE instructors also teach traditional CSE courses.
- Combine multiple CBE sections to meet faculty load requirements using existing load formula.

Registration policies and procedures
- Students can take up to four courses simultaneously, but one course at a time is recommended.
- Students can enroll in a new course at any point during the first 12 weeks of the term.
- Adding, dropping, and withdrawing from courses must be approved by an academic coach.

Course delivery
- Courses initially offered through the CSE department; program transitioned to BC online campus during final year of grant period.
- All courses are fully online except one hybrid course.
- Assessments delivered in-person at college or testing centers or through Proctor U, an online assessment platform.
- Students can test out of a course by passing an initial challenge assessment and passing all unit evaluations with a score of 81 percent or better; financial incentive for testing out.

Key staff
- CSE faculty and adjuncts who teach CBE courses
- CSE associate dean

LEARNER SUPPORT

Recruitment, screening, and enrollment
- Recruitment focused on BC students who expressed interest in online courses or IT; visits to classrooms across disciplines cited as most successful recruitment approach.
- Mass marketing included robo-calls, radio ads, and announcements at Miami Dolphins games.
- A single recruiter speaks to every applicant about his or her objectives and fit for the program.
- Used commercial intake assessment at the beginning of grant; now use internally developed computer literacy assessment admissions criteria dependent upon students' objectives.

Retention support
- Initially used faculty advisors, but were overburdened; now two academic coaches offer support for approximately 75 students each.
- Coaches are in weekly contact with students via phone or email.
- Coaches use reports with student test results to monitor progress and are in close contact with faculty about student performance.
- Recruiter also provides ad hoc student support but is not assigned a caseload of students.

Transition support
- Industry partner coordinator developed contacts with employers but had limited contact with students.
- Students can participate in BC's formal internship program and can access other resources in BC's career center.

Key staff
- Academic coaches
- Recruiter
- Industry partner coordinator

COLLEGE CONTEXT

- **Student population.** Approximately 63,000 unique enrollments in 2014-15; 29 percent full-time; 36 percent age 25 or older; 24 percent take all or some courses via distance learning.
- **Leadership.** Presidential interest in innovation; strong departmental leadership, but with turnover in associate dean and CBE project manager.
- **College culture and climate.** CBE new to BC, but leadership interested in experimenting. Online college is vehicle for expanding e-learning capacity; was a priority to maintain competitiveness. BC is a U.S. Department of Education experimental site for direct assessment.
- **Organizational structure and processes**. Prior to grant, CSE department offered most of same courses in traditional formats. Union contract dictates teaching load and faculty roles.

EXTERNAL CONTEXT

- **Local labor market.** Few large IT companies present in area, but demand for IT skills is high among local employers. Unemployment prior to the grant was 8.5 percent.

Figure A.3. Sinclair Community College: Accelerate IT competency-based model

- Accelerate IT is housed in the computer information systems (CIS) department and the distance learning division. Offers CBE programs leading to four short-term certificates (fast track programmer, IT fundamentals, Microsoft Certified Systems Administrator, and network engineering) and three associate of applied sciences degrees (network engineering, secure systems networking, and software development), which include five general education courses. Courses prepare students to sit for additional industry certification exams (Net+, Security+, and software testing).
- Additional CBE programming offered in multiple modalities, including traditional instructor-led online, hybrid/emporium, and web-enhanced face-to-face courses.

INDUSTRY AND WORKFORCE RELATIONSHIPS

- **Employers.** Developed Stakeholder Collaborative partnership framework that includes executives and line managers, as well as workforce partners to identify current and future skills needed for industry jobs.
- **Other partners.** Developed relationships with a number of other partners including community workforce and economic development organizations, industry-based recruiting agencies, and public workforce agencies. Department program advisory boards.

CURRICULUM DEVELOPMENT

Development and mapping of competencies

- Program-level competencies are based on Ohio's state IT standards and specific industry certification standards, including Cisco Certified Network Associate, Microsoft Certified Solutions Associate, and CompTIA Network+ and Security+.
- Official college curriculum revised and all course outcomes and competencies revised to align with new standards prior to development of CBE courses.
- Master course model and common template standardize course organization and presentation.
- Outcomes and competencies mapped to course content and assessment items.

Development and packaging of programs and courses

- Two to three instructors work with instructional designers to develop CBE courses.
- Faculty serve as content experts and develop all course materials; instructional designer serves as project manager, guides team through course development, and edits and approves all content.
- All CBE courses developed with adherence to Quality Matters and Americans with Disabilities Act requirements.
- As of spring 2015, developed 27 CBE courses leading to four short-term certificates, four industry certifications, and three AAS degrees.
- Programs include CIS and general education courses required for associate degrees.

Assessment development

- Assessments are developed by faculty from the course development team, who may not have been involved in content development.
- At the end of the semester, assessments for each course are reviewed and revised as needed.

Accreditation and articulation

- SCC submitted CBE application to HLC; after review HLC determined that the CBE programs are covered under SCC's existing accreditation of asynchronous distance-learning program; however, HLC requested additional information to support the new June 2015 requirements.
- Articulation does not differ from traditional CIS courses or programs; articulation agreements signed with WGU, University of Cincinnati, Ohio University, Franklin University, and Wright State University.

Key staff

- CIS department chair
- CIS faculty
- Instructional designers

CURRICULUM DELIVERY

Scheduling and staffing

- Staffing determined by CIS department chair.
- Most instructors are full-time CIS faculty.
- CBE instructors also teach traditional in-person and online CIS courses.
- All CBE students in one section per course; faculty payload calculated at independent study rate.

Registration policies and procedures

- Students can take as many as four courses simultaneously, but one course at a time is recommended.
- Students can enroll in a new course any Monday of the 12-week term.
- Rolling starts are supported by separate "flex term" section in the SIS for each start date and a single "content" shell in the LMS for interacting with instructor, classmates, and course materials. IT process automatically combines all students from individual registration sections into a single content shell.
- Adding, dropping, and withdrawing from courses must be approved by an academic coach.

Course delivery

- Courses offered through the CIS department in four modalities: flex-paced online (Accelerate IT), instructor-led online, hybrid/emporium, web-enhanced classroom.
- High-stakes online assessments require in-person proctoring either on campus or another proctored testing site; performance assessments not proctored.
- 80 percent required passing grade to advance.
- Existing college PLA allows students to demonstrate proficiency through a variety of methods.

Key staff

- CIS faculty
- CIS department chair

LEARNER SUPPORT

Recruitment, screening, and enrollment

- Focus on recruiting students who are a good fit for CBE—typically adult learners with some college and experience in IT (or CIS coursework) who have succeeded in past online courses.
- Recruit students both internally to SCC and externally via local resources such as the workforce office and the Dayton Area Higher Education Consortium
- Used commercial intake assessment at the beginning of grant, however developed a computer literacy assessment and course that better capture the skills needed to be successful in program.

Retention support

- Three academic coaches provide day-to-day support for Accelerate IT modality.
- Coaches work with students to develop a MAP in Student Success Plan (SSP) and use pace charts to help students track progress through courses.
- Coaches are, at a minimum, in weekly contact with students via phone or email.
- All coach interactions with students documented in SSP.
- Check-ins are guided by LMS progress reports, which include information on student log-ins, assignment submissions, course progress, and grades.
- Coaches provide targeted interventions to students who exhibit high-risk behaviors (for example, not logging in, low assessment scores).
- "Light" coaching model implemented for traditional online CBE students.

Transition support

- One coach focuses on internship and career placement.
- Career counselling embedded throughout five-phase student support process.
- Coach embedded at county American Job Center, building relationships with displaced workers and employers; provides referral to SCC career services offices when appropriate (for example, for resume writing support).
- Internship coordinator secures internships as needed.
- Students may participate in reverse job fair, hosted by Ohio Department of Job and Family Services, co-sponsored by Accelerate IT.

Key staff

- Academic coaches, one of which focuses part-time on developing career services
- Recruiter/admissions counselor

COLLEGE CONTEXT

- **Student population.** Approximately 36,000 unique enrollments in 2012-13; 27 percent enroll full-time; 44 percent are age 25 or older; 32 percent take all or some courses via distance learning.
- **Leadership.** Strong college and departmental leadership supporting CBE.
- **College culture and climate**. Existing culture of assessment (since mid-80s) and sound instructional design (over 10 years). Strong support from leadership, however, more challenging to get faculty onboard with new delivery mode.
- **Organizational structure and processes.** Over the past decade, a deliberate shift toward implementing CBE through the eLearning Division (formally the Distance Learning and Instructional Support Division). Self-pacing is new for the department.

EXTERNAL CONTEXT

- **Local labor market.** Unemployment was 8.2 percent in spring 2012. Dayton region stabilized since the loss of 13,000 jobs in 2008 when GM factory left. Currently a strong focus on bringing start-ups and small companies to Dayton.
- No large IT corporations, but IT embedded in many industries; Wright-Patterson AFB and associated contractors have large IT workforce; regional focus on IT.
- **State policies.** State developed technical and academic content standards for the IT field. Governor promoting CBE in higher education planning.

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APPENDIX B

DATA AND ANALYTIC METHODS

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A. Data

We used two sources of data for this report:

1. College administrative data (program intake data, student transcripts, course history data, financial aid data, and self-reported student characteristics available through student records)
2. State wage record data (employment and wage data from state workforce agencies)

Using these data sources, we created four analysis datasets and merged them as needed to conduct the analyses in this report.

1. **Dataset 1** contains baseline student characteristics (that is, characteristics measured at or before program entry) and education and employment outcome variables. This is a student-level dataset: each observation corresponds to one student. We used data from all sources (several college administrative data sources and state wage record data) to create this dataset.
2. **Dataset 2** contains quarterly employment outcome data. Each observation corresponds to a job within a quarter for each student with wage record data. Students with multiple wage records (for example, multiple quarters of wage record data or multiple jobs within one quarter) will have multiple observations in this dataset. We used state wage record data to create this dataset.
3. **Dataset 3** contains course information (term, length of course, and so on). Each observation corresponds to one course. We used college administrative data (specifically, course history data) to create this dataset.
4. **Dataset 4** contains student-specific program of study completion information (program of study name, type of program/credential, time to completion, etc.). Each observation corresponds to one student in a single program of study. Students who have attempted and/or completed multiple programs will have multiple observations. We used college administrative data (specifically, course history and program completion data) to create this dataset.

Data availability varied by data source and by college. For example, program intake data were not available for comparison students, limiting the types of baseline data we had for those students. In addition, many key baseline variables had large amounts of missing data. Tables B.1–B.3 contain summary statistics on the baseline and outcome variables we analyzed.

To address the problem of missing data on key baseline variables, we used multiple imputation when conducting analyses in Chapters III and IV (described below). Multiple imputation is a statistical technique for analyzing incomplete data. It involves three steps. The first step is filling in missing entries based on nonmissing data to form multiple complete datasets. The next step is conducting the desired analysis within each imputed dataset. The last step is combining the results across all imputed dataset. We implemented multiple imputation using chained equations within the statistical software program Stata (version 14). We created 20 imputed datasets to obtain results for our bivariate and multivariate analyses.

Table B.1. Summary statistics of baseline and outcome variables, ACC

	Participants					Comparison students				
	Obs.	Mean	SD	Min	Max	Obs.	Mean	SD	Min	Max
Age	494	34.4	9.8	16.0	75.0	4,138	25.9	9.3	13.0	72.0
Female	674	0.4	0.5	0.0	1.0	6,005	0.4	0.5	0.0	1.0
Hispanic	790	0.2	0.4	0.0	1.0	6,548	0.3	0.5	0.0	1.0
White	814	0.7	0.5	0.0	1.0	7,544	0.5	0.5	0.0	1.0
Black	814	0.1	0.3	0.0	1.0	7,544	0.1	0.3	0.0	1.0
Asian	814	0.1	0.3	0.0	1.0	7,544	0.1	0.3	0.0	1.0
American Indian or Alaska Native	814	0.0	0.1	0.0	1.0	7,544	0.0	0.2	0.0	1.0
Native Hawaiian or Other Pacific Islander	814	0.0	0.0	0.0	0.0	7,544	0.0	0.1	0.0	1.0
More than one race	814	0.0	0.2	0.0	1.0	7,544	0.0	0.2	0.0	1.0
ESL/ELL	814	0.0	0.1	0.0	1.0	7,548	0.0	0.2	0.0	1.0
Pell-eligible	814	0.2	0.4	0.0	1.0	7,548	0.3	0.5	0.0	1.0
Expected family contribution ($)	247	6,113.34	11,196.46	0.00	99,999.00	2,913	5,160.20	11,385.99	0.00	220,700.00
High school GPA	798	3.3	0.5	1.4	3.9	0				
Placed into developmental English or writing course	814	0.0	0.0	0.0	0.0	7,548	0.0	0.0	0.0	1.0
Placed into developmental math course	814	0.0	0.1	0.0	1.0	7,548	0.0	0.1	0.0	1.0
Prior postsecondary experience	814	0.7	0.5	0.0	1.0	7,548	0.1	0.3	0.0	1.0
Prior postsecondary credential	814	0.7	0.5	0.0	1.0	7,548	0.1	0.3	0.0	1.0
Enrolled full time	772	0.2	0.4	0.0	1.0	2,261	0.4	0.5	0.0	1.0
Incumbent worker status	811	0.7	0.5	0.0	1.0	0				
Incumbent wage	558	10,324.32	7,934.48	88.00	71,074.00	0				
Veteran	814	0.1	0.3	0.0	1.0	7,548	0.1	0.3	0.0	1.0
TAA-eligible	813	0.0	0.1	0.0	1.0	0				
Program completion	814	0.6	0.5	0.0	1.0	7,548	0.2	0.4	0.0	1.0
Credential completion	814	0.3	0.5	0.0	1.0	7,547	0.1	0.3	0.0	1.0
Certificate completion	814	0.3	0.4	0.0	1.0	7,548	0.1	0.2	0.0	1.0
Degree completion	814	0.1	0.2	0.0	1.0	7,548	0.1	0.3	0.0	1.0
Industry certification prep course completion	814	0.5	0.5	0.0	1.0	7,548	0.1	0.3	0.0	1.0
Gatekeeper course completion	505	0.7	0.5	0.0	1.0	2,043	0.7	0.5	0.0	1.0
Employment status at end of study period	814	0.7	0.5	0.0	1.0	0				
Wage at end of study period	577	11,581.73	8,021.84	60.00	71,074.00	0				

Source: College administrative and state wage record data.

Note: Blank cells indicate that data were unavailable.

Table B.2. Summary statistics of baseline and outcome variables, BC

	Participants					Comparison students				
	Obs.	Mean	SD	Min	Max	Obs.	Mean	SD	Min	Max
Age	445	28.9	9.7	17.0	66.0	180	26.3	9.0	16.0	69.0
Female	483	0.4	0.5	0.0	1.0	177	0.2	0.4	0.0	1.0
Hispanic	498	0.3	0.5	0.0	1.0	180	0.3	0.5	0.0	1.0
White	401	0.6	0.5	0.0	1.0	142	0.5	0.5	0.0	1.0
Black	401	0.4	0.5	0.0	1.0	142	0.4	0.5	0.0	1.0
Asian	401	0.0	0.1	0.0	1.0	142	0.0	0.2	0.0	1.0
American Indian or Alaska Native	401	0.0	0.1	0.0	1.0	142	0.0	0.0	0.0	0.0
Native Hawaiian or Other Pacific Islander	401	0.0	0.1	0.0	1.0	142	0.0	0.0	0.0	0.0
More than one race	401	0.0	0.2	0.0	1.0	142	0.0	0.2	0.0	1.0
ESL/ELL	436	0.1	0.4	0.0	1.0	169	0.2	0.4	0.0	1.0
Pell-eligible	498	0.6	0.5	0.0	1.0	186	0.7	0.5	0.0	1.0
Expected family contribution ($)	381	3,280.41	6,280.55	0.00	60,235.00	160	3,443.31	7,613.66	0.00	51,526.00
High school GPA	151	2.8	0.4	1.4	3.9	63	2.7	0.3	2.0	3.7
Placed into developmental English or writing course	498	0.0	0.0	0.0	0.0	180	0.0	0.0	0.0	0.0
Placed into developmental math course	498	0.0	0.0	0.0	0.0	180	0.0	0.0	0.0	0.0
Prior postsecondary experience	498	0.9	0.3	0.0	1.0	180	0.4	0.5	0.0	1.0
Prior postsecondary credential	498	0.2	0.4	0.0	1.0	180	0.0	0.2	0.0	1.0
Enrolled full time	475	0.7	0.5	0.0	1.0	46	0.8	0.4	0.0	1.0
Incumbent worker status	329	0.7	0.5	0.0	1.0	0				
Incumbent wage	220	7,152.45	5,080.84	21.00	25,093.00	0				
Veteran	498	0.1	0.2	0.0	1.0	186	0.1	0.2	0.0	1.0
TAA-eligible	0					0				
Program completion	498	0.3	0.5	0.0	1.0	186	0.2	0.4	0.0	1.0
Credential completion	498	0.1	0.3	0.0	1.0	186	0.2	0.4	0.0	1.0
Certificate completion	498	0.0	0.2	0.0	1.0	186	0.0	0.2	0.0	1.0
Degree completion	498	0.1	0.3	0.0	1.0	186	0.2	0.4	0.0	1.0
Industry certification prep course completion	498	0.2	0.4	0.0	1.0	186	0.0	0.0	0.0	0.0
Gatekeeper course completion	129	0.5	0.5	0.0	1.0	68	0.8	0.4	0.0	1.0
Employment status at end of study period	498	0.6	0.5	0.0	1.0	0				
Wage at end of study period	318	7,935.10	5,495.39	102.00	26,534.00	0.0				

Source: College administrative and state wage record data.

Note: Blank cells indicate that data were unavailable.

Table B.3. Summary statistics of baseline and outcome variables, SCC

	Participants					Comparison students				
	Obs.	Mean	SD	Min	Max	Obs.	Mean	SD	Min	Max
Age	4,233	28.3	10.2	13.0	72.0	5,975	26.1	10.1	12.0	80.0
Female	4,233	0.4	0.5	0.0	1.0	5,975	0.5	0.5	0.0	1.0
Hispanic	3,423	0.0	0.2	0.0	1.0	4,658	0.0	0.2	0.0	1.0
White	3,601	0.8	0.4	0.0	1.0	4,802	0.7	0.4	0.0	1.0
Black	3,601	0.2	0.4	0.0	1.0	4,802	0.2	0.4	0.0	1.0
Asian	3,601	0.0	0.2	0.0	1.0	4,802	0.0	0.2	0.0	1.0
American Indian or Alaska Native	3,601	0.0	0.1	0.0	1.0	4,802	0.0	0.1	0.0	1.0
Native Hawaiian or Other Pacific Islander	3,601	0.0	0.1	0.0	1.0	4,802	0.0	0.0	0.0	1.0
More than one race	3,601	0.0	0.2	0.0	1.0	4,802	0.0	0.2	0.0	1.0
ESL/ELL	4,233	0.0	0.0	0.0	1.0	5,975	0.0	0.1	0.0	1.0
Pell-eligible	4,233	0.4	0.5	0.0	1.0	5,975	0.4	0.5	0.0	1.0
Expected family contribution ($)	2,754	5,150.44	21,564.42	0.00	708,766.00	3,524	5,502.84	20,309.92	0.00	792,433.00
High school GPA	1,037	3.0	0.6	0.9	3.9	193	3.0	0.6	0.9	3.9
Placed into developmental English or writing course	4,233	0.0	0.2	0.0	1.0	5,975	0.2	0.4	0.0	1.0
Placed into developmental math course	4,233	0.2	0.4	0.0	1.0	5,975	0.3	0.5	0.0	1.0
Prior postsecondary experience	4,233	0.8	0.4	0.0	1.0	5,975	0.8	0.4	0.0	1.0
Prior postsecondary credential	4,233	0.2	0.4	0.0	1.0	5,975	0.1	0.3	0.0	1.0
Enrolled full time	4,233	0.5	0.5	0.0	1.0	5,975	0.5	0.5	0.0	1.0
Incumbent worker status	1,885	0.7	0.5	0.0	1.0	0				
Incumbent wage	1,256	5,888.00	6,429.42	4.00	81,488.00	0				
Veteran	4,233	0.1	0.2	0.0	1.0	5,975	0.0	0.2	0.0	1.0
TAA-eligible	4,233	0.0	0.1	0.0	1.0	5,975	0.0	0.0	0.0	1.0
Program completion	4,233	0.3	0.5	0.0	1.0	5,975	0.2	0.4	0.0	1.0
Credential completion	4,233	0.1	0.3	0.0	1.0	5,975	0.2	0.4	0.0	1.0
Certificate completion	4,233	0.1	0.3	0.0	1.0	5,975	0.1	0.3	0.0	1.0
Degree completion	4,233	0.1	0.3	0.0	1.0	5,975	0.1	0.3	0.0	1.0
Industry certification prep course completion	4,233	0.2	0.4	0.0	1.0	5,975	0.0	0.0	0.0	0.0
Gatekeeper course completion	2,692	0.7	0.5	0.0	1.0	4,023	0.7	0.5	0.0	1.0
Employment status at end of study period	4,233	0.7	0.5	0.0	1.0	5,975	0.0	0.0	0.0	0.0
Wage at end of study period	2,823	6,579.61	5,834.27	2.00	88,268.00	0.0				

Source: College administrative and state wage record data.

Note: Blank cells indicate that data were unavailable.

B. Analytic approaches

This report addresses four key research questions:

1. What are the cumulative education and employment outcomes of TAACCCT participants?
2. What factors are associated with TAACCCT participants' outcomes?
3. Do education outcomes differ for participants exposed to different course modalities or different levels of student support?
4. How do TAACCCT participants' education outcomes compare to those of nonparticipants?

Our analytic approach differed by research question.

Analytic approach for research question 1 (Chapter II)

To answer research question 1 and to report on baseline characteristics of participants in Chapter II, we conducted descriptive analyses. These analyses consisted of tabulating data on the number of participants, participant characteristics, and education and employment outcomes for participants. We report the results of these analyses in Figures II.1–II.7 and Table II.1 in Chapter II, and in Appendix Tables C.II.1–C.II.7.

Analytic approach for research question 2 (Chapter III)

To answer our research question 2 in Chapter III, we conducted descriptive, bivariate, and multivariate analyses. The descriptive analyses were similar to those for research question 1 but restricted to participants who completed programs or credentials. We report the results of these descriptive analyses in Figure III.1 and in Appendix Tables C.III.1 and C.III.2.

In the bivariate analyses, we used logit models in which we regressed a program or credential completion indicator on each of the following baseline participant characteristics:

- Age
- Gender
- Race/ethnicity
- English language learner (ELL) status
- Pell eligibility
- Expected family contribution
- High school GPA
- Took developmental English or writing course
- Took developmental mathematics course
- Full- or part-time student status
- Incumbent worker status
- Veteran status

- TAA eligibility

We conducted the bivariate analyses separately for each college and by pooling participants from all three colleges. In the pooled analysis, we also included college indicators as covariates in the regression. We report the results of the bivariate analyses in Table III.1 and in Appendix Table C.III.7.

For the multivariate analyses, we first assessed the correlations among the baseline variables listed above. We report these correlations in Appendix Tables C.III.3–C.III.6. We then regressed the program or credential completion indicator on the baseline characteristics which exhibited at least one significant bivariate correlation to assess the associations between each characteristic and the outcome, holding all other characteristics constant. As with the bivariate analyses, we conducted the multivariate analysis separately for each college and by pooling participants from all three colleges. In the pooled analysis, we also included college indicators as covariates in the regression. We report the results of the multivariate analysis in Table III.2 and Appendix Table C.III.8.

In Chapter III, we also examined gatekeeper course completion for participants using descriptive analyses. We report the numbers of participants who attempted and completed gatekeeper courses and the completion percentage in Table III.3 and in Appendix Table C.III.9. We also examined the percentages of gatekeeper course completers and noncompleters who earned a credential. To conduct this analysis, we used a two-sided Student's *t* test to examine whether the percentage of gatekeeper course completers who earned a credential was significantly different from the percentage of noncompleters who earned a credential. We report the results of this analysis in Figure III.2 and in Appendix Table C.III.10.

Analytic approach for research question 3 (Chapter III)

The final Chapter III analyses consisted of examining differences in program and credential completion rates for SCC's participant T groups. First, we calculated the number of participants in each group, the percentage completing a program, and the percentage completing a credential. We then used logit regressions to test whether the percentages of participants completing a program or credential differed between the T1 group (which was exposed to the full grant-funded program model) and the other groups (which were exposed to limited features of the model). We combined the three smallest T groups (T4, T6, and T7) in these analyses because of their small numbers. In other words, we used logit regressions to compare program and credential completion rates between the T1 group and the T2 group, between the T1 group and the T3 group, and between the T1 group and groups T4, T6, and T7 combined. We report these results in Table III.4 and in Appendix Table C.III.11.

Next, we used imputed data to examine differences in baseline participant characteristics for members of SCC's T groups. We report average baseline characteristics for the participant T groups (T1, T2, T3; and T4, T6, and T7 combined) in Figure III.3 and Appendix Table C.III.12. In Appendix Table C.III.12, we also report the results of statistical tests of whether participant characteristics differed between the T1 group and other groups. To conduct these tests, we regressed each baseline characteristic listed above on a set of T group indicators. For continuous baseline characteristics such as age, we used linear regressions. For binary baseline characteristics such as prior postsecondary experience, we used logit regressions. Finally, we

used imputed data to conduct multivariate analyses to examine differences in program and credential completion rates for SCC's participant T groups after adjusting for the baseline characteristics listed above. In these analyses, we used logit regressions of the program or credential completion indicator on T group indicators and the set of key baseline characteristics listed above. We report the results of this analysis in Table C.III.13.

Analytic approach for research question 4 (Chapter IV)

To answer research question 4, we first analyzed the baseline characteristics of participants and the full set of comparison students at each college and consortium wide. We compared the following characteristics for participants and nonparticipants:

- Age
- Gender
- Race/ethnicity
- ELL status
- Pell eligibility
- Expected family contribution
- High school GPA
- Took developmental English or writing course
- Took developmental mathematics course
- Full- or part-time student status
- Veteran status
- TAA eligibility

In Appendix Table C.IV.1, we report the average of each characteristic for participants and comparison students and the results of two-sided Student's *t* tests to determine whether the groups differed significantly on each characteristic.

Next, we compared gatekeeper course and credential completion rates for participants and nonparticipants by conducting three analyses using imputed data. In the first, we calculated the percentages of participants and comparison students who completed (1) a gatekeeper course and (2) a credential (degree or certificate) and calculated the unadjusted mean difference in completion rates between the two groups for each college and for the consortium as a whole. To calculate the unadjusted means and mean differences, we used logit regressions of the gatekeeper course or credential completion outcome on a participant status indicator (in the consortium-wide regressions, we also included college indicators). We report the results of this analysis in Figures IV.1 and IV.2, Tables IV.1 and IV.2, and Appendix Tables C.IV.2 and C.IV.3.

In the second analysis, we calculated adjusted mean differences, which represent estimates of the mean difference in completion rates between the participant and comparison groups after adjusting for the baseline characteristics listed above. To calculate the adjusted means and mean

differences, we used logit regressions of the gatekeeper course or credential completion outcome on a participant status indicator and the characteristics listed above (in the consortium-wide regressions, we also included college indicators). We report the results of this analysis in Figures IV.1 and IV.2, Tables IV.1 and IV.2, and Appendix Tables C.IV.3–C.IV.5.

In the third analysis, we used a propensity score matching method that involved the selection of one or more comparison students who were similar to each participant in terms of the baseline characteristics listed above. Using the matched groups, we then estimated the relationship between program participation and outcomes. We used the "teffects psmatch" command in Stata Version 14.1 to conduct this analysis. We report the results of this analysis in Tables IV.1 and IV.2. Covariate balance analyses reported in Appendix Tables C.IV.6–C.IV.9 indicate that the matched groups of participants and comparison students were much more similar than the unmatched groups, but that some differences remained.

APPENDIX C

FULL RESULTS TABLES

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CHAPTER II TABLES

Table C.II.1. Enrollment in grant-funded programs over time, by college and overall

	ACC	BC	SCC	Consortium
Fall 2013	113	14	468	595
Spring 2014	261	25	901	1,187
Summer 2014	310	76	1,066	1,452
Fall 2014	443	181	1,946	2,570
Spring 2014	588	227	2,637	3,452
Summer 2014	638	268	2,937	3,843
Fall 2015	729	329	3,724	4,782
Spring 2016	811	483	4,233	5,527

Source: College administrative data.

Note: Table reports number of participants who enrolled in grant-funded programs in each term, by college and overall. The total number of participants at each college was as follows: ACC: 814; BC: 509, and SCC: 4233. We lack information on initial grant-funded enrollment term for 3 participants at ACC and 26 participants at BC.

Table C.II.2. Characteristics of TAACCCT participants at the time of enrollment in the grant-funded program, by college and overall

Participant characteristic	ACC	BC	SCC	Consortium
Number of participants	814	509	4,233	5,556
Average age	34.4	28.9	28.3	28.9
25 or older (percent)	86.8	59.3	51.9	55.8
Female (percent)	35.9	40.8	36.1	36.5
Race/ethnicity (percent)				
Hispanic	17.5	32.3	4.2	9.4
White	75.8	55.1	78.2	75.8
Black or African American	7.8	38.7	14.6	15.6
Asian	12.0	1.7	2.8	4.1
American Indian or Alaska Native	1.8	0.5	0.7	0.8
Native Hawaiian or Other Pacific Islander	0.0	0.7	0.3	0.3
More than one race	2.5	3.2	3.4	3.3
ESL/ELL (percent)	1.1	14.0	0.1	1.3
Pell-eligible (percent)	14.7	57.6	40.2	38
Expected family contribution ($)	6,113.34	3,280.41	5,150.44	5,010.09
High school GPA	3.3	2.8	3.0	3.1
Placed into developmental English or writing course (percent)	0.0	0.0	4.2	3.2
Placed into developmental math course (percent)	0.2	0.0	15.4	11.8
Prior postsecondary experience (percent)	72.6	87.6	83.2	82
Prior postsecondary credential (percent)	67.8	20.5	16.1	24.1
Enrolled full time at program entry (percent)	21.8	65.5	44.6	43.2
Incumbent worker (percent)	68.8	66.9	66.6	67.2
Veteran (percent)	10.3	6.0	4.7	5.7
TAA-eligible (percent)	1.8		0.3	0.6

Source: College administrative and state wage record data.

Note: Blank cells indicate cases in which we were unable to calculate results due to insufficient data.

ESL = English as a second language; ELL = English language learner; GPA = grade point average; TAA = trade adjustment assistance.

Table C.II.3. Education and employment outcomes for participants, by college and overall

	ACC	BC	SCC	Consortium
Education outcomes				
Completed program (percent)	57.9	30.5	30.6	34.5
Time to completion (average number of terms)	1.9	1.4	2.1	2.0
Completed credential (certificate or degree, percent)	27.6	13.1	11.6	14.1
Time to completion (average number of terms)	4.1	2.4	3.8	3.8
Completed industry certification prep course (percent)	52.6	16.9	24.1	27.6
Time to completion (average number of terms)	1.7	1.0	1.8	1.7
Completed certificate (percent)	25.2	2.4	7.5	9.6
Time to completion (average number of terms)	4.2	3.0	4.0	4.0
Earned degree (percent)	6.4	10.6	7.3	7.4
Time to completion (average number of terms)	4.5	2.5	4.0	3.8
Employment outcomes				
Employment rate at enrollment in grant-funded program (percent)	68.8	66.9	66.6	67.2
Employment rate at end of study period (percent)	70.8	66.9	66.7	67.4
Employment rate growth (percent)	2	0	0.1	0.1
Average wage at enrollment in grant-funded program ($)	10,324.30	7,152.50	5,888.00	6,653.80
Average wage at end of study period ($)	11,599.70	8,575.50	6,579.60	7,497.94
Average wage growth (percent)	12.4	19.9	11.7	12.7

Source: College administrative and state wage record data.

Table C.II.4. Education outcomes for participants who first enrolled in a grant-funded program between fall 2013 and fall 2014, by college and overall

	ACC	BC	SCC	Consortium
Completed program (percent)	65.9	49.2	42.0	46.7
Time to completion (average number of terms)	2.0	1.6	2.3	2.2
Completed credential (certificate or degree, percent)	37.5	18.8	17.8	21.2
Time to completion (average number of terms)	4.6	3.0	4.3	4.3
Completed industry certification prep course (percent)	60.0	28.7	33.8	38.0
Time to completion (average number of terms)	1.8	1.0	1.9	1.9
Completed certificate (percent)	34.5	3.3	12.6	15.7
Time to completion (average number of terms)	4.7	4.2	4.3	4.4
Earned degree (percent)	9.0	15.5	11.2	11.1
Time to completion (average number of terms)	5.0	3.0	4.5	4.4

Source: College administrative data.

Table C.II.5. Cumulative outcomes adapted from DOL APR part B outcomes, overall and by college

Participant outcomes	ACC	BC	SCC	Consortium
Number of participants	814	509	4,233	5,556
Program completion				
Total number who have completed a program of study	471	152	1,296	1,919
Total number who have completed a grant-funded program of study	453	93	1,084	1,630
Total number who completed a program of study and are still enrolled at the college	239	41	726	1,006
Total number who completed a program of study and are no longer enrolled at the college	232	111	570	913
Total number who did not complete a program of study and are still enrolled at the college	133	181	1,286	1,600
Total number who did not complete a program of study and are no longer enrolled at the college	210	165	1,651	2,037
Credit completion				
Total number of credit hours completed	19,182	2,892	62,577	84,651
Total number of students completing credit hours	709	282	3,457	4,448
Total number of credit hours completed, grant-funded courses only	10,885	78	17,910	28,873
Total number of students completing grant-funded credit hours	658	25	2,990	3,673
Certificate and degree completion				
Total number of earned degrees/certificates	499	180	732	1,420
Total number of students earning certificates	205	12	317	534
Total number of students earning degrees	52	53	308	413
Total number of earned grant-funded degrees/certificates	198	85	251	539
Total number of students earning grant-funded certificates	86	3	147	236
Total number of students earning grant-funded degrees	37	6	98	141
Employment outcomes				
Total number employed after program of study completion	342	92	966	1,400
Total number retained in employment after program of study completion	283	78	270	631
Total number of those employed at enrollment who received a wage increase post-enrollment	497	210	1,187	1,894

Source: College administrative and state wage record data.

Note: Table contains figures based on DOL APR Part B outcomes. These may not match final APR figures for several reasons: the evaluation (1) used each college's definition of a participant, which may differ slightly from the DOL definition; (2) used wage record data obtained in Q2 2016, whereas the APR used data obtained in Q3; (3) did not use National Student Clearinghouse data to track further enrollment; and (4) expanded the definition of program completion to include credentials for which participants may have earned credits through grant-funded courses but were not explicitly grant-funded.

Table C.II.6. Employment rates and average wages in each fiscal quarter, by college and overall

	ACC		BC		SCC		Consortium	
Fiscal quarter	Employment rate (%)	Average wage ($)	Employment rate (%)	Average wage ($)	Employment rate (%)	Average wage ($)	Employment rate (%)	Average wage ($)
2013 Q3	69.0	8,487.32	64.3	6,260.79	78.8	3,420.35	75.7	4,422.92
2013 Q4	68.1	8,006.24	71.4	5,996.07	78.2	3,739.55	75.2	4,571.38
2014 Q1	69.3	7,448.48	72.0	6,374.16	73.6	3,493.55	72.0	4,336.88
2014 Q2	67.7	7,377.79	67.1	5,662.46	78.9	3,972.23	73.8	4,626.02
2014 Q3	70.9	7,596.34	66.3	5,061.38	77.6	4,123.97	73.4	4,718.58
2014 Q4	72.0	8,064.61	69.6	5,553.36	65.9	3,947.75	66.9	4,698.00
2015 Q1	70.7	7,976.20	69.6	5,052.36	64.3	3,846.89	65.6	4,562.30
2015 Q2	71.9	7,862.57	68.7	5,281.22	67.1	4,199.60	67.9	4,835.35
2015 Q3	69.7	7,710.00	65.7	5,086.33	67.8	4,282.27	67.9	4,858.12
2015 Q4	69.3	8,330.68	66.9	5,734.34	67.3	4,749.80	67.5	5,364.62
2016 Q1	70.8	8,209.88			66.7	4,387.96	67.3	5,004.37

Source: College administrative and state wage record data.

Note: Blank cells indicate cases in which we were unable to calculate results due to insufficient data.

Table C.II.7. Employment and wage growth by cohort, by college and overall

Initial grant-funded enrollment term	ACC		BC		SCC		Consortium	
	Employment growth (%)	Wage growth (%)	Employment growth (%)	Wage growth (%)	Employment growth (%)	Wage growth (%)	Employment growth (%)	Wage growth (%)
Fall 2013 (2013 Q3)	5.3	25.3	14.3	47.4	-7.7	36.1	-3.8	35.6
Spring 2014 (2014 Q1)	-1.4	22.4	-18.2	-3.6	-10.4	5.9	-9.8	7.4
Summer 2014 (2014 Q2)	8.2	7.2	-2.0	28.6	-12.0	4.5	-8.1	7.1
Fall 2014 (2014 Q3)	-0.8	15.2	-1.9	20.2	-7.4	17.5	-5.9	17.4
Spring 2015 (2015 Q1)	6.2	24.2	2.2	32.6	5.4	5.5	5.2	10.7
Summer 2015 (2015 Q2)	4.0	6.7	2.4	18.8	0.5	7.2	1.2	8.2
Fall 2015 (2015 Q3)	-2.2	3.2	1.6	4.9	0.0	2.2	-0.2	2.6

Source: College administrative and state wage record data.

CHAPTER III TABLES

Table C.III.1. Characteristics of TAACCCT participants who completed programs, by college and overall

Participant characteristic	ACC	BC	SCC	Consortium
Number of participants who completed a program	471	152	1,296	1,919
Average age	34.0	31.1	28.7	29.8
25 or older (percent)	86.6	68.9	55.2	61.9
Female (percent)	33.8	35.8	27.9	30.0
Race/ethnicity (percent)				
Hispanic	16.6	28.9	4.3	10.0
White	68.6	59.8	80.1	75.5
Black or African American	5.3	33.6	12.9	12.3
Asian	11.5	2.5	3.0	5.3
American Indian or Alaska Native	1.5	0.0	0.7	0.9
Native Hawaiian or Other Pacific Islander	0.0	0.8	0.1	0.1
More than one race	1.7	3.3	3.2	2.8
ESL/ELL (percent)	0.8	15.9	0.1	1.4
Pell-eligible (percent)	20.0	61.8	36.7	34.5
Expected family contribution ($)	5,914.56	3,392.52	6,645.96	6,169.65
High school GPA	3.3	2.9	3.0	3.1
Placed into developmental English or writing course (percent)	0.0	0.0	5.6	3.8
Placed into developmental math course (percent)	0.4	0.0	13.3	9.1
Prior postsecondary experience (percent)	67.9	89.5	87.4	82.8
Prior postsecondary credential (percent)	62.2	28.3	17.3	29.2
Enrolled full time (percent)	29.4	74.0	50.3	47.3
Incumbent worker (percent)	65.4	69.0	68.9	67.3
Veteran (percent)	12.1	4.6	5.1	6.8
TAA-eligible (percent)	1.5		0.8	1.0

Source: College administrative and state wage record data.

Note: Blank cells indicate cases in which we were unable to calculate results due to insufficient data.

ESL = English as a second language; ELL = English language learner; GPA = grade point average; TAA = trade adjustment assistance.

Table C.III.2. Characteristics of TAACCCT participants who completed credentials, by college and overall

Participant characteristic	ACC	BC	SCC	Consortium
Number of participants who completed a credential	225	65	492	782
Average age	35.9	29.7	29.5	30.9
25 or older (percent)	91.6	60.9	58.7	66.1
Female (percent)	34.7	35.4	38.6	37.2
Race/ethnicity (percent)				
Hispanic	13.1	32.3	4.4	10.1
White	71.1	59.2	81.7	76.7
Black or African American	4.9	32.7	12.7	11.6
Asian	12.0	4.1	1.9	5.4
American Indian or Alaska Native	1.3	0.0	0.5	0.7
Native Hawaiian or Other Pacific Islander	0.0	0.0	0.0	0.0
More than one race	1.8	4.1	3.1	2.8
ESL/ELL (percent)	1.3	16.9	0.0	1.7
Pell-eligible (percent)	21.3	64.6	34.8	33.4
Expected family contribution ($)	7,433.79	2,861.83	6,569.14	6,289.68
High school GPA	3.3	2.9	3.1	3.2
Placed into developmental English or writing course (percent)	0.0	0.0	4.7	2.9
Placed into developmental math course (percent)	0.0	0.0	9.6	6.0
Prior postsecondary experience (percent)	67.6	92.3	94.3	86.4
Prior postsecondary credential (percent)	63.1	38.5	20.9	34.5
Enrolled full time (percent)	36.5	93.7	54.7	53.0
Incumbent worker (percent)	61.3	67.2	72.5	64.7
Veteran (percent)	12.4	7.7	3.9	6.6
TAA-eligible (percent)	2.7		1.4	1.8

Source: College administrative and state wage record data.

Note: Blank cells indicate cases in which we were unable to calculate results due to insufficient data.

ESL = English as a second language; ELL = English language learner; GPA = grade point average; TAA = trade adjustment assistance.

Table C.III.3. Correlations between baseline participant characteristics, ACC

	Age	Fe-male	His-panic	White	ESL/ ELL	Pell	EFC	HS GPA	Dev. Eng. or writing	Dev. math	Prior PSE	Prior PSE cred.	Full-time	Emp. at enroll	Vet	TAA
Age	1.00	0.04	-0.14	0.07	0.06	-0.12	0.13	-0.11		0.04	0.25	0.29	-0.06	-0.11	0.17	0.15
Female	0.04	1.00	-0.02	-0.11	0.08	-0.02	-0.01	0.16		0.02	0.22	0.16	0.04	-0.11	-0.13	0.01
Hispanic	-0.14	-0.02	1.00	-0.28	0.04	0.14	-0.03	-0.05		-0.02	0.00	-0.06	0.08	0.04	0.01	0.01
White	0.07	-0.11	-0.28	1.00	-0.10	-0.02	0.06	-0.03		-0.02	-0.08	-0.08	0.04	0.06	0.03	-0.06
ESL/ELL	0.06	0.08	0.04	-0.10	1.00	-0.04	-0.03	-0.01		-0.01	0.01	0.00	0.04	-0.03	-0.04	-0.01
Pell	-0.12	-0.02	0.14	-0.02	-0.04	1.00	-0.36	-0.17		-0.02	-0.26	-0.35	0.18	-0.04	0.05	-0.01
EFC	0.13	-0.01	-0.03	0.06	-0.03	-0.36	1.00	0.09		0.03	0.04	0.07	-0.08	0.01	-0.01	-0.05
HS GPA	-0.11	0.16	-0.05	-0.03	-0.01	-0.17	0.09	1.00		-0.09	0.22	0.26	0.02	-0.02	-0.13	0.01
Developmental English or writing course																
Developmental math course	0.04	0.02	-0.02	-0.02	-0.01	-0.02	0.03	-0.09		1.00	-0.08	-0.07	-0.03	0.03	0.06	-0.01
Prior postsecondary experience	0.25	0.22	0.00	-0.08	0.01	-0.26	0.04	0.22		-0.08	1.00	0.89	-0.01	0.00	-0.05	0.02
Prior postsecondary credential	0.29	0.16	-0.06	-0.08	0.00	-0.35	0.07	0.26		-0.07	0.89	1.00	-0.03	0.01	-0.05	0.04
Enrolled full time	-0.06	0.04	0.08	0.04	0.04	0.18	-0.08	0.02		-0.03	-0.01	-0.03	1.00	-0.17	0.09	0.07
Incumbent worker	-0.11	-0.11	0.04	0.06	-0.03	-0.04	0.01	-0.02		0.03	0.00	0.01	-0.17	1.00	-0.04	-0.05
Veteran	0.17	-0.13	0.01	0.03	-0.04	0.05	-0.01	-0.13		0.06	-0.05	-0.05	0.09	-0.04	1.00	0.01
TAA-eligible	0.15	0.01	0.01	-0.06	-0.01	-0.01	-0.05	0.01		-0.01	0.02	0.04	0.07	-0.05	0.01	1.00

Source: College administrative and wage record data.

Note: Blank cells indicate cases in which we were unable to calculate results due to insufficient data.

ESL = English as a second language; ELL = English language learner; EFC = expected family contribution; HS GPA = high school grade point average; TAA = trade adjustment assistance.

Table C.III.4. Correlations between baseline participant characteristics, BC

	Age	Fe-male	His-panic	White	ESL/ ELL	Pell	EFC	HS GPA	Dev. Eng. or writing	Dev. math	Prior PSE	Prior PSE cred.	Full-time	Emp. at enroll	Vet	TAA
Age	1.00	-0.02	-0.08	0.09	0.07	-0.05	-0.06	-0.33			0.02	0.19	-0.15	0.05	0.05	
Female	-0.02	1.00	0.01	-0.03	0.02	-0.03	-0.07	0.13			-0.02	-0.01	0.01	-0.04	-0.16	
Hispanic	-0.08	0.01	1.00	0.44	0.28	-0.10	0.11	0.02			-0.04	-0.01	-0.07	0.05	-0.05	
White	0.09	-0.03	0.44	1.00	0.07	-0.15	0.09	0.00			-0.03	0.01	0.03	-0.07	-0.04	
ESL/ELL	0.07	0.02	0.28	0.07	1.00	0.06	-0.09	0.05			0.08	0.01	0.05	-0.06	-0.10	
Pell-eligible	-0.05	-0.03	-0.10	-0.15	0.06	1.00	-0.71	-0.25			0.10	-0.15	0.18	-0.02	0.03	
EFC	-0.06	-0.07	0.11	0.09	-0.09	-0.71	1.00	0.26			-0.05	0.07	-0.01	0.12	-0.03	
HS GPA	-0.33	0.13	0.02	0.00	0.05	-0.25	0.26	1.00			0.06	0.07	0.11	-0.10	-0.13	
Developmental English or writing course																
Developmental math course																
Prior postsecondary experience	0.02	-0.02	-0.04	-0.03	0.08	0.10	-0.05	0.06			1.00	0.16	0.09	0.08	0.02	
Prior postsecondary credential	0.19	-0.01	-0.01	0.01	0.01	-0.15	0.07	0.07			0.16	1.00	0.06	0.06	-0.02	
Enrolled full time	-0.15	0.01	-0.07	0.03	0.05	0.18	-0.01	0.11			0.09	0.06	1.00	-0.02	0.13	
Incumbent worker	0.05	-0.04	0.05	-0.07	-0.06	-0.02	0.12	-0.10			0.08	0.06	-0.02	1.00	-0.04	
Veteran	0.05	-0.16	-0.05	-0.04	-0.10	0.03	-0.03	-0.13			0.02	-0.02	0.13	-0.04	1.00	
TAA-eligible																

Source: College administrative and wage record data.

Note: Blank cells indicate cases in which we were unable to calculate results due to insufficient data.

ESL = English as a second language; ELL = English language learner; EFC = expected family contribution; HS GPA = high school grade point average; TAA = trade adjustment assistance.

Table C.III.5. Correlations between baseline participant characteristics, SCC

	Age	Fe-male	His-panic	White	ESL/ ELL	Pell	EFC	HS GPA	Dev. Eng. or writing	Dev. math	Prior PSE	Prior PSE cred.	Full-time	Emp. at enroll	Vet	TAA
Age	1.00	0.09	-0.04	-0.01	0.00	-0.01	-0.08	-0.12	0.00	0.02	0.18	0.29	-0.21	0.02	0.12	0.09
Female	0.09	1.00	0.02	-0.06	-0.01	0.11	-0.07	0.10	0.03	0.07	0.09	0.05	0.01	-0.05	-0.09	-0.01
Hispanic	-0.04	0.02	1.00	-0.05	-0.01	-0.03	0.03	0.06	0.03	-0.01	-0.02	-0.01	0.01	0.04	0.02	-0.01
White	-0.01	-0.06	-0.05	1.00	-0.02	-0.10	0.06	0.06	-0.06	-0.10	-0.01	0.04	-0.01	0.07	-0.01	0.00
ESL/ELL	0.00	-0.01	-0.01	-0.02	1.00	-0.01	0.00		-0.01	-0.01	-0.03	-0.01	0.02	-0.03	-0.01	0.00
Pell-eligible	-0.01	0.11	-0.03	-0.10	-0.01	1.00	-0.27	-0.13	0.05	0.19	0.00	-0.18	0.22	-0.02	-0.02	0.00
EFC	-0.08	-0.07	0.03	0.06	0.00	-0.27	1.00	0.13	-0.03	-0.06	-0.01	-0.02	-0.01	0.07	-0.02	-0.01
HS GPA	-0.12	0.10	0.06	0.06		-0.13	0.13	1.00	-0.11	-0.20	0.00	0.07	0.03	0.05	-0.07	0.04
Developmental English or writing course	0.00	0.03	0.03	-0.06	-0.01	0.05	-0.03	-0.11	1.00	0.25	-0.11	-0.07	0.10	-0.09	-0.02	-0.01
Developmental math course	0.02	0.07	-0.01	-0.10	-0.01	0.19	-0.06	-0.20	0.25	1.00	-0.14	-0.14	0.08	-0.07	-0.01	0.00
Prior postsecondary experience	0.18	0.09	-0.02	-0.01	-0.03	0.00	-0.01	0.00	-0.11	-0.14	1.00	0.18	-0.07	0.13	0.04	0.00
Prior postsecondary credential	0.29	0.05	-0.01	0.04	-0.01	-0.18	-0.02	0.07	-0.07	-0.14	0.18	1.00	-0.17	0.10	0.04	0.00
Enrolled full time	-0.21	0.01	0.01	-0.01	0.02	0.22	-0.01	0.03	0.10	0.08	-0.07	-0.17	1.00	-0.09	0.01	0.06
Incumbent worker	0.02	-0.05	0.04	0.07	-0.03	-0.02	0.07	0.05	-0.09	-0.07	0.13	0.10	-0.09	1.00	-0.05	-0.06
Veteran	0.12	-0.09	0.02	-0.01	-0.01	-0.02	-0.02	-0.07	-0.02	-0.01	0.04	0.04	0.01	-0.05	1.00	-0.01
TAA-eligible	0.09	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.04	-0.01	0.00	0.00	0.00	0.06	-0.06	-0.01	1.00

Source: College administrative and wage record data.

ESL = English as a second language; ELL = English language learner; EFC = expected family contribution; HS GPA = high school grade point average; TAA = trade adjustment assistance.

Table C.III.6. Correlations between baseline participant characteristics, Consortium

	Age	Fe-male	His-panic	White	ESL/ ELL	Pell	EFC	HS GPA	Dev. Eng. or writing	Dev. math	Prior PSE	Prior PSE cred.	Full-time	Emp. at enroll	Vet	TAA
Age	1.00	0.08	-0.02	-0.01	0.02	-0.05	-0.07	-0.03	-0.01	-0.01	0.16	0.32	-0.21	0.00	0.13	0.10
Female	0.08	1.00	0.01	-0.07	0.02	0.08	-0.06	0.10	0.02	0.06	0.10	0.05	0.01	-0.06	-0.10	0.00
Hispanic	-0.02	0.01	1.00	-0.07	0.22	-0.01	0.01	0.00	-0.01	-0.07	-0.02	0.05	0.02	0.04	0.02	0.01
White	-0.01	-0.07	-0.07	1.00	-0.04	-0.09	0.06	-0.01	-0.03	-0.05	-0.02	-0.03	0.00	0.05	-0.01	-0.03
ESL/ELL	0.02	0.02	0.22	-0.04	1.00	0.05	-0.02	-0.01	-0.02	-0.04	0.03	0.00	0.06	-0.02	-0.03	0.00
Pell-eligible	-0.05	0.08	-0.01	-0.09	0.05	1.00	-0.28	-0.23	0.05	0.18	0.00	-0.26	0.25	-0.03	-0.02	-0.01
EFC	-0.07	-0.06	0.01	0.06	-0.02	-0.28	1.00	0.14	-0.03	-0.05	-0.01	-0.01	-0.01	0.06	-0.02	-0.01
HS GPA	-0.03	0.10	0.00	-0.01	-0.01	-0.23	0.14	1.00	-0.10	-0.20	0.03	0.25	-0.05	0.00	-0.08	0.04
Developmental English or writing course	-0.01	0.02	-0.01	-0.03	-0.02	0.05	-0.03	-0.10	1.00	0.26	-0.09	-0.08	0.09	-0.07	-0.02	-0.01
Developmental math course	-0.01	0.06	-0.07	-0.05	-0.04	0.18	-0.05	-0.20	0.26	1.00	-0.11	-0.17	0.08	-0.05	-0.02	-0.01
Prior postsecondary experience	0.16	0.10	-0.02	-0.02	0.03	0.00	-0.01	0.03	-0.09	-0.11	1.00	0.25	-0.02	0.09	0.01	0.00
Prior postsecondary credential	0.32	0.05	0.05	-0.03	0.00	-0.26	-0.01	0.25	-0.08	-0.17	0.25	1.00	-0.18	0.07	0.04	0.04
Enrolled full time	-0.21	0.01	0.02	0.00	0.06	0.25	-0.01	-0.05	0.09	0.08	-0.02	-0.18	1.00	-0.10	0.02	0.05
Incumbent worker	0.00	-0.06	0.04	0.05	-0.02	-0.03	0.06	0.00	-0.07	-0.05	0.09	0.07	-0.10	1.00	-0.05	-0.04
Veteran	0.13	-0.10	0.02	-0.01	-0.03	-0.02	-0.02	-0.08	-0.02	-0.02	0.01	0.04	0.02	-0.05	1.00	0.00
TAA-eligible	0.10	0.00	0.01	-0.03	0.00	-0.01	-0.01	0.04	-0.01	-0.01	0.00	0.04	0.05	-0.04	0.00	1.00

Source: College administrative and wage record data.

ESL = English as a second language; ELL = English language learner; EFC = expected family contribution; HS GPA = high school grade point average; TAA = trade adjustment assistance.

Table C.III.7. Participant characteristics predicting program and credential completion, bivariate results

	Program completion				Credential (certificate or degree) completion			
	ACC	BC	SCC	Consortium	ACC	BC	SCC	Consortium
Age	-0.01	0.03*	0.01	0.01	0.01	0.01	0.01*	0.01*
Female	-0.38*	-0.29	-0.53*	-0.48*	-0.16	-0.25	0.12	0.02
Race/ethnicity								
Hispanic	-0.30	-0.23	-0.03	-0.17	-0.57*	0.00	-0.04	-0.25
White	0.22	0.26	0.15	0.18*	0.30	0.15	0.25	0.25*
Black or African American	-0.57*	-0.30	-0.20	-0.24*	-0.48	-0.32	-0.17	-0.23
Asian	0.23	0.45	0.12	0.18	0.20	0.76	-0.37	0.01
Other race	-0.40	-0.19	-0.15	-0.19	-0.28	-0.04	-0.25	-0.21
ESL/ELL	-0.55	0.22	-0.28	0.07	0.27	0.27	0.00	0.21
Pell-eligible	1.11*	0.25	-0.22*	-0.05	0.67*	0.34	-0.26*	-0.08
Expected family contribution	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High school GPA	-0.15	0.20	0.12	0.09	-0.02	0.32	0.35*	0.27*
Placed into developmental English or writing course	0.00	0.00	0.44*	0.44*	0.00	0.00	0.12	0.13
Placed into developmental math course	0.00	0.00	-0.25*	-0.24*	0.00	0.00	-0.60*	-0.60*
Prior postsecondary experience	-0.57*	0.26	0.47*	0.21*	-0.34*	0.60	1.31*	0.52*
Prior postsecondary credential	-0.63*	0.65*	0.13	0.00	-0.29	1.06*	0.37*	0.23*
Enrolled full time	1.15*	0.57*	0.33*	0.44*	1.07*	2.04*	0.46*	0.65*
Incumbent worker	-0.39*	0.14	0.02	-0.03	-0.47*	0.02	-0.04	-0.14
Veteran	0.48	-0.39	0.11	0.16	0.30	0.31	-0.24	0.03
TAA-eligible	-0.46		1.74*	0.63	0.57		2.04*	1.30*

Source: College administrative data.

Note: Table contains regression coefficients (log odds) from a logit model in which we regressed the relevant completion indicator on each covariate indicated in the table. In the consortium-wide regression, we also included indicators for each college. Blank cells indicate cases in which we were unable to calculate results due to insufficient data. These analyses used imputed data.

* Significantly different from zero at the 0.05 level, two-tailed test.

ESL = English as a second language; ELL = English language learner; GPA = grade point average; TAA = trade adjustment assistance.

Table C.III.8. Participant characteristics predicting program and credential completion, multivariate results

	Program completion				Credential (certificate or degree) completion			
	ACC	BC	SCC	Consortium	ACC	BC	SCC	Consortium
Age	0.00	0.04*	0.01*	0.01*	0.02*	0.02	0.01*	0.02*
Female	-0.36*	-0.35	-0.59*	-0.54*	-0.16	-0.33	0.05	-0.07
Race/ethnicity								
Hispanic	-0.51*	-0.25	-0.03	-0.17	-0.73*	0.09	-0.04	-0.28
Black or African American	-0.54	-0.37	-0.15	-0.22*	-0.52	-0.26	-0.15	-0.24
Asian	0.20	0.49	0.12	0.15	0.05	0.82	-0.42	-0.13
Other	-0.45	-0.24	-0.14	-0.19	-0.20	-0.17	-0.22	-0.20
Pell-eligible	0.91*	0.41	-0.18*	-0.05	0.63*	0.30	-0.28*	-0.12
High school GPA	0.01	0.35	0.14	0.13	0.11	0.33	0.28*	0.26*
Placed into developmental English or writing course			0.68*				0.52*	
Placed into developmental math course			-0.15				-0.44*	
Prior postsecondary experience	0.03	-0.02	0.56*	0.28*	-0.47	0.08	1.26*	0.47*
Prior postsecondary credential	-0.43	0.47	0.04	-0.09	0.15	0.97*	0.13	-0.02
Enrolled full time	1.06*	0.59*	0.43*	0.51*	1.04*	2.04*	0.64*	0.76*
Incumbent worker	-0.24	0.16	0.00	-0.03	-0.28	0.05	-0.05	-0.08
TAA-eligible			1.39*				1.55*	
N	814	498	4,233	5,556	814	498	4,233	5,556

Source: College administrative and state wage record data.

Note: Table contains regression coefficients (log odds) from a logit model in which we regressed the credential completion indicator on the covariates indicated in the table. “White” is the omitted race category (since the race categories are mutually exclusive). In the consortium-wide regression, we also included indicators for each college. Blank cells indicate cases in which we were unable to calculate results due to insufficient data. This analyses used imputed data.

* Significantly different from zero at the 0.05 level, two-tailed test.

ESL = English as a second language; ELL = English language learner; GPA = grade point average; TAA = trade adjustment assistance.

Table C.III.9. Completion of gatekeeper courses

Course	Course description	Number of participants who attempted course	Number of participants who completed course	Percentage of participants who completed course
ACC				
COSC 1336, Programming Fundamentals I	Introduces the fundamental concepts of structured programming. Topics include software development methodology, data types, control structures, functions, arrays, and the mechanics of running, testing, and debugging.	505	347	68.7
BC				
CIS1000c Introduction to Computer Science	This course is designed to provide students with a broad perspective of the field of Computer Science, from core issues and concepts inherent to the discipline of computing, to the various sub-disciplines of computer science. Topics include: Number Systems and Data Representation; Computer Components and Architecture including Gates and Circuits; Problem Solving and Systems Development Methodologies; Low-Level and High-Level Programming Languages; Abstract Data Representations and Algorithms; Operating Systems, File Systems and Directories; Information Systems; Artificial Intelligence; Simulation, Graphics, and Other Applications; Networks and The World Wide Web.	121	60	49.6
CET2742c Advanced Networking	This course is for support professionals who are new to networking services and will be responsible for installing, configuring, managing, and supporting a network infrastructure that uses various networking services. It also provides students with the prerequisite knowledge and skills required for implementing and administering directory services such as Microsoft Active Directory.	25	7	28.0
SCC				
BIS 1120, Introduction to Software Applications	Use word processing, spreadsheet, database and presentation software applications to create reports, spreadsheets, databases and presentations for business and other applications.	2,209	1,565	70.8
CIS 1107, Introduction to Operating Systems	Introduction to operating systems and their concepts. Both the command line interface, with commonly used instructions, and a graphical interface will be used to manage and administer the current Microsoft Windows and Linux operating systems.	1,809	1,299	71.8
CIS 1111, Introduction to Problem Solving & Computer Programming	Introduction to problem solving techniques used in programming. Students learn to use tools such as flowcharts and pseudocode to plan solutions. Using current programming languages, students will design, code and test programs using the basic structures of sequence, selection, iteration, functions and one dimensional arrays.	1,120	755	67.4

Course	Course description	Number of participants who attempted course	Number of participants who completed course	Percentage of participants who completed course
CIS 1130 Network Fundamentals	Introduction to computer networking. Topics include network standards and the Open Source Interconnection (OSI) model, topologies and Ethernet standards, network hardware, remote connectivity, wireless networking, in-depth TCP/IP, network security, network troubleshooting and network management.	1,152	891	77.3

Source: College administrative data; college course catalogs.

COSC = computer science; CIS = computer information systems; CET = computer engineering technology; BIS = business information systems.

Table C.III.10. Gatekeeper course completion and credential completion

	Percentage of course noncompleters who earned a credential	Percentage of course completers who earned a credential
ACC		
COSC-1336	7.0	39.5*
BC		
CIS 1000C	11.5	18.3
CET 2742C	22.2	42.9
SCC		
BIS-1120	1.6	14.7*
CIS-1107	1.4	13.3*
CIS-1111	2.2	16.8*
CIS-1130	3.8	17.7*

Source: College administrative data.

* Percentages of completers and noncompleters who earned a credential were significantly different from zero at the 0.05 level, two-tailed test.

COSC = computer science; CIS = computer information systems; CET = computer engineering technology; BIS = business information systems.

Table C.III.11. SCC participant "T" groups

T group	Course modality	Student supports	Number of students	Percent completing program	Percent completing credential
T1	Self-paced online	Eligible for special case management from an academic coach	409	48.7	21.5
T2	Traditional online	Eligible for special case management from an academic coach	2,042	22.7*	9.1*
T3	Face-to-face	Not eligible for special case management from an academic coach	1,699	35.6*	12.5*
T4, T6, T7	Self-paced hybrid course, self-paced online course, or multiple-modality course	Eligible for less intensive academic support	83	36.1*	7.2*

Source: College administrative data, college data dictionary.

Note: Table shows the number of students within each SCC participant "T" group, and the percentage within each group completing a credential. T5s and T8s were considered nonparticipants and are discussed in Chapter IV.

* Significantly different from the T1 group at the 0.05 level, two-tailed test.

Table C.III.12. SCC T group participant characteristics

Participant characteristic	T group			
	T1	T2	T3	T4, T6, T7
Age	31.6	28.4*	26.9*	36.5*
Female	25.2	50.6*	20.4*	56.6*
Race/ethnicity				
Hispanic	4.1	3.6	5.1	0.0
White	82.1	78.4	77.3	70.1*
Black or African American	12.1	15.1	14.2	25.4*
Asian	3.8	2.0*	3.5	4.5
Other race	2.0	4.6*	4.9*	0.0
ESL/ELL	0.0	0.0	0.2	1.2*
Pell-eligible	32.8	46.3*	34.2	49.4*
Expected family contribution	4,656.54	4,481.87	6,412.68	1,932.84
High school GPA	3.1	3.0*	2.9*	2.9
Placed into developmental English or writing course	0.5	2.6*	6.9*	7.2*
Placed into developmental math course	7.1	14.9*	17.8*	21.7*
Prior postsecondary experience	91.0	86.1*	77.8*	83.1*
Prior postsecondary credential	32.8	15.9*	12.1*	20.5*
Enrolled full time	27.1	44.5*	49.3*	34.9
Incumbent worker	71.4	69.7	64.2	50.0*
Veteran	8.1	4.7*	4.1*	3.6
TAA-eligible	0.5	0.2	0.5	0.0

Source: College administrative data.

Note: Table shows percentage of participants in each T group with the indicated characteristic. T5s and T8s were considered nonparticipants and are discussed in Chapter IV.

* Significantly different from the T1 group at the 0.05 level, two-tailed test.

ESL = English as a second language; ELL = English language learner; GPA = grade point average; TAA = trade adjustment assistance.

Table C.III.13. SCC T groups and program and credential completion, multivariate regression results

	Program completion	Credential (certificate or degree) completion
T2	-1.11*	-1.06*
T3	-0.59*	-0.60*
T4, T6, T7	-0.39	-1.28*
Age	0.01*	0.01*
Female	-0.42*	0.22
Race/ethnicity		
Hispanic	-0.06	-0.06
Black or African American	-0.15	-0.14
Asian	0.06	-0.46
Other race	-0.11	-0.20
ESL/ELL	-0.58	0.00
Pell-eligible	-0.14	-0.23
Expected family contribution	0.00	0.00
High school GPA	0.12	0.26
Placed into developmental English or writing course	0.62*	0.46
Placed into developmental math course	-0.16	-0.45*
Prior postsecondary experience	0.58*	1.26*
Prior postsecondary credential	-0.03	0.05
Enrolled full time	0.47*	0.68*
Incumbent worker	0.02	-0.05
Veteran	-0.07	-0.38
TAA-eligible	1.31*	1.43*
N	4,233	4,229

Source: College administrative and state wage record data.

Note: Table contains regression coefficients (log odds) from a logit model in which we regressed the credential completion indicator on the covariates indicated in the table. These analyses used imputed data.

* Significantly different from zero at the 0.05 level, two-tailed test.

ESL = English as a second language; ELL = English language learner; GPA = grade point average; TAA = trade adjustment assistance.

CHAPTER IV TABLES

Table C.IV.1. Baseline characteristics of TAACCCT participants and comparison students, by college and overall

	ACC		BC		SCC		Consortium	
Characteristic	Participants	Comparison students	Participants	Comparison students	Participants	Comparison students	Participants	Comparison students
Number	814	7,548	498	186	4,233	5,975	5,556	13,709
Average age	34.4	25.9*	28.9	26.3*	28.3	26.1*	28.9	26.0*
25 or older (percent)	86.8	42.5*	59.3	44.4*	51.9	39.6*	55.8	40.8*
Female (percent)	35.9	34.8	40.8	14.7*	36.1	47.6*	36.5	40.8*
Race/ethnicity (percent)								
Hispanic	17.5	30.7*	32.3	34.4	4.2	3.6	9.4	19.6*
White	66.5	52.0*	55.1	52.8	78.2	72.9*	74.3	60.0*
Black or African American	6.9	7.4	38.7	40.1	14.6	20.4*	15.3	12.8*
Asian	10.6	7.0*	1.7	2.8	2.8	3.0	4.0	5.4*
Other race	3.8	7.0*	4.5	4.2	4.4	3.8	4.3	5.7*
ESL/ELL (percent)	1.1	2.2*	14.0	17.8	0.1	0.5*	1.3	1.6
Pell-eligible (percent)	14.7	27.4*	57.6	69.9*	40.2	36.8*	38.0	32.1*
Expected family contribution ($)	6,113.34	5,160.20	3,280.41	3,443.31	5,150.44	5,502.84	5,010.09	5,301.59
High school GPA	3.3		2.8	2.7	3.0	3.0	3.1	2.9*
Placed into developmental English or writing course (percent)	0.0	0.2	0.0	0.0	4.2	18.0*	3.2	8.0*
Placed into developmental math course (percent)	0.2	0.6	0.0	0.0	15.4	31.3*	11.8	14.0*
Prior postsecondary experience (percent)	72.6	12.4*	87.6	42.8*	83.2	77.5*	82.0	41.2*
Prior postsecondary credential (percent)	67.8	12.4*	20.5	2.8*	16.1	8.5*	24.1	10.6*
Enrolled full time (percent)	21.8	42.2*	65.5	78.3	44.6	50.6*	43.2	48.5*
Veteran (percent)	10.3	10.5	6.0	5.4	4.7	3.6*	5.7	7.4*
TAA-eligible (percent)	1.8				0.3	0.1*	0.6	0.1*

Source: College administrative and state wage record data.

Note: Blank cells indicate cases in which we were unable to calculate results due to insufficient data.

* Participant and comparison student means are significantly different at the 0.05 level, two-sided test.

ESL = English as a second language; ELL = English language learner; GPA = grade point average; TAA = trade adjustment assistance.

Table C.IV.2. Completion of gatekeeper courses for participants and comparison students

Course	Number of participants who attempted course	Number of participants who completed course	Percentage of participants who completed course	Number of comparison students who attempted course	Number of comparison students who completed course	Percentage of comparison students who completed course
ACC						
COSC 1336, Programming Fundamentals I	505	347	68.7	2,043	1,324	64.8
BC						
CIS1000c Introduction to Computer Science	121	60	49.6	52	34	65.4
CET2742c Advanced Networking	25	7	28.0	21	21	100.0
SCC						
BIS 1120, Introduction to Software Applications	2,209	1,565	70.8	3,988	2,839	71.2
CIS 1111, Introduction to Problem Solving & Computer Programming	1,120	755	67.4	42	28	66.7

Source: College administrative data.

Table C.IV.3. Estimates of gatekeeper course completion rates for participants and comparison students from three models, by college and overall

	ACC				BC				SCC				Consortium			
Analysis	**P**	**C**	**MD**	**N**	**P**	**C**	**MD**	**N**	**P**	**C**	**MD**	**N**	**P**	**C**	**MD**	**N**
Unmatched samples																
Analysis 1 (unadjusted)[a]	68.7	64.8	3.9	2,548	47.3	75.0	-27.7*	197	66.6	71.1	-4.5*	6,715	65.9	69.2	-3.4*	9,460
Analysis 2 (adjusted)[a]	63.3	66.1	-2.8	2,548	48.8	72.5	-23.8*	197	65.4	71.8	-6.3*	6,704	63.4	70.4	-7.0*	9,460
Matched samples																
Analysis 3[b]	59.1	66.4	-7.3	1,218	55.8	69.0	-13.1	274	67.1	70.5	-3.4*	10,354	65.9	70.5	-4.6*	11,792

Source: College administrative data.

Note: Table presents differences between gatekeeper course completion rates for participants and comparison students from three analyses described in Appendix B. Table C.IV.5 presents full regression results for analysis 2.

[a] These analyses used imputed data.

[b] This analyses used propensity score matching, in which each participant was matched to one or more similar comparison students.

* Significantly different from zero at the 0.05 level, two-tailed test.

P = participant; C = comparison student; MD = mean difference.

Table C.IV.4. Estimates of credential completion rates for participants and comparison students from three models, by college and overall

	ACC				BC				SCC				Consortium			
Analysis	**P**	**C**	**MD**	**N**	**P**	**C**	**MD**	**N**	**P**	**C**	**MD**	**N**	**P**	**C**	**MD**	**N**
Unmatched samples																
Analysis 1 (unadjusted)[a]	27.6	11.3	16.3*	8,362	13.1	23.1	-10.1*	684	11.6	15.8	-4.2*	10,208	13.8	13.6	0.2	19,265
Analysis 2 (adjusted)[a]	22.5	11.7	10.8*	8,362	12.3	26.7	-14.4*	684	10.7	16.7	-6.0*	10,208	11.7	14.7	-3.0*	19,265
Matched samples																
Analysis 3[b]	38.9	16.6	22.3*	3,882	13.9	6.2	7.6*	706	10.6	16.0	-5.4*	15,354	13.7	16.3	-2.6*	19,988

Source: College administrative data.

Note: Table presents differences between gatekeeper course completion rates for participants and comparison students from three analyses described in Appendix B. Table C.IV.5 presents full regression results for analysis 2.

[a] These analyses used imputed data.

[b] This analyses used propensity score matching, in which each participant was matched to one or more similar comparison students.

* Significantly different from zero at the 0.05 level, two-tailed test.

P = participant; C = comparison student; MD = mean difference.

Table C.IV.5. Gatekeeper course completion and credential completion, by college and overall, full regression results

	Gatekeeper course completion				Credential (certificate or degree) completion			
	ACC	BC	SCC	Consortium	ACC	BC	SCC	Consortium
Participant status	-0.13	-1.11*	-0.31*	-0.33*	0.83*	-1.05*	-0.55*	-0.28*
Age	0.00	0.00	0.01*	0.01*	0.03*	0.02	0.02*	0.03*
Female	-0.19	-0.68	0.19*	0.07	0.11	-0.18	0.14*	0.12*
Race/ethnicity								
Hispanic	-0.64*	-0.05	0.02	-0.37*	-0.36*	0.05	-0.19	-0.29*
Black or African American	-0.49*	-0.23	-0.64*	-0.60*	-0.29*	-0.19	-0.25*	-0.24*
Asian	0.08	0.49	-0.03	0.04	0.05	0.59	-0.28	-0.11
Other race	0.08	0.76	-0.47*	-0.26*	-0.58*	-0.13	-0.38*	-0.47*
ESL/ELL	0.17	0.65	0.00	0.46	0.42*	0.26	-0.73	0.29
Pell-eligible	0.31*	0.05	-0.41*	-0.24*	0.55*	-0.19	-0.32*	0.01
Expected family contribution	0.00	0.00	0.00*	0.00*	0.00	0.00	0.00*	0.00
High school GPA		0.28	0.19			1.22	0.63*	
Placed into developmental English, writing, or math course	0.83	0.00	-0.10	-0.12*	-0.01	2.22	-0.10	-0.16*
Prior postsecondary experience	0.09	-0.10	0.30*	0.27*	-0.04	0.65*	1.29*	0.60*
Prior postsecondary credential	0.48	-0.26	0.26*	0.22*	0.34	0.75*	0.84*	0.46*
Enrolled full time	0.01	0.60	-0.01	0.01	0.60*	1.48*	0.59*	0.59*
Veteran	-0.24	0.61	-0.16	-0.13	0.28*	0.02	-0.28	0.14
TAA-eligible			0.72				1.16	
N	2,548	197	6,704	9,460	8,362	684	10,208	19,265

Source: College administrative data.

Note: Table contains regression coefficients (log odds) from a logit model in which we regressed the gatekeeper course or credential completion indicator on the covariates indicated in the table. In the consortium-wide regression, we also included indicators for each college. Blank cells indicate cases in which we were unable to calculate results due to insufficient data. These analyses used imputed data.

* Significantly different from zero at the 0.05 level, two-tailed test.

ESL = English as a second language; ELL = English language learner; GPA = grade point average; TAA = trade adjustment assistance.

Table C.IV.6. Covariate balance, ACC

	Gatekeeper course completion				Credential (certificate or degree) completion			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Characteristic	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Average age	1.01	0.06	1.28	0.65	0.89	0.20	1.17	0.61
Female	0.33	0.11	1.39	1.10	0.01	-0.11	1.01	0.91
Race/ethnicity								
Hispanic	-0.16	-0.02	0.79	0.97	-0.34	-0.10	0.65	0.89
Black or African American	0.06	-0.08	1.22	0.75	-0.03	-0.22	0.91	0.42
Asian	-0.06	0.32	0.87	1.76	0.15	0.02	1.54	1.06
Other race	-0.19	-0.07	0.46	0.75	-0.17	0.03	0.51	1.10
ESL/ELL	-0.07	-0.03	0.54	0.72	-0.02	-0.04	0.84	0.67
Pell-eligible	-0.51	-0.13	0.49	0.86	-0.55	0.20	0.52	1.10
Placed into developmental English, writing, or math course					0.06	-0.01	2.79	0.67
Prior postsecondary experience	1.47	0.03	2.02	1.02	1.54	0.01	1.94	1.02
Prior postsecondary credential								
Enrolled full time	-0.56	0.11	0.75	1.04	-0.47	0.11	0.75	1.02
Veteran	-0.03	0.09	0.94	1.20	-0.06	0.07	0.87	1.17

Source: College administrative data.

Note: Participant and comparison groups are well matched when the standardized differences in the "Matched" columns are near 0 and when the variance ratios in the "Matched" columns are near 1. Values in the "Raw" column indicate standardized differences and variance ratios between participant and comparison groups in the raw, unmatched data. Blank cells indicate cases in which we were unable to calculate results due to insufficient data.

ESL = English as a second language; ELL = English language learner.

Table C.IV.7. Covariate balance, BC

	Gatekeeper course completion				Credential (certificate or degree) completion			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Characteristic	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Average age	0.24	-0.06	0.91	0.69	0.45	0.12	1.78	2.84
Female	0.33	0.11	1.39	1.10	0.80	-0.08	3.28	0.96
Race/ethnicity								
Hispanic	-0.16	0.15	0.81	1.29	0.14	0.26	1.17	1.44
Black or African American	0.01	-0.09	1.00	0.94	0.05	0.38	1.01	1.47
Other race	-0.19	-0.07	0.46	0.75	-0.02	0.13	0.91	2.09
ESL/ELL	-0.16	0.07	0.72	1.17	-0.20	0.24	0.64	2.19
Pell-eligible	-0.16	-0.03	1.13	1.04	-0.32	-0.50	1.29	1.90
Placed into developmental English, writing, or math course								
Prior postsecondary experience	0.98	0.00	0.30	1.00	0.97	-0.15	0.43	1.37
Prior postsecondary credential	0.73	0.04	5.57	1.06	0.41	-0.45	2.99	0.60
Enrolled full time	-0.56	0.11	0.75	1.04	-0.36	-0.50	1.48	2.02
Veteran	-0.01	-0.06	0.97	0.91	-0.03	-0.19	0.90	0.58

Source: College administrative and state wage record data.

Note: Participant and comparison groups are well matched when the standardized differences in the “Matched” columns are near 0 and when the variance ratios in the “Matched” columns are near 1. Values in the “Raw” column indicate standardized differences and variance ratios between participant and comparison groups in the raw, unmatched data. Blank cells indicate cases in which we were unable to calculate results due to insufficient data.

ESL = English as a second language; ELL = English language learner.

Table C.IV.8. Covariate balance, SCC

	Gatekeeper course completion				Credential (certificate or degree) completion			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Characteristic	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Average age	0.23	-0.01	0.96	0.87	0.26	-0.02	1.10	0.87
Female	-0.15	0.00	0.98	1.00	-0.27	0.02	0.93	1.00
Race/ethnicity								
Hispanic	0.01	-0.02	1.08	0.88	0.02	-0.01	1.11	0.91
Black or African American	-0.20	0.01	0.71	1.01	-0.16	-0.01	0.76	0.98
Asian	0.00	-0.01	1.01	0.92	-0.01	0.01	0.93	1.06
Other race	0.03	-0.02	1.15	0.93	0.03	0.03	1.16	1.15
ESL/ELL	-0.03	0.02	0.41	1.57	-0.07	0.00	0.24	1.04
Pell-eligible	0.13	0.00	1.03	1.00	0.09	0.02	1.03	1.01
Placed into developmental English, writing, or math					-0.46	-0.01	0.64	0.99
Prior postsecondary experience	0.20	0.01	0.75	0.98	0.12	0.00	0.83	1.01
Prior postsecondary credential	0.19	0.00	1.78	1.01	0.21	-0.02	1.71	0.95
Enrolled full time	-0.11	-0.02	1.02	1.00	-0.12	0.03	1.00	1.00
Veteran	0.05	0.02	1.22	1.08	0.04	0.00	1.21	1.02
TAA eligibility								

Source: College administrative and state wage record data.

Note: Participant and comparison groups are well matched when the standardized differences in the "Matched" columns are near 0 and when the variance ratios in the "Matched" columns are near 1. Values in the "Raw" column indicate standardized differences and variance ratios between participant and comparison groups in the raw, unmatched data. Blank cells indicate cases in which we were unable to calculate results due to insufficient data.

ESL = English as a second language; ELL = English language learner.

Table C.IV.9. Covariate balance, Consortium

	Gatekeeper course completion				Credential (certificate or degree) completion			
	Standardized differences		Variance ratio		Standardized differences		Variance ratio	
Characteristic	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Average age	0.30	0.01	1.02	0.84	0.31	0.03	1.16	0.91
Female	-0.11	-0.01	0.98	1.00	-0.18	0.06	0.94	1.02
Race/ethnicity								
Hispanic	0.00	0.00	0.99	1.01	-0.14	0.03	0.62	1.11
Black or African American	-0.16	-0.02	0.76	0.97	-0.05	0.01	0.91	1.02
Asian	-0.01	0.01	0.94	1.03	-0.03	0.01	0.88	1.05
Other race	0.01	0.00	1.05	1.00	-0.02	-0.04	0.92	0.84
ESL/ELL	0.02	-0.01	1.30	0.84	0.03	0.08	1.30	2.15
Pell-eligible	0.09	0.01	1.03	1.00	0.07	-0.07	1.03	0.97
Placed into developmental English, writing, or math course	-0.53	0.02	0.58	1.01	-0.32	0.06	0.64	1.07
Prior postsecondary experience	0.34	-0.01	0.67	1.01	0.49	0.07	0.61	0.94
Prior postsecondary credential	0.34	-0.03	2.30	0.94	0.32	0.01	1.99	1.03
Enrolled full time	-0.14	-0.02	1.02	1.00	-0.11	0.00	0.99	1.00
Veteran	0.03	-0.01	1.14	0.95	-0.04	-0.05	0.88	0.83

Source: College administrative and state wage record data.

Note: Participant and comparison groups are well matched when the standardized differences in the "Matched" columns are near 0 and when the variance ratios in the "Matched" columns are near 1. Values in the "Raw" column indicate standardized differences and variance ratios between participant and comparison groups in the raw, unmatched data.

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